FUJITSU Storage
ETERNUS AF, ETERNUS DX

Configuration Guide –Server Connection–

(Fibre Channel) for VMware® ESX
Driver Settings for Non-Fujitsu Fibre Channel Cards

FUJITSU

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Preface

This manual briefly explains the operations that need to be performed by the user in order to connect an ETERNUS AF/DX to a server running VMware® ESX and using non-Fujitsu Fibre Channel cards via a Fibre Channel interface.

This manual is used when performing the setup procedure described in "Setting Up the VMware ESX Server" of the "Configuration Guide -Server Connection- (Fibre Channel) for VMware® ESX".

This manual should be used in conjunction with any other applicable user manuals, such as those for the ETERNUS AF/DX, server, OS, Fibre Channel cards, and drivers.

In this manual, the setting procedures are explained using examples in the BIOS mode.

For the UEFI mode, the parameter names and the procedures may differ from those in this manual. Replace the setting values of the BIOS mode in this manual with the corresponding setting values found in the manuals of the Fibre Channel card and the server.

Refer to "Configuration Guide -Server Connection- Notations" for the notations used in this manual such as product trademarks and product names. For storage systems that are supported by the OS, refer to the Server Support Matrix of the ETERNUS AF/DX.

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The Contents and Structure of this Manual

This manual is composed of the following two chapters and an appendix.

This chapter describes how to set up the Emulex Fibre Channel card when connecting the ETERNUS AF/DX storage systems to the server via Emulex Fibre Channel cards.

This chapter describes how to set up the QLogic Fibre Channel card when connecting the ETERNUS AF/DX storage systems to the server via QLogic Fibre Channel cards.

A WWN instance management table for the server which is used for checking the Fibre Channel card is described in the appendix.

Table of Contents

Chapter 1
Setup Procedure for Emulex Fibre Channel Cards

This chapter describes how to set up the VMware ESX server when the connecting server uses Emulex Fibre Channel cards.

1.1 Workflow

Workflow

1

Setting Up the Fibre Channel Cards

Install the Fibre Channel cards, and acquire their physical addresses and WWN information.

- "1.2.1 Setting Up the Fibre Channel Cards" (page 6)

▼

2

Setting Up SAN Boot

Set up the SAN Boot configuration (if SAN Boot is to be used).

- "1.2.2 Setting Up SAN Boot" (page 14)

▼

3

Installing the VMware ESX

Install the VMware ESX software.

- "1.2.3 Installing the VMware ESX" (page 16)

▼

5

4

Setting Up the Fibre Channel Card Driver
Set up the parameters for the Fibre Channel card driver.

▽

After completing all the required procedures in this manual, proceed to "Checking the LUNs" in "Configuration Guide -Server Connection- (Fibre Channel) for VMware® ESX".

1.2   Setting Up the Fibre Channel Cards

This section explains how to set up the server for use with the Emulex Fibre Channel cards described in the "Server Support Matrix".

◯ N o t e

Depending on the Fibre Channel card used, the actual on-screen Fibre Channel card information may differ from that in the screenshots shown in this manual.

1.2.1   Setting Up the Fibre Channel Cards

Install the Fibre Channel cards in the server, acquire the relevant physical addresses and World Wide Names (WWNs), and perform Topology and LinkSpeed settings.

The physical address and WWN of a Fibre Channel card are required information in the following cases: when an error has occurred in the system, when using the ETERNUS AF/DX storage systems (security function, host affinity function, etc.) to restrict server access, or when connecting the ETERNUS AF/DX storage systems and the server using a Fibre Channel switch.

■ Checking and Configuring with UEFI

The workflow is shown below.

> (1) Install the Fibre Channel card
>
> (2) Turn on the server
>
> (3) Acquire the WWN for the Fibre Channel card
>
> (4) Add a record for the server in the WWN instance management table for the server
>
> (5) Set the Topology and LinkSpeed

The following shows an example of the checking and configuration procedure.

◯ N o t e

If the setting window is different, confirm that the parameters are same as the example and then perform a configuration.

Procedure

1 Install the Fibre Channel card in the server.

For the installation method, slot positions, activation of the installed slot, and notes regarding the Fibre Channel card, refer to the manual provided with the Fibre Channel card or the user guide of the server.

2 Turn on the server, and start the [UEFI BIOS setup] menu.

To display the menu, refer to the User's Guide for the server.

3 Select the port for the Fibre Channel card that is to be checked and press the [Enter] key.

4 Check the value of [Port Name].

The value of [Port Name] is the WWN.

```
                         Aptio Setup Utility - Copyright (C) 2019 American Megatrends, Inc.
        Advanced
 001: LPe32002-M2    PCIe8.0GT/s , x8                              Set to Enable to SCAN Fabric.
 LPe32002-M2 Port Name : 100000109B1B97C0
 Seg#: 00 Bus#: 18 Dev#: 00 Func#: 00

 Set Boot from SAN                    [Disable]
 ▶ Scan for Fibre Devices
 ▶ Add Boot Device
 ▶ Delete Boot Device
 ▶ Change Boot Device Order
 ▶ Configure HBA and Boot Parameters
 ▶ Set Emulex Adapter to Default Settings
 ▶ Display Adapter Info
 ▶ Legacy Only Configuration Settings
 ▶ Request RESET or RECONNECT to Make Changes Active
 ▶ Emulex Firmware Update Utility

                                                                  ↔: Select Screen
                                                                  ↑↓: Select Item
                                                                  Enter: Select
                                                                  +/-: Change Opt.
                                                                  F1: General Help
                                                                  F2: Previous Values
                                                                  F3: Optimized Defaults
                                                                  F4: Save & Exit
                                                                  ESC: Exit

                         Version 2.19.1268. Copyright (C) 2019 American Megatrends, Inc.
```

5 Record the WWN in the "WWN instance management table for the server".

The following shows an example of this.

WWN instance management table for the server

Host name	Server#1		
IP Address	192.168.0.10		
Physical slot name	Fibre Channel card WWN	Instance name	Cable tag
slot0	100000109B1B97C0		SRV1_SLOT0 to G620_1_port0

Details of contents

The details of contents for the WWN instance management table for the server are as follows:

Host name:

Record the host name.

IP Address:

Record the IP address of the server.

Physical slot name:

Record the slot position of the installed Fibre Channel card.

For the installation location, refer to the User's Guide for each server.

Fibre Channel card WWN:

Record the value of [Port Name].

Instance name:

Not necessary to record.

Cable tag:

Record a tag name which indicates the connection path (relationship between the connected device and the port).

6   Select "Configure HBA and Boot Parameters" and press the [Enter] key.

7   Select "Topology" and press the [Enter] key.

⬤ N o t e
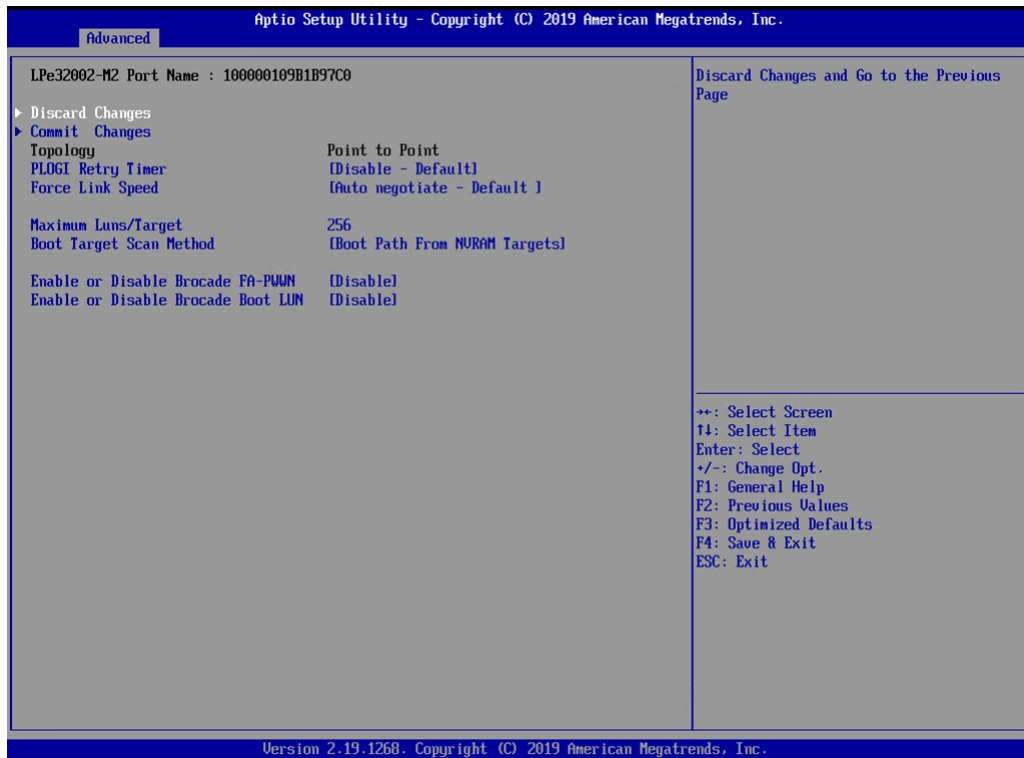
This setting is not required if an LPe3*xxxx* series Fibre Channel card is used. Proceed to Step 9.

8   Select "FC-AL" (for a direct connection) or "Point to Point" (for a switch connection), and then press the [Enter] key.

When a direct connection is used and the LinkSpeed is 16Gbit/s, select "Point to Point".

9   Select "Force Link Speed" and press the [Enter] key.

10   Select the transfer rate according to the values listed in the LinkSpeed settings table below, and press the [Enter] key.

LinkSpeed settings

Maximum transfer rate of the Fibre Channel card to be connected	Switch connection Fibre Channel switch maximum transfer rate					Direct connection Maximum CA transfer rate			
	64Gbit/s	32Gbit/s	16Gbit/s	8Gbit/s	4Gbit/s	32Gbit/s	16Gbit/s	8Gbit/s	4Gbit/s
64Gbit/s	64	32	16	8	–	32	16	8	–
32Gbit/s	32	32	16	8	4	32	16	8	4
16Gbit/s	16	16	16	8	4	16	16	8	4
8Gbit/s	8	8	8	8	4	8	8	8	4
4Gbit/s	–	4	4	4	4	–	4	4	4

> ▷ **Caution**

Contact the server vendor for supported transfer speeds because the supported transfer speeds vary depending on the OS and the storage system that is used.

11   Select "Commit Changes" and press the [Enter] key.

12   Return to the [UEFI BIOS setup] menu by pressing the [Esc] key.

13   Save the settings in the [UEFI BIOS setup] menu and then reboot.
For details, refer to the User's Guide for the server.

End of procedure

■ Checking and Configuring with Emulex LightPulse FC BIOS Utility

The relationship between a physical address and WWN cannot be determined from the BIOS. The physical address and WWN must be recorded as a pair when each Fibre Channel card is installed. Physical address and WWN must be assigned to "WWN instance management table for the server".

The workflow is shown below.

    (1) Install the Fibre Channel card

    (2) Turn on the server

    (3) Acquire the physical address and WWN for the Fibre Channel card

    (4) Add a record for the server in the WWN instance management table for the server

    (5) Set the Topology and LinkSpeed

The following shows an example of the checking and configuration procedure.

🔵 **N o t e**

If the setting window is different, confirm that the parameters are same as the example and then perform a configuration.

Procedure

1   Install the Fibre Channel card in the server.

For the installation method, slot positions, activation of the installed slot, and notes regarding the Fibre Channel card, refer to the manual provided with the Fibre Channel card or the user guide of the server.

2   Turn on the server, and press the [Alt] + [E] keys while the following message is displayed.

```
!!! Emulex LPxxxx BIOS Copyright xxxx !!! xxxxxxxx
Press <Alt E> to go to Emulex BIOS Utility.
Press <s> to skip Emulex BIOS
```

"Emulex LightPulse FC BIOS Utility" starts.

3   Select the port for the Fibre Channel card that is to be checked and press the [Enter] key.

4   Check the [Mem Base] and [Port Name] values.

The value of [Mem Base] is the physical address and the value of [Port Name] is the WWN.

```
    ------------------------------------------------------------------------------
                     Emulex LightPulse FC BIOS Utility, KA6.00a13
    ------------------------------------------------------------------------------
    01:  LPe16002-M6:                           Bus#: 02 Dev#: 00 Func#: 00
    Mem Base:  CE000000   Firmware Version:   1.1.8.0        BIOS: Disabled
    Port Name:  10000090FA02097E                Node Name:   20000090FA02097E
                                                Link Status:  Link Down
    ------------------------------------------------------------------------------


     Fibre Channel card WWN

     Physical address

                        Enable/Disable Boot from SAN
                        Scan for Target Devices
                        Reset Adapter Defaults
                        Configure Boot Devices
                        Configure Advanced Adapter Parameters




                        Enter <Esc> to Previous Menu
                   <↑/↓> to Highlight, <Enter> to Select
```

🔵 **N o t e**

The name of the physical address might be "I/O Base", "I/O Address", or "Mem Base", depending on the HBA BIOS version. For more information about how to check the physical address, refer to the HBA manual.

P3AM-6372-27ENZ0

5   Record the physical address and WWN in the "WWN instance management table for the server".

(found in "Appendix A WWN Instance Management Table for the Server (Blank)" (page 38)).

The following shows an example of this.

WWN instance management table for the server

Host name	Server#1			
IP Address	192.168.0.10			
Physical slot name	Fibre Channel card WWN	Instance name	Physical address	Cable tag
slot0	10000090FA02097E		CE000000	SERV1_SLOT0 to SN200_1_port0

Details of contents

Host name:

Record the host name.

IP Address:

Record the IP address of the server.

Physical slot name:

Record the slot position of the installed Fibre Channel card.

Fibre Channel card WWN:

Record the value of [Port Name].

Instance name:

Not necessary to record.

Physical address:

Record the value of [Mem Base].

Cable tag:

Record a tag name which indicates the connection path (relationship between the connected device and the port).

6   Select "Configure Advanced Adapter Parameters" and press the [Enter] key.

7   Select "Topology Selection" and press the [Enter] key.

🔵 N o t e

This setting is not required if an LPe3*xxxx* series Fibre Channel card is used. Proceed to Step 10.

8   Select "FC-AL" (for a direct connection) or "Fabric Point to Point" (for a switch connection), and then press the [Enter] key.

When a direct connection is used and the LinkSpeed is 16Gbit/s, select "Fabric Point to Point".

9   Press the [Esc] key to return to the window shown in Step 7.

13

10   Select "Link Speed Selection" and press the [Enter] key.

11   Select the transfer rate according to the values listed in the LinkSpeed settings table below, and press the [Enter] key.

LinkSpeed settings

Maximum transfer rate of the Fibre Channel card to be connected	Switch connection Fibre Channel switch maximum transfer rate					Direct connection Maximum CA transfer rate			
	64Gbit/s	32Gbit/s	16Gbit/s	8Gbit/s	4Gbit/s	32Gbit/s	16Gbit/s	8Gbit/s	4Gbit/s
64Gbit/s	64	32	16	8	–	32	16	8	–
32Gbit/s	32	32	16	8	4	32	16	8	4
16Gbit/s	16	16	16	8	4	16	16	8	4
8Gbit/s	8	8	8	8	4	8	8	8	4
4Gbit/s	–	4	4	4	4	–	4	4	4

▶ **Caution**

Contact the server vendor for supported transfer speeds because the supported transfer speeds vary depending on the OS and the storage system that is used.

12   Press the [Esc] key to quit the "Emulex LightPulse FC BIOS Utility".

When the total number of ports for installed Fibre Channel cards is two or more, first repeat Step 3 through Step 11 for each port, and then press the [Esc] key to exit "Emulex LightPulse FC BIOS Utility".

End of procedure

1.2.2   Setting Up SAN Boot

Refer to "Server Support Matrix" to check the support status of SAN Boot and refer to the manual of the server, OS, or the Fibre Channel card that is to be used.

When using a logical unit (LUN) of the ETERNUS AF/DX storage systems as a boot disk, make sure that the LUN has enough capacity to install the OS.

■ Configuring with UEFI

The following shows an example of a configuration procedure.

◯ **N o t e**

If the setting window is different, confirm that the parameters are same as the example and then perform a configuration.

Procedure

1   Turn on the server, and start the [UEFI BIOS setup] menu.

To display the menu, refer to the User's Guide for the server.

2   Select the Fibre Channel card port to be used for SAN Boot and press the [Enter] key.

3   Select "Set Boot from SAN" and press the [Enter] key.

4   Select "Enable" and press the [Enter] key.

5   Return to the [UEFI BIOS setup] menu by pressing the [Esc] key.

6   Save the settings in the [UEFI BIOS setup] menu and then reboot.
For details, refer to the User's Guide for the server.

End of procedure

1.2.3   Installing the VMware ESX

VMware ESX should be installed now if it has not yet been installed in the server. Refer to the following URL for details.

https://www.vmware.com/support/pubs/

1.2.4   Setting Up the Fibre Channel Card Driver

Change the parameters for the Fibre Channel card driver.

▷ **Caution**

For more details, refer to the VMware web-site for the KB. For details about application, check with your server vendor.

https://kb.vmware.com/s/article/84325

1.2.4.1   For VMware vSphere 5.5 or Later

Procedure

1   Record the module name for the Fibre Channel card that is loaded into VMware ESXi.

The underlined portion indicates the loaded module name. In the following example, "lpfc" is the module name.

```
# esxcli system module list | grep lpfc
lpfc                                    true        true
```

Module names may vary depending on the Fibre Channel card that is used.

2   Check the number of ports on the Fibre Channel card.

The number of HBA Names for the Fibre Channel card that is displayed represents the number of ports.

In the following example, the number of ports is "two" since "vmhba1" and "vmhba2" (two underlined portions) are displayed as the HBA Names of the card.

```
# esxcfg-scsidevs -a | grep lpfc
vmhba1  lpfc            link-up   fc.20000000c98df7c4:10000000c98df7c4    (0:2:0.0) Emulex Corporation
LPe12000 8Gb Fibre Channel Host Adapter
vmhba2  lpfc            link-up   fc.20000000c98df7c5:10000000c98df7c5    (0:2:0.1) Emulex Corporation
LPe12000 8Gb Fibre Channel Host Adapter
```

3   Check the default value for the Fibre Channel card.

Specify the module name for the Fibre Channel card that you recorded in Step 1 and check the default value.

```
# esxcli system module parameters list -m lpfc | grep lpfc[0-1]_lun_queue_depth
lpfc0_lun_queue_depth        int           Max number of FCP commands we can queue to a specific LUN
lpfc1_lun_queue_depth        int           Max number of FCP commands we can queue to a specific LUN
```

[0-1] indicates that the number of ports is two.

4   Change the setting values of the parameter for the Fibre Channel card driver.

Driver parameter	Setting value	
	When the VVOL function is used	For conditions that are not described in the left column
lpfcX_lun_queue_depth	8	Arbitrary (*1)

*1:   Recommended value = (maximum number of simultaneous command processes per CA port) ÷ (number of Fibre Channel ports connected to a single CA port) ÷ (number of LUNs)

(Round the result down to the nearest whole number)

• The maximum number of simultaneous command processes per CA port is as follows:

The value is used by multiple servers that share the CA port. The commands are processed until the limit is reached.

Model	Maximum number of simultaneous command processes
ETERNUS AF S3 series, ETERNUS DX S5 series, ETERNUS DX8900 S4	2048
Models other than the above	1024

• Use the value of "8" if the actual result is lower. Use the maximum value if the actual result exceeds the maximum value of the OS or the driver.

• To achieve maximum system performance, this value can be changed according to the server load and the peak operating times.

▷ **Caution**

When the value for this setting is changed, refer to "Configuration Guide -Server Connection- (Fibre Channel) for VMware® ESX" and change the setting value for the Maximum Outstanding Disk Requests for virtual machines as well.

Use the following command to change the setting values when the driver parameter name is "lpfcX_lun_queue_depth", the number of I/Os is "8", the module name is "lpfc", and the number of ports is "2".

```
# esxcli system module parameters set -p "lpfc0_lun_queue_depth=8 lpfc1_lun_queue_depth=8" -m lpfc
```

Input the number of I/Os ("8" in this example) for each driver parameter setting.

5   Reboot VMware ESXi.

```
# reboot
```

6   After rebooting VMware ESXi, check the setting values.

```
# esxcli system module parameters list -m lpfc | grep lpfc[0-1]_lun_queue_depth
lpfc0_lun_queue_depth        int    8      Max number of FCP commands we can queue to a specific LUN
lpfc1_lun_queue_depth        int    8      Max number of FCP commands we can queue to a specific LUN
```

End of procedure

Chapter 2
Setup Procedure for QLogic Fibre Channel Cards

This chapter describes how to set up the VMware ESX server when the connecting server uses QLogic Fibre Channel cards.

2.1   Workflow

Workflow

1

Setting Up the Fibre Channel Cards

Install the Fibre Channel cards, and acquire their physical addresses and WWN information.

- "2.2.1 Setting Up the Fibre Channel Cards" (page 20)

2

Setting Up SAN Boot

Set up the SAN Boot configuration (if SAN Boot is to be used).

- "2.2.2 Setting Up SAN Boot" (page 29)

3

Installing the VMware ESX

Install the VMware ESX software.

- "2.2.4 Installing the VMware ESX" (page 33)

19

4

Setting Up the Fibre Channel Card Driver
Set up the parameters for the Fibre Channel card driver.
- "2.2.5 Setting Up the Fibre Channel Card Driver" (page 34)

▼

After completing all the required procedures in this manual, proceed to "Checking the LUNs" in "Configuration Guide -Server Connection- (Fibre Channel) for VMware® ESX".

2.2   Setting Up the Fibre Channel Cards

This section describes how to set up the VMware ESX server for use with the QLogic Fibre Channel cards described in the "Server Support Matrix".

⬤ N o t e

Depending on the Fibre Channel card used, the actual on-screen Fibre Channel card information may differ from that in the screenshots shown in this manual.

2.2.1   Setting Up the Fibre Channel Cards

Install the Fibre Channel cards in the server, acquire the relevant physical addresses and World Wide Names (WWNs), and perform Topology and LinkSpeed settings.

The physical address and WWN of a Fibre Channel card are required information in the following cases: when an error has occurred in the system, when using the ETERNUS AF/DX storage systems (security function, host affinity function, etc.) to restrict server access, or when connecting the ETERNUS AF/DX storage systems and the server using a Fibre Channel switch.

■ Checking and Configuring with UEFI

The workflow is shown below.

(1) Install the Fibre Channel card

(2) Turn on the server

(3) Acquire the WWN for the Fibre Channel card

(4) Add a record for the server in the WWN instance management table for the server

(5) Set the Topology and LinkSpeed

The following shows an example of the checking and configuration procedure.

⬤ N o t e

If the setting window is different, confirm that the parameters are same as the example and then perform a configuration.

Procedure

1   Install the Fibre Channel card in the server.

For the installation method, slot positions, activation of the installed slot, and notes regarding the Fibre Channel card, refer to the manual provided with the Fibre Channel card or the user guide of the server.

2   Turn on the server, and start the [UEFI BIOS setup] menu.

To display the menu, refer to the User's Guide for the server.

3   Select the port for the Fibre Channel card that is to be checked and press the [Enter] key.

4   Select "Adapter Information" and press the [Enter] key.

21

5   Check the "WWPN" setting.

```
Aptio Setup Utility - Copyright (C) 2019 American Megatrends, Inc.
 Advanced

 Device Path                    PciRoot(0x1)/Pci(0x0,0x0)/Pci(0x0,0x0)
 WWPN                           21000024FF1712F4
 WWNN                           20000024FF1712F4
 Multiboot Version              1.01.89
 UEFI Driver Version            7.00
 BIOS Version                   3.62
 FCode Version                  4.11
 Firmware Version               8.08.204




                                                      →←: Select Screen
                                                      ↑↓: Select Item
                                                      Enter: Select
                                                      +/-: Change Opt.
                                                      F1: General Help
                                                      F2: Previous Values
                                                      F3: Optimized Defaults
                                                      F4: Save & Exit
                                                      ESC: Exit

       Version 2.19.1268. Copyright (C) 2019 American Megatrends, Inc.
```

6   Record the WWN in the "WWN instance management table for the server".

(found in).

The following shows an example of this.

WWN instance management table for the server

Host name	Server#1		
IP Address	192.168.0.10		
Physical slot name	Fibre Channel card WWN	Instance name	Cable tag
slot0	21000024FF1712F4		SRV2_SLOT0 to G620_2_port0

Details of contents

The details of contents for the WWN instance management table for the server are as follows:

Host name:

Record the host name.

IP Address:

Record the IP address of the server.

Physical slot name:

Record the slot position of the installed Fibre Channel card.

For the installation location, refer to the User's Guide for each server.

Fibre Channel card WWN:

Record the value of [WWPN].

22

Instance name:

Not necessary to record.

Cable tag:

Record a tag name which indicates the connection path (relationship between the connected device and the port).

7　Return to the menu shown in Step 3 by pressing the [Esc] key.

8　Select "Adapter Settings" and press the [Enter] key.

9　Select "FC Tape" and press the [Enter] key.
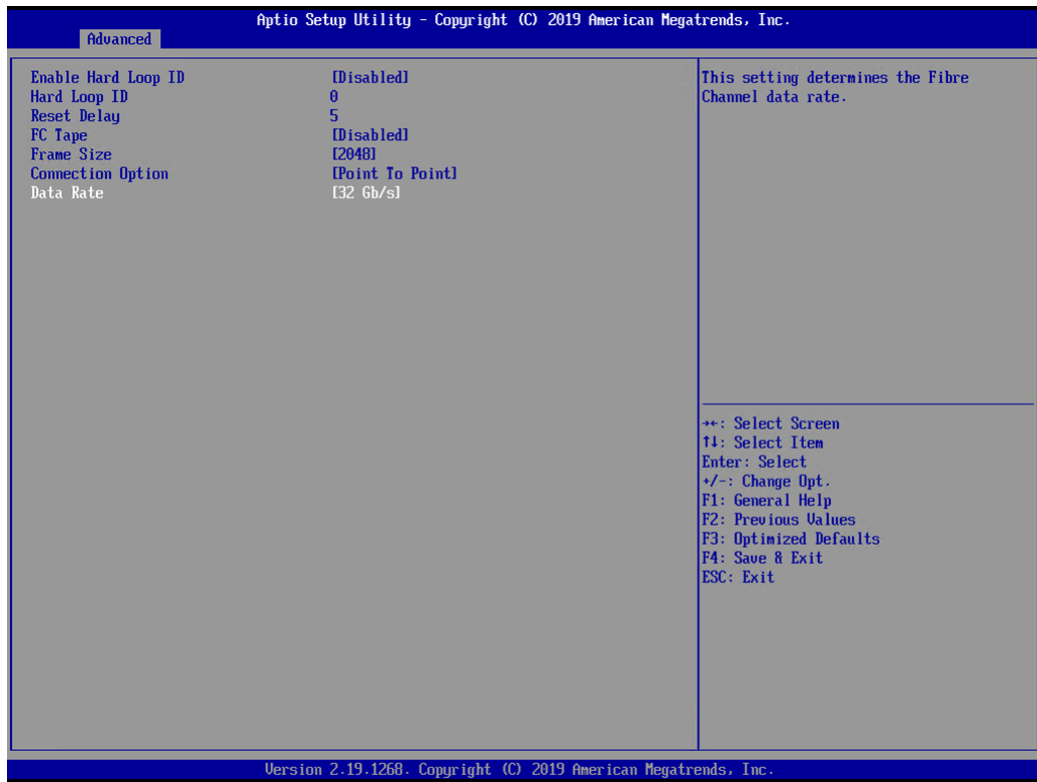

10　Select "Disabled" and press the [Enter] key.

11　Select "Connection Option" and press the [Enter] key.

12　Select "FC-AL" (for direct connections with an 8Gbit/s or lower Link Speed) or "Point to Point" (for other speeds), and then press the [Enter] key.

13　Select "Data Rate" and press the [Enter] key.

14   Select the transfer rate according to the values listed in the LinkSpeed settings table below, and press the [Enter] key.

LinkSpeed settings

Maximum transfer rate of the Fibre Channel card to be connected	Switch connection Fibre Channel switch maximum transfer rate					Direct connection Maximum CA transfer rate			
	64Gbit/s	32Gbit/s	16Gbit/s	8Gbit/s	4Gbit/s	32Gbit/s	16Gbit/s	8Gbit/s	4Gbit/s
64Gbit/s	64	32	16	8	–	32	16	8	–
32Gbit/s	32	32	16	8	4	32	16	8	4
16Gbit/s	16	16	16	8	4	16	16	8	4
8Gbit/s	8	8	8	8	4	8	8	8	4
4Gbit/s	–	4	4	4	4	–	4	4	4

```
                  Aptio Setup Utility – Copyright (C) 2019 American Megatrends, Inc.
    Advanced

  Enable Hard Loop ID        [Disabled]              This setting determines the Fibre
  Hard Loop ID               0                       Channel data rate.
  Reset Delay                5
  FC Tape                    [Disabled]
  Frame Size                 [2048]
  Connection Option          [Point To Point]
  Data Rate                  [32 Gb/s]




                                                     →←: Select Screen
                                                     ↑↓: Select Item
                                                     Enter: Select
                                                     +/-: Change Opt.
                                                     F1: General Help
                                                     F2: Previous Values
                                                     F3: Optimized Defaults
                                                     F4: Save & Exit
                                                     ESC: Exit

                  Version 2.19.1268. Copyright (C) 2019 American Megatrends, Inc.
```

▶ **Caution**

Contact the server vendor for supported transfer speeds because the supported transfer speeds vary depending on the OS and the storage system that is used.

15   Press the [Esc] key twice to return to the [UEFI BIOS setup] menu.

16   Save the settings in the [UEFI BIOS setup] menu and then reboot.

For details, refer to the User's Guide for the server.

End of procedure

■ Checking and Configuring with Fast!UTIL

The relationship between a physical address and WWN cannot be determined from the BIOS. The physical address and WWN must be recorded as a pair when each Fibre Channel card is installed. Physical address and WWN must be assigned to "WWN instance management table for the server".

The workflow is shown below.

   (1) Install the Fibre Channel card

   (2) Turn on the server

   (3) Acquire the physical address and WWN for the Fibre Channel card

   (4) Add a record for the server in the WWN instance management table for the server

   (5) Set the Fibre Channel card BIOS

The following shows an example of the checking and configuration procedure.

○ N o t e

If the setting window is different, confirm that the parameters are same as the example and then perform a configuration.
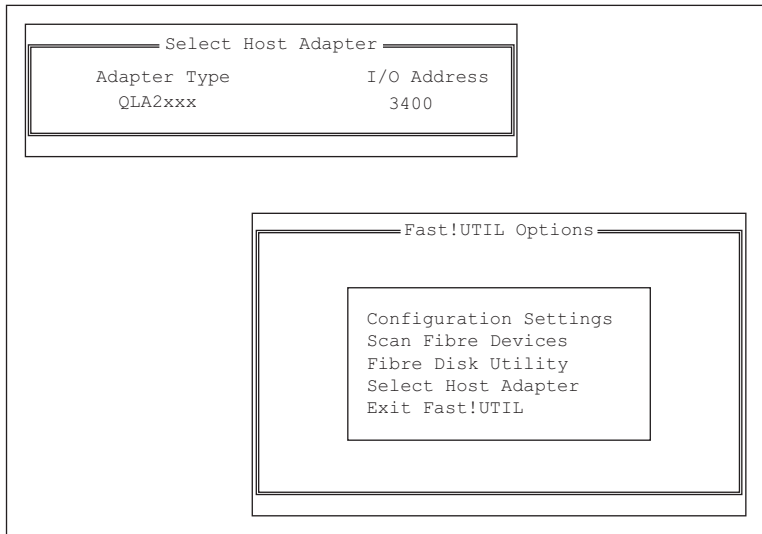
Procedure

1   Install the Fibre Channel card in the server.

For the installation method, installable positions (or positions of the PCI bus slots), activation of the installed slot, and notes regarding the Fibre Channel card, refer to the manual provided with the Fibre Channel card or the user guide of the server.

2   Turn on the server, and press the [Ctrl] + [Q] keys while the following message is displayed.

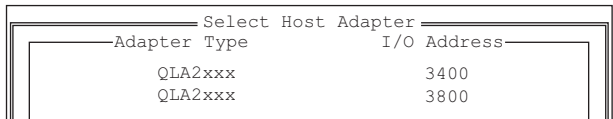The "Fast!UTIL" program starts up (Startup may take longer than usual).

```
QLogic Corporation
QLA2xxx PCI Fibre Channel ROM BIOS Version *.**
Copyright(C) QLogic Corporation 2000. All rights reserved
www.qlogic.com

Press <CTRL-Q> for Fast!UTIL
```
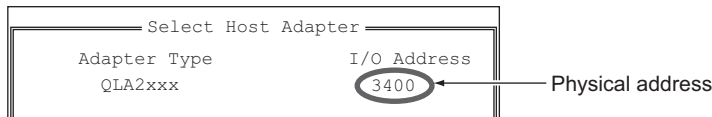
25

- When the "Fast!UTIL" program is started in an environment where the total number of ports of the installed Fibre Channel card is one, the following window appears.

```
┌──────── Select Host Adapter ────────┐
│  Adapter Type          I/O Address  │
│     QLA2xxx               3400      │
│                                     │
└─────────────────────────────────────┘

          ┌──────── Fast!UTIL Options ────────┐
          │                                   │
          │   ┌───────────────────────────┐   │
          │   │ Configuration Settings    │   │
          │   │ Scan Fibre Devices        │   │
          │   │ Fibre Disk Utility        │   │
          │   │ Select Host Adapter       │   │
          │   │ Exit Fast!UTIL            │   │
          │   └───────────────────────────┘   │
          │                                   │
          └───────────────────────────────────┘
```
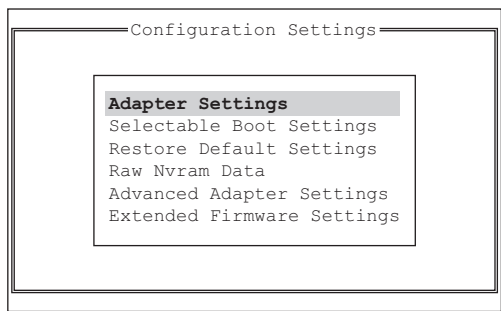
- When the "Fast!UTIL" program is started in an environment where the total number of ports of the installed Fibre Channel cards is two or more, the following [Select Host Adapter] window appears. Select a Fibre Channel card, and press the [Enter] key to get the above window.
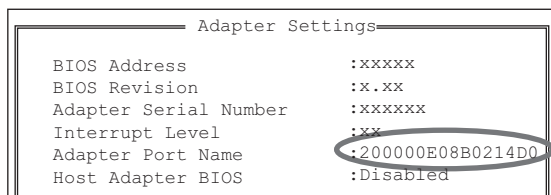
```
┌──────── Select Host Adapter ────────┐
│ Adapter Type          I/O Address   │
│    QLA2xxx               3400       │
│    QLA2xxx               3800       │
│                                     │
```

3   Check the value of [I/O Address].

The value of [I/O Address] is the physical address.

```
┌──────── Select Host Adapter ────────┐
│  Adapter Type          I/O Address  │
│     QLA2xxx              (3400) ◄──── Physical address
│                                     │
```

4   Select [Configuration Settings] from the [Fast!UTIL Options] menu.

5   Select [Adapter Settings] and press the [Enter] key.

```
┌──────── Configuration Settings ────────┐
│                                        │
│   ┌────────────────────────────────┐   │
│   │ Adapter Settings               │   │
│   │ Selectable Boot Settings       │   │
│   │ Restore Default Settings       │   │
│   │ Raw Nvram Data                 │   │
│   │ Advanced Adapter Settings      │   │
│   │ Extended Firmware Settings     │   │
│   └────────────────────────────────┘   │
│                                        │
└────────────────────────────────────────┘
```

6   Check the value of [Adapter Port Name].

The value of [Adapter Port Name] is the Fibre Channel card WWN.

```
╔══════════════ Adapter Settings══════════════╗
║                                              ║
║  BIOS Address            :xxxxx              ║
║  BIOS Revision           :x.xx               ║
║  Adapter Serial Number   :xxxxxx             ║
║  Interrupt Level         :xx                 ║
║  Adapter Port Name       :200000E08B0214D0   ║
║  Host Adapter BIOS       :Disabled           ║
╚══════════════════════════════════════════════╝
```

7   Record the physical address and WWN in the "WWN instance management table for the server".

(found in).

The following shows an example of this.

Host name	Server#1			
IP Address	192.168.0.10			
Physical slot name	Fibre Channel card WWN	Instance name	Physical address	Cable tag
slot0	20 00 00 E0 8B 02 14 D0		3400	SERV1_SLOT0 to SN200_1_port0

Details of contents

Host name:

Record the host name.

IP Address:

Record the IP address of the server.

Physical slot name:

Record the slot position of the installed Fibre Channel card.

Fibre Channel card WWN:

Record the value of [Adapter Port Name].

Instance name:

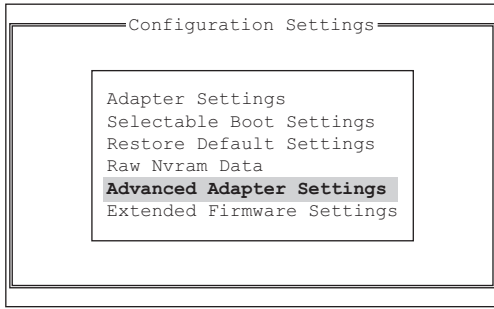Not necessary to record.

Physical address:

Record the value of [I/O Address].
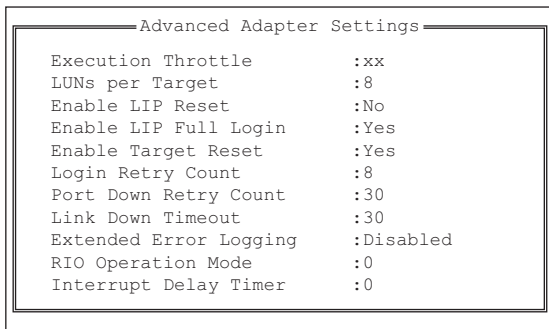
Cable tag:

Record a tag name which indicates the connection path (relationship between the connected device and the port).

8   Check the values for each parameter in the [Adapter Settings] window.

Refer to the section for the installed Fibre Channel card in and set each value.

For details on how to set the values, refer to Fibre Channel card user guide.

9   Return to the [Configuration Settings] menu by pressing the [Esc] key.

10   Select [Advanced Adapter Settings] and press the [Enter] key.

```
┌─────────Configuration Settings─────────┐
│                                        │
│   ┌──────────────────────────────┐     │
│   │  Adapter Settings            │     │
│   │  Selectable Boot Settings    │     │
│   │  Restore Default Settings    │     │
│   │  Raw Nvram Data              │     │
│   │  Advanced Adapter Settings   │     │
│   │  Extended Firmware Settings  │     │
│   │                              │     │
│   └──────────────────────────────┘     │
│                                        │
└────────────────────────────────────────┘
```

11   Check the values for each parameter in the [Advanced Adapter Settings] window.

Refer to the section for the installed Fibre Channel card in "2.2.6 Setting Up the Fibre Channel Card BIOS" (page 36) and set each value.

```
┌────────────Advanced Adapter Settings────────────┐
│                                                 │
│   Execution Throttle        :xx                 │
│   LUNs per Target           :8                  │
│   Enable LIP Reset          :No                 │
│   Enable LIP Full Login     :Yes                │
│   Enable Target Reset       :Yes                │
│   Login Retry Count         :8                  │
│   Port Down Retry Count     :30                 │
│   Link Down Timeout         :30                 │
│   Extended Error Logging    :Disabled           │
│   RIO Operation Mode        :0                  │
│   Interrupt Delay Timer     :0                  │
│                                                 │
└─────────────────────────────────────────────────┘
```
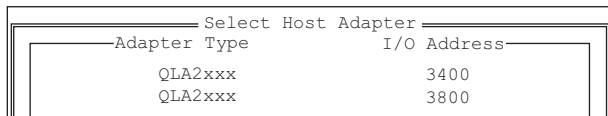
12   Press the [Esc] key twice to return to the [Fast!UTIL Options] menu.

If the BIOS settings were changed, save the settings using [Save xxxxxx]. If two or more Fibre Channel cards are installed in the server, select the second or a subsequent Fibre Channel card using the following steps and set the BIOS for the selected card.

(1)   Select [Select Host Adapter] and press the [Enter] key.

```
┌─────────Fast!UTIL Options─────────┐
│                                   │
│   ┌───────────────────────────┐   │
│   │  Configuration Settings   │   │
│   │  Scan Fibre Devices       │   │
│   │  Fibre Disk Utility       │   │
│   │  Select Host Adapter      │   │
│   │  Exit Fast!UTIL           │   │
│   └───────────────────────────┘   │
│                                   │
└───────────────────────────────────┘
```
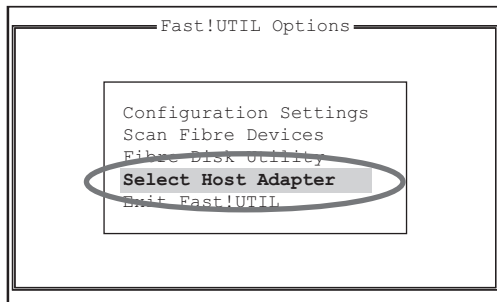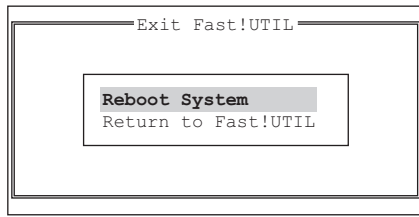
(2)   Select the Fibre Channel card to be set (BIOS setting) in the [Select Host Adapter] window.

The [Fast!UTIL Options] menu appears. Then perform Step 2 through Step 12.

```
┌─────────Select Host Adapter─────────┐
│┌─Adapter Type─────────I/O Address─┐ │
││                                  │ │
││   QLA2xxx              3400       │ │
││   QLA2xxx              3800       │ │
```

13   Select [Exit Fast!UTIL] and press the [Enter] key.

14   Select [Reboot System] and press the [Enter] key.

```
┌──────Exit Fast!UTIL──────┐
│                          │
│                          │
│   Reboot System          │
│   Return to Fast!UTIL     │
│                          │
│                          │
└──────────────────────────┘
```

The server reboots.

To return to the [Fast!UTIL] menu, select [Return to Fast!UTIL].

End of procedure

2.2.2   Setting Up SAN Boot

Refer to "Server Support Matrix" to check the support status of SAN Boot and refer to the manual of the server, OS, or the Fibre Channel card that is to be used.

When using a logical unit (LUN) of the ETERNUS AF/DX storage systems as a boot disk, make sure that the LUN has enough capacity to install the OS.

■ Configuring with UEFI

The following shows an example of a configuration procedure.

◉ **N o t e**

If the setting window is different, confirm that the parameters are same as the example and then perform a configuration.

Procedure

1   Turn on the server, and start the [UEFI BIOS setup] menu.
    To display the menu, refer to the User's Guide for the server.

2   Select the Fibre Channel card port to be used for SAN Boot and press the [Enter] key.

P3AM-6372-27ENZ0

3   Select "Boot Settings" and press the [Enter] key.
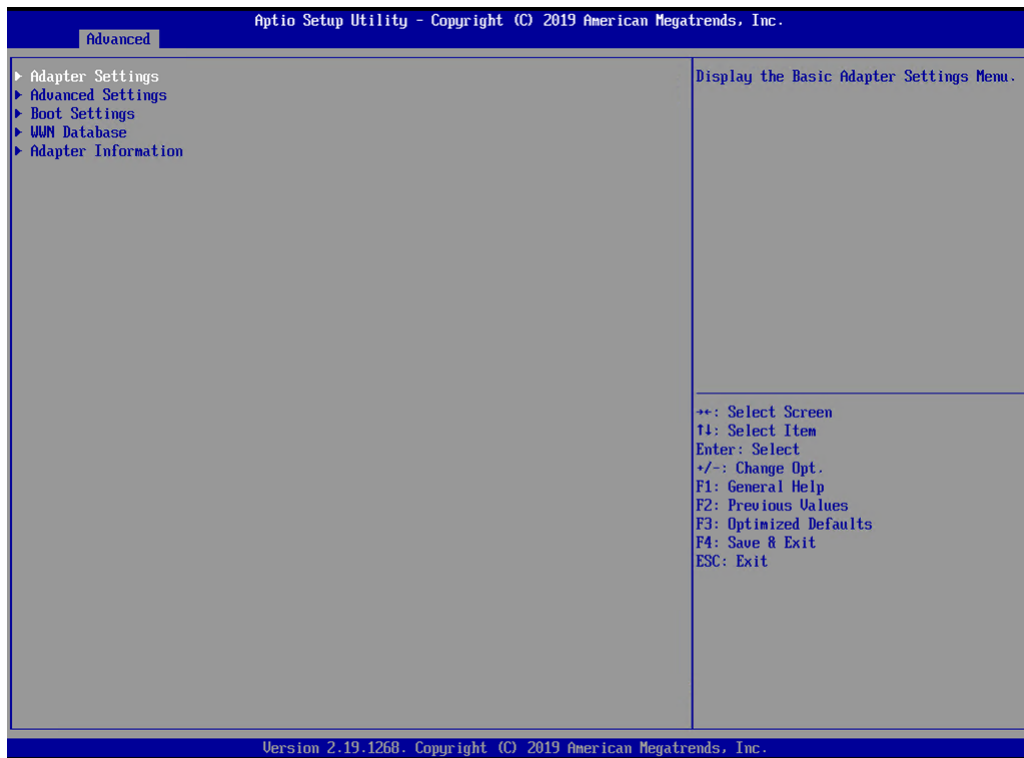
4   Select "Adapter Driver" and press the [Enter] key.
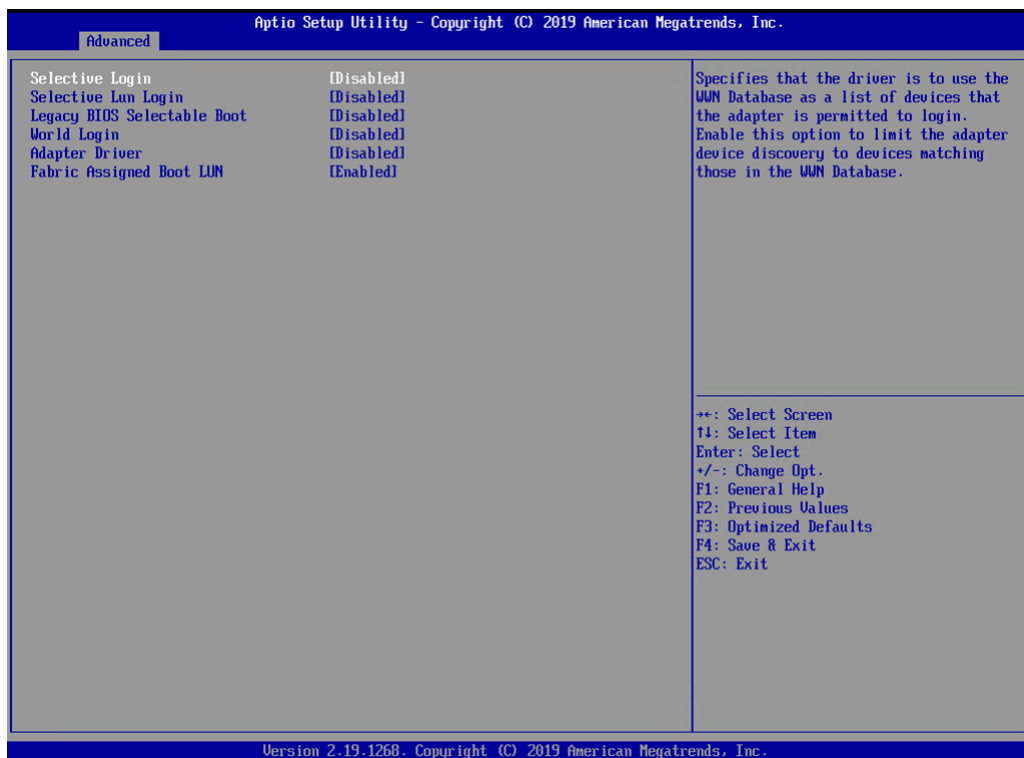
5   Select "Enabled" and press the [Enter] key.

6   Press the [Esc] key twice to return to the [UEFI BIOS setup] menu.

7   Save the settings in the [UEFI BIOS setup] menu and then reboot.
For details, refer to the User's Guide for the server.

End of procedure
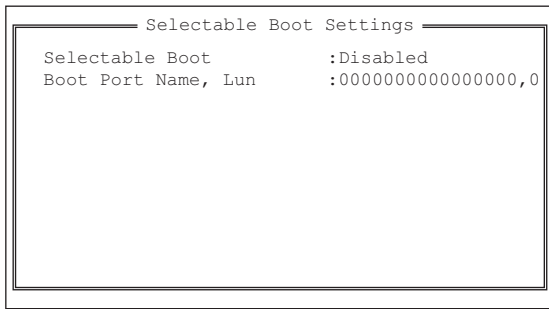
2.2.3   Setting the Selectable Boot

Procedure

1   Select [Selectable Boot Settings] from the [Configuration Settings] menu and press the [Enter] key.

2   Set [Selectable Boot] to "Enabled".

3   Select a boot path (ETERNUS AF/DX port WWN) and boot LUN#.

▷ **Caution**

The boot path and boot LUN# selection window only appears when [Host Adapter BIOS] is "Enabled" in [SAN Boot].

If [Host Adapter BIOS] is "Disabled", the boot path and boot LUN# selection window does not appear. Instead, the window shown in Step 4 appears when [Selectable Boot Settings] is selected.

4   Check the values for each parameter.

```
══════════ Selectable Boot Settings ══════════

 Selectable Boot          :Disabled
 Boot Port Name, Lun      :0000000000000000,0
```

Parameter	Setting value	Remarks
Selectable Boot	Enabled or Disabled	• Set [Enabled] for SAN Boot. • Set [Disabled] for non SAN Boot.
Boot Port Name, Lun	ETERNUS AF/DX port WWN, LUN# or 0000000000000000, 0	• The boot path (ETERNUS AF/DX port WWN) and boot LUN# for SAN Boot are separated by a comma. • "0000000000000000, 0" for non SAN Boot.

5   Return to the [Configuration Settings] menu by pressing the [Esc] key.

6   Press the [Esc] key twice to return to the [Fast!UTIL Options] menu.

If the BIOS settings were changed, save the settings using [Save xxxxxx].

When two or more Fibre Channel cards are installed in the server, select the second or later Fibre Channel card using the following steps, and set the BIOS of the selected card.

(1)   Select [Select Host Adapter] from the [Fast!UTIL Options] menu and press the [Enter] key.

```
══════════ Fast!UTIL Options ══════════


      Configuration Settings
      Scan Fibre Devices
      Fibre Disk Utility
      Select Host Adapter
      Exit Fast!UTIL
```

(2)   Select the Fibre Channel card to be set (BIOS setting).

```
══════════ Select Host Adapter ══════════
     Adapter Type          I/O Address
       QLA2xxx                3400
       QLA2xxx                3800
```
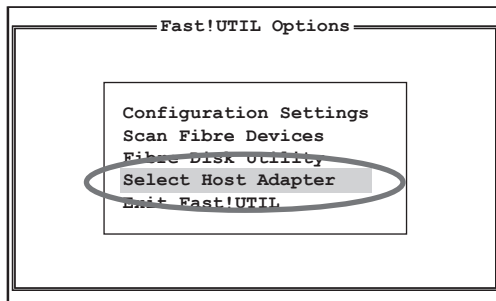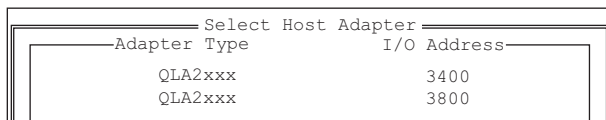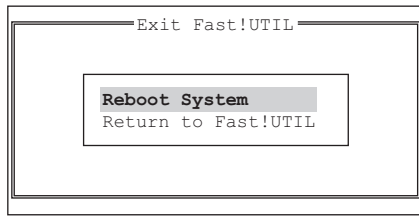
(3)   The [Fast!UTIL Options] menu appears. Then perform Step 1 through Step 6.

7   Select [Exit Fast!UTIL] and press the [Enter] key.

32

8   Select [Reboot System] and press the [Enter] key.

```
┌──────Exit Fast!UTIL──────┐
│                          │
│                          │
│  Reboot System           │
│  Return to Fast!UTIL     │
│                          │
│                          │
│                          │
└──────────────────────────┘
```

The server reboots.

To return to the [Fast!UTIL] menu, select [Return to Fast!UTIL].

End of procedure

2.2.4   Installing the VMware ESX

• VMware ESX should be installed now if it has not yet been installed in the server. Refer to the following URL for details.

  https://www.vmware.com/support/pubs/

• If SAN Boot is used, use the QLogic "Fast!UTIL" tool to check the Fibre Channel path in the Fibre Channel card BIOS.

  The Fibre Channel path can be checked on the server BIOS screen after the Fibre Channel settings are completed.

The checking procedure is as follows:

Procedure

1   Turn on the server, and press the [Ctrl] + [Q] keys while the following message is displayed.

  The "Fast!UTIL" program starts up (Startup may take longer than usual).

```
QLogic Corporation
QLA2xxx PCI Fibre Channel ROM BIOS Version *.**
Copyright(C) QLogic Corporation 2000. All rights reserved
www.qlogic.com

Press <CTRL-Q> for Fast!UTIL
```

2   When there are two or more Fibre Channel ports for the Fibre Channel card, select the appropriate port.

3   Select [Scan Fibre Devices] from the [Fast!UTIL Options] menu.

  The ETERNUS AF/DX storage systems should appear.

End of procedure

If the ETERNUS AF/DX storage systems appear, the settings were performed successfully. If the ETERNUS AF/DX storage systems do not appear, recheck the setup procedures given in this manual and the Fibre Channel switch settings.

2.2.5   Setting Up the Fibre Channel Card Driver

Change the parameters for the Fibre Channel card driver.

> ▷ **Caution**
>
> For more details, refer to the VMware web-site for the KB. For details about application, check with your server vendor.
>
> https://kb.vmware.com/s/article/84325

2.2.5.1   For VMware vSphere 5.5 or later

Procedure

1   Record the module name for the Fibre Channel card that is loaded into VMware ESXi.

The underlined portion indicates the loaded module name. In the following example, "qlnativefc" is the module name.

```
# esxcli system module list | grep qlnativefc
qlnativefc                          true        true
```

Module names may vary depending on the Fibre Channel card that is used.

2   Check the default value for the Fibre Channel card.

Specify the module name for the Fibre Channel card that you recorded in Step 1 and check the default value.

```
# esxcli system module parameters list -m qlnativefc | grep ql2xmaxqdepth
ql2xmaxqdepth               int          Maximum queue depth to report for target devices.
```

3   Change the setting values of the parameter for the Fibre Channel card driver.

Driver parameter	Setting value	
	When the VVOL function is used	**For conditions that are not described in the left column**
ql2xmaxqdepth	8	Arbitrary (*1)

*1:   Recommended value = (maximum number of simultaneous command processes per CA port) ÷ (number of Fibre Channel ports connected to a single CA port) ÷ (number of LUNs)

(Round the result down to the nearest whole number)

- The maximum number of simultaneous command processes per CA port is as follows:

The value is used by multiple servers that share the CA port. The commands are processed until the limit is reached.

Model	Maximum number of simultaneous command processes
ETERNUS AF S3 series, ETERNUS DX S5 series, ETERNUS DX8900 S4	2048
Models other than the above	1024

34

- Use the value of "8" if the actual result is lower. Use the maximum value if the actual result exceeds the maximum value of the OS or the driver.
- To achieve maximum system performance, this value can be changed according to the server load and the peak operating times.

> **Caution**

When the value for this setting is changed, refer to "Configuration Guide -Server Connection- (Fibre Channel) for VMware® ESX" and change the setting value for the Maximum Outstanding Disk Requests for virtual machines as well.

Use the following command to change the setting values when the driver parameter name is "ql2xmaxqdepth", the number of I/Os is "8", and the module name is "qlnativefc".

```
# esxcli system module parameters set -p ql2xmaxqdepth=8 -m qlnativefc
```

Input the number of I/Os ("8" in this example) for the driver parameter setting.

> **Caution**

This option cannot be individually applied to each port on the Fibre Channel card.

All ports on the target Fibre Channel card are configured with the same settings.

4   Reboot VMware ESXi.

```
# reboot
```

5   After rebooting VMware ESXi, check the setting values.

```
# esxcli system module parameters list -m qlnativefc | grep ql2xmaxqdepth
ql2xmaxqdepth                int   8      Maximum queue depth to report for target devices.
```

End of procedure

2.2.6   Setting Up the Fibre Channel Card BIOS

- [Adapter Settings] window

  Set the following parameters to the indicated values.

  If the current parameter values are different, change them to the indicated values. Note that some BIOS versions may not have the setting items.

Parameter	Setting value	Remarks
BIOS Address	Fixed for each card	Settings cannot be changed.
BIOS Revision (*1)		
Adapter Serial Number		
Interrupt Level		
Adapter Port Name		
Host Adapter BIOS	Enabled or Disabled	• Set [Enabled] for SAN Boot. • Set [Disabled] for non SAN Boot.
Frame Size	2048	If the current parameter values are different, change them to the indicated values.
Loop Reset Delay	5	
Adapter Hard Loop ID	Disabled	
Hard Loop ID	0	
Spinup Delay	Disabled	
Connection Options	0 or 1	• For direct connection: 0 (*2) • For switch connection: 1 (*3)
Fibre Channel Tape Support	Disabled	If the current parameter values are different, change them to the indicated values.
Data Rate	(*4)	0: 1Gbit/s fixed 1: 2Gbit/s fixed 2: Auto-negotiated 3: 4Gbit/s fixed 4: 8Gbit/s fixed 5: 16Gbit/s fixed 6: 32Gbit/s fixed

*1:   The BIOS version of the Fibre Channel card is displayed. Check that the BIOS version is the same as shown in "Server Support Matrix".

*2:   A setting value used for directly connecting to the ETERNUS AF/DX storage systems via a Fibre Channel pass-through blade.

   However, select "1" for direct connections between a 16Gbit/s or a 32Gbit/s Fibre Channel card and CAs with a 16Gbit/s or faster transfer rate.

*3:   A setting value used for connecting the Fibre Channel Switch to the ETERNUS AF/DX storage systems via a Fibre Channel pass-through blade or Fibre Channel switch blade.

*4:   Data Rate setting value list

Maximum transfer rate of the Fibre Channel card to be connected	Switch connection Fibre Channel switch maximum speed					Direct connection Maximum CA transfer rate			
	64Gbit/s	32Gbit/s	16Gbit/s	8Gbit/s	4Gbit/s	32Gbit/s	16Gbit/s	8Gbit/s	4Gbit/s
64Gbit/s	7	6	5	4	–	6	5	4	–
32Gbit/s	6	5	5	4	–	6	5	4	–
16Gbit/s	5	5	5	4	3	5	5	4	3
8Gbit/s	4	4	4	4	3	4	4	4	3
4Gbit/s	–	–	3	3	3	–	3	3	3

When connecting a QLogic 4Gbit/s Fibre Channel card and ETERNUS SN200 series Fibre Channel switch, the SFP can prevent the link from being established. Set Data Rate to 2 (AutoSelect) in that case. Contact your Fujitsu maintenance engineer for more details.

- [Advanced Adapter Settings] window

Set the following parameters to the indicated values.

If the current parameter values are different, change them to the indicated values. Note that some BIOS versions may not have the setting items.

Parameter	Setting value				
	32Gbit/s Fibre Channel card	16Gbit/s Fibre Channel card	8Gbit/s Fibre Channel card	4Gbit/s Fibre Channel card	2Gbit/s Fibre Channel card
Execution Throttle	–	–	65535	16	16
LUNs per Target	128				8
Enable LIP Reset	No				
Enable LIP Full Login	Yes				
Enable Target Reset	Yes				
Login Retry Count	8				
Port Down Retry Count	30				
Link Down Timeout	30				
Extended Error Logging	Disabled				
RIO Operation Mode	0				
Interrupt Delay Timer	0				
Enabled interrupt	No				–
EV Controller Order	Disabled				–

37

Appendix A
WWN Instance Management Table for the Server (Blank)

This management table is used in "Checking the Fibre Channel Card".

Utilize this table if necessary.

Host name				
IP Address				
Physical slot name	Fibre Channel card WWN	Instance name	Physical address	Cable tag

FUJITSU Storage ETERNUS AF, ETERNUS DX Configuration Guide -Server Connection-
(Fibre Channel) for VMware® ESX
Driver Settings for Non-Fujitsu Fibre Channel Cards

P3AM-6372-27ENZ0

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