FUJITSU

FUJITSU Server
PRIMEQUEST 2000 Series
Administration Manual

CA92344-0537-11

Preface

This manual describes the functions and features of the PRIMEQUEST 2000 series. The manual is intended for system administrators.
For details on the regulatory compliance statements and safety precautions, see the *PRIMEQUEST 2000 Series Safety and Regulatory Information* (CA92344-0523).

Organization of this manual

This manual is organized as follows.

CHAPTER 1 Network Environment Setup and Tool Installation
CHAPTER 2 Operating System Installation
CHAPTER 3 Component Configuration and Replacement (Add, Remove)
CHAPTER 4 Hot Maintenance in Red Hat Enterprise Linux 6
CHAPTER 5 Hot Maintenance in Red Hat Enterprise Linux 7
CHAPTER 6 PCI Card Hot Maintenance in SUSE Linux Enterprise Server 11
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Appendix M Information of PCI Express card

Revision History

Edition	Date	Revised location (type) (*1)	Description
01	2014-08-12	All pages	- The edition is initialized to "01" for changing manual code - Added descripations about Extended Partitioning function
02	2014-10-07	All pages	- Added description about RHEL7
03	2015-02-03	Chapter 3	- Modified and added description about Extended Partitioning and Dynamic Reconfiguration
04	2015-05-01	All pages	- Added description about PRIMEQUEST 2400E2/2800E2/2800B2 - Added description about Memory Scale-up Board and Extended Socket
05	2015-09-29	Appendix G	- Added description about 32GB RDIMM.
06	2015-10-30	Chapter 3	- Modified and added description about Extended Partitioning
07	2016-01-29	Chapter 3	- Added description about Expansion of components
08	2016-05-30	All pages	- Added description about PRIMEQUEST 2400E3/2800E3/2800B3
		Chapter 3	- Added description about Address Range Mirror
09	2016-11-28	Chapter 3	- Modified description about Address Range Mirror
		Chapter 5, 7	Modified description about RHEL 7 and SLES 12.
10	2017-02-08	All pages	- Added description about Windows Server 2016
		Chapter 3	- Modified description about Reserved SB setting
11	2017-08-08	Chapter 3	- Modified description about Extended Partitioning

*1: Chapter, section, and item numbers in the "Revised location" column refer to those in the latest edition of the document. However, a number marked with an asterisk (*) denotes a chapter, section, or item in a previous edition of the document.

Product operating environment

This product is a computer intended for use in a computer room environment. For details on the product operating environment, see the following manual:
PRIMEQUEST 2000 Series Hardware Installation Manual (CA92344-0535)

Safety Precautions

Alert messages

This manual uses the following alert messages to prevent users and bystanders from being injured and to prevent property damage.

WARNING

This indicates a hazardous (potentially dangerous) situation that is likely to result in death or serious personal injury if the user does not perform the procedure correctly.

CAUTION

This indicates a hazardous situation that could result in minor or moderate personal injury if the user does not perform the procedure correctly. This also indicates that damage to the product or other property may occur if the user does not perform the procedure correctly.

Important

This indicates information that could help the user use the product more efficiently.

Alert messages in the text

An alert statement follows an alert symbol. An alert statement is indented on both ends to distinguish it from regular text. Similarly, one space line is inserted before and after the alert statement.

WARNING

Only Fujitsu certified service engineers should perform the following tasks on this product and the options provided by Fujitsu. Customers must not perform these tasks under any circumstances. Otherwise, electric shock, injury, or fire may result.

- Newly installing or moving equipment
- Removing the front, rear, and side covers
- Installing and removing built-in options
- Connecting and disconnecting external interface cables
- Maintenance (repair and periodic diagnosis and maintenance)

The List of important alert items table lists important alert items.

List of important alert items

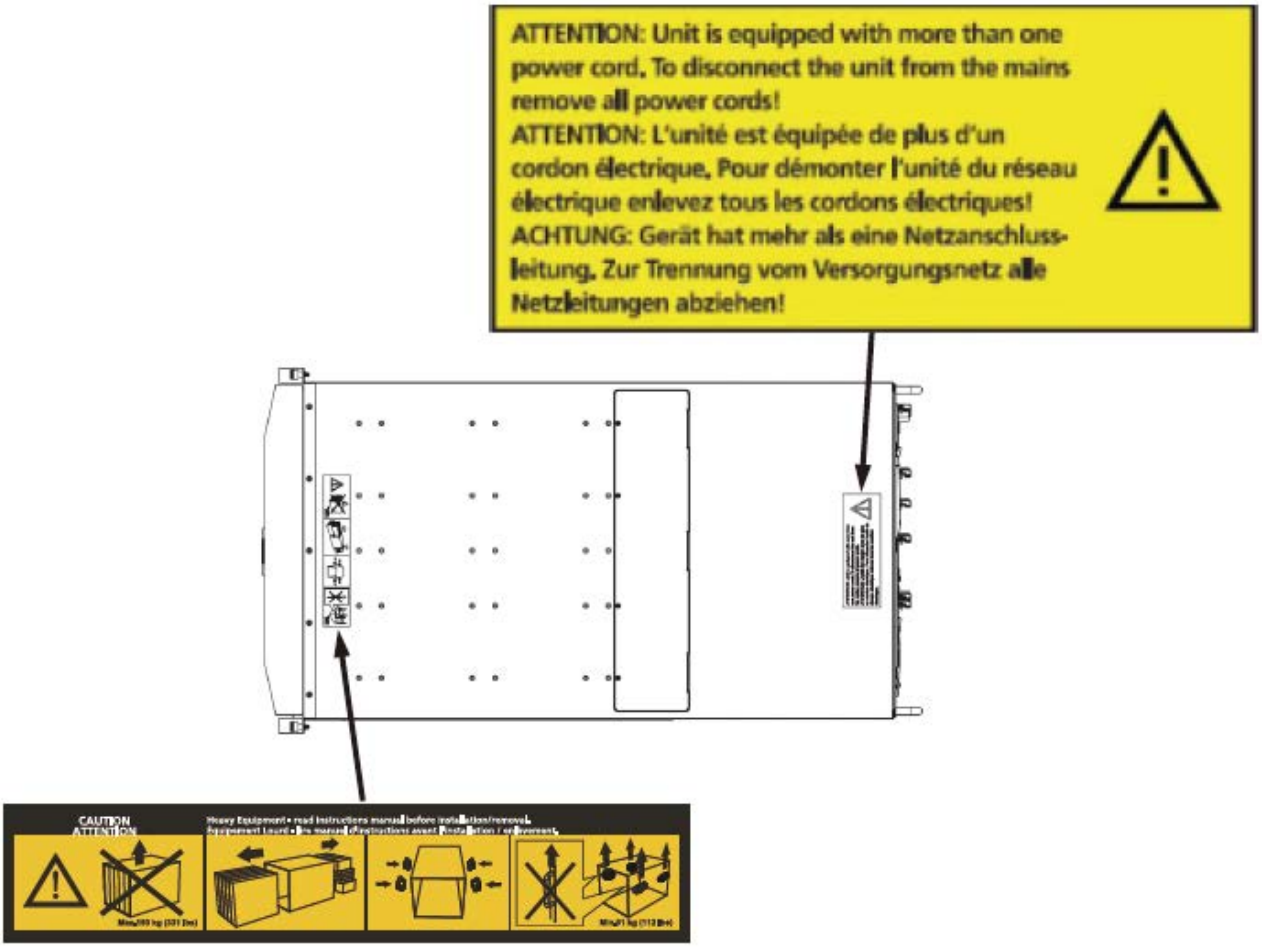
This manual does not contain important alert items.

Warning labels

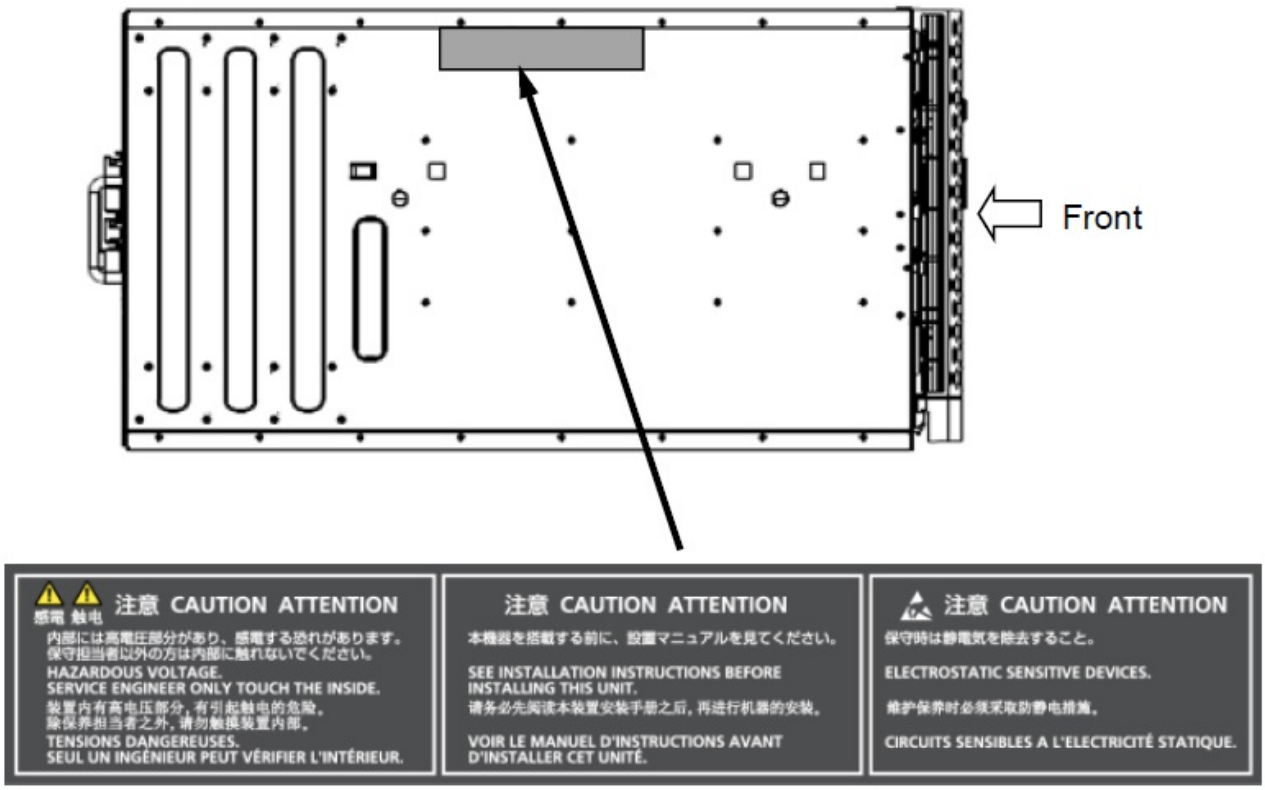
CAUTION

Never remove the warning labels.

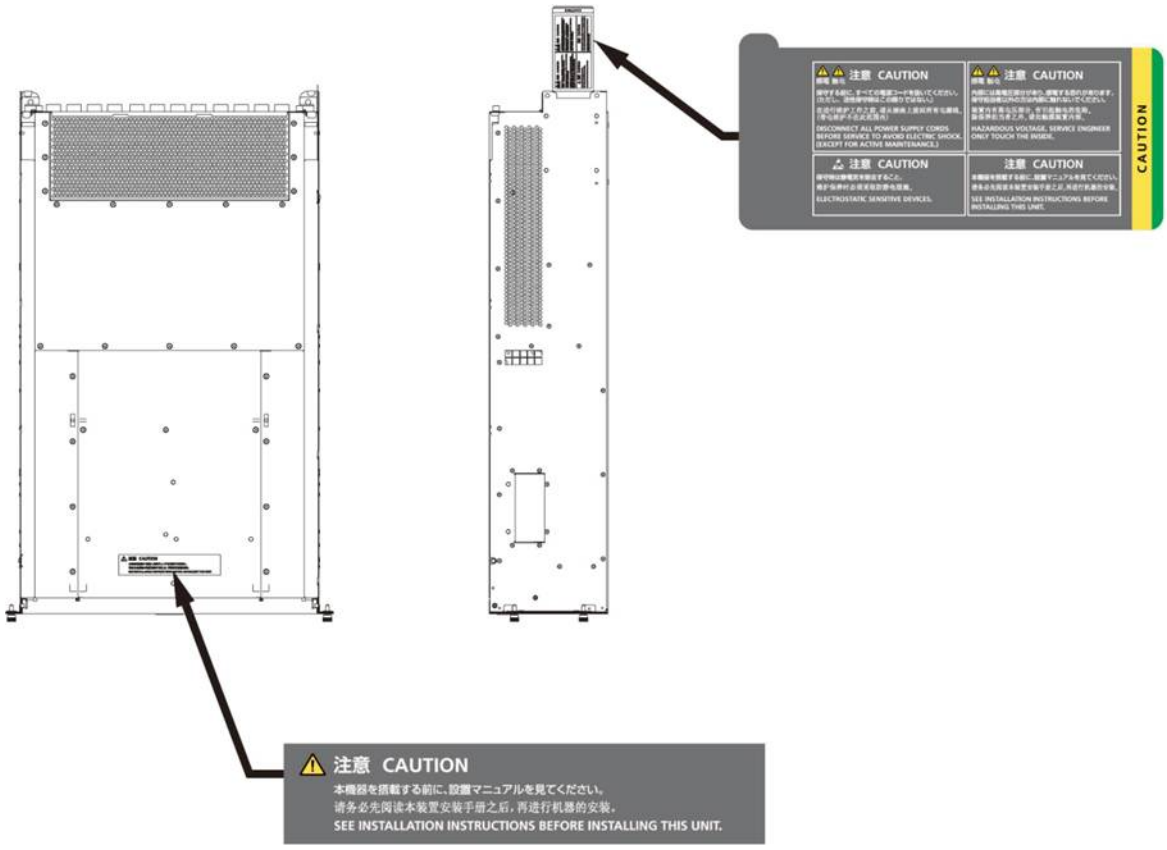
Warning label location (the main cabinet top)


ATTENTION: Unit is equipped with more than one power cord. To disconnect the unit from the mains remove all power cords!
ATTENTION: L'unité est équipée de plus d'un cordon électrique. Pour démonter l'unité du réseau électrique enlevez tous les cordons électriques!
ACHTUNG: Gerät hat mehr als eine Netzanschluss-leitung. Zur Trennung vom Versorgungsnetz alle Netzleitungen abziehen!
CAUTION
ATTENTION

Warning label location (the main cabinet left)



Warning label location (PCI_Box)



Notes on Handling the Product

About this product

This product is designed and manufactured for standard applications. Such applications include, but are not limited to, general office work, personal and home use, and general industrial use. The product is not intended for applications that require extremely high levels of safety to be guaranteed (referred to below as "safety-critical" applications). Use of the product for a safety-critical application may present a significant risk of personal injury and/or death. Such applications include, but are not limited to, nuclear reactor control, aircraft flight control, air traffic control, mass transit control, medical life support, and missile launch control. Customers shall not use the product for a safety-critical application without guaranteeing the required level of safety. Customers who plan to use the product in a safety-critical system are requested to consult the Fujitsu sales representatives in charge.

Storage of accessories

Keep the accessories in a safe place because they are required for server operation.

Adding optional products

For stable operation of the PRIMEQUEST 2000 series server, use only a Fujitsu-certified optional product as an added option.

Note that the PRIMEQUEST 2000 series server is not guaranteed to operate with any optional product not certified by Fujitsu.

Exportation/release of this product

Exportation/release of this product may require necessary procedures in accordance with the regulations of the Foreign Exchange and Foreign Trade Control Law of Japan and/or US export control laws.

Maintenance

Only Fujitsu certified service engineers should perform the following tasks on this product and the options provided by Fujitsu. Customers must not perform these tasks under any circumstances. Otherwise, electric shock, injury, or fire may result.

- Newly installing or moving equipment
- Removing the front, rear, and side covers
- Installing and removing built-in options
- Connecting and disconnecting external interface cables
- Maintenance (repair and periodic diagnosis and maintenance)

Only Fujitsu certified service engineers should perform the following tasks on this product and the options provided by Fujitsu. Customers must not perform these tasks under any circumstances. Otherwise, product failure may result. PRIMEQUEST 2000 Series General Description

- Unpacking an optional Fujitsu product, such as an optional adapter, delivered to the customer

Modifying or recycling the product

Modifying this product or recycling a secondhand product by overhauling it without prior approval may result in personal injury to users and/or bystanders or damage to the product and/or other property.

Note on erasing data from hard disks when disposing of the product or transferring it

Disposing of this product or transferring it as is may enable third parties to access the data on the hard disk and use it for unforeseen purposes. To prevent the leakage of confidential information and important data, all of the data on the hard disk must be erased before disposal or transfer of the product.

However, it can be difficult to completely erase all of the data from the hard disk. Simply initializing (reformatting) the hard disk or deleting files on the operating system is insufficient to erase the data, even though the data appears at a glance to have been erased. This type of operation only makes it impossible to access the data from the operating system. Malicious third parties can restore this data.

If you save your confidential information or other important data on the hard disk, you should completely erase the data, instead of simply carrying out the aforementioned operation, to prevent the data from being restored. To prevent important data on the hard disk from being leaked when the product is disposed of or transferred, you will need to take care to erase all the data recorded on the hard disk on your own responsibility.
Furthermore, if a software license agreement restricts the transfer of the software (operating system and application software) on the hard disk in the server or other product to a third party, transferring the product without deleting the software from the hard disk may violate the agreement. Adequate verification from this point of view is also necessary.

Product and service inquiries

For all product use and technical inquiries, contact the distributor where you purchased your product, or a Fujitsu sales representative or systems engineer (SE). If you do not know the appropriate contact address for inquiries about the PRIMEQUEST 2000 series, use the Fujitsu contact line.

Fujitsu contact line

We accept Web inquiries. For details, visit our website:
https://support.ts.fujitsu.com/IndexContact.asp?lng=COM&ln=true

Warranty

If a component failure occurs during the warranty period, we will repair it free of charge in accordance with the terms of the warranty agreement. For details, see the warranty.

Before requesting a repair

If a problem occurs with the product, confirm the problem by referring to 12.2 Troubleshooting in the *PRIMEQUEST 2000 Series Administration Manual* (CA92344-0537). If the error recurs, contact your sales representative or a field engineer.
Confirm the model name and serial number shown on the label affixed to the right front of the device and report it. Also check any other required items beforehand according to 12.2 Troubleshooting in the *PRIMEQUEST 2000 Series Administration Manual* (CA92344-0537).
The system settings saved by the customer will be used during maintenance.

Manual

How to use this manual

This manual contains important information about the safe use of this product. Read the manual thoroughly to understand the information in it before using this product. Be sure to keep this manual in a safe and convenient location for quick reference.
Fujitsu makes every effort to prevent users and bystanders from being injured and to prevent property damage. Be sure to use the product according to the instructions in this manual.
Exportation/release of this document may require necessary procedures in accordance with the regulations of the Foreign Exchange and Foreign Trade Control Law of Japan and/or US export control laws.

Manuals for the PRIMEQUEST 2000 series

The following manuals have been prepared to provide you with the information necessary to use the PRIMEQUEST 2000 series.
You can access HTML versions of these manuals at the following sites:
Japanese-language site:
http://www.fujitsu.com/jp/products/computing/servers/primequest/products/2000/catalog/manual/2000/
Global site:
http://www.fujitsu.com/global/products/computing/servers/mission-critical/primequest/documents/manuals/
http://manuals.ts.fujitsu.com/

Title	Description	Manual code
PRIMEQUEST 2000 Series Getting Started Guide	Describes what manuals you should read and how to access important information after unpacking the PRIMEQUEST 2000 series server. (This manual comes with the product.)	CA92344-0522
PRIMEQUEST 2000 Series Safety and Regulatory Information	Contains important information required for using the PRIMEQUEST 2000 series safely.	CA92344-0523
PRIMEQUEST 2000 Series General Description	Describes the functions and features of the PRIMEQUEST 2000 series.	CA92344-0534
SPARC Enterprise/ PRIMEQUEST Common Installation Planning Manual	Provides the necessary information and concepts you should understand for installation and facility planning for SPARC Enterprise and PRIMEQUEST installations.	C120-H007EN
PRIMEQUEST 2000 Series Hardware Installation Manual	Includes the specifications of and the installation location requirements for the PRIMEQUEST 2000 series.	CA92344-0535
PRIMEQUEST 2000 Series Installation Manual	Describes how to set up the PRIMEQUEST 2000 series server, including the steps for installation preparation, initialization, and software installation.	CA92344-0536
PRIMEQUEST 2000 Series User Interface Operating Instructions	Describes how to use the Web-UI and UEFI to assure proper operation of the PRIMEQUEST 2000 series server.	CA92344-0538
PRIMEQUEST 2000 Series Administration Manual	Describes how to use tools and software for system administration and how to maintain the system (component replacement and error notification).	CA92344-0537
PRIMEQUEST 2000 Series Tool Reference	Provides information on operation methods and settings, including details on the MMB and UEFI functions.	CA92344-0539
PRIMEQUEST 2000 Series Message Reference	Lists the messages that may be displayed when a problem occurs during operation and describes how to respond to them.	CA92344-0540
PRIMEQUEST 2000 Series REMCS Installation Manual	Describes REMCS service installation and operation	CA92344-0542
PRIMEQUEST 2000 Series Glossary	Defines the PRIMEQUEST 2000 series related terms and abbreviations.	CA92344-0541

Related manuals

The following manuals relate to the PRIMEQUEST 2000 series.
You can access these manuals at the following site:

http://www.fujitsu.com/global/products/computing/servers/mission-critical/primequest/documents/manuals/
http://manuals.ts.fujitsu.com/
Contact your sales representative for inquiries about the ServerView manuals.

Title	Description
ServerView Suite ServerView Operations Manager Quick Installation (Windows)	Describes how to install and start ServerView Operations Manager in a Windows environment.
ServerView Suite ServerView Operations Manager Quick Installation (Linux)	Describes how to install and start ServerView Operations Manager in a Linux environment.
ServerView Suite ServerView Installation Manager	Describes the installation procedure using ServerView Installation Manager.

Title	Description
ServerView Suite ServerView Operations Manager Server Management	Provides an overview of server monitoring using ServerView Operations Manager, and describes the user interface of ServerView Operations Manager.
ServerView Suite ServerView RAID Management User Manual	Describes RAID management using ServerView RAID Manager.
ServerView Suite Basic Concepts	Describes basic concepts about ServerView Suite.
ServerView Operations Manager Installation ServerView Agents for Linux	Describes installation and update installation of ServerView Linux Agent.
ServerView Operations Manager Installation ServerView Agents for Windows	Describes installation and update installation of ServerView Windows Agent.
ServerView Mission Critical Option User Manual	Describes the necessary functions unique to PRIMEQUEST (cluster linkage) and ServerView Mission Critical Option (SVmco), which is required for supporting these functions.
ServerView RAID Manager VMware vSphere ESXi 5 Installation Guide	Describes the installation and settings required to use ServerView RAID Manager on the VMware vSphere ESXi 5 server.
Modular RAID Controller *LSI MegaRAID SAS 2.0 Software* *LSI MegaRAID SAS 2.0 Device Driver Installation*	Provides technical information on using SAS RAID controllers. RAID Ctrl SAS 6Gb 1GB (D3116C) MegaRAID SAS 9286CV-8e Refer to the following URL: The Fujitsu Technology Solutions manuals server http://manuals.ts.fujitsu.com/
Modular RAID Controller *LSI MegaRAID SAS 3.0 Software* *LSI Integrated RAID SAS 3.0 Solution*	Provides technical information on using SAS RAID controllers. PRAID EP400i / EP420i (D3216) PRAID EP420e Refer to the following URL: The Fujitsu Technology Solutions manuals server http://manuals.ts.fujitsu.com/

Abbreviations

This manual uses the following product name abbreviations.

Formal product name	Abbreviation
Microsoft (R) Windows Server (R) 2016 Datacenter	Windows, Windows Server 2016
Microsoft (R) Windows Server (R) 2016 Standard	
Microsoft (R) Windows Server (R) 2012 R2 Datacenter	Windows, Windows Server 2012 R2
Microsoft (R) Windows Server (R) 2012 R2 Standard	
Microsoft (R) Windows Server (R) 2012 Datacenter	Windows, Windows Server 2012
Microsoft (R) Windows Server (R) 2012 Standard	
Microsoft (R) Windows Server (R) 2008 R2 Standard	Windows, Windows Server 2008
Microsoft (R) Windows Server (R) 2008 R2 Enterprise	

Formal product name	Abbreviation
Microsoft (R) Windows Server (R) 2008 R2 Datacenter	
Red Hat (R) Enterprise Linux (R) 7 (for Intel64)	Linux, RHEL7, RHEL
Red Hat (R) Enterprise Linux (R) 6 (for Intel64)	Linux, RHEL6, RHEL
Oracle Linux 6 (x86_64)	Oracle Linux, Oracle Linux 6
VMware vSphere (R) 6	VMware, vSphere 6.x, VMware 6, VMware 6.x
VMware (R) ESXi (TM) 6	ESXi, ESXi 6, ESXi 6.x
VMware vSphere (R) 5	VMware, vSphere 5.x, VMware 5, VMware 5.x
VMware (R) ESXi (TM) 5	ESXi, ESXi 5, ESXi 5.x
SUSE (R) Linux Enterprise Server 12	SLES12
SUSE (R) Linux Enterprise Server 11 Service Pack 3	SLES11 SP3

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- Xen is a trademark or registered trademark of Citrix Systems, Inc. or its subsidiaries in the United States and other countries.
- Other company names and product names are the trademarks or registered trademarks of their respective owners.
- Trademark indications are omitted for some system and product names in this manual.

Notation

This manual uses the following fonts and symbols to express specific types of information.

Font or symbols	Meaning	Example
italics	Title of a manual that you should refer to	See the *PRIMEQUEST 2000 Series Installation Manual* (CA92344-0536).
[ ]	Window names as well as the names of buttons, tabs, and drop-down menus in windows are enclosed in brackets.	Click the [OK] button.

Notation for the CLI (command line interface)

The following notation is used for commands.

Command syntax

Command syntax is represented as follows.

- Variables requiring the entry of a value are enclosed in angle brackets < >.

- Optional elements are enclosed in brackets [ ].
- Options for optional keywords are grouped in | (stroke) separated lists enclosed in brackets [ ].
- Options for required keywords are grouped in | (stroke) separated lists enclosed in braces { }.

Command syntax is written in a box.

Remarks

The command output shown in the PDF manuals may include line feeds at places where there is no line feed symbol (¥ at the end of the line).

Notes on notations

- If you have a comment or request regarding this manual, or if you find any part of this manual unclear, please take a moment to share it with us by filling in the form at the following webpage, stating your points specifically, and sending the form to us:
  https://support.ts.fujitsu.com/IndexContact.asp?lng=COM&ln=true
- The contents of this manual may be revised without prior notice.
- In this manual, the Management Board and MMB firmware are abbreviated as "MMB."
- In this manual, IOU_10GbE and IOU_1GbE are collectively referred to as IO Units.
- Screenshots contained in this manual may differ from the actual product screen displays.
- The IP addresses, configuration information, and other such information contained in this manual are display examples and differ from that for actual operation.
- The PDF file of this manual is intended for display using Adobe® Reader® in single page viewing mode at 100% zoom.

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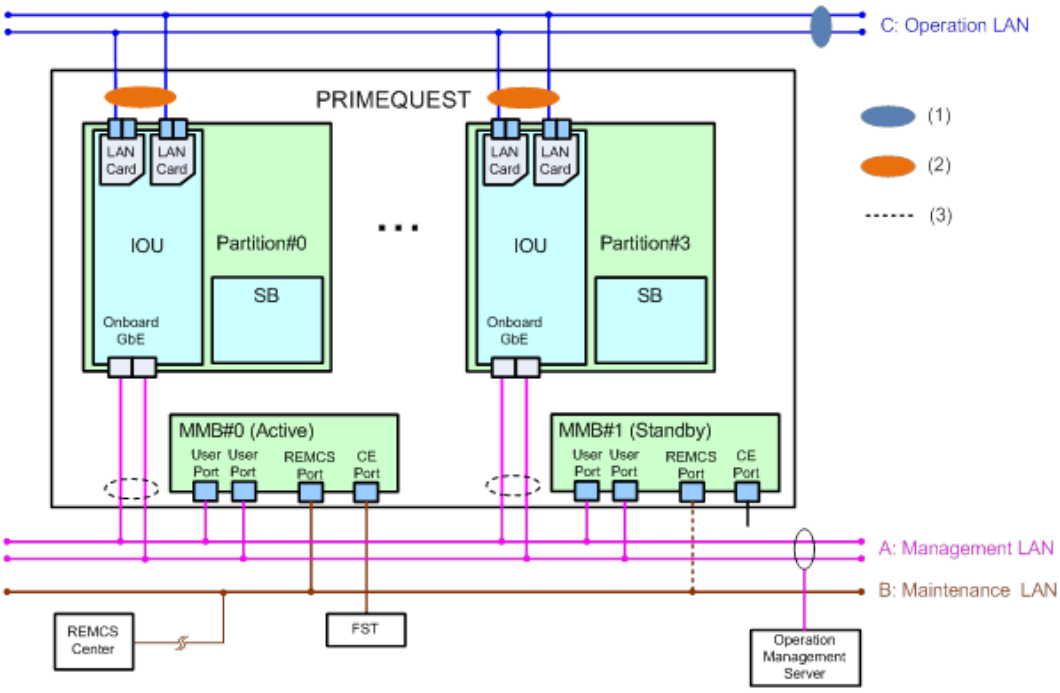
CHAPTER 1 Network Environment Setup and Tool Installation

This chapter describes the external network environment and management tool installation for the PRIMEQUEST 2000 series. For an overview of the management tools used for the PRIMEQUEST 2000 series, see Chapter 8 Operations Management Tools in the PRIMEQUEST 2000 Series General Description (CA92344-0534).

1.1 External Network Configuration

The following diagram shows the external network configuration for the PRIMEQUEST 2000 series.

FIGURE 1.1 External network configuration



No.	Description
(1)	SW redundancy
(2)	Redundancy by teaming (GLS or equivalent)
(3)	Disabled on the standby side

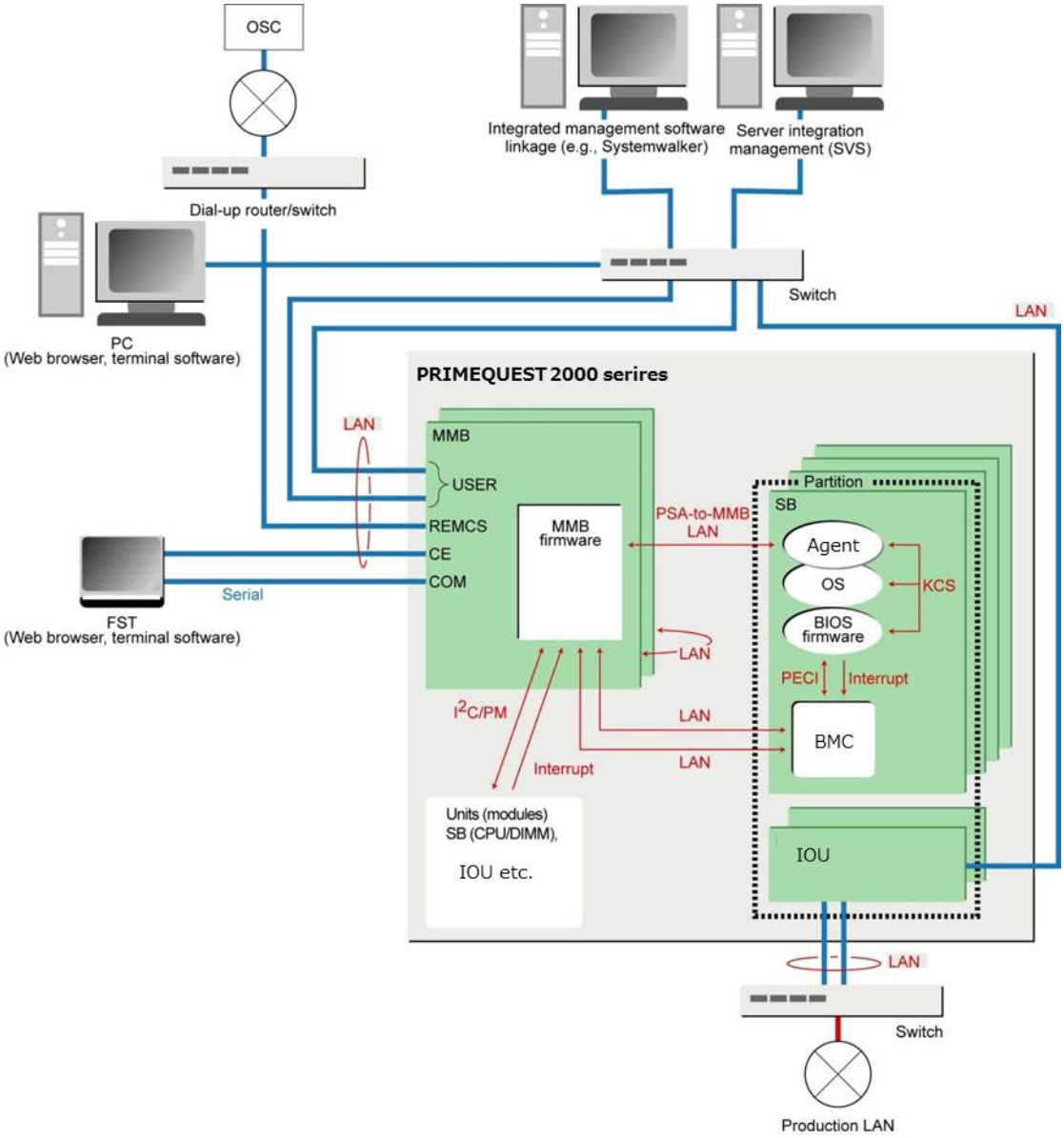
The following table lists the external networks. The letters A, B, and C correspond to those in FIGURE 1.1 External network configuration.

TABLE 1.1 External network names and functions

Letter	External network name	Function
A	Management LAN	- MMB Web-UI/CLI operations - Operations management server - Video redirection - PRIMECLUSTER linkage - Systemwalker linkage - ServerView linkage - REMCS connection
B	Maintenance LAN	- FST (CE terminal) connection - REMCS connection
C	Operation LAN (production LAN)	For job operations

Connect a LAN cable for User Port and a LAN cable for REMCS Port to different HUB each other or divide them by using VLAN.
The following diagram shows the functions of external networks for the PRIMEQUEST 2000 series.

FIGURE 1.2 External network functions



1.2 How to Configure the External Networks (Management LAN/ Maintenance LAN/Production LAN)

The PRIMEQUEST 2000 series server must be connected to the following three types of external networks. The respective external networks are dedicated to security and load distribution. (See FIGURE 1.1 External network configuration.)

- Management LAN
- Maintenance LAN
- Production LAN

Note
Be sure to connect management LAN, production LAN and maintenance LAN to different subnet each other

This section describes the IP addresses for the PRIMEQUEST 2000 series server.

1.2.1 IP addresses used in the PRIMEQUEST 2000 series server

Each of the SB, IOU, and MMB units in the PRIMEQUEST 2000 series server has network interfaces. Each port of these network interfaces must be assigned an IP address.
To the ports, assign IP addresses appropriate to the external network environment of the PRIMEQUEST 2000 series server.
The following describes the IP addresses assigned to the ports.
TABLE 2 IP addresses for the PRIMEQUEST 2000 series server (IP addresses set from the MMB) lists the IP addresses that are set from the MMB. TABLE 3 IP addresses for the PRIMEQUEST 2000 series server (set from the operating system in a partition) lists the IP addresses that are set from the operating system.
The IP addresses in TABLE 2 IP addresses for the PRIMEQUEST 2000 series server (IP addresses set from the MMB) are assigned to the NICs (network interface controllers) on the MMBs. Each NIC is connected to an SB or an external network port of the MMB through the switching hub on the MMB. The MMB firmware uses the IP addresses.
The standard configuration has one MMB. For a dual MMB configuration, which has two MMBs, assign a common virtual IP address to both MMBs and assign one physical IP address to each MMB.

TABLE 1.2 IP addresses for the PRIMEQUEST 2000 series server (IP addresses set from the MMB)

Name	NIC	Type	IP address setting method	Description
- Management LAN IP address: MMB Virtual/Physical IP address This IP address is used for communication when the MMB is connected to the management LAN. The physical IP address is assigned to the NIC of the user port of each MMB, and the virtual IP address is assigned commonly to the duplicated MMBs. The virtual IP address is used for access from PC etc. on the management LAN. The virtual IP is inherited by an active MMB.				
Virtual IP Address	MMB (common) (*1)	Virtual IP address	Set it from the MMB CLI or MMB Web-UI.	The PC connected to the management LAN uses this IP address to communicate (via the Web, telnet, etc.) with the (active) MMB. The PC users need not to be aware of which MMB is active, MMB#0 or MMB#1.
MMB#0 IP Address	MMB#0 (*1)	Physical IP address	Set it from the MMB CLI or MMB Web-UI.	The PC connected to the management LAN uses this IP address to communicate with MMB#0. (*2)
MMB#1 IP Address	MMB#1 (*1)	Physical IP address	Set it from the MMB CLI or MMB Web-UI.	The PC connected to the management LAN uses this IP address to communicate with MMB#1. (*2)
- Maintenance LAN IP address: Maintenance IP address This IP address is used for communication when the MMB is connected to the maintenance LAN.				
Maintenance IP Address	MMB (common)	Physical IP address	Set it from the MMB	This IP address is used for communication with REMCS, without using the management

Name	NIC	Type	IP address setting method	Description
		(*3)	CLI or MMB Web-UI.	LAN. The MMB also uses the IP address to communicate with the maintenance terminal connected to the CE port.
- Internal LAN IP address: MMB-PCH IP Address This is a dedicated IP address for MMB communication with SVS running on the operating system in each partition. (*7)				
Internal IP Address	MMB (common) (*5)	Physical IP address (*4)	Set it from the MMB Web-UI.	This is a dedicated IP address for REMCS option.
- Console redirection IP address: Console Redirection IP Address				
Console Redirection IP Address	BMC	Physical IP address (*6)	Set it from the MMB Web-UI.	This IP address is used to access the console redirection function in each partition from the PC on the management LAN. An IP address on the management LAN is assigned to each partition.

*1 These three addresses must have the same subnet address.
*2 The server administrator need not be concerned with individual IP addresses specified for communication.
*3 The IP address is intended only for communication with the active MMB. In PRIMEQUEST 2400E3/2800E3/2800B3/2400E2/2800E2/2800B2, the default setting is 192.168.1.1.
*4 The IP address is intended only for communication with the active MMB.
*5 It is connected to the communication of the Internal LAN, and is not connected to any external network. The assigned IP address must be in a different subnet from the management LAN, maintenance LAN, or production LAN. The default setting is 172.30.0.1/24, and it does not have to be changed unless there is a conflict with another subnet.
*6 This IP address is to access the console redirection function provided by BMC. It accesses BMC from the user port on the management LAN of MMB via the dedicated network for BMC-to-MMB communication inside the cabinet.
MMB changes the local IP address of BMC to the IP address on the management LAN by NAT. From the PC on the management LAN, the console redirection function of BMC is used via MMB.
*7 If Disable is set for this address, neither REMCS notification nor e-mail notification in case of panic.

Remarks

- Internal LAN does not support IPv6.
- A separate subnet must be assigned to "Management LAN", "Maintenance LAN" (external network), and "Internal LAN" (inside the cabinet LAN).
- Since "3. Internal LAN" is closed to the outside of the cabinet, the same subnet as that for "Internal LAN" in another cabinet can be used.
- For the IP address to be assigned to "Console redirection", the same subnet as that assigned to 1. Management LAN" must be used.
- MMB uses the following subnets permanently for internal communication.
  The following subnets cannot be specified:
  127.1.1.0/24
  127.1.2.0/24
  127.1.3.0/24

The PCH on an SB in each partition has a 100 Mb Ethernet port connected with the PCH-to-MMB communication LAN inside the cabinet. The operating system assigns the IP address of the 100 Mb Ethernet port.

TABLE 1.3 IP addresses for the PRIMEQUEST 2000 series server (set from the operating system in a partition)

LAN port	IP address setting method	Description
100 MbE port on SB (NIC in PCH) (*1)	Set it from the OS in each partition.	100 MbE port connected to the Internal LAN. This IP address and the IP address of the Internal LAN IP Address in TABLE 2 IP addresses for the PRIMEQUEST 2000 series server (IP addresses set from the MMB) IP addresses for the PRIMEQUEST 2000 series server (IP addresses set from the MMB) are in the same subnet. An IP address must be assigned to each partition.

LAN port	IP address setting method	Description
LAN port in IOU	Set it from the OS in each partition.	This depends on the partition configuration.
Network card mounted in PCI Express slot in IOU or PCI_Box.	Set it from the OS in each partition.	Each port is connected to a network outside the cabinet. The ports in the relevant partition must have IP addresses. (Assign IP addresses to the ports used for actual operation.)

*1 The default IP address (172.30.0.[partition number + 2]) is assigned during installation of SVS. The default IP address can be used unless it is in conflict with the one in the other subnet.

Remarks

- The NIC in PCH on the Home SB is used as the NIC of the partition for internal LAN. The network device name is not defined uniquely. The NIC in PCH on the Home SB is searched by using the bus number, device number, and function number assigned to NIC.
- Even if the Home SB is switched by Reserved SB function, Internal LAN is kept communicating. MMB writes over the MAC address of the NIC in PCH on the Home SB and keeps the same MAC address as that before the SB was switched.
  For this MAC address, a unique value is assigned to each partition and managed as system FRU information so that it is unique per cabinet.
- Only “AutoNego” is supported as setting of GbE port speed in IOU_10GbE.

1.3 Management LAN

This section describes the configuration of the management LAN for the PRIMEQUEST 2000 series.

1.3.1 Overview of the management LAN

The MMB has two GbE LAN ports (USER ports) dedicated to the management LAN.
The partition side can use the LAN port on the IOU as a management LAN port. The PCL communications/ operations management server is connected to the MMB USER port through an external switch.

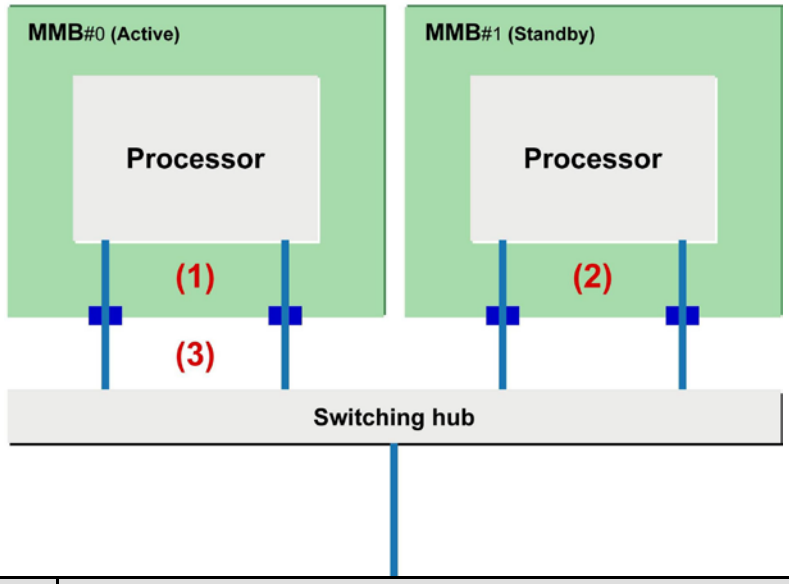
IP addresses of the management LAN (MMB)

Each MMB has one physical IP address for the management interface of the PRIMEQUEST 2000 series server. In addition to that, the primary MMB shares a common virtual IP address in the system. You can set these IP addresses from the MMB Web-UI or CLI.

Remarks

Virtual LAN interfaces are used for the management LAN interfaces. The physical LAN interfaces are used only for recognizing the respective MMBs.
The physical LAN interface of each MMB makes redundant the two User ports located in that MMB, using the interface redundancy function, to create a single LAN interface.
Virtual LAN interfaces handle the common virtual IP address shared between the two redundant MMBs. The Virtual LAN interfaces share the physical LAN interfaces, which are ports on the two MMBs. The ports are treated as valid channels on the active MMB. Any switching of the active MMB causes switching of the corresponding connections to Virtual LAN channels.
The following shows a management LAN configuration diagram. The IP addresses are examples. The addresses depend on the settings.

FIGURE 1.3 Management LAN configuration



No.	Description
(1)	Physical LAN IP example (MMB #0): 10.20.30.101
(2)	Physical LAN IP example (MMB #1): 10.20.30.102
(3)	Virtual LAN IP example: 10.20.30.100

If either USER port fails, the interface redundancy function switches to the other port in the MMB to ensure continuous service. If a failure occurs in the active MMB itself, the Virtual LAN channels become unusable. Then, the standby MMB inherits the virtual IP address from the active MMB to ensure continuous service. The following interfaces are available with a configured management LAN:

Interfaces available to the system administrator:

- Web-UI interface using HTTP/HTTPS
- CLI interface via telnet/SSH
- Partition and console operations through the video redirection function

Interface available to system management software:

- RMCP and RMCP + interface

Remarks
The restrictions on management LAN interfaces other than Virtual LAN channels are described below.

TABLE 1.4 Restrictions on the management LAN

Channel name	RMCP connection (UDP)	Web-UI connection (http/https)	CLI connection (telnet/ssh)
Virtual LAN channel	Possible	Possible	Possible
Physical LAN channel (Active MMB)	Possible	Not possible	Possible
Physical LAN channel (Standby MMB) (*1)	Possible with restrictions (*2)(*3)	Not possible	Possible with restrictions (*4) (*5)

*1 Only PRIMEQUEST 2400E3/2800E3/2400E2/2800E2/2400E/2800E can have two MMBs. PRIMEQUEST 2800B3/2800B2/2800B can have only one MMB.
*2 The connection cannot send or receive data of over 4 Kbytes.
*3 The connection sends data to the active MMB, so adequate performance cannot be obtained.
*4 Only the following commands can be executed:

- Set command
  set active_mmb 0
- Show commands
  show active_mmb

- show access_control
  show date
  show timezone
  show gateway
  show http
  show http_port
  show https
  show https_port
  show ssh
  show ssh_port
  show telnet
  show telnet_port
  show ip
  show network
  show exit_code
  ping
  who
  netck arptbl
  netck arping
  netck ifconfig
  netck stat
  show user_list
  help
  show snmp sys_location
  show snmp sys_contact
  show snmp community
  show snmp trap
  show maintenance_ip

*5 SSH connection to standby MMB is not supported.

IP address of the management LAN (partition)

To the partition side, an IP address of the management LAN must be assigned to communicate with SVS running on the operating system from the terminal on the management LAN. The IP address is assigned to the LAN port on the IOU or the PCI_Box mounted on the network card. Also, for monitoring with SVOM, an IP address must be assigned to the management LAN.

When it is linked with PRIMECLUSTER, the SVS on the partition side communicates with the user port of the MMB via the management LAN. It also provides the function for monitoring the status of the cluster node and the node switching function.

1.3.2 How to configure the management LAN

The network for MMB access from external terminals is the management LAN.
For management LAN-related settings for MMB access, use the CLI or the [Network Configuration] menu in the Web-UI. For details on the network configuration, see 1.1 External Network Configuration.
The following lists the settings for the management LAN configuration. Only a user with Administrator privileges can make management LAN-related settings.

TABLE 1.5 Parts of the management LAN configuration

Display/Setting item	Description
Network Interface: IP address and other settings for MMB access	
Virtual IP Address	Virtual IP address. In a dual MMB configuration, the IP address is overtaken during MMB switching. Host Name/IP Address/Subnet Mask/Gateway Address
MMB#0 (MMB#1) IP Address (*1)	Physical IP address of MMB#0 (MMB#1). You set this IP address for MMB#0 (MMB#1) mounted in the system. Enable/Disable setting Interface Name/IP Address/Subnet Mask/Gateway Address
DNS (optional)	Option. It specifies the IP address of the DNS server used. The default is ‘Disabled’. Enable/Disable setting IP Address: DNS Server 1/DNS Server 2/DNS Server 3
Management LAN	Specifies duplication of the management LAN ports. The default is ‘Disabled’. (Only the ports on the #0 side are enabled.)

Display/Setting item	Description
	Enable/Disable setting
Maintenance IP Address	Specifies the REMCS/CE port. The default is 'Disabled'. Enable/Disable setting IP Address/Subnet Mask/SMTP Address
Internal LAN IP Address	IP Address/Subnet Mask/Gateway Address Specifies the NIC on the MMB of the Internal (PCH-to-MMB) LAN. The default is Enable and the specified [IP Address] value. The MMB blocks communication between partitions.
Management LAN Port Configuration: Management LAN port settings	
Speed/Duplex for MMB#0 (MMB#1) (*1)	Specifies a Speed/Duplex value for the MMB#0 (MMB#1) LAN ports. Port: USER Port, Maintenance Port, REMCS Port Setting value: Auto (default), 100M/Full, 100M/Half, 10M/Full, 10M/ Half The MMB USER port is duplicated. The possible settings for the respective ports depend on the MMB hardware configuration.
Network Protocols: Network protocol settings	
HTTP, HTTPS, telnet, SSH, SNMP	Specifies whether to enable or disable a protocol, the port number, and the Timeout time.
SNMP Configuration: SNMP-related settings	
SNMP Community	Specifies SNMP System Information and Community/User values. - System Information: Specifies System Location and System Contact values for SNMP. It also displays the system name specified from [System] - [System Information]. - Community: Can specify up to 16 Community/User items. Each Community/User item includes the access-permitted IP address, SNMP version, access permission, and authentication settings. For settings specific to SNMP v3, use the SNMP v3 Configuration menu.
SNMP Trap	Specifies SNMP trap destinations. You can set up to 16 destinations. Each trap destination item includes the Community/User name, destination IP address, SNMP version, and authentication level settings. - [Test Trap] button: Sends a test trap to the specified trap destination.
SNMP v3 Configuration: Settings specific to SNMP v3	
Engine ID	Specifies the Engine ID. - Enter the encryption hash function, authentication passphrase, and encryption passphrase for users.
SSL: SSL settings	
Create CSR	Creates a private key and a request for a signature (CSR: Certificate Signing Request) - SSL certificate status: Displays the current status of SSL certificate installation. - Key length: Length of the private key, 1024 bits or 2048 bits - Entered information on the owner specified for the CSR - Country, prefecture, city/town, organization, department, server, e-mail address - [Create CSR] button: Displays a confirmation dialog box. Clicking [OK] creates a new private key and a request for a signature. After completion, a dialog box appears. Clicking [OK] registers the private key and causes a jump to the [Export Key/CSR] window. Clicking [Cancel] gives an instruction to discard the created private key and CSR.
Export Key/CSR	Exports an MMB private key/CSR (backup). - [Export Key] button: Exports a private key. - [Export CSR] button: Exports a CSR. **Note** Clicking the [Export Key] button/ [Export CSR] button using FireFox 4 or later flashes a save confirmation dialog box, resulting in the secret key not being downloadable. Therefore, use Internet Explorer during [Export Key/Export CSR] window manipulation.
Import Certificate	Imports a signed electronic certificate sent from a certificate authority. To import a file, specify the file, and click the [Import] button.

Display/Setting item	Description
Create Selfsigned Certificate	Creates a self-signed certificate. - SSL certificate status: Displays the current status of self-signed certificate installation. - Term: Specifies the term of validity (number of days) of the self-signed certificate. - The other settings are the same as on the [Create CSR] window. - [Create Selfsigned Certificate] button: Creates a self-signed certificate.
SSH: SSH settings	
Create SSH Server Key	Creates an SSH server private key. - SSH Server Key Status: Displays the status of SSH server key installation. - [Create SSH Server Key] button: Creates a private key. After creation is completed, a confirmation dialog box appears. Clicking [OK] installs the created key. Clicking [Cancel] discards it.
Remote Server Management: User settings for remote control of the MMB via RMCP - Use the [Edit User] button to select the user to be edited. The default settings for all users is [No Access] and [Disable]. - You can edit the user name, password, permission, and status (Enable/Disable) in the [Edit User] - To deny access to a user, set [No Access] for permission or [Disable] for [Status].	
Access Control: Access control settings for network protocols	
[Add Filter]/[Edit Filter]/ [Remove Filter] button	Adds, edits, or deletes a filter.
[Edit Filter] window	- Protocol: Select the target protocol (HTTP/HTTPS/telnet/SSH/SNMP). - Access Control: Select [Enable] or [Disable]. - Disable: Denies access by any IP address. - Enable: Permits access by only the specified IP addresses. - IP Address/Subnet Mask: You can specify this item only if the [Access Control] setting is [Enable]. The filtering permits access by only the IP addresses specified here.
Alarm E-Mail: Settings for e-mail notification of an event	
Alarm E-Mail	Used to select whether to send e-mail for the occurrence of an event (Enable/ Disable).
From	Sender address
To	Destination address
SMTP Server	IP address or FQDN of the SMTP server
Subject	E-mail title
[Filter] button	Used to edit Alarm E-mail transmission filter settings. The occurrence of any event specified in the filter settings is reported by e-mail. The default for target events is all events. - Severity: Target severity (Error/Warning/Info) - Partition: Target partition - Unit: Target unit - Source: Target source (CPU/DIMM/Chipset/Voltage/Temperature/ Other)
[Test E-Mail] button	Sends test e-mail.
Video redirection/remote storage network settings	
[Partition] - [Console Redirection Setup] menu	The video redirection/remote storage network relays traffic through the MMB, so the BMC IP address is not seen by users. Users access the system via the management LAN of the MMB. Here, specify the IP address used for access by the video redirection client (Java applet). The MMB handles address conversion between the specified address and BMC IP address.

*1 Only PRIMEQUEST 2400E3/2800E3/2400E2/2800E2/2400E/2800E can have two MMBs. PRIMEQUEST 2800B3/2800B2/2800B can have only one MMB.

The settings of the management LAN on the partition side are made on the operating system. These are required to access SVS from a management PC on the management LAN. SVS also communicates with the MMB via the management LAN to monitor and to switch cluster nodes in the PRIMECLUSTER linkage.
To the NIC to be used for the management LAN, the LAN port on IOU or the network card mounted in the PCI_Box is assigned. Following is used for Management LAN:

- Onboard LAN ports in IOU.
- PCI express card in IOU or PCI_Box.

The subnet of the management LAN shares the virtual IP address and the physical address of the MMB, which are specified by Web-UI/CLI on the MMB.
The management LAN and production LAN can be configured in the same subnet. In such case, an IP address is assigned to both the management LAN and the production LAN on the partition connected to the subnet of the LAN to which the MMB User Port is connected.

1.3.3 Redundant configuration of the management LAN

For the MMB, only MMB#0 is mounted as standard. By mounting MMB#1, the MMB can be redundant for PRIMEQUEST 2400E3/2800E3/2400E2/2800E2/2400E/2800E. MMB cannot be redundant for PRIMEQUEST 2800B3/2800B2/2800B. For PRIMEQUEST 2400E3/2800E3/2400E2/2800E2/2400E/2800E , when the MMB detects an error in the MMB itself, it switches the active MMB so that operations can continue. When the active MMB is switched, the virtual IP address is inherited by the MMB that becomes active. Therefore, the administrator does not to need to consider which MMB is active.
Because the MMB cannot recognize errors occurring in the path for accessing the MMB user port from the management LAN, it is unable to recover from them by switching the active MMB. Therefore, two user ports of the management LAN are mounted on the MMB. This redundant configuration enables recovery from management LAN errors. The redundant configuration of the user port is disabled as standard, and only user port #0 is enabled.
When the redundant configuration of the user port of the management LAN is enabled, the NICs on both user port #0 and user port #1 are enabled. These two NICs appear as one virtual interface from external devices because of the bonding function (each MMB has a physical address and a MAC address).
The MMB monitors errors of the management LAN (including connections to unit-external switches and LAN cable disconnections). When it detects an error, it switches the duplicated NIC so that the monitoring operation, which includes the Web-UI operations, can continue. The values of the physical IP address and the MAC address of the MMB prior to switching are maintained.
To set up the management LAN in a redundant configuration, select [Network Configuration] - [Network Interface] from the MMB Web-UI, and then set Enable for [Dualization] of [Maintenance LAN].
For the redundant configuration of the management LAN on the partition side, duplicate the NIC by teaming with Linux Bonding driver, GLS or Intel PROSet.
When the MMB is duplicated, but the management LAN user port of the MMB is not duplicated, if an error occurs on the management LAN, MMB access is disabled in PRIMEQUEST 2400E3/2800E3/2400E2/2800E2/2400E/2800E . Because the MMB does not recognize its error, it does not automatically switch the active MMB, and the virtual IP address of the MMB cannot be switched to the available MMB. In such cases, the active MMB must be switched manually. The procedure is described below for only PRIMEQUEST 2400E3/2800E3/2400E2/2800E2/2400E/2800E .

- (When MMB#0 is active, and MMB#1 is standby, an error occurs during an attempt by the management LAN to access the user port on the MMB#0 side, and MMB#0 access is disabled)

1. Connect to the physical IP address of the management LAN user port on MMB#1 with telnet/ssh.
2. Execute the following command on MMB#1, and switch the active MMB to MMB#1.

```
> set active_mmb 1
```

3. The virtual IP address of the MMB is switched to MMB#1, and access is enabled with the virtual IP address.

Note
This command is a compulsion switch command of MMB used when the trouble occurs. Execute the set mmbcontrol switch_over command or execute Switch over of MMB Web-UI about a usual switch. Do not execute this command when it is normal. MMB might not operate normally.

1.4 Maintenance LAN/REMCS LAN

The MMB provides the following LAN ports for maintenance purposes.

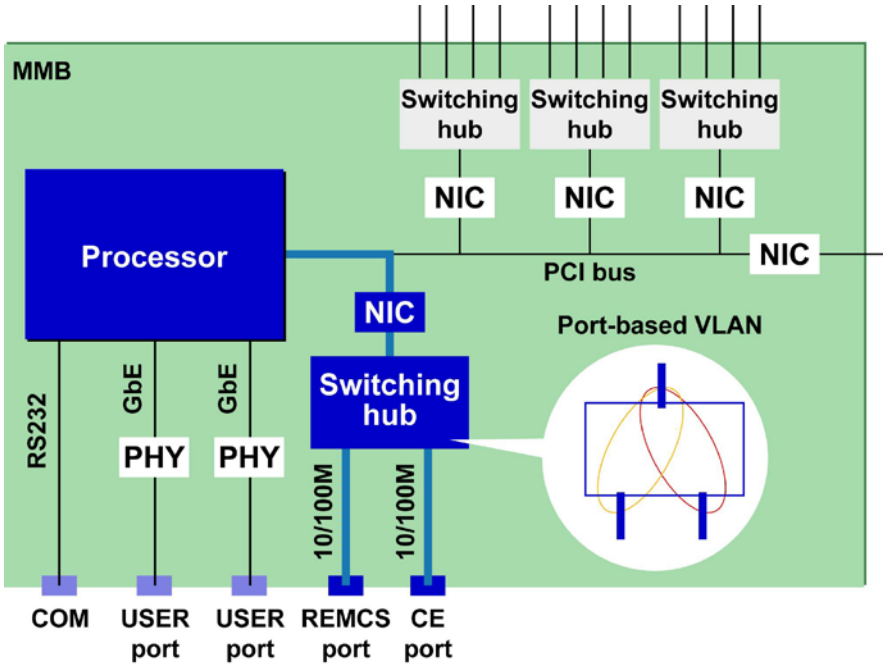
TABLE 1.6 Maintenance LAN/REMCS LAN

Port	Description	Remarks
CE LAN	FST (CE terminal) port for use in maintenance work	100Base-TX, RJ45
REMCS LAN	For a connection with the REMCS Center (*)	100Base-TX, RJ45

*: For REMCS connection without using the management LAN

The port-based VLAN function of the switching hub on the MMB blocks communication between the CE port and REMCS port. The following shows an outline of the maintenance LAN and REMCS LAN of the MMB.

FIGURE 1.4 Maintenance LAN and REMCS LAN of the MMB



The maintenance LAN is configured with Web-UI or CLI of the MMB. The subnet of the maintenance LAN must be separated from the other subnets such as one for the management LAN, the production LAN, etc. When the MMB is duplicated, the maintenance LAN can only access to the MMB on the active side. The NIC on the standby MMB is disabled.

Remarks

The active and standby MMBs in the PRIMEQUEST 2000 series server each have a CE terminal port used in maintenance and a LAN port for REMCS notification. Communication through the ports is enabled only on the active MMB and disabled on the standby MMB. A field engineer configures the maintenance LAN and REMCS LAN during system installation.

Maintenance IP can pass beyond only one gateway with specified address.

1.5 Production LAN

This section describes the configuration of the production LAN for the PRIMEQUEST 2000 series.

1.5.1 Overview of the production LAN

The IOU includes LAN ports for the production LAN.

You can mount additional LAN cards in the PCI Express slots on the IOU and PCI_Box as needed, to use their ports for the production LAN.

1.5.2 Redundancy of the production LAN

This section describes redundancy of the production LAN.

Duplication of the transmission path between servers (high-speed switching method)

For details on duplication of the transmission path between servers, see 'PRIMECLUSTER Global Link Service Configuration and Administration Guide Redundant Line Control Function' (J2UZ-7781).

Duplication between the server hub/switch in the same network (Virtual NIC method/NIC switching method)

For details on duplication between the server hub/switch in the same network, see PRIMECLUSTER GLS for Windows User's Guide' (B1FN-5851-04Z2).

Teaming by Intel PROSet

The teaming configuration using Intel PROSet is available. For details, see the help for Intel PROSet.

Redundancy by using standard function of operating system

LAN can be duplicated by using standard function of operating system that is bonding function in RHEL or SLES and is NIC teaming function in Windows Server 2012, 2012 R2 or 2016.

1.6 Management Tool Operating Conditions and Use

This section describes the operating conditions and use of the management tools.

1.6.1 MMB

The MMB Web-UI operating conditions are as follows.

Supported Web browsers

Firefox version 20 or later (operating system: Windows or Linux)
Internet Explorer version 9 or later (operating system: Windows)

Maximum number of Web-UI login users

Up to 16 users can log in to the Web-UI at a time. If 16 users have logged in when another user attempts to log in, a warning dialog box appears and the login attempt is rejected.
The MMB Web-UI login procedure is as follows.

1. Specify the URL of the MMB in the Web browser to connect to the MMB.
   >> The [Login] window appears.
2. Enter your user name and password.
   >> The [Web-UI] window ([System] - [System Status]) appears.

MMB user privileges

User privileges specify the levels of MMB operating privileges held by user accounts.
Only users with Administrator privileges can create, delete, and modify user accounts.
For details on operations permitted (i.e., privileges) in the MMB Web-UI menus, see Chapter 1 MMB Web-UI (Web User Interface) Operations in the *PRIMEQUEST 2000 Series Tool Reference* (CA92344-0539).

NTP client function setting on the MMB

In the PRIMEQUEST 2000 series, the MMB acts as an NTP client to ensure synchronization with external NTP servers.

1.6.2 Remote operation (BMC)

Supported Web browsers

Firefox version 20 or later (operating system: Windows or Linux)
Internet Explorer version 9 or later (operating system: Windows)

Required Java Runtime Environment

Java 7 or later

Notes

- For a terminal whose operating system is Windows Vista or later and Windows Server 2008 or later, set UAC (User Account Control) or UAP (User Account Protection) to "Disabled" or start the browser as administrator privilege.
- For video redirection and virtual media, a connection may not be established if the network is connected via a proxy. In such cases, change the browser setting to avoid network connection via the proxy. If you still cannot establish a connection, perform the setting used for direct connection for Java network.
- To start the video direction function with Internet Explorer, click the mouse while holding down the [Control] key. Even if the following message is displayed, click the mouse while holding down the [Control] key.
- Message displayed on the status bar of Internet Explorer
  "Pop-up blocked." (To allow the pop-up window to open, click the mouse while holding down the [Ctrl] key. With FireFox, you can establish a connection simply by clicking the mouse.
- If " java.net.SocketException: Malformed reply from SOCKS server" occurs when you attempt to establish a video redirection connection, make the following browser setting.
  - For Internet Explorer:
    1. Select [Tools] - [Internet Options] - [Connection] tab - [LAN Settings] - [Proxy Server] - [Advanced].
    2. Uncheck [Use the same proxy server for all protocols].
    3. Clear the Socks field.
  - For FireFox:
    1. Select [Tools] - [Options] - [Network] tab - [Connection Settings].
    2. Check [Manual proxy configuration].
    3. Uncheck [Use this proxy server for all protocols].
    4. Clear the SOCKS field.
- Window may be maximized when you attempt to establish a video redirection connection or during video redirection connection. In such cases, change to window size suitable for environment of your terminal.
- When you cannot establish a video redirection connection even if you try to re-establish a video redirection connection, contact the distributor where you purchased your product, or a Fujitsu sales representative or systems engineer (SE).

Maximum number of connections

The following lists the maximum number of connections using the remote operation (BMC) function.

TABLE 1.7 Maximum number of connections using the remote operation function

Item	Description
Video redirection	Up to 2 users can be connected concurrently. However, only 1 user can perform operations. The other user can only refer to information.
Virtual Media	Up to two devices can be connected for floppy, CD or DVD, Hard disk drive, independently.

The operating conditions for BMC installation of individual BMC functions is described below.

Operating environment settings

You need to make the appropriate settings for video redirection and virtual media for your network environment. In the [Console Redirection Setup] window of the MMB Web-UI, set the IP address and subnet mask, and set enable or disable for video redirection and virtual media.
For details on setup by MMB Web-UI, see '1.3.3 [Console Redirection Setup] menu' in "*PRIMEQUEST 2000 series Tool Reference*" (CA92344-0539).

Video redirection

With the video redirection function, users can access windows for the partition side from a remote location.

When a user starts video redirection from the [Console Redirection] window of the MMB Web-UI, a Java applet is sent to the user's terminal. Through the Java applet, the terminal displays VGA output sent to the LAN.
User input with the mouse or keyboard on the terminal is routed through the LAN to the partition.
List of video redirection function is shown below.

Note

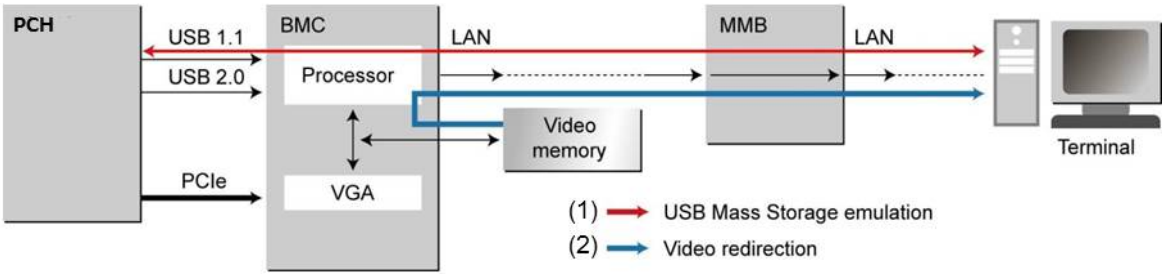
- If you cannot access to DNS server in the terminal for video redirection, do not set up the address of DNS server.
- Virtual media for multiple partitions cannot be available in the same user terminal.

TABLE 1.8 List of video redirection function

Function	Description	Note
Window	Perform operation of screen display such as pause, zoom-in, zoom-out and language selection.	
Keyboard	Operate keyboard by keyboard of terminal PC.	Special key cannot be used directly.
Virtual keyboard	Display and operate virtual keyboard	
Mouse	Operate mouse by mouse of terminal PC. A mouse pointer in a partition and a mouse pointer in a terminal PC run simultaneously. Display of mouse in a terminal PC can be set to enable or disable. Set position of mouse to 'Absolute mode'. Default is 'Absolute mode'.	
Special key	Send key operation of [Ctrl], [Alt], and [Windows] key. [Lock] key holds down the [Ctrl], [Alt], or [Windows] key.	
Power	Power on, power off, or re-start a partition.	

The following shows a diagram of the connection configuration for video redirection.

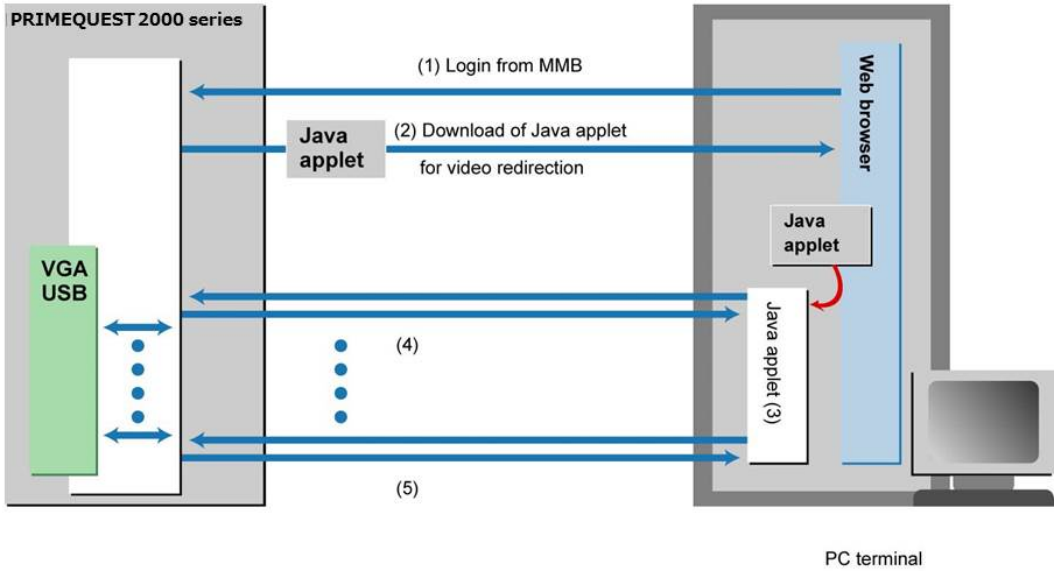
FIGURE 1.5 Connection configuration for video redirection



No.	Description
(1)	USB keyboard emulation and mouse emulation
(2)	Video redirection

The following shows the operating sequence of video redirection.

FIGURE 1.6 Operating sequence of video redirection



In the diagram, (1) to (5) indicates the following operations.

(1) Log in to the MMB Web-UI by browser.

(2) Display the window, and start video redirection.

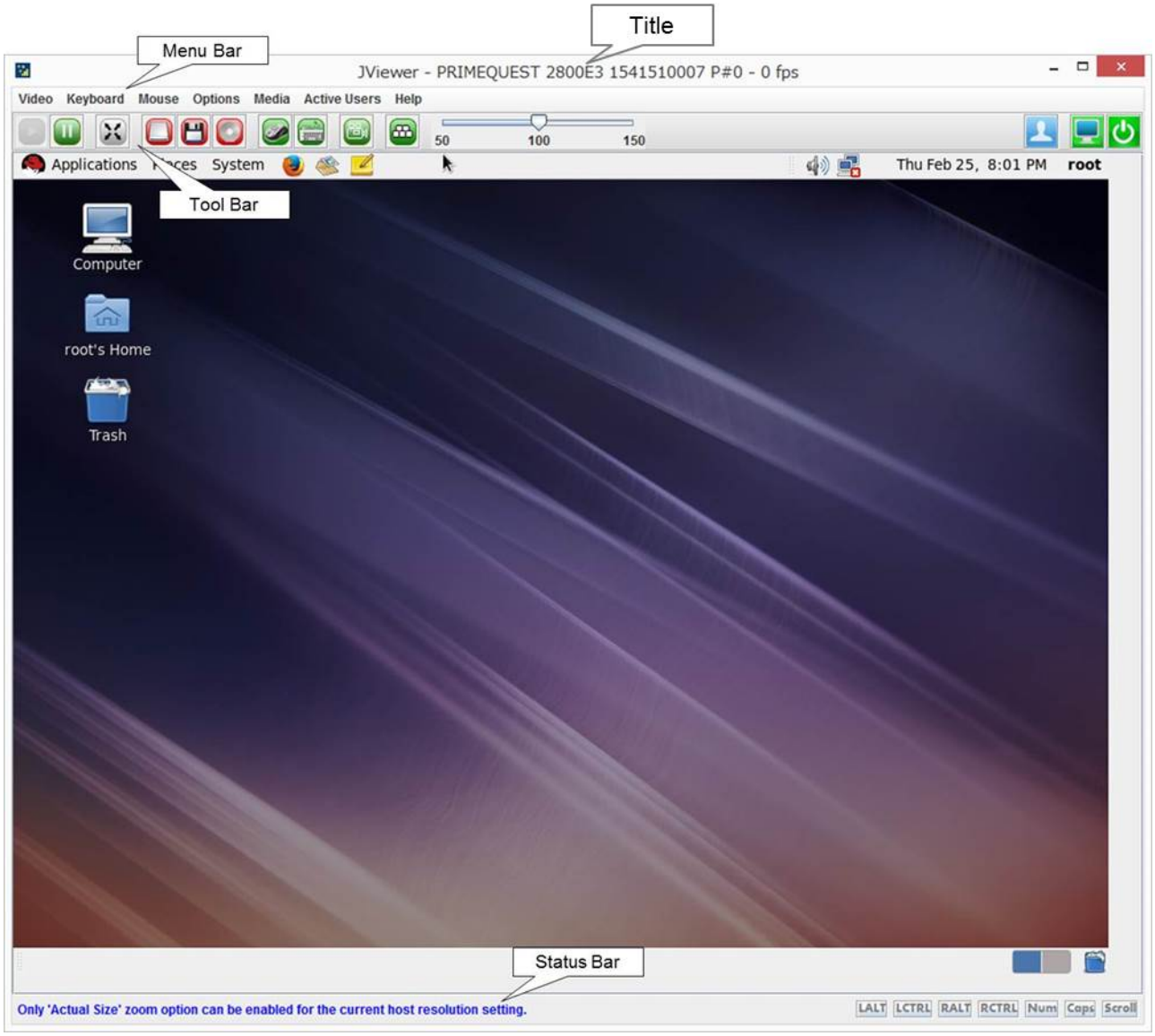
(3) You can perform partition operations from the [Video Redirection] window by using the keyboard and mouse.

(4) You can perform partition operations through the Java applet for video redirection.

(5) Exit video redirection.

The following shows an example of the [Video Redirection] window.

FIGURE 1.7 [Video Redirection] window



Title of [Video Redirection] window is shown as the following:

- For PRIMEQUEST 2400E3/2800E3,
  PRIMEQUEST 2400E3/2800E3 + Product serial number + partitioin number.
  Example of PQ 2800E3 where Product serial number is “123456789012” and partition number is “3”:
  JViewer - PRIMEQUEST 2800E3 123456789012 P#3

- For PRIMEQUEST 2800B3,
  PRIMEQUEST 2800B3 + Product serial number.
  Example of PQ 2800B3 where Product serial number is “123456789012”:
  JViewer - PRIMEQUEST 2800B3 123456789012

- For PRIMEQUEST 2400E2/2800E2,
  PRIMEQUEST 2400E2/2800E2 + Product serial number + partitioin number.
  Example of PQ 2800E2 where Product serial number is “123456789012” and partition number is “3”:
  JViewer - PRIMEQUEST 2800E2 123456789012 P#3

- For PRIMEQUEST 2800B2,
  PRIMEQUEST 2800B2 + Product serial number.
  Example of PQ 2800B2 where Product serial number is “123456789012”:
  JViewer - PRIMEQUEST 2800B2 123456789012

- PRIMEQUEST 2400E/2800E + Product serial number + partitioin number.
  Example of PQ 2800E where Product serial number is “123456789012” and partition number is “3”:
  JViewer‐PRIMEQUEST 2800E 123456789012 P#3
- For PRIMEQUEST 2800B,
  PRIMEQUEST 2800B + Product serial number.
  Example of PQ 2800B where Product serial number is “123456789012”:
  JViewer‐PRIMEQUEST 2800B 123456789012

Avairable menus in [Video Redirection] window are shown in the table below.

TABLE 1.9 Menu Bar in [Video redirection] window

Menu Bar			Description
Video			
	Pause Redirection		Perform pause of [Video redirection] window.
	Resume Redirection		Release pause of [Video redirection] window.
	Refresh Video		Refresh [Video redirection] window.
	Turn ON Host Display Video		Show video operation on host monitor.
	Turn OFF Host Display		Show video operation on host monitor.
	Low Bandwidth Mode		Set bits per pixel (bpp) of [Video redirection] window.
		Normal	Set ‘Normal’.
		8 bpp	Set ‘8 bpp’.
		8 bpp B&W	Set ‘8 bpp monochrome’.
		16 bpp	Set ’16 bpp’.
	Capture Screen		Capture [Video redirection] window. The screen is preserved into terminal PC in jpeg format.
	Full Screen		Maximize [Video redirection] window. It is required that client and host are the same resolution.
	Start Record		Start to record [Video redirection] window. The video is preserved into terminal PC in avi format.
	Stop Record		Stop to record [Video redirection] window.
	Settings		Perform setup for record of [Video redirection] such as record time and save location.
	Exit		Close video redirection.
Keyboard			
	Hold Right Ctrl Key		Hold down right [Ctrl] key. [RCTRL] button turns red.
	Hold Right Alt Key		Hold down right [Alt] key. [RALT] button turns red.
	Hold Left Ctrl Key		Hold down left [Ctrl] key. [LCTRL] button turns red.
	Hold Left Alt Key		Hold down left [Alt] key. [LALT] button turns red.
	Left Windows Key		
		Hold Down	Hold down [Windows] key.
		Press and Release	Press [Windows] key.
	Right Windows Key		
		Hold Down	Hold down [Windows] key.
		Press and Release	Press [Windows] key.
	Ctrl+Alt+Del		Press [Ctrl] key, [Alt] key, and [Del] key simultaneously.
	Context Menu		Open Context Menu (shortcut menu).
	Hot Keys		
		Add Hot Keys	Set Hot keys (shortcut key).
	Host Physical Keyboard		
		Auto Detect	Set to ‘Auto Detect’ Physical keyboard type is detected automatically.
		English(United States)	Set to ‘English (United States)’.
		French	Set to ‘French’.
		German(Germany)	Set to ‘German’.
		Japanese	Set to ‘Japanese’.
		Spanish	Set to ‘Spanish’.
	SoftKeyboard		

Menu Bar			Description
		English(United States)	Set to ‘English (United States)’.
		English(United Kingdom)	Set to ‘English (United Kingdom)’.
		Spanish	Set to ‘Spanish’.
		French	Set to ‘French’.
		German(Germany)	Set to ‘German (Germany)’.
		Italian	Set to ‘Italian’.
		Danish	Set to ‘Danish’.
		Finnish	Set to ‘Finnish’.
		German(Switzerland)	Set to ‘German (Switzerland)’.
		Norwegian(Norway)	Set to ‘Norwegian’.
		Portuguese	Set to ‘Portuguese’.
		Swedish	Set to ‘Swedish’.
		Hebrew	Set to ‘Hebrew’.
		French(Belgium)	Set to ‘French (Belgium)’.
		Dutch(Belgium)	Set to ‘French.’
		Russian(Russia)	Set to ‘Russian’.
		Japanese(QWERTY)	Set to ‘Japanese (QWERTY)’.
		Japanese(Hiragana)	Set to ‘Japanese (Hiragana)’.
		Japanese(Katakana)	Set to ‘Japanese (Katakana)’.
		Turkish - F	Set to ‘Turkish -F’.
		Turkish - Q	Set to ‘Turkish -Q’.
Mouse			
	Show Cursor		Display cursor.
	Mouse Calibration		Perform calibration of mouse location.
	Show Host Cursor		Display host cursor.
	Mouse Mode		
		Absolute mouse mode	Set a mouse to ‘Absolute mode’. A mouse pointer in [Video redirection] window is adjusted to absolute value of a mouse pointer in terminal PC.
		Relative mouse mode	Set a mouse to ‘Relative mode’. A mouse pointer in [Video redirection] window is adjusted to relative position calculated by difference from previous position of a mouse in terminal PC.
		Hide mouse mode (*1)	Set a mouse to ‘Hide mode’. This mode should be used if action of a mouse pointer in [Video redirection] does not match with that in terminal PC.
Options			
	Keyboard/Mouse Encryption		Encrypts keyboard data and mouse data.
	Window Size		
		Actual Size	Return size of [Video redirection] window to normal size (100%).
		Fit to Client Resolution	Fit to resolution of client window.
		Fit to Host Resolution	Fit to resolution of host window.
	GUI Languages		
		DE - Deutsch	Set menu display to ‘German’.
		EN - English	Set menu display to ‘English’.
		JA - 日本語	Set menu display to ‘Japanese’.
	Request Full Permission		Request ‘Full Virtual Console access’ which means the permission of the ‘full access’. This item is shown only if your permission is the ‘partial access’ where you can only see the screen mainly.
Media			
	Virtual Media Wizard		Set virtual media.
Active Users			
	:		Display user who is performing video redirection.
Power (*2)			
	Power On		Power on a partition.
	Immediate Power Off		Power off a partition immediately.
	Power Cycle		After powering off a partition, power on a partition again.
	Press Power Button		Press power button.

Menu Bar		Description
	Immediate Reset	Perform hardware reset.
	Pulse NMI	Issue NMI.
	Graceful Reset (Reboot)	Perform Graceful Reset (Reboot).
	Graceful Power off (Shutdown)	Perform Graceful Power off (Shutdown)
	Set Boot Options	Perform setup of Boot Options.
Help		
	About JViewer	Display version information. If you click the "About JViewer", it may take a few minutes to appear the dialog box that displays the JViewer information. You cannot operate the video redirection in the meantime. In such a case, please wait a while for the dialog box to appear, or stop the javaw.exe task in task manager and then restart the video redirection.
	Server Information	Display information of server.

(*1) Set mouse mode to 'Hide mouse mode' when operate LSI WebBIOS since action of cursor in LSI WebBIOS is adjusted to actual action of your mouse cursor.
When you use two displays to operate LSI WebBIOS in Legacy Mode, use primary display of monitor 1. If you set to 'Hide mouse mode' in secondary display of monitor 2, cursor does not run. Even if you set to 'Hide mouse mode', it is no problem to use primary display and operate UEFI.

(*2) Power menu is shown in only PRIMEQUEST 2800B3/2800B2/2800B. It is not shown in other models. Sometimes you cannot operate any power operations because power button menu is grayed out. In such case, reconnect the video redirection to select power menu button or perform the power operation by [Power Control] window of MMB Web-UI.

TABLE 1.10 Tool Bar menu in [Video redirection] window

Tool bar	Description
[Resume Redirection]	Release pause of [Video redirection] window.
[Pause Redirection]	Perform pause of [Video redirection] window.
[Full Screen]	Maximize [Video redirection] window. It is required that client and host are the same resolution.
[Hard disk/USB]	Set virtual media.
[Floppy]	Set virtual media.
[CD/DVD]	Set virtual media.
[Cursor]	Display cursor.
[Softkeyboard]	Display software keyboard.
[Video Record]	Perform setup for record of [Video redirection] such as record time and save location.
[Hot Keys]	Set Hot keys (shortcut key).
[Zoom]	Zoom in or Zoom out [Video redirection] window.
[Active Users]	Display users who are using video redirection.
[Host Display]	Display video control on host monitor (local monitor).
[Power] (*1)	Power on/ off

(*1) supported by only PRIMEQUEST 2800B3/2800B2/2800B.

TABLE 1.11 Status Bar in [Video redirection] window

Status Bar	Description
[LALT]	Hold down left [Alt] key. [LALT] button turns red.
[LCTRL]	Hold down left [Ctrl] key. [LCTRL] button turns red.
[RALT]	Hold down right [Alt] key. [RALT] button turns red.
[RCTRL]	Hold down right [Ctrl] key. [RCTRL] button turns red.
[Num]	Hold down right [Num] key. [Num] button turns red.
[Caps]	Hold down right [Caps] key. [Caps] button turns red.
[Scroll]	Hold down right [Scroll] key.

Status Bar	Description
	[Scroll] button turns red.

Note

- When resolution of window in server is 800 x 600, a part of window displayed in video redirection may luck or track of mouse cursor may remain during installing Linux.
- While the video redirection is being used, a warning message indicating that the digital signature is expired may be displayed. Since this warning message does not affect the operation of Java Application, click the [Execute] button. To avoid displaying this waning message every time the video redirection is connected, check the check box for [Always trust content from this publisher], and click the [Execute] button.
- Network communication problems between the terminal and PRIMEQUEST may cause a session interruption, resulting in the [Video Redirection] window failing to respond to user operation. In such cases, the window cannot be closed normally. Reconnect to the network after forcibly ending the video redirection.
- If below problems occur while using video redirection, reconnect video redirection.
  - No response comes from video redirection and any operation cannot be performed.
  - Display of video redirection window remains black or 'No Signal'.
  - Error dialog of video redirection appears and any operation cannot be performed.
  - Window of video redirection is disconnected unintentionally.
- If you use RHEL6 or RHEL7, windows for various settings may not be displayed paritially because maximum resolution of display is 1024 x 768 when you connect to the partition by only video redirection. Set the resolution of display to higher than 1024 x 768 by following steps. Following steps show the procedure to set to 1600 x 1200 as an example.

  1. Execute init 3 to stop Xwindow.

```
# /sbin/init 3
```

  2. Execute Xorg -configure command to create xorg.conf.new

```
# Xorg –configure
```

  3. Execute cvt x y to create modeline (x, y: pixel number). 1600 x 1200 is set in following example.

```
# cvt 1600 1200
# 1600x1200 59.87 Hz (CVT 1.92M3) hsync: 74.54 kHz; pclk:
161.00 MHz Modeline "1600x1200_60.00"  161.00  1600 1712 1880
2160  1200 1203 1207 1245 -hsync +vsync
```

  4. Edit xorg.conf.new to add ModeLine to Section "Monitor".

```
Section "Monitor"
 Identifier   "Monitor0"
 VendorName   "Monitor Vendor"
 ModelName    "Monitor Model"
 ModeLine     "1600x1200_60.00"  161.00  1600 1712 1880 2160
1200 1203 1207 1245 -hsync +vsync
EndSection
```

  5. Change name of xorg.conf.new to xorg.conf, and put it in /etc/X11/xorg.conf
  6. Reboot the partition. After rebooting partition, resolution of display becomes 1600 x 1200. 1600 x 1200 is added to choices of resolution in property of display.
     Note
     If you set higher resolution than default, response of video redirection becomes slower.

Below description is how to connect video redirection.

1. First terminal PC is connected to a partition by video redirection with Full Virtual Console Access.
2. If you connect to same partition by video redirection, a message requesting permission to virtual console access appears in second terminal PC.

FIGURE 1.8 Message of requesting access to Virtual Console in second terminal PC

3. In first terminal PC, window where connection privilege of second terminal PC is selected appears. Select connection privilege from below.

   - Allow Virtual Console
     permit Full Virtual Console access where all operation of video redirection can be performed.
   - Allow only Video
     permit only video where display function of video redirection can be performed.
   - Deny Access
     deny access to video redirection.

   If thirty seconds passes, [Allow Virtual Console] is selected.

FIGURE 1.9 Popup window of [Virtual Console Sharing Privileges]

4. Popup which shows result selected by first terminal PC.

   - Display in first terminal PC.
     Such below window is displayed depending on result of selection except for [Allow only Video].

FIGURE 1.10 Popup for [Allow Virtual Console] in first terminal PC

FIGURE 1.11 Popup for TIMEOUT in first terminal PC

   - Display in second terminal PC.
     Result selected by first terminal PC is shown below in second terminal PC.

FIGURE 1.12 Popup for [Allow Virtual Console] in second terminal PC

FIGURE 1.13 Popup for [Allow only video] in second terminal PC

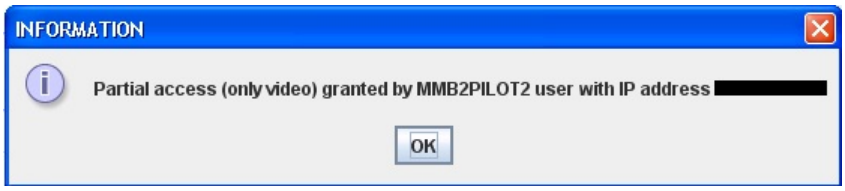


FIGURE 1.14 Popup for [Deny Access] in second terminal PC

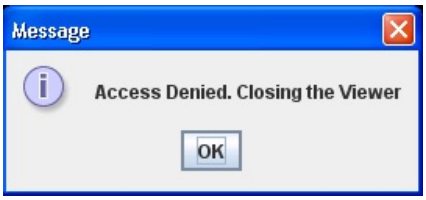
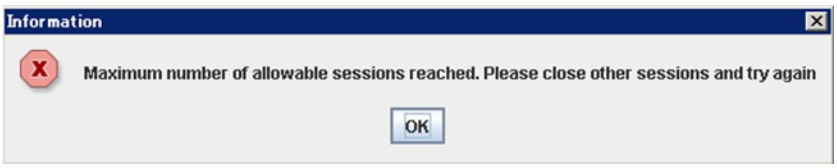


FIGURE 1.15 Popup for TIMEOUT in first terminal PC

- Display in third terminal
  If you try to open video redirection in third terminal PC, the dialog box instructing that connect again after closing other video redirection since the number of connection reaches the maximum of permitted number for video redirection.

FIGURE 1.16 Popup for reaching maximum number of connection in second terminal PC



Console redirection

PRIMEQUEST 2000 series provides console redirection to route serial output from partitions via a LAN. Console redirection conforms to the specifications of IPMI v2.0 SOL (Serial Over LAN).
When you perform console command with the partition specified on MMB CLI, console output to the COM port on the partition is redirected. Input from the terminal is reported to the COM port on the partition.

Connection period of text console redirection

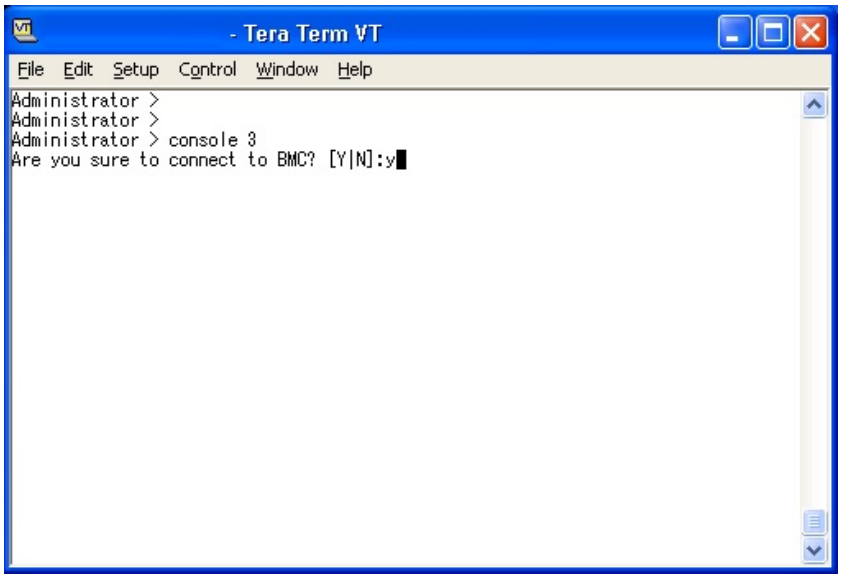
Console redirection is automatically disconnected after a certain idle time. You can set automatic disconnection time, timeout value, by console command.
For details on console command, see ‘2.2.4 console’ in “*PRIMEQUEST 2000 series Tool Reference*” (CA92344-0539).

How to connect console redirection

Note
If console redirection is disconnected due to timeout, below message appears.
“You have exceeded your idle time limit. Logging you off now.”

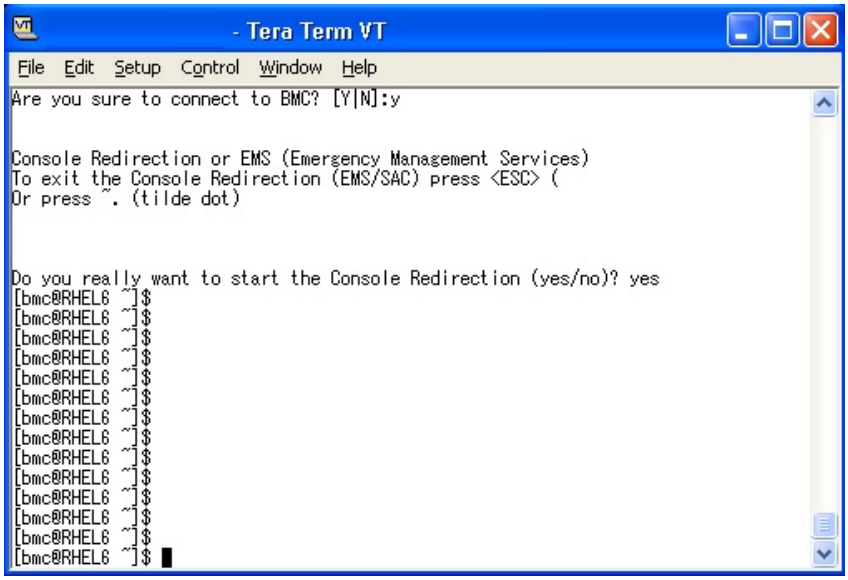
1. Login to MMB CLI and specify partition to which you intend to connect.
   If the message which confirms whether you connects or not appears, input ‘y’.

FIGURE 1.17 Example of setting partition #3 (1)



2. If the message “Do you really want to start the Console Redirection (yes/no)?” appears, input ‘yes’. You can connect to specified partition.

FIGURE 1.18 Example of setting partition #3 (2)



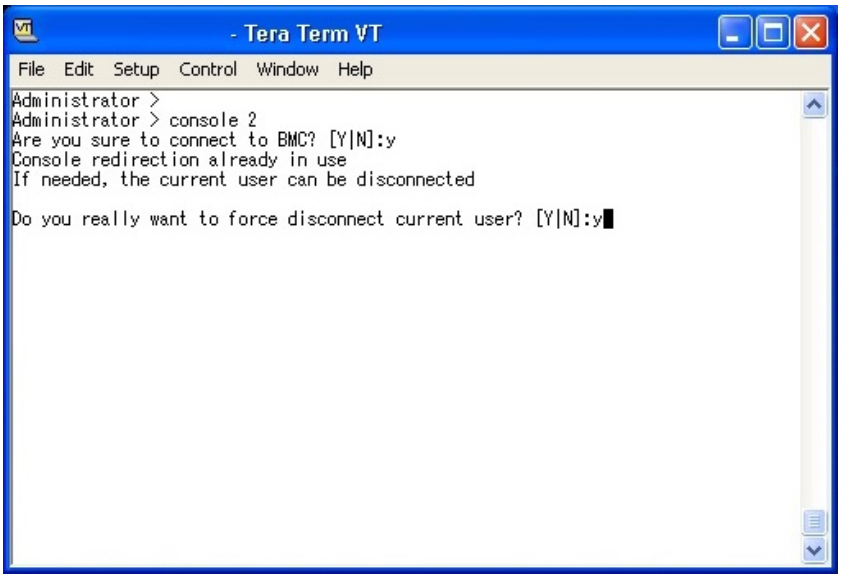
3. If you connect to other partition, perform step 1 and step 2 again after closing current console redirection. To close the console redirection, perform either of below operation:
   - Press [ESC] key and then press [(] key.
   - Press [~] key and then press [.] key.

Forced disconnection of console redirection

Note
Only one user at a time is permitted to use the console redirection function.

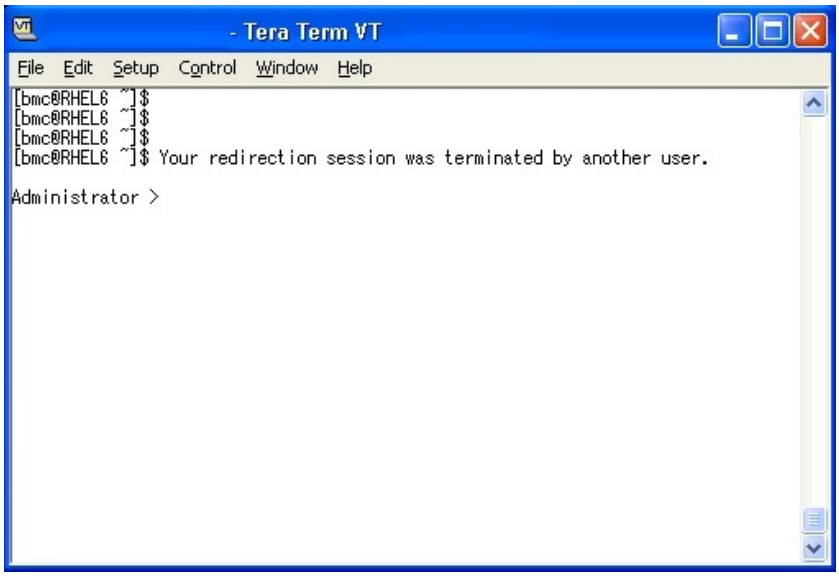
1. If a user attempts to connect using the function while another user is using it, the message "Console Redirection already in use" appears. The window appears as follows.

FIGURE 1.19 Forced disconnection of console redirection (1)



2. If you disconnect the console redirection of other user who has been already used, enter ‘yes’.
   You can use console redirection in place of current user.
   The terminal software of the disconnected user displays the following window.

FIGURE 1.20 Forced disconnection of console redirection (2)



Virtual Media

The virtual media function enables a partition to share the floppy disk drives, CD or DVD drives, and HDD or USB devices of terminals as storage devices. For ISO images, ISO images on the terminal appear as emulated drives on the partition side.
Up to two devices can be used per each device at the same time. Up to six devices can be used at same time in total.

Note

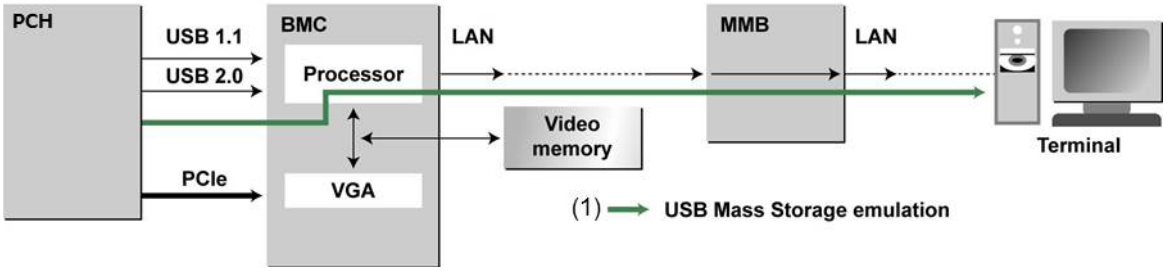
- For a terminal whose operating system is Windows Vista or later and Windows Server 2008 or later, set UAC (User Account Control) or UAP (User Account Protection) to "Disabled” or start the browser as administrator privilege.
- If the operation terminal is accessing the USB memory by using explorer and so on, the operation terminal does not recognize the USB as a connectable device by virtual media.

- You may receive a STOP error message on a blue screen when using the virtual media function from your terminal.
  The blue screen appears on the terminal under the following circumstances.
  - You are using the remote storage function from a terminal running one of the following Windows operating systems:
    - Windows XP
    - Windows Vista
    - Windows 7
    - Windows Server 2008 R2
    - Windows Server 2012
  - You are using two USB devices as remote storage devices.

This issue does not occur when only one USB device is used.
Example: One of your remote storage devices is a USB device and the other is an iso image.
If your terminal is running on Windows Vista or Windows Server 2008, you can avoid this issue by applying the hotfix from KB 974711. For details, see the Microsoft Knowledge Base.
If your terminal is running on Windows XP, Windows 7, or Windows Server 2008 R2, use only one USB device.
For more information related to Windows 7 or Windows Server 2008 R2, see the Microsoft Knowledge Base.

The following shows a diagram of the connection configuration for remote storage.

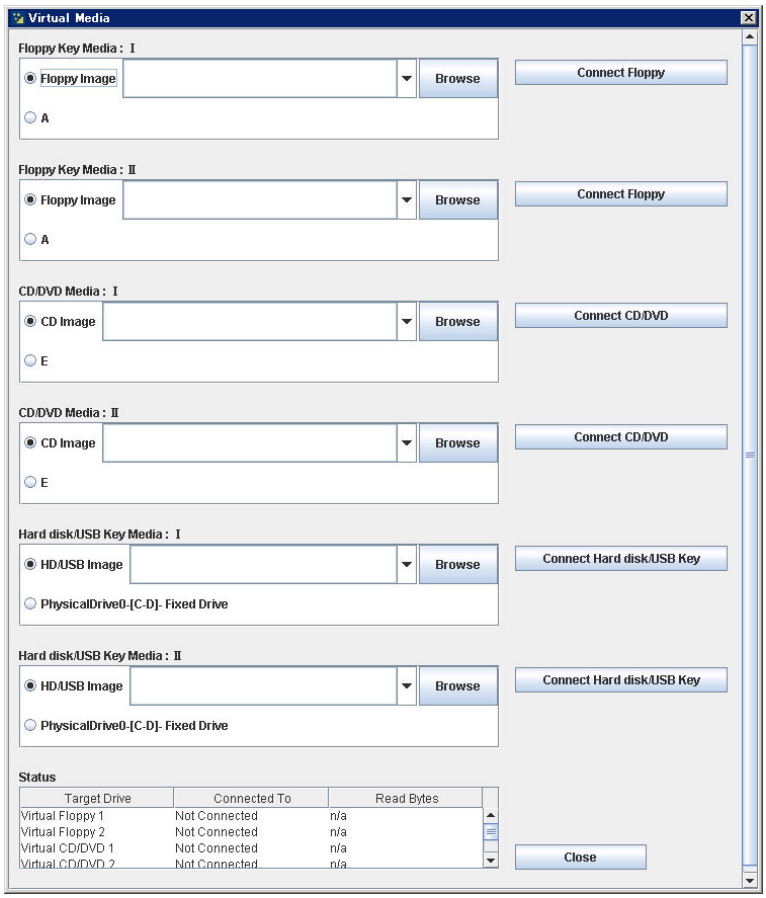
FIGURE 1.21 Configuration of virtual media connection



No.	Description
(1)	USB Mass Storage emulation

To recognize and display the devices that can be connected remotely, select [Virtual Media Wizard…] from the [Media] menu in the [Video Redirection] window. To recognize CD drives and DVD drives as devices that can be connected remotely, the drives must already have media inserted in them.

FIGURE 1.22 [Virtual Media] window (1)



The following lists the buttons available in the virtual media list window.

TABLE 1.12 Buttons in [Virtual Media] window

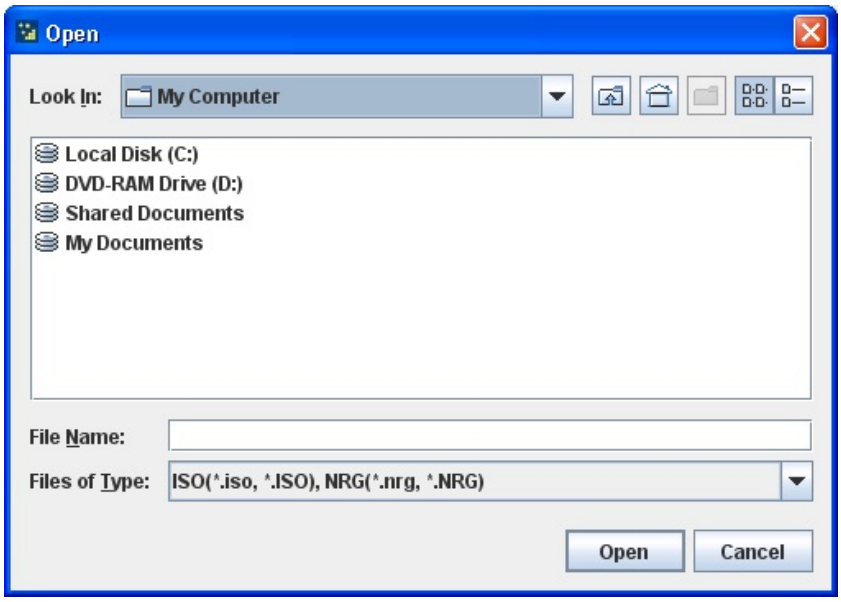
Item	Description
[Browse]	Add image file as virtual media.
[Connect]/[Disconnect]	Connect or disconnect selected device to a partition.
[Close]	Closes this window.

Note

- If you replace media while connecting to virtual media, click [Disconnect] button after setting new media. Click [Connect] again.
- When the [Video Redirection] window closes, all devices are disconnected from the server. Also, the devices are removed from the list.
- If mounting the media selected by virtual media fails when connecting the media, click [Disconnect] button and click [Connect] button again.

Click the [Browse] button to display the image file selection window. From the storage devices on the PC, you can select those to be connected to the partition.

FIGURE 1.23 Image file selection window



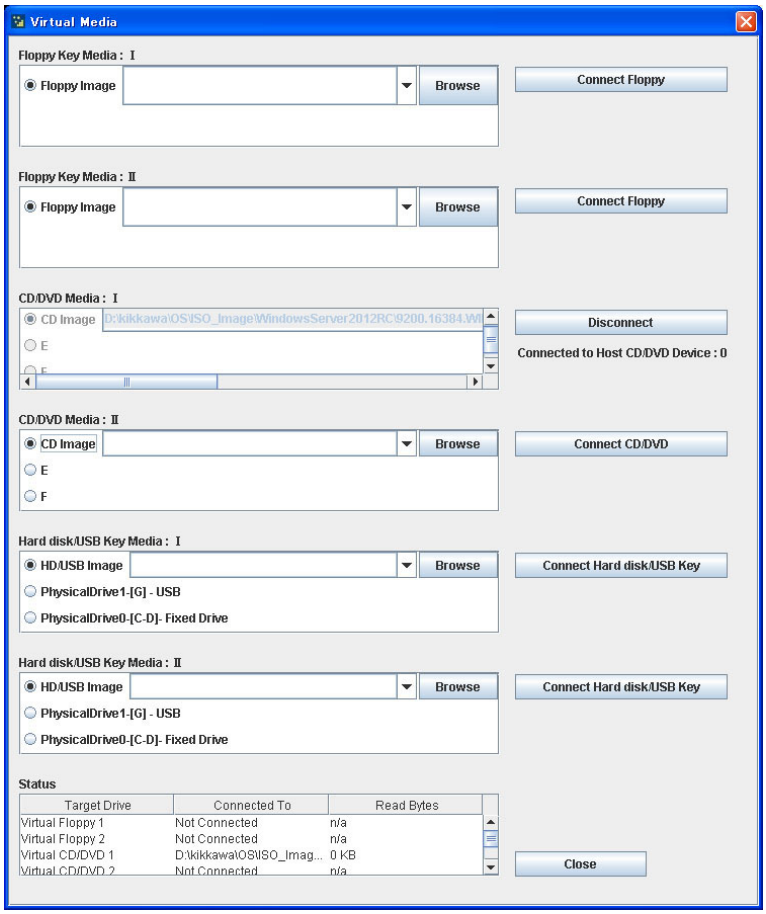
Items in image file selection window are listed below.

TABLE 1.13 Items in image file selection window

Item	Description
Look In	Displays the current search location
File name	Used to enter the device index letter (e.g., E:)
File of type	Used to specify a file type.
Open	Adds the selected device to the list.
Cancel	Closes this window.

Below formats of image can be used for virtual media.
Floppy: ima, img
CD/DVD: nrg, iso
HDD/USB: img
Select the ISO image file, and click the [Select] button. Then, the display returns to the [Virtual Media] window. Click [Connect CD/DVD] button in [Virtual Media] window to register the ISO image to target list of virtual media.

FIGURE 1.24 [Virtual Media] window (2)



Retrying a connection after the Reserved SB is switched

When changing the Home SB of the partition, connect console and video redirection again.

1.6.3 ServerView Suite

ServerView Suite environment setup for Windows

For details on the environmental settings of ServerView Suite for Windows, see the *ServerView Suite ServerView Installation Manager*.

ServerView Suite environment setup for Linux

For details on the environmental settings of ServerView Suite for Linux, see the *ServerView Suite ServerView Installation Manager*.

Creating and managing server groups

For details on how to create and manage server groups for individual users, see the *ServerView Suite ServerView Operations Manager Server Management*.
For more information about ServerView Suite, see below web site.
http://manuals.ts.fujitsu.com/

CHAPTER 2 Operating System Installation

For details on how to install an operating system on a partition, see Chapter 4 Installing the Operating System and Bundled Software in the PRIMEQUEST 2000 Series Installation Manual.

CHAPTER 3 Component Configuration and Replacement (Add, Remove)

This section describes the configuration and replacement of component of the PRIMEQUEST 2000 series.

3.1 Partition Configuration

This section describes the configuration of physical partition and Extended Partition.

- 3.1.1 Physical Partition Configuration
- 3.1.2 Extended Partition configuration

The partition is set in MMB Web-UI.

- 3.1.3 Setting procedure of partition in MMB Web-UI

3.1.1 Physical Partition Configuration

In order to configure and operate a partition, at least one usable SB, and at least one usable IOU are necessary.
During the course the configuration operation, there may be instances where the above conditions are not met (e.g.: partitions without SB); in such cases, the partition cannot be powered on and operated. Partition can be powered on without DU and PCI_Box while these components are necessary for expansion of storage capacity or PCI slots.
Configuration rules for partition are shown below

TABLE 3.1 Configuration rules for partition (components)

Components	Required number (common for all models)
SB	1 or more
IOU	1 or more
Memory Scale-up Board	Optional
DU	Optional
PCI_Box	Optional

Regarding DU, it is necessary that IOU containing DU should be possible.
Example:
To use DU#0, the use of IOU#0 or IOU#1 must be enabled.
To use DU#1, the use of IOU#2 or IOU#3 must be enabled.
For the installation conditions of the CPU, see 'Appendix G Component Mounting Conditions'.
A conceptual diagram of partitioning function for each model is shown below.

PRIMEQUEST 2400E3/2400E2

For PRIMEQUEST 2400E3/2400E2, up to two partitions can be configured. An optional SB/Memory Scale-up Baord and an optional IOU can be freely combined. The partition configuration is shown below. Components with dotted line /and white background color in the diagram show the components that are not mounted.

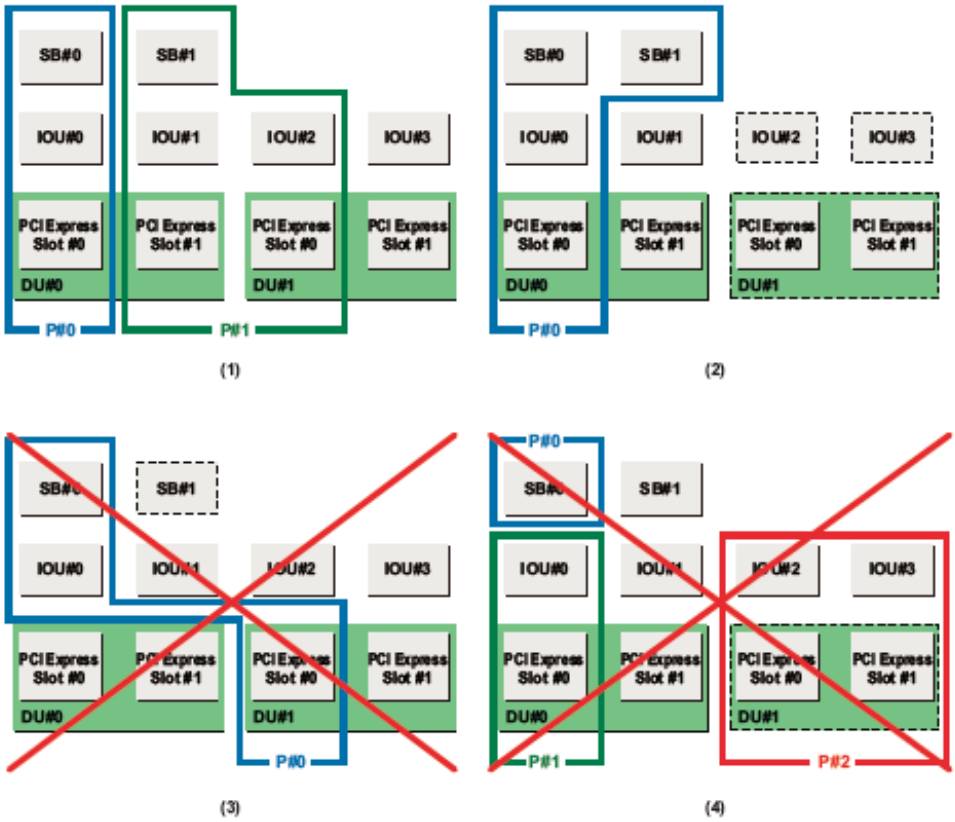
FIGURE 3.1 Conceptual diagram of the partitioning function (PRIMEQUEST 2400E3/2400E2)

No.	Configuration example	Description
(1)	Partition configuration example (possible)	Example of dividing into two partitions. Partition #1 includes one SB and two IOUs. SBs and IOUs can be freely combined.
(2)	Partition configuration example (possible)	Example of combining two SBs and one IOU.
(3)	Partition configuration example (possible)	Example of combining two SBs, two Memory Scale-up Boards and two IOUs.
(4)	Partition configuration example (not possible)	DU #1 cannot be used if IOU #2 or IOU #3 is not included in the partition.
(5)	Partition configuration example (not possible)	No partition can consist of only an SB, Memory Scale-up Board and IOU.

PRIMEQUEST 2400E

For PRIMEQUEST2400E, up to two partitions can be configured. An optional SB and an optional IOU can be freely combined. The partition configuration is shown below. Components with dotted line /and white background color in the diagram show the components that are not mounted.

FIGURE 3.2 Conceptual diagram of the partitioning function (PRIMEQUEST 2400E)

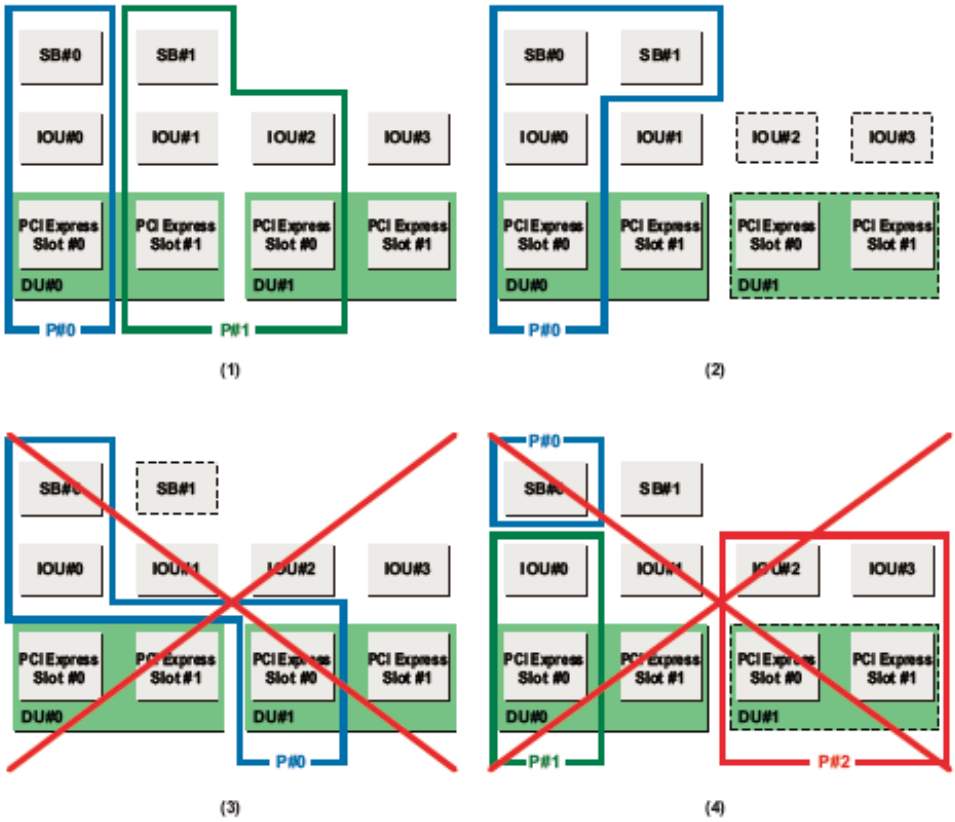


No.	Configuration example	Description
(1)	Partition configuration example (possible)	Example of dividing into two partitions. Partition #1 includes one SB and two IOUs. SBs and IOUs can be freely combined.
(2)	Partition configuration example (possible)	Example of combining two SBs and one IOU.
(3)	Partition configuration example (not possible)	DU #1 cannot be used if IOU #2 or IOU #3 is not included in the partition.
(4)	Partition configuration example (not possible)	No partition can consist of only an SB and IOU.

PRIMEQUEST 2800E3/2800E2/2800E

For PRIMEQUEST 2800E3/2800E2/2800E, up to four partitions can be configured. Optional SB and optional path can be freely combined. Examples of partition configuration are shown below. Components with dotted line and white background in the diagram show the components that are not mounted.

FIGURE 3.3 Conceptual diagram of the partitioning function (PRIMEQUEST 2800E3/2800E2/2800E)



No.	Configuration example	Description
(1)	Partition configuration example (possible)	Example of dividing into three partitions. Partition #1 includes one SB and two IOUs. Partition #2 includes one SB and one IOU. SBs and IOUs can be freely combined.
(2)	Partition configuration example (possible)	Example of configuring a partition of two SB and one IOU into two partitions
(3)	Partition configuration example (not possible)	DU #1 cannot be used if IOU #2 and IOU #3 are not included in the partition.
(4)	Partition configuration example (not possible)	No partition can consist of only an SB, and IOU.

3.1.2 Extended Partition configuration

Extended Partition is configured by allocating the following hardware resources.

- CPU core
- DIMM
  Memory can be allocated in units of 1GB.
- HDD/SSD
- PCI Express slot
- Onboard device (VGA, USB port)
  There are two ways how to allocate Onboard devices.
  - By VGA and two USB ports
  - By two USB ports

The configuration settings of Extended Partitioning are performed when the target partition of Extended Partitioning is powered off. The minimum configuration, maximum configuration and allocation unit of resources of the Extended Partitioning are shown below.

TABLE 3.2 Configuration number and unit of Extended Partitioning

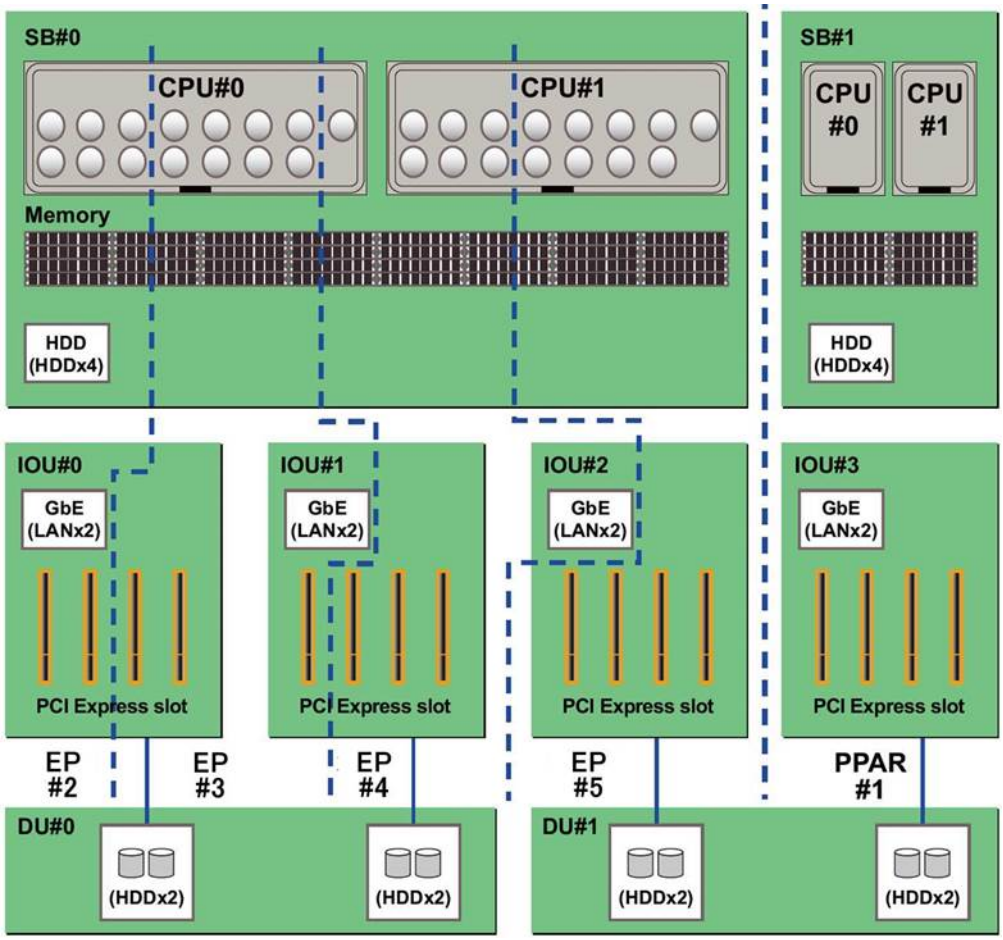
Resource type	Minimum configuration	Maximum configuration	Allocation unit
Number of CPU cores	1 Core	the number of core is the total number of core of CPU in physical partition which is divided to relevant Extended Partitions allotted to relevant Extended Partition minus one.	1 core
Memory capacity	2 GB	Capacity after deducting two GB from the total installed memory capacity in physical partition which is divided to relevant Extended Partitions	1 GB
HDD/SSD in SB	None	All installed HDD/SSDs	4 drives
HDD/SSD in DU	None	All installed HDD/SSDs	2 drives
PCI Express slot	None	All PCI Express slots	1 slot
Onboard VGA	None	One device	1 device
Onboard USB	None	4 port (maximum number of 1 SB)	2 ports

Remarks
PRIMEQUEST 2400E3/2800E3/2400E2/2800E2/2400E/2800E supports the Extended Partitioning function. A conceptual diagram of the Extended Partitioning function for each model is shown below.

PRIMEQUEST 2400E3/2400E2/2400E

For PRIMEQUEST 2400E3/2400E2/2400E, up to four Extended Partitions can be configured. An example of partition configuration is shown below.
In below figure, one physical partition and four Extended Partitions are configured.

FIGURE 3.4 Example of partition configuration where Extended Partition is used in PRIMEQUEST 2400E3/2400E2/2400E

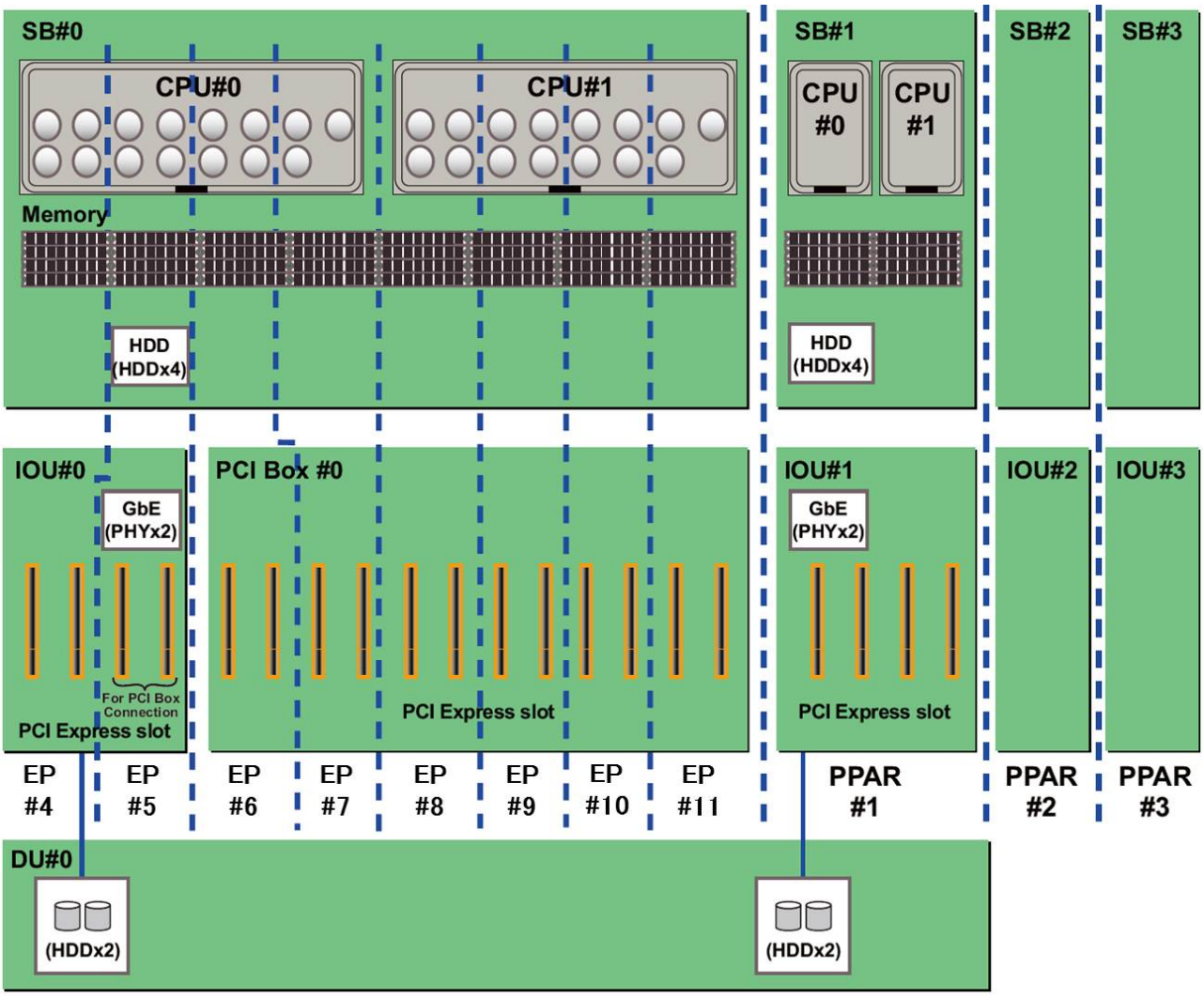


PRIMEQUEST 2800E3/2800E2/2800E

For PRIMEQUEST 2800E3/2800E2/2800E, up to eight Extended Partitions can be configured. An example of partition configuration is shown below.
In below figure, three physical partitions and eight Extended Partitions are configured.

Remarks
In PRIMEQUEST 2800E3/2800E2/2800E, a PCI_Box is required depending on the configuration of Physical partition or Extended Partition.
For example, when three physical partitions and six Extended Partitions are configured, two PCI Express slots are assigned to each Extended Partition. In such case, one PCI_Box is needed.

FIGURE 3.5 Example of partition configuration where Extended Partition is used in PRIMEQUEST 2800E3/2800E2/2800E



3.1.3 Setting procedure of partition in MMB Web-UI

For the procedure to set the partition in the MMB Web-UI, see “PRIMEQUEST 2000 series Installation manual” (CA92344-0536).

3.2 High availability configuration

This section describes the following functions for realizing a high system availability of the PRIMEQUEST 2000 series.

- 3.2.1 Extended Partitioning
- 3.2.2 Extended Socket
- 3.2.3 Dynamic Reconfiguration (DR)
- 3.2.4 Reserved SB
- 3.2.5 Memory Operation Mode
- 3.2.6 Memory Mirror
- 3.2.7 Hardware RAID
- 3.2.8 Server View RAID
- 3.2.9 Cluster configuration

3.2.1 Extended Partitioning

PRIMEQUEST 2400E3/2800E3/2400E2/2800E2/2400E/2800E supports the Extended Partitioning function. Extended Partitioning is a function for partitioning the Physical partition with the firmware in the CPU core units. A low-cost, highly reliable and secure means is provided for the server aggregation needs. The hardware resource partitioning by Extended Partitioning can be set using the MMB WEB-UI.
For details on the partition configuration, see '3.1.2 Extended Partition configuration'.

TABLE 3.3 Maximum number of partitions of various models

	PRIMEQUEST 2400E3/2400E2/2400E	PRIMEQUEST 2800E3/2800E2/2800E	PRIMEQUEST 2800B3/2800B2/2800B
Maximum number of Physical partitions	2	4	1
Maximum number of Extended Partitions per server	4	8	(Not available)

Note

- Before enabling the Extended Partitioning, check the operation for the test of the middleware products and applications.
- In the Extended Partition, one CPU socket may be shared by multiple Extended Partitions based on the configuration. You may note performance of application decreases in environment where CPU socket is shared by multiple extended partitions due to conflict for allotment of CPU resources. In this case Intel(R) Turbo Boost may not perform as expected. Even if you allot cores to the Extended Partition by the unit of CPU sockets, performance of Intel(R) Turbo Boost is may be lower than that for physical partition. To avoid this problem, you must allot CPU sockets to Extended Partitions. For details of MMB Web-UI, see “PRIMEQUEST2000 series Tool Reference” (CA92344-0539)

Management functions

Extended Partitioning is controlled by MMB Web-UI. The functions of Web-UI are as follows.

- Extended Partitioning status display function
- Setting the Extended Partition mode
- Extended Partition power management
- Extended Partition reset/NMI
- Extended Partition Activate, Deactivate
- Extended Partition configuration change

- Schedule operations

Function of displaying the status of Extended Partitioning

Physical partition and Extended Partition can be distinguished by the partition number.

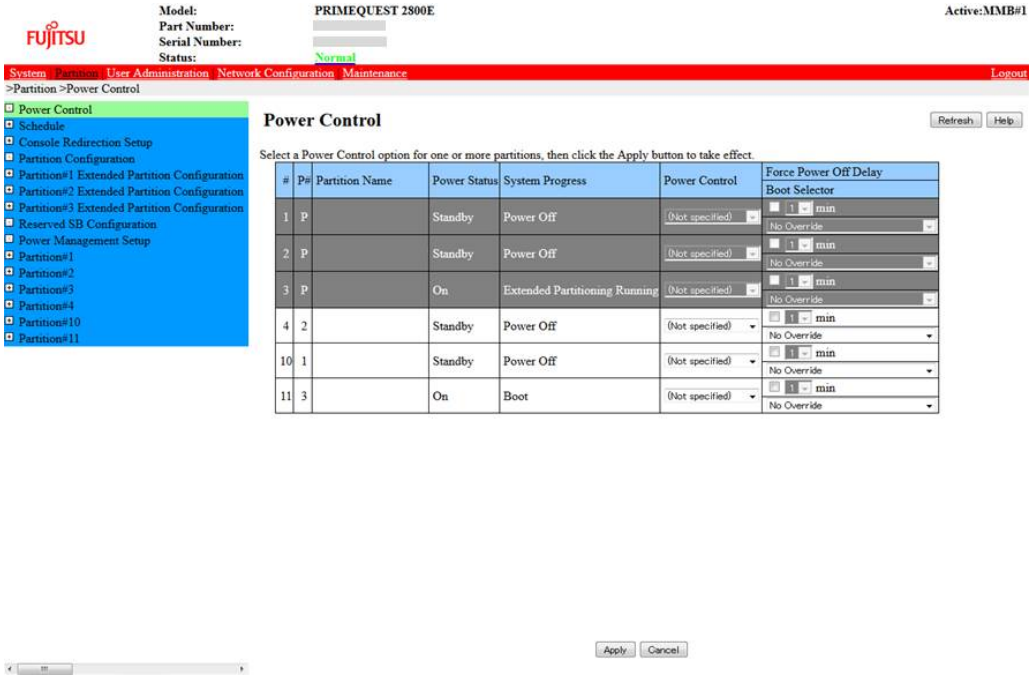
TABLE 3.4 Partition numbers for various models

	PRIMEQUEST 2400E3/2400E2/2400E	PRIMEQUEST 2800E3/2800E2/2800E	PRIMEQUEST 2800B3/2800B2/2800B
Physical partition ID	0, 1	0, 1, 2, 3	0
Extended Partition ID	2, 3, 4, 5	4, 5, 6, 7, 8, 9, 10, 11	(Not available)

Windows related to setting of a partition of Extended Partitioning are explained below.
For details of the MMB Web-UI, see "*PRIMEQUEST 2000 series Tool Reference*" (CA92344-0539)

- [Power Control] window
  In the Power Control window, the status of Physical partition and Extended Partition and power management display can be set.

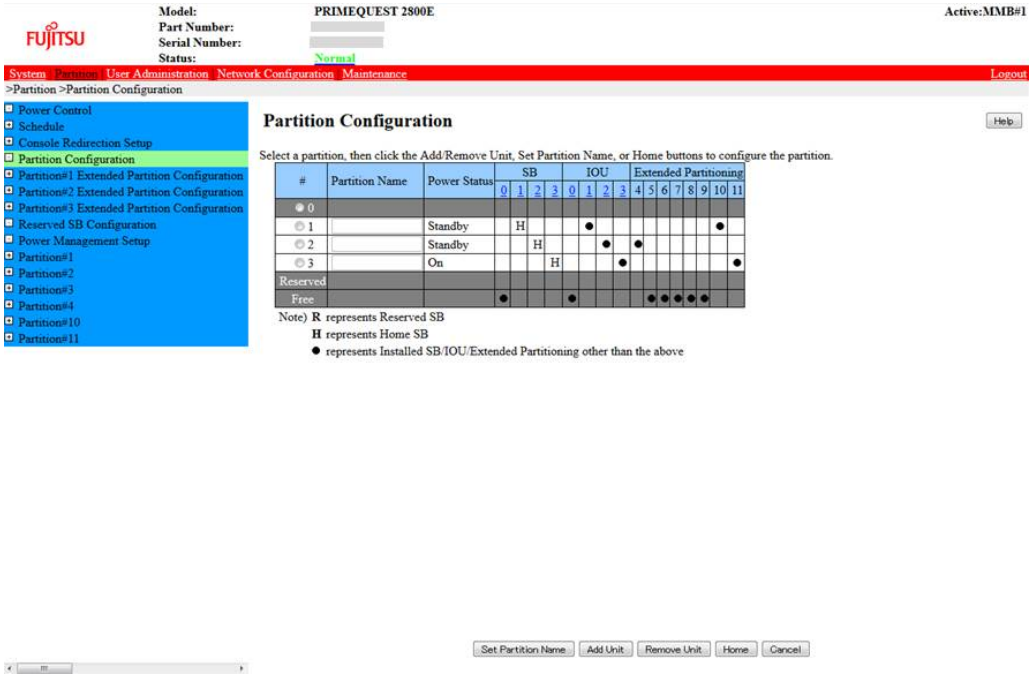
FIGURE 3.6 Example of [Power Control] window (Extended Partitioning is enabled.)



In FIGURE 3.6 Example of [Power Control] window (Extended Partitioning is enabled.), partition#4, #10, #11, which are Extended Partitions, are running. If Extended Partitioning mode of a physical partition is set to 'Enable', power operations cannot be performed in that physical partition.
Because partition #1, #2, #3 are physical partitions where Extended Partitioning mode is enabled, they are grayed out on the window.
'P#' of an Extended Partition shows partition ID of the physical partition whose resources are used by that Extended Partition. In above figure, 'P#' of partition #4, #10, #11 are displayed as '2', '1', '3', respectively. Partition #4, #10, #11, which are Extended Partitions, use resources of partition #2, #1, #3 which are physical partitions, respectively.
If Extended Partitioning mode of a physical partition is set to 'Disable', you cannot perform power operations of Extended Partitions which use resources of that physical partition. In this case, those Extended Partitions are grayed out on the window. In above figure, none of Extended Partitions are grayed out because Extended Partitioning mode is enabled on all physical partitions.
For details of [Power Control] window, see '1.3.1 [Power Control] window' in "*PRIMEQUEST 2000 series Tool Reference*" (CA92344-0539).

- [Partition Configuration] window
  In the [Partition Configuration] window, SB, IOU and Extended Partitioning are displayed as resources allocated to the Physical Partition.

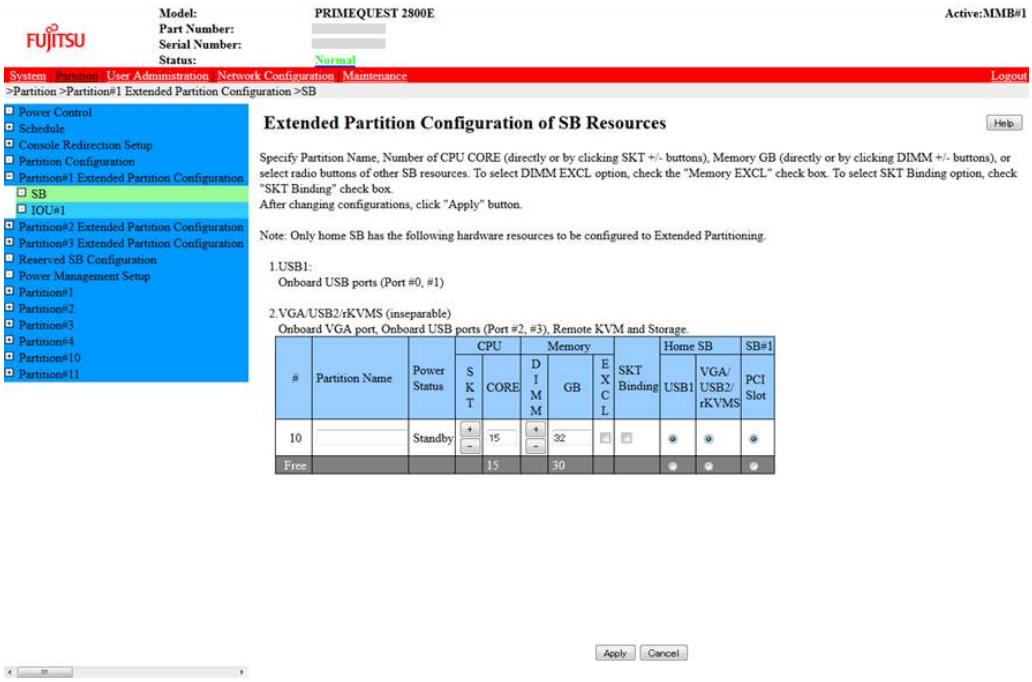
FIGURE 3.7 Example of [Partition Configuration] window (Extended Partitioning is enabled.)



For details of [Partition Configuration] window, see ‘1.3.4 [Partition Configuration] window’ in “*PRIMEQUEST 2000 series Tool Reference*” (CA92344-0539).

- [SB window]
  In the [SB] window, you can set a [Partition Name] or set how you allocate resouces in an SB such as [CPU] and [Memory] to each Extended Partition.

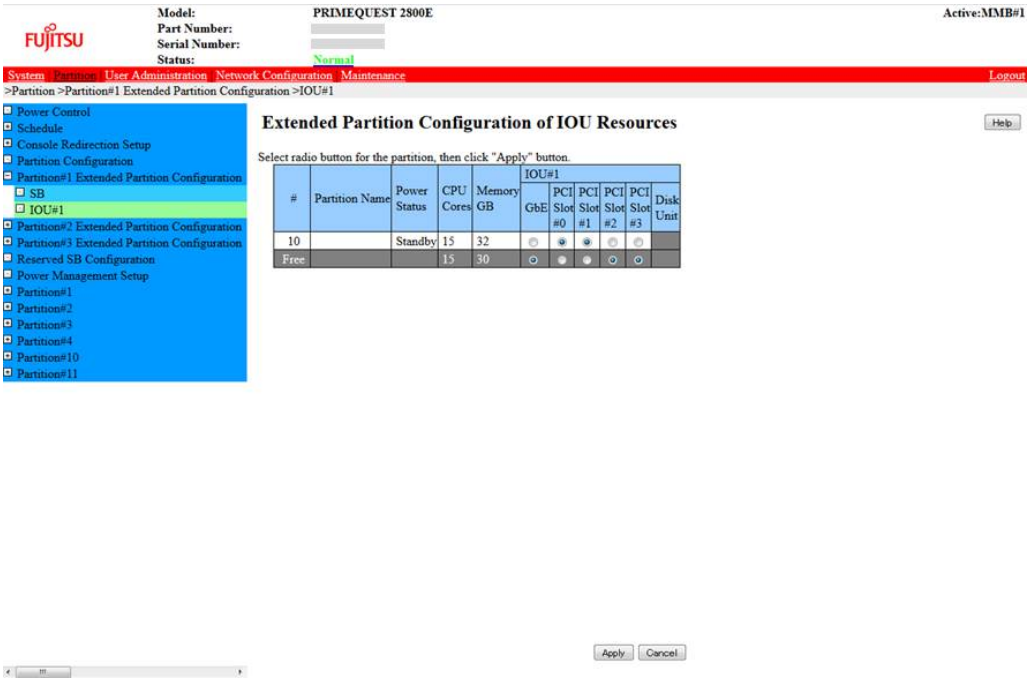
FIGURE 3.8 Example of [SB] window of Extended Partition



In ‘FIGURE 3.8 Example of [SB] window of Extended Partition’, it can be used in Extended Partition #5. If there are multiple SBs, multiple SBs are displayed under Partition#x Extended Partition Configuration in the sub menu area.
For details of [SB] window of Extended Partition, see ‘1.3.5.1 [SB] window’ in “*PRIMEQUEST 2000 series Tool Reference*” (CA92344-0539).

- [IOU] window
  The IOU configuring the Extended Partition is set in the [IOU] window.

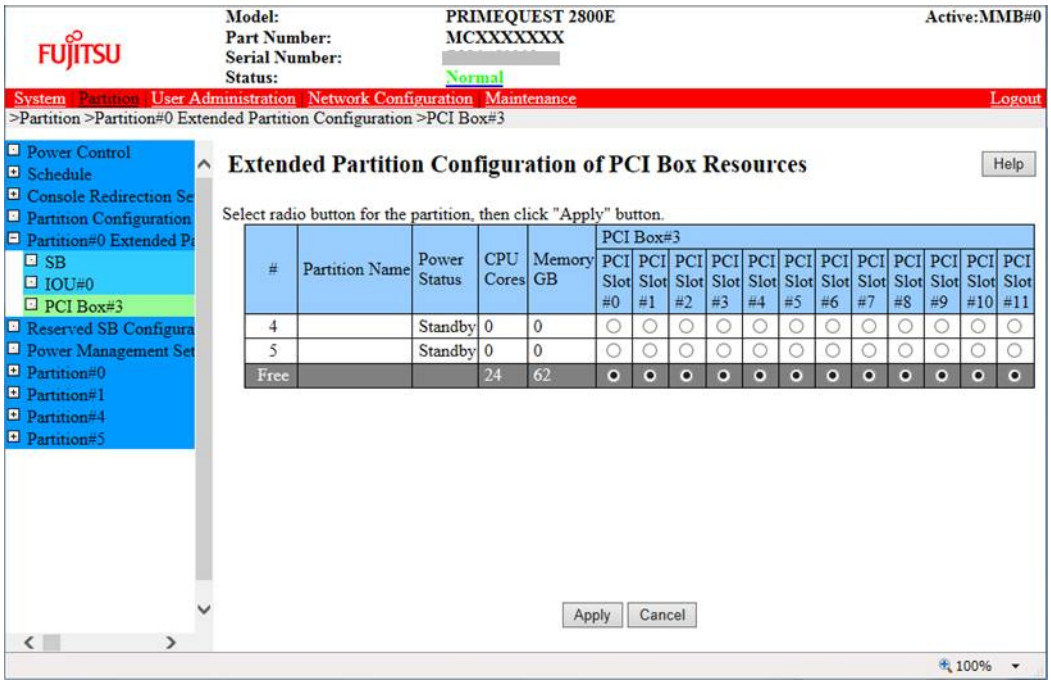
FIGURE 3.9 Example of Extended Partition of [IOU] window



If there are multiple IOUs, the [IOU#x] will be displayed in the Partition #x Extended Partition Configuration under the sub-menu area. For example, if IOU #1 and IOU #2 are available, then the [IOU #2] will be displayed under [IOU #1].
For details of [IOU] window of Extended Partition, see ‘1.3.5.2 [IOU] window’ in “*PRIMEQUEST 2000 series Tool Reference*” (CA92344-0539).

- [PCI_Box] window
  In the [PCI_Box] window, the PCI_Box configuring the Extended Partition will be set.

FIGURE 3.10 Example of [PCI_Box] window of Extended Partition



When there is one PCNC, the displayed number of PCI slots will become half, which is six. In ‘FIGURE 3.10 Example of [PCI_Box] window of Extended Partition’, two PCNCs are mounted. Therefore, 12 PCI slots will be displayed. If there are multiple PCI_Boxes, the [PCI_Box#x] will be displayed under the Partition #x Extended Partition Configuration in the sub-menu area. For example, if PCI_Box #1 and PCI_Box#2 are present, the [PCI_Box#2] will be displayed under [PCI_Box#1].
For details of [PCI_Box] window of Extended Partition, see ‘1.3.5.3 [PCI_Box] window’ in “*PRIMEQUEST 2000 series Tool Reference*” (CA92344-0539).

- [IPv4 Console Redirection Setup] / [IPv6 Console Redirection Setup] window
  Console redirection is set in the [IPv4 Console Redirection Setup] / [IPv6 Console Redirection Setup] window.

FIGURE 3.11 Example of [IPv4 Console Redirection Setup] window

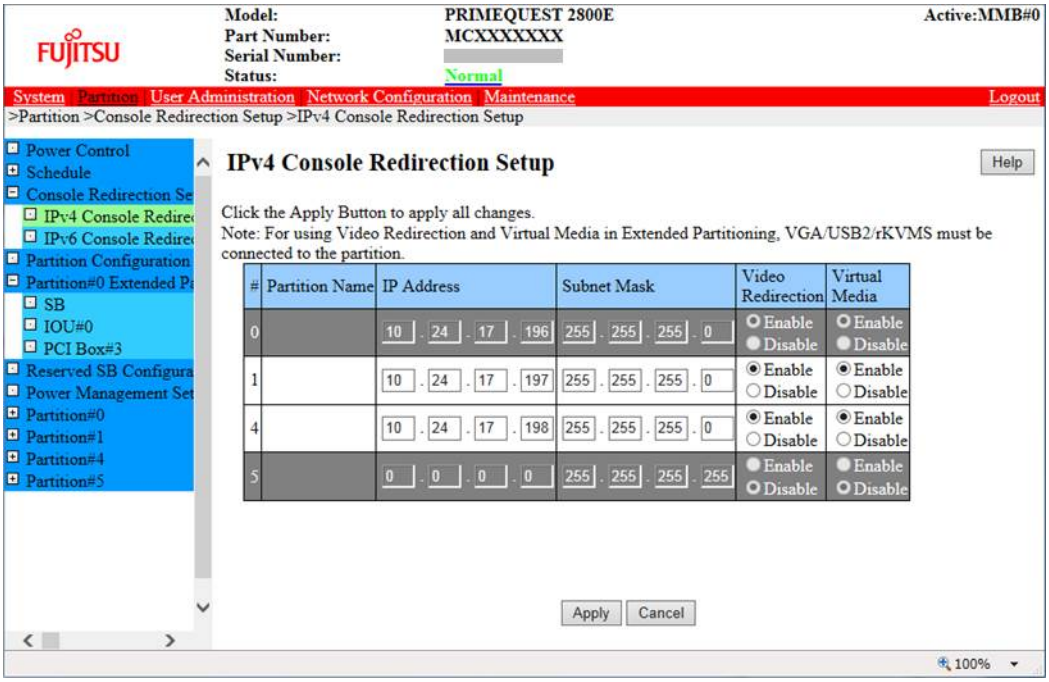
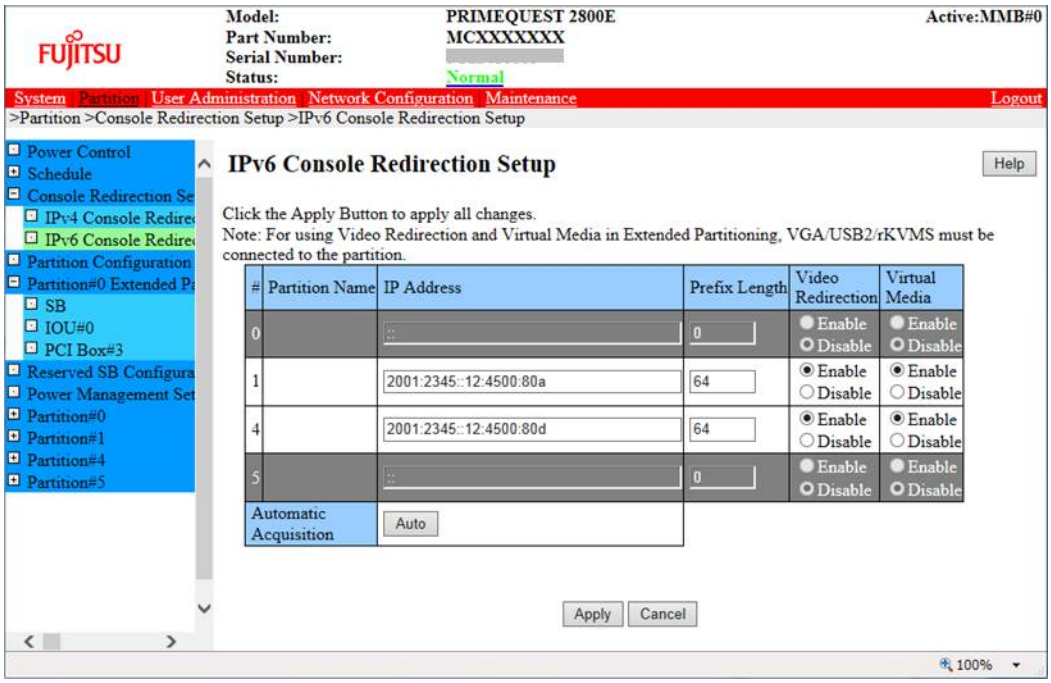


FIGURE 3.12 Example of [IPv6 Console Redirection Setup] window

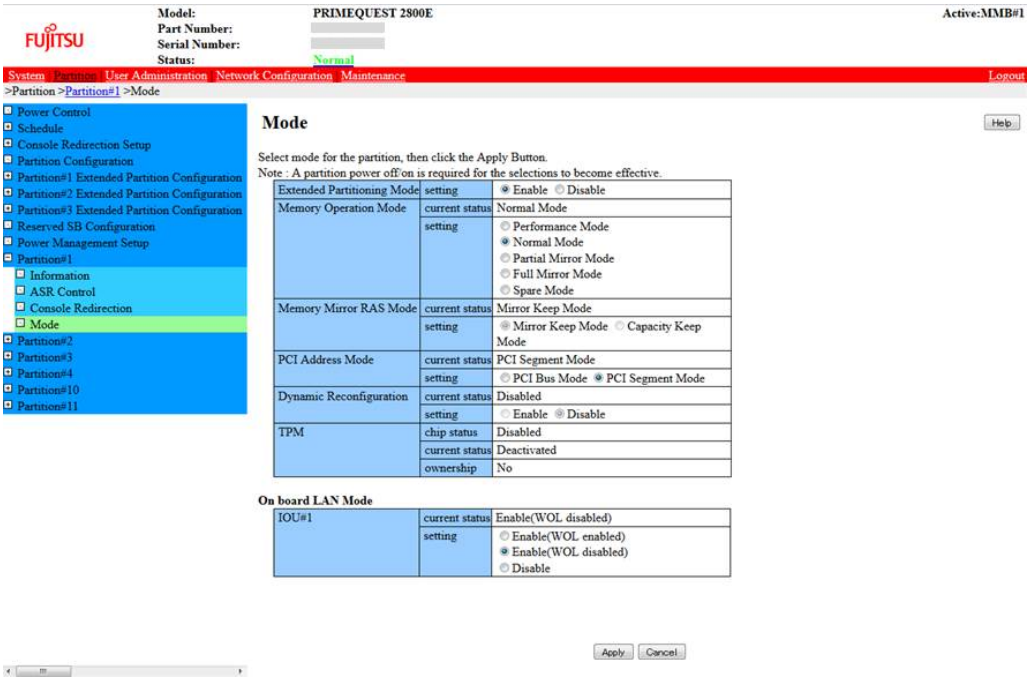


You must set IP addresses to Extended Partitions regardless of the physical partitions which are divided to Extended Partitions (Partition #0 of 'FIGURE 3.11 Example of [IPv4 Console Redirection Setup] window' / Partition #0 of 'FIGURE 3.12 Example of [IPv6 Console Redirection Setup] window'). In Extended Partition without VGA and USB2 allocation in the [Extended Partition Configuration] window (This is Extended Partition #5 in 'FIGURE 3.11 Example of [IPv4 Console Redirection Setup] window' and in 'FIGURE 3.12 Example of [IPv6 Console Redirection Setup] window'), the video redirection or virtual

media cannot be used even if Enabled. The physical partitions which are divided to Extended Partitions (Partition #0 in 'FIGURE 3.11 Example of [IPv4 Console Redirection Setup] window') will be grayed out. For details of [IPv4 Console Redirection Setup] window/ [IPv6 Console Redirection Setup] window, see '1.3.3 [Console Redirection Setup] window' in "*PRIMEQUEST 2000 series Tool Reference*" (CA92344-0539).

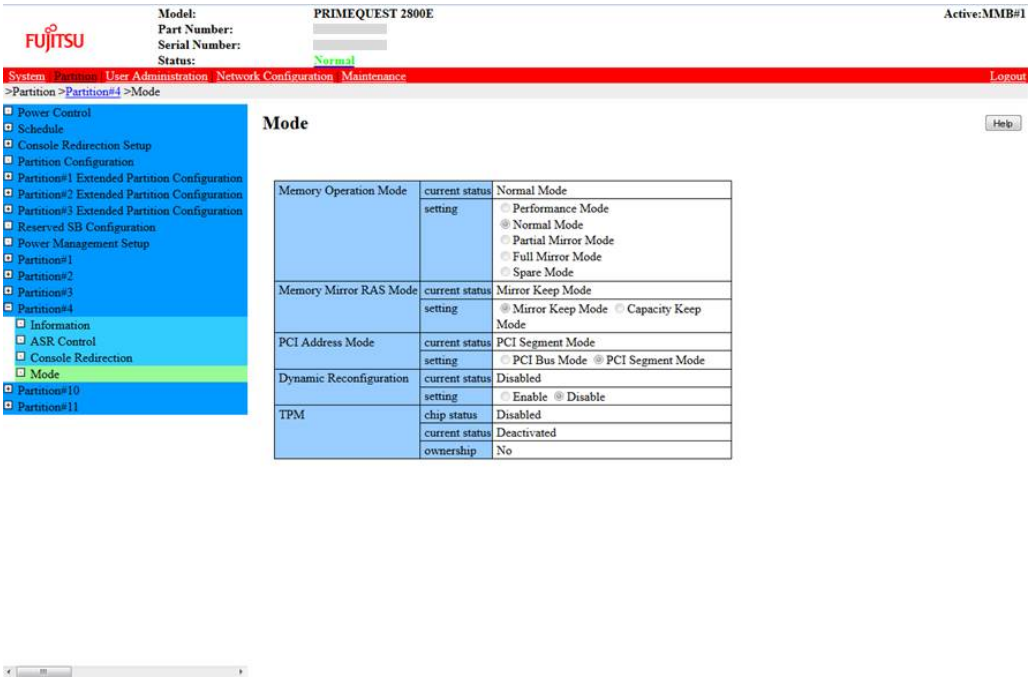
- [Mode] window
  Enable/Disable of Extended Partitioning can be set in the [Mode] window of the physical partition. Extended Partitioning is disabled as default setting.

FIGURE 3.13 Example of [Mode] window of physical partition



- [Mode] (Extended Partitioning) window
  The settings of mode are confirmed in the [Mode] window of the Extended Partition.

FIGURE 3.14 [Mode] window of Extended Partition



For details of [Mode] window, see '1.3.9.4 [Mode] window' in "*PRIMEQUEST 2000 series Tool Reference*" (CA92344-0539).

Setting of Extended Partitioning mode

Extended Partitioning is enabled by the following procedure.

1. Set the [Extended Partitioning Mode] to 'Enable' from the [Partition]-[Mode] menu.
2. Click the [Apply] button.
   The confirmation dialog box appears.
3. Click the [OK] button.

Note
When [Extended Partitioning Mode] is 'Enable', you cannot set [Dynamic Reconfiguration] to 'Enable'.

Extended Partitioning is disabled by the following procedure.
A partition where Extended Partitioning is disabled operates as a physical partition from next startup.

1. Set the [Extended Partitioning Mode] to 'Disable' from the [Partition]-[Mode] menu.
2. Click the [Apply] button.
   The confirmation dialog box appears.
3. Click the [OK] button.

Note
Even if [Extended Partitioning Mode] is set to 'Disable', the configuration information such as Extended Partition number and allocation of resources is saved.

The following is the window of the MMB affected by the Extended Partitioning mode.

TABLE 3.5 Effect on the menu of the MMB due to Extended Partitioning mode change

Menu		Effect due to Extended Partitioning mode setting	Reference
Partition	Power Control	On: Power operation of Physical partition is not possible Off: Power operation of Extended Partition is not possible	'FIGURE 3.6 Example of [Power Control] window (Extended Partitioning is enabled.)'
	Console Redirection	On: Parent Physical partition cannot be set (gray out) Off: Gray out cancel	'FIGURE 3.11 Example of [IPv4 Console Redirection Setup] window' 'FIGURE 3.12 Example of [IPv6 Console Redirection Setup] window'
	Partition #n → Mode	On: Setting change other than Extended Partitioning mode will not be possible for the Physical partition (grayed out) Off: Gray out cancel	'FIGURE 3.13 Example of [Mode] window of physical partition'

Power control of Extended Partitioning

The power on/off status of the Physical partition and Extended Partition are listed in the [Partition]-[Power Control] window of the MMB Web-UI. The user specifies the Physical partition or the Extended Partition from the list and turns on/off the partition power.

- When turning on the power of the first Extended Partition on the Physical partition, the Extended Partition would be powered on after the Physical Partition powered is turned on
- When turning off the power of the last Extended Partition on the Physical partition, the Extended Partition is first powered off, followed by the power off for the Physical partition.

The following power operations are possible in the Extended Partitioning mode.

- All Partition Power On
- All Partition Power Off
- Partition Power On

- Partition Power Off
- Partition Force Power Off
- Power Cycle
- Reset
- NMI
- sadump

For details, see '11.2 Partition Power on and Power off'.
For details on [System Power Control] window, see '1.2.8 [System Power Control] window' of "*PRIMEQUEST 2000 series Tool Reference*" (CA92344-0539).

Reset/NMI of Extended Partitioning

For how to operate Reset or NMI to a partition of Extended Partitioning, see '1.3.1 [Power Control] window' of "*PRIMEQUEST 2000 series Tool Reference*" (CA92344-0539)

Extended Partitioning Activate, Deactivate

In the absence of hardware resources, there are four Extended Partitions in PRIMEQUEST 2400E3/2400E2/2400E or eight Extended Partitions in PRIMEQUEST 2800E3/2800E2/2800E as free partitions. The Extended Partition can be activated by allocating the resources in the Physical partition to the Extended Partition. When the Extended Partition is released from the Physical partition, that Extended Partitioning will be in free state. This operation is called as Deactivating the Extended Partition. The method of Activating and Deactivating the Extended Partition is described below.

- Activating the Extended Partition

  1. Using the MMB Web-UI, the free Extended Partition number is allocated to the Physical partition. For details, see '1.3.3 [Partition Configuration] window' in "*PRIMEQUEST 2000 series Tools Reference*" (CA92344-0539)
  2. In addition, the necessary hardware resource is allocated to the Extended Partition by setting the SB, IOU and PCI_Box. The Extended Partition will become usable. For details, see '1.3.4 [Partition #x Extended Partition Configuration] menu' in "*PRIMEQUEST 2000 series Tools Reference*" (CA92344-0539).

- Deactivating the Extended Partition

  1. Power off the Extended Partition.
  2. Using the MMB Web-UI, select the Physical partition and specify the Extended Partition number to be deactivated. For details, see '1.3.3 [Partition Configuration] window' in "*PRIMEQUEST 2000 series Tools Reference*" (CA92344-0539).

  The hardware resources allocated to the deactivated Extended Partition can be allocated to other Extended Partitions using the configuration modification function of the Extended Partitioning. When the Extended Partition is deactivated, the configuration information of that partition will be deleted.

  The following are the conditions for Extended Partitioning Activate/Deactivate of Extended Partitioning.

TABLE 3.6 Activate/Deactivate for Extended Partition

Extended Partitioning Mode setting in parent Physical partition (*1)	Extended Partitioning number setting in parent Physical partition (*2)	Resource allocation in Extended Partition (*3)	Status	Remarks
Enable	Present	Present	Activate	Extended Partition startup is possible
		None	Deactivate	Extended Partition startup is not possible
	None			The resource allocation information to Extended Partition is automatically cleared
Disable	Present	Present		The resource allocation information in Extended Partition is saved
		None		

Extended Partitioning Mode setting in parent Physical partition (*1)	Extended Partitioning number setting in parent Physical partition (*2)	Resource allocation in Extended Partition (*3)	Status	Remarks
	None			The resource allocation information in Extended Partition is automatically cleared

*1: For details, see '■ [Mode] window' of '1.3.9 [Partition #x] menu' in "*PRIMEQUEST 2000 series Tool Reference*" (CA92344-0539).
*2: For details, see '1.3.3 [Partition Configuration] window' of "*PRIMEQUEST 2000 series Tool Reference*" (CA92344-0539).
*3: For details, see [Partition #x Extended Partition Configuration] menu' of '1.3.4 [Partition #x Extended Partition Configuration] menu' in "*PRIMEQUEST 2000 series Tool Reference*" (CA92344-0539).

Extended Partitioning configuration change

In the configuration change function of Extended Partitioning, the hardware resource allocated to Extended Partition can be changed. Following are the target hardware resources. The configuration change function of Extended Partitioning is run by disconnecting the power of the target Extended Partition.
For the minimum configuration, maximum configuration and the allocation unit of Extended Partitioning, see 'TABLE 3.2 Configuration number and unit of Extended Partitioning'.

Switching function of serial output

The switching function of the serial output switches the connections between the serial output of Physical partition (COM port) and the Extended Partition.
The switching method is described below.

1. Select a partition of Extended Partitioning which you want to connect via console redirection by 'console' command of MMB command line interface. If there is another partition of Extended Partitioning that is already using console redirection, select whether or not to forcibly switch the console redirection. If console redirection is forcibly switched, serial output may not be shown normally. A fixed volume of data, which was serially output from the Extended Partition, while serial output for Extended Partition was not selected, will be saved. Then, it will be output when connected to the Extended Partition. If the output data exceeds a certain volume, then the data from the old data will be discarded.

Notes/Limitations of Extended Partitioning

- Physical partition which is divided to relevant Extended Partition can allow the partition configuration with one SB or the partition configuration with two SBs of SB#0 and SB#1 or SB#2 and SB#3. If the Physical partition which is divided to relevant Extended Partition includes two SBs, Reserved SB cannot be set.
- Dynamic Reconfiguration and Extended Partitioning are exclusive to each other. The Dynamic Reconfiguration cannot be used when the Extended Partitioning mode is Enabled.
  The Dynamic Reconfigurationi function can be used only in the partition that is operating as a Physical partition.
- The memory capacity that can be used in Extended Partition becomes smaller than the memory capacity of Physical Partition by about 2GB, because 2GB memory are used by Extended Partitioning firmware.
- The firmware of Extended Partitioning occupies one core to manage common part without affecting the performance of Extended Partitions. So, number of CPU core which can be used by Extended Partition decrease by one core than number of CPU core of physical partition.
- The following functions are not supported in the Extended Partition.
  - BitLocker drive encryption function
  - TPM
- Extended Partitioning cannot be used in a partition including Memory Scale-up Board.
- The UEFI / BMC firmware is updated by including online update during Extended Partitioning operation. The Physical Partition must be reset for incorporating the update
- The settings of the following CPU functions can be changed only in the UEFI of the Physical partition. The settings cannot be changed in the UEFI of Extended Partition.
  - Hyper threading

  - Power Technology
  - Enhanced SpeedStep
  - Turbo Mode
  - Energy Performance
  - P-State Coordination
  - QPI Link Frequency Select
  - Frequency Floor Override
  - DIMM Speed setting
- Select the action of Extended Partitioning from following actions after the Watchdog timeout is detected.
  - Continue
  - Reset
  - NMI
  - Power Cycle (*1)

  *1: The 'Power Cycle' of Extended Partitioning executes control in the same way as reset.
- For the memory setting, the setting of the Physical partition is also applicable to the Extended Partition. Setting cannot be carried out in the Extended Partition.
  - Memory Operation Mode
  - Memory Mirror RAS Mode
  - Patrol Scrub (set in the UEFI menu)
- Although the physical partition incorporating the Reserved SB maintains the configuration information of previous Extended Partition, the hardware resources may vary from the SB prior to the degradation.
- Extended Partitioning is supported in CPU core degradation / memory degradation and spare CPU core / spare memory. If there is error in the CPU core / memory, and degradation occurs during Extended Partitioning startup, Extended Partitioning will first attempt to use the reserve CPU core / reserve memory (*1), and if the allocated resources are still insufficient, CPU core degradation / memory degradation will occur.

  *1: Free CPU core / memory that is not allocated to the Extended Partition
  - If there is a spare CPU core / spare memory:
    Extended Partition is initialized by using the spare CPU core / spare memory in place of the failed CPU core / memory.
  - If there is not a spare CPU core / spare memory, or if the spare CPU core / spare memory is insufficient:
    The allocated CPU core / memory is reduced and the Extended Partition is initialized, and the order of priority of the CPU core / memory allocation when multiple Extended Partitions startup, will be in the ascending order of partition number.
    When there is no locatable CPU core / memory, the Extended Partitioning firmware will detect configuration error.
    The Extended Partition does not start.
- In Extended Partitioning, sadump can be used in the Extended Partitioning-BIOS, and the operating system hierarchy. Dump of Extended Partitioning firmware hierarchy cannot be taken.
- An Extended Partition takes longer time to access devices which are shared among other Extended Partitions than occupied by only the Extended Partition. Hence, performance depends on pattern in which the application accesses the device.
- If such below massage appears at OS boot, system operation is not affected.
  “Jul 5 23:05:32 localhost kernel: TSC: HPET/PMTIMER calibration failed.”
- When an Extended Partition number is removed from a physical partition in Partition Configuration window, hardware resources assigned to the Extended Partition are freed but its BIOS settings are reserved.
  So if the same Extended Partition number is assigned to the same physical partition again, the reserved BIOS settings of the Extended Partition are restored.

However, if the Extended Partition Number is re-assigned to another physical partition with different BIOS setting, some BIOS settings of the Extended Partition are changed because some BIOS settings of an Extended Partition are taken from the physical partition.
For which BIOS settings are taken from the physical partition, see ‘Chapter 3 UEFI Menu Operations' of "*PRIMEQUEST 2000 series Tool Reference*" (CA92344-0539).

- Multiple Extended Partitions share the same IPMI interface of BMC. So IPMI performance of Extended Partition may be lower than that of physical partition.
- If you make cluster configuration of Extended Partitions, do not make cluster configuration of Extended Partitions which are on the same physical partition.
- When the Personality setting of CNA card or LAN card is changed using BIOS Menu on Extended Partition, the change is not reflected by reset of Extended Partition.
  Reset the physical partition, or change Personality setting on the physical partition to reflect the change.
- In the Extended Partitiong, Emulex single/dual Fibre Channel Card (8Gbps/16Gbps) and Emulex Dual Channel CNA card (10Gbps) are supported only in UEFI mode.
- The lifetime of SSD cannot be monitored in Extended Partition using MMB Web-UI. Install SV Agent and SV RAID, and use the monitoring function of SV RAID.
- When activating a RAID software license of a SAS RAID controller card using ServerView RAID Manager, issue physical partition power off and on after activation key entry.
- If following message appears at OS boot, there is no problem in system operation:
  「ivbep_uncore: probe of XXXX:YY:ZZ.W failed with error -22」 (XXXX,YY,Z,W: hexadecimal)

Installing the operating system in Extended Partitioning

The operating system is installed in the Extended Partition using the network installation that is connected to the PXE. In the Extended Partitioning where the USB port of BMC is allocated, the operating system can be installed even through a virtual media.
The installation of the operating system using SVIM is recommended in the PRIMEQUEST 2000 series. The DVD drive is not provided in the PRIMEQUEST 2000 series. The installation of the operating system using SVIM has the following two options, namely Remote and Local.

- Remote installation
  The operating system is installed by using video redirection and virtual media. The video redirection and virtual media can use only an Extended Partition in which the VGA/USB2 has been allocated on one Physical Partition.
  For details, see ‘1.3.4 [Partition #x Extended Partition Configuration] menu' in "PRIMEQUEST 2000 series Tools Reference” (CA92344-0539). After the operating system has been installed in the Extended Partition, in case of installing the operating system in another Extended Partition on the same Physical partition, first the Extended Partition must be powered off, then the configuration of the partition (allocation of VGA/USB2) can be changed. When the operating system is installed, in order to prevent change in the physical configuration at the time of actual operation, a virtual dummy USB controller is created for the Extended Partition for which VGA/USB2 has not been allocated. Therefore, it is the same as inserting and removing the cable of the USB device when viewed from the operating system, as in the case of the DVD Switch in the existing PRIMEQUEST series.
- Local installation
  The operating system is installed in Local, by allocating a physical port (VGA, USB, etc.) to the Extended Partition and using a KVM. While installing the operating system, an on-board VGA / USB port can be temporarily used as in the conventional PRIMEQUEST series, however on a single Physical partition, it is possible to allocate a VGA port to one Extended Partition, and a USB port to two Extended Partitioning only. Therefore, in order to install the operating system on multiple Extended Partitions of the same Physical partition using only the on-board VGA / USB port, it is necessary to first power off the Extended partition and then change the configuration of the partition.

A comparison of remote installation and local installation is shown below.

TABLE 3.7 Comparison of the operating system installation options

Option	Feature	Remarks
Remote installation	- Remote operation possible	- To install the operating system to multiple Extended Partitions of the same Physical partition, Extended Partition must be powered off before changing the configuration.
Local installation	- Installing operating system into Extended Partitions with physical	- Local operation is necessary. - When an expansion card is not provided, and

	port (VGA, USB, …) on different physical partition in parallel.	to install the operating system on multiple Extended Partitions of the same Physical partition, Extended partition must be powered off before changing the configuration.

Extended Partitioning maintenance work

If you replace an SB, an IOU_1GbE, an IOU_10GbE, a DU or a PCI_Box when Extended Partitioning is enabled, turn off all Extended Partitions on the physical partition which includes the SB, the IOU_1GbE, the IOU_10GbE, the DU or the PCI_Box to be replaced.
If you replace PCI Express slots of an IOU_1GbE, an IOU_10GbE or a DU when Extended Partitioning is enabled, turn off all Extended Partitions on the physical partition which includes the SB, the IOU_1GbE, the IOU_10GbE, the DU or the PCI_Box to be replaced.
If you replace PCI Express slots of a PCI_Box when Extended Partitioning is enabled, turn off the Extended Partition and then perform maintenance work, or use the PHP function in OS.

The feasibility of maintenance of the PCI Express slot of the IOU_1GbE, the IOU_10GbE, the DU or the PCI_Box where Extended Partitioning is enabled is shown below.

TABLE 3.8 Maintenance of PCI Express slot of the IOU_1GbE/IOU_10GbE/DU

Extended Partitioning allocation of PCI Express slot	Physical Partition power	Extended Partitioning on the physical partition power	Maintenance
Not assigned	Off	-	Possible
	On		Not Possible
Assigned	Off	Off	Possible
	On	On	Not Possible
		Off	Not Possible

TABLE 3.9 Maintenance of PCI Express slot of the PCI_Box

Extended Partitioning allocation of PCI Express slot	Physical Partition power	Extended Partitioning on the physical partition power	Maintenance
Not assigned	Off	-	Possible
	On		Possible
Assigned	Off	Off	Possible
	On	On	Possible (*1)
		Off	Possible

(*1) only in cards which support PHP.

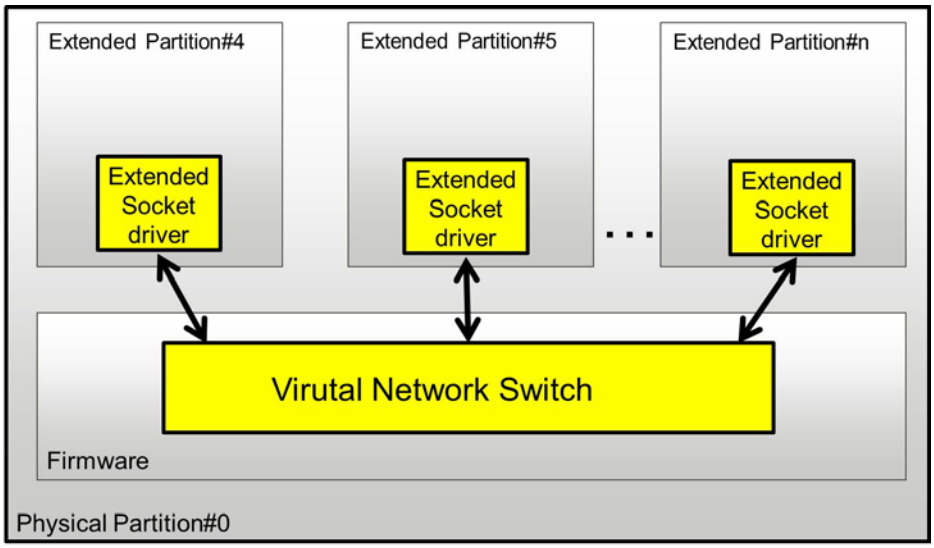
If you update the firmware of fibre channel card in PCI_Box, also update the module which makes the firmware version of fibre channel card the same version among the fibre channel cards after hot replacement no matter whether you replace the fibre channel card or not. The module is got in following URL to installe the module; http://support.ts.fujitsu.com/

For details, see '3.3 Replacing components".

3.2.2 Extended Socket

Extended Socket is the function which enables up to 40 Gbps high-speed communication among Extended Partitions of the same physical Partition without adding network hardware device such as a physical NIC. Virtual Network Switch in firmware combined with Extended Socket Driver helps communication between Extended Partitions.
Extended Socket driver is installed in the OS of each Extended Partition and it is seen as an additional network device by the OS.

FIGURE 3.15 Overview of Extended Socket



Enabling/Disabling Extended Socket

Extended Socket is set to 'Enable'/'Disable' in [Mode] window of the Extended Partition of MMB Web-UI.
For detail of [Mode] window, see '1.3.9.4 [Mode] window' in "*PRIMEQUEST 2000 series Tool Reference*" (CA92344-0539).

Zoning function

Zoning function allows an Extended Partition to communicate by using Extended Socket with only Extended Partitions which are allowed.
In Extended Socket, set 'Zone' which is communication group, to each Extended Partition. Communication among only Extended Partitions which belong to same Zone is allowed.
Below table shows maximum number of Zone of each model.

TABLE 3.10 Maximum number of Zone in each model

	PRIMEQUEST 2400E3/2400E2/2400E	PRIMEQUEST 2800E3/2800E2/2800E	PRIMEQUEST 2800B3/2800B2/2800B
Maximum number of Zone	4	8	Extended Socket is not supported.

Note

- Extended Partition where Zone is not assigned cannot communicate with other Extended Partition by using Extended Socket.
- Only one Zone can be set to one Extended Partition.
- Zone where Extended Partitions on different physical partition belong to cannot be set to an Extended Partition.
- If you can change the setting of Zone of an Extended Partition while the Extended Partition is running, perform following steps:

  1. Unload Extended Socket driver on OS.
     Unload Extended Socket driver by steps written in 'Loading/Unloading Extended Socket driver'.
  2. Change the setting of Zone by MMB Web-UI.
  3. Load Extended Socket driver on OS.
     Load Extended Socket driver by steps written in 'Loading/Unloading Extended Socket driver'.
  4. Restart the application on OS.

The setting of Zone is performed by [Extended Socket Configuration] window in MMB Web-UI.
For details of [Extended Socket Configuration] window, see '1.3.6 [Extended Socket Configuration] window' in "*PRIMEQUEST 2000 series Tool Reference*" (CA92344-0539)

VLAN function

Extended Socket supports Tag-VLAN function within the Zone.

How to confirm interface of Extended Socket on OS

Extended Socket is normally seen as network interface of “es0”.
If “es0” already exists, the number is increased like “es1”. In such cases, you can confirm which interface is assigned to Extended Socket as follows:

1. Confirm the hardware address of Extended Socket.
   The hardware address of Extended Socket is definded for each Extended Partition number in each model.
   The hardware address of Extended Socket for each Extended Partition number in each model is shown below:

Extended Partition number	Hardware address	
	2400E3/2400E2/2400E	2800E3/2800E2/2800E
#2	02:00:00:00:00:00	-
#3	02:00:00:00:00:01	-
#4	02:00:00:00:00:02	02:00:00:00:00:00
#5	02:00:00:00:00:03	02:00:00:00:00:01
#6	-	02:00:00:00:00:02
#7	-	02:00:00:00:00:03
#8	-	02:00:00:00:00:04
#9	-	02:00:00:00:00:05
#10	-	02:00:00:00:00:06
#11	-	02:00:00:00:00:07

2. Confirm the name of interface which has above hardware address.
   In example 1, “es0” is already used and “es1” is not used in Extended Partition#4 in PRIMEQUEST 2400E3/2400E2/2400E.

   Example 1:

```
# grep –il “02:00:00:00:00:02” /sys/class/net/*/address
/sys/class/net/es1/address
```

   In example 2, “es0” is already used and “es1” is not used in Extended Partition#4 in PRIMEQUEST 2800E3/2800E2/2800E.

```
# grep –il “02:00:00:00:00:00” /sys/class/net/*/address
/sys/class/net/es1/address
```

Loading/Unloading Extended Socket driver

- Loading Extended Socket driver.
  Perform following command.
  - RHEL 7.2 or earlier

```
# /sbin/modprobe fjexsock
```

  - RHEL 7.3 or later

```
# /sbin/modprobe fjes
```

- Unloading Extended Socket driver.
  1. Confirm the name of network interface of Extended Socket
     Confirm the name of network interface of Extended Socket by the method of “How to confirm interface of Extended Socket on OS”.
  2. Stop the network interface of the Extended Socket.
     Example) When the name of network interface of the Extended Socket is “es0”.

```
# /sbin/ifconfig es0 down
```

  3. Unload Extended Socket driver.
  - RHEL 7.2 or earlier

```
# /sbin/modprobe -r fjexsock
```

  - RHEL 7.3 or later

```
# /sbin/modprobe fjes
```

Notes/Limitations of Extended Socket

- When using Extended Socket, set Memory Operation Mode to ‘Performance Mode’. If you set Memory Operation mode to other modes, the performance of communication among Extended Partitions by using Extended Socket may decrease.
- If you use Extended Socket with Hyper Threading disable, the performance of communication among Extended Partitions by using Extended Socket may decrease. To avoid this problem, you must fix C state and P state of CPU to C0 and P0 respectively.

  To fix C state to C0, you perform following steps on OS.

  1. Modify /etc/default/grub if you booted OS with UEFI mode, or modify /etc/default/grub if you booted OS with Legacy mode as follows:
     Add "intel_idle.max_cstate=0 processor.max_cstate=0 idle=poll" at the line of GRUB_CMDLINE_LINUX.
  2. Perform following command.
     When booting OS with UEFI mode:

```
# grub2-mkconfig -o /boot/efi/EFI/redhat/grub.cfg
```

     When booting OS with Legacy mode:

```
# grub2-mkconfig -o /boot/grub2/grub.cfg
```

  To fix P state to P0, you perform following steps on OS.

  1. Become super user.

```
$ su -
```

  2. Perform following command.

```
# cpupower frequency-set –g performance
```

- Do not redirect kdump to the remote host via Extended Socket.

3.2.3 Dynamic Reconfiguration (DR)

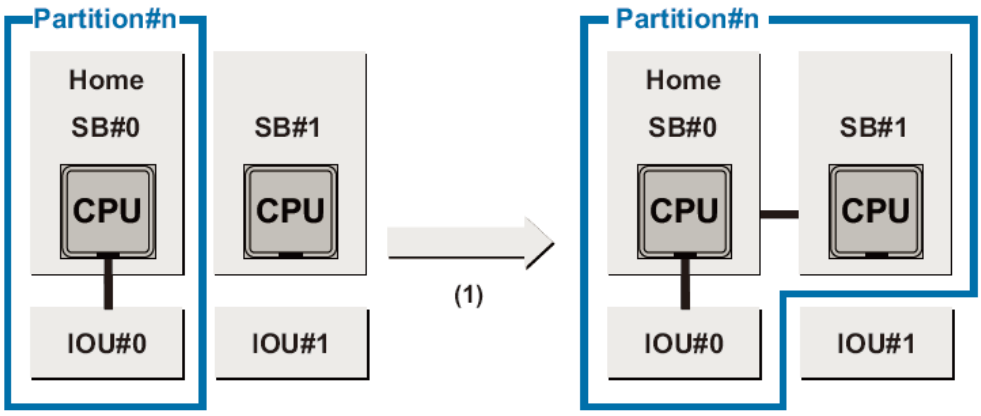
This section describes the hot maintenance by DR.
For details on the hot maintenance, see CHAPTER 4 Hot Maintenance in Red Hat Enterprise Linux 6, .CHAPTER 5 Hot Maintenance in Red Hat Enterprise Linux 7 or CHAPTER 7 PCI Card Hot Maintenance in SUSE Linux Enterprise Server 12.

Function Overview

The DR function is intended for adding or removing hardware resources, such as CPU, memory and I/O, without stopping the partition system. Units for adding and removal are the partition configuration components of SB and IOU (including the PCI_Box). The DR functions for various configuration elements are as follows.

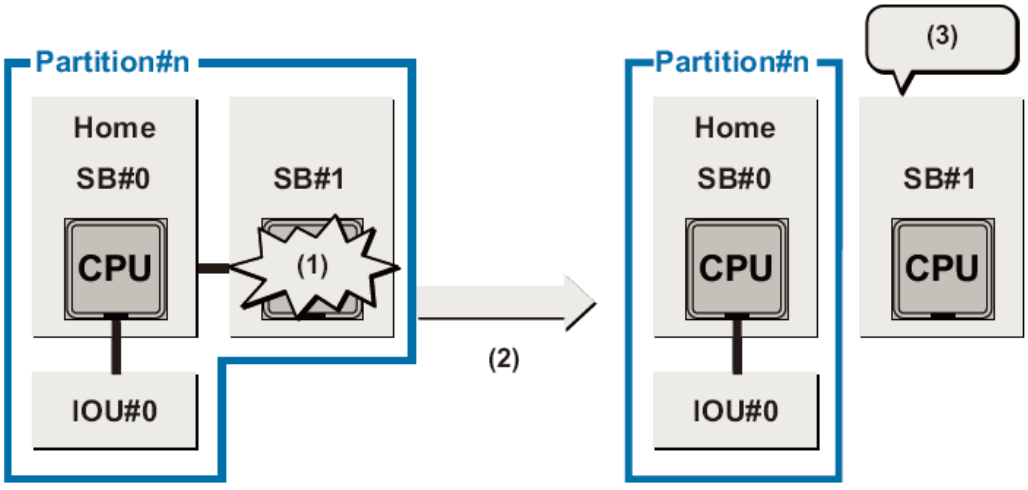
- SB hot maintenance (SB hot add / SB hot remove)
  It is a function for adding the CPU and memory resource to the SB unit without stopping the partition system. The following functions are provided.
  - Enable the expansion of the CPU and the memory resources of a system that is running.
  - Enable the hot maintenance of SB where a suspected fault was detected.
  - Redistribute the SB resources across partitions in accordance with the load.

FIGURE 3.16 SB hotadd



No.	Description
(1)	Dynamic addition of SB (operated by the operator)

FIGURE 3.17 SB Hot remove (Disconnecting a faulty SB)

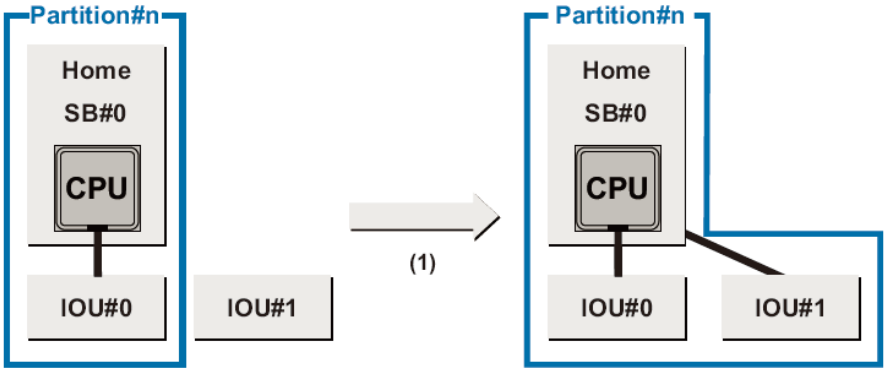


No.	Description

No.	Description
(1)	Fault suspected
(2)	Dynamic disconnection of SB (operation by operator)
(3)	Replacement

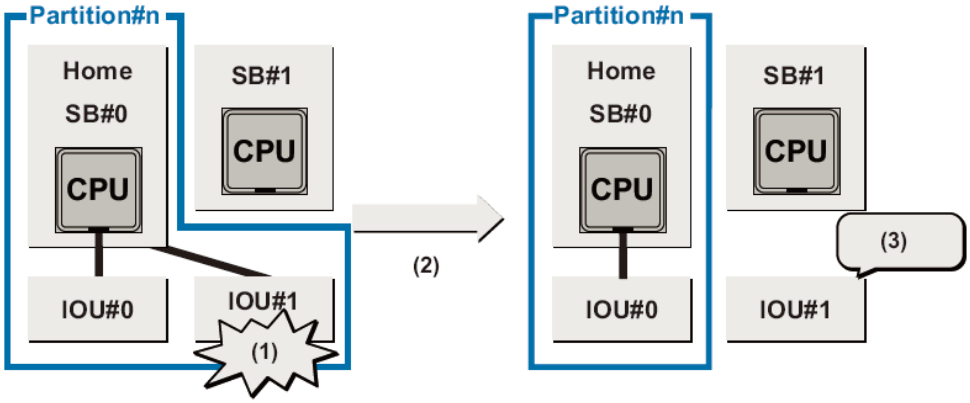
- IOU hot maintenance (IOU hot add/ IOU hot remove)
  Function that can incorporate an IOU into the system (IOU hot add), or disconnect an IOU from the system (IOU hot remove) without restarting the operating system.
  Hot-plug of PCI_Box is not possible. Hot-plug of PCI card on the PCI_Box is possible.
  The following functions are provided.
  - Enabling the I/O resource enhancement (especially the resource enhancement that requires the addition of PCI Express slot) in a running system.
  - Enables the hot-swap of the failed IOU and the pre-failed IOU.
  - Perform a redistribution of IOU resources across partitions in accordance with the load.

FIGURE 3.18 IOU Hot add



No.	Description
(1)	Dynamic addition of IOU (operation by operator)

FIGURE 3.19 IOU hot remove (removal of failed IOU)



No.	Description
(1)	Fault suspected
(2)	Dynamic disconnection of IOU (operator operation)
(3)	Replacement

Rules of DR

The DR applicable conditions are as follows.

TABLE 3.11 Applicable criteria

Item	Setting / criteria
IO mode	Flexible I/O mode

Item		Setting / criteria
PCI Address mode		PCI segment mode
SB		At least 1 SB
Memory (*1)	Home SB	2GB + (Quantity of Logical CPUs X100MB) + (Memory capacity of the total system x0.03) + Memory capacity of HugeTLB
	Excluding Home SB	Nothing specific
Extended Partitioning function		Disabled
Dynamic Reconfiguration function		Enabled
TPM function		Disabled

*1: In case of SB hot add, the SB to be added, should be a Free SB, or a Reserved SB of the target partition.

The target of the DR function and supported operating systems are shown below.

TABLE 3.12 DR supported list

Component	Function	Windows Server 2008 R2 or later	VMware ESXi 5 or later	Red Hat Enterprise Linux 6.4 or later	Red Hat Enterprise Linux 7.0 or later	SUSE Linux Enterprise Server 11	SUSE Linux Enterprise Server 12 (*4)
SB CPU (*1) DIMM (*1)	Hot add			✓	✓		✓
	Hot remove				✓		✓
	Hot replace				✓		✓
IOU (*2)	Hot add			✓	✓		✓
	Hot remove			✓	✓		✓
	Hot replace			✓	✓		✓
PCI_Box (*2) (*3)	Hot add						
	Hot remove						
	Hot replace						

✓: Supported
Blank: Not supported
*1: Physical replacement of CPU and DIMM as hardware is not possible. When replacing the CPU and the DIMM, the SB is removed by the hot remove of SB. Or the partition is stopped.
*2: All PCI Express cards mounted in the partition must support PCI hot plug.
*3: DR function of PCI_Box is operated with DR function of IOU.
*4: DR feature is supported by only SUSE Linux Enterprise Server 12 x86_64 SP 1.

How to check the dr command package

Execute the following command, and check whether the dr command package has been installed.
rpm –qa | grep FJSVdr-util

Example:

```
# rpm -qa | grep FJSVdr-util
FJSVdr-util-RHEL6-1.0.0-1.noarch
```

In case it has not been installed, see 4.1.2 dr Command Package Install/ Uninstall.

Type of memory in DR

There are three types of memory related to DR operations as shown below below, depending on the conditions of use.

- Kernel memory
  It is the memory internally used by the operating system. The kernel memory cannot be disconnected from the system by SB hot-plug operation. It is secured from the memory of the Home SB at startup
- User memory
  If is a memory in which the kernel memory is not loaded, the user memory can be hot-removed from the system by the SB hot plug operation.
- Special memory
  It is a hugetlbfs special memory. hugetlbfs cannot be disconnected from the system by SB hot plug operation. Therefore, this memory is present only on the Home SB.

Notes/Limitations of Dynamic Reconfiguration

Notes or Limitations common to SB/IOU hot add/ hot remove

- Notes or Limitations related to setting
  - All the SB firmware shall be of the same version number.
  - In the partition with DR enabled, a HDD/SSD on the non-Home SB cannot be used.
  - DR operation cannot be performed if memory operation mode is Performance mode. Set the memory operation mode other than Performance mode.
  - Legacy OS cannot be started up since a partition with DR mode enabled forcibly starts up in UEFI mode. If you start up Legacy OS, disable DR mode.
  - Do not enable DR function and TPM function together.
  - Hot add/ Hot remove of Memory Scale-up Board cannot be peformed.
  - Dynamic Reconfiguration cannot be used in the partition including Memory Scale-up Board.
  - If you use DR function on RHEL 6.4, errata below must be adopted:
    Advisory number is RHSA-2013:1051-1 or later.
    (https://rhn.redhat.com/errata/RHSA-2013-1051.html%22)
  - Errata below must be adopted to kvm problem in RHEL6
    RHEL 6.4: Advisory number is RHSA-2014-0900 or later.
    (https://rhn.redhat.com/errata/RHSA-2014-0900.html)
    RHEL 6.5: Advisory number is RHSA-2014-0771 or later.
    (https://rhn.redhat.com/errata/RHSA-2014-0771.html)
  - In RHEL6.4/6.5, errata below is adopted when memor size within the partition is 1TB or more.
    When hot adding SB, errata below is adopted if total memory size within the Physical Partition becomes 1TB or more after adding an SB.
    RHEL 6.4: Advisory number is RHSA-2014-0284 or later
    (https://rhn.redhat.com/errata/RHSA-2014-0284.html)
  - RHEL6.5: Advisory number is RHSA-2014-0328 or later
    (https://rhn.redhat.com/errata/RHSA-2014-0328.html)
  - If you use DR function on RHEL 7, KSM (ksm, ksmtuned) function must be disabled.
  - Errata below must be adopted to use SB hot add in RHEL7.0.
    Advisory number is RHSA-2014-1724 or later
    (https://rhn.redhat.com/errata/RHSA-2014-1724.html)
  - Errata below must be adopted to collect kdump after SB hot remove in RHEL7:
    Advisory number is RHBA-2014:0943-1 or later.
    (https://rhn.redhat.com/errata/RHBA-2014-0943.html)
- Notes or Limitations during operation
  - The DR function (SB hot add/ SB hot remove, IOU hot add/ IOU hot remove) is manually operated using the DR operation of the MMB command of the command interface (CLI). There will be no automatic processing in conjunction with proactive monitoring. DR operation is not possible in the maintenance mode.
  - DR operation (SB hot add, SB hot remove, IOU hot add, IOU hot remove, hot add of PCI Express card or hot remove of PCI Express card) cannot be performed in parallel at the same time in the chassis.
  - In SB hot add, SB hot remove, IOU hot add or IOU hot remove operation, multiple SBs or multiple IOUs cannot be specified at the same time. If you perform hot add or hot remove of multiple SBs or multiple IOUs, perform the DR operation of each device one by one.
  - DR operation cannot be performed on the EFI Shell. Perform DR operation on OS.
  - DR operation cannot be canceled by methods other than powering off the partition or reset the partition.
  - When executing the DR in a cluster configuration, the execution is performed after disconnecting the relevant machine from the cluster group. For details, see ‘PRIMECLUSTER Installation and Administration Guide’ (J2UZ-5274-08Z0).
  - In case you intend to perform hot add of SB or IOU, DR operation will not be possible if there is a warning or error in the SB or IOU to be added.
  - When the message “BIOS Error Code =0xXXXX” is shown during hot add or hot remove of an SB or an IOU, you cannot perform hot add or hot remove operation again unless the relevant partition is turned off.

- Perform DR operation when low load is applied to the partition since TIMEOUT may occur if DR operation is performed when high load is applied to the partition during DR operation.
  For how to deal with if TIMEOUT occurs, see '4.2.4 How to deal with timeout while OS is processing SB hot add'.
- Do not perform operation of video redirection during DR operation.
- If you use DR function on RHEL7/SLES12, memory cannot be bound to process by using only memory of node on non-Home SB.

Notes or Limitations related to IOU hot add/ hot remove

- Notes or Limitations during operation
  - Do not perform hot add, hot remove and hot replace of the IOU which has disks for kdump or sadump because the kdump or sadump do not function. Check that dump disks is not connected to the IOU, and then hot add, hot remove or hot replace the IOU.
  - For IOU hot add or IOU hot replacement, PCI bus address which is allocated to PCI device on relevant IOU just after IOU hot add or replacement may differ at next partition boot.
  - Hot add, hot remove, or hot replace of an IOU which is connected a DU cannot be performed.
  - Error of added IO may not be detected during hot adding an IOU.
  - In RHEL6.4/6.5, hot add, hot remove or hot replace of an IOU which is connected a PCI_Box cannot be performed.
  - Hot add of IOU which installes two PCNCs cannot be performed.

Notes or Limitations related to SB hot add/ hot remove

- Notes or Limitations related to setting
  - When increasing the number of CPUs in the partition by SB hot add operation (hot add), additional CPU licenses must be purchased for the software that is running in the relevant partition.
  - The TSC (Time Stamp Counter) of added SB by SB hot add does not synchronize with the running system. It is required that the programs which use TSC to process time adjustment or time synchronization is changed so as to use HPET.
  - If you execute SB hot remove in PRIMEQUEST 2400E3/2800E3/2400E2/2800E2, "workqueue.disable_numa" must be specified to kernel option.
- Notes or Limitations during operation
  - Two CPUs must be mounted on SBs in the partition where SB hot add is intended to be performed.
  - Kernel memory is present only in the Home SB. Therefore, hot remove of Home SB is not supported.
  - The Home SB cannot be changed to another SB while the partition is running. If you change the Home SB, change it after powering off the partition.
  - The settings of the Reserved SB are deleted after the Reserved SB is incorporated into the partition by hot add.
  - In case of hot remove of the Reserved SB that belongs to a partition, the Reserved SB setting is not canceled.
  - The sadump function does not work during the SB hot add or SB hot remove operation.
  - If SB hot remove is implemented when allocating a process to a specific CPU using CPU binding, the relevant process will be moved to another CPU which is not intended. Consider the effect of CPU binding before performing SB hot remove.
  - If you perform power control operation such as power off, reset and power cycle or error occurs during SB hot add, partition configuration differs at next boot depending on whether test phase process has been completed or not.
    - If test phase process has not been completed, partition configuration is the same one as before SB hot add. The partition does not include an added SB.
    - If test phase process has been completed, partition configuration changes to the configuration specified by DR operation. The partition includes not only current SBs but also an added SB.
      If error occurred in CPU or memory of hot added SB, the failed CPU or memory is degraded.
      If you remove the SB which failed in hot add from the partition, you must power off the partition.

- Error of IO and memory cannot be detected and may cause reset during SB hot add and SB hot remove.
- Time required to complete SB hot add depends on mounted memory size, the load of CPU, the load of IO and so on. Estimate how long time SB hot add takes by performing DR operation in advance when system integration.
  For example, time required for SB hot add is about 60 minutes if to the partition which has an SB with 384 GB and an IOU, you add an SB with the same memory size as that of the partition. Its value is measured in the partition without any other loads.
- During SB hot add or hot remove, at least one logical CPU is used by 100 % for hot add or hot remove process.
- After SB hot add, reboot from the operating system and reset by MMB Web-UI may operate as Power Cycle only once.
- In RHEL7, kdump by NMI cannot be performed during "Offlining removed Memory/CPU" phase of SB hot remove.
- While DR is performed in RHEL7, call trace may be output together with message of "WARNING: at arch/x86/kernel/cpu/perf_event_intel_uncore.c:XXXX uncore_change_context+0xYYYY/0xZZZZ()" (XXXX: decimal number, YYYY, ZZZZ: hexadecimal number). That is no problem.
- In RHEL7/SLES12, Turbo Boost function of CPUs which are added by SB hot add may not be used.
- In PRIMEQUEST 2400E3/2800E3/2400E2/2800E2, do not power off the partition during SB hot remove.
- "nmi_watchdog=0" must be specified to kernel option.

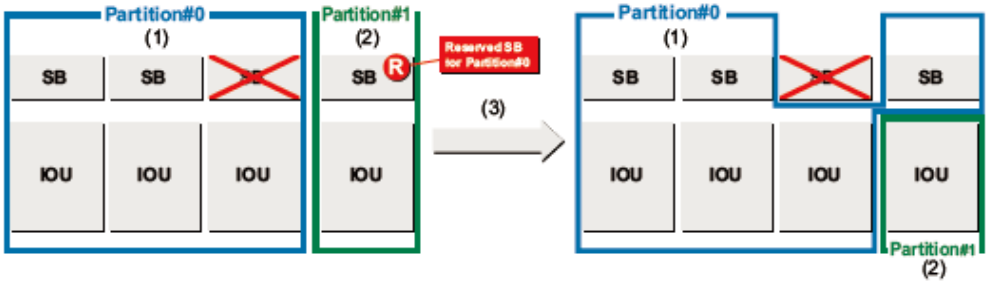
3.2.4 Reserved SB

In the Reserved SB function, a spare SB is mounted in the chassis in advance, the faulty SB is automatically disconnected, the spare SB is incorporated and the partition is restarted. The spare SB intended for switching when there is a fault is called the Reserved SB. PRIMEQUEST 2400E3/2800E3/2400E2/2800E2/2400E/2800E support the Reserved SB function.
Using a Reserved SB function has the following advantages when a hardware error occurs in the SB.

- Quick recovery is possible without reduction in SB resources.
- In a partition with one SB, recovery is possible even if the SB fails (SB degradation)

In addition, in PRIMEQUEST 2000 series, SB in a running partition can be also specified as a Reserved SB. A Reserved SB can be used very efficiently by using this function.
An SB in a running partition can be also used as a Reserved SB. In this case, the SB will be referred to as Active Reserved SB.
The example below shows the operation where the SB also assigned as Reserved SB is used for test purporses..
If there is an SB failure in a partition of the production system, the firmware issues a shutdown instruction to the partition of the test system. After the shutdown is completed, the partition is incorporated as the SB of the production system. However, this setting is applicable only if the shutdown time of the test system can be permitted.

FIGURE 3.19 Example of operation of a partition of a test system using the SB as a Reserved SB



No.	Description
(1)	Production system
(2)	Test system
(3)	Partition #1 is shutdown

Remarks

- Reserved SB is used in case of hardware failure. The cause of switching to the Reserved SB from the memory dump report cannot be determined. See the system event log of the MMB to find out the cause of switching to the Reserved SB. The memory dump information is used for determining software failures.
- In a Windows installed partition, restart is prompted at the first startup, after switching to the Reserved SB. Restart is done following instructions.
- In a Windows installed partition, when the operation is stopped during an SB failure, the time taken for restarting has to be considered. The total time taken for two restarts, the reboot time and the time it takes for the first startup after switching to the Reserved SB will be required. Besides, restart can be carried out once, at the first startup when there is a failure, by implementing workaround in advance. For details on the workaround, see '● Procedure to prevent Windows restart' of '3.4.3 Reserved SB Setting' in "PRIMEQUEST 2000 series Installation Manual" (CA92344-0536)

Reserved SB definition

The definition of the Reserved SB is automatically canceled after the Reserved SB operates.

Note

When restoring during maintenance after the Reserved SB operation, replace the faulty unit and reset the Reserved SB information from the Web-UI.

Reserved SB Setting Rules

The Reserved SB setting criteria are as follows.

- Any SB not belonging to the own partition can be set as a Reserved SB. (However, the reserved SB does not work for the Memory Scale-up Board.)
- An SB can be set as a Reserved SB for multiple partitions.
- Multiple Reserved SBs can be set for a single partition.
- If a partition includes by a single SB, the CPU and DIMM of the Reserved SB must comply with the installation rules in the Reserved SB. (*1)
- Two CPUs must be mounted to a Reserved SB.
- If a partition includes multiple SBs, only the SB with the DIMM configuration that satisfies the mounting order of the Memory Operation Mode, which is the same as the source SB, can be set as a Reserved SB.
- If a partition includes multiple SBs, only the SB that satisfies criteria for mixing the CPUs with the partition can be set as the Reserved SB.
- If a partition includes multiple SBs, only the SB that satisfies the conditions for mixing DIMM with the partition can be set as the Reserved SB.
- The SB that is set as the Reserved SB, is set from the MMB Web-UI, and can be incorporated in an arbitrary partition. At that time, the Reserved SB settings for the incorporated destination partition will be canceled. The Reserved SB settings for other partitions will be continued.
- Memory Scale-up Board cannot be set as Home SB.
- Memory Scale-up Board cannot be set as Reserved SB.

*1: If a partition is configured of one SB, the Source SB is disconnected from the partition by Reserved SB switching. Therefore, there is no need to consider the DIMM and CPU mixing criteria between the Reserved SB and the source SB. There may be one or two CPUs for a Reserved SB. The Reserved SB need not consider Yes/No for Memory Mirroring / Sparing. However, if the DIMM configuration of the Reserved SB is different from the switching source SB, the Memory Operation Mode may change after switching to the Reserved SB switching may change from the Memory Operation Mode of the source SB. Specific changes in the Memory Operation Mode before and after Reserved SB are shown below.

TABLE 3.13 Memory Operation Mode before and after Reserved SB switching, when a partition is configured from one SB.

Source SB Memory Operation Mode	SB DIMM configuration for Reserved SB	Memory Operation Mode after Reserved SB switching
Mirror	Normal	Normal
	Mirror	Mirror
	Spare	Spare
	Normal or Mirror (*1)	Normal
	Normal or Mirror or Spare (*2)	Normal

Source SB Memory Operation Mode	SB DIMM configuration for Reserved SB	Memory Operation Mode after Reserved SB switching
Mirror	Normal	Normal
	Mirror	Mirror
	Spare	Spare
	Normal or Mirror (*1)	Mirror
	Normal or Mirror or Spare (*2)	Mirror
Spare	Normal	Normal
	Mirror	Mirror
	Spare	Spare
	Normal or Mirror (*1)	Normal
	Normal or Mirror or Spare (*2)	Spare

*1: DIMM configuration wherein both the Normal Mode and the Mirror Mode can be set. In case of one CPU, 8, 16 or 24 DIMMs are mounted, and in case of two CPUs, 16, 32 or 48 DIMMs are mounted.

*2: DIMM configuration wherein the Normal Mode, the Mirror Mode and the Spare Mode can be set. In case of one CPU, 24 DIMMs are mounted, and in case of two CPUs, 48 DIMMs are mounted.

Notes on Windows

The operating system may not start at the first startup after an SB is switched to the Reserved SB in a partition running Windows. Set Windows to automatically restart to set the Reserved SB in the partition running Windows.
For details on the setting, see‘11.4.3 Dump environment setting (Windows) ’, and check the [Automatically restart] check box of ‘FIGURE11.14 [Startup and Recovery] dialog box’.
Consider the time taken to restart, if the SB failure results in the suspension of work for the above stated reason. The restart will require twice the length of the time, since a restart is needed after the switching to the Reserved SB and the subsequent initial startup.
However, the following workaround can suppress the restart request.

Workaround for Windows restart

In the PRIMEQUEST 2000 series, the restart request can be suppressed by identifying the Reserved SB in advance.
Execute the following procedures for all the partitions with Windows installed.
When these workaround steps are executed, restart is not requested when there is a switching to the Reserved SB due to SB failure.

1. Shutdown the partition after completing the installation of Windows.
2. Remove one SB from the partition by using the MMB Web-UI. When there are multiple SBs, any SB can be removed.
   For details, see ‘Removal of SB and IOU’ of’ 3.4.1 Partition Configuration Setting’ in “PRIMEQUEST 2000 series Installation Manual” (CA92344-0536).
3. Add the SB of the Reserved SB to the partition.
   For details, see ‘Adding an SB/IOU’ of 3.4.1 Partition Configuration Setting’ in “PRIMEQUEST 2000 series Installation Manual” (CA92344-0536).
4. Power on the partition and start the Windows.
5. Log in with Administrator privilege. After the message that the system must be restarted is displayed on the window, follow the instructions and restart the system.
6. Shutdown the system after restarting the Windows has been completed.
7. Using the MMB Web-UI, remove the SB of the Reserved SB, which was added in Step 3.
8. Add the SB removed in Step 2, to the partition.

Notes on VMware

In a process of switching to the Reserved SB in the partition running VMware, the guest operating system may not start at the first restart after the switch over.
Set the guest operating system to automatically restart, and the Blue Window Timeout items when setting Reserved SB in a partition running VMware.
For details on the setting, see the VMware Manual.

Switching rules

Switching rules for the Reserved SB are as follows.

- Determining the switching source SB

- When an SB has been configured as a Reserved SB for multiple partitions, and there is simultaneous failure in multiple partitions, the partition with the lowest number takes priority for switching (Example 1).
- When multiple SBs fail in a partition, the SB with the lowest number takes priority for switching (Example 2). Determining the switching destination SB
- When multiple Reserved SBs have been sent in a partition, and there are Reserved SBs that do not belong to any partition, the Reserved SB having the highest SB number takes priority for switching (Example 3).
- When multiple Reserved SBs are set in a partition, and there are only Reserved SBs included in the partition, the Reserved SB having the highest SB number in a powered off partition takes priority for switching (Example 4). If all the partitions are powered on, the Reserved SB with the highest SB number takes priority for switching (Example 5).

FIGURE 3.20 Example 1-a. Example where two SBs are set as Reserved SBs in two partitions (when SB #0 and SB #1 have simultaneously failed)

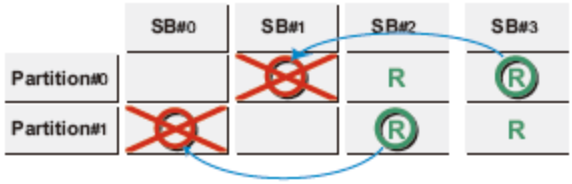
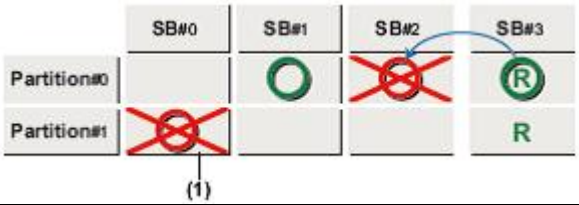


FIGURE 3.21 Example 1-b.Example when one SB is set as the Reserved SB in two partitions (SB #0 and SB #2 have simultaneously failed)

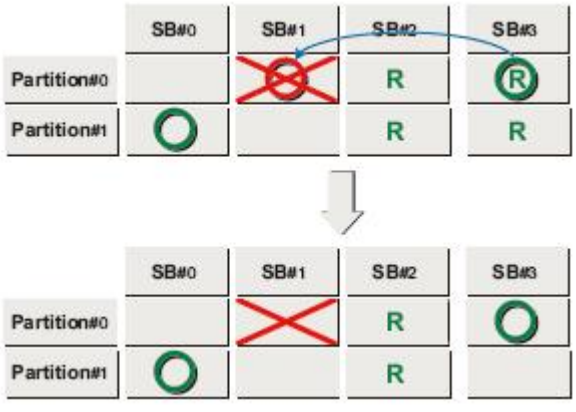


No.	Description
(1)	No switching to the Reserved SB

FIGURE 3.22 Example 2. When multiple SBs have failed within a partition

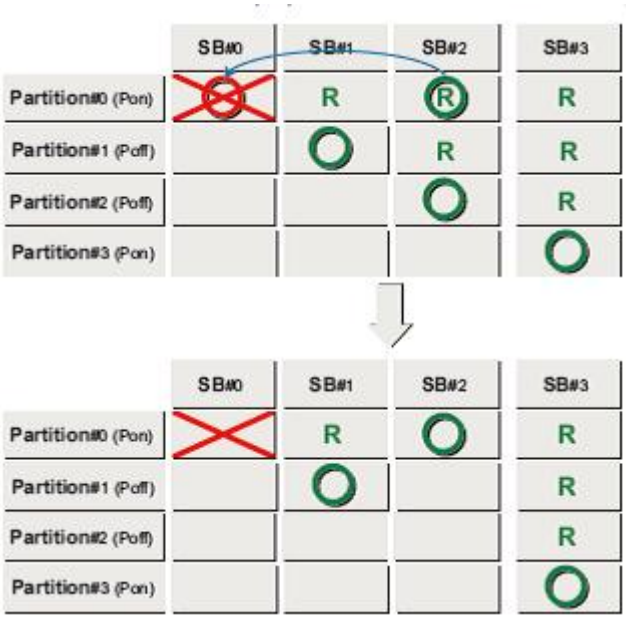
No.	Description
(1)	No switching to the Reserved SB

FIGURE 3.22 Example 3. Example when multiple free SB (#2,#3) is set as Reserved SBs in Partition #0



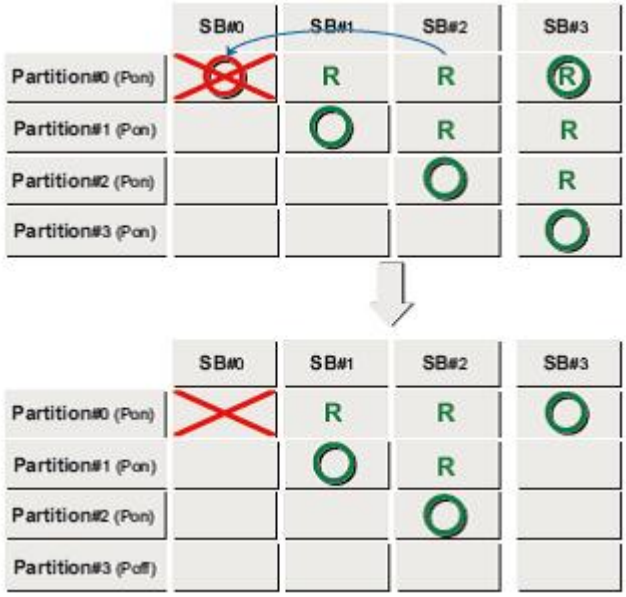
In example 4, since SB #1 and SB #2 of a powered off partition are available, the SB with the highest number is selected as the switching destination.

FIGURE 3.23 Example 4. where Reserved SBs (#1, #2, #3) of Partition #0 belong to other partitions



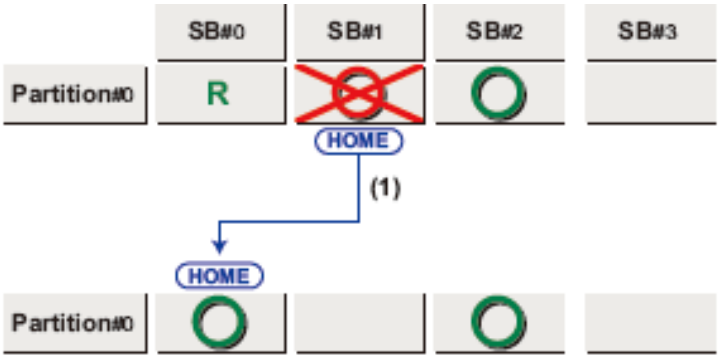
In example 5, since there is no SB in a powered off partition , among SB #1, SB #2, and SB #3 in the powered-on partitions, SB #3 having the highest SB number is selected as the switching destination.

FIGURE 3.24 Example 5. Example where the Reserved SBs (#1, #2, #3) of Partition #0 belong to other partitions



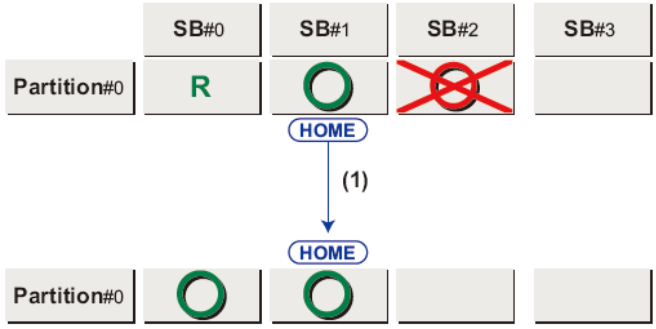
Description of handling the Home SB when switching to the Reserved SB is as follows.
When the Home SB is switched to the Reserved SB, the SB, including the Reserved SB, having the lowest SB number is made as the Home SB (Example 6).
The Home SB does not change if an SB which is not the Home SB is degraded (Example 7).

FIGURE 3.25 Example 6. Example where a Reserved SB has been set in SB #0 (When the Home SB has failed)



No.	Description
(1)	Since Partition #0 is the configuration of SB #0 and SB #2, SB #0 with the lowest number becomes the Home SB.

FIGURE 3.26 Example 7. Example when SB #0 is set as the Reserved SB (when an SB other than the Home SB) fails)



No.	Description
(1)	The Home SB does not change when an SB other than the Home fails.

Next Switching rules for the Reserved SB when the partition includes Memory Scale-up Board are described here.
SB can switch to Reserved SB even if the partition includes Memory Scale-up Board. The switching rule for SB is the same as rules for partitions without Memory Scale-up Boards. You may note the Memory Scale-up Board does not switch to Reserved SB even in its failure.
In example 8-a, SB (SB#0) fails when Reserved SB (SB#3) is set to the partition including Memory Scale-up Board (SB#1). The particular SB (SB#1) switches to Reserved SB (SB#3).
In example 8-b, Memory Scale-up Board (SB#1) fails when Reserved SB (SB#3) is set to the partition including Memory Scale-up Board (SB#1). The Memory Scale-up Board (SB#1) does not switch to Reserved SB (SB#3). The Memory Scale-up Board (SB#1) degrades.

FIGURE 3.27 Example 8-a. Example where a Reserved SB has been set in the partition including Memory Scale-up Board (When the SB has failed)

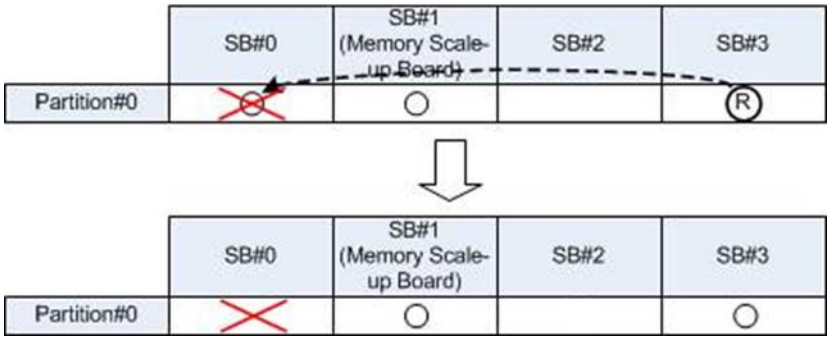
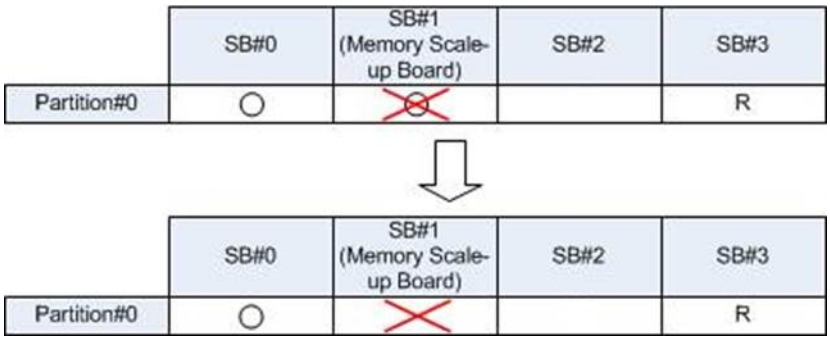


FIGURE 3.28 Example 8-b. Example where a Reserved SB has been set in the partition including Memory Scale-up Board (When the Memory Scale-up Board has failed)



Switching policy

The triggers for switching to a Reserved SB are as follows.
Furthermore, the timing for switching to the Reserved SB is when the partition is started up.
This section describes the conditions (triggers) for switching to the Reserved SB when the partition is started up.

- SB degradation
- DIMM degradation (even in a single DIMM degradation)
- When a Memory Mirror collapse is detected
- When a QPI Lane degradation is detected
- When an SMI2 Lane switching to is detected
- When a PCI Express Lane/Speed degradation on an SB is detected
- When a CPU core degradation is detected

Remarks

- When you use Reserved SB function, set a value which is greater than or equal to 1 in [Number of Restart Tries] of the [ASR Control] window.
  For details on the [ASR Control] window, see 11.4 Automatic Partition Restart Conditions.
- When you set a value which is greater than or equal to 1 in [Number of Restart Tries] of the [ASR Control] window, a failed SB is replaced to a Reserved SB at first automatic restart of the partition.

Active Reserved SB switching process

The process of switching of the Active Reserved SB (*1) is described in this section.
*1: SB which is incorporated in a partition, and is also set as the Reserved SB in another partition.

- When the partition that incorporates the Reserved SB is powered off, the corresponding SB will be disconnected.
- When the partition that incorporates the Reserved SB is powered on, the firmware instructs OS shutdown for the corresponding partition.
  If a partition has not been powered off after the firmware instructed OS shutdown for a partition, and the forced shutdown time has elapsed, Force Power Off is executed, the power of the partition is forcefully disconnected, and the corresponding SB is disconnected. The forced shutdown time of 0～99 minutes can be set from the MMB Web-UI.
- When an SB have been set as Reserved SB for multiple partitions, after being disconnected as a Reserved SB, the Reserved SB for other partitions will be automatically removed.

Notes/Limitations of Reserved SB function

The function of the Reserved SB has the following limitations.

- When the I/O device is connected to the USB port or VGA port of the Home SB, and the Home SB switches to the Reserved SB, the connected I/O device must be manually reconnected.
- The system must be restarted during Reserved SB switching.

- Set the Reserved SB according to the partition priority.
  Do not set mutual loops although it can be done under the configuration rules.
- When the memory capacity is reduced after switching to a Reserved SB, confirm that the decreased capacity has to be within the permissible range for applications.
- The shutdown wait time for switching to a Reserved SB being used by another partition is the value that is set from the MMB Web-UI (0 to 99 minutes); the default is 10 minutes. One shutdown wait time can be set in the system (in the chassis). If the shutdown is completed before the specified time elapses, the switching starts immediately. Set only when the switching time is acceptable.
- When using the Trusted Platform Module (TPM) function, the Reserved SB function cannot be used.
- Do not set a Reserved SB for a partition where the HDD/SSD on the SB is used as a boot disk or data disk.
- When simultaneously using the Software RAID and the Reserved SB function, do not configure the HDD/SSD Mirror in the SB.

Home SB switching method

When the Home SB fails, the method of taking over the information of the various settings when switching to Reserved SB is as follows.

Note

License authentication may be prompted after the switch to the Reserved SB, when using the volume license or package product, and the SB purchased at the same time as the enable kit is not being used.

TABLE 3.14 Operational restrictions when switching to a Reserved SB

Item	Operational restrictions
USB port	When connected to a USB port, the connection to the USB port of the Reserved SB must be changed manually after the switching.
VGA port	When connected to a VGA port, the connection to the VGA port of the Reserved SB must be changed manually after the switching.
Time setting	If the NTP is not used, operating system time must be verified and set, as there may be a time difference time after the switching.

Remarks

License authentication may be prompted after switching to a Reserved SB in the following cases.

- -When using a volume license or package product
- When using an SB purchased together with the enable kit

For details, see License Authentication with SB and Enable kit Combinations in 3.4 Expansion of components.

3.2.5 Memory Operation Mode

The Memory Operation Mode can be set from the MMB Web-UI for each Physical Partition partition. The following six modes are supported as Memory Operation Modes.

- Performance Mode
- Normal Mode
- Partial Mirror Mode
- Full Mirror Mode
- Address Range Mirror Mode
- Spare Mode

The default is Normal Mode.
The overview of each mode is given the TABLE below.

TABLE 3.15 Overview of Memory Operation Modes

Memory Operation Mode	Description
Performance Mode	Mode that elicits the maximum memory performance. However, it does not support any RAS function except the SDDC.
Normal Mode	Mode in which the Memory Mirror and Memory Spare are used. DDDC is supported as a memory RAS function in addition to SDDC.

Memory Operation Mode	Description
	Mode which is set as the default.
Full Mirror Mode	Mode in which the Memory Mirror is used in all the SBs and Memory Scale-up Boards included in a partition. In this mode, mirror maintenance mode or the capacity maintenance mode is selected as the Memory Mirror RAS mode. For details on the Memory Mirror, see 3.2.6 Memory Mirror For details on the Memory Mirror RAS, see Memory Mirror RAS of 3.2.6 Memory Mirror
Partial Mirror Mode	The Memory Mirror mode is used only in the Home SB. In this mode, mirror maintenance mode or capacity maintenance mode is selected as the Memory Mirror RAS mode. For details on the Memory Mirror, see 3.2.6 Memory Mirror For details on the Memory Mirror RAS, see Memory Mirror RAS of 3.2.6 Memory Mirror
Address Range Mirror Mode	Memory mounted in the partition is partially mirrored. For details on Address Range Mirror, see 3.2.6 Memory Mirror.
Spare Mode	Mode in which the Memory Spare is used. **Note** - The Memory Spare cannot be used if the Memory Mirror has been set. - In memory spare mode, the memory size recognized by the operating system decreases by from about two-thirds to five-sixth of memory size mounted physically in the partition.

Note
When installation number of DIMM is at minimum and partition configuration and memory operation mode match conditions below, partition cannot be rebooted after DIMM fails.

- Partition includes only one SB and memory operation mode is set to Normal mode, Full/Partial mirror mode (*1), Address Range Mirror, or Spare mode.
- In PRIMEQUEST 2400E3/2400E2,
  partition includes memory scale-up board and only one SB is included in the partition,
  and memory operation mode is set to Normal mode, Full/Partial mirror mode (*1), Address Range Mirror, or Spare mode,
  and DIMMs in the SB fails.

(*1) Only case where Mirror RAS mode is Mirror Keep.

3.2.6 Memory Mirror

In the PRIMEQUEST 2000 series, the Mirror Mode, the Partial Mirror Mode and Address Range Mirror Mode are supported as the memory mirror, in which the function with the CPU is used. Full Mirror/Partial Mirror/Address Range Mirror can be selected from the MMB Web-UI.

TABLE 3.16 Memory Mirror Mode

Mirror type	Description
Full Mirror	Memory Mirroring is executed to memories on all SBs and Memory Scale-up Boards included in a partition.
Partial Mirror (*1)	Memory Mirroring is executed to memories on only Home SB included in a partition. Memory Mirroring is not executed for an SB which is not the Home SB.
Address Range Mirror	Memory Mirroring is partially executed to memories included in a partition. Memory size to be mirrored is specified by BIOS or OS.

*1: The operation of both Full Mirroring and Partial Mirroring is the same, when the partition is configured by one SB.

Note
When configuring the partition with one SB, the Memory Mirror may be deleted before and after the Reserved SB, depending on the SB DIMM configuration of the Reserved SB. For details, Reserved SB setting rules of 3.2.4 Reserved SB.

Memory Mirror and supported model

Each of memory mirror mode and supported model is shown in the table below.

TABLE 3.17 Memory Mirror and supported model

Mirror type	PRIMEQUEST	
	2400E3/2800E3/2800B3	2400E2/2800E2/2800B2/ 2400E/2800E/2800B
Full Mirror	Supported	Supported
Partial Mirror	Supported	Supported
Address Range Mirror	Supported	Not supported

Address Range Mirroring

If Address Range Mirror is enabled, memory included in the partition can be partially mirrored. Memory size to be mirrored must be set by BIOS menu or OS. The way to specify mirror size can be selected by BIOS menu. If you use Address Range Mirror, you must enable Address Range Mirror on MMB Web-UI and perform size setting or percentage setting on OS or BIOS menu in order to enable Address Range Mirror for the partition.
You can select setting from BIOS menu or setting on OS to specify mirror size by specifying “BIOS Menu Setting” or “OS Request” in BIOS menu.
For BIOS menu, see ‘3.4.6 [Memory Configuration] menu’ in the “PRIMEQUEST 2000 series Tool Reference’ (CA92344-0539).
For setting by OS, see ‘Use of Address Range MIrror in Red Hat Enterprise Linux/ SUSE Linux Enterprise Server’.

Maximu memory size being able to mirror

In Address Range Mirror mode, Maximum memory size being able to mirror of all memory included in the partition is as follows:

- If PCI Address mode is ‘Segment mode’,
  ‘Half of quantity of all installed memory in the partition’ – ‘Half of DIMM capacity under CPU#0 of Home SB’ + 1.5 GB (*1)
- If PCI Address mode is ‘Bus mode’,
  ‘Half of quantity of all installed memory in the partition’ – ‘Half of DIMM capacity under CPU#0 of Home SB’ + 2.0 GB (*1)

(*1) calculate by 1GB = 1024 x 1024 x 1024B

In Home SB and Non-Home SB, memory size being able to mirror is shown in the table below.

TABLE 3.18 Mirror size being able to mirror in Home SB and Non-Home SB

Home SB		Non-Home SB	
CPU#0	CPU#1	CPU#0	CPU#1
Segment mode: 1.5 GB Bus mode: 2.0 GB	Half of quantity under CPU#1	Half of quantity under CPU#0	Half of quantity under CPU#1

Address Range Mirroring when Extended Partitioning is enbaled

When Extended Partitioning is enabled, only memory region which is used by Extended Partitioning firmware is mirrored. Memory region used by OS is not mirrored.

Operation where there is an error in the DIMM when the Address Range Mirror is enabled

- If the way to specify mirror size is set to “OS Request” in BIOS menu,
  after an error in the DIMM occurs, the partition will start up with the rest of nomal DIMMs mirrored by the size or percentage specified by OS before an error in the DIMM occurs.
- If the way to specify mirror size is set to “BIOS Menu Setting” in BIOS menu,
  after an error in the DIMM occurs, the partition will start up with the rest of nomal DIMMs mirrored by the size specified by BIOS menu before an error in the DIMM occurs.

Use of Address Range MIrror in Red Hat Enterprise Linux/ SUSE Linux Enterprise Server

This section describes how to use Address Range Mirror in Red Hat Enterpise Linux/ SUSE Linux Entepirse Server. You must select “OS Request” to specify mirror size in BIOS menu.

Percentage of mirror size

You set percentage to <Percentage of mirror size> in 'Setting Procedure'. The minimum value and maximum value of settable value are shown below. (*1)

(*1) In following calcutaion, calculate by 1GB = 1024 x 1024 x 1024B.

- Minimum value
  There are following two rules;
  1. Mirror size must be 16GB and more.
     e.g) for installed memory size = 128GB: 13%, for installed memory size = 256GB: 7%.
  2. Percentage of mirror size must be 3% and more.
     e.g) for installed memory size = 1TB: 3%, for installed memory size = 2TB: 3%.
- Maximum value
  Maximum value can be calculate as follows;
  100 x ('Half of quantity of all installed memory in the partition' – 'Half of DIMM capacity under CPU#0 of Home SB') / 'quantity of all installed memory in the partition'
  e.g) Maximum value is as follows when each SB has the same amount of memory;

TABLE 3.19 Maximum mirror size when each SB has the same amount of memory

Number of SB included in the partition			
1 SB configuration	2 SB configuration	3 SB configuration	4 SB configuration
25%	37%	41%	43%

Setting Procedure

1. Stop the partition.
2. Select Memory Operation to change to Address Range Mirror Mode in Partition -> [Parttion#x] -> Mode window.
3. Start the partition.
4. Execute following command.

   ```
   # efibootmgr -m t -M <Percentage of mirror size>
   ```

   For percentage of mirror size, see "Percentage of mirror size".
5. Reboot the partition.

   ```
   # systemctl reboot
   ```
6. Confirm following message is output in /var/log/message.

   ```
   efi: Memory: XXXM/YYYM mirrored memory
   ```

   The number is displayed in XXX and YYY.
7. Modify /etc/default/grub as follows;
8. Execute following command.
   - For Red Hat Enterprise Linux

     ```
     # grub2-mkconfig -o /boot/efi/EFI/redhat/grub.cfg
     ```
   - SUSE Linux Enterprise Server

     ```
     # grub2-mkconfig -o /boot/grub2/grub.cfg
     ```
9. Reboot the partition.

   ```
   # systemctl reboot
   ```

Note

- If you use Address Range Mirror mode, you must boot OS with UEFI. If you boot OS with Legacy, OS does not aware Address Range Mirror mode.
- There is no setting about Memory Mirror RAS for Address Range Mirror mode.

- When PCI Address mode is Segment mode, memory under CPU#0 in Home SB can be mirrored by only 1.5 GB. When PCI Address mode is Bus mode, memory under CPU#0 in Home SB can be mirrored by only 2.0 GB.
- If the way to specify mirror size is set to “OS Request” in BIOS menu, memory size to be mirrored cannot be reflected by BIOS menu.
- If the way to specify mirror size is set to “BIOS Menu Setting” in BIOS menu, memory size to be mirrored specified by OS cannot be reflected.
- If the way to specify mirror size is set to “OS Request” in BIOS menu and the memory size which exceeds maximum size being able to mirror is specified by OS, the partition start up by no mirror.
- If the way to specify mirror size is set to “BIOS Menu Setting” in BIOS menu and the memory size which exceeds maximum size being able to mirror is specified to memory under the CPU by BIOS menu, the partition start up in the state where memory undert the CPU is not mirrored.
- When you add or remove SB, or you add or remove memory, the setting of memory size to be mirrored remains the same as before adding or removing SB/memory.
  When you remove SB, or you remove memory, check whether the setting of mirror size in Address Range Mirror does not exceed the maximum memory size being able to mirror. When the way to specify mirror size is set to “BIOS Menu Setting” in BIOS menu, check whether mirror size setting of memory under CPU of each SB does not exceed the maximum memory size being able to mirror.
- Address Range Mirror cannot be used when Dynamic Reconfiguration is enabled.
- When the Extended Partitioning is enabled, memory size to be mirrored specified by OS cannot be reflected.

Note in Red Hat Enterprise Linux/ SUSE Linux Enterprise Server

- If percentage of mirror size exceeds the maximum value or lower than minimum value, it is possible that OS cannot start up.
- Memory region used by the kernel is limited to mirrored regrion.
- Depending on the system operation, memory which can be used by the kernel may be insufficient and system may not run normally. In that case, increase mirror size.

Memory Mirror RAS

This section describes the operation when there is an error in the DIMM in the Memory Mirror status.

- The Memory operation when using the Memory Mirror is selected from the MMB Web-UI.
- Mirror maintenance mode (the default)
  When restarting the partition, the failed DIMM and the paired DIMM are not incorporated. The other normal DIMMs will maintain the Memory Mirror.
  - The Memory Mirror status will be maintained because only the normal DIMM would be used.
  - Since the DIMM area suspected to have failed will be degraded, the memory capacity seen from the operating system will be reduced.
- Memory capacity maintenance mode
  The Memory Mirror status of the memory mirror group in which the memory suspected to have failed will be deleted after the partition is restarted. Up to six The DIMM (DIMM with the same NN number as the DIMM#NNM), including the failure suspected memory are not incorporated. The memory mirror group maintains the status of the Memory Mirror.

For details on the memory mirror group, see ‘TABLE 3.17 Memory mirror group’.

TABLE 3.20 Memory mirror group

Memory mirror group 1	Memory mirror group 2	Memory mirror group 3	Memory mirror group 4
DIMM#0A0	DIMM#0C0	DIMM#1A0	DIMM#1C0
DIMM#0A1	DIMM#0C1	DIMM#1A1	DIMM#1C1
DIMM#0A2	DIMM#0C2	DIMM#1A2	DIMM#1C2
DIMM#0A3	DIMM#0C3	DIMM#1A3	DIMM#1C3
DIMM#0A4	DIMM#0C4	DIMM#1A4	DIMM#1C4
DIMM#0A5	DIMM#0C5	DIMM#1A5	DIMM#1C5
DIMM#0B0	DIMM#0D0	DIMM#1B0	DIMM#1D0
DIMM#0B1	DIMM#0D1	DIMM#1B1	DIMM#1D1

Memory mirror group 1	Memory mirror group 2	Memory mirror group 3	Memory mirror group 4
DIMM#0B2	DIMM#0D2	DIMM#1B2	DIMM#1D2
DIMM#0B3	DIMM#0D3	DIMM#1B3	DIMM#1D3
DIMM#0B4	DIMM#0D4	DIMM#1B4	DIMM#1D4
DIMM#0B5	DIMM#0D5	DIMM#1B5	DIMM#1D5

- Since the memory mirror group having a failure suspected DIMM operates in the Non Mirror, the status would be Partial Memory Mirror.
- Since half the number of DIMMs having a failure suspected DIMM in a Partial Mirrored memory group will not be incorporated, the memory capacity seen from the operating system will be maintained.

The memory incorporation status before and after a partition restart is shown below.

FIGURE 3.29 Status when there is an error in the memory (mirror maintenance mode)

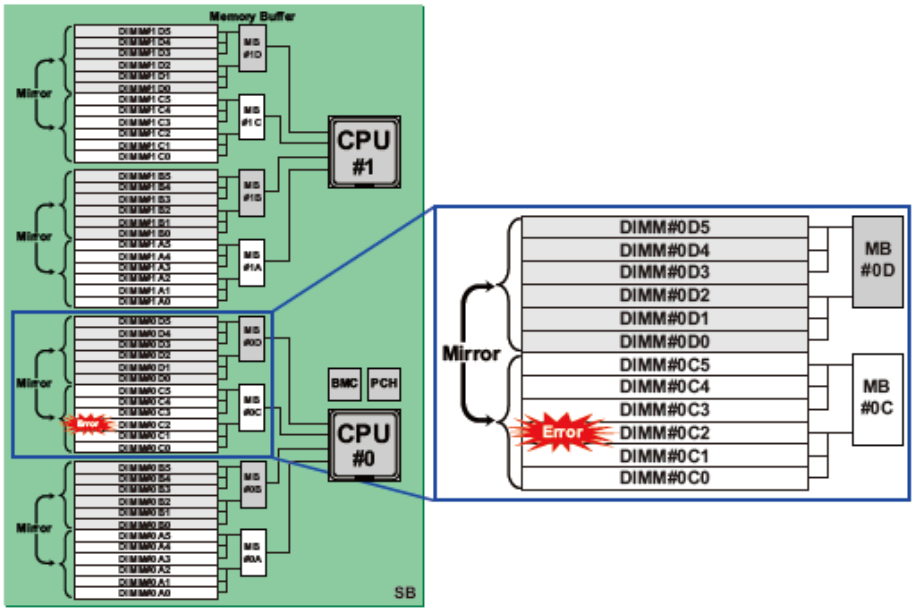


FIGURE 3.30 Status when the error had occurred in the system was restarted (mirror maintenance mode)

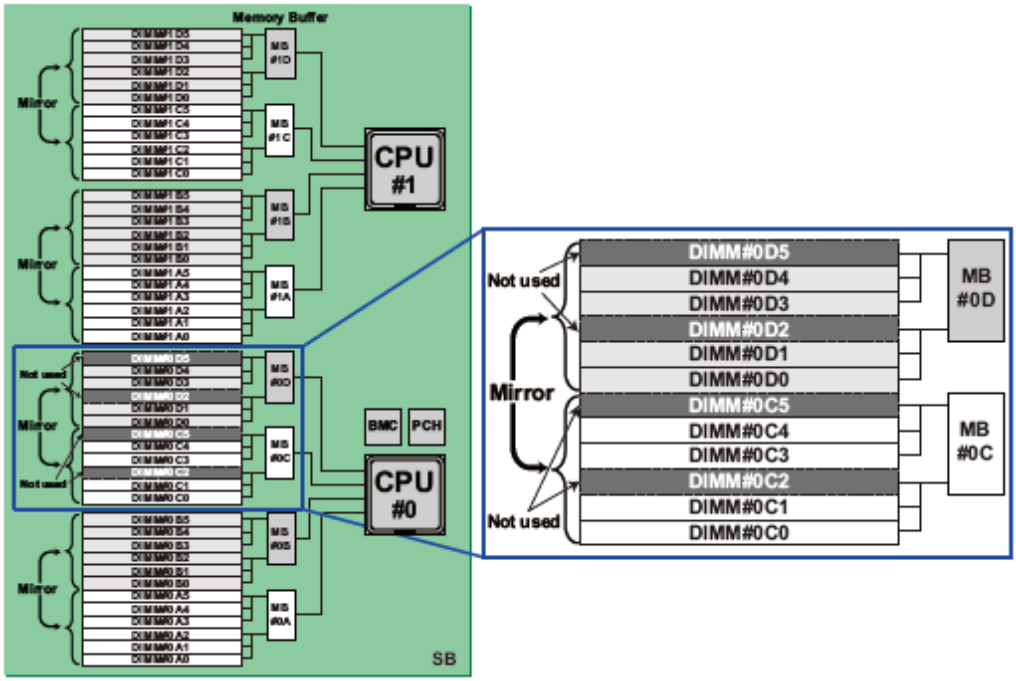


FIGURE 3.31 Status when there error has occurred in the memory (memory capacity maintenance mode)

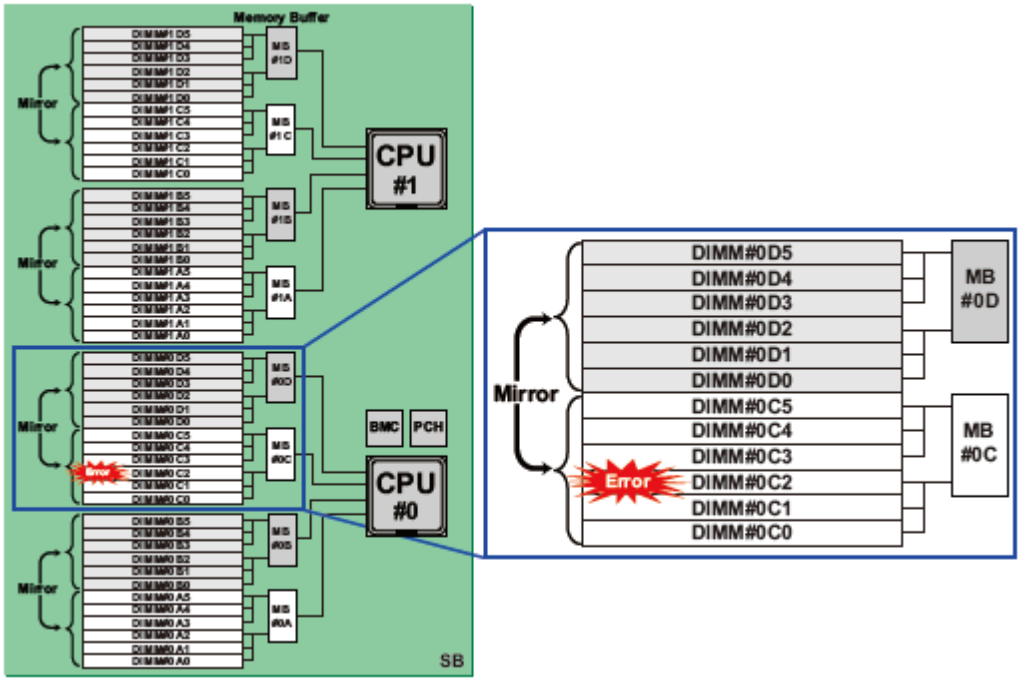
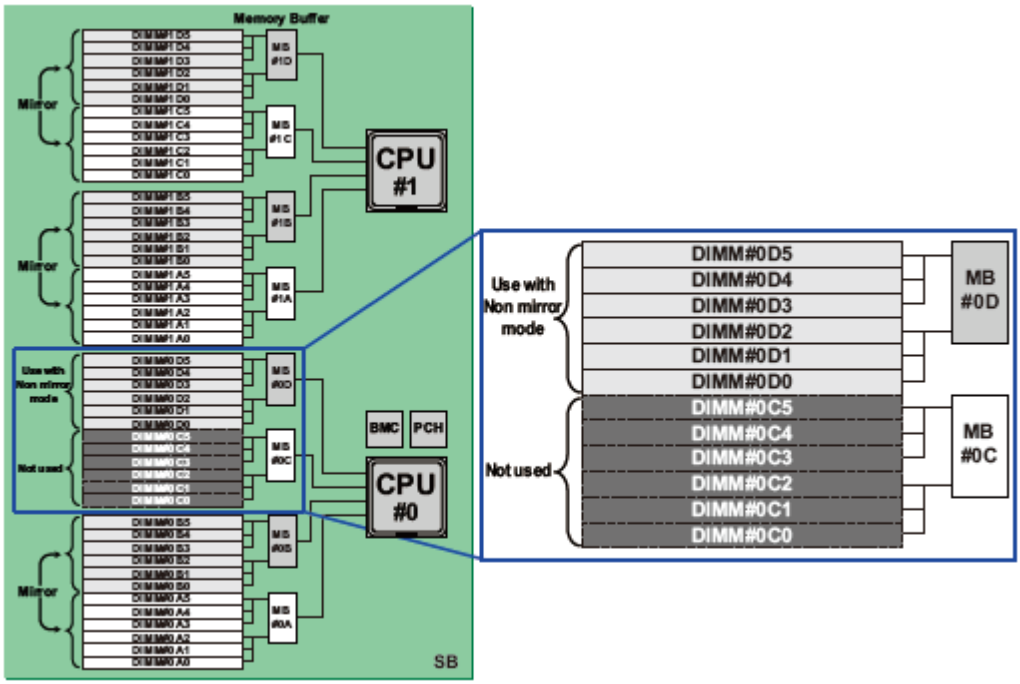


FIGURE 3.32 Status when an error has occurred in the memory (memory capacity maintenance mode)



The patterns supported in the combination of memory mirror status and failed DIMM are listed in the table below.

TABLE 3.21 Combination of the memory mirror status and the failed DIMM (Non Mirror)

Mirror RAS Mode	Mirror mode before reboot (during operation)	Places where the DIMM has failed	Mirror mode after reboot	Memory capacity after reboot
Mirror Keep Mode	Full Mirror	Mirror part	Full Mirror (*1)	Reduction (*1)
	Partial Mirror	Mirror part	Partial Mirror (*1)	Reduction (*1)
		Non Mirror part	Partial Mirror (*1)	Reduction (*1)

Mirror RAS Mode	Mirror mode before reboot (during operation)	Places where the DIMM has failed	Mirror mode after reboot	Memory capacity after reboot
Capacity Keep Mode	Full Mirror	Mirror part	Partial Mirror or Non-Mirror (*1)	No change (*1)
	Partial Mirror	Mirror part	Partial Mirror or Non-Mirror (*1)	No change (*1)
		Non Mirror part	Partial Mirror (*1)	Reduction (*1)

*1: Switches to the Reserved SB when a Reserved SB has been set. Therefore, the system returns to the status before the reboot.

Memory Mirror conditions

The DIMM is mounted following the 'G.2.1 DIMM mounting order and DIMM mixed mounting condition'.
The condition for the hardware is to have the same capacity as that of the mirroring DIMM group.

Memory Mirroring

Memory Mirroring is executed in the memory on the same SB.

3.2.7 Hardware RAID

The PRIMEQUEST 2000 series supports Hardware RAID.
Hardware RAID is a RAID function that performs operations using the SAS array controller card. The SAS array controller card is a PCI Express card having a dedicated RAID controller chip and firmware, and which can control the array (faulty HDD disconnection, incorporation, LED control).
RAID levels supported in the hardware RAID are RAID0, RAID1, RAID5, RAID6, RAID1E, RAID10, RAID50, and RAID60.
However, RAID level supported in the HDD/SSD on the SB and DU are RAID0, RAID1, RAID5, RAID6, RAID1E, and RAID10.
For details on the hardware RAID setting, see 'Server View RAID Management User Manual'. For details on the HDD/SSD replacement of the hardware RAID configuration, see '5.3 Replacing HDD/SSD when active replacement is not possible'.
Note

- The logical volume configured with hardware RAID except for RAID0 cannot be used by Software RAID (GDS) in the same partition.
- When using the hardware RAID, consider either of the following conditions to protect the customer's data in the event of a power failure.
- An FBU is mounted.
- Ensure stable AC power by redundant power mechanism, dual system reception mechanism, and UPS.

3.2.8 Server View RAID

For details on the Server View RAID, see 'Server View RAID Management User Manual'.

3.2.9 Cluster configuration

- For inter-cabinet clustering, clustering with only PRIMEQUEST 2000 series is supported. The inter-cabinet clustering with cabinets other than PRIMEQUEST 2000 series is not supported.
- For inter-cabinet clustering, clustering with only the same models is supported. The inter-cabinet clustering with different models such as clustering with PRIMEQUEST 2400E2 and 2800E2, or PRIMEQUEST2400E2 and 2400E is not supported.

3.3 Replacing components

Components to be replaced can be identified from the replacement board and OPL LED display. For details on the LED display, see Appendix F Status Checks with LEDs.

3.3.1 Replaceable components

Replaceable components and replacement conditions are listed in the table below.

TABLE 3.22 Replaceable components and replacement conditions

Component name	AC power off (Device stop)	AC power on status All partitions off status (hot maintenance)	AC power on target partition off (hot maintenance)	AC power on target partition on (hot maintenance)
PSU_P/PSU_S	Replaceable	Replaceable	Replaceable (*1)	Replaceable (*1)
FANM	Replaceable	Replaceable	Replaceable (*1)	Replaceable (*1)
FANU	Replaceable	Replaceable	Replaceable	Replaceable
FANM	Replaceable	Replaceable	Replaceable	Replaceable
SB	Replaceable	Replaceable	Replaceable	Replaceable (*5)
CPU	Replaceable	Replaceable	Replaceable	Not replaceable
DIMM	Replaceable	Replaceable	Replaceable	Not replaceable
Mezzanine	Replaceable	Replaceable	Replaceable	Not replaceable
DIMM	Replaceable	Replaceable	Replaceable	Not replaceable
SAS RAID Controller card (*6)	Replaceable	Replaceable	Replaceable	Not replaceable
FBU	Replaceable	Replaceable	Replaceable	Not replaceable
HDD/SSD	Replaceable	Replaceable	Replaceable	Replaceable (*2)
Battery	Replaceable	Replaceable	Replaceable	Not replaceable
Memory Scale-up Board	Replaceable	Replaceable	Replaceable	Not replaceable
DIMM	Replaceable	Replaceable	Replaceable	Not replaceable
Mezzanine	Replaceable	Replaceable	Replaceable	Not replaceable
DIMM	Replaceable	Replaceable	Replaceable	Not replaceable
Battery	Replaceable	Replaceable	Replaceable	Not replaceable
IOU_1GbE/IOU _10GbE	Replaceable	Replaceable	Replaceable	Replaceable (*5)
PCI Express card (*6)	Replaceable	Replaceable	Replaceable	Not replaceable
DU	Replaceable	Replaceable	Replaceable	Not replaceable
SAS RAID Controller card (*6)	Replaceable	Replaceable	Replaceable	Not replaceable
FBU	Replaceable	Replaceable	Replaceable	Not replaceable
HDD/SSD	Replaceable	Replaceable	Replaceable	Replaceable (*2)
MMB	Replaceable	Replaceable (*3)	Replaceable (*3)	Replaceable (*3)
OPL	Replaceable	Not replaceable	Not replaceable	Not replaceable
MP, PDB	Replaceable	Not replaceable	Not replaceable	Not replaceable
PCI_Box	Replaceable	Replaceable	Replaceable	Not replaceable
IO_PSU	Replaceable	Replaceable	Replaceable (*1)	Replaceable (*1)
IO_FAN	Replaceable	Replaceable	Replaceable (*1)	Replaceable (*1)
PEXU	Replaceable	Replaceable	Replaceable	Not replaceable
PCI Express card (*6)	Replaceable	Replaceable	Replaceable	Replaceable (*4)

*1: Possible only in redundancy configuration.
*2: Possible only for redundancy configuration with RAID.
*3: Possible only for MMB duplication configuration.
*4: PCI hot plug function is required. Operation by maintenance staff is optional.
*5: DR function is required.
*6: If you replace SAS RAID Controller card, settings of SAS RAID Controller card get back to default value.
If you change settings of SAS RAID Controller card, you must replicate it.
If you replace SAS RAID Controller card due to its failure, restore the settings.
For details of settings of SAS RAID Controller card, see also “the setting for SAS array controller” (CA97232-0153).

3.3.2 Component replacement conditions

This section describes the replacement conditions of each component.

PSU

The PSU unit can be replaced while the system continues operating. PSU replacement in a non-redundant configuration requires the system to be stopped.

FAN

The FAN unit can be replaced while the system continues operating.

SB

If the DR function (SB hot remove and SB hot add) is used, the SB can be replaced even when the partition using the SB is powered on. When the DR function is not used, the SB can be replaced if the partition using the SB is powered off.

Remarks

Since the CPU/Mezzanine/DIMM/PCI Express card /FBU which is mounted on the SB can be replaced after removing the SB from the device, the replacement can be done under the same conditions as the SB.

Note

Since there may be a time deviation after the Home SB is replaced, set the time in the operating system when the NTP is not used.

Memory Scale-up Board

Memory Scale-up Board can be replaced when partition including the Memory Scale-up Board is powered off.

Remarks

Since the Mezzanine/DIMM which is mounted on the Memory Scale-up Board can be replaced after removing the Memory Scale-up Board from the device, the replacement can be done under the same conditions as the Memory Scale-up Board.

IOU_1GbE/IOU_10GbE

If the DR function (IOU hot remove and IOU hot add) is used, the IOU_1GbE and IOU_10GbE can be replaced even if the partition that uses the IOU_1GbE/IOU_10GbE is powered on. If the DR function is not used, then the replacement is possible when the partition that uses the IOU_1GbE/IOU_10GbE is powered off.

For PXE boot, re-configuring of boot order is required after replacing IOU.

For details of re-configuring of boot order, see ‘3.3.2 Boot specification of UEFI’ in the “PRIMEQUEST 2000 series Tool Reference’ (CA92344-0539)

DU

DU can be replaced when the status of the partition that uses the DU to be replaced is powered off.

MMB

In a system with two MMBs installed, hot replacement can be used to replace an MMB when the system continues operating. Basically, the faulty MMB (Standby MMB) can simply be replaced since a faulty MMB would have been switched with a standby MMB. To replace the active MMB, switch it with the standby MMB before replacing it. The replacement does not affect control and monitoring in the system.

3.3.3 Replacement procedures in hot maintenance

This section describes the procedures before and after replacement in hot maintenance.

Procedure before replacement

See ‘7.1.2 Power off of Partitions’ in “PRIMEQUEST 2000 series Installation Manual” (CA92344-0536) and stop the relevant partition.

Procedure after replacement

See ‘7.1.1 Power on of partitions’ in “PRIMEQUEST 2000 series Installation Manual” (CA92344-0536) stop the relevant partition following the

3.3.4 Replacement procedures in cold maintenance

This section describes the procedures before and after replacement in cold maintenance.

Procedure before replacement

Stop all the partitions.

Procedure after replacement

Start the relevant partition.

3.3.5 Replacing the battery backup unit of the uninterrupted power supply unit (UPS)

This section describes the procedure for replacing the battery backup unit of the UPS. The UPS battery is regularly replaced and the life cycle is monitored by the standard monitoring function of the operating system. For details on the standard monitoring function of the operating system, see 'PQ-replace-notification-en' which can be got from below URL:
http://www.fujitsu.com/global/products/computing/servers/mission-critical/primequest/documents/manuals/

3.3.6 Replacing the PCI SSD card

This section describes the procedure for replacing the PCI SSD card.
Note
The PCI SSD card does not support hot replacement. Stop the partition before replacing.

In a RAID configuration (Linux software RAID)

1. Place the faulty PCI Express card offline and remove the card.
   Example:

```
# mdadm/dev/md0 –fail  /dev/fiob
# mdadm/dev/md0–remove  /dev/fiob
```

2. Power off the partition.
   For details on the powering off the partition, see '7.1.2 Powering off partitions' in "PRIMEQUEST 2000 series Installation Manual" (CA92344-0536).
3. Replace the faulty PCI Express card.
4. Power on the partition.
   For details on powering on the partition, see '7.1.1 Powering on Partitions' in the "PRIMEQUEST 2000 series Installation Manual" (CA92344-0536).
5. Initialize the replaced PCI Express card.
6. The executing procedure is as follows.
   a. fio-detach (Disconnecting the device from the operating system)
   b. fio-format (Low level formatting of the device)
   c. fio-attach ((Making the device available on the operating system)

   Example:

```
# fio-detach /dev/fct1
# fio-format /dev/fct1
# fio-attach /dev/fct1
```

   Remarks
   The work of adding the device will trigger the rebuild operation.
   Example:

```
# mdadm /dev/md0 –add /dev/fiob
```

In SWAP configuration

1. Delete the swap entry of the faulty PCI Express card.

```
(Example) # swapoff /dev/fioal
```

2. Confirm the serial number of the faulty PCI card
3. Delete the serial number of the failed PCI card from the pre-allocate memory in /etc/modprobe.d/ioMemory-vsl.conf.
   Note

Before replacing the PCI card, delete the serial number of the faulty PCI card from the pre-allocate memory in /etc/modprobe.d/ioMemory-vsl.conf.
For details on the procedure, see 'PCIe SSD-xx ioMemory VSL x.x.x User Guide for Linux'. xx is the capacity. X.x.x is the version number.
http://manuals.ts.fujitsu.com/

4. Power off the partition.
   For details on powering off, see '7.1.2 Powering off Partitions' in the "PRIMEQUEST 2000 series Installation Manual" (CA92344-0536).

5. Replace the faulty PCI Express card.

6. Power on the partition.
   For details on powering on the partition, see '7.1.1 Powering on Partitions' in the "PRIMEQUEST 2000 series Installation Manual" (CA92344-0536).

7. Initialize the replaced PCI Express card.
   The executing procedure is as follows.

   a fio-detach (Disconnecting the device from the operating system)

   b fio-format (Low-level formatting of the device)

   Remarks
   If the device is used as a SWAP device, the formatting must have a 4K sector size.

   c fio-attach (Making the device available on the operating system)
   Example:

```
# fio-detach /dev/fct0
# fio-format –b 4K /dev/fct0
# fio-attach /dev/fct0
```

   Remarks
   For details on each command, see 'PCIe SSD-xx ioMemory VSL x.x.x User Guide for Linux'. xx is the capacity. X.x.x. is the version number.
   http://manuals.ts.fujitsu.com/

8. Create a swap entry for the replaced PCI Express card.
   Remarks
   A partition must be created before creating a swap entry.
   Example:

```
# mkswap /dev/fioa1
# swapon /dev/fioa1
```

9. Confirm the serial number of the replaced PCI Express card.
   For details on the procedure, see 'PCIe SSD-xx ioMemory VSL x.x.x User Guide for Linux'. xx is the capacity. X.x.x is the version number.
   http://manuals.ts.fujitsu.com/

10. Register the serial number of the replaced PCI Express card in the pre-allocate memory in /etc/modprobe.d/ioMemory-vsl.conf.
    Note
    After replacing the PCI Express card, add the target serial number in the pre-allocate memory in /etc/modprobe.d/ioMemory-vsl.conf.
    For details on each command, see 'PCIe SSD-xx ioMemory VSL x.x.x User Guide for Linux'. xx is the capacity. X.x.x. is the version number.
    http://manuals.ts.fujitsu.com/

11. Restart the partition (opening system).

3.4 Expansion of components

This section describes how to add components.
The components and the conditions for maintaining the addition of each component are listed in the table below.
Some components cannot be added.

TABLE 3.23 Expandable components

Component name	AC power off (Device stop)	AC power on All partitions off (hot maintenance)	AC power on Target partition off (hot maintenance)	AC power on Target partition on (hot maintenance)
PSU_P/PSU_S	Expandable	Not Expandable	Not Expandable	Not Expandable
FANM	-	-	-	-
FANU	-	-	-	-
FANM	-	-	-	-
SB (*4)	Expandable	Expandable	Expandable	Expandable (*2)
CPU	Expandable	Expandable	Expandable	Not expandable
DIMM	Expandable	Expandable	Expandable	Not expandable
Mezzanine	-	-	-	-
DIMM	Expandable	Expandable	Expandable	Not expandable
PCI Express card	Expandable	Expandable	Expandable	Not expandable
FBU	Expandable	Expandable	Expandable	Not expandable
HDD/SSD (*3)	Expandable	Expandable	Expandable	Expandable
battery	-	-	-	-
Memory Scale-up Board				
DIMM	Expandable	Expandable	Expandable	Not expandable
Mezzanine	-	-	-	-
DIMM	Expandable	Expandable	Expandable	Not expandable
Battery	-	-	-	-
IOU_1GbE/IOU_10GbE (*4)	Expandable	Expandable	Expandable	Expandable (*2)
PCI Express card (*5)	Expandable	Expandable	Expandable	Not expandable
DU	Expandable	Expandable	Expandable	Not expandable
PCI Express card	Expandable	Expandable	Expandable	Not expandable
FBU	-	-	-	-
HDD/SSD	Expandable	Expandable	Expandable	Expandable
MMB (*3)	Expandable	Expandable	Expandable	Expandable
OPL	-	-	-	-
MP, PDB	-	-	-	-
PCI_Box (*3)	Expandable	Expandable	Expandable	Not expandable
IO_PSU	Expandable	Expandable	Expandable	Expandable
IO_FAN	-	-	-	-
PEXU	-	-	-	-
PCI Express card (*5)	Expandable	Expandable	Expandable	Expandable (*1)

- : Outside the expansion target
*1: PCI hot plug function is required
*2: DR function is required
*3: For only PRIMEQUEST 2400E3/2800E3/2400E2/2800E2/2400E/2800E.
*4: When you perform expansion of SBs or IOUs in PRIMEQUEST 2800B3/2800B2/2800B, PCI Bus number assigned to PCI Express slots of IOUs or PCI_Boxes may varies after expansion. Since change of PCI Bus number assigned to PCI Express slots of IOUs or PCI_Boxes may impact on the system largely, it is difficult to reconfigure settings on the operating system. So, reinstall the operating system.
*5: When configuring Option ROM functions(*1) of PCIe card, write down the settings you have done in a configuration sheet for each card and keep it as a backup if needed.
You may be required to re-configure the settings after replacing a faulty card to a spare part. (*2)
The configuration sheets for PCIe cards are listed and downloadable in the following sites:
http://www.fujitsu.com/global/services/computing/server/primequest/
(*1) Functions of option ROM
- SR-IOV setting, UMC(Universal Multi-Channel), Boot setting, etc.

(*2) Reconfiguring LAN/CNA card when replacing
For reconfiguring LAN card, hand the configuration sheets which you had made beforehand the field engineer in charge of your system. The field engineer reconfigures the settings.
For reconfiguring CNA card, reconfigure the settings of storage device connected to the CNA card as well as the settings of the CNA card as needed. The system administrator reconfigures the storage device connected to the CNA card and the CNA card using the configuration sheets which you had made beforehand.

Perform the license authentication following the Windows window instructions.

Windows license authentication

1. When starting Windows, click the balloon for license authentication that is displayed in the task tray.
2. Click [Product Key Input] and enter the product key found on the COA label attached to rear lateral side of the cabinet.
3. License authentication can be performed via the Internet or by making a phone call to the Microsoft customer service center.

Hot add procedure for HDD/SSD

For details on the hot add procedure for HDD/SSD, see CHAPTER 8 Replacement of HDD/SSD.

Changing the firmware when expanding components

The firmware may be required to be changed when expanding a component.
Use the same firmware version number of the FC (Fiber Channel) card within the same partition.

- FC card (PCI Express card)
  Use the same version number as the firmware version number that is currently in use.

How to confirm the firmware number

After adding a card, and the partition is started, use the following procedure to confirm the firmware version number.
How to confirm the FC card firmware version number
To confirm the version number, see ‘1.2.14 [IOU] menu’ or‘1.2.16 [PCI_Box] menu’ in the “PRIMEQUEST 2000 series Tool Reference’ (CA92344-0539).

Changing the firmware

If the firmware version numbers are not identical, change the firmware.
The information on the firmware and the procedure are provided in the following website.
Download of drivers and the bundled software of the PRIMEQUEST 2000 series.
http://support.ts.fujitsu.com/
Remarks
In the PRIMEQUEST 2000 series, the customer will change a part of the firmware.

3.4.1 Procedure of expansion in hot maintenance

This section describes the procedures before and after expansion in hot maintenance.

Procedure before expansion

“Stop the relevant partition referring to ‘7.1.2 Powering off Partitions’ in the “PRIMEQUEST 2000 series Installation Manual” (CA92344-0536).

Procedure after expansion

Start the relevant partition referring to‘7.1.1 Powering on Partitions’ in the “PRIMEQUEST 2000 series Installation Manual” (CA92344-0536).

3.4.2 Procedure of expansion in cold maintenance

This section describes the procedures before and after expansion in cold maintenance.

Procedure before expansion

Stop all the partitions referring to‘7.1.2 Powering off Partitions’ in the “PRIMEQUEST 2000 series Installation Manual” (CA92344-0536).

Procedure after expansion

Start the required partition referring to 7.1.1 Powering on Partitions' in the "PRIMEQUEST 2000 series Installation Manual" CA92344-0536).

3.4.3 Expansion of PCI SSD card

This section describes the procedure of expanding the PCI SSD card (PCI Express SSD card 785GB / PCI SSD card1.2TB).

Note

Hot replacement is not supported in the PCI SSD card. Stop the partition before the addition.

In a RAID configuration (Linux software RAID)

1. Power off the partition.

   For details on powering off, see '7.1.2 Powering off Partitions' in the "PRIMEQUEST 2000 series Installation Manual" (CA92344-0536).

2. Add the PCI Express card.

3. Power on the partition.

   For details on powering on the partition, see '7.1.1 Powering on Partitions' in the "PRIMEQUEST 2000 series Installation Manual" (CA92344-0536).

4. Set the environment of the added PCI Express card.

Remarks

For details on the environmental setting procedure, see 'PCIe SSD-xx ioMemory VSL x.x.x User Guide for Linux'. xx is the capacity. x.x.x is the version number.
http://manuals.ts.fujitsu.com/

In a SWAP configuration

1. Power off the partition.

   For details on powering off, see '7.1.2 Powering off Partitions' in the "PRIMEQUEST 2000 series Installation Manual" (CA92344-0536).

2. Add the PCI Express card.

3. Power on the partition.

   For details on powering on the partition, see '7.1.1 Powering on Partitions' in the "PRIMEQUEST 2000 series Installation Manual" (CA92344-0536).

4. Set the environment of the added PCI Express card.

Remarks

For details on the procedure of setting the environment, see 'PCIe SSD-xx ioMemory VSL x.x.x User Guide for Linux'. xx is the capacity. x.x.x is the version number.
http://manuals.ts.fujitsu.com/

5. Restart the partition (operating system).

3.5 Process after switching to the Reserved SB and Automatic Partition Reboot

This section describes the processes after switching to the Reserved SB, and the partition has automatically rebooted (example, status check and re-configuration).

3.5.1 Checking the status after switching to a Reserved SB and automatic rebooting

The status after the partition reboot is checked in the [Partition Configuration] window, [System Status] window, [SB #x] window of the MMB Web-UI.

Immediately after switching to a Reserved SB and the partition has started (booted), the status will be as follows.

- The Reserved SB is incorporated in the partition in place of the faulty SB.
- The setting of Reserved SB for multiple partitions is cancelled if the Reserved SB that was incorporated in the partition in place of the faulty SB had been the Reserved SB for multiple partitions before the incorporation.
- The faulty SB is disconnected from the partition configuration and freed.

3.5.2 Processing after replacement of a faulty SB

This section describes how to reconfigure a Reserved SB after replacement of a faulty SB. Perform the settings as needed, considering the current configuration and the operating status.
After switching to the Reserved SB and partition reboot, the following Procedures of 1 and 2 are required. The process for partition configuration is required, except when continuing the operation without setting a new Reserved SB.

1. Restore the Reserved SB that was incorporated in the partition to replace the faulty SB, to a Reserved SB again.
2. Set the replacement SB as a Reserved SB.

This section describes the operation of procedure 1 noted above.

1. From the log, analyze all the partitions where the Reserved SB (hereafter referred to as the source Reserved SB) was incorporated in the partition in place of the faulty SB.
   For details on the analysis procedure, see 3.5.3 Checking the source partition configuration information when switching to a Reserved SB.
2. Check the status.
   Click [System] - [System Status]. Check the status in the [System Status] window.
3. Stop the partition.
   a Click [Partition] - [Power Control]. The [Power Control] window appears.
   b Select [Power Off] from the [Power Control] of the relevant partition and click the [Apply] button.
4. Check the configuration status of the partition.
   Click [Partition] - [Partition Configuration]; check the configuration status of the partition in the [Partition Configuration] window.
5. Restore the source Reserved SB to a Reserved SB again.
   a Click [Partition] - [Partition Configuration] - [Remove Unit] button. [Remove the SB/IOU from the Partition] window appears.
   b Click the radio button of the source Reserved SB; then click the [Apply] button. The source Reserved SB will be disconnected from the partition and will be in the free status.
   c Click [Partition] - [Reserved SB Configuration]. [Reserved SB Configuration] window, check the check box of the SB set to the free status in 2) mentioned above, select the reserved target partition and click the [Apply] button. When reserving multiple partitions, select them at the same time and click the [Apply] button.
6. Incorporate the replacement SB.
   a Click [Partition] - [Partition Configuration] - [Add Unit] button. [Add SB/IOU to Partition] window appears.
   b Click the radio button of the replacement SB; then click the [Apply] button. The replacement SB will be incorporated into the partition.
7. Start the partition.
   Click [Partition] - [Power Control]. In the [Power Control] window, select [Power on] from [Power Control] of the relevant partition, and click the [Apply] button. The partition will start.

When setting the maintenance replaced SB as a Reserved SB

Perform the following procedures for the replaced SB.

1. From the log, analyze all the partitions where a Reserved SB that was incorporated in a rebooted partition place of a faulty SB.
   For details on the analysis procedure, see '3.5.3 Checking the source partition setting information when switching to a Reserved SB'.
2. Check the status.
   Click [System] - [System Status]. Confirm the status in [System Status] window.
3. Confirm the configuration status of the partition.
   Click [Partition] - [Partition Configuration].
   Check the configuration status of the partition in the [Partition Configuration] window.
4. Set the replaced SB as the Reserved SB.
   a Click [Partition]-[Reserved SB Configuration]. [Reserved SB Configuration] window appears.
   b Check the check box of the SB replaced for maintenance.

   Select reserve target and click the [Apply] button.
   If there are multiple reserve targets, select them simultaneously and click the [Apply] button.

3.5.3 Checking the source partition configuration information when switching to a Reserved SB

This section describes the method of checking the source partition configuration information when there is a switch to a Reserved SB.

Note

Checking the source partition configuration information is presumed basically from the SEL information output by the MMB, but it need not necessarily be uniquely determined. It should be determined from the operation status of the partition during Reserved SB switching.

A case where the partition and a Reserved SB have been set is given below. SB #c of Partition #R, is set as the Reserved SB of Partition #P and Partition #Q.

TABLE 3.24 Partition setting (before switching)

Partition	SB		
	a	b	c
Partition #P	O		
Partition #Q		O	
Partition #R			O

O: Indicates the partition setting status

TABLE 3.25 Reserved SB setting (before switching)

Partition	SB		
	a	b	c
Partition #P			O
Partition #Q			O
Partition #R			

O : Indicates the status of the Reserved SB

When there is a fault in SB #a, and SB #a is switched to Reserved SB #c, the SB that configures the partition changes as follows.

```
Partition #P: SB #a -> Partition #P: SB#c
Partition #Q: SB #b -> Partition #Q: SB#b
Partition #R: SB #c -> Partition #R:  ----
```

The status transition of each partition is shown from (1) to (4) of the 'Partition status transition' in the table below.

TABLE 3.26 Partition status transition

Partition	Status transition (Chronological: Left to right)			
	(1)	(2)	(3)	(4)
Partition #P	In operation	Faulty	Reset/SB switching	Power on -> In operation
Partition #Q	In operation	In operation	In operation	In operation
Partition #R	In operation	In operation	Power off	Power off

Even if Partition #P, Partition #Q or Partition #R is running, the status of the partition will be as indicated in (1) in the table.

TABLE 3.27 Description of partition status transition

No.	Description (the numbers correspond to the status transition)
(1)	Partition #P, Partition #Q and Partition #R are in operation.
(2)	SB #a of Partition #P becomes faulty.
(3)	SB #a of Partition #P is disconnected and stopped. Following this, Partition #R is powered off. After that, SB #c is removed from Partition #R configuration, and the specification of Reserved SB of Partition #Q is canceled.
(4)	After being removed from the Partition #Q configuration, SB #c is configured as the SB of Partition #P. Partition #P is automatically powered on and the partition begins to operate.

In the status transition of (1) to (4), SB #c is incorporated in Partition #P in place of the faulty SB #a, restarted and it starts operating. Partition #Q is not affected. Partition #R stops and SB #c is removed from the configuration. SB #c, which was set as a Reserved SB in (1), is cleared of this status.
The resulting status shown in 'Partition setting (after switching)'and 'Reserved SB setting (after switching)'. After the SB switches to the Reserved SB, MMB changes its settings as shown in the table below.

TABLE 3.28 Partition setting (after switching)

Partition	SB		
	a	b	c
Partition #P			O
Partition #Q		O	
Partition #R			

O: Shows the partition setting status

TABLE 3.29 Reserved SB setting (after switching)

Partition	SB		
	a	b	c
Partition #P			
Partition #Q			
Partition #R			

O: Indicates the setting status of the Reserved SB (However, all are blank)
When there was a switch to the Reserved SB as mentioned above, MMB displays the following SELs.

```
SEL-1. SB #a was replaced with Reserved SB #c in Partition #P
SEL-2. Reserved SB #c was removed from Partition #Q
SEL-3. Reserved SB #c was removed from Partition #R
```

SEL-1 indicates that SB #a of Partition #P has been switched to Reserved SB #c.
The messages of SEL-2 and SEL-3 indicate that the Reserved SB setting for SB #c has been canceled, or SB #c has been removed from the operating partition, when there was a switch to the Reserved SB #c.
The status is determined from the partition operation before add after the switching. In the above example, since Partition #R was powered off just before SB #c was removed, you can see that SB #c has been removed from Partition #R that is in operation.

CHAPTER 4 Hot Maintenance in Red Hat Enterprise Linux 6

This chapter describes hot maintenance of System Boards, IOUs and PCI cards in Red Hat Enterprise Linux 6.

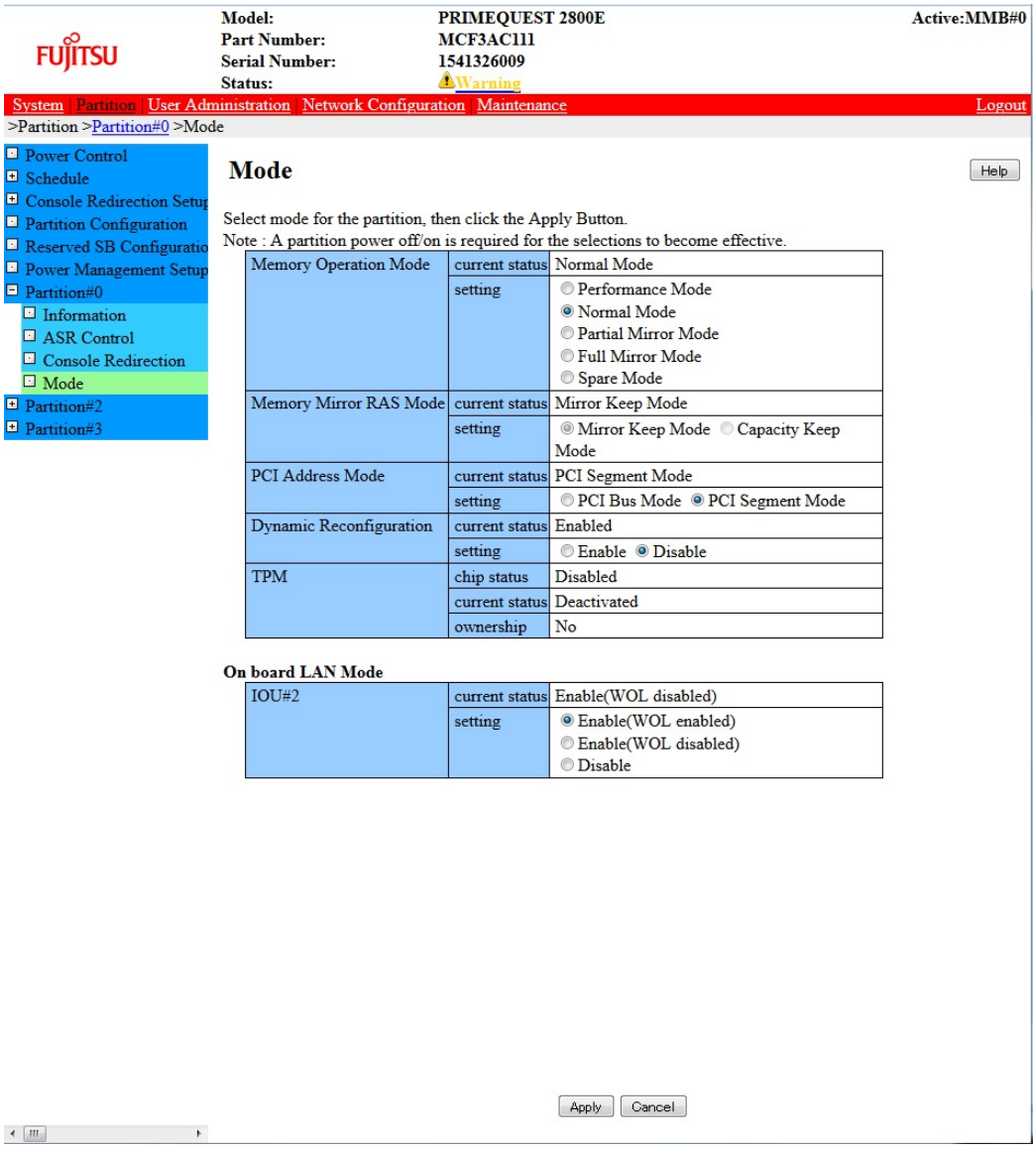
4.1 Dynamic Reconfiguration (DR)

This section describes Dynamic Reconfiguration (DR).
DR function has to be enabled by MMB Web-UI and Dynamic Reconfiguration Utility package has to be installed in the partition to perform hot maintenance of SB and IOU. For hot maintenance of PCI Express card, neither Enabling DR function nor installing Dynamic Reconfiguration Utility package has to be always needed.
For the summary of the DR function, applicable rules and corresponding list and restrictions, see '3.2.3 Dynamic Reconfiguration (DR)'.
For details on the MMB Web-UI/CLI, see respective chapters in "*PRIMEQUEST 2000 series Tool Reference*" (CA92344-0539).
For details on the OS CLI, see '5.1 DR command' in "*PRIMEQUEST 2000 series Tool Reference*" (CA92344-0539).

4.1.1 DR function configuration setting

Enable/Disable is set for the DR function of each partition, from Partition->Partition #x->Mode window of MMB Web-UI. Items for [Dynamic Reconfiguration] of the [Mode] window can be seen below. For details on the Mode window, see respective chapters in "*PRIMEQUEST 2000 series Tool Reference*" (CA92344-0539).

FIGURE 4.1 [Mode] window (Dynamic Reconfiguration)



Item		Description
Dynamic Reconfiguration	current status	Setting status of the current DR function (Enable/Disable)
	setting	Dynamic Reconfiguration function Enable/Disable setting -Enable -Disable (Default)

4.1.2 dr Command Package Install/ Uninstall

This section describes the install /uninstall of the dr command package.
To install dr command package, it is necessary to enable DR function on MMB.
The dr command can be applied using the SVIM application wizard. When installing after building the system, procure the package from Fujitsu Web download site, and install following the procedure below.
<Common install /uninstall>
Use FJSVdr-util-RHEL<Version number>-x.x.x-x-x86_64.tar.gz.
The file name for the RHEL6 dr command package is FJSVdr-util-RHEL6-x.x.x-x-x86_64.tar.gz. the following files are stored.

FJSVdr-util/RPMS/FJSVdr-util-RHEL6-x.x.x-x.noarch.rpm
FJSVdr-util/SRPMS/FJSVdr-util-RHEL6-x.x.x-x.noarch.rpm
FJSVdr-util/DOC/README.ja_JP.EUC.txt
FJSVdr-util/DOC/README.ja_JP.SJIS.txt
FJSVdr-util/DOC/README.ja_JP.UTF-8.txt
FJSVdr-util/DOC/README.txt
FJSVdr-util/INSTALL.sh
FJSVdr-util/UNINSTALL.sh

<When installing>
Install FJSVdr-util-RHEL6-x.x.x-x.noarch.rpm using the following procedure.

1. Become super user.

```
$ su -
```

2. Execute INSTALL.sh in the FJSVdr-util directory.
   Depending on the status, the rpm package will be installed or uninstalled.

```
# FJSVdr-util/INSTALL.sh
```

3. Restart the partition.

```
# /sbin/shutdown -r    now
```

<During uninstallation>
Perform the uninstallation using the following procedure.

1. Becomes super user.

```
$ su -
```

2. Execute UNSTALL.s in the FJSVdr-util directory.

```
# FJSVdr-util/UNINSTALL.sh
```

3. Restart the partition.

```
# systemctl reboot
```

4.2 Hot add of SB

This section describes the hot add of SB.

4.2.1 Preparing for SB hot add

The preparation flow is described below.

1. Arrange the SBs to be added.
   An SB to be added must require below conditions.
   - The SB to be added and CPU have same product name in the target partition.
   - Two CPUs must be mounted on the SB to be added.

- For SB hot add, mount the same number of DIMMs in the SB to be added as that in the Home SB of target partition.

2. Check if the configuration of CPU and DIMMs in arranged SBs to be added is the same as the Home SB in the target partition.
3. Insert the arranged SB into a free SB slot.
   This step will be performed by the field engineer in charge of your system.
4. Confirm the installation of the DR function using the following procedure.
   a. Check if the size of the dump disk save area is sufficient for the memory capacity to be added. For details on how to estimate the size required, contact the distributor where you purchased your product, or your sales representative.
   b. Check if the points/restrictions are clear. For detail, see '3.2.3 Dynamic Reconfiguration (DR)'
5. Check for any errors in the SB to be added.
   Example：How to check from the MMB Web-UI
   a. Open System >SB >SB #n window.
   b. Check if the status of the [Board Information] is 'OK'.
   c. Check if the other statuses displayed in SB #n window are 'OK'.
   d. Open Partition >Partition Configuration window.
   e. Check if the status of the SB for addition is a Free SB or Reserved SB. The number of the SB for adding is noted down.

4.2.2 Confirming the status of SB before SB hot add

1. Update the firmware version of added SB.
   Update the firmware version of added SB by using maintenance wizard to make the same firmware version of all SBs in the partition.
2. Confirming the size of resources before SB hot add
   Confirm the status of the SB before SB hot add to compare the state after SB hot add with the state before SB hot add. The number or sizes of resources before SB hot add can be confirmed by checking below files.
   - CPU: /proc/cpuinfo
     /proc/cpuinfo outputs information of each CPU recognized by OS at the time when this file is opened. The number of CPU can be obtained by below command.

```
# grep -c processor /proc/cpuinfo
120
```

   - Memory: /proc/meminfo
     /proc/meminfo outputs size of memory recognized by OS at the time when this file is opened.

```
# cat /proc/meminfo
MemTotal:      65169992 kB
MemFree:       63382120 kB
Buffers:          30034 kB
          :
          :
```

     The size of memory can be seen by the line of MemTotal.

4.2.3 DR operation in SB hot add

This section describes the operation of the DR, for performing SB hot add.

1. Log into the MMB Web-UI using Administrator privileges.
2. Execute hotadd command.
   Example：When adding SB2 in partition 1.

```
Administrator > hotadd partition 1 SB 2
Are you sure to continue adding SB#2 to partition#1? [Y/N] Y
```

```
DR operation start (1/5)
Assigning SB#2 to partition#1 (2/5)
Testing SB#2 (3/5)
Reconfiguring partition#1 (4/5)
Onlining added Memory/CPU (5/5)
Adding SB#2 to Partition#1 has been completed successfully.
Administrator >
```

3. See Operation Log window or perform “show dynamic_reconfiguration status” command and confirm below messages.
   Example：When adding SB2 in partition 1.

   Operation Log window:
   “I_10110 Partition1 : Hot-add SB#2 Completed.”

   show dynamic_reconfiguration status:
   “Adding SB#2 to Partition#1, completed”

4.2.4 How to deal with timeout while OS is processing SB hot add

If OS does not finish the process of SB hot add within predetermined time, timeout message “DR sequence timeout: SB hot-add OS failure” is shown on MMB CLI.
It means that DR completion message from OS does not arrive at MMB. In such case, some collaboration programs may hang though DR process is still running on OS. Rebooting the partition is recommended because it is difficult to estimate when the process will be completed.
The process of SB hot add by OS can be mainly divided into three parts. Check /var/log/message, analyzing which process takes a lot of time.

- Pre-process of collaboration program
- Activating added resources
- Post-process of collaboration program

1. Checking pre-process of collaboration program
   Process of below messages in /var/log/messages is pre-process of the collaboration program.

```
Dec 17 00:15:33 xxx dr-util[4457]: INFO : 800 : Detected SB
hot-add
Dec 17 00:15:33 xxx dr-util[4457]: INFO : 801 : Added SB3,
Node6,7
Dec 17 00:15:33 xxx dr-util[4457]: INFO : 807 : Execute 1
user programs at ADD_PRE timing
...
Dec 17 00:15:34 xxx dr-util[4457]: 10-FJSVdr-util-kdump-
restart : INFO : start
...
Dec 17 00:15:34 xxx dr-util[4457]: 10-FJSVdr-util-kdump-
restart : INFO : result: 0
...
Dec 17 00:15:34 xxx dr-util[4457]: INFO : 808 : Executed
user programs at ADD_PRE timing
```

   If “INFO : 808 : Executed user programs at ADD_PRE timing” is not output, pre-process of the collaboration program is delayed. Check which collaboration program takes a lot of time by seeing /var/log/messages and ‘collaboration program name.log’ made in /opt/FJSVdr-util/var/log directory, if any. Acquire the information of the collaboration program which takes a lot of time by below rpm command and ask the Fujitsu engineer about the cause of its delay.

   (Example) Checking the developer of the collaboration program “10-FJSVdr-util-kdump-restart”

```
$ rpm -qif /opt/FJSVdr-util/user_command/10-FJSVdr-util-
kdump-restart
...
```

   Rebooting the partition is recommended because SB hot add process has an imperfect state.

2. Checking the time for activating added resources
   Process of below messages in /var/log/messages is the process of activating added resources.

```
Dec 17 00:15:34 xxx dr-util[4457]: INFO : 802 : Add CPU30-59
(total 30)
Dec 17 00:15:34 xxx dr-util[4457]: INFO : 804 : Add
MEM98304-98559,114688-114943 (total 67108864 kiB)
...
Dec 17 00:15:47 xxx dr-util[4457]: INFO : 809 : Added SB3
```

If “INFO : 809 : Added SBX” is not output, process of activating added resources is delayed. Check that the process of adding CPU or memory is performed by executing below command at several seconds.

- Checking the number of CPU

```
$ grep -c processor /proc/cpuinfo
30
```

- Checking the size of memory

```
$ cat /proc/meminfo |grep MemTotal
MemTotal:       65271964 kB
```

In case that the number of CPU or the size of memory keeps increasing:

It is expected that cause of the delay is the load of the partition. The process of SB hot add can be completed sooner by reducing the load of the partition.

In case that the number of CPU or the size of memory does not increase though they does not reach expected quantity.

3. Checking post-process of collaboration program
Process of below messages in /var/log/messages is post-process of the collaboration program.

```
Dec 17 00:15:47 xxx dr-util[4457]: INFO : 807 : Execute 1
user programs at ADD_POST timing
...
Dec 17 00:15:48 SB-hotplug dr-util[4457]: 10-FJSVdr-util-
kdump-restart : INFO : start
...
Dec 17 00:15:49 SB-hotplug dr-util[4457]: 10-FJSVdr-util-
kdump-restart : INFO : result: 0
...
Dec 17 00:15:49 xxx dr-util[4457]: INFO : 808 : Executed
user programs at ADD_POST timing
```

If “INFO : 808 : Executed user programs at ADD_POST timing” is not output, post-process of the collaboration program is delayed. Check which collaboration program takes a lot of time by seeing /var/log/messages and ‘collaboration program name.log’ made in /opt/FJSVdr-util/var/log directory, if any. The developer of the collaboration program can be confirmed by below rpm command. Ask the developer about the cause of its delay.

(Example) Checking the developer of the collaboration program “10-FJSVdr-util-kdump-restart”

```
$ rpm -qif /opt/FJSVdr-util/user_command/10-FJSVdr-util-
kdump-restart
...
```

Rebooting the partition is recommended because SB hot add process has been imperfect state.

4.2.5 Operation after SB hot add

This section describes the process and operations after SB hot add.
After completing DR command operation, check that the quantity of added resources is correct by opening below files as doing before SB hot add.

- CPU: /proc/cpuinfo
(Added CPU information is added.)

```
# grep -c processor /proc/cpuinfo
180
```

- Memory: /proc/meminfo
(Added memory size is reflected to MemTotal)

```
# cat /proc/meminfo
MemTotal:        98724424 kB
MemFree:         96825552 kB
Buffers:            30804 kB
 :
 :
```

If below command keeps to be executed, added resources are not reflected. Re-execute the command in order to reflect added resources.

- sar
- iostat
- mpstat

If SVAgent is installed in the partition, perform below command with root privilege.

```
# /usr/sbin/srvmagt restart
```

If CPUs and memories of SB that is added by hot add of SB is used for KVM, below steps are required.

1. Change parameters of libvirt and qemu control group.

   a. Check parameters of root control group

   ```
   # cgget -r cpuset.cpus -r cpuset.mems /
   /:
   cpuset.cpus: xxx-yyy
   cpuset.mems: X-Y
   ```

   (xxx-yyy: logical CPU number, X-Y: node number)

   b. Change parameters of libvirt and qemu control group.

   ```
   # cgset -r cpuset.cpus=xxx-yyy libvirt
   # cgset -r cpuset.mems=X-Y libvirt

   # cgset -r cpuset.cpus=xxx-yyy libvirt/qemu
   # cgset -r cpuset.mems=X-Y libvirt/qemu
   ```

   Note
   After changing parameters of libvirt qemu control group, newly started guest VM can use all CPUs and memories in the partition including a new SB that is added by hot add of SB.

2. If all CPUs and memories in the partition including a new SB that is added by hot add of SB is used in a guest VM which has been already started, change of parameters of control groups of the guest VM is required.

   a. Change parameters of control groups of the particular guest VM.

   ```
   # cgset -r cpuset.cpus=xxx-yyy libvirt/qemu/<guest VM name>
   # cgset -r cpuset.mems=X-Y libvirt/qemu/<guest VM name>
   ```

   b. Display the number of vcpu defined in the particular guest.

   ```
   # env LANG=C virsh vcpucount <guest VM name> | egrep
   'current.*live'
   current         live    N
   ```

   (N: vcpu number)

   c. Pin vcpu of the particular guest VM to all CPUs including CPUs that are added by hot add of SB.

   ```
   # virsh vcpupin <guest VM name> <0> xxx-yyy
   # virsh vcpupin <guest VM name> <1> xxx-yyy
   ...
   # virsh vcpupin <guest VM name> <N-1> xxx-yyy
   ```

   Note
   If resources such as CPU which the guest VM can use are fixed in the guest VM, the balance of entire KVM system may be lost because of adding resources.
   It is recommended to redesign how to use CPUs and memories in the KVM system.

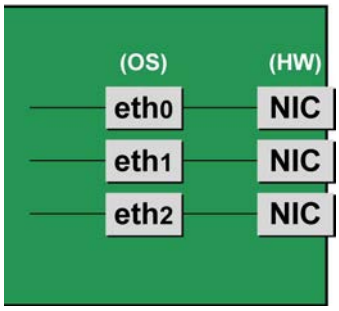
4.3 Hot replacement of IOU

This section describes the hot replacement of the IOU. There are two cases in hot replacement of the IOU:

- Replacing IOU itself due to trouble of IOU itself or trouble of onboard NIC
- Replacing, expanding or removing PCI Express card installed in IOU

For replacing, expanding or removing PCI Express card, IOU itself does not need to be replaced. However, it is needed that the IOU has to be removed from the cabinet for a moment. Then there is the same impact as that of replacing IOU. It is needed to take the same steps as those of replacing IOU.
Note

- If IOU itself is hot replaced, onboard NIC of the IOU is replaced.
  Note that MAC address of onboard NIC is changed after replacing IOU.
- PCI address (bus address) of PCI Express card on IOU may change after hot replacement of IOU. This change may be occurred for replacing, expanding or removing PCI Express card.
- If iSCSI (NIC) is mounted on an IOU, hot replacement of the IOU can be performed only if all of conditions below are satisfied.
  - DM-MP (Device-Mapper Multipath) or ETERNUS multi driver (EMPD) is used for storage connection.
  - Multiple path consists of a NIC on the IOU to be replaced and a NIC on an IOU other than the IOU to be replaced.
  - A NIC on the IOU to be replaced makes an interface independently.
    Example of single interface:



  - If FC card used for SAN boot is mounted on an IOU to be replaced, hot replacement of the IOU cannot be performed.

The step of hot replacement of IOU is described below in order.

4.3.1 Preparation for IOU hot replacement

The description of the flow of preparations is given below.

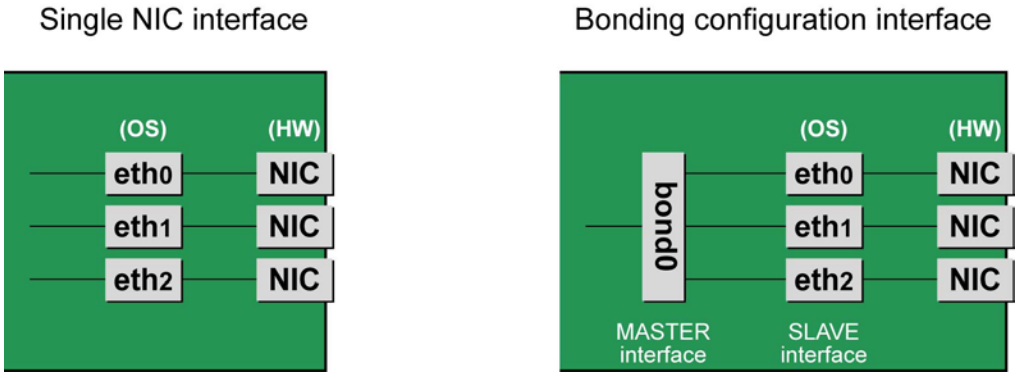
1. Arrange for the IOU for replacement.
   Note
   This step is not needed if the IOU is reused when expanding, replacing or removing PCI Express card. After arranging for the IOU, check whether I/O device of the IOU normally works at free partition. Pre-diagnosis does not performed when IOU is added.
2. For replacing IOU or expanding, replacing or removing PCI Express card in the IOU, it is needed to remove IOU. If IOU is removed, PCI Express card and onboard NIC installed in the IOU are also removed. Check that no software use the PCI Express card to be removed, performing either of below measure.
   a. Stopping the software which uses PCI Express card or onboard NIC in the IOU to be removed before removing.
   b. Preventing the software from operating PCI Express card and onboard NIC.

   Execute the command /opt/FJSVdr-util/sbin/dr show IOU from shell on OS to check resources installed in the IOU.
   Example: checking IOU3

```
# /opt/FJSVdr-util/sbin/dr show IOU3
```

```
0000:82:00.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:83:09.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:84:00.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:85:02.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:85:08.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:85:09.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:85:10.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:85:11.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:89:00.0 Ethernet controller: Intel Corporation I350
Gigabit
Network Connection (rev 01)
0000:89:00.1 Ethernet controller: Intel Corporation I350
Gigabit
Network Connection (rev 01)
0000:8c:00.0 Ethernet controller: Intel Corporation I350
Gigabit
Network Connection (rev 01)
0000:8c:00.1 Ethernet controller: Intel Corporation I350
Gigabit
Network Connection (rev 01)
0000:8f:00.0 Fibre Channel: Emulex Corporation Saturn-X:
LightPulse
Fibre Channel Host Adapter (rev 03)
0000:8f:00.1 Fibre Channel: Emulex Corporation Saturn-X:
LightPulse
Fibre Channel Host Adapter (rev 03)
```

NIC on the IOU (including onboard NIC)
For replacing IOU itself (replacement of onboard NIC) or expanding, replacing or removing NIC on the IOU, not only common procedure of IOU replacement but also special procedure before and after powering on or powering off IOU is needed. Here describes case of replacement of IOU itself. (otherwise add note) The procedure describes operations where a single NIC is configured as one interface. It also describes cases where multiple NICs are bonded together to configure one interface (bonding configuration). For bonding multiple NIC by using PRIMECLUSTER Global Link Services (GLS), see manual of PRIMECLUSTER Global Link Services.



Notes

- To perform hot replacement in a system where a bonding device is installed, design the system so that it specifies ONBOOT=YES in all interface configuration files (the /etc/sysconfig/network-scripts/ifcfg-eth*files and the /etc/sysconfig/network-scripts/ifcfg-bond*files), regardless of whether the NIC to be replaced is a configuration interface of the bonding device.
  An IP address need not to be assigned to unused interfaces. This procedure is to prevent the device name of the replacement target NIC from being changed after hot replacement. If ONBOOT=NO also exists, the procedure described here may not work properly.

1. Confirm where the NIC is mounted.
   Confirm the correspondence between PCI Address and interface name of NIC mounted in the IOU which is confirmed by above “dr show IOU” command.
   Example: When PCI Address is “0000:89:00.0”.

```
# ls -l /sys/class/net/*/device | grep "0000:89:00.0"
lrwxrwxrwx. 1 root root 0 Aug 27 16:06 2013
/sys/class/net/eth0/
device ¥
-> ../../../ 0000:89:00.0
```

   The ¥ at the end of a line indicates that there is no line feed.

   In this case, eth0 is the interface name which is correspondent to PCI bus address “0000:89:00.0”.

   Note
   You will use the bus address obtained here in steps 2 and procedure after IOU replacement. Record the bus address so that you can reference it later.

   Next, check the PCI slot number for this PCI bus address.
   Execute “ethtool -p” command, making the LED of NIC blinked. Check IOU or PCI_Box connected to the IOU, checking in which slots the NIC is mounted, (e.g. PCI#0)

   Example: Blinking the LED of the NIC corresponding to interface “eth0” for ten seconds.

```
# /sbin/ethtool -p eth0 10
```

2. Make a table with information including interface name, hardware address and PCI bus address of NIC mounted on IOU to be replaced.
   Make a below table with information of IOU to be replaced within information which is got by step 1.

TABLE 4.1 Correspondence between bus addresses and interface names

Interface name	Hardware address	Bus address	Location
eth0		0000:89:01.0	Onboard 0
eth1		0000:89:01.1	Onboard 1
eth2		0000:8c:00.0	PCI#0
...		...	...

   Note
   When recording a bus address, include the function number (number after the period).

   - Confirm the correspondence between the interface name and hardware address
     Execute below command, checking the correspondence between the interface name and the hardware address.
     Example: eth0 for a single interface

```
# cat /sys/class/net/eth0/address
2c:d4:44:f1:44:f0
```

     Example: eth0 for a bonding interface

```
# cat /proc/net/bonding/bondY
Ethernet Channel Bonding Driver .........
.
.
Slave interface: eth0
.
Permanent HW addr: 2c:d4:44:f1:44:f0
.
.
```

     You can use this procedure only when the bonding device is active. If the bonding device is not active or the slave has not been incorporated, use the same procedure as for a single interface.

     Also, the correspondence between the interface name and hardware address is automatically registered by the system in the udev function rule file, /etc/udev/rules.d/70-persistent-net.rules. Confirm that the ATTR{address} and NAME items have the same definitions as in the above output.

Example: eth0

```
grep eth0 /etc/udev/rules.d/70-persistent-net.rules

SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*", ¥
ATTR{address}=="2c:d4:44:f1:44:f0", ATTR{type}=="1", ¥
KERNEL=="eth*", NAME="eth0"
```

The ¥ at the end of a line indicates that there is no line feed.

You can always obtain the correct hardware address from the description in etc/udev/rules.d/70-persistent-net.rules regardless of whether the interface is incorporated in bonding.

Confirm the hardware address of other interfaces by repeating the operation with the same command. The following table lists examples of descriptions.

TABLE 4.2 Hardware address description examples

Interface name	Hardware address	Bus address	Location
eth0	2c:d4:44:f1:44:f0	0000:89:01.0	Onboard 0
eth1	2c:d4:44:f1:44:f1	0000:89:01.1	Onboard 1
eth2	00:19:99:d7:36:5f	0000:8c:00.0	PCI#0
...		...	...

3. Execute the higher-level application processing required before NIC replacement.
   Stop all access to the interface as follows. Stop the application that was confirmed in step 2 as using the interface, or exclude the interface from the target of use by the application.

4. Deactivate the NIC.
   Execute the following command to deactivate all the interfaces that you confirmed in step 2. The applicable command depends on whether the target interface is a single NIC interface or the SLAVE interface of a bonding device.

   For a single NIC interface:

   ```
   # /sbin/ifdown ethX
   ```

   If the single NIC interface has a VLAN device, you also need to remove the VLAN interface. Perform the following operations (before deactivating the real interface).

   ```
   # /sbin/ifdown ethX.Y
   # /sbin/vconfig rem ethX.Y
   ```

   For the SLAVE interface of a bonding device:

   If the bonding device is operating in mode 1, use the following steps to exclude SLAVE interface to be replaced from the bonding configuration. In any other mode, removing it immediately should not cause any problems.
   Confirm that the SLAVE interface to be replaced is the interface currently being used for communication. First, confirm the interface currently being used for communication by executing the following command.

   ```
   # cat /sys/class/net/bondY/bonding/active_slave
   ```

   If the displayed interface matches the SLAVE interface being replaced, execute the following command to switch the current communication interface to another SLAVE interface.

   ```
   # /sbin/ifenslave -c bondY ethZ
   ```
   (ethZ: Interface that composes bondY and does not perform hot replacement)

   Finally, remove the SLAVE interface being replaced, from the bonding configuration. Immediately after being removed, the interface is automatically no longer used.

   ```
   # /sbin/ifenslave -d bondY ethX
   ```

5. Save all the interface configuration files that you checked in step 2 by executing the following command. udevd and configuration scripts may reference the contents of files in /etc/sysconfig/network-scripts. For this reason, create a save directory and save these files to the directory so that udevd and the configuration scripts will not reference them.

   ```
   # cd /etc/sysconfig/network-scripts
   # mkdir temp
   # mv ifcfg-ethX temp
   (following also executed for bonding configuration)
   ```

```
# mv ifcfg-bondX temp
```

6. Delete the entries associated with the replaced NIC from the udev function rule file.
   The entry to be removed is only onboard NIC for replacing IOU itself. For replacing or removing PCI Express card, the entry to be removed is the interface corresponding to the PCI Express card.

   a. Confirm the correspondence between the interface name and hardware address in the table created in step 2.

   b. Edit the udev function rule file, /etc/udev/rules.d/70-persistent-net.rules, to delete or comment out the entry lines of all the interface names and hardware addresses confirmed in the above step a.

   The following example shows editing of the udev function rule file.

   Example of descriptions in the file before editing

```
# PCI device 0x8086:0x1521 (igb)
SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*", ¥
ATTR{address}=="2c:d4:44:f1:44:f0", ATTR{type}=="1",
KERNEL=="eth*", NAME="eth0"

# PCI device 0x8086:0x1521 (igb)
SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*", ¥
ATTR{address}=="2c:d4:44:f1:44:f1", ATTR{type}=="1",
KERNEL=="eth*", NAME="eth1"
 :
 :
```

   The ¥ at the end of a line indicates that there is no line feed.

   Example of descriptions in the file after editing
   (In the example, eth0 was deleted, and eth1 is commented out.)

```
# PCI device 0x8086:0x1521 (igb)
#SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*", ¥
ATTR{address}=="2c:d4:44:f1:44:f1", ATTR{type}=="1",
KERNEL=="eth*", NAME="eth1"

 :
 :
```

   The ¥ at the end of a line indicates that there is no line feed.

   Do this editing for all the interfaces listed in the table created in step 2.

7. Reflect the edited rules in udev.
   udevd reads the rules described in the rule file at its start time and then retains the rules in memory. Simply changing the rule file does not mean the changed rules are reflected. Take action as follows to reflect the new rules in udev.

```
# udevadm control --reload-rules
```

iSCSI (NIC) on the IOU
If replace iSCSI (NIC) on the IOU, you have to take not only the same steps of 'NIC on the IOU (including Onboard NIC)' but also takes steps below in step 3 of that.

1. Perform the work for suppressing access to the iSCSI connection interface.

   a. Confirm the state of multiple path by DM-MP (*1) or EMPD (*2).

   b. Use the iscsiadm command to log out from the path (iqn) through which the iSCSI card to be replaced is routed, and disconnect the session.
      Example which confirms the state of session before disconnecting:

```
# /sbin/iscsiadm -m session
tcp: [1] 192.168.1.64:3260,1 iqn.2000-
09.com.fujitsu:storage-system.eternus-
dx400:00001049.cm0ca0p0
tcp: [2] 192.168.2.66:3260,3 iqn.2000-
09.com.fujitsu:storage-system.eternus-
dx400:00001049.cm1ca0p0
```

      Example which logout path going through a NIC to be replaced:

```
# /sbin/iscsiadm -m node -T iqn.2000-09.com.fujitsu:storage-
system.eternus-dx400:00001049.cm1ca0p0 -p 192.168.2.66:3260
–-logout
```

c. Use the iscsiadm command to confirm that the target session has been disconnected.
Example which confirms the state of session after disconnecting

```
# /sbin/iscsiadm -m session
tcp: [1] 192.168.1.64:3260,1 iqn.2000-
09.com.fujitsu:storage-system.eternus-
dx400:00001049.cm0ca0p0
```

d. You can confirm the disconnection of sessions on multipath products using DM-MP or ETERNUS multidriver.
*1: Write down the DM-MP display contents at the session disconnection.
Example of DM-MP display before disconnecting path

```
# /sbin/multipath -ll
mpath1 (36000b5d0006a0000006a104900000000) dm-0
FUJITSU,ETERNUS_DX400
[size=50G][features=0][hwhandler=0][rw]
¥_ round-robin 0 [prio=2][active]
 ¥_ 3:0:0:0 sdb 8:16  [active][ready]
 ¥_ 4:0:0:0 sdc 8:32  [active][ready]
```

Example of DM-MP display after disconnecting path

```
# /sbin/multipath -ll
mpath1 (36000b5d0006a0000006a104900000000) dm-0
FUJITSU,ETERNUS_DX400
[size=50G][features=0][hwhandler=0][rw]
¥_ round-robin 0 [prio=1][enabled]
 ¥_ 3:0:0:0 sdb 8:16  [active][ready]
```

*2: See the ETERNUS Multipath Driver User's Guide (For Linux).

FC card

1. Stop the access to FC card on IOU by such a way as stopping application.

4.3.2 DR operation of IOU hot replacement

This section describes the DR operation for IOU hot replacement.

1. Execute “/opt/FJSVdr-util/sbin/dr rm IOU” command on the shell of OS.
The IOU to be removed is cut off from OS.
Example: Cutting off the IOU 3

```
# /opt/FJSVdr-util/sbin/dr rm IOU3
#
```

2. Execute “/opt/FJSVdr-util/sbin/dr rm IOU” command on the shell of OS.
A list of IOU included in the partition is shown. Check that IOU which is cut off is displayed as ‘offline’.
Example: Cutting off the IOU 3

```
# /opt/FJSVdr-util/sbin/dr stat IOU
IOU0: empty
IOU1: empty
IOU2: empty
IOU3: offline
```

3. Login to MMB console as administrator

4. Execute “hotremove” command on MMB console.
Example: removing IOU 3 from partition 1

```
Administrator > hotremove partition 1 IOU 3
Are you sure to continue removing IOU#3 from Partition#1?
[Y/N]: Y
DR operation start (1/3)
Remove IOU#3 (2/3)
```

```
IOU#3 power-off (3/3)
Removing IOU#3 from partition#1 has been completed
successfully.
Administrator >
```

5. See Operation Log window or perform “show dynamic_reconfiguration status” command and confirm below messages.
   Example：When removing IOU3 from partition 1.

   Operation Log window:
   “I_10110 Partition1 : Hot-remove IOU#3 Completed.”

   show dynamic_reconfiguration status:
   “Removing IOU#3 from Partition#1, completed”

6. Pulling the IOU out from the slot of cabinet
   For replacing IOU itself, insert PCI Express card mounted on old IOU to new one.
   For replacing, expanding or removing PCI Express card on the IOU, do it now.
   This step is performed by the field engineer in charge of your system.

7. Take off all cables such as LAN cable and FC cable connected to the IOU.
   This step is performed by the field engineer in charge of your system.

8. Inserting IOU to the slot of the cabinet.
   This step is performed by the field engineer in charge of your system.

9. Mount cables other than LAN cables.
   This step is performed by the field engineer in charge of your system.
   Note
   In GLS configuration with NIC switching way, mount also LAN cables.

10. Execute “hotadd” command on MMB console.
    Example: Adding IOU 3 to partition 1

```
Administrator > hotadd partition 1 IOU 3
Are you sure to continue adding IOU#3 to Partition#1? [Y/N]
Y
DR operation start (1/3)
Assigning IOU#3 to partition#1 (2/3)
Power on IOU#3 (3/3)
Adding IOU#3 to Partition#1 has been completed successfully.
Administrator >
```

11. See Operation Log window or perform “show dynamic_reconfiguration status” command and confirm below messages.
    Example：When adding IOU3 to partition 1.
    Operation Log window:
    “I_10110 Partition1 : Hot-add IOU#3 Completed.”

    show dynamic_reconfiguration status:
    “Adding IOU#3 to Partition#1, completed”

12. Execute “/opt/FJSVdr-util/sbin/dr stat IOU” command
    A list of IOU included in the partition is shown. Check that added IOU is shown.
    Example: adding IOU 3

```
# /opt/FJSVdr-util/sbin/dr stat IOU
IOU0: empty
IOU1: empty
IOU2: empty
IOU3: offline
```

    IOU added to partition is shown as offline state because it is power-off state at this time.

13. Execute “/opt/FJSVdr-util/sbin/dr add IOU” command on the shell of OS.
    The IOU to be removed will turn on.
    Example: turning on IOU 3

```
# /opt/FJSVdr-util/sbin/dr add IOU3
#
```

4.3.3 Operation after IOU hot replacement

Note

If SVAgent is installed in the partition, perform below command with root privilege.

```
# /usr/sbin/srvmagt restart
```

NIC on the IOU (including onboard NIC)

1. Collect the information associated with NIC on the replaced IOU.
   An interface (ethX) is created for the replaced NIC. Make a table with information including the interface name, hardware address, bus address, and location of the interface made corresponding to NIC mounted on replaced according to step1 and step 2 of the section 4.3.1 Preparation for IOU hot replacement. The interface name, hardware address and PCI bus address may change before and after replacing IOU.

   TABLE 4.3 Example of interface information about interfaces after replacement

Interface name	Hardware address	Bus address	Location
eth0	2c:d4:44:f1:44:d2	0000:86:01.0	Onboard 0
eth1	2c:d4:44:f1:44: d3	0000:86:01.1	Onboard 1
eth2	00:19:99:d7:36:5f	0000:87:00.0	PCI#0
...		...	...

   For replacing IOU itself, confirm that new hardware address is defined to NIC of onboard. Confirm that the interface name used before replacing NIC is re-assigned. New PCI bus address may be assigned. Also confirm that the relevant entries in the above-described table were automatically added to the udev function rule file, /etc/udev/rules.d/70-persistent-net.rules.
   For expanding or removing PCI Express card by replacing IOU, the number of entry in table increase or decrease.

2. Deactivate each newly created interface.
   The interfaces created for the replaced NIC may be active by turning on IOU. In such cases, you need to deactivate them before changing the interface configuration file.
   Execute the below command for all the interface names (including interfaces which are not actually replaced) on the IOU confirmed in step 1.
   Example: eth0

   ```
   # /sbin/ifconfig eth0 down
   ```

3. Confirm the correspondence between the interface names before and after the NIC replacement.
   According to the table with the interface information about before and after the NIC replacement in steps 2 of 4.3.1 Preparation for IOU hot replacement and step 1 in this section, confirm that the relation between the interface name and location is correct.
   When switching interface name occurs before and after IOU replacement, make the correspondence between interface name and location into the correspondence before IOU replacement by below procedure.

   Note

   For the interface which name does not change before and after IOU replacement, this procedure does not need.

   Here shows the procedure to change the interface name of eth2 and eth3 (change eth2 to eth3, eth3 to eth2) as a specific example.

   a. Edit the udev function rule file, /etc/udev/rules.d/70-persistent-net.rules, modifying the target interface name to desired name. (In this example, change eth2 to eth3, eth3 to eth2.)
      Example of descriptions in the file before editing

      ```
      # PCI device 0x8086:0x1521 (igb)
      SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*", ¥
      ATTR{address}=="00:19:99:d7:36:21", ATTR{type}=="1",
      KERNEL=="eth*", NAME="eth2"
      # PCI device 0x8086:0x1521 (igb)
      SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*", ¥
      ATTR{address}=="00:19:99:d7:36:22", ATTR{type}=="1",
      KERNEL=="eth*", NAME="eth3"
       :
       :
      ```

The ¥ at the end of a line indicates that there is no line feed.

Example of descriptions in the file after editing

```
# PCI device 0x8086:0x1521 (igb)
SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*", ¥
ATTR{address}=="00:19:99:d7:36:21", ATTR{type}=="1",
KERNEL=="eth*", NAME="eth3"
# PCI device 0x8086:0x1521 (igb)
SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*", ¥
ATTR{address}=="00:19:99:d7:36:22", ATTR{type}=="1",
KERNEL=="eth*", NAME="eth2"
 :
 :
```

The ¥ at the end of a line indicates that there is no line feed.

b. Execute below command, reflecting the edited rules

```
# udevadm control --reload-rules
```

c. Assert uevent to target interfaces (in this case, eth2 and eth3). Note to specify the interface name before changing at this time. For example, assert uevent with specifying eth2 when changing eth2 to eth10.

```
# echo add > /sys/class/net/eth2/uevent
# echo add > /sys/class/net/eth3/uevent
```

Interpret properly eth2 or eth3 to appropriate name.

d. Check whether the interface name is changed to desired name.

4. Edit the saved interface configuration file.
Write a new hardware address to replace the old one. In "HWADDR," set the hardware address of the replaced NIC in TABLE 4.9 Example of entered values corresponding to the interface names before and after NIC replacement or TABLE 4.10 Confirmation of interface names. Also, for SLAVE under bonding, the file contents are partly different, but the lines to be set are the same.
Example:

```
DEVICE=eth0
NM_CONTROLLED=no
BOOTPROTO=static
HWADDR=2c:d4:44:f1:44:d2
BROADCAST=192.168.16.255
IPADDR=192.168.16.1
NETMASK=255.255.255.0
NETWORK=192.168.16.0
ONBOOT=yes
TYPE=Ethernet
```

Do this editing for all the saved interfaces except for the interface with no change of hardware address.

5. Restore the saved interface configuration file to the original file.
Restore the interface configuration file saved to the save directory to the original file by executing the following command.

```
# cd /etc/sysconfig/network-scripts/temp
# mv ifcfg-ethX  ..
(following also executed for bonding configuration)
# mv ifcfg-bondX  ..
```

6. Activate the replaced interface.
The method for activating a single NIC interface differs from that for activating the SLAVE interfaces under bonding.
For a single NIC interface:
Execute the following command to activate the interface. Activate all the necessary interfaces.

```
# /sbin/ifup ethX
```

Also, if the single NIC interface has a VLAN device and the VLAN interface was temporarily removed, restore the VLAN interface. If the priority option has changed, set it again.

```
# /sbin/vconfig add ethX Y
# /sbin/ifup ethX.Y
(enter command to set VLAN option as needed)
```

For SLAVE under bonding
Execute the following command to incorporate the SLAVE interface into the existing bonding configuration. Incorporate all the necessary interfaces.

```
# /sbin/ifenslave bondY ethX
```

The VLAN-related operation is normally not required because a VLAN is created on the bonding device.

7. Mount all cables connected to the particular PCIC.
   This step is performed by the field engineer in charge of your system.
   Note
   In GLS configuration with NIC switching way, you do not need to perform this step.

8. Remove the directory to which the interface configuration file was saved.
   After all the interfaces to be replaced have been replaced, remove the save directory created in step 5 in 4.3.1 Preparation for IOU hot replacement by executing the following command.

```
# rmdir /etc/sysconfig/network-scripts/temp
```

9. Execute the higher-level application processing required after NIC replacement.
   Perform the necessary post processing (such as starting applications or restoring changed settings) for the operations performed for the higher-level applications in step 3 in 4.3.1 Preparation for IOU hot replacement.

iSCSI (NIC) on the IOU

If replace iSCSI (NIC) on the IOU, you have to take not only the same steps of 'NIC on the IOU (including Onboard NIC)' but also takes steps below in step 8 of that.

1. To restore access to the iSCSI connection interface, perform the following.

   a. Confirm the state of multiple path by DM-MP (*1) or EMPD (*2).

   b. Use the iscsiadm command to log in to the path (iqn) through which the replacement iSCSI card is routed, and reconnect the session.
      Example which confirms the state of session before connecting:

```
# /sbin/iscsiadm -m session
tcp: [1] 192.168.1.64:3260,1 iqn.2000-
09.com.fujitsu:storage-system.eternus-
dx400:00001049.cm0ca0p0
```

      Example which login path going through a NIC to be replaced:

```
# /sbin/iscsiadm -m node -T iqn.2000-09.com.fujitsu:storage-
system.eternus-dx400:00001049.cm1ca0p0 -p 192.168.2.66:3260
--login
```

   c. Use the iscsiadm command to confirm that the target session has been activated.
      Example which confirms the state of session after connecting

```
# /sbin/iscsiadm -m session
tcp: [1] 192.168.1.64:3260,1 iqn.2000-
09.com.fujitsu:storage-system.eternus-
dx400:00001049.cm0ca0p0
tcp: [3] 192.168.2.66:3260,3 iqn.2000-
09.com.fujitsu:storage-system.eternus-
dx400:00001049.cm1ca0p0
```

   d. You can confirm the activation of sessions on multipath products using DM-MP or ETERNUS multidriver.
      *1: Write down the DM-MP display contents at the session activation.
      Example of DM-MP display before connecting path

```
# /sbin/multipath -ll
mpath1 (36000b5d0006a0000006a104900000000) dm-0
FUJITSU,ETERNUS_DX400
[size=50G][features=0][hwhandler=0][rw]
¥_ round-robin 0 [prio=1][active]
```

```
 ¥_ 3:0:0:0 sdb 8:16  [active][ready]
```

Example of DM-MP display after connecting path

```
# /sbin/multipath -ll
mpath1 (36000b5d0006a0000006a104900000000) dm-0
FUJITSU,ETERNUS_DX400
[size=50G][features=0][hwhandler=0][rw]
¥_ round-robin 0 [prio=2][enabled]
 ¥_ 3:0:0:0 sdb 8:16  [active][ready]
 ¥_ 5:0:0:0 sdc 8:32  [active][ready]
```

*2: See the ETERNUS Multipath Driver User's Guide (For Linux).

FC Card

1. Restart the application which has stopped at preparing for IOU hot replacement

Common operation of all PCI Express cards after IOU hot replacement
Execute pciinfo command on MMB CLI.
Example: hot adding IOU#2 into partition#1.

```
Administrator > pciinfo partition 1 iou 2
Are you sure to continue updating IOU#2 in Partition#1?
[Y/N]: y
Update IOU#2 PCI information in Partition#1 has been
completed successfully.
Administrator >
```

4.4 Hot add of IOU

This section describes the hot add of the IOU.

4.4.1 Preparation for IOU hot add

The description of the flow of preparations is given below.

1. Arrange for the IOU for addition.
2. Check if number of IOU required for addition is available.
3. Insert the IOU to be added into a free IOU slot.
   This step is performed by the field engineer in charge of your system.
4. Mount cables other than LAN cables if you also add PCI Express card.
   This step is performed by the field engineer in charge of your system.

Note

- If you add an IOU with PCI Express cards, insert PCI Express cards into the IOU before inserting the IOU into the slot.
  For how to confirm the slot number of the PCI Express slot, see ‘Confirming the slot number of a PCI Express slot’ in ‘4.6.2 PCI Express card replacement procedure in detail’.
- Check if the I/O device is normally operating in the free partition. During addition, I/O pre-diagnostic process is not executed.

4.4.2 DR operation of IOU hot add

This section describes the DR operation for IOU hot add.

1. Log into the MMB Web-UI using Administrator privileges.
2. Execute the hotadd command.

Example：When adding IOU1 in partition1.

```
Administrator > hotadd partition 1 IOU 1
Are you sure to continue adding IOU#1 to Partition#1? [Y/N]
```

```
Y
DR operation start (1/3)
Assigning IOU#1 to partition#1 (2/3)
Power on IOU#1 (3/3)
Adding IOU#1 to Partition#1 has been completed successfully.
Administrator >
```

3. See Operation Log window or perform “show dynamic_reconfiguration status” command and confirm below messages.
   Example：When adding IOU1 to partition 1.

   Operation Log window:
   “I_10110 Partition1 : Hot-add IOU#1 Completed.”

   show dynamic_reconfiguration status:
   “Adding IOU#1 to Partition#1, completed”

4. Execute /opt/FJSVdr-util/sbin/dr stat IOU command in the operating system shell.
   The list of IOUs connected to the system is displayed. Check if the IOU that was added is displayed.
   Example：When IOU1 is added.

```
# /opt/FJSVdr-util/sbin/dr stat IOU
IOU0: online
IOU1: offline
IOU2: empty
IOU3: empty
```

   When newly adding an IOU to a partition, it will be displayed as offline since the IOU is not recognized by the operating system.

5. Execute /opt/FJSVdr-util/sbin/dr add IOU1 command in the operating system shell.
   The IOU that was newly added to the partition will be powered on.
   Example：When IOU1 is powered on

```
# /opt/FJSVdr-util/sbin/dr add IOU1
#
```

4.4.3 Operation after IOU hot add

This section describes the process and operation after IOU hot add.

Note

If SVAgent is installed in the partition, perform below command with root privilege.

```
# /usr/sbin/srvmagt restart
```

1. Check the resource that was added.
   Execute the /opt/FJSVdr-util/sbin/dr show IOU command in the operating system shell.
   Example：When IOU1 was added

```
# /opt/FJSVdr-util/sbin/dr show IOU1
0000:03:00.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:04:09.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:05:00.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:06:02.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:06:08.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:06:09.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:06:10.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:06:11.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
```

```
0000:0a:00.0 Ethernet controller: Intel Corporation I350
Gigabit
Network Connection (rev 01)
0000:0a:00.1 Ethernet controller: Intel Corporation I350
Gigabit
Network Connection (rev 01)
0000:0d:00.0 Ethernet controller: Intel Corporation I350
Gigabit
Network Connection (rev 01)
0000:0d:00.1 Ethernet controller: Intel Corporation I350
Gigabit
Network Connection (rev 01)
0000:10:00.0 Fibre Channel: Emulex Corporation Saturn-X:
LightPulse
Fibre Channel Host Adapter (rev 03)
0000:10:00.1 Fibre Channel: Emulex Corporation Saturn-X:
LightPulse
Fibre Channel Host Adapter (rev 03)
0000:27:00.0 PCI bridge: PLX Technology, Inc. Device 8764
(rev aa)
0000:28:01.0 PCI bridge: PLX Technology, Inc. Device 8764
(rev aa)
0000:28:04.0 PCI bridge: PLX Technology, Inc. Device 8764
(rev aa)
0000:28:05.0 PCI bridge: PLX Technology, Inc. Device 8764
(rev aa)
0000:28:08.0 PCI bridge: PLX Technology, Inc. Device 8764
(rev aa)
0000:28:09.0 PCI bridge: PLX Technology, Inc. Device 8764
(rev aa)
0000:28:0c.0 PCI bridge: PLX Technology, Inc. Device 8764
(rev aa)
0000:28:0d.0 PCI bridge: PLX Technology, Inc. Device 8764
(rev aa)
```

2. Make the configuration file for being able to use added resources on OS.

   - Setting of FC card
     Perform step 3 or later in '4.7.3 FC card (Fibre Channel card) addition procedure'.
   - Setting of NIC (including onboard NIC)
     Perform step 4 or later in '4.7.4 Network card addition procedure'.

Common operation of all PCI Express cards after IOU hot replacement
Execute pciinfo command on MMB CLI.
Example: hot adding IOU#2 into partition#1.

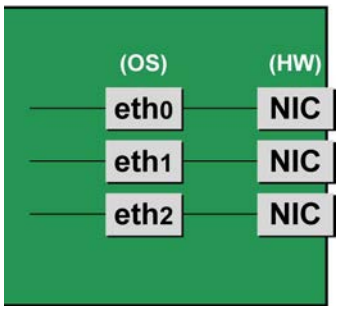
```
Administrator > pciinfo partition 1 iou 2
Are you sure to continue updating IOU#2 in Partition#1?
[Y/N]: y
Update IOU#2 PCI information in Partition#1 has been
completed successfully.
Administrator >
```

4.5 IOU hot remove

The description of the flow of the preparation is as follows.
Note

- If iSCSI (NIC) is mounted on an IOU, hot replacement of the IOU can be performed only if all of conditions below are satisfied.
  - DM-MP (Device-Mapper Multipath) or ETERNUS multi driver (EMPD) is used for storage connection.
  - Multiple path consists of a NIC on the IOU to be replaced and a NIC on an IOU other than the IOU to be replaced.

- A NIC on the IOU to be replaced makes an interface independently.
  Example of single interface:



- If FC card used for SAN boot is mounted on an IOU to be replaced, hot replacement of the IOU cannot be performed.

4.5.1 Preparation for IOU hot remove

The description of the flow of the preparation is as follows.

Note
When the disk connected via the IOU to be removed is used as the dump saving area if kdump, the dump environment is changed to enable the use of another disk.

1. When the IOU is removed, the PCI Express card, which is mounted on the IOU is also removed. Confirm that there is no software where the PCI Express card is used, and implement any of the following measures.

   a. Before removing, stop the software in which the PCI Express card to be removed is being used.

   b. The PCI Express card is to be outside the software operation target.

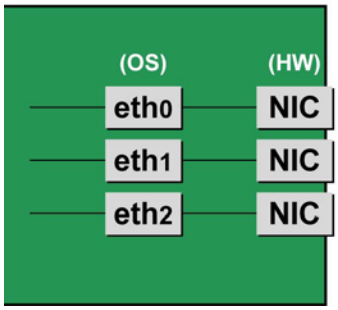
   To confirm the resources mounted on the target IOU, execute /opt/FJSVdr-util/sbin/dr show IOU command from the operating system shell.
   Example：When checking IOU3.

```
# /opt/FJSVdr-util/sbin/dr show IOU3
0000:82:00.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:83:09.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:84:00.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:85:02.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:85:08.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:85:09.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:85:10.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:85:11.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:89:00.0 Ethernet controller: Intel Corporation I350
Gigabit
Network Connection (rev 01)
0000:89:00.1 Ethernet controller: Intel Corporation I350
Gigabit
Network Connection (rev 01)
0000:8c:00.0 Ethernet controller: Intel Corporation I350
Gigabit
Network Connection (rev 01)
0000:8c:00.1 Ethernet controller: Intel Corporation I350
Gigabit
Network Connection (rev 01)
```

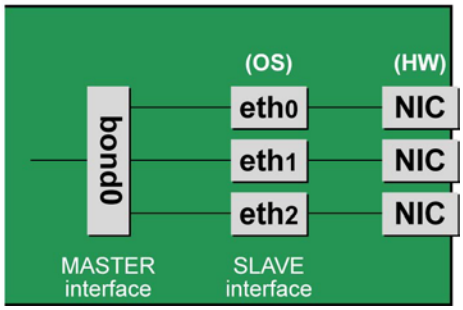
```
0000:8f:00.0 Fibre Channel: Emulex Corporation Saturn-X:
LightPulse
Fibre Channel Host Adapter (rev 03)
0000:8f:00.1 Fibre Channel: Emulex Corporation Saturn-X:
LightPulse
Fibre Channel Host Adapter (rev 03)
```

NIC on the IOU (including onboard NIC)
The procedure describes operations where a single NIC is configured as one interface. It also describes cases where multiple NICs are bonded together to configure one interface (bonding configuration). For bonding multiple NIC by using PRIMECLUSTER Global Link Services (GLS), see manual of PRIMECLUSTER Global Link Services.

Single NIC interface



Bonding configuration interface



Notes

- To perform hot replacement in a system where a bonding device is installed, design the system so that it specifies ONBOOT=YES in all interface configuration files (the /etc/sysconfig/network-scripts/ifcfg-eth*files and the /etc/sysconfig/network-scripts/ifcfg-bond*files), regardless of whether the NIC to be replaced is a configuration interface of the bonding device.
  An IP address need not to be assigned to unused interfaces. This procedure is to prevent the device name of the replacement target NIC from being changed after hot replacement. If ONBOOT=NO also exists, the procedure described here may not work properly.

1. Confirm where the NIC is mounted.
   Confirm the correspondence between PCI Address and interface name of NIC mounted in the IOU which is confirmed by above “dr show IOU” command.
   Example: When PCI Address is “0000:89:00.0”.

   ```
   # ls -l /sys/class/net/*/device | grep "0000:89:00.0"
   lrwxrwxrwx. 1 root root 0 Aug 27 16:06 2013
   /sys/class/net/eth0/
   device ¥
   -> ../../../ 0000:89:00.0
   ```

   The ¥ at the end of a line indicates that there is no line feed.

   In this case, eth0 is the interface name which is correspondent to PCI bus address “0000:89:00.0”.

   Note
   You will use the bus address obtained here in steps 2 and procedure after IOU replacement. Record the bus address so that you can reference it later.

   Next, check the PCI slot number for this PCI bus address.
   Execute “ethtool -p” command, making the LED of NIC blinked. Check IOU or PCI_Box connected to the IOU, checking in which slots the NIC is mounted, (e.g. PCI#0)

   Example: Blinking the LED of the NIC corresponding to interface “eth0” for ten seconds.

   ```
   # /sbin/ethtool -p eth0 10
   ```

2. Make a table with information including interface name, hardware address and PCI bus address of NIC mounted on IOU to be replaced.
   Make a below table with information of IOU to be replaced within information which is got by step 1.

TABLE 4.4 Correspondence between bus addresses and interface names

Interface name	Hardware address	Bus address	Location
eth0		0000:89:01.0	Onboard 0
eth1		0000:89:01.1	Onboard 1
eth2		0000:8f:00.0	PCI#0
...		...	...

Note
When recording a bus address, include the function number (number after the period).

- Confirm the correspondence between the interface name and hardware address
  Execute below command, checking the correspondence between the interface name and the hardware address.
  Example: eth0 for a single interface

```
# cat /sys/class/net/eth0/address
2c:d4:44:f1:44:f0
```

  Example: eth0 for a bonding interface

```
# cat /proc/net/bonding/bondY
Ethernet Channel Bonding Driver .........
.
.
Slave interface: eth0
.
Permanent HW addr: 2c:d4:44:f1:44:f0
.
.
```

  You can use this procedure only when the bonding device is active. If the bonding device is not active or the slave has not been incorporated, use the same procedure as for a single interface.

  Also, the correspondence between the interface name and hardware address is automatically registered by the system in the udev function rule file, /etc/udev/rules.d/70-persistent-net.rules. Confirm that the ATTR{address} and NAME items have the same definitions as in the above output.

  Example: eth0

```
grep eth0 /etc/udev/rules.d/70-persistent-net.rules

SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*", ¥
ATTR{address}=="2c:d4:44:f1:44:f0", ATTR{type}=="1", ¥
KERNEL=="eth*", NAME="eth0"
```

  The ¥ at the end of a line indicates that there is no line feed.

  You can always obtain the correct hardware address from the description in etc/udev/rules.d/70-persistent-net.rules regardless of whether the interface is incorporated in bonding.

  Confirm the hardware address of other interfaces by repeating the operation with the same command. The following table lists examples of descriptions.

TABLE 4.5 Hardware address description examples

Interface name	Hardware address	Bus address	Location
eth0	2c:d4:44:f1:44:f0	0000:89:01.0	Onboard 0
eth1	2c:d4:44:f1:44:f1	0000:89:01.1	Onboard 1
eth2	00:19:99:d7:36:5f	0000:8f:00.0	PCI#0
...		...	...

3. Execute the higher-level application processing required before NIC replacement.
   Stop all access to the interface as follows. Stop the application that was confirmed in step 2 as using the interface, or exclude the interface from the target of use by the application.

4. Deactivate the NIC.
   Execute the following command to deactivate all the interfaces that you confirmed in step 2. The applicable command depends on whether the target interface is a single NIC interface or the SLAVE interface of a bonding device.

   For a single NIC interface:

   ```
   # /sbin/ifdown ethX
   ```

   If the single NIC interface has a VLAN device, you also need to remove the VLAN interface. Perform the following operations (before deactivating the real interface).

   ```
   # /sbin/ifdown ethX.Y
   # /sbin/vconfig rem ethX.Y
   ```

   For the SLAVE interface of a bonding device:

   If the bonding device is operating in mode 1, use the following steps to exclude SLAVE interface to be replaced from the bonding configuration. In any other mode, removing it immediately should not cause any problems.
   Confirm that the SLAVE interface to be replaced is the interface currently being used for communication. First, confirm the interface currently being used for communication by executing the following command.

   ```
   # cat /sys/class/net/bondY/bonding/active_slave
   ```

   If the displayed interface matches the SLAVE interface being replaced, execute the following command to switch the current communication interface to another SLAVE interface.

   ```
   # /sbin/ifenslave -c bondY ethZ
   ```
   (ethZ: Interface that composes bondY and does not perform hot replacement)

   Finally, remove the SLAVE interface being replaced, from the bonding configuration. Immediately after being removed, the interface is automatically no longer used.

   ```
   # /sbin/ifenslave -d bondY ethX
   ```

5. Remove the interface configuration file..
   Delete the configuration files of all the interfaces confirmed in step 2, by executing the following command.

   ```
   # rm /etc/sysconfig/network-scripts/ifcfg-ethX
   ```

6. Delete the entries associated with the replaced NIC from the udev function rule file.
   The entry to be removed is only onboard NIC for replacing IOU itself. For replacing or removing PCI Express card, the entry to be removed is the interface corresponding to the PCI Express card.

   a. Confirm the correspondence between the interface name and hardware address in the table created in step 2.

   b. Edit the udev function rule file, /etc/udev/rules.d/70-persistent-net.rules, to delete or comment out the entry lines of all the interface names and hardware addresses confirmed in the above step a.

   The following example shows editing of the udev function rule file.

   Example of descriptions in the file before editing

   ```
   # PCI device 0x8086:0x1521 (igb)
   SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*", ¥
   ATTR{address}=="2c:d4:44:f1:44:f0", ATTR{type}=="1",
   KERNEL=="eth*", NAME="eth0"
   ```

```
# PCI device 0x8086:0x1521 (igb)
SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*", ¥
ATTR{address}=="2c:d4:44:f1:44:f1", ATTR{type}=="1",
KERNEL=="eth*", NAME="eth1"
 :
 :
```

The ¥ at the end of a line indicates that there is no line feed.

Example of descriptions in the file after editing
(In the example, eth0 was deleted, and eth1 is commented out.)

```
# PCI device 0x8086:0x1521 (igb)
#SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*", ¥
ATTR{address}=="2c:d4:44:f1:44:f1", ATTR{type}=="1",
KERNEL=="eth*", NAME="eth1"

 :
 :
```

The ¥ at the end of a line indicates that there is no line feed.

Do this editing for all the interfaces listed in the table created in step 2.

7. Reflect the edited rules in udev.
udevd reads the rules described in the rule file at its start time and then retains the rules in memory. Simply changing the rule file does not mean the changed rules are reflected. Take action as follows to reflect the new rules in udev.

```
# udevadm control --reload-rules
```

iSCSI (NIC) on the IOU
If replace iSCSI (NIC) on the IOU, you have to take not only the same steps of 'NIC on the IOU (including Onboard NIC)' but also takes steps below in step 3 of that.

1. Perform the work for suppressing access to the iSCSI connection interface.

   a. Confirm the state of multiple path by DM-MP (*1) or EMPD (*2).

   b. Use the iscsiadm command to log out from the path (iqn) through which the iSCSI card to be replaced is routed, and disconnect the session.
   Example which confirms the state of session before disconnecting:

```
# /sbin/iscsiadm -m session
tcp: [1] 192.168.1.64:3260,1 iqn.2000-
09.com.fujitsu:storage-system.eternus-
dx400:00001049.cm0ca0p0
tcp: [2] 192.168.2.66:3260,3 iqn.2000-
09.com.fujitsu:storage-system.eternus-
dx400:00001049.cm1ca0p0
```

   Example which logout path going through a NIC to be replaced:

```
# /sbin/iscsiadm -m node -T iqn.2000-09.com.fujitsu:storage-
system.eternus-dx400:00001049.cm1ca0p0 -p 192.168.2.66:3260
–-logout
```

   c. Use the iscsiadm command to confirm that the target session has been disconnected.
   Example which confirms the state of session after disconnecting

```
# /sbin/iscsiadm -m session
tcp: [1] 192.168.1.64:3260,1 iqn.2000-
09.com.fujitsu:storage-system.eternus-
dx400:00001049.cm0ca0p0
```

   d. You can confirm the disconnection of sessions on multipath products using DM-MP or ETERNUS multidriver.
   *1: Write down the DM-MP display contents at the session disconnection.
   Example of DM-MP display before disconnecting path

```
# /sbin/multipath -ll
mpath1 (36000b5d0006a0000006a104900000000) dm-0
```

```
FUJITSU,ETERNUS_DX400
[size=50G][features=0][hwhandler=0][rw]
¥_ round-robin 0 [prio=2][active]
 ¥_ 3:0:0:0 sdb 8:16  [active][ready]
 ¥_ 4:0:0:0 sdc 8:32  [active][ready]
```

Example of DM-MP display after disconnecting path

```
# /sbin/multipath -ll
mpath1 (36000b5d0006a0000006a104900000000) dm-0
FUJITSU,ETERNUS_DX400
[size=50G][features=0][hwhandler=0][rw]
¥_ round-robin 0 [prio=1][enabled]
 ¥_ 3:0:0:0 sdb 8:16  [active][ready]
```

*2: See the ETERNUS Multipath Driver User's Guide (For Linux).

FC card

1. Stop the access to FC card on IOU by such a way as stopping application.

4.5.2 DR operation of IOU hot remove

This section describes DR operation for executing IOU hot remove.

1. Execute the /opt/FJSVdr-util/sbin/dr rm IOU command from the operating system shell. The IOU to be removal will be powered off.
   Example：To power off IOU3.

```
# /opt/FJSVdr-util/sbin/dr rm IOU3
#
```

2. Execute “/opt/FJSVdr-util/sbin/dr rm IOU” command on the shell of OS.
   A list of IOU included in the partition is shown. Check that IOU which is cut off is displayed as ‘offline’.
   Example: Cutting off the IOU 3

```
# /opt/FJSVdr-util/sbin/dr stat IOU
IOU0: empty
IOU1: empty
IOU2: empty
IOU3: offline
```

3. Log into the MMB Web-UI using Administrator privileges.
4. Execute hotremove command.
   Example：When removing IOU3 from partition1

```
Administrator > hotremove partition 1 IOU 3
Are you sure to continue removing IOU#3 from Partition#1?
[Y/N]: Y
DR operation start (1/3)
Remove IOU#3 (2/3)
IOU#3 power-off (3/3)
Removing IOU#3 from partition#1 has been completed
successfully.
Administrator >
```

5. See Operation Log window or perform “show dynamic_reconfiguration status” command and confirm below messages.
   Example： When removing IOU3 from partition 1.

   Operation Log window:
   “I_10110 Partition1 : Hot-remove IOU#3 Completed.”

   show dynamic_reconfiguration status:
   “Removing IOU#3 from Partition#1, completed”

4.5.3 Operation after IOU hot remove

This section describes the process and operation after IOU hot remove.
Note

If SVAgent is installed in the partition, perform below command with root privilege.

```
# /usr/sbin/srvmagt restart
```

IOU removed from the partition has become “free state” where it does not belong to any partition. You can perform below operations:

- Pull up the IOU from the cabinet physically.
- Integrate the IOU into other inactive partition.
- Hot add the IOU into other active partition.

Perform the necessary post processing (such as re-starting an application) for the operations performed for the higher-level applications in 4.5.1 Preparation for IOU hot remove.

NIC on the IOU (including onboard NIC)

1. Restart the application which is stop at preparing for IOU hot replacement

FC Card

1. Restart the application which is stop at preparing for IOU hot replacement

4.6 Hot Replacement of PCI Express Cards

This section describes the following methods of PCI Express card replacement with the PCI Hot Plug (PHP) function:

- Common replacement operations for all PCI Express cards such as power supply operations
- Specific operations added to procedures to use a specified card function or a driver for installation

There are two ways to perform PCI hot plug:

- Operation by using sysfs
- Operation by using dr commands

You can perform the operation by using dr commands if Dynamic Reconfiguration utility is installed in the partition. If not, be sure to use the operation by using sysfs. Although you can perform the operation by using sysfs even if Dynamic Reconfiguration utility is installed in the partition, it is recommended to perform the operation by using dr commands to prevent wrong operation.
Hereafter, description about the operation by using dr commands starts at ‘For the partition with Dynamic Reconfiguration utility installed’ and description about the operation by sysfs starts at ‘For the partition without Dynamic Reconfiguration utility installed’.

Notes

- If you replace PCI Express cards on an IOU, see ‘4.3 Hot replacement of IOU’.
- In hot replacement of PCI Express cards, if you reboot the partition on OS without hot adding new PCI card to same PCI Express slot after you performed hot remove command, you cannot hot add a PCI Express card to the PCI Express slot unless you power off the partition.
  If you reboot the partition on OS before hot adding, you must power off the partition and replace the PCI Express card.
- If the Extended Partitioning is enabled, dr command is not supported for PCI Express card hot replacement.

Remarks
For details on the card replacement procedures not described in this chapter, see the respective product manuals.

4.6.1 Overview of common replacement procedures for PCI Express cards

This section provides an overview of common replacement procedures for all PCI Express cards.

1. Performing the required operating system and software operations depending on the PCI Express card type
2. Powering off a PCI slot
3. Replacing a PCI card
   This step is performed by the field engineer in charge of your system.
4. Powering on a PCI slot
5. Performing the required operating system and software operations depending on the PCI card type

Note
This chapter provides instructions (e.g., commands, configuration file editing) for the operating system and subsystems. Be sure to refer to the respective product manuals to confirm the command syntax and impact on the system before performing tasks with those instructions.
The following sections describe card addition, removal, and replacement with the required instructions (e.g., commands, configuration file editing) for the operating system and subsystems, together with the actual hardware operations. Step 3 is performed by the field engineer in charge of your system.

4.6.2 PCI Express card replacement procedure in detail

This section describes how to replace a PCI Express card.

Preparing the software using a PCI Express card

When a PCI Express card is replaced or removed, there must be no software using the PCI Express card. For this reason, before replacing or removing the PCI Express card, stop the software using the PCI Express card or make the software operations inapplicable.

Confirming the slot number of a PCI Express slot

When replacing, adding or removing a PCI Express card, you need to power on/off the appropriate slot, through the operating system. First, use the following procedure to obtain the slot number from the mounting location of the PCI Express slot for the card. It will be used to manipulate the power supply.

1. Identify the mounting location of the PCI Express card.
   See the figure in "B.1 Physical Mounting Locations of Components" to check the mounting location (board and slot) of the PCI Express card to be replaced.
2. Obtain the slot number of the mounting location.
   Check the table in "D.2 Correspondence between PCI Slot Mounting Locations and Slot Numbers", and obtain the slot number that is unique in the cabinet and assigned to the confirmed mounting locations. This slot number is the identification information for operating the slot of the PCI Express card to be replaced.

Note
The four-digit decimal numbers shown in <Slot number> in D.2 Correspondence between PCI Slot Mounting Locations and Slot Numbers have the leading digits filled with zeroes. The actual slot numbers do not include the zeroes in the leading digits.

Checking the power status of a PCI Express slot

- For the partition with Dynamic Reconfiguration utility installed
  Execute /opt/FJSVdr-util/sbin/dr stat pcie command on the shell of OS.
  After the list of the power status of PCI Express slots is shown, see the power status of the slot with the slot number which you confirmed at "Confirming the slot number of a PCI Express slot"
  Example:

```
# /opt/FJSVdr-util/sbin/dr stat pcie
pcie20: online
pcie21: offline
pcie22: empty
```

- For the partition without Dynamic Reconfiguration utility installed
  Using the PCI Express slot number confirmed in “Confirming the slot number of a PCI Express slot”, confirm that the /sys/bus/pci/ slots directory contains a directory for this slot information, which will be referenced and otherwise used. Below, the PCI Express slot number confirmed in “Confirming the slot number of a PCI Express slot” is shown at <slot number> location in the directory path in the following format, where the directory is the operational target.

  ```
  /sys/bus/pci/slots/<slot number>
  ```

  Confirm that the PCI Express card in the slot is enabled or disabled by displaying the "power" file contents in this directory.

  ```
  # cat /sys/bus/pci/slots/<slot number>/power
  ```

  When displayed, "0" means disabled, and "1" means enabled.

Powering on and off PCI Express slots

- For the partition with Dynamic Reconfiguration utility installed
  Execute /opt/FJSVdr-util/sbin/dr rm pcie<slot number> command on the shell of OS.
  The PCI Express card is disabled and has become to be ready for removal. The LED turns off.
  Example: Making the PCI Express slot with PCI Express slot number 20 power off

  ```
  # /opt/FJSVdr-util/sbin/dr rm pcie20
  ```

  This operation removes the device associated with the relevant adapter from the system.

  Execute /opt/FJSVdr-util/sbin/dr add pcie<slot number> command on the shell of OS to power on the target slot and enable the PCI Express card on the slot. The PCI Express card becomes available again.
  Example:

  ```
  # /opt/FJSVdr-util/sbin/dr add pcie20
  ```

  This operation installs the device associated with the relevant adapter on the system. After power-on, you need to confirm that the card and driver are correctly installed. The procedures vary depending on the card and driver specifications. For the appropriate procedures, see the respective manuals.

- For the partition without Dynamic Reconfiguration utility installed
  You can power on and off a PCI Express slot through an operation on the file confirmed in “Checking the power status of a PCI Express slot”.
  To disable a PCI Express card and make it ready for removal, write "0" to the "power" file in the directory corresponding to the target slot. The LED turns off.

  ```
  # echo 0 > /sys/bus/pci/slots/<slot number>/power
  ```

  This operation removes the device associated with the relevant adapter from the system.

  To enable the card again and make it available, write "1" to the "power" file in the directory corresponding to the disabled slot.

  ```
  # echo 1 > /sys/bus/pci/slots/<slot number>/power
  ```

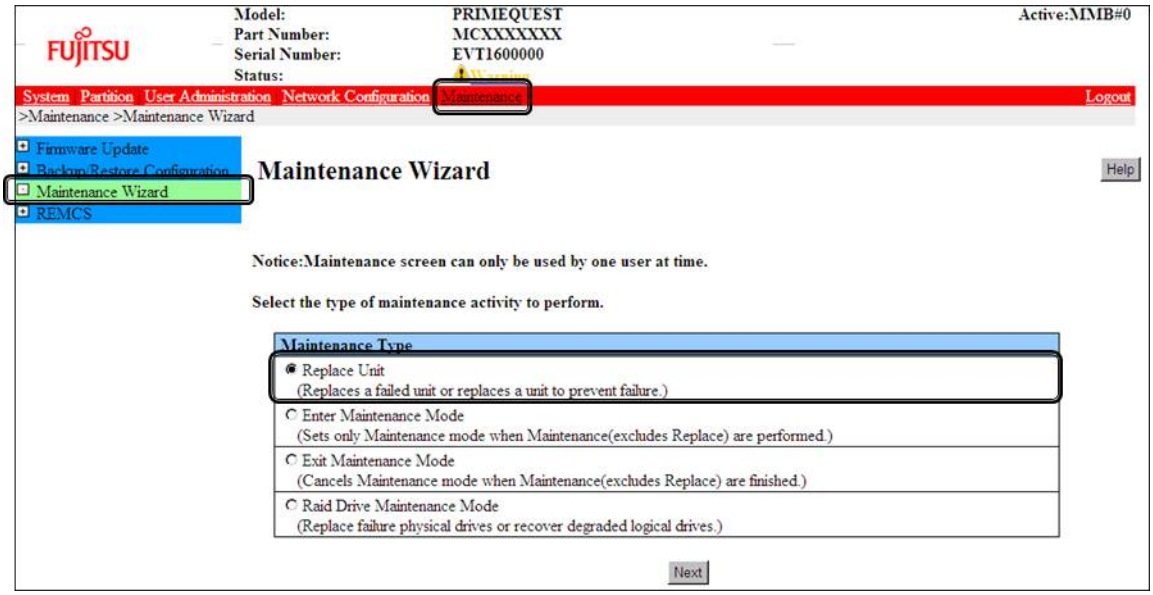
This operation installs the device associated with the relevant adapter on the system. After power-on, you need to confirm that the card and driver are correctly installed. The procedures vary depending on the card and driver specifications. For the appropriate procedures, see the respective manuals.

Operation for Hot replacement of PCI Express card by Maintenance Wizard

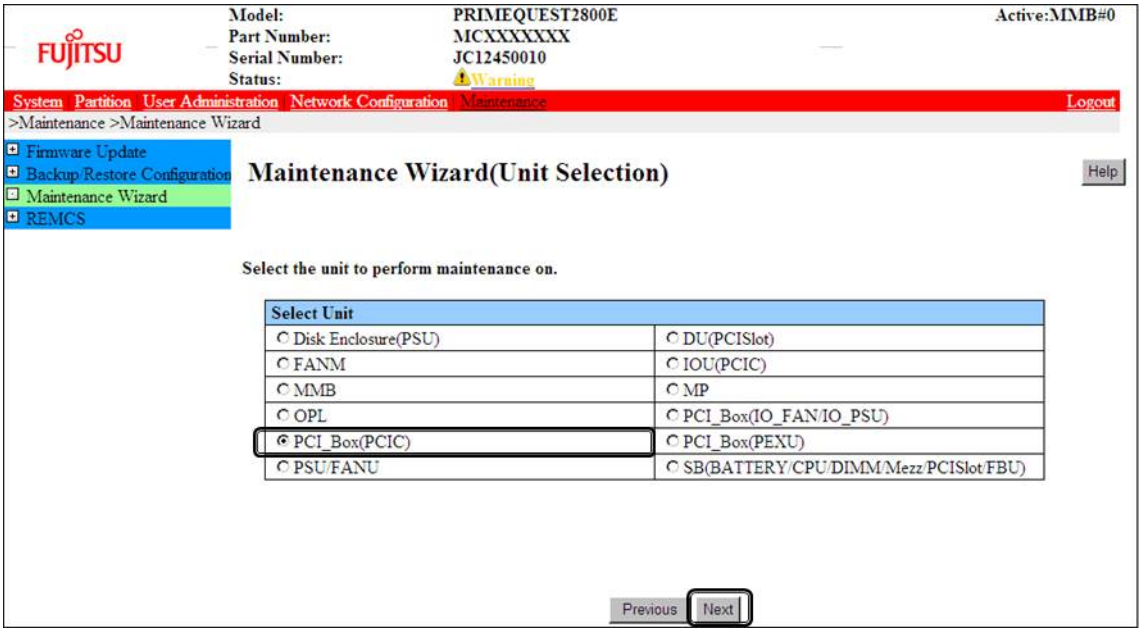
This item describes Operation for Hot replacement of PCI Express card (PCIC) by Maintenance Wizard
Below works are performed by the field engineer in charge of your system.

1. Start [Maintenance Wizard] menu by MMB Web-UI and display [Maintenance Wizard] view.

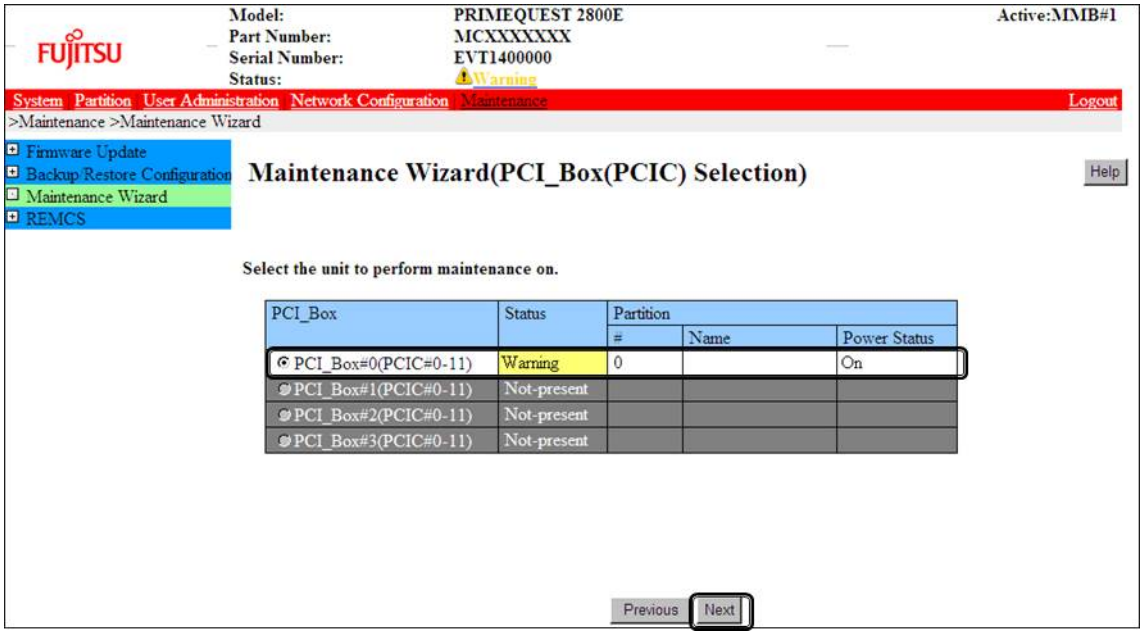
2. Select [Replace Unit] and click [Next].



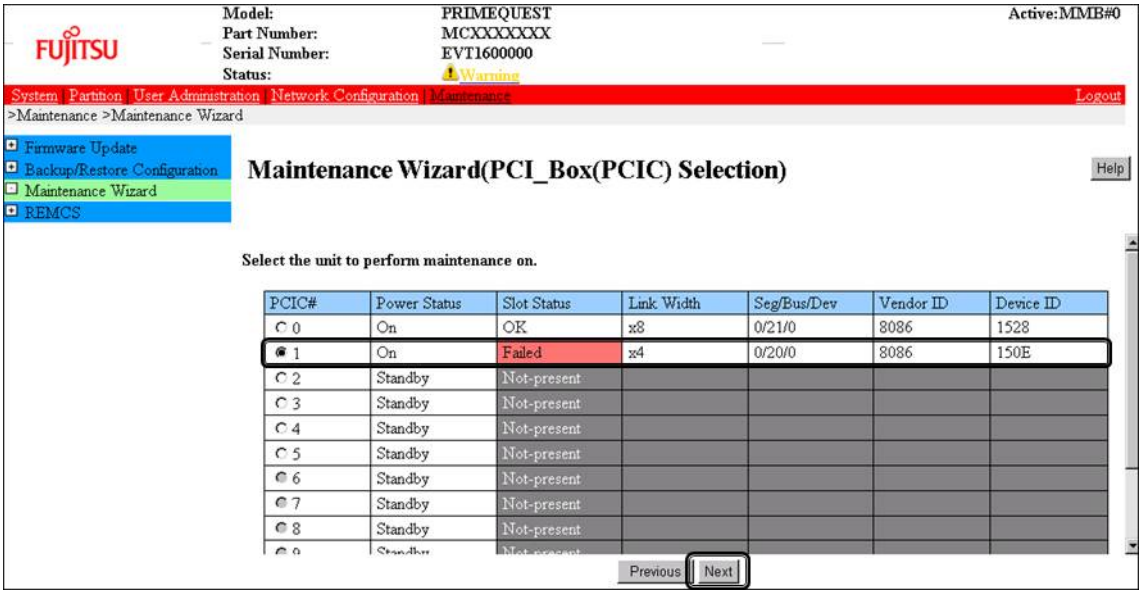
3. Select [PCI_Box(PCIC)], click [Next].



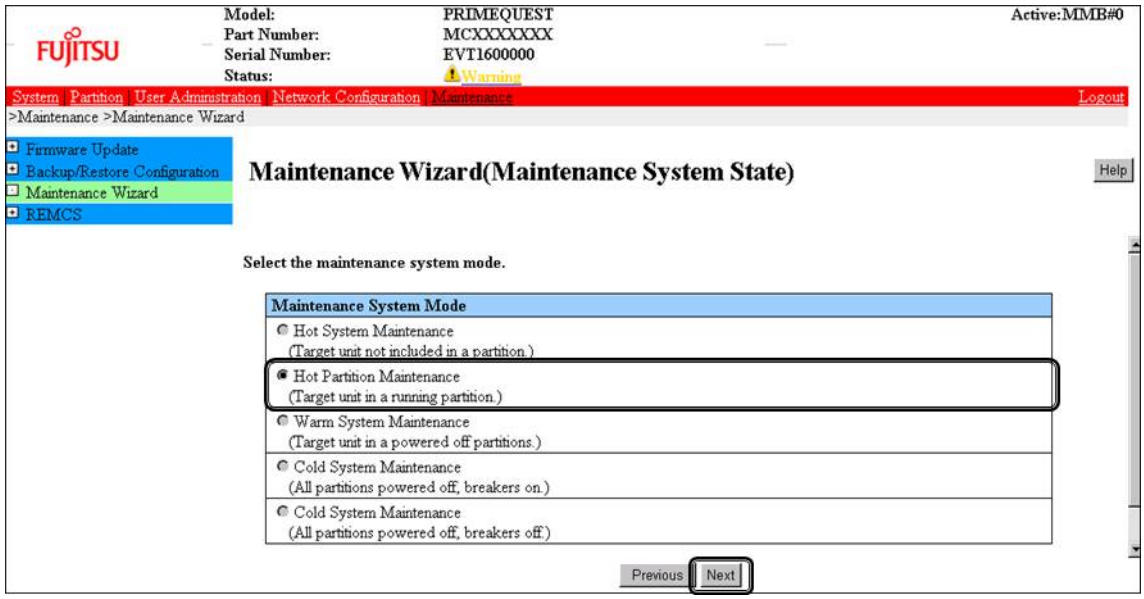
4. Select the radio button of PCI_Box with the particular number, click [Next]
   Example of operation for hot replacing PCI Express card of PCIC#1 mounted on PCI_Box#0



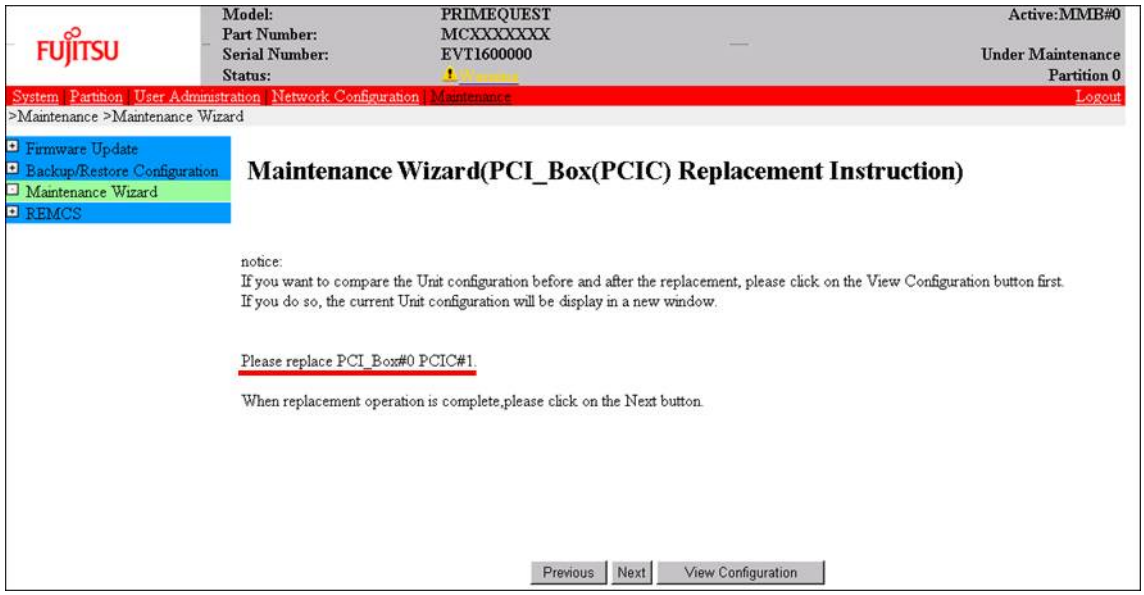
5. Select the radio button of the particular PCIC number and click [Next]



6. Select [Hot Partition Maintenance (Target unit in a running partition.)] and click [Next]



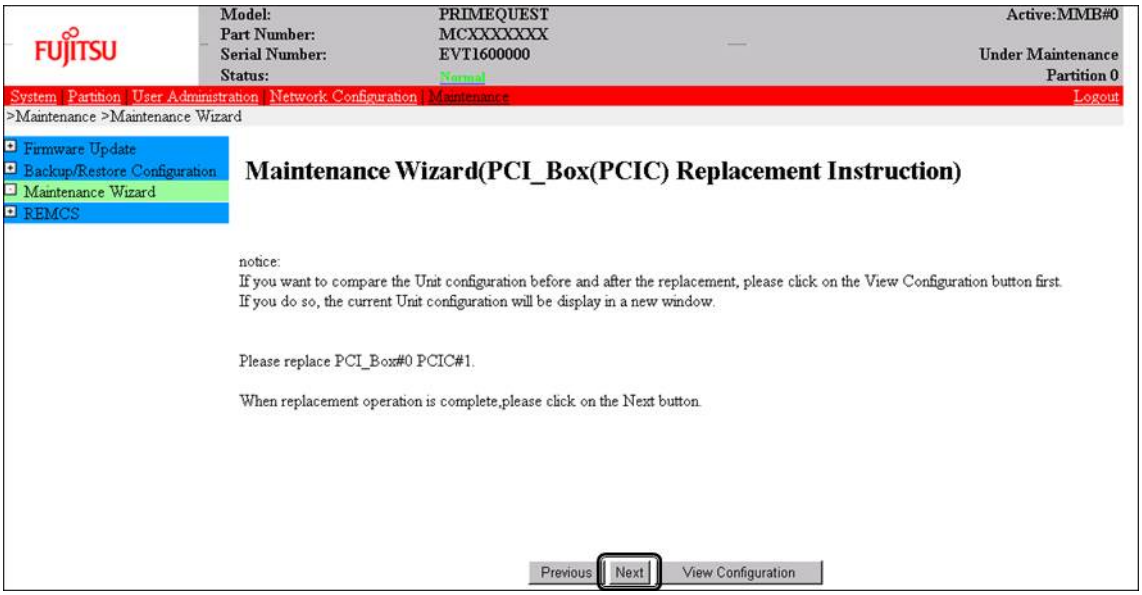
7. Maintenance mode is set (with information area of MMB Web-UI gray out) and then replacement instruction for the particular PCIC appears. Take off all cables such as LAN cable and FC cable connected to the particular PCIC and replace the particular PCIC with this window displayed.
See the figure in 'B.1 Physical Mounting Locations of Components' to confirm the location of the PCI Express card to be replaced.



Note
Do NOT click [Next] until replacing the PCIC.

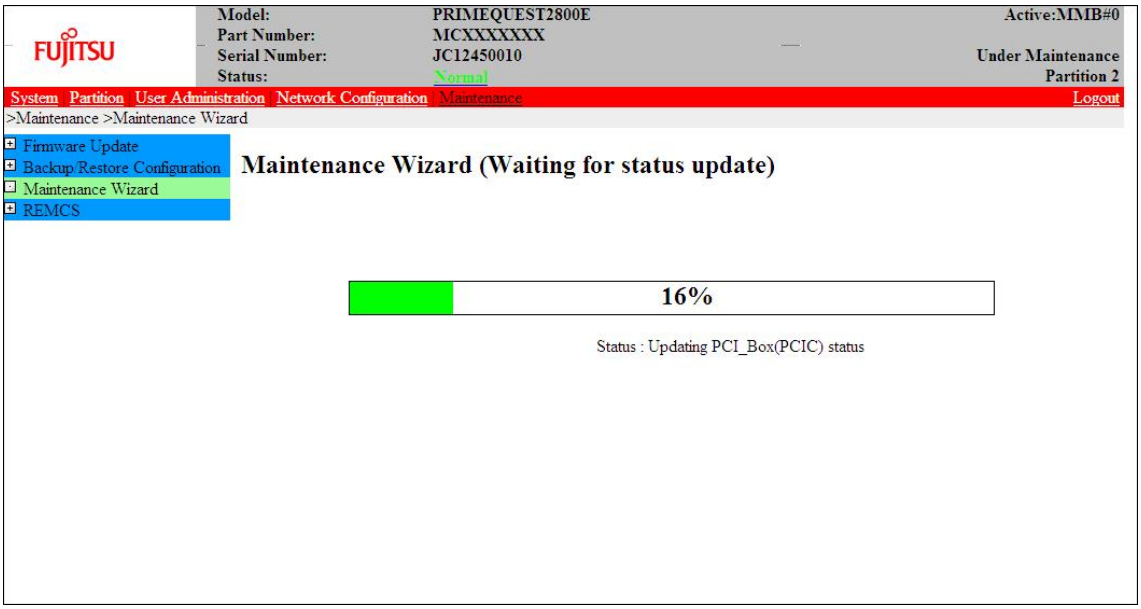
8. After replacing the particular PCIC, mount cables other than LAN cables.
Note
In GLS configuration with NIC switching way, mount also LAN cables.

9. Powering on the particular PCIC slot, click [Next].
   For how to power on the PCIC slot, see “Powering on and off PCI Express slots” in “4.6.2 PCI Express card replacement procedure in detail”.
   It is the administrator of your system who power on the PCI Express slot.

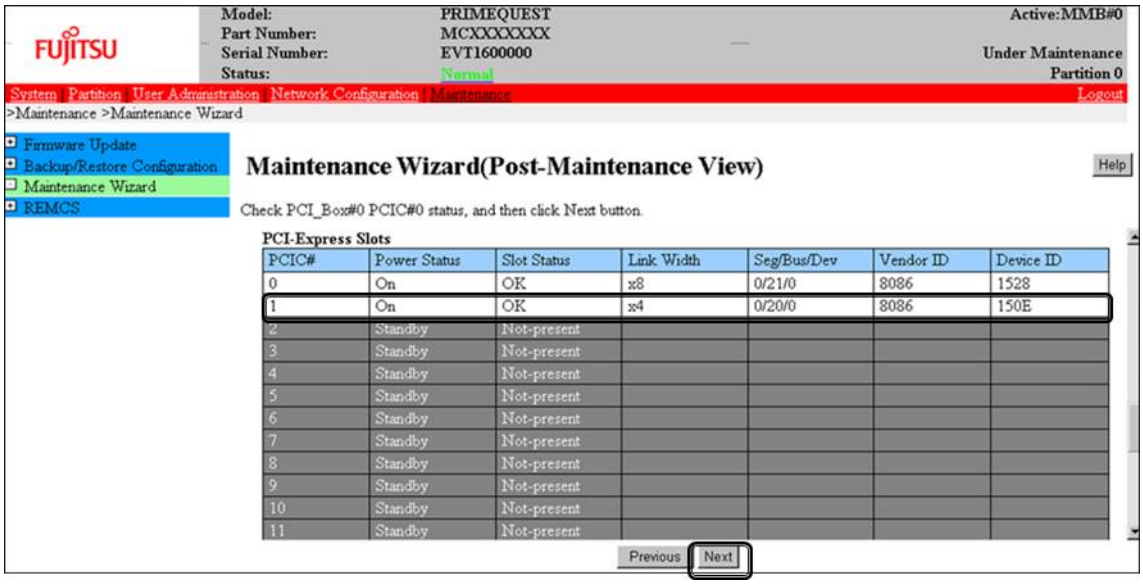


Note
Ask the administrator of your system to power on the PCI Express slot.

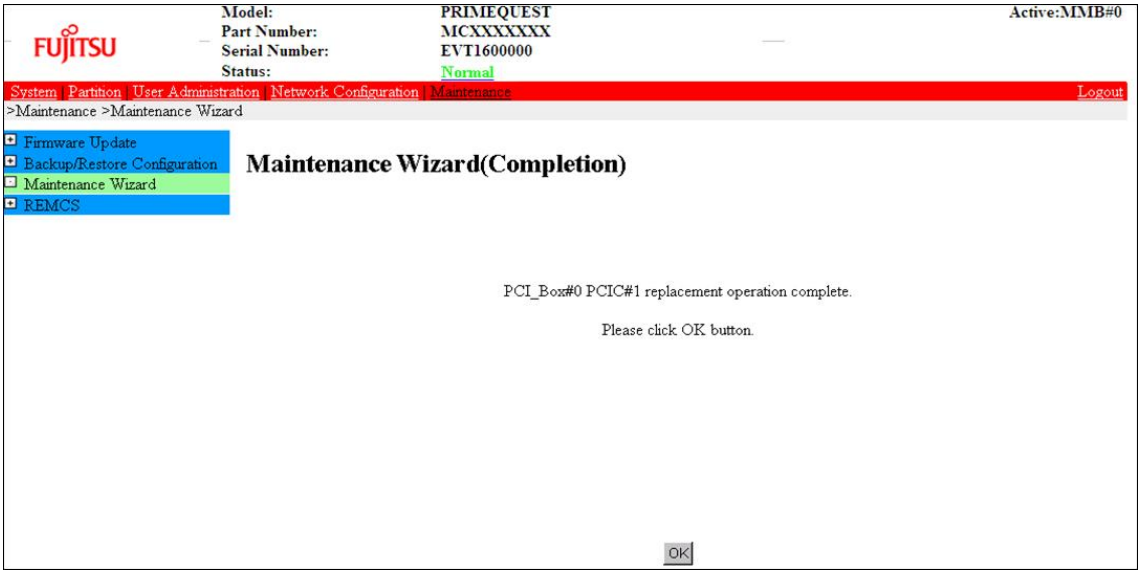
10. The window updating status appears.



11. Check the status of replaced PCIC and click [Next].



12. Confirm that maintenance mode has been released (with information area of MMB Web-UI not gray out) and click [Next].



Post-processing of software using a PCI Express card

After replacing a PCI Express card, restart the software stopped before the PCI Express card replacement or make the software operation applicable again, as needed.

4.6.3 FC card (Fibre Channel card) replacement procedure

The descriptions in this section assume that an FC card is being replaced.
Notes

- The FC card used for SAN boot does not support hot plugging.
- Although you can hot replace FC card used for dump device of sadump, collecting dump of memory fails until reconfiguring HBA UEFI or extended BIOS with the partition inactive after replacing the FC card.
- This section does not cover configuration changes in peripherals (e.g., UNIT addition or removal for a SAN disk device).

- This manual does not describe how to change the configuration of peripherals such as expanding and removing the unit of SAN disk device.
- To prevent a device name mismatch due to the failure, addition, removal, or replacement of an FC card, access the SAN disk unit by using the by-id name (/dev/disk/by-id/...) for the device name.
- If all the paths in a mounted disk become hidden when an FC card is hot replaced, unmount the disk. Then, execute PCI hot plug.

FC card replacement procedure

The procedure for replacing only a faulty FC card without replacing other peripherals is as follows.

1. Make the necessary preparations.
   Stop access to the faulty FC card, such as by stopping applications.
2. Confirm the slot number of the PCI Express slot.
   See 'Confirming the slot number of a PCI Express slot' in "4.6.2 PCI Express card replacement procedure in detail".
3. Power off the PCI Express slot.
   See 'Powering on and off PCI Express slots' in "4.6.2 PCI Express card replacement procedure in detail".
4. Physically replace the target card by using MMB Maintenance Wizard. This step is performed by the field engineer in charge of your system.
   For details on the operation of replacement, see step 1 to 7 of 'Operation for Hot replacement of PCI Express card by Maintenance Wizard' in "4.6.2 PCI Express card replacement procedure in detail".
5. Reconfigure the peripheral according to its manual.
   For example, suppose that the storage device used is ETERNUS and that the host affinity function is used (to set the access right for each server). Their settings would need to be changed as a result of FC card replacement.
6. Power on the PCI Express slot.
   See 'Powering on and off PCI Express slots' in "4.6.2 PCI Express card replacement procedure in detail".
7. Check whether there is an error in added FC card by MMB Maintenance Wizard.
   This step is performed by the field engineer in charge of your system.
   For details on the operation of replacement, see step 8 to 11 of 'Operation for Hot replacement of PCI Express card by Maintenance Wizard' in "4.6.2 PCI Express card replacement procedure in detail".
8. Check the version of the firmware
   It is required that the firmware version of new FC card is same as the FC card which had been replaced.
   If the firmware version of new FC card is same as the FC card which had been replaced (current firmware version), it is not necessary to update the firmware version of new FC card to current firmware version.
   If the firmware version of new FC card is not same as the FC card which had been replaced (current firmware version), update the firmware version of new FC card to current firmware version.
   For how to update the firmware version, see Firmware update manual for fibre channel card.
   Note
   If you cannot confirm the firmware version of the FC card before replacing due to the fault of the FC card, check the firmware version of the FC card which is same type as the faulty one to update firmware version.
9. Confirm the incorporation results.
   'Confirming the FC card incorporation results' describes the confirmation method. Start operation with the FC card again by restarting applications as needed or by other such means.
10. Perform the necessary post-processing.
    If you stopped any other application in step 1, restart it too as needed.

Confirming the FC card incorporation results

Confirm successful incorporation of the FC card and the corresponding driver in the following method. Then, take appropriate action. Check the log. (The following example shows a log of FC card hot plugging.)
As shown below, the output of an FC card incorporation message and device found message as the log output to /var/log/messages after the PCI Express slot containing the mounted FC card is enabled means that the FC card was successfully incorporated.

```
scsi10:Emulex LPe1250-F8 8Gb PCIe Fibre Channel ¥
       Adapter on PCI bus 0f device 08 irq 59 ...(*1)
       lpfc 0000:0d:00.0: 0:1303 Link Up Event x1 received ¥
       Data: x1 x0 x10 x0 x0 x0 0 ...(*2)
```

```
       scsi 2:0:0:0: Direct-Access FUJITSU E4000 ¥
0000 PQ: 1 ANSI: 5        ...(*3)
```

The ¥ at the end of a line indicates that there is no line feed.

If only the message in (*1) is displayed but the next line is not displayed or if the message in (*1) is not displayed, the FC card replacement itself was unsuccessful. (See Note below.) In this case, power off the slot once. Then, check the following points again:

- Whether the FC card is correctly inserted into the PCI Express slot
- Whether the latch is correctly set

Eliminate the problem, power on the slot again, and check the log.
If the message in (*1) is displayed but the FC linkup message in (*2) is not displayed, the FC cable may be disconnected or the FC path may not be set correctly. Power off the slot once. Confirm the following points again.

- Confirm the FC driver setting.
  The definition file containing a description of the driver option of the FC driver (lpfc) is identified with the following command.
  Example: Description in /etc/modprobe.d/lpfc.conf

  ```
  # grep -l lpfc /etc/modprobe.d/*

  /etc/modprobe.d/lpfc.conf
  ```

  Confirm that the driver option of the FC driver (lpfc) is correctly set. For details, contact the distributor where you purchased your product, or your sales representative.
- Check the FC cable connection status.
- Confirm the Storage FC settings.
  Confirm that the settings that conform to the actual connection format (Fabric connection or Arbitrated Loop connection) were made.
  If the messages in (*1) and (*2) are displayed but the messages in (*3) are not displayed, the storage is not yet found. Check the following points again. These are not card problems, so you need not power off the slot for work.
  - Review FC-Switch zoning settings.
  - Review storage zoning settings.
  - Review storage LUN Mapping settings.

    Also, confirm that the storage can be correctly viewed from LUN0.
    Eliminate the problem. Then, confirm the settings and recognize the system by using the following procedure.

1. Confirm the host number of the incorporated FC card from the message at (*1).
   xx in scsixx (xx is a numerical value) in the message at (*1) is a host number. In the above example, the host number is 10.
2. Scan the device by executing the following command.

   ```
   # echo "-" "-" "-" > /sys/class/scsi_host/hostxx/scan
   (# is command prompt)

   (xx in hostxx is the host number entered in step 1.)
   ```

   The command for the above example is as follows.

   ```
   # echo "-" "-" "-" > /sys/class/scsi_host/host10/scan
   ```
3. Confirm that a message like (*3) was output to /var/log/messages.
   If this message is not displayed, confirm the settings again.

   Note
   In specific releases of RHEL, a message like (*1) for confirming FC card incorporation may be output in the following format with card name information omitted.

   ```
   scsi10 : on PCI bus 0f device 08 irq 59
   ```

In this case, check for the relevant message on the FC card incorporation by using the following procedure.

a. Confirm the host number.
xx in scsixx (xx is a numerical value) in the message is a host number. In the above example, the host number is 10.

b. Check whether the following file exists by using the host number.

```
/sys/class/scsi_host/hostxx/modeldesc
(xx in hostxx is the host number entered in step 1.)
```

If the file does not exist, the judgment is that no such message was output from the FC card.

c. If the file exists, check the file contents by using the following operation.

```
# cat /sys/class/scsi_host/hostxx/modeldesc
Emulex LPe1250-F8 8Gb PCIe Fibre Channel Adapter

(xx in hostxx is the host number entered in step 1.)
```

If the output is like the above, the judgment is that the relevant message was output by the incorporation of the FC card.

4.6.4 Network card replacement procedure

Network card (referred to as NIC below) replacement using hot plugging needs specific processing before and after PCI Express slot power-on or power-off. Its procedure also includes the common PCI Express card replacement procedure.
The procedure describes operations where a single NIC is configured as one interface. It also describes cases where multiple NICs are bonded together to configure one interface (bonding configuration). For bonding multiple NIC by using PRIMECLUSTER Global Link Services (GLS), see manual of PRIMECLUSTER Global Link Services.

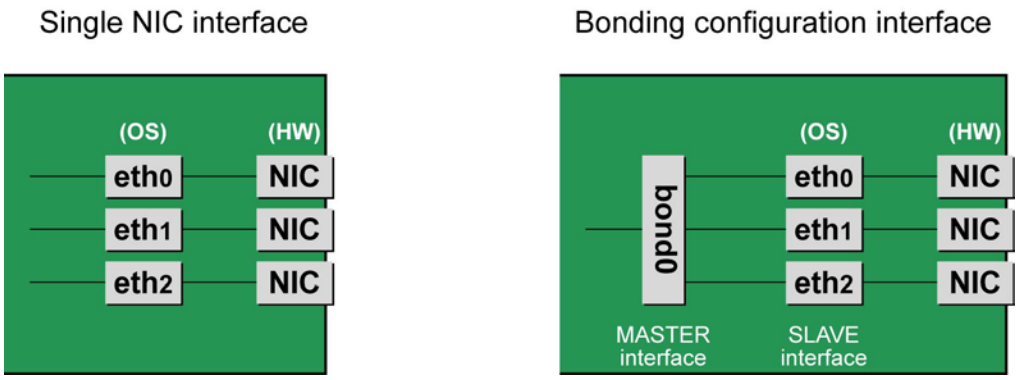


FIGURE 4.2 Single NIC interface and bonding configuration interface

NIC replacement procedure

This section describes the procedure for NIC replacement.
Notes

- When replacing multiple NICs, be sure to replace them one by one. If you replace multiple cards at the same time, they may not be correctly configured.
- To perform hot replacement in a system where a bonding device is installed, design the system so that it specifies ONBOOT=YES in all interface configuration files (the /etc/sysconfig/network-scripts/ifcfg-eth*files and the /etc/sysconfig/network-scripts/ifcfg-bond*files), regardless of whether the NIC to be replaced is a configuration interface of the bonding device.
An IP address need not to be assigned to unused interfaces. This procedure is to prevent the device name of the replacement target NIC from being changed after hot replacement. If ONBOOT=NO also exists, the procedure described here may not work properly.

1. Confirm the slot number of the PCI Express slot that has the mounted interface.
Confirm the interface mounting location through the configuration file information and the operating

system information. First, confirm the bus address of the PCI Express slot that has the mounted interface to be replaced.
Example: eth0 interface

```
# ls -l /sys/class/net/eth0/device
lrwxrwxrwx 1 root root 0 Sep 29 10:17 ¥
/sys/class/net/eth0/device
->../../../0000:00:01.2/0000:08:00.2/0000:0b:01.0
```

The ¥ at the end of a line indicates that there is no line feed.

Excluding the rest of the directory path, check the part corresponding to the file name in the symbolic link destination file of the output results. In the above example, the underlined part shows the bus address. ("0000:0b:01" in the example)

Note
You will use the bus address obtained here in steps 2 and 11. Record the bus address so that you can reference it later.

Next, check the PCI Express slot number for this bus address.

```
# grep -il 0000:0b:01 /sys/bus/pci/slots/*/address
/sys/bus/pci/slots/20/address
```

Read the output file path as shown below, and confirm the PCI Express slot number.

```
/sys/bus/pci/slots/<slot number>/address
```

Notes
If the above file path is not output, it indicates that the NIC is not mounted in a PCI Express slot (e.g., GbE port in the IOU).
With the PCI Express slot number confirmed here, see 'D.2 Correspondence between PCI Slot Mounting Locations and Slot Numbers'PCI Express slot to check the mounting location, and see also 'B.1 Physical Mounting Locations of Components' to identify the physical mounting location corresponding to the PCI Express slot number. You can confirm that it matches the mounting location of the operational target NIC.

2. Collect information about interfaces on the same NIC.
For a NIC that has more than one interface, you will need to deactivate all the interfaces on the NIC. Use the following procedure to check each interface that has the same bus address as that confirmed in step 1. Then, make a table with information including the interface name, hardware address, and bus address.
Note
Collect the following information even if the NIC has only one interface.

- Confirm the correspondence between the bus address and interface name.
Execute the following command, and confirm the correspondence between the bus address and interface name.
Example: The bus address is "0000:0b:01".

```
# ls -l /sys/class/net/*/device | grep "0000:0b:01"
lrwxrwxrwx 1 root root 0 Sep 29 10:17 ¥
/sys/class/net/eth0/device
->../../../0000:00:01.2/0000:08:00.2/0000:0b:01.0
lrwxrwxrwx 1 root root 0 Sep 29 10:17 ¥
/sys/class/net/eth1/device
->../../../0000:00:01.2/0000:08:00.2/0000:0b:01.1
```

The ¥ at the end of a line indicates that there is no line feed.

The following table shows the correspondence between the bus addresses and interface names from the above output example.

TABLE 4.6 Correspondence between bus addresses and interface names

Interface name	Hardware address	Bus address	Slot number
eth0		0000:0b:01.0	20
eth1		0000:0b:01.1	20
...		...	...

Note
When recording a bus address, include the function number (number after the period).

- Confirm the correspondence between the interface name and hardware address.
Execute the following command, and confirm the correspondence between the interface name and

hardware address.
Example: eth0 [For a single interface]

```
# cat /sys/class/net/eth0/address
00:0e:0c:70:c3:38
```

Example: eth0 [For a bonding interface]
The bonding driver rewrites the values for the slave interface of the bonding device. Confirm the hardware address by executing the following command.

```
# cat /proc/net/bonding/bondY

Ethernet Channel Bonding Driver .........
.
.
Slave interface: eth0
.
Permanent HW addr: 00:0e:0c:70:c3:38
.
.
```

You can use this procedure only when the bonding device is active. If the bonding device is not active or the slave has not been incorporated, use the same procedure as for a single interface.

Also, the correspondence between the interface name and hardware address is automatically registered by the system in the udev function rule file, /etc/udev/rules.d/70-persistent-net.rules. Confirm that the ATTR{address} and NAME items have the same definitions as in the above output.
Example: eth0

```
grep eth0 /etc/udev/rules.d/70-persistent-net.rules

SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*", ¥
ATTR{address}=="00:0e:0c:70:c3:38", ATTR{type}=="1", ¥
KERNEL=="eth*", NAME="eth0"
```

The ¥ at the end of a line indicates that there is no line feed.

You can always obtain the correct hardware address from the description in etc/udev/rules.d/70-persistent-net.rules regardless of whether the interface is incorporated in bonding.
Confirm the hardware address of other interfaces by repeating the operation with the same command. The following table lists examples of descriptions.

TABLE 4.7 Hardware address description examples

Interface name	Hardware address	Bus address	Slot number
eth0	00:0e:0c:70:c3:38	0000:0b:01.0	20
eth1	00:0e:0c:70:c3:39	0000:0b:01.1	20
...	...	...	...

The step above is used in creating the correspondence table in step 13. Prepare a table here so that you can reference it later.
Note
In a replacement due to a device failure, the information in the table showing the correspondence between the interface and the hardware address, bus address, and slot number may be inaccessible depending on the failure condition. We strongly recommend that a table showing the correspondence between the interface and the hardware address, bus address, and slot number be created for all interfaces at system installation.

3. Execute the higher-level application processing required before NIC replacement.
   Stop all access to the interface as follows. Stop the application that was confirmed in step 2 as using the interface, or exclude the interface from the target of use by the application.

4. Deactivate the NIC.
   Execute the following command to deactivate all the interfaces that you confirmed in step 2.
   The applicable command depends on whether the target interface is a single NIC interface or the SLAVE interface of a bonding device.
   [For a single NIC interface]

```
# /sbin/ifdown ethX
```

If the single NIC interface has a VLAN device, you also need to remove the VLAN interface. Perform the following operations (before deactivating the real interface).

```
# /sbin/ifdown ethX.Y
# /sbin/vconfig rem ethX.Y
```

[For the SLAVE interface of a bonding device]
If the bonding device is operating in mode 1, use the following steps to exclude SLAVE interface to be replaced from the bonding configuration. In any other mode, removing it immediately should not cause any problems.
Confirm that the SLAVE interface to be replaced is the interface currently being used for communication. First, confirm the interface currently being used for communication by executing the following command.

```
# cat /sys/class/net/bondY/bonding/active_slave
```

If the displayed interface matches the SLAVE interface being replaced, execute the following command to switch the current communication interface to another SLAVE interface.

```
# /sbin/ifenslave -c bondY ethZ
(ethZ: Interface that composes bondY and does not perform
hot replacement)
```

Finally, remove the SLAVE interface being replaced, from the bonding configuration. Immediately after being removed, the interface is automatically no longer used.

```
# /sbin/ifenslave -d bondY ethX
```

5. Power off the PCI Express slot.

   - For the partition with Dynamic Reconfiguration utility installed
     Execute /opt/FJSVdr-util/sbin/dr rm pcie<slot number> command on the shell of OS.
     The PCI Express card is disabled and has become to be ready for removal. The LED turns off.
     Example: Making the PCI Express slot with PCI Express slot number 20 power off

     ```
     # /opt/FJSVdr-util/sbin/dr rm pcie20
     ```

     This operation removes the device associated with the relevant adapter from the system.

   - For the partition without Dynamic Reconfiguration utility installed
     Confirm that the /sys/bus/pci/slots directory contains a directory for the target slot information, which will be referenced and otherwise used. Below, the slot number confirmed in step 1 is shown at <slot number> in the directory path in the following format, where the directory is the operational target.

     ```
     /sys/bus/pci/slots/<slot number>
     ```

     To disable a PCI Express card and make it ready for removal, write "0" to the "power" file in the directory corresponding to the target slot. The LED turns off. The interface (ethX) is removed at the same time.

     ```
     # echo 0 > /sys/bus/pci/slots/<slot number>/power
     ```

6. Save the interface configuration file.
   Save all the interface configuration files that you checked in step 2 by executing the following command. udevd and configuration scripts may reference the contents of files in /etc/sysconfig/network-scripts. For this reason, create a save directory and save these files to the directory so that udevd and the configuration scripts will not reference them.

   ```
   # cd /etc/sysconfig/network-scripts
   # mkdir temp
   # mv ifcfg-ethX temp
   (following also executed for bonding configuration)
   # mv ifcfg-bondX temp
   ```

7. Physically replace the NIC by using MMB Maintenance Wizard. This step is performed by the field engineer in charge of your system.
   For details on the operation of replacement, see step 1 to 7 of ‘Operation for Hot replacement of PCI Express card by Maintenance Wizard’ in “4.6.2 PCI Express card replacement procedure in detail”.

8. Delete the entries associated with the replaced NIC from the udev function rule file.
   Each entry for the new NIC is automatically added to the udev function rule file, /etc/udev/rules.d/70-persistent-net.rules, when the NIC is detected. However, the entries of a NIC are not automatically

deleted even if the NIC is removed. Leaving the entries of the removed NIC may have the following impact.

- The interface names defined in the entries of the removed NIC cannot be assigned to the replaced NIC or an added NIC.

For this reason, delete or comment out the entries of the removed NIC from the udev function rule file.

a. Confirm the correspondence between the interface name and hardware address in the table created in step 2.

b. Edit the udev function rule file, /etc/udev/rules.d/70-persistent-net.rules, to delete or comment out the entry lines of all the interface names and hardware addresses confirmed in the above step 1.

The following example shows editing of the udev function rule file.
[Example of descriptions in the file before editing]

```
# PCI device 0x****:0x**** (e1000)
SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*", ¥
ATTR{address}=="00:0e:0c:70:c3:38", ATTR{type}=="1", ¥
KERNEL=="eth*", NAME="eth0"
# PCI device 0x****:0x**** (e1000)
SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*", ¥
ATTR{address}=="00:0e:0c:70:c3:39", ATTR{type}=="1", ¥
KERNEL=="eth*", NAME="eth1"
  :
  :
```

The ¥ at the end of a line indicates that there is no line feed.

[Example of descriptions in the file after editing]
(In the example, eth0 was deleted, and eth1 is commented out.)

```
# PCI device 0x****:0x**** (e1000)
# SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*", ¥
ATTR{address}=="00:0e:0c:70:c3:39", ATTR{type}=="1", ¥
KERNEL=="eth*", NAME="eth1"
  :
  :
```

The ¥ at the end of a line indicates that there is no line feed.

Do this editing for all the interfaces listed in the table created in step 2.

9. Reflect the edited rules in udev.
udevd reads the rules described in the rule file at its start time and then retains the rules in memory. Simply changing the rule file does not mean the changed rules are reflected. Take action as follows to reflect the new rules in udev.

```
# udevadm control --reload-rules
```

10. Power on the PCI Express slot.
See ‘Powering on and off PCI Express slots’ in “4.6.2 PCI Express card replacement procedure in detail”.

11. Check whether there is an error in added FC card by MMB Maintenance Wizard.
This step is performed by the field engineer in charge of your system.
For details on the operation of replacement, see step 8 to 11 of ‘Operation for Hot replacement of PCI Express card by Maintenance Wizard’ in “4.6.2 PCI Express card replacement procedure in detail”.

12. Collect the information associated with an interface on the replaced NIC.
An interface (ethX) is created for the replaced NIC at the power-on time. Make a table with information about each interface created for the replaced NIC. Such information includes the interface name, hardware address, and bus address. Use the bus address confirmed in step 1 and the same procedure as in step 2.

TABLE 4.8 Example of interface information about the replaced NIC

Interface name	Hardware address	Bus address	Slot number
eth1	00:0e:0c:70:c3:40	0000:0b:01.0	20
eth0	00:0e:0c:70:c3:41	0000:0b:01.1	20
...	...	...	...

Confirm that a new hardware address is defined for the bus address. Also confirm that the assigned interface name is the same as that before the NIC replacement.

Also confirm that the relevant entries in the above-described table were automatically added to the udev function rule file, /etc/udev/rules.d/70-persistent-net.rules.

Note

The correspondence between the bus address and interface name may be different from that before NIC replacement. In such cases, just proceed with the work. This is explained in step 13.

13. Deactivate each newly created interface.
    The interfaces created for the replaced NIC may be active because power is on to the PCI Express slot. In such cases, you need to deactivate them before changing the interface configuration file.
    Execute the following command for all the interface names confirmed in step 11.
    Example: eth0

```
# /sbin/ifconfig eth0 down
```

14. Confirm the correspondence between the interface names before and after the NIC replacement.
    From the interface information created before and after the NIC replacement in steps 2 and 11, confirm the correspondence between the interface names before replacement and the new interface names.
    a. Confirm the correspondence between the bus address and interface name on each line in the table created in step 2.
    b. Likewise, confirm the correspondence between the bus addresses and interface names in the table created in step 11.
    c. Match the interface names to the same bus addresses before and after the NIC replacement.
    d. In the table created in step 11, enter values corresponding to the interface names before and after the NIC replacement.

TABLE 4.9 Example of entered values corresponding to the interface names before and after NIC replacement

Interface name After replacement (-> Before replacement)	Hardware address	Bus address	Slot number
eth1 (-> eth0)	00:0e:0c:70:c3:40	0000:0b:01.0	20
eth0 (-> eth1)	00:0e:0c:70:c3:41	0000:0b:01.1	20
...	...	...	...

15. If an interface name is switched before and after the NIC replacement, make the interface name correspond to the same bus address as before the NIC replacement by using the following procedure.
    Note
    Confirm that the interface name is the same before and after the NIC replacement. Then, proceed to step 15.
    a. Power off the PCI Express slot again.
       Repeat the process done in step 5 to power off the PCI Express slot.
    b. Correct the interface name that is not the same before and after the NIC replacement in the entries of the udev function rule file, /etc/udev/rules.d/70-persistent-net.rules. Make the interface name the same as before the NIC replacement.
       [Example of descriptions in the file before editing]

```
# PCI device 0x****:0x**** (e1000)
SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*", ¥
ATTR{address}=="00:0e:0c:70:c3:40", ATTR{type}=="1", ¥
KERNEL=="eth*", NAME="eth1"
# PCI device 0x****:0x**** (e1000)
SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*", ¥
ATTR{address}=="00:0e:0c:70:c3:41", ATTR{type}=="1", ¥
KERNEL=="eth*", NAME="eth0"
 :
 :
```

The ¥ at the end of a line indicates that there is no line feed.

[Example of descriptions in the file after editing]
(eth1, the name after replacement, has been corrected to eth0, the name before replacement.)

```
# PCI device 0x****:0x**** (e1000)
```

```
SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*", ¥
ATTR{address}=="00:0e:0c:70:c3:40", ATTR{type}=="1", ¥
KERNEL=="eth*", NAME="eth0"
# PCI device 0x****:0x**** (e1000)

SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*", ¥
ATTR{address}=="00:0e:0c:70:c3:41", ATTR{type}=="1", ¥
KERNEL=="eth*", NAME="eth1"
  :
  :
```

The ¥ at the end of a line indicates that there is no line feed.

c. Reflect the edited rules again.
Repeat the process done in step 9 to reflect the rules.

```
# udevadm control --reload-rules
```

d. Power on the PCI Express slot.
Repeat the process done in step 10 to power on the PCI Express slot.
The interfaces created for the replaced NIC may be active because power is on to the PCI Express slot. At this stage, since we recommend proceeding with the work with the interface on the replaced NIC deactivated, repeat the operation in step 12.

e. Collect the information about interfaces on the NIC again, and create a table.
Use the same procedure as in step 2 to update the interface name information in the table from step 13 showing the correspondence of the interface before and after NIC replacement.
Note
Confirm that each specified interface name is the same as before the NIC replacement.

TABLE 4.10 Confirmation of interface names

Interface name	Hardware address	Bus address	Slot number
eth0	00:0e:0c:70:c3:40	0000:0b:01.0	20
eth1	00:0e:0c:70:c3:41	0000:0b:01.1	20
...	...	...	...

16. Edit the saved interface configuration file.
Write a new hardware address to replace the old one. In "HWADDR," set the hardware address of the replaced NIC in ‘TABLE 4.9 Example of entered values corresponding to the interface names before and after NIC replacement’’ or ‘TABLE 4.10 Confirmation of interface names’. Also, for SLAVE under bonding, the file contents are partly different, but the lines to be set are the same.

```
(Example)
DEVICE=eth0
NM_CONTROLLED=no BOOTPROTO=static HWADDR=00:0E:0C:70:C3:40
BROADCAST=192.168.16.255
IPADDR=192.168.16.1
NETMASK=255.255.255.0
NETWORK=192.168.16.0
ONBOOT=yes
TYPE=Ethernet
```

Do this editing for all the saved interfaces.

17. Restore the saved interface configuration file to the original file.
Restore the interface configuration file saved to the save directory to the original file by executing the following command.

```
# cd /etc/sysconfig/network-scripts/temp
# mv ifcfg-ethX   ..
(following also executed for bonding configuration)
# mv ifcfg-bondX   ..
```

18. Activate the replaced interface.
The method for activating a single NIC interface differs from that for activating the SLAVE interfaces under bonding.
[For a single NIC interface]
Execute the following command to activate the interface. Activate all the necessary interfaces.

```
# /sbin/ifup ethX
```

Also, if the single NIC interface has a VLAN device and the VLAN interface was temporarily removed, restore the VLAN interface. If the priority option has changed, set it again.

```
# /sbin/vconfig add ethX Y
# /sbin/ifup ethX.Y
(enter command to set VLAN option as needed)
```

[For SLAVE under bonding]
Execute the following command to incorporate the SLAVE interface into the existing bonding configuration. Incorporate all the necessary interfaces.

```
# /sbin/ifenslave bondY ethX
```

The VLAN-related operation is normally not required because a VLAN is created on the bonding device.

19. Mount all cables connected to the particular PCIC.
    This step is performed by the field engineer in charge of your system.
    Note
    In GLS configuration with NIC switching way, you do not need to perform this step.

20. Remove the directory to which the interface configuration file was saved.
    After all the interfaces to be replaced have been replaced, remove the save directory created in step 6 by executing the following command.

```
# rmdir /etc/sysconfig/network-scripts/temp
```

21. Execute the higher-level application processing required after NIC replacement.
    Perform the necessary post processing (such as starting an application or restoring changed settings) for the operations performed for the higher-level applications in step 3.

4.6.5 Hot replacement procedure for iSCSI (NIC)

When performing hot replacement of NICs used for iSCSI connection, use the following procedures.

- 4.6.1 Overview of common replacement procedures for PCI Express cards
- 4.6.2 PCI Express card replacement procedure in detail
- 4.6.4 Network card replacement procedure

A supplementary explanation of the procedure follows.

Prerequisites for iSCSI (NIC) hot replacement

- The prerequisites for iSCSI (NIC) hot replacement are as follows.
- The storage connection is established on a multipath using DM-MP (Device-Mapper Multipath) or ETERNUS multidriver (EMPD).
- To replace more than one iSCSI card, one card at a time will be replaced.
- A single NIC is configured as one interface.

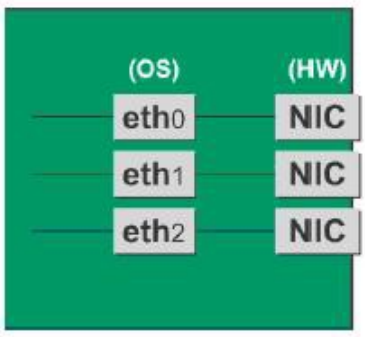


FIGURE 4.3 Example of single NIC interface

Work to be performed before iSCSI (NIC) replacement

For iSCSI (NIC) hot replacement, be sure to follow the procedure below when performing Step 3 of the 'NIC replacement procedure' in '4.6.4 Network card replacement procedure'

1. Perform the work for suppressing access to the iSCSI connection interface.

   a. Confirm the state of multiple path by DM-MP (*1) or EMPD (*2).

   b. Use the iscsiadm command to log out from the path (iqn) through which the iSCSI card to be replaced is routed, and disconnect the session.
   Example which confirms the state of session before disconnecting:

```
# /sbin/iscsiadm -m session
tcp: [1] 192.168.1.64:3260,1 iqn.2000-
09.com.fujitsu:storage-system.eternus-
dx400:00001049.cm0ca0p0
tcp: [2] 192.168.2.66:3260,3 iqn.2000-
09.com.fujitsu:storage-system.eternus-
dx400:00001049.cm1ca0p0
```

   Example which logout path going through a NIC to be replaced:

```
# /sbin/iscsiadm -m node -T iqn.2000-09.com.fujitsu:storage-
system.eternus-dx400:00001049.cm1ca0p0 -p 192.168.2.66:3260
–-logout
```

   c. Use the iscsiadm command to confirm that the target session has been disconnected.
   Example which confirms the state of session after disconnecting

```
# /sbin/iscsiadm -m session
tcp: [1] 192.168.1.64:3260,1 iqn.2000-
09.com.fujitsu:storage-system.eternus-
dx400:00001049.cm0ca0p0
```

   d. You can confirm the disconnection of sessions on multipath products using DM-MP or ETERNUS multidriver.
   *1: Write down the DM-MP display contents at the session disconnection.
   Example of DM-MP display before disconnecting path

```
# /sbin/multipath -ll
mpath1 (36000b5d0006a0000006a104900000000) dm-0
FUJITSU,ETERNUS_DX400
[size=50G][features=0][hwhandler=0][rw]
¥_ round-robin 0 [prio=2][active]
 ¥_ 3:0:0:0 sdb 8:16  [active][ready]
 ¥_ 4:0:0:0 sdc 8:32  [active][ready]
```

   Example of DM-MP display after disconnecting path

```
# /sbin/multipath -ll
mpath1 (36000b5d0006a0000006a104900000000) dm-0
FUJITSU,ETERNUS_DX400
[size=50G][features=0][hwhandler=0][rw]
¥_ round-robin 0 [prio=1][enabled]
 ¥_ 3:0:0:0 sdb 8:16  [active][ready]
```

*2: See the ETERNUS Multipath Driver User's Guide (For Linux).

Work to be performed after NIC replacement

For iSCSI (NIC) hot replacement, be sure to follow the procedure below when Step 19 of the NIC replacement procedure in 4.6.4 Network card replacement procedure.

1. To restore access to the iSCSI connection interface, perform the following.

   a. Confirm the state of multiple path by DM-MP (*1) or EMPD (*2).

   b. Use the iscsiadm command to log in to the path (iqn) through which the replacement iSCSI card is routed, and reconnect the session.
   Example which confirms the state of session before connecting:

```
# /sbin/iscsiadm -m session
tcp: [1] 192.168.1.64:3260,1 iqn.2000-
```

```
09.com.fujitsu:storage-system.eternus-
dx400:00001049.cm0ca0p0
```

Example which login path going through a NIC to be replaced:

```
# /sbin/iscsiadm -m node -T iqn.2000-09.com.fujitsu:storage-
system.eternus-dx400:00001049.cm1ca0p0 -p 192.168.2.66:3260
–-login
```

c. Use the iscsiadm command to confirm that the target session has been activated.
Example which confirms the state of session after connecting

```
# /sbin/iscsiadm -m session
tcp: [1] 192.168.1.64:3260,1 iqn.2000-
09.com.fujitsu:storage-system.eternus-
dx400:00001049.cm0ca0p0
tcp: [3] 192.168.2.66:3260,3 iqn.2000-
09.com.fujitsu:storage-system.eternus-
dx400:00001049.cm1ca0p0
```

d. You can confirm the activation of sessions on multipath products using DM-MP or ETERNUS multidriver.
*1: Write down the DM-MP display contents at the session activation.
Example of DM-MP display before connecting path

```
# /sbin/multipath -ll
mpath1 (36000b5d0006a0000006a104900000000) dm-0
FUJITSU,ETERNUS_DX400
[size=50G][features=0][hwhandler=0][rw]
¥_ round-robin 0 [prio=1][active]
 ¥_ 3:0:0:0 sdb 8:16  [active][ready]
```

Example of DM-MP display after connecting path

```
# /sbin/multipath -ll
mpath1 (36000b5d0006a0000006a104900000000) dm-0
FUJITSU,ETERNUS_DX400
[size=50G][features=0][hwhandler=0][rw]
¥_ round-robin 0 [prio=2][enabled]
 ¥_ 3:0:0:0 sdb 8:16  [active][ready]
 ¥_ 5:0:0:0 sdc 8:32  [active][ready]
```

*2: See the ETERNUS Multipath Driver User's Guide (For Linux).

4.7 Hot Addition of PCI Express cards

This section describes the PCI Express card addition procedure with the PCI Hot Plug function.
The procedure includes common steps for all PCI Express cards and the additional steps required for a specific card function or driver.
Thus, the descriptions cover both the common operations required for all cards (e.g., power supply operations) and the specific procedures required for certain types of card. For details on addition of the cards not described in this section, see the respective product manuals.
There are two ways to perform PCI hot plug:

- Operation by using sysfs
- Operation by using dr commands

You can perform the operation by using dr commands if Dynamic Reconfiguration utility is installed in the partition. If not, be sure to use the operation by using sysfs. Although you can perform the operation by using sysfs even if Dynamic Reconfiguration utility is installed in the partition, it is recommended to perform the operation by using dr commands to prevent wrong operation.
Hereafter, description about the operation by using dr commands starts at ‘For the partition with Dynamic Reconfiguration utility installed’ and description about the operation by sysfs starts at ‘For the partition without Dynamic Reconfiguration utility installed’.
Notes

- If you hot add PCI Express cards into an IOU, see ‘4.4 Hot add of IOU’.

- If the Extended Partitioning is enabled, dr command is not supported for PCI Express card hot replacement.

4.7.1 Common addition procedures for all PCI Express cards

1. Performing the required operating system and software operations depending on the PCI card type
2. Confirming that the PCI Express slot power is off
3. Adding a PCI card
   This step is performed by the field engineer in charge of your system.
4. Powering on a PCI Express slot.
5. Performing the required operating system and software operations depending on the PCI card type

Notes
This section describes instructions for the operating system and subsystems (e.g., commands, configuration file editing). Be sure to refer to the respective product manuals to confirm the command syntax and impact on the system before performing tasks with those instructions.
The following sections describe card addition with the required instructions (e.g., commands, configuration file editing) for the operating system and subsystems, together with the actual hardware operations. Step 3 is performed by the field engineer in charge of your system.

4.7.2 PCI Express card addition procedure in detail

This section describes operations that must be performed in the PCI Express card addition procedure.

Confirming the slot number of a PCI Express slot

See ‘Confirming the slot number of a PCI Express slot’ in “4.6.2 PCI Express card replacement procedure in detail”.

Checking the power status of a PCI Express slot

See ‘Checking the power status of a PCI Express slot’ in “4.6.2 PCI Express card replacement procedure in detail”.

Powering on and off PCI Express slots

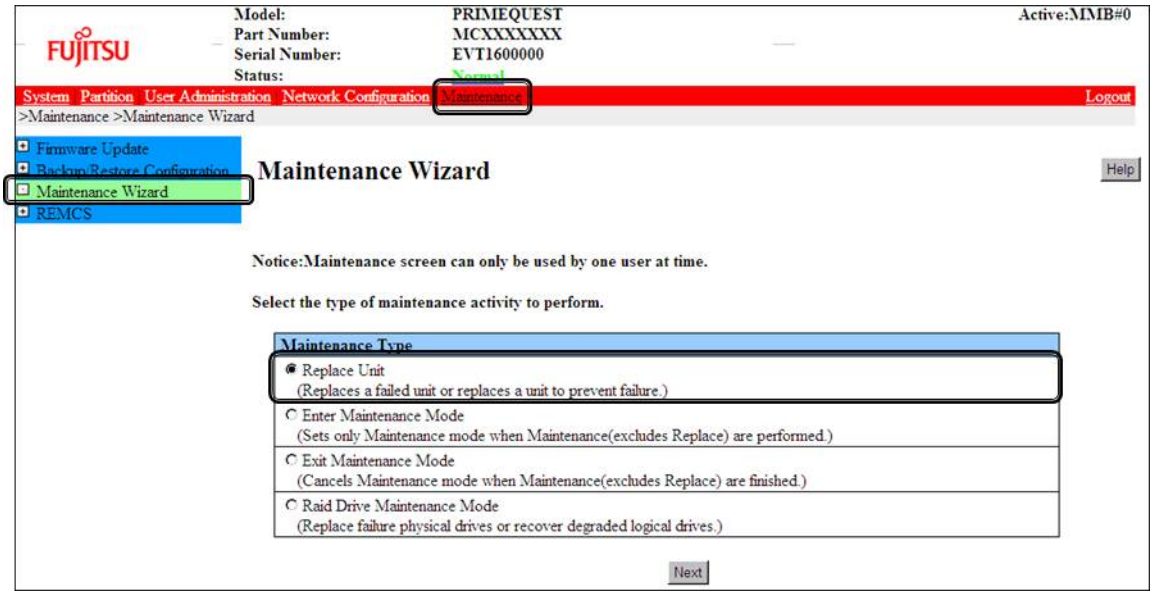
See ‘Powering on and off PCI Express slots’ in “4.6.2 PCI Express card replacement procedure in detail”.

Operation for Hot add of PCI Express card by Maintenance Wizard

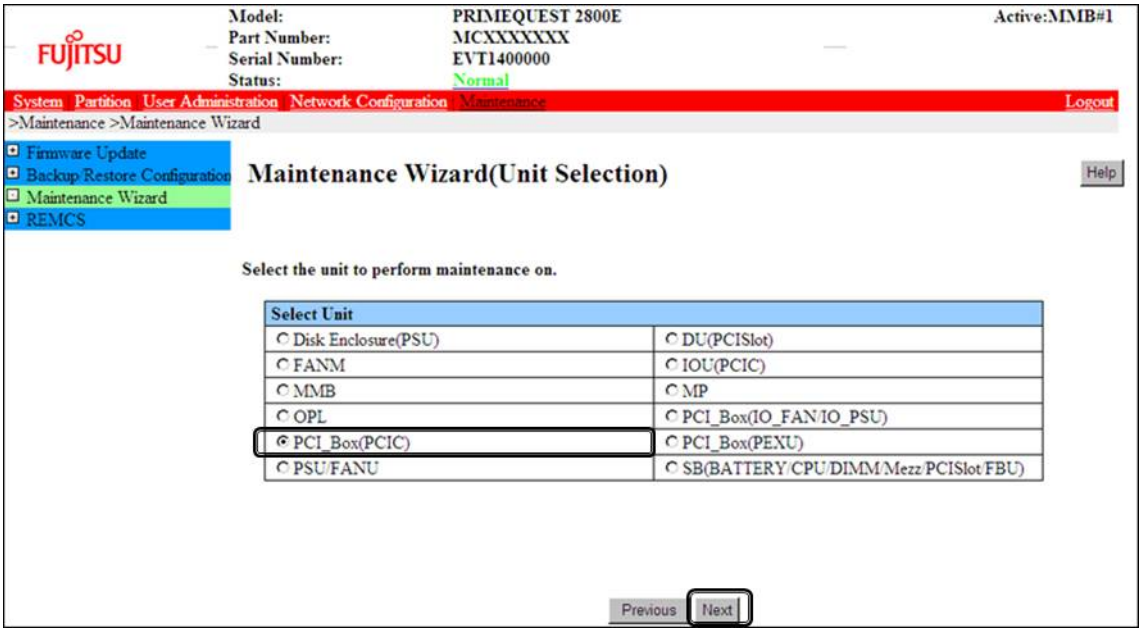
This item describes Operation for Hot add of PCI Express card (PCIC) by Maintenance Wizard.
Below works are performed by the field engineer in charge of your system.

1. Start [Maintenance Wizard] menu by MMB Web-UI and display [Maintenance Wizard] view.

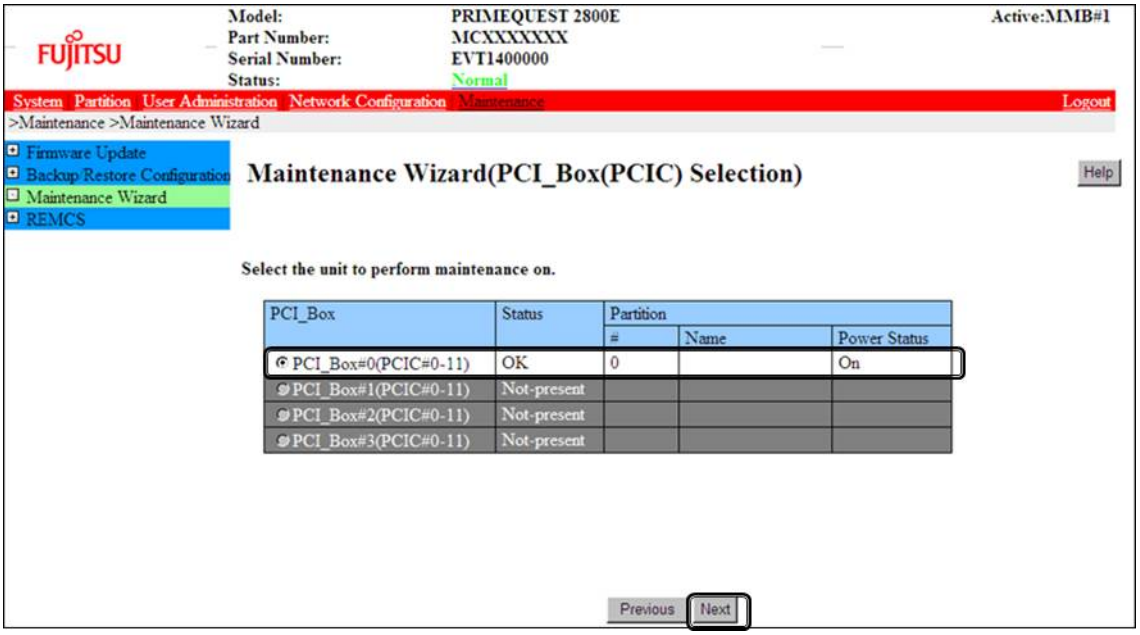
2. Select [Replace Unit] and click [Next].



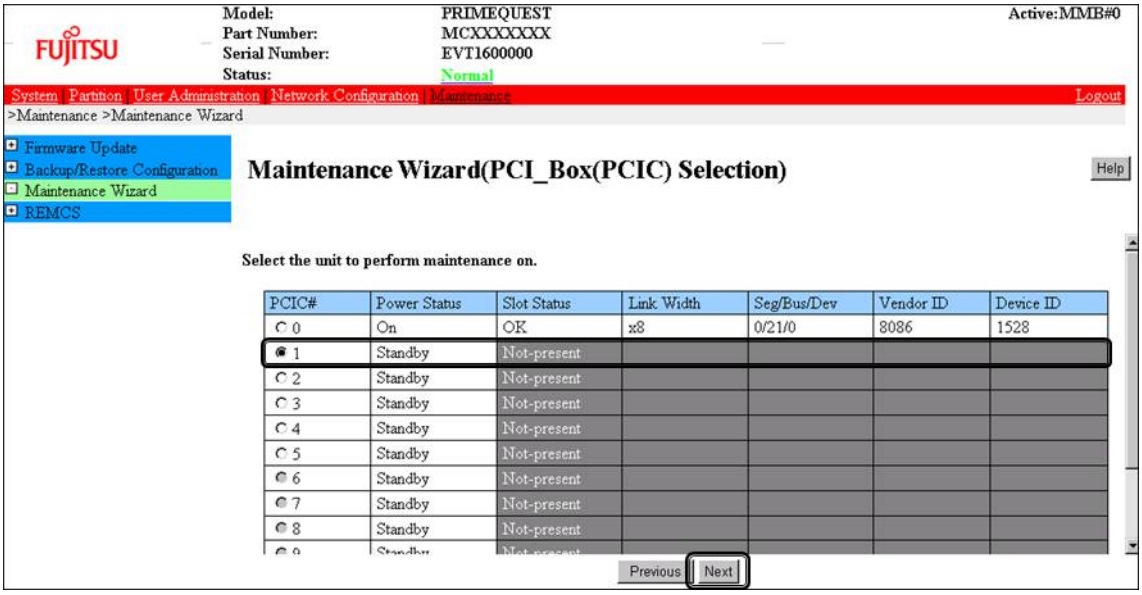
3. Select [PCI_Box(PCIC)], click [Next].



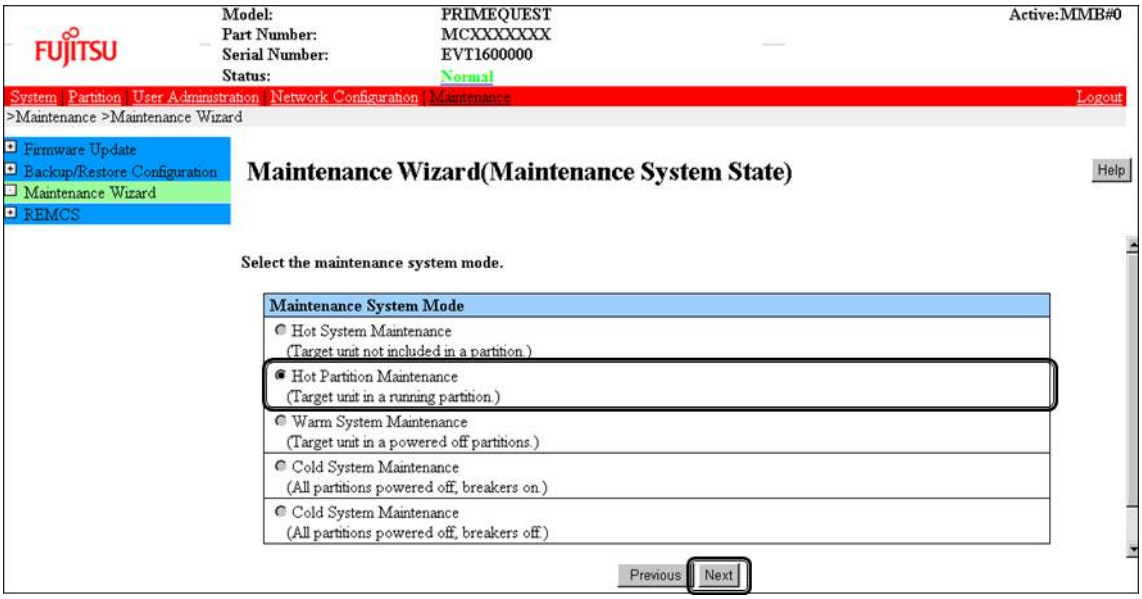
4. Select the radio button of PCI_Box with the particular number, click [Next]
   Example of operation for hot replacing PCI Express card of PCIC#1 mounted on PCI_Box#0



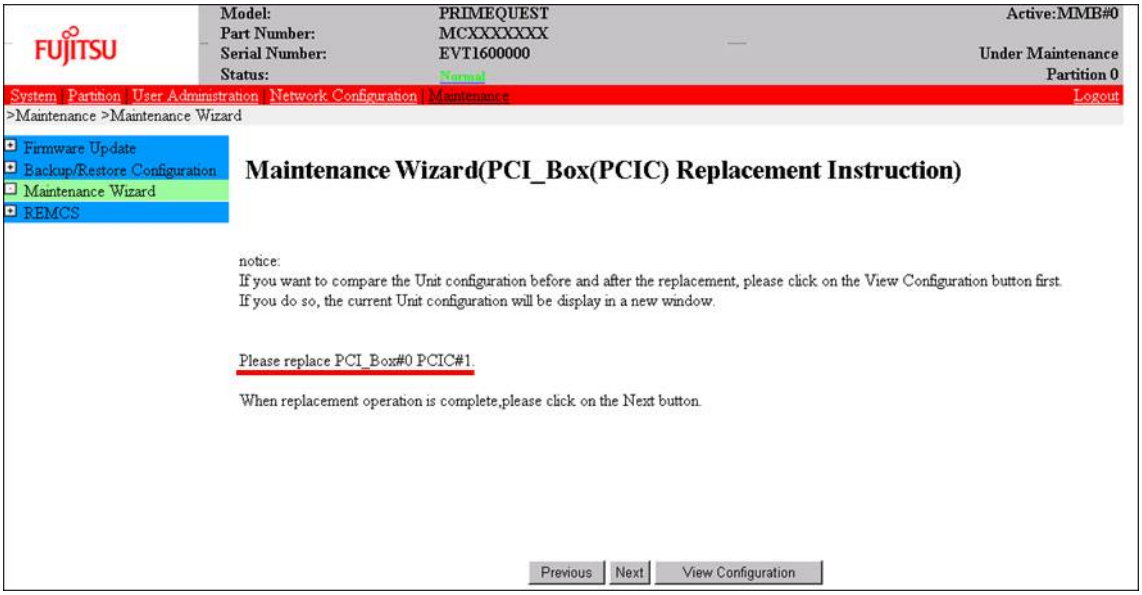
5. Select the radio button of the particular PCIC number and click [Next]



6. Select [Hot Partition Maintenance (Target unit in a running partition.)] and click [Next]



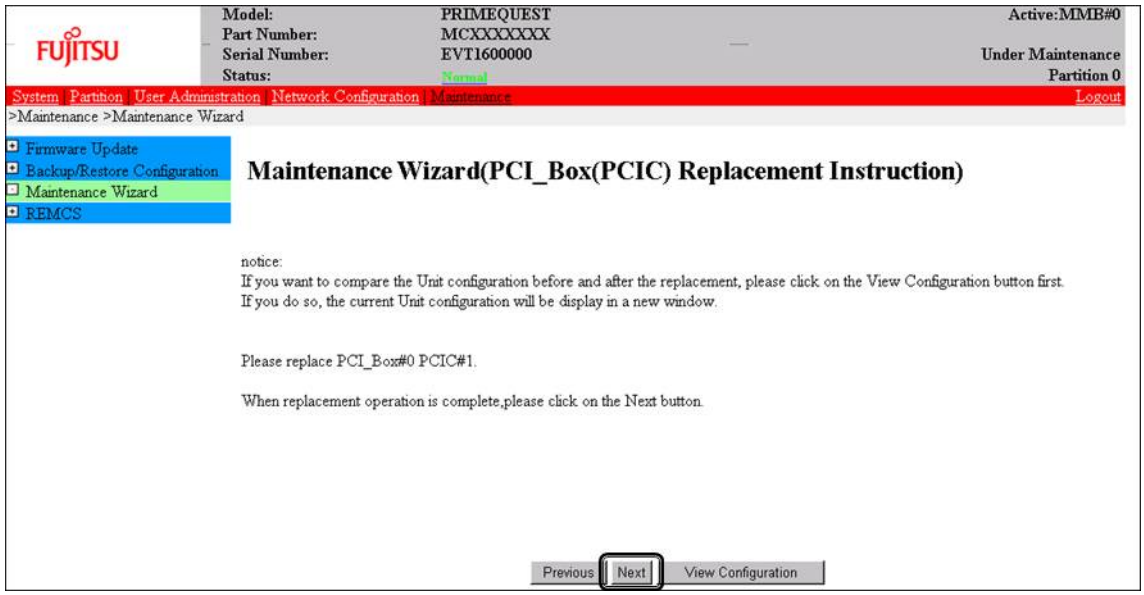
7. Maintenance mode is set (with information area of MMB Web-UI gray out) and then replacement instruction for the particular PCIC appears. Add a new PCI Express card with this window displayed. See the figure in 'B.1 Physical Mounting Locations of Components' to confirm the location of the PCI Express card to be replaced.



Note
Do NOT click [Next] until adding the PCIC.

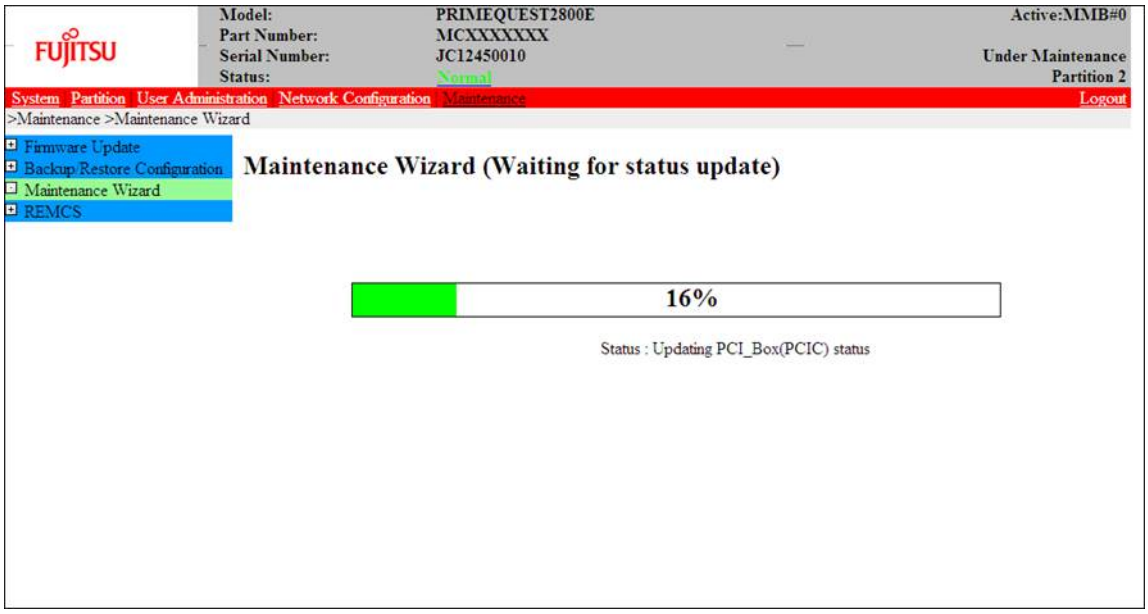
8. After adding the particular PCIC, mount cables other than LAN cables.
Note
In GLS configuration with NIC switching way, mount also LAN cables.

9. Powering on the particular PCIC slot, click [Next].
   For how to power on the PCIC slot, see “Powering on and off PCI Express slots” in “4.6.2 PCI Express card replacement procedure in detail”.
   It is the administrator of your system who power on the PCI Express slot.

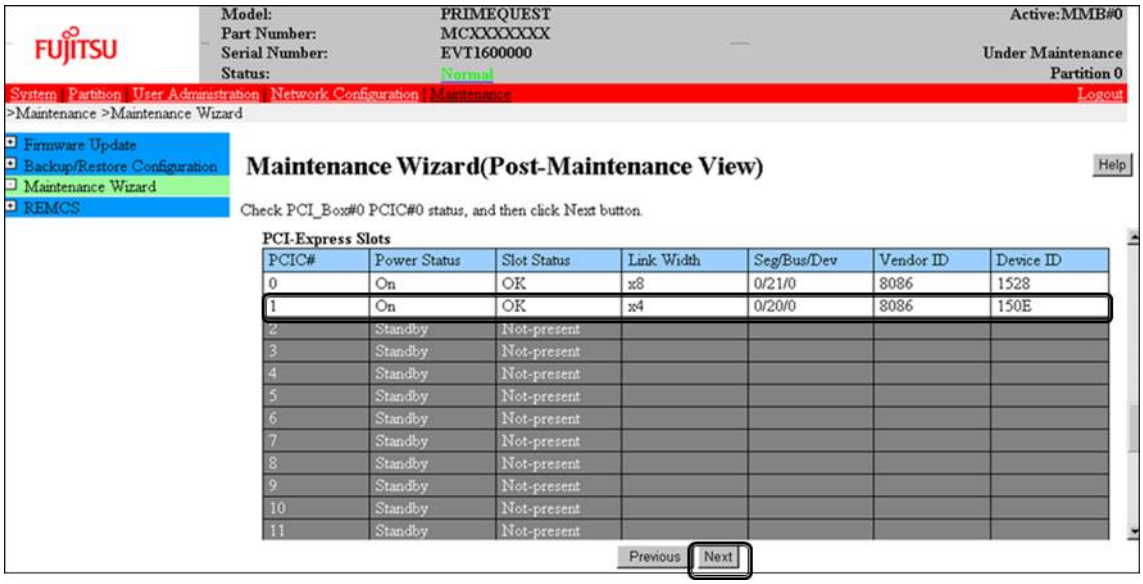


Note
Ask the administrator of your system to power on the PCI Express slot.

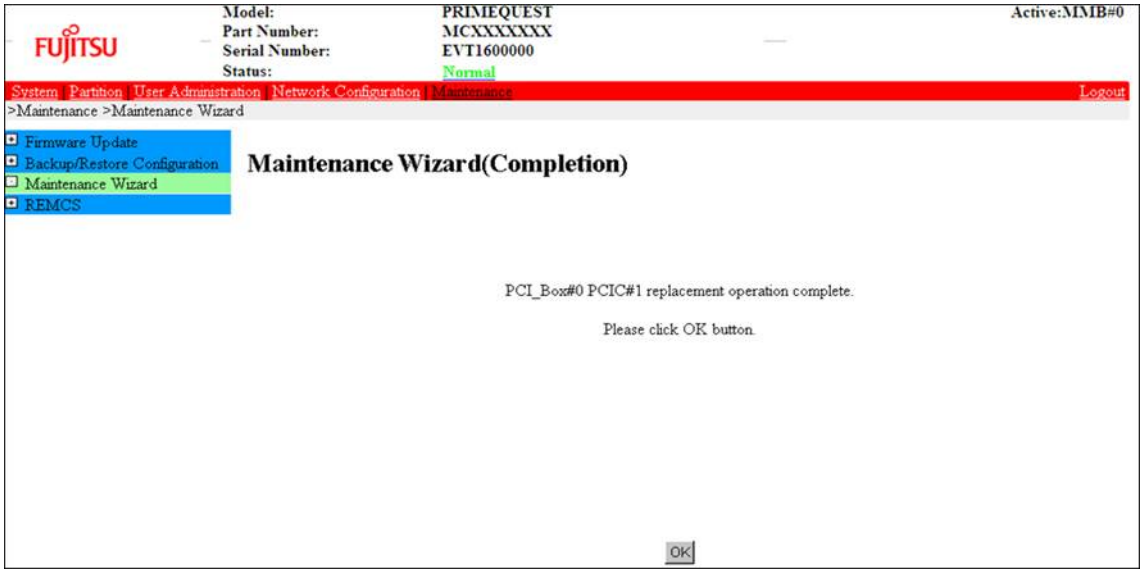
10. The window updating status appears.



11. Check the status of added PCIC and click [Next].



12. Confirm that maintenance mode has been released (with information area of MMB Web-UI not gray out) and click [Next].



4.7.3 FC card (Fibre Channel card) addition procedure

The descriptions in this section assume that an FC card is being added.
Notes

- The FC card used for SAN boot does not support hot plugging.
- Although you can hot replace FC card used for dump device of sadump, collecting dump of memory fails until reconfiguring HBA UEFI or extended BIOS with the partition inactive after replacing the FC card.
- This section does not cover configuration changes in peripherals (e.g., UNIT addition or removal for a SAN disk device).
- This manual does not describe how to change the configuration of peripherals such as expanding and removing the unit of SAN disk device.
- To prevent a device name mismatch due to the failure, addition, removal, or replacement of an FC card, access the SAN disk unit by using the by-id name (/dev/disk/by-id/...) for the device name.

- If all the paths in a mounted disk become hidden when an FC card is hot replaced, unmount the disk. Then, execute PCI hot plug.

FC card addition procedure

The procedure for adding new FC cards and peripherals is as follows.

1. Confirm the slot number of the PCI slot by using the following procedure.
   See 'Confirming the slot number of a PCI Express slot' in "4.6.2 PCI Express card replacement procedure in detail".
2. Confirm that power status of the PCI Express slot is off.
   See 'Checking the power status of a PCI Express slot' in "4.6.2 PCI Express card replacement procedure in detail".
3. Physically add the target card by using MMB Maintenance Wizard.
   For details on the operation of replacement, see step 1 to 7 of 'Operation for Hot replacement of PCI Express card by Maintenance Wizard' in "4.7.2 PCI Express card addition procedure in detail".
4. Reconfigure the peripheral according to its manual.
   For example, suppose that the storage device used is ETERNUS and that the host affinity function is used (to set the access right for each server). Their settings would need to be changed as a result of FC card replacement.
5. Connect the FC card cable.
6. Power on the PCI Express slot.
   See 'Powering on and off PCI Express slots' in "4.6.2 PCI Express card replacement procedure in detail".
7. Check whether there is an error in added FC card by MMB Maintenance Wizard.
   This step is performed by the field engineer in charge of your system.
   For details on the operation of replacement, see step 8 to 11 of 'Operation for Hot replacement of PCI Express card by Maintenance Wizard' in "4.7.2 PCI Express card addition procedure in detail".
8. Check the version of the firmware
   It is required that the firmware version of new FC card is same as the FC card which had been replaced.
   If the firmware version of new FC card is same as the FC card which had been replaced (current firmware version), it is not necessary to update the firmware version of new FC card to current firmware version.
   If the firmware version of new FC card is not same as the FC card which had been replaced (current firmware version), update the firmware version of new FC card to current firmware version.
   For how to update the firmware version, see Firmware update manual for fibre channel card.
   Note
   If you cannot confirm the firmware version of the FC card before replacing due to the fault of the FC card, check the firmware version of the FC card which is same type as the faulty one to update firmware version.
9. Confirm the incorporation results
   The method of confirming is the same as that is performed in the replacement of FC card. See 'Confirming the FC card incorporation results' in '4.6.3 FC card (Fibre Channel card) replacement procedure'.

4.7.4 Network card addition procedure

NIC (network card) addition using hot plugging needs specific processing before and after PCI slot power-on or power-off. Its procedure also includes the common PCI Express card addition procedure.
The procedure describes operations where a single NIC is configured as one interface. It also describes cases where multiple NICs are bonded together to configure one interface (bonding configuration). For bonding multiple NIC by using PRIMECLUSTER Global Link Services (GLS), see manual of PRIMECLUSTER Global Link Services.

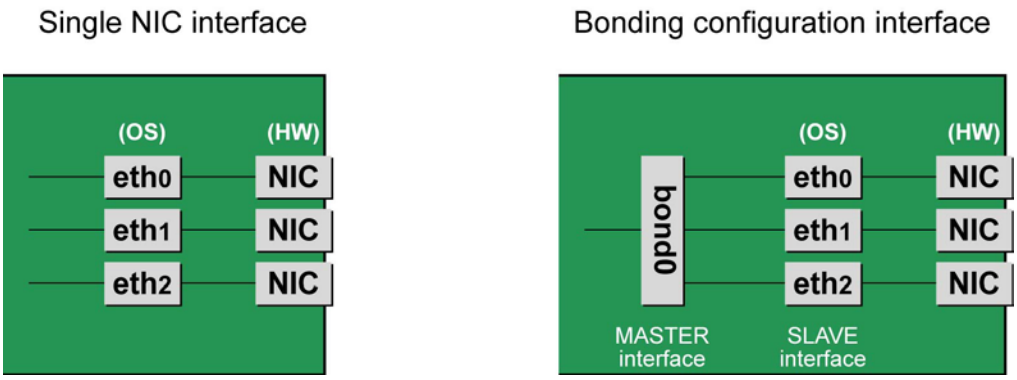


FIGURE 4.4 Single NIC interface and bonding configuration interface

NIC addition procedure

This section describes the procedure for hot plugging only a network card.

Note

When adding multiple NICs, be sure to add them one by one. If you do this with multiple cards at the same time, the correct settings may not be made.

1. Confirm the existing interface names.
   To confirm the interface names, execute the following command.
   Example: eth0 is the only interface on the NIC.

```
# /sbin/ifconfig -a
eth0  Link encap:Ethernet HWaddr 00:0E:0C:70:C3:38
BROADCAST MULTICAST MTU:1500 Metric:1
RX packets:0 errors:0 dropped:0 overruns:0 frame:0
TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:1000
RXbytes:0 (0.0 b) TX bytes:0 (0.0 b)

Lo  Link encap:Local Loopback
inet addr:127.0.0.1 Mask:255.0.0.0
UP LOOPBACK RUNNING MTU:16436 Metric:1
RX packets:0 errors:0 dropped:0 overruns:0 frame:0
TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:0
RXbytes:0 (0.0 b) TX bytes:0 (0.0 b)
```

2. Confirm the slot number of the PCI Express slot by using the following procedure.
   See ‘Confirming the slot number of a PCI Express slot’ in “4.6.2 PCI Express card replacement procedure in detail”.

3. Confirm that power status of the PCI Express slot
   See ‘Checking the power status of a PCI Express slot’ in “4.6.2 PCI Express card replacement procedure in detail”.

4. Physically add the target NIC by using MMB Maintenance Wizard.
   For details on the operation of replacement, see step 1 to 7 of ‘Operation for Hot replacement of PCI Express card by Maintenance Wizard’ in “4.7.2 PCI Express card addition procedure in detail”
   This step is performed by the field engineer in charge of your system.

5. Power on the PCI Express slot.
   See ‘Powering on and off PCI Express slots’ in “4.6.2 PCI Express card replacement procedure in detail”.

6. Check whether there is an error in added FC card by MMB Maintenance Wizard.
   This step is performed by the field engineer in charge of your system.
   For details on the operation of replacement, see step 8 to 11 of ‘Operation for Hot replacement of PCI Express card by Maintenance Wizard’ in “4.7.2 PCI Express card addition procedure in detail”.

7. Confirm the newly added interface name.
   Powering on the slot creates an interface (ethX) for the added NIC. Execute the following command.
   Compare its results with those of step 1 to confirm the created interface name.

```
# /sbin/ifconfig –a
```

8. Confirm the hardware address of the newly added interface.
   Confirm the hardware address (HWaddr) and the created interface by executing the ifconfig command.
   For a single NIC with multiple interfaces, confirm the hardware addresses of all the created interfaces.
   Example: eth1 is a new interface created for the added NIC.

```
# /sbin/ifconfig -a
eth0  Link encap:Ethernet HWaddr 00:0E:0C:70:C3:38
BROADCAST MULTICAST MTU:1500 Metric:1
RX packets:0 errors:0 dropped:0 overruns:0 frame:0
TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:1000
RXbytes:0 (0.0 b) TX bytes:0 (0.0 b)

eth1  Link encap:Ethernet HWaddr 00:0E:0C:70:C3:40
BROADCAST MULTICAST MTU:1500 Metric:1
RX packets:0 errors:0 dropped:0 overruns:0 frame:0
TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:1000
RXbytes:0 (0.0 b) TX bytes:0 (0.0 b)

lo  Link encap:Local Loopback
inet addr:127.0.0.1 Mask:255.0.0.0
UP LOOPBACK RUNNING MTU:16436 Metric:1
RX packets:0 errors:0 dropped:0 overruns:0 frame:0
TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:0
RXbytes:0 (0.0 b) TX bytes:0 (0.0 b)
```

9. Create an interface configuration file.
   Create an interface configuration file (/etc/sysconfig/network-scripts/ifcfg-ethX) for the newly created interface as follows. In "HWADDR," set the hardware address confirmed in step 8.
   If multiple NICs are added or if a NIC where multiple interfaces exist is added, create a file for all the interfaces.

   The explanation here assumes, as an example, that a name automatically assigned by the system is used. To install a new interface, you can use a new interface name different from the one automatically assigned by the system. Normally, there is no requirement on the name specified for a new interface. To use an interface name other than the one automatically assigned by the system, follow the instructions in step 14 of the 'NIC replacement procedure' in '4.6.4 Network card replacement procedure'.

   The contents differ slightly depending on whether the interface is a single NIC interface or a SLAVE interface of the bonding configuration.
   [For a single NIC interface]

```
(Example)
DEVICE=eth1             <- Specified interface name
confirmed in step g
NM_CONTROLLED=no
BOOTPROTO=static
HWADDR=00:0E:0C:70:C3:40
BROADCAST=192.168.16.255
IPADDR=192.168.16.1
NETMASK=255.255.255.0
NETWORK=192.168.16.0
ONBOOT=yes
TYPE=Ethernet
```

   [SLAVE interface of the bonding configuration]

```
(Example)
DEVICE=eth1             <- Specified interface name
confirmed in step g
NM_CONTROLLED=no
BOOTPROTO=static
HWADDR=00:0E:0C:70:C3:40
MASTER=bondY
SLAVE=yes
```

```
ONBOOT=yes
```

Note
Adding the bonding interface itself also requires the MASTER interface configuration file of the bonding configuration.

10. To add a bonding interface, configure the bonding interface driver settings.
    If the bonding interface has already been installed, execute the following command to check the descriptions in the configuration file and confirm the setting corresponding to the bonding interface and driver.
    Example: Description in /etc/modprobe.d/bonding.conf

```
# grep -l bonding /etc/modprobe.d/*
/etc/modprobe.d/bonding.conf
```

    Note
    If the configuration file is not found or if you are performing an initial installation of the bonding interface, create a configuration file with an arbitrary file name with the ".conf" extension (e.g., /etc/modprobe.d/bonding.conf) in the /etc/modprobe.d directory).
    After specifying the target configuration file, add the setting for the newly created bonding interface.

```
alias bondY bonding      <- Add (bondY: Name of the newly
added bonding interface)
```

    You can specify options of the bonding driver in this file. Normally, the BONDING_OPTS line in each ifcfg- bondY file is used. Options can be specified to the bonding driver.

11. Activate the added interface.
    Execute the following command to activate the interface. Activate all the necessary interfaces. The activation method depends on the configuration.
    [For a single NIC interface]
    Execute the following command to activate the interface. Activate all the necessary interfaces.

```
# /sbin/ifup ethX
```

    [For the bonding configuration]
    For a SLAVE interface added to an existing bonding configuration, execute the following command to incorporate it into the bonding configuration.
    Example: bondY is the bonding interface name, and ethX is the name of the interface to be incorporated.

```
# /sbin/ifenslave bondY ethX
```

    For a newly added bonding interface with a SLAVE interface, execute the following command to activate the interfaces. You need not execute the ifenslave command individually for the SLAVE interface.

```
# /sbin/ifup bondY
```

12. Mount all cables connected to the particular PCIC.
    This step is performed by the field engineer in charge of your system.
    Note
    In GLS configuration with NIC switching way, you do not need to perform this step.

4.8 Removing PCI Express cards

This section describes the PCI Express card removal procedure with the PCI Hot Plug function.
The procedure includes common steps for all PCI Express cards and the additional steps required for a specific card function or driver.
Thus, the descriptions cover both the common operations required for all cards (e.g., power supply operations) and the specific procedures required for certain types of card. For details on removal of the cards not described in this section, see the respective product manuals.
There are two ways to perform PCI hot plug:

- Operation by using sysfs
- Operation by using dr commands

You can perform the operation by using dr commands if Dynamic Reconfiguration utility is installed in the partition. If not, be sure to use the operation by using sysfs. Although you can perform the operation by using sysfs even if Dynamic Reconfiguration utility is installed in the partition, it is recommended to perform the operation by using dr commands to prevent wrong operation.

Hereafter, description about the operation by using dr commands starts at ‘For the partition with Dynamic Reconfiguration utility installed’ and description about the operation by sysfs starts at ‘For the partition without Dynamic Reconfiguration utility installed’.

Note

- If you hot remove PCI Express cards from an IOU, see ‘4.5 IOU hot remove’.
- In hot removal of PCI Express cards, if you reboot the partition on OS without hot adding new PCI card to same PCI Express slot after you performed hot remove command, you cannot hot add a PCI Express card to the PCI Express slot unless you power off the partition.
  If you reboot the partition on OS before hot adding, you must power off the partition and replace the PCI Express card.
- If the Extended Partitioning is enabled, dr command is not supported for PCI Express card hot replacement.

4.8.1 Common removal procedures for all PCI Express cards

1. Performing the required operating system and software operations depending on the PCI Express card type
2. Powering off a PCI slot
3. Removing a PCI Express card
4. Performing the required operating system and software operations depending on the PCI Express card type

Note

This section describes instructions for the operating system and subsystems (e.g., commands, configuration file editing). Be sure to refer to the respective product manuals to confirm the command syntax and impact on the system before performing tasks with those instructions.
The following sections describe card removal with the required instructions (e.g., commands, configuration file editing) for the operating system and subsystems, together with the actual hardware operations. Step 3 is performed by the field engineer in charge of your system.

4.8.2 PCI Express card removal procedure in detail

This section describes operations that must be performed in the PCI Express card removal procedure.

Preparing the software using a PCI Express card

See ‘Preparing the software using a PCI Express card’ in “4.6.2 PCI Express card replacement procedure in detail”.

Confirming the slot number of a PCI Express slot

See ‘Confirming the slot number of a PCI Express slot’ in “4.6.2 PCI Express card replacement procedure in detail”.

Checking the power status of a PCI Express slot

See ‘Checking the power status of a PCI Express slot’ in “4.6.2 PCI Express card replacement procedure in detail”.

Powering off PCI Express slots

See ‘Powering on and off PCI Express slots’ in “4.6.2 PCI Express card replacement procedure in detail”.

4.8.3 FC card (Fibre Channel card) removal procedure

The descriptions in this section assume that an FC card is being removed.

Notes

- The FC card used for SAN boot does not support hot plugging.
- This manual does not describe how to change the configuration of peripherals such as expanding and removing the unit of SAN disk device.

FC card removal procedure

The procedure for removing an FC card and peripherals is as follows.

1. Make the necessary preparations.
   Stop access to the FC card by stopping applications or by other such means.
2. Confirm the slot number of the PCI slot by using the following procedure.
   See 'Confirming the slot number of a PCI Express slot' in "4.6.2 PCI Express card replacement procedure in detail".
3. Power off the PCI Express slot.
   See 'Powering on and off PCI Express slots' in "4.6.2 PCI Express card replacement procedure in detail".
4. After taking off all cables connected to the target card, physically remove the target card.

4.8.4 Network card removal procedure

Network card (referred to as NIC below) removal using hot plugging needs specific processing before and after PCI slot power-on or power-off. Its procedure also includes the common PCI Express card removal procedure.
The procedure describes operations where a single NIC is configured as one interface. It also describes cases where multiple NICs are bonded together to configure one interface (bonding configuration). For bonding multiple NIC by using PRIMECLUSTER Global Link Services (GLS), see manual of PRIMECLUSTER Global Link Services.

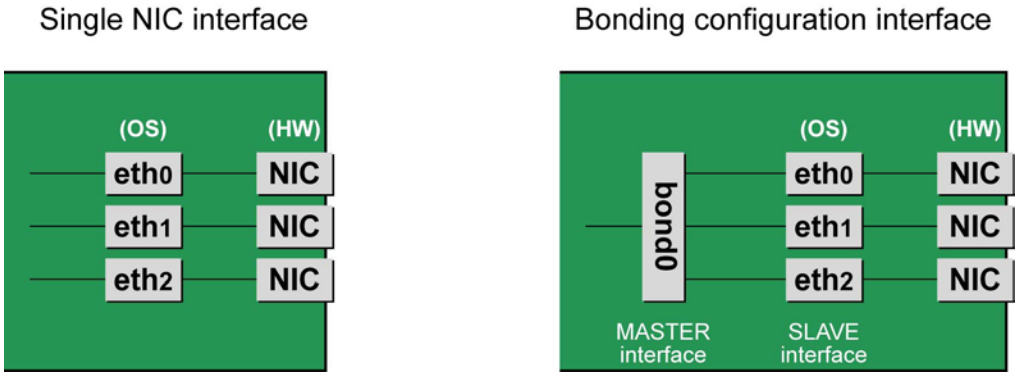


FIGURE 4.5 Single NIC interface and bonding configuration interface

NIC removal procedure

This section describes the procedure for hot plugging only a network card.
Note
When removing multiple NICs, be sure to remove them one by one. If you do this with multiple cards at the same time, the correct settings may not be made.

1. Confirm the slot number of the PCI slot that has the mounted interface.
   Confirm the interface mounting location through the configuration file information and the operating system information.
   First, confirm the bus address of the PCI slot that has the mounted interface to be removed.

```
# ls -l /sys/class/net/eth0/device
lrwxrwxrwx 1 root root 0 Sep 29 09:26 /sys/class/net ¥
/eth0/device
->../../../0000:00:01.2/0000:08:00.2/0000:0b:01.0
```

   The ¥ at the end of a line indicates that there is no line feed.

   Excluding the rest of the directory path, check the part corresponding to the file name in the symbolic link destination file of the output results. In the above example, the underlined part shows the bus address. ("0000:0b:01" in the example)

   Next, check the PCI slot number for this bus address.

```
# grep -il 0000:0b:01 /sys/bus/pci/slots/*/address
/sys/bus/pci/slots/20/address
```

Read the output file path as shown below, and confirm the PCI slot number.

```
/sys/bus/pci/slots/<slot number>/address
```

Notes
If the above file path is not output, it indicates that the NIC is not mounted in a PCI slot (e.g., GbE port in the IOU).

With the PCI slot number confirmed here, see 'D.2 Correspondence between PCI Slot Mounting Locations and Slot Numbers' to check the mounting location, and see also 'B.1 Physical Mounting Locations of Components' to identify the physical mounting location corresponding to the PCI slot number. You can confirm that it matches the mounting location of the operational target NIC.

2. Confirm each interface on the same NIC.
If the NIC has multiple interfaces, you need to remove all of them. Confirm that all the interfaces that have the same bus address in a subsequent command.

```
# ls -l /sys/class/net/*/device | grep "0000:0b:01"
lrwxrwxrwx 1 root root 0 Sep 29 09:26 /sys/class/net ¥
/eth0/device
->../../../0000:00:01.2/0000:08:00.2/0000:0b:01.0
lrwxrwxrwx 1 root root 0 Sep 29 09:26 /sys/class/net ¥
/eth1/device
->../../../0000:00:01.2/0000:08:00.2/0000:0b:01.1
```

The ¥ at the end of a line indicates that there is no line feed.
As the above example shows, when more than one interface is displayed, they are on the same NIC.

3. Execute the higher-level application processing required before NIC removal.
Stop all access to the interface as follows. Stop the application that was confirmed in step 2 as using the interface, or exclude the interface from the target of use by the application.

4. Deactivate the NIC.
Execute the following command to deactivate all the interfaces that you confirmed in step 2.
The applicable command depends on whether the target interface is a single NIC interface or the SLAVE interface of a bonding device.

[For a single NIC interface]

```
# /sbin/ifdown ethX
```

If the single NIC interface has a VLAN device, you also need to remove the VLAN interface. Perform the following operations. (These operations precede deactivation of the physical interface.)

```
# /sbin/ifdown ethX.Y
# /sbin/vconfig rem ethX.Y
```

[For the interface under bonding]
If the bonding device is operating in mode 1, use the following steps to exclude SLAVE interface to be replaced from the bonding configuration. In any other mode, removing it immediately should not cause any problems. Confirm that the SLAVE interface is the interface currently being used for communication.

```
# cat /sys/class/net/bondY/bonding/active_slave
```

If the displayed interface name corresponds to the SLAVE interface to be removed, execute the following command to switch to communicating now with the other SLAVE interface.

```
# /sbin/ifenslave -c bondY ethZ
(ethZ: bondY-configured interface not subject to hot
replacement)
```

Finally, remove the SLAVE interface being replaced, from the bonding configuration. Immediately after being removed, the interface is automatically no longer used.

```
# /sbin/ifenslave -d bondY ethX
```

To remove the interfaces, including the bonding device, deactivate them collectively by executing the following command.

```
# /sbin/ifdown bondY
```

5. Power off the PCI slot.
See 'Powering on and off PCI Express slots' in "4.6.2 PCI Express card replacement procedure in detail".

6. After taking of all cables connected to the NIC, remove the NIC from the PCI Express slot.

7. Remove the interface configuration file.
   Delete the configuration files of all the interfaces confirmed in step 2, by executing the following command.

```
# rm /etc/sysconfig/network-scripts/ifcfg-ethX
```

   When deleting a bonding device, also delete the related bonding items (ifcfg-bondY files).

8. Edit the settings in the udev function rule file.
   The entries of the interface assigned to the removed NIC still remain in the udev function rule file, /etc/udev/ rules.d/70-persistent-net.rules. Leaving the entries will affect the determination of interface names for replacement cards or added cards in the future. For this reason, delete or comment out those entries.
   The following example shows editing of the udev function rule file, /etc/udev/rules.d/70-persistent-net.rules. (In this example, the file is edited when the eth10 interface is removed.)
   [Example of descriptions in the file before editing]

```
SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*", ¥
ATTR{address}=="00:0e:0c:70:c3:38", ATTR{type}=="1", ¥
KERNEL=="eth*", NAME="eth0"
 :
 :
SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*", ¥
ATTR{address}=="00:0e:0c:70:c3:40", ATTR{type}=="1", ¥
KERNEL=="eth*", NAME="eth10"
```

   The ¥ at the end of a line indicates that there is no line feed.

   [Example of descriptions in the file after editing]
   The entries for the eth10 interface are commented out.

```
SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*", ¥
ATTR{address}=="00:0e:0c:70:c3:38", ATTR{type}=="1", ¥
KERNEL=="eth*", NAME="eth0"
 :
 :
# SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*", ¥
ATTR{address}=="00:0e:0c:70:c3:40", ATTR{type}=="1", ¥
KERNEL=="eth*", NAME="eth10"
```

   The ¥ at the end of a line indicates that there is no line feed.
   Do this editing for all the interfaces confirmed in step 2.

9. Reflect the udev function rules.
   Since rules are not automatically reflected in udev at the removal time, take action to reflect the new rules in udev.

```
# udevadm control --reload-rules
```

10. If the removed interface includes any bonding interface, delete the driver setting of the interface.
    When removing a bonding interface, be sure to delete the setting corresponding to the bonding interface and driver. Execute the following command to check the descriptions in the configuration file, and confirm the setting corresponding to the bonding interface and driver.

    Example: Description in /etc/modprobe.d/bonding.conf

```
# grep -l bonding /etc/modprobe.d/*

/etc/modprobe.d/bonding.conf
```

    Edit the file that describes the setting, and delete the setting of the removed bonding interface.

```
alias bondY bonding        <- Delete
```

    bondY: Name of the removed bonding interface
    Note
    There are no means to dynamically remove the MASTER interface (bondY) of the bonding configuration. If you want to remove the entire bonding interface, you can disable the bonding configuration and remove all the SLAVE interfaces but the MASTER interface itself remains.

11. Execute the higher-level application processing required after NIC removal.
    Perform the necessary post processing (such as changing application settings or restarting an application) for the operations performed for the higher-level applications in step 3.

4.8.5 Hot removal procedure for iSCSI (NIC)

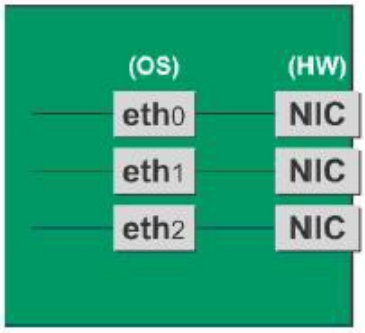
When performing hot replacement of NICs used for iSCSI connection, use the following procedures.

- 4.8.1 Common removal procedures for all PCI Express cards
- 4.8.2 PCI Express card removal procedure in detail
- 4.8.4 Network card removal procedure

A supplementary explanation of the procedure follows.

Prerequisites for iSCSI (NIC) hot removal

- The prerequisites for iSCSI (NIC) hot replacement are as follows.
- The storage connection is established on a multipath using DM-MP (Device-Mapper Multipath) or ETERNUS multidriver (EMPD).
- To replace more than one iSCSI card, one card at a time will be replaced.
- A single NIC is configured as one interface.



Work to be performed before iSCSI (NIC) removal

For iSCSI (NIC) hot replacement, be sure to follow the procedure below when performing Step 3 of the 'NIC removal procedure' in '4.8.4 Network card removal procedure'

1. Perform the work for suppressing access to the iSCSI connection interface.
   a. Confirm the state of multiple path by DM-MP (*1) or EMPD (*2).
   b. Use the iscsiadm command to log out from the path (iqn) through which the iSCSI card to be replaced is routed, and disconnect the session.
      Example which confirms the state of session before disconnecting:

```
# /sbin/iscsiadm -m session
tcp: [1] 192.168.1.64:3260,1 iqn.2000-
09.com.fujitsu:storage-system.eternus-
dx400:00001049.cm0ca0p0
tcp: [2] 192.168.2.66:3260,3 iqn.2000-
09.com.fujitsu:storage-system.eternus-
dx400:00001049.cm1ca0p0
```

      Example which logout path going through a NIC to be replaced:

```
# /sbin/iscsiadm -m node -T iqn.2000-09.com.fujitsu:storage-
system.eternus-dx400:00001049.cm1ca0p0 -p 192.168.2.66:3260
--logout
```

   c. Use the iscsiadm command to confirm that the target session has been disconnected.
      Example which confirms the state of session after disconnecting

```
# /sbin/iscsiadm -m session
tcp: [1] 192.168.1.64:3260,1 iqn.2000-
```

```
09.com.fujitsu:storage-system.eternus-
dx400:00001049.cm0ca0p0
```

d. You can confirm the disconnection of sessions on multipath products using DM-MP or ETERNUS multidriver.
*1: Write down the DM-MP display contents at the session disconnection.
Example of DM-MP display before disconnecting path

```
# /sbin/multipath -ll
mpath1 (36000b5d0006a0000006a104900000000) dm-0
FUJITSU,ETERNUS_DX400
[size=50G][features=0][hwhandler=0][rw]
¥_ round-robin 0 [prio=2][active]
 ¥_ 3:0:0:0 sdb 8:16  [active][ready]
 ¥_ 4:0:0:0 sdc 8:32  [active][ready]
```

Example of DM-MP display after disconnecting path

```
# /sbin/multipath -ll
mpath1 (36000b5d0006a0000006a104900000000) dm-0
FUJITSU,ETERNUS_DX400
[size=50G][features=0][hwhandler=0][rw]
¥_ round-robin 0 [prio=1][enabled]
 ¥_ 3:0:0:0 sdb 8:16  [active][ready]
```

*2: See the ETERNUS Multipath Driver User's Guide (For Linux).

CHAPTER 5 Hot Maintenance in Red Hat Enterprise Linux 7

This chapter describes hot maintenance of System Boards, IOUs and PCI cards in Red Hat Enterprise Linux 7.

5.1 Dynamic Reconfiguration (DR)

This section describes Dynamic Reconfiguration (DR).
DR function has to be enabled by MMB Web-UI and Dynamic Reconfiguration Utility package has to be installed in the partition to perform hot maintenance of SB and IOU. For hot maintenance of PCI Express card, neither Enabling DR function nor installing Dynamic Reconfiguration Utility package has to be always needed.
For the summary of the DR function, applicable rules and corresponding list and restrictions, see '3.2.3 Dynamic Reconfiguration (DR)'.
For details on the MMB Web-UI/CLI, see respective chapters in "*PRIMEQUEST 2000 series Tool Reference*" (CA92344-0539).
For details on the OS CLI, see '5.1 DR command' in "*PRIMEQUEST 2000 series Tool Reference*" (CA92344-0539).

5.1.1 DR function configuration setting

Enable/Disable is set for the DR function of each partition, from Partition->Partition #x->Mode window of MMB Web-UI. If the settings are changed while the target partition is running, the settings will be reflected at the next partition restart. Items for [Dynamic Reconfiguration] of the [Mode] window can be seen below.

FIGURE 5.1 [Mode] window (Dynamic Reconfiguration)

Item		Description
Dynamic Reconfiguration	current status	Setting status of the current DR function (Enable/Disable)
	setting	Dynamic Reconfiguration function Enable/Disable setting -Enable -Disable (Default)

5.1.2 dr Command Package Install/ Uninstall

This section describes the install /uninstall of the dr command package.
To install dr command package, it is necessary to enable DR function on MMB.
The dr command can be applied using the SVIM application wizard. When installing after building the system, procure the package from Fujitsu Web download site, and install following the procedure below.
<Common install /uninstall>
Use FJSVdr-util-RHEL<Version number>-x.x.x-x-x86_64.tar.gz.
The file name for the RHEL7 dr command package is FJSVdr-util-RHEL7-x.x.x-x-x86_64.tar.gz. the following files are stored.

FJSVdr-util/RPMS/FJSVdr-util-RHEL7-x.x.x-x.noarch.rpm
FJSVdr-util/SRPMS/FJSVdr-util-RHEL7-x.x.x-x.noarch.rpm
FJSVdr-util/DOC/README.ja_JP.EUC.txt
FJSVdr-util/DOC/README.ja_JP.SJIS.txt
FJSVdr-util/DOC/README.ja_JP.UTF-8.txt
FJSVdr-util/DOC/README.txt
FJSVdr-util/INSTALL.sh
FJSVdr-util/UNINSTALL.sh

<When installing>
Install FJSVdr-util-RHEL7-x.x.x-x.noarch.rpm using the following procedure.

1. Become super user.

```
$ su -
```

2. Execute INSTALL.sh in the FJSVdr-util directory.
   Depending on the status, the rpm package will be installed or uninstalled.

```
# FJSVdr-util/INSTALL.sh
```

3. Restart the partition.

```
# /sbin/shutdown -r     now
```

<During uninstallation>
Perform the uninstallation using the following procedure.

4. Becomes super user.

```
$ su -
```

5. Execute UNSTALL.s in the FJSVdr-util directory.

```
# FJSVdr-util/UNINSTALL.sh
```

6. Restart the partition.

```
# /sbin/shutdown -r now
```

5.2 Hot add of SB

This section describes the hot add of SB.

5.2.1 Preparing for SB hot add

The preparation flow is described below.

1. Arrange the SBs to be added.
   An SB to be added must require below conditions.
   - The SB to be added and CPU have same product name in the target partition.
   - Two CPUs must be mounted on the SB to be added.
   - For SB hot add, mount the same number of DIMMs in the SB to be added as that in the Home SB of target partition.
2. Check if the configuration of CPU and DIMMs in arranged SBs to be added is the same as the Home SB in the target partition.
3. Insert the arranged SB into a free SB slot.
   This step will be performed by the field engineer in charge of your system.
4. Confirm the installation of the DR function using the following procedure.

a. Check if the size of the dump disk save area is sufficient for the memory capacity to be added. For details on how to estimate the size required, contact the distributor where you purchased your product, or your sales representative.

b. Check if the points/restrictions are clear. For detail, see '3.2.3 Dynamic Reconfiguration (DR)'

5. Check for any errors in the SB to be added.
   Example：How to check from the MMB Web-UI
   a. Open System >SB >SB #n window.
   b. Check if the status of the [Board Information] is 'OK'.
   c. Check if the other statuses displayed in SB #n window are 'OK'.
   d. Open Partition >Partition Configuration window.
   e. Check if the status of the SB for addition is a Free SB or Reserved SB. The number of the SB for adding is noted down.

5.2.2 DR operation in SB hot add

This section describes the operation of the DR, for performing SB hot add.

1. Log into the MMB Web-UI using Administrator privileges.
2. Execute hotadd command.
   Example：When adding SB2 in partition 1.

```
Administrator > hotadd partition 1 SB 2
Are you sure to continue adding SB#2 to partition#1? [Y/N] Y
DR operation start (1/5)
Assigning SB#2 to partition#1 (2/5)
Testing SB#2 (3/5)
Reconfiguring partition#1 (4/5)
Onlining added Memory/CPU (5/5)
Adding SB#2 to Partition#1 has been completed successfully.
Administrator >
```

3. See Operation Log window or perform "show dynamic_reconfiguration status" command and confirm below messages.
   Example：When adding SB2 in partition 1.

   Operation Log window:
   "I_10110 Partition1 : Hot-add SB#2 Completed."

   show dynamic_reconfiguration status:
   "Adding SB#2 to Partition#1, completed"

5.2.3 How to deal with timeout while OS is processing SB hot add

If OS does not finish the process of SB hot add within fixed predetermined time, timeout message "DR sequence timeout: SB hot-add OS failure" is shown on MMB CLI.
It means that DR completion message from OS does not arrive at MMB. In such case, some collaboration programs may hang though DR process is still running on OS. Rebooting the partition is recommended because it is difficult to estimate when the process will be completed.
The process of SB hot add by OS can be mainly divided into three parts. Check /var/log/message, analyzing which process takes a lot of time.

- Pre-process of collaboration program
- Activating added resources
- Post-process of collaboration program

1. Checking pre-process of collaboration program
   Process of below messages in /var/log/messages is pre-process of the collaboration program.

```
Dec 17 00:15:33 xxx dr-util[4457]: INFO : 800 : Detected SB
hot-add
Dec 17 00:15:33 xxx dr-util[4457]: INFO : 801 : Added SB3,
```

```
Node6,7
Dec 17 00:15:33 xxx dr-util[4457]: INFO : 807 : Execute 1
user programs at ADD_PRE timing
...
Dec 17 00:15:34 xxx dr-util[4457]: 10-FJSVdr-util-kdump-
restart : INFO : start
...
Dec 17 00:15:34 xxx dr-util[4457]: 10-FJSVdr-util-kdump-
restart : INFO : result: 0
...
Dec 17 00:15:34 xxx dr-util[4457]: INFO : 808 : Executed
user programs at ADD_PRE timing
```

If “INFO : 808 : Executed user programs at ADD_PRE timing” is not output, pre-process of the collaboration program is delayed. Check which collaboration program takes a lot of time by seeing /var/log/messages and ‘collaboration program name.log’ made in /opt/FJSVdr-util/var/log directory, if any. Acquire the information of the collaboration program which takes a lot of time by below rpm command and ask the Fujitsu engineer about the cause of its delay.

(Example) Checking the developer of the collaboration program “10-FJSVdr-util-kdump-restart”

```
$ rpm -qif /opt/FJSVdr-util/user_command/10-FJSVdr-util-
kdump-restart
...
```

Rebooting the partition is recommended because SB hot add process has been imperfect state.

2. Checking the time for activating added resources
Process of below messages in /var/log/messages is the process of activating added resources.

```
Dec 17 00:15:34 xxx dr-util[4457]: INFO : 802 : Add CPU30-59
(total 30)
Dec 17 00:15:34 xxx dr-util[4457]: INFO : 804 : Add
MEM98304-98559,114688-114943 (total 67108864 kiB)
...
Dec 17 00:15:47 xxx dr-util[4457]: INFO : 809 : Added SB3
```

If “INFO : 809 : Added SBX” is not output, process of activating added resources is delayed. Check that the process of adding CPU or memory is performed by executing below command at several seconds.

- Checking the number of CPU

```
$ grep -c processor /proc/cpuinfo
30
```

- Checking the size of memory

```
$ cat /proc/meminfo |grep MemTotal
MemTotal:       65271964 kB
```

In case that the number of CPU or the size of memory keeps increasing:

It is expected that cause of the delay is the load of the partition. The process of SB hot add can be completed sooner by reducing the load of the partition.

In case that the number of CPU or the size of memory does not increase though they does not reach expected quantity.

3. Checking post-process of collaboration program
Process of below messages in /var/log/messages is post-process of the collaboration program.

```
Dec 17 00:15:47 xxx dr-util[4457]: INFO : 807 : Execute 1
user programs at ADD_POST timing
...
Dec 17 00:15:48 SB-hotplug dr-util[4457]: 10-FJSVdr-util-
kdump-restart : INFO : start
...
Dec 17 00:15:49 SB-hotplug dr-util[4457]: 10-FJSVdr-util-
kdump-restart : INFO : result: 0
...
Dec 17 00:15:49 xxx dr-util[4457]: INFO : 808 : Executed
user programs at ADD_POST timing
```

If “INFO : 808 : Executed user programs at ADD_POST timing” is not output, post-process of the collaboration program is delayed. Check which collaboration program takes a lot of time by seeing /var/log/messages and ‘collaboration program name.log’ made in /opt/FJSVdr-util/var/log directory, if any. The developer of the collaboration program can be confirmed by below rpm command. Ask the developer about the cause of its delay.

(Example) Checking the developer of the collaboration program “10-FJSVdr-util-kdump-restart”

```
$ rpm -qif /opt/FJSVdr-util/user_command/10-FJSVdr-util-
kdump-restart
...
```

Rebooting the partition is recommended because SB hot add process has been imperfect state.

5.2.4 Operation after SB hot add

This section describes the process and operations after SB hot add.
After completing DR command operation, check that the quantity of added resources is correct by opening below files as doing before SB hot add.

(Example) When adding SB2

```
# /opt/FJSVdr-util/sbin/dr show SB2
CPU: 60-119: 60
MEM: 32768-33023,49152-49407: 67108864 kiB
Node: 2,3
```

If below command keeps to be executed, added resources are not reflected. Re-execute the command in order to reflect added resources.

- sar
- iostat
- mpstat

If SVAgent is installed in the partition, perform below command with root privilege.

```
# /usr/sbin/srvmagt restart
```

If CPUs and memories of SB that is added by hot add of SB is used for KVM, change parameter of ‘machine.slice’ control group.

1. Check whether machine.slice control group exists or not.

```
# find /sys/fs/cgroup/cpuset/ -name "machine.slice"
/sys/fs/cgroup/cpuset/machine.slice
```

   If machine.slice control group does not exist, machine.slice control group is created when new guest VM is started. CPU and memory added by SB hot add are reflected to the machine.slice control group. Hence, parameters of machine.slice control group does not need to be changed.

2. Change parameters of machine.slice control group.

```
# cgset -r cpuset.cpus=xxx-yyy machine.slice
# cgset -r cpuset.mems=X-Y machine.slice
```

   Note
   Guest VM which is started after changing parameters of machine.slice control group can use all CPUs and memories on the partition.
   If resources such as CPU which the guest VM can use are fixed in the guest VM, the balance of entire KVM system may be lost because of adding resources.
   It is recommended to redesign how to use CPUs and memories in the KVM system.

5.3 Hot remove of SB

This section describes the hot remove of SB.

5.3.1 Preparing for SB hot remove

The preparation flow is described below.

1. Check the SBs to be removed.
   Check the SBs to be removed by MMB Web-UI.
   a Open Partition->Partition Configuration window
   b Check the SB to be removed is not Home SB.
2. If processes on operating system are fixed to CPU and node on SB to be removed, change those settings.
   a Check resources of SB to be removed
   Example: When checking resources of SB#2

```
# /opt/FJSVdr-util/sbin/dr show SB2
CPU: 60-119: 60
MEM: 32768-33023,49152-49407: 67108864 kiB
Node: 2,3
```

   b Change settings of services on operating system which are fixed to CPU and node of SB to be removed.
   Example: Changing settings of guest VM (KVM)
   a Check CPU which is fixed to VCPU of guest VM.

```
# virsh vcpupin RHEL7GA
VCPU: CPU affinity
----------------------------------
   0: 0-119
   1: 0-119
...
   N-1: 0-119
```

   b Change the setting of CPU fix to all VCPUs of guest VM.
   Example:

```
# virsh vcpupin <guest VM name> <0> 0-59
# virsh vcpupin <guest VM name> <1> 0-59
...
# virsh vcpupin <guest VM name> <N-1> 0-59
```

3. Check whether KSM service stops.
   a Check status of KSM service
      1. Check status of ksm.service

```
# systemctl status ksm.service
```

      2. Check status of ksmtuned.service

```
# systemctl status ksmtuned.service
```

   b If KSM service runs, stop KSM service
      1. Stop ksm.service.

```
# systemctl stop ksm.service
```

      2. Stop ksmtuned.service.

```
# systemctl stop ksmtuned.service
```

5.3.2 Confirming the status of SB before SB hot remove

Check free space of swap region and free space of memory by steps below.

1. Check free space of swap region.

```
# free
              total        used        free      shared     buffers      cached
```

```
Mem:     132364204   25165476  107198728      10140   14647644     319328
-/+ buffers/cache:   10198504  122165700
Swap:      4194300          0    4194300
```

2. Check whether free space of memory is enough.

   a Check memory capacity of SB to be removed.
   Example: When removing SB#2.

```
# /opt/FJSVdr-util/sbin/dr show SB2 | grep MEM
MEM: 32768-33023,49152-49407: 67108864 kiB
```

   b Calculate free memory capacity after removing SB

```
# cat /proc/meminfo
MemTotal:       132364204 kB
MemFree:        107200452 kB
MemAvailable:   122518540 kB
Buffers:        14647644 kB
Cached:           329468 kB
SwapCached:            0 kB
Active:          7652860 kB
Inactive:       14910268 kB
Active(anon):    7587292 kB
Inactive(anon):     8864 kB
Active(file):      65568 kB
Inactive(file): 14901404 kB
```

   Free memory space = MemFree + Inactive(anon) + Active(file) + Inactive(file)
   = 107200452KB + 8864KB + 65568KB + 14901404KB
   = 122176288KB
   Free memory space after removing SB = “free memory space” - “memory capacity of SB to be removed”.
   = 122176288KB - 67108864KB
   = 55067424KB
   If free memory remains after removal of SB,, SB hot remove can be performed. However, if no free memory space, SB hot remove can be performed if free memory space after removing SB is free space of swap region or less. In such case, system performance becomes strikingly slow because swap out occurs.

5.3.3 DR operation in SB hot remove

This section describes the operation of the DR, for performing SB hot remove.

1. Log into the MMB Web-UI using Administrator privileges.
2. Execute hotremove command.
   Example：When removing SB#2 from partition #1.

```
# hotremove partition 1 SB 2
```

3. Perform “show dynamic_reconfiguration status” command and confirm below messages.
   Example：When removing SB#2 from partition #1.

   show dynamic_reconfiguration status:
   “Removing SB#2 from Partition#1, completed”

5.3.4 Operation after SB hot remove

This section describes the process and operations after SB hot remove.

- Check SB has been removed.
  Example: When removing SB#2

```
# /opt/FJSVdr-util//sbin/dr stat SB
SB0: online
SB1: empty
SB2: empty
```

```
SB3: empty
```

If below command keeps to be executed, added resources are not reflected. Re-execute the command in order to reflect added resources.

- sar
- iostat
- mpstat

If SVAgent is installed in the partition, perform below command with root privilege.

```
# /usr/sbin/srvmagt restart
```

If CPUs and memories of SB that is added by hot add of SB is used for KVM, steps below are required.

3. If KSM service is stopped at preparing for SB hot remove, start KSM service.
   a Start ksmtuned.service.

```
# systemctl start ksmtuned.service
```

   b Change parameters of libvirt and qemu control group.

```
# systemctl start ksm.service
```

4. Using MMB Web-UI, check that SB having been removed is powered off.
   a. Open System -> SB -> SB#n window.
   b. Check that “Power Status” of “Board Information” is ‘standby’.

5.4 Hot replacement of IOU

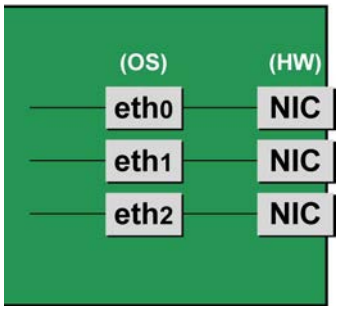
This section describes the hot replacement of the IOU. There are two cases in hot replacement of the IOU:

- Replacing IOU itself due to trouble of IOU itself or trouble of onboard NIC
- Replacing, expanding or removing PCI Express card installed in IOU

For replacing, expanding or removing PCI Express card, IOU itself does not need to be replaced. However, it is needed that the IOU has to be removed from the cabinet for a moment. Then there is the same impact as that of replacing IOU. It is needed to take the same steps as those of replacing IOU.

Note

- If IOU itself is hot replaced, onboard NIC of the IOU is replaced.
  Note that MAC address of onboard NIC is changed after replacing IOU.
- PCI address (bus address) of PCI Express card on IOU may change after hot replacement of IOU. This change may be occurred for replacing, expanding or removing PCI Express card.
- If iSCSI (NIC) is mounted on an IOU, hot replacement of the IOU can be performed only if all of conditions below are satisfied.
  - DM-MP (Device-Mapper Multipath) or ETERNUS multi driver (EMPD) is used for storage connection.
  - Multiple path consists of a NIC on the IOU to be replaced and a NIC on an IOU other than the IOU to be replaced.
  - A NIC on the IOU to be replaced makes an interface independently.
    Example of single interface:



- If FC card used for SAN boot is mounted on an IOU to be replaced, hot replacement of the IOU cannot be performed.

The step of hot replacement of IOU is described below in order.

5.4.1 Preparation for IOU hot replacement

The description of the flow of preparations is given below.

1. Arrange for the IOU for replacement.
   Note
   This step is not needed if the IOU is reused when expanding, replacing or removing PCI Express card. After arranging for the IOU, check whether I/O device of the IOU normally works at free partition. Pre-diagnosis does not performed when IOU is added.

2. For replacing IOU or expanding, replacing or removing PCI Express card in the IOU, it is needed to remove IOU. If IOU is removed, PCI Express card and onboard NIC installed in the IOU are also removed. Check that no software use the PCI Express card to be removed, performing either of below measure.

   a. Stopping the software which uses PCI Express card or onboard NIC in the IOU to be removed before removing.

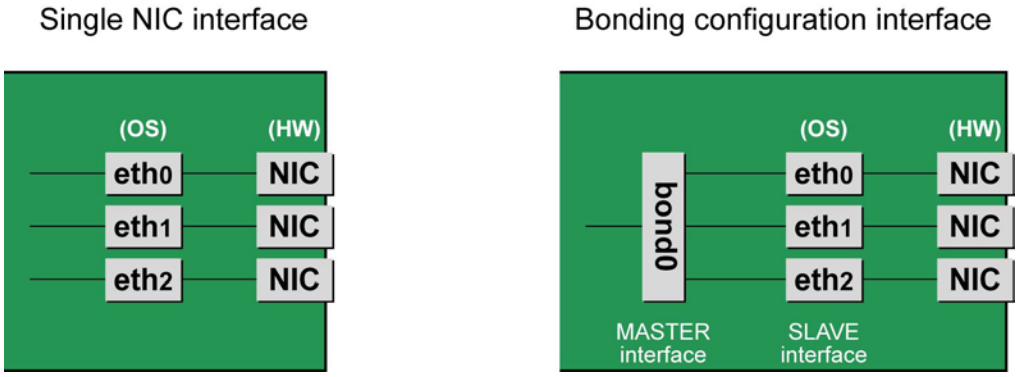
   b. Preventing the software from operating PCI Express card and onboard NIC.

   Execute the command /opt/FJSVdr-util/sbin/dr show IOU from shell on OS to check resources installed in the IOU.
   Example: checking IOU3

```
# /opt/FJSVdr-util/sbin/dr show IOU3
0000:82:00.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:83:09.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:84:00.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:85:02.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:85:08.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:85:09.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:85:10.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:85:11.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:89:00.0 Ethernet controller: Intel Corporation I350
Gigabit
Network Connection (rev 01)
0000:89:00.1 Ethernet controller: Intel Corporation I350
Gigabit
Network Connection (rev 01)
0000:8c:00.0 Ethernet controller: Intel Corporation I350
Gigabit
Network Connection (rev 01)
0000:8c:00.1 Ethernet controller: Intel Corporation I350
Gigabit
Network Connection (rev 01)
0000:8f:00.0 Fibre Channel: Emulex Corporation Saturn-X:
LightPulse
Fibre Channel Host Adapter (rev 03)
0000:8f:00.1 Fibre Channel: Emulex Corporation Saturn-X:
LightPulse
Fibre Channel Host Adapter (rev 03)
```

NIC on the IOU (including onboard NIC)
For replacing IOU itself (replacement of onboard NIC) or expanding, replacing or removing NIC on the IOU, not only common procedure of IOU replacement but also special procedure before and after powering on or powering off IOU is needed. Here describes case of replacement of IOU itself. (otherwise add note) The

procedure describes operations where a single NIC is configured as one interface. It also describes cases where multiple NICs are bonded together to configure one interface (bonding configuration). For bonding multiple NIC by using PRIMECLUSTER Global Link Services (GLS), see manual of PRIMECLUSTER Global Link Services.
Although name form of NIC differs depending on mounting location of the NIC in RHEL7, conventional ‘ethX’ is used in below description. ‘ethX’ should be replaced to actual name of the NIC as necessary.



Notes

- To perform hot replacement in a system where a bonding device is installed, design the system so that it specifies ONBOOT=YES in all interface configuration files (the /etc/sysconfig/network-scripts/ifcfg-eth*files and the /etc/sysconfig/network-scripts/ifcfg-bond*files), regardless of whether the NIC to be replaced is a configuration interface of the bonding device.
  An IP address need not to be assigned to unused interfaces. This procedure is to prevent the device name of the replacement target NIC from being changed after hot replacement. If ONBOOT=NO also exists, the procedure described here may not work properly.

1. Confirm where the NIC is mounted.
   Confirm the correspondence between PCI Address and interface name of NIC mounted in the IOU which is confirmed by above “dr show IOU” command.
   Example: When PCI Address is “0000:89:00.0”.

```
# ls -l /sys/class/net/*/device | grep "0000:89:00.0"
lrwxrwxrwx. 1 root root 0 Aug 27 16:06 2013
/sys/class/net/eth0/
device ¥
-> ../../../ 0000:89:00.0
```

   The ¥ at the end of a line indicates that there is no line feed.

   In this case, eth0 is the interface name which is correspondent to PCI bus address “0000:89:00.0”.

   Note
   You will use the bus address obtained here in steps 2 and procedure after IOU replacement. Record the bus address so that you can reference it later.

   Next, check the PCI slot number for this PCI bus address.
   Execute “ethtool -p” command, making the LED of NIC blinked. Check IOU or PCI_Box connected to the IOU, checking in which slots the NIC is mounted, (e.g. PCI#0)

   Example: Blinking the LED of the NIC corresponding to interface “eth0” for ten seconds.

```
# /sbin/ethtool -p eth0 10
```

2. Make a table with information including interface name, hardware address and PCI bus address of NIC mounted on IOU to be replaced.
   Make a below table with information of IOU to be replaced within information which is got by step 1.

TABLE 5.1 Correspondence between bus addresses and interface names

Interface name	Hardware address	Bus address	Location
eth0		0000:89:01.0	Onboard 0
eth1		0000:89:01.1	Onboard 1
eth2		0000:8c:00.0	PCI#0

...		...	...

Note
When recording a bus address, include the function number (number after the period).

- Confirm the correspondence between the interface name and hardware address
  Execute below command, checking the correspondence between the interface name and the hardware address.
  Example: eth0 for a single interface

```
# cat /sys/class/net/eth0/address
2c:d4:44:f1:44:f0
```

  Example: eth0 for a bonding interface

```
# cat /proc/net/bonding/bondY
Ethernet Channel Bonding Driver .........
.
.
Slave interface: eth0
.
Permanent HW addr: 2c:d4:44:f1:44:f0
.
.
```

  You can use this procedure only when the bonding device is active. If the bonding device is not active or the slave has not been incorporated, use the same procedure as for a single interface.
  Confirm the hardware address of other interfaces by repeating the operation with the same command.
  The following table lists examples of descriptions.

TABLE 5.2 Hardware address description examples

Interface name	Hardware address	Bus address	Location
eth0	2c:d4:44:f1:44:f0	0000:89:01.0	Onboard 0
eth1	2c:d4:44:f1:44:f1	0000:89:01.1	Onboard 1
eth2	00:19:99:d7:36:5f	0000:8c:00.0	PCI#0
...		...	...

3. Execute the higher-level application processing required before NIC replacement.
   Stop all access to the interface as follows. Stop the application that was confirmed in step 2 as using the interface, or exclude the interface from the target of use by the application.

4. Deactivate the NIC.
   Execute the following command to deactivate all the interfaces that you confirmed in step 2. The applicable command depends on whether the target interface is a single NIC interface or the SLAVE interface of a bonding device.

   For a single NIC interface:

```
# /sbin/ifdown ethX
```

   If the single NIC interface has a VLAN device, you also need to remove the VLAN interface. Perform the following operations (before deactivating the real interface).

```
# /sbin/ifdown ethX.Y
# /sbin/vconfig rem ethX.Y
```

   For the SLAVE interface of a bonding device:

   If the bonding device is operating in mode 1, use the following steps to exclude SLAVE interface to be replaced from the bonding configuration. In any other mode, removing it immediately should not cause any problems.
   Confirm that the SLAVE interface to be replaced is the interface currently being used for communication. First, confirm the interface currently being used for communication by executing the following command.

```
# cat /sys/class/net/bondY/bonding/active_slave
```

   If the displayed interface matches the SLAVE interface being replaced, execute the following command to switch the current communication interface to another SLAVE interface.

```
# /sbin/ifenslave -c bondY ethZ
```

   (ethZ: Interface that composes bondY and does not perform hot replacement)

Finally, remove the SLAVE interface being replaced, from the bonding configuration. Immediately after being removed, the interface is automatically no longer used.

```
# /sbin/ifenslave -d bondY ethX
```

5. Save all the interface configuration files that you checked in step 2 by executing the following command. Configuration scripts may reference the contents of files in /etc/sysconfig/network-scripts. For this reason, create a save directory and save these files to the directory so that the configuration scripts will not reference them.

```
# cd /etc/sysconfig/network-scripts
# mkdir temp
# mv ifcfg-ethX temp
(following also executed for bonding configuration)
# mv ifcfg-bondX temp
```

iSCSI (NIC) on the IOU

If replace iSCSI (NIC) on the IOU, you have to take not only the same steps of 'NIC on the IOU (including Onboard NIC)' but also takes steps below in step 3 of that.

1. Perform the work for suppressing access to the iSCSI connection interface.

   a. Confirm the state of multiple path by DM-MP (*1) or EMPD (*2).

   b. Use the iscsiadm command to log out from the path (iqn) through which the iSCSI card to be replaced is routed, and disconnect the session.
   Example which confirms the state of session before disconnecting:

```
# /sbin/iscsiadm -m session
tcp: [1] 192.168.1.64:3260,1 iqn.2000-
09.com.fujitsu:storage-system.eternus-
dx400:00001049.cm0ca0p0
tcp: [2] 192.168.2.66:3260,3 iqn.2000-
09.com.fujitsu:storage-system.eternus-
dx400:00001049.cm1ca0p0
```

   Example which logout path going through a NIC to be replaced:

```
# /sbin/iscsiadm -m node -T iqn.2000-09.com.fujitsu:storage-
system.eternus-dx400:00001049.cm1ca0p0 -p 192.168.2.66:3260
–-logout
```

   c. Use the iscsiadm command to confirm that the target session has been disconnected.
   Example which confirms the state of session after disconnecting

```
# /sbin/iscsiadm -m session
tcp: [1] 192.168.1.64:3260,1 iqn.2000-
09.com.fujitsu:storage-system.eternus-
dx400:00001049.cm0ca0p0
```

   d. You can confirm the disconnection of sessions on multipath products using DM-MP or ETERNUS multidriver.
   *1: Write down the DM-MP display contents at the session disconnection.
   Example of DM-MP display before disconnecting path

```
# /sbin/multipath -ll
mpath1 (36000b5d0006a0000006a104900000000) dm-0
FUJITSU,ETERNUS_DX400
[size=50G][features=0][hwhandler=0][rw]
¥_ round-robin 0 [prio=2][active]
 ¥_ 3:0:0:0 sdb 8:16  [active][ready]
 ¥_ 4:0:0:0 sdc 8:32  [active][ready]
```

   Example of DM-MP display after disconnecting path

```
# /sbin/multipath -ll
mpath1 (36000b5d0006a0000006a104900000000) dm-0
FUJITSU,ETERNUS_DX400
[size=50G][features=0][hwhandler=0][rw]
¥_ round-robin 0 [prio=1][enabled]
 ¥_ 3:0:0:0 sdb 8:16  [active][ready]
```

*2: See the ETERNUS Multipath Driver User's Guide (For Linux).

FC card

1. Stop the access to FC card on IOU by such a way as stopping application.

5.4.2 DR operation of IOU hot replacement

This section describes the DR operation for IOU hot replacement.

1. Execute “/opt/FJSVdr-util/sbin/dr rm IOU” command on the shell of OS.
   The IOU to be removed is cut off from OS.
   Example: Cutting off the IOU 3

```
# /opt/FJSVdr-util/sbin/dr rm IOU3
#
```

2. Execute “/opt/FJSVdr-util/sbin/dr rm IOU” command on the shell of OS.
   A list of IOU included in the partition is shown. Check that IOU which is cut off is displayed as ‘offline’.
   Example: Cutting off the IOU 3

```
# /opt/FJSVdr-util/sbin/dr stat IOU
IOU0: empty
IOU1: empty
IOU2: empty
IOU3: offline
```

3. Login to MMB console as administrator
4. Execute “hotremove” command on MMB console.
   Example: removing IOU 3 from partition 1

```
Administrator > hotremove partition 1 IOU 3
Are you sure to continue removing IOU#3 from Partition#1?
[Y/N]: Y
DR operation start (1/3)
Remove IOU#3 (2/3)
IOU#3 power-off (3/3)
Removing IOU#3 from partition#1 has been completed
successfully.
Administrator >
```

5. See Operation Log window or perform “show dynamic_reconfiguration status” command and confirm below messages.
   Example：When removing IOU3 from partition 1.

   Operation Log window:
   “I_10110 Partition1 : Hot-remove IOU#3 Completed.”

   show dynamic_reconfiguration status:
   “Removing IOU#3 from Partition#1, completed”

6. Pulling the IOU out from the slot of cabinet
   For replacing IOU itself, insert PCI Express card mounted on old IOU to new one.
   For replacing, expanding or removing PCI Express card on the IOU, do it now.
   This step is performed by the field engineer in charge of your system.
7. Take off all cables such as LAN cable and FC cable connected to the IOU.
   This step is performed by the field engineer in charge of your system.
8. Inserting IOU to the slot of the cabinet.
   This step is performed by the field engineer in charge of your system.
9. Mount cables other than LAN cables.
   This step is performed by the field engineer in charge of your system.
   Note
   In GLS configuration with NIC switching way, mount also LAN cables.
10. Execute “hotadd” command on MMB console.
    Example: Adding IOU 3 to partition 1

```
Administrator > hotadd partition 1 IOU 3
Are you sure to continue adding IOU#3 to Partition#1? [Y/N]
Y
DR operation start (1/3)
Assigning IOU#3 to partition#1 (2/3)
Power on IOU#3 (3/3)
Adding IOU#3 to Partition#1 has been completed successfully.
Administrator >
```

11. See Operation Log window or perform “show dynamic_reconfiguration status” command and confirm below messages.
    Example：When adding IOU3 to partition 1.
    Operation Log window:
    “I_10110 Partition1 : Hot-add IOU#3 Completed.”

    show dynamic_reconfiguration status:
    “Adding IOU#3 to Partition#1, completed”

12. Execute “/opt/FJSVdr-util/sbin/dr stat IOU” command
    A list of IOU included in the partition is shown. Check that added IOU is shown.
    Example: adding IOU 3

```
# /opt/FJSVdr-util/sbin/dr stat IOU
IOU0: empty
IOU1: empty
IOU2: empty
IOU3: offline
```

    IOU added to partition is shown as offline state because it is power-off state at this time.

13. Execute “/opt/FJSVdr-util/sbin/dr add IOU” command on the shell of OS.
    The IOU to be removed will turn on.
    Example: turning on IOU 3

```
# /opt/FJSVdr-util/sbin/dr add IOU3
#
```

5.4.3 Operation after IOU hot replacement

Note

If SVAgent is installed in the partition, perform below command with root privilege.

```
# /usr/sbin/srvmagt restart
```

NIC on the IOU (including onboard NIC)

1. Collect the information associated with NIC on the replaced IOU.
   An interface (ethX) is created for the replaced NIC. Make a table with information including the interface name, hardware address, bus address, and location of the interface made corresponding to NIC mounted on replaced according to step1 and step 2 of the section 5.4.1 Preparation for IOU hot replacement. The interface name, hardware address and PCI bus address may change before and after replacing IOU.

TABLE 5.3 Example of interface information about interfaces after replacement

Interface name	Hardware address	Bus address	Location
eth0	2c:d4:44:f1:44:d2	0000:86:01.0	Onboard 0
eth1	2c:d4:44:f1:44: d3	0000:86:01.1	Onboard 1
eth2	00:19:99:d7:36:5f	0000:87:00.0	PCI#0
...		...	...

Note

If you use standard name for interfaces, you should consider the following.

- The theory of assignment of PCI bus address is different between BIOS and operating system. Then, PCI bus address which is different from that one assigned before replacement is assigned when hot replacement, and name of interface is changed.
- After hot replacement, if the partition is reboot, PCI bus address is reassigned. So, new interface name becomes the name which is not identical with PCI Bus address.

- Not to change the interface name of upper driver or network script and so on, you must do setting that interface name is assigned by the form of ethX after install. For details, see Red Hat, Inc's networking guide.

2. Edit the saved interface configuration file.
   Write a new hardware address to replace the old one. In "HWADDR," set the hardware address of the replaced NIC in TABLE 5.9 Example of entered values corresponding to the interface names before and after NIC replacement. If the interface name is changed, change also the interface name. (in this case, you must change file name itself.) Also, for SLAVE under bonding, the file contents are partly different, but the lines to be set are the same.
   Example:

```
DEVICE=eth0
NM_CONTROLLED=no
BOOTPROTO=static
HWADDR=2c:d4:44:f1:44:d2
BROADCAST=192.168.16.255
IPADDR=192.168.16.1
NETMASK=255.255.255.0
NETWORK=192.168.16.0
ONBOOT=yes
TYPE=Ethernet
```

   Do this editing for all the saved interfaces except for the interface with no change of hardware address and interface name.

3. Restore the saved interface configuration file to the original file.
   Restore the interface configuration file saved to the save directory to the original file by executing the following command.

```
# cd /etc/sysconfig/network-scripts/temp
# mv ifcfg-ethX  ..
(following also executed for bonding configuration)
# mv ifcfg-bondX  ..
```

4. Activate the replaced interface.
   The method for activating a single NIC interface differs from that for activating the SLAVE interfaces under bonding.
   For a single NIC interface:
   Execute the following command to activate the interface. Activate all the necessary interfaces.

```
# /sbin/ifup ethX
```

   Also, if the single NIC interface has a VLAN device and the VLAN interface was temporarily removed, restore the VLAN interface. If the priority option has changed, set it again.

```
# /sbin/vconfig add ethX Y
# /sbin/ifup ethX.Y
(enter command to set VLAN option as needed)
```

   For SLAVE under bonding
   Execute the following command to incorporate the SLAVE interface into the existing bonding configuration. Incorporate all the necessary interfaces.

```
# /sbin/ifenslave bondY ethX
```

   The VLAN-related operation is normally not required because a VLAN is created on the bonding device.

5. Mount all cables connected to the particular PCIC.
   This step is performed by the field engineer in charge of your system.
   Note
   In GLS configuration with NIC switching way, you do not need to perform this step.

6. Remove the directory to which the interface configuration file was saved.
   After all the interfaces to be replaced have been replaced, remove the save directory created in step 5 in 5.4.1 Preparation for IOU hot replacement by executing the following command.

```
# rmdir /etc/sysconfig/network-scripts/temp
```

7. Execute the higher-level application processing required after NIC replacement.
   Perform the necessary post processing (such as starting applications or restoring changed settings) for

the operations performed for the higher-level applications in step 3 in 5.4.1 Preparation for IOU hot replacement.

iSCSI (NIC) on the IOU

If replace iSCSI (NIC) on the IOU, you have to take not only the same steps of 'NIC on the IOU (including Onboard NIC)' but also takes steps below in step 8 of that.

1. To restore access to the iSCSI connection interface, perform the following.
   a. Confirm the state of multiple path by DM-MP (*1) or EMPD (*2).
   b. Use the iscsiadm command to log in to the path (iqn) through which the replacement iSCSI card is routed, and reconnect the session.
   Example which confirms the state of session before connecting:

```
# /sbin/iscsiadm -m session
tcp: [1] 192.168.1.64:3260,1 iqn.2000-
09.com.fujitsu:storage-system.eternus-
dx400:00001049.cm0ca0p0
```

   Example which login path going through a NIC to be replaced:

```
# /sbin/iscsiadm -m node -T iqn.2000-09.com.fujitsu:storage-
system.eternus-dx400:00001049.cm1ca0p0 -p 192.168.2.66:3260
--login
```

   c. Use the iscsiadm command to confirm that the target session has been activated.
   Example which confirms the state of session after connecting

```
# /sbin/iscsiadm -m session
tcp: [1] 192.168.1.64:3260,1 iqn.2000-
09.com.fujitsu:storage-system.eternus-
dx400:00001049.cm0ca0p0
tcp: [3] 192.168.2.66:3260,3 iqn.2000-
09.com.fujitsu:storage-system.eternus-
dx400:00001049.cm1ca0p0
```

   d. You can confirm the activation of sessions on multipath products using DM-MP or ETERNUS multidriver.
   *1: Write down the DM-MP display contents at the session activation.
   Example of DM-MP display before connecting path

```
# /sbin/multipath -ll
mpath1 (36000b5d0006a0000006a104900000000) dm-0
FUJITSU,ETERNUS_DX400
[size=50G][features=0][hwhandler=0][rw]
¥_ round-robin 0 [prio=1][active]
 ¥_ 3:0:0:0 sdb 8:16  [active][ready]
```

   Example of DM-MP display after connecting path

```
# /sbin/multipath -ll
mpath1 (36000b5d0006a0000006a104900000000) dm-0
FUJITSU,ETERNUS_DX400
[size=50G][features=0][hwhandler=0][rw]
¥_ round-robin 0 [prio=2][enabled]
 ¥_ 3:0:0:0 sdb 8:16  [active][ready]
 ¥_ 5:0:0:0 sdc 8:32  [active][ready]
```

   *2: See the ETERNUS Multipath Driver User's Guide (For Linux).

FC Card

1. Restart the application which is stop at preparing for IOU hot replacement

Common operation of all PCI Express cards after IOU hot replacement
Execute pciinfo command on MMB CLI.
Example: hot adding IOU#2 into partition#1.

```
Administrator > pciinfo partition 1 iou 2
Are you sure to continue updating IOU#2 in Partition#1?
[Y/N]: y
```

```
Update IOU#2 PCI information in Partition#1 has been
completed successfully.
Administrator >
```

5.5 Hot add of IOU

This section describes the hot add of the IOU.

5.5.1 Preparation for IOU hot add

The description of the flow of preparations is given below.

1. Arrange for the IOU for addition.
2. Check if number of IOU required for addition is available.
3. Insert the IOU to be added into a free IOU slot.
   This step is performed by the field engineer in charge of your system.
4. Mount cables other than LAN cables if you also add PCI Express card.
   This step is performed by the field engineer in charge of your system.

Note

- If you add an IOU with PCI Express cards, insert PCI Express cards into the IOU before inserting the IOU into the slot.
  For how to confirm the slot number of the PCI Express slot, see 'Confirming the slot number of a PCI Express slot' in '5.7.2 PCI Express card replacement procedure in detail'.
- Check if the I/O device is normally operating in the free partition. During addition, I/O pre-diagnostic process is not executed.

5.5.2 DR operation of IOU hot add

This section describes the DR operation for IOU hot add.

1. Log into the MMB Web-UI using Administrator privileges.
2. Execute the hotadd command.

Example：When adding IOU1 in partition1.

```
Administrator > hotadd partition 1 IOU 1
Are you sure to continue adding IOU#1 to Partition#1? [Y/N]
Y
DR operation start (1/3)
Assigning IOU#1 to partition#1 (2/3)
Power on IOU#1 (3/3)
Adding IOU#1 to Partition#1 has been completed successfully.
Administrator >
```

3. See Operation Log window or perform "show dynamic_reconfiguration status" command and confirm below messages.
   Example： When adding IOU1 to partition 1.

   Operation Log window:
   "I_10110 Partition1 : Hot-add IOU#1 Completed."

   show dynamic_reconfiguration status:
   "Adding IOU#1 to Partition#1, completed"
4. Execute /opt/FJSVdr-util/sbin/dr stat IOU command in the operating system shell.
   The list of IOUs connected to the system is displayed. Check if the IOU that was added is displayed.
   Example：When IOU1 is added.

```
# /opt/FJSVdr-util/sbin/dr stat IOU
IOU0: online
```

```
IOU1: offline
IOU2: empty
IOU3: empty
```

When newly adding an IOU to a partition, it will be displayed as offline since the IOU is not recognized by the operating system.

5. Execute /opt/FJSVdr-util/sbin/dr add IOU1 command in the operating system shell.
   The IOU that was newly added to the partition will be powered on.
   Example：When IOU1 is powered on

```
# /opt/FJSVdr-util/sbin/dr add IOU1
#
```

5.5.3 Operation after IOU hot add

This section describes the process and operation after IOU hot add.

Note

If SVAgent is installed in the partition, perform below command with root privilege.

```
# /usr/sbin/srvmagt restart
```

1. Check the resource that was added.
   Execute the /opt/FJSVdr-util/sbin/dr show IOU command in the operating system shell.
   Example：When IOU1 was added

```
# /opt/FJSVdr-util/sbin/dr show IOU1
0000:03:00.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:04:09.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:05:00.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:06:02.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:06:08.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:06:09.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:06:10.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:06:11.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:0a:00.0 Ethernet controller: Intel Corporation I350
Gigabit
Network Connection (rev 01)
0000:0a:00.1 Ethernet controller: Intel Corporation I350
Gigabit
Network Connection (rev 01)
0000:0d:00.0 Ethernet controller: Intel Corporation I350
Gigabit
Network Connection (rev 01)
0000:0d:00.1 Ethernet controller: Intel Corporation I350
Gigabit
Network Connection (rev 01)
0000:10:00.0 Fibre Channel: Emulex Corporation Saturn-X:
LightPulse
Fibre Channel Host Adapter (rev 03)
0000:10:00.1 Fibre Channel: Emulex Corporation Saturn-X:
LightPulse
Fibre Channel Host Adapter (rev 03)
0000:27:00.0 PCI bridge: PLX Technology, Inc. Device 8764
(rev aa)
0000:28:01.0 PCI bridge: PLX Technology, Inc. Device 8764
(rev aa)
```

```
0000:28:04.0 PCI bridge: PLX Technology, Inc. Device 8764
(rev aa)
0000:28:05.0 PCI bridge: PLX Technology, Inc. Device 8764
(rev aa)
0000:28:08.0 PCI bridge: PLX Technology, Inc. Device 8764
(rev aa)
0000:28:09.0 PCI bridge: PLX Technology, Inc. Device 8764
(rev aa)
0000:28:0c.0 PCI bridge: PLX Technology, Inc. Device 8764
(rev aa)
0000:28:0d.0 PCI bridge: PLX Technology, Inc. Device 8764
(rev aa)
```

2. Make the configuration file for being able to use added resources on OS.

   - Setting of FC card
     Perform step 3 or later in '5.8.3 FC card (Fibre Channel card) addition procedure'.
   - Setting of NIC (including onboard NIC)
     Perform step 4 or later in '5.8.4 Network card addition procedure'.

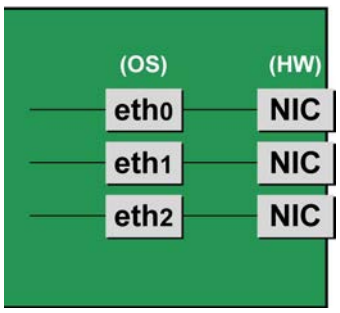
Common operation of all PCI Express cards after IOU hot replacement
Execute pciinfo command on MMB CLI.
Example: hot adding IOU#2 into partition#1.

```
Administrator > pciinfo partition 1 iou 2
Are you sure to continue updating IOU#2 in Partition#1?
[Y/N]: y
Update IOU#2 PCI information in Partition#1 has been
completed successfully.
Administrator >
```

5.6 IOU hot remove

The description of the flow of the preparation is as follows.
Note

- If iSCSI (NIC) is mounted on an IOU, hot replacement of the IOU can be performed only if all of below conditions are satisfied.
  - DM-MP (Device-Mapper Multipath) or ETERNUS multi driver (EMPD) is used for storage connection.
  - Multiple path consists of a NIC on the IOU to be replaced and a NIC on an IOU other than the IOU to be replaced.
  - A NIC on the IOU to be replaced makes an interface independently.
    Example of single interface:



  - If FC card used for SAN boot is mounted on an IOU to be replaced, hot replacement of the IOU cannot be performed.

5.6.1 Preparation for IOU hot remove

The description of the flow of the preparation is as follows.

Note

When the disk connected via the IOU to be removed is used as the dump saving area if kdump, the dump environment is changed to enable the use of another disk.

1. When the IOU is removed, the PCI Express card, which is mounted on the IOU is also removed. Confirm that there is no software where the PCI Express card is used, and implement any of the following measures.

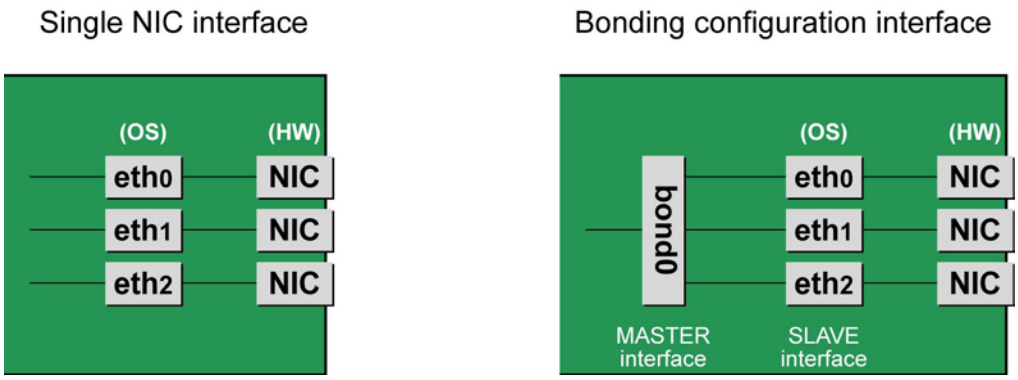
   a. Before removing, stop the software in which the PCI Express card to be removed is being used.

   b. The PCI Express card is to be outside the software operation target.

   To confirm the resources mounted on the target IOU, execute /opt/FJSVdr-util/sbin/dr show IOU command from the operating system shell.
   Example：When checking IOU3.

```
# /opt/FJSVdr-util/sbin/dr show IOU3
0000:82:00.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:83:09.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:84:00.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:85:02.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:85:08.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:85:09.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:85:10.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:85:11.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:89:00.0 Ethernet controller: Intel Corporation I350
Gigabit
Network Connection (rev 01)
0000:89:00.1 Ethernet controller: Intel Corporation I350
Gigabit
Network Connection (rev 01)
0000:8c:00.0 Ethernet controller: Intel Corporation I350
Gigabit
Network Connection (rev 01)
0000:8c:00.1 Ethernet controller: Intel Corporation I350
Gigabit
Network Connection (rev 01)
0000:8f:00.0 Fibre Channel: Emulex Corporation Saturn-X:
LightPulse
Fibre Channel Host Adapter (rev 03)
0000:8f:00.1 Fibre Channel: Emulex Corporation Saturn-X:
LightPulse
Fibre Channel Host Adapter (rev 03)
```

NIC on the IOU (including onboard NIC)
The procedure describes operations where a single NIC is configured as one interface. It also describes cases where multiple NICs are bonded together to configure one interface (bonding configuration). For bonding multiple NIC by using PRIMECLUSTER Global Link Services (GLS), see manual of PRIMECLUSTER Global Link Services. Although name form of NIC differs depending on mounting location of the NIC in RHEL7, conventional ‘ethX’ is used in below description. ‘ethX’ should be replaced to actual name of the NIC as necessary.



Notes

- To perform hot replacement in a system where a bonding device is installed, design the system so that it specifies ONBOOT=YES in all interface configuration files (the /etc/sysconfig/network-scripts/ifcfg-eth*files and the /etc/sysconfig/network-scripts/ifcfg-bond*files), regardless of whether the NIC to be replaced is a configuration interface of the bonding device.
  An IP address need not to be assigned to unused interfaces. This procedure is to prevent the device name of the replacement target NIC from being changed after hot replacement. If ONBOOT=NO also exists, the procedure described here may not work properly.

1. Confirm where the NIC is mounted.
   Confirm the correspondence between PCI Address and interface name of NIC mounted in the IOU which is confirmed by above “dr show IOU” command.
   Example: When PCI Address is “0000:89:00.0”.

```
# ls -l /sys/class/net/*/device | grep "0000:89:00.0"
lrwxrwxrwx. 1 root root 0 Aug 27 16:06 2013
/sys/class/net/eth0/
device ¥
-> ../../../ 0000:89:00.0
```

   The ¥ at the end of a line indicates that there is no line feed.

   In this case, eth0 is the interface name which is correspondent to PCI bus address “0000:89:00.0”.

   Note
   You will use the bus address obtained here in steps 2 and procedure after IOU replacement. Record the bus address so that you can reference it later.

   Next, check the PCI slot number for this PCI bus address.
   Execute “ethtool -p” command, making the LED of NIC blinked. Check IOU or PCI_Box connected to the IOU, checking in which slots the NIC is mounted, (e.g. PCI#0)

   Example: Blinking the LED of the NIC corresponding to interface “eth0” for ten seconds.

```
# /sbin/ethtool -p eth0 10
```

2. Make a table with information including interface name, hardware address and PCI bus address of NIC mounted on IOU to be replaced.
   Make a below table with information of IOU to be replaced within information which is got by step 1.

TABLE 5.4 Correspondence between bus addresses and interface names

Interface name	Hardware address	Bus address	Location
eth0		0000:89:01.0	Onboard 0
eth1		0000:89:01.1	Onboard 1
eth2		0000:8f:00.0	PCI#0
...		...	...

   Note
   When recording a bus address, include the function number (number after the period).

   - Confirm the correspondence between the interface name and hardware address
     Execute below command, checking the correspondence between the interface name and the

hardware address.
Example: eth0 for a single interface

```
# cat /sys/class/net/eth0/address
2c:d4:44:f1:44:f0
```

Example: eth0 for a bonding interface

```
# cat /proc/net/bonding/bondY
Ethernet Channel Bonding Driver .........
.
.
Slave interface: eth0
.
Permanent HW addr: 2c:d4:44:f1:44:f0
.
.
```

You can use this procedure only when the bonding device is active. If the bonding device is not active or the slave has not been incorporated, use the same procedure as for a single interface.

Confirm the hardware address of other interfaces by repeating the operation with the same command. The following table lists examples of descriptions.

TABLE 5.5 Hardware address description examples

Interface name	Hardware address	Bus address	Location
eth0	2c:d4:44:f1:44:f0	0000:89:01.0	Onboard 0
eth1	2c:d4:44:f1:44:f1	0000:89:01.1	Onboard 1
eth2	00:19:99:d7:36:5f	0000:8f:00.0	PCI#0
...		...	...

3. Execute the higher-level application processing required before NIC replacement.
   Stop all access to the interface as follows. Stop the application that was confirmed in step 2 as using the interface, or exclude the interface from the target of use by the application.

4. Deactivate the NIC.
   Execute the following command to deactivate all the interfaces that you confirmed in step 2. The applicable command depends on whether the target interface is a single NIC interface or the SLAVE interface of a bonding device.

   For a single NIC interface:

   ```
   # /sbin/ifdown ethX
   ```

   If the single NIC interface has a VLAN device, you also need to remove the VLAN interface. Perform the following operations (before deactivating the real interface).

   ```
   # /sbin/ifdown ethX.Y
   # /sbin/vconfig rem ethX.Y
   ```

   For the SLAVE interface of a bonding device:

   If the bonding device is operating in mode 1, use the following steps to exclude SLAVE interface to be replaced from the bonding configuration. In any other mode, removing it immediately should not cause any problems.
   Confirm that the SLAVE interface to be replaced is the interface currently being used for communication. First, confirm the interface currently being used for communication by executing the following command.

   ```
   # cat /sys/class/net/bondY/bonding/active_slave
   ```

   If the displayed interface matches the SLAVE interface being replaced, execute the following command to switch the current communication interface to another SLAVE interface.

   ```
   # /sbin/ifenslave -c bondY ethZ
   ```
   (ethZ: Interface that composes bondY and does not perform hot replacement)

   Finally, remove the SLAVE interface being replaced, from the bonding configuration. Immediately after being removed, the interface is automatically no longer used.

   ```
   # /sbin/ifenslave -d bondY ethX
   ```

5. Remove the interface configuration file..
   Delete the configuration files of all the interfaces confirmed in step 2, by executing the following command.

```
# rm /etc/sysconfig/network-scripts/ifcfg-ethX
```

iSCSI (NIC) on the IOU
If replace iSCSI (NIC) on the IOU, you have to take not only the same steps of 'NIC on the IOU (including Onboard NIC)' but also takes steps below in step 3 of that.

1. Perform the work for suppressing access to the iSCSI connection interface.

   a. Confirm the state of multiple path by DM-MP (*1) or EMPD (*2).

   b. Use the iscsiadm command to log out from the path (iqn) through which the iSCSI card to be replaced is routed, and disconnect the session.
   Example which confirms the state of session before disconnecting:

```
# /sbin/iscsiadm -m session
tcp: [1] 192.168.1.64:3260,1 iqn.2000-
09.com.fujitsu:storage-system.eternus-
dx400:00001049.cm0ca0p0
tcp: [2] 192.168.2.66:3260,3 iqn.2000-
09.com.fujitsu:storage-system.eternus-
dx400:00001049.cm1ca0p0
```

   Example which logout path going through a NIC to be replaced:

```
# /sbin/iscsiadm -m node -T iqn.2000-09.com.fujitsu:storage-
system.eternus-dx400:00001049.cm1ca0p0 -p 192.168.2.66:3260
–logout
```

   c. Use the iscsiadm command to confirm that the target session has been disconnected.
   Example which confirms the state of session after disconnecting

```
# /sbin/iscsiadm -m session
tcp: [1] 192.168.1.64:3260,1 iqn.2000-
09.com.fujitsu:storage-system.eternus-
dx400:00001049.cm0ca0p0
```

   d. You can confirm the disconnection of sessions on multipath products using DM-MP or ETERNUS multidriver.
   *1: Write down the DM-MP display contents at the session disconnection.
   Example of DM-MP display before disconnecting path

```
# /sbin/multipath -ll
mpath1 (36000b5d0006a0000006a104900000000) dm-0
FUJITSU,ETERNUS_DX400
[size=50G][features=0][hwhandler=0][rw]
¥_ round-robin 0 [prio=2][active]
 ¥_ 3:0:0:0 sdb 8:16  [active][ready]
 ¥_ 4:0:0:0 sdc 8:32  [active][ready]
```

   Example of DM-MP display after disconnecting path

```
# /sbin/multipath -ll
mpath1 (36000b5d0006a0000006a104900000000) dm-0
FUJITSU,ETERNUS_DX400
[size=50G][features=0][hwhandler=0][rw]
¥_ round-robin 0 [prio=1][enabled]
 ¥_ 3:0:0:0 sdb 8:16  [active][ready]
```

   *2: See the ETERNUS Multipath Driver User's Guide (For Linux).

FC card

1. Stop the access to FC card on IOU by such a way as stopping application.

5.6.2 DR operation of IOU hot remove

This section describes DR operation for executing IOU hot remove.

1. Execute the /opt/FJSVdr-util/sbin/dr rm IOU command from the operating system shell. The IOU to be removal will be powered off.
   Example：To power off IOU3.

```
# /opt/FJSVdr-util/sbin/dr rm IOU3
#
```

2. Execute “/opt/FJSVdr-util/sbin/dr rm IOU” command on the shell of OS.
   A list of IOU included in the partition is shown. Check that IOU which is cut off is displayed as ‘offline’.
   Example: Cutting off the IOU 3

```
# /opt/FJSVdr-util/sbin/dr stat IOU
IOU0: empty
IOU1: empty
IOU2: empty
IOU3: offline
```

3. Log into the MMB Web-UI using Administrator privileges.
4. Execute hotremove command.
   Example：When removing IOU3 from partition1

```
Administrator > hotremove partition 1 IOU 3
Are you sure to continue removing IOU#3 from Partition#1?
[Y/N]: Y
DR operation start (1/3)
Remove IOU#3 (2/3)
IOU#3 power-off (3/3)
Removing IOU#3 from partition#1 has been completed
successfully.
Administrator >
```

5. See Operation Log window or perform “show dynamic_reconfiguration status” command and confirm below messages.
   Example： When removing IOU3 from partition 1.

   Operation Log window:
   “I_10110 Partition1 : Hot-remove IOU#3 Completed.”

   show dynamic_reconfiguration status:
   “Removing IOU#3 from Partition#1, completed”

5.6.3 Operation after IOU hot remove

This section describes the process and operation after IOU hot remove.
Note

If SVAgent is installed in the partition, perform below command with root privilege.

```
# /usr/sbin/srvmagt restart
```

IOU removed from the partition has become “free state” where it does not belong to any partition. You can perform below operations:

- Pull up the IOU from the cabinet physically.
- Integrate the IOU into other inactive partition.
- Hot add the IOU into other active partition.

Perform the necessary post processing (such as re-starting an application) for the operations performed for the higher-level applications in 5.6.1 Preparation for IOU hot remove.

NIC on the IOU (including onboard NIC)

1. Restart the application which is stop at preparing for IOU hot replacement

FC Card

1. Restart the application which is stop at preparing for IOU hot replacement

5.7 Hot Replacement of PCI Express Cards

This section describes the following methods of PCI Express card replacement with the PCI Hot Plug (PHP) function:

- Common replacement operations for all PCI Express cards such as power supply operations
- Specific operations added to procedures to use a specified card function or a driver for installation

There are two ways to perform PCI hot plug:

- Operation by using sysfs
- Operation by using dr commands

You can perform the operation by using dr commands if Dynamic Reconfiguration utility is installed in the partition. If not, be sure to use the operation by using sysfs. Although you can perform the operation by using sysfs even if Dynamic Reconfiguration utility is installed in the partition, it is recommended to perform the operation by using dr commands to prevent wrong operation.
Hereafter, description about the operation by using dr commands starts at 'For the partition with Dynamic Reconfiguration utility installed' and description about the operation by sysfs starts at 'For the partition without Dynamic Reconfiguration utility installed'.

Notes

- If you replace PCI Express cards on an IOU, see '5.4 Hot replacement of IOU'.
- In hot replacement of PCI Express cards, if you reboot the partition on OS without hot adding new PCI card to same PCI Express slot after you performed hot remove command, you cannot hot add a PCI Express card to the PCI Express slot unless you power off the partition.
  If you reboot the partition on OS before hot adding, you must power off the partition and replace the PCI Express card.
- If the Extended Partitioning is enabled, dr command is not supported for PCI Express card hot replacement.

Remarks
For details on the card replacement procedures not described in this chapter, see the respective product manuals.

5.7.1 Overview of common replacement procedures for PCI Express cards

This section provides an overview of common replacement procedures for all PCI Express cards.

1. Performing the required operating system and software operations depending on the PCI Express card type
2. Powering off a PCI slot
3. Replacing a PCI card
   This step is performed by the field engineer in charge of your system.
4. Powering on a PCI slot
5. Performing the required operating system and software operations depending on the PCI card type

Note
This chapter provides instructions (e.g., commands, configuration file editing) for the operating system and subsystems. Be sure to refer to the respective product manuals to confirm the command syntax and impact on the system before performing tasks with those instructions.
The following sections describe card addition, removal, and replacement with the required instructions (e.g., commands, configuration file editing) for the operating system and subsystems, together with the actual hardware operations. Step 3 is performed by the field engineer in charge of your system.

5.7.2 PCI Express card replacement procedure in detail

This section describes how to replace a PCI Express card.

Preparing the software using a PCI Express card

When a PCI Express card is replaced or removed, there must be no software using the PCI Express card. For this reason, before replacing or removing the PCI Express card, stop the software using the PCI Express card or make the software operations inapplicable.

Confirming the slot number of a PCI Express slot

When replacing, adding or removing a PCI Express card, you need to power on/off the appropriate slot, through the operating system. First, use the following procedure to obtain the slot number from the mounting location of the PCI Express slot for the card. It will be used to manipulate the power supply.

1. Identify the mounting location of the PCI Express card.
   See the figure in "B.1 Physical Mounting Locations of Components" to check the mounting location (board and slot) of the PCI Express card to be replaced.
2. Obtain the slot number of the mounting location.
   Check the table in "D.2 Correspondence between PCI Slot Mounting Locations and Slot Numbers", and obtain the slot number that is unique in the cabinet and assigned to the confirmed mounting locations. This slot number is the identification information for operating the slot of the PCI Express card to be replaced.

Note
The four-digit decimal numbers shown in <Slot number> in D.2 Correspondence between PCI Slot Mounting Locations and Slot Numbers have the leading digits filled with zeroes. The actual slot numbers do not include the zeroes in the leading digits.

Checking the power status of a PCI Express slot

- For the partition with Dynamic Reconfiguration utility installed
  Execute /opt/FJSVdr-util/sbin/dr stat pcie command on the shell of OS.
  After the list of the power status of PCI Express slots is shown, see the power status of the slot with the slot number which you confirmed at "Confirming the slot number of a PCI Express slot"
  Example:

```
# /opt/FJSVdr-util/sbin/dr stat pcie
pcie20: online
pcie21: offline
pcie22: empty
```

- For the partition without Dynamic Reconfiguration utility installed
  Using the PCI Express slot number confirmed in "Confirming the slot number of a PCI Express slot", confirm that the /sys/bus/pci/ slots directory contains a directory for this slot information, which will be referenced and otherwise used. Below, the PCI Express slot number confirmed in Confirming the slot number of a PCI Express slot is shown at <slot number> location in the directory path in the following format, where the directory is the operational target.

```
/sys/bus/pci/slots/<slot number>
```

  Confirm that the PCI Express card in the slot is enabled or disabled by displaying the "power" file contents in this directory.

```
# cat /sys/bus/pci/slots/<slot number>/power
```

  When displayed, "0" means disabled, and "1" means enabled.

Powering on and off PCI Express slots

When you insert a PCI Express card into the slot, the target slot is automatically powered on depending on the version of RHEL 7. You have to confirm the power status of the target slot by procedure in 'Checking the power status of a PCI Express slot'. If the target slot has already been powered on, it is not necessary to perform following operation of powering on the PCI Express slot.

- Powering on PCI Express slots:
  - For the partition with Dynamic Reconfiguration utility installed
    When you execute /opt/FJSVdr-util/sbin/dr add pcie<slot number> command on the shell of OS to power on the target slot, the PCI Express card becomes available and the LED turns on.
    Example: Making the PCI Express slot with PCI Express slot number 20 power on

```
# /opt/FJSVdr-util/sbin/dr add pcie20
```

- For the partition without Dynamic Reconfiguration utility installed
  When you write "1" to the "power" file in the directory corresponding to the target slot, the PCI Express card becomes available and the LED turns on.
  Example: Making the PCI Express slot with PCI Express slot number 20 power on

```
# echo 1 > /sys/bus/pci/slots/<slot number>/power
```

  This operation installs the device associated with the relevant adapter on the system.

  Note
  You need to confirm that the card and driver are correctly installed. The procedures vary depending on the card and driver specifications. For the appropriate procedures, see the respective manuals.

- Powering off PCI Express slots:
  - For the partition with Dynamic Reconfiguration utility installed
    When you execute /opt/FJSVdr-util/sbin/dr rm pcie<slot number> command on the shell of OS, the PCI Express card is disabled and has become to be ready for removal and the LED turns off.
    Example: Making the PCI Express slot with PCI Express slot number 20 power off

```
# /opt/FJSVdr-util/sbin/dr rm pcie20
```

  - For the partition without Dynamic Reconfiguration utility installed
    When you write "0" to the "power" file in the directory corresponding to the target slot, the PCI Express card is disabled and has become to be ready for removal and the LED turns off.
    Example: Making the PCI Express slot with PCI Express slot number 20 power off

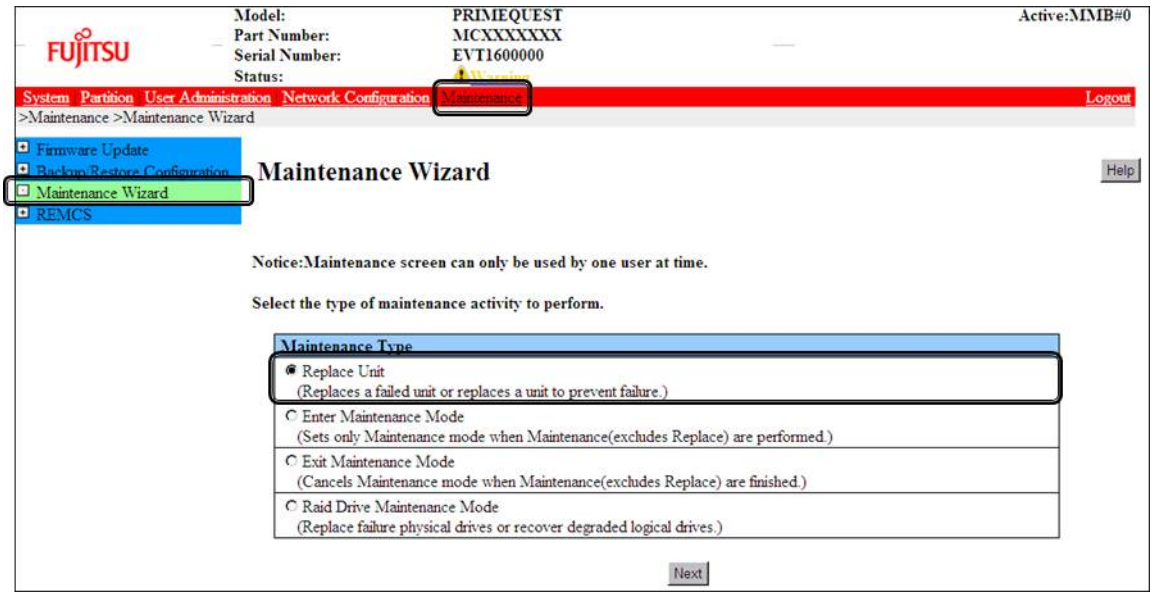
```
# echo 0 > /sys/bus/pci/slots/<slot number>/power
```

    This operation removes the device associated with the relevant adapter from the system.

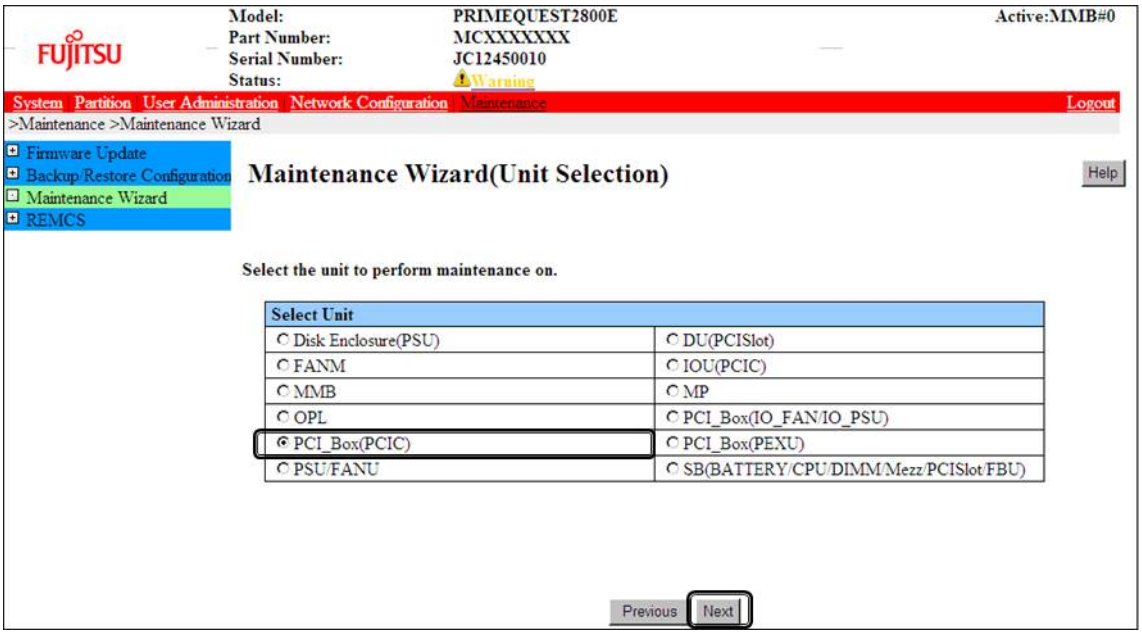
Operation for Hot replacement of PCI Express card by Maintenance Wizard

This item describes Operation for Hot replacement of PCI Express card (PCIC) by Maintenance Wizard Below works are performed by the field engineer in charge of your system.

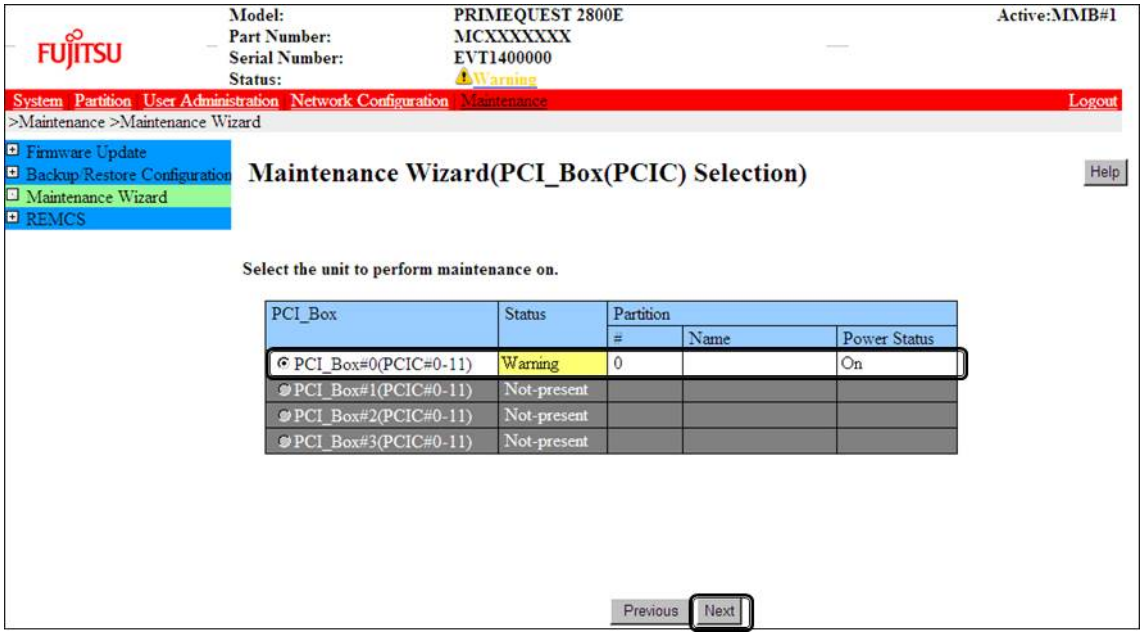
1. Start [Maintenance Wizard] menu by MMB Web-UI and display [Maintenance Wizard] view.
2. Select [Replace Unit] and click [Next].



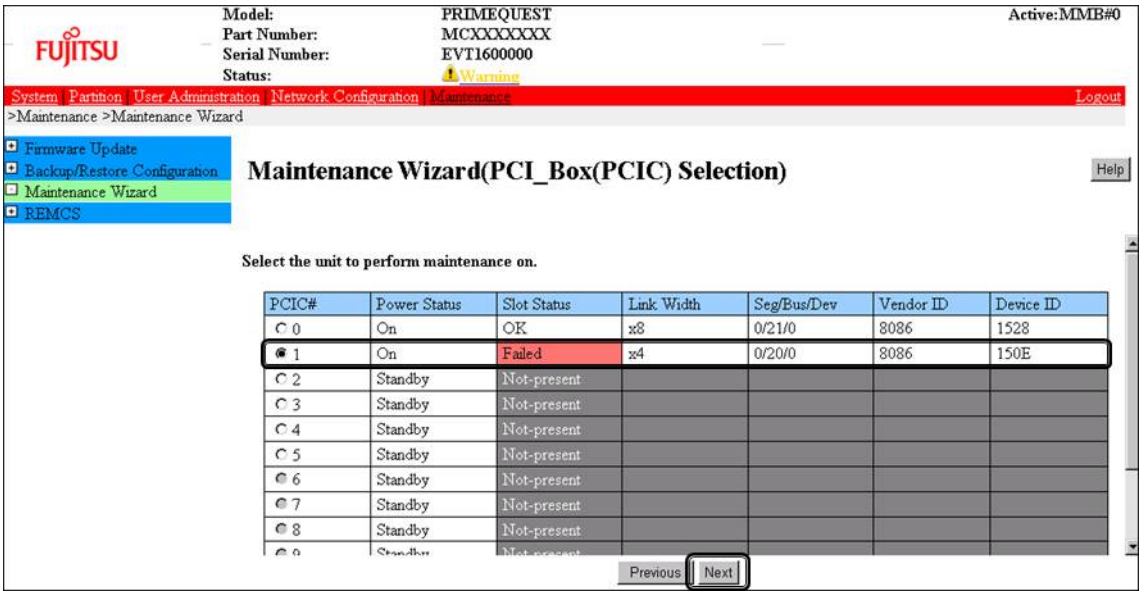
3. Select [PCI_Box(PCIC)], click [Next].



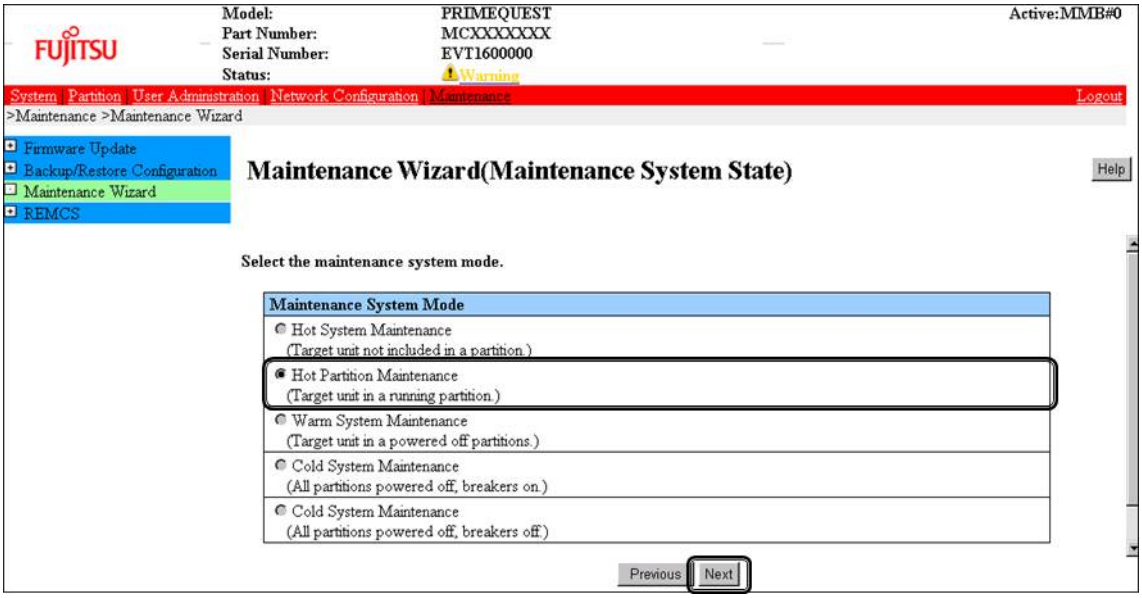
4. Select the radio button of PCI_Box with the particular number, click [Next]
   Example of operation for hot replacing PCI Express card of PCIC#1 mounted on PCI_Box#0



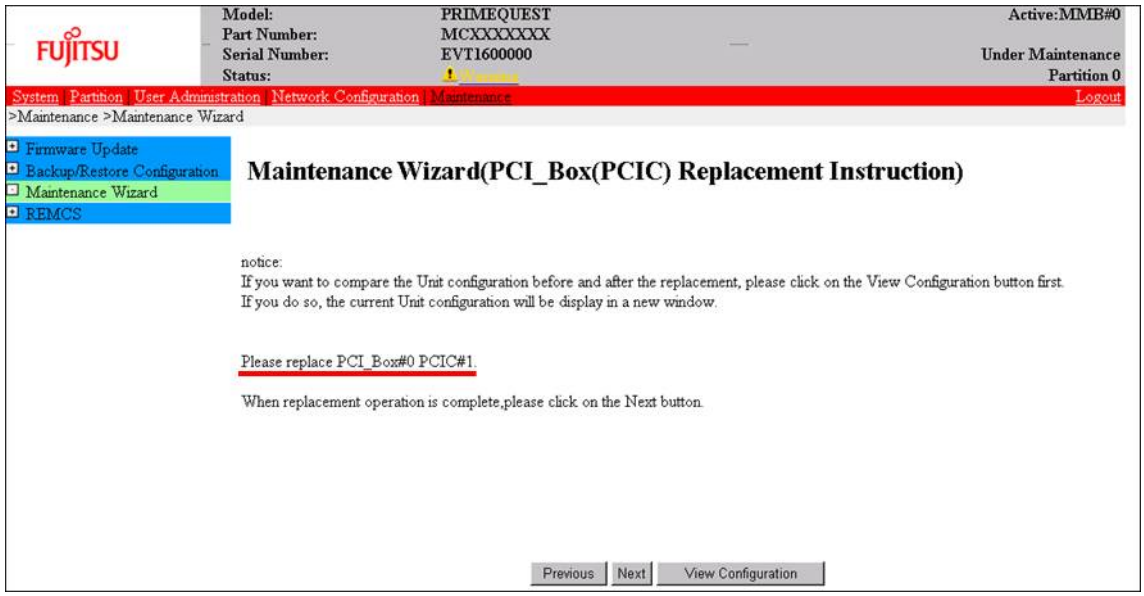
5. Select the radio button of the particular PCIC number and click [Next]



6. Select [Hot Partition Maintenance (Target unit in a running partition.)] and click [Next]



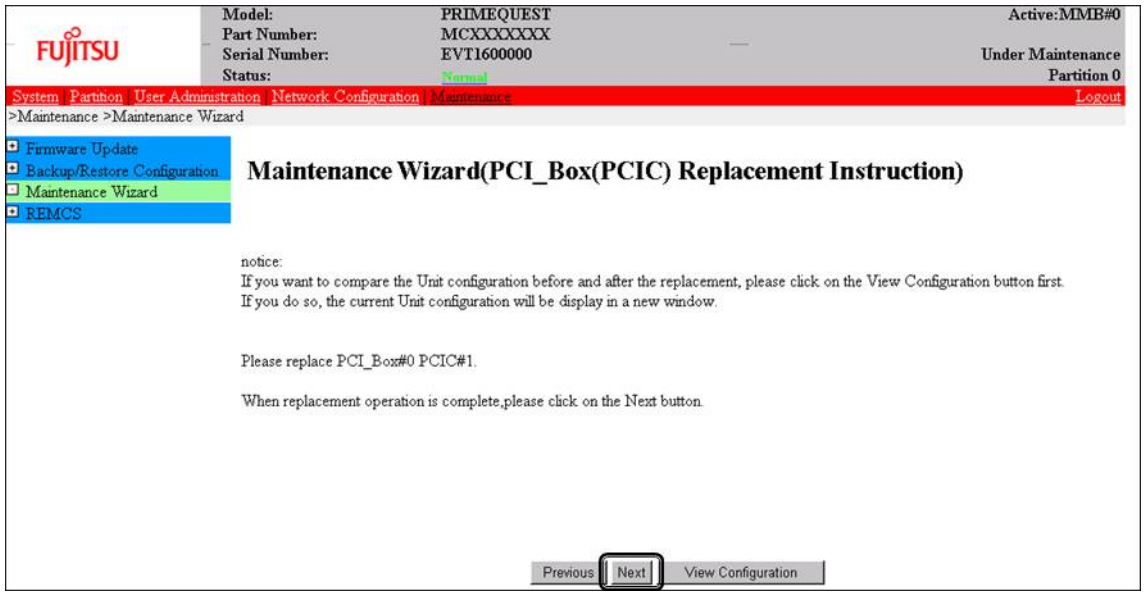
7. Maintenance mode is set (with information area of MMB Web-UI gray out) and then replacement instruction for the particular PCIC appears. Take off all cables such as LAN cable and FC cable connected to the particular PCIC and replace the particular PCIC with this window displayed.
   See the figure in 'B.1 Physical Mounting Locations of Components' to confirm the location of the PCI Express card to be replaced.



Note
Do NOT click [Next] until replacing the PCIC.

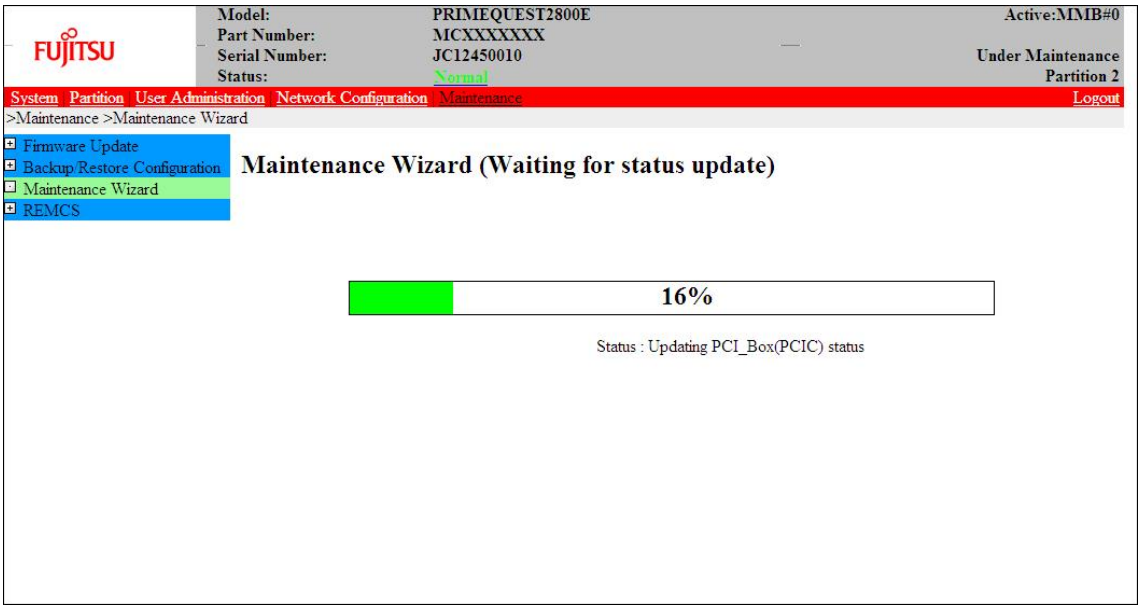
8. After replacing the particular PCIC, mount cables other than LAN cables.
   Note
   In GLS configuration with NIC switching way, mount also LAN cables.

9. Powering on the particular PCIC slot, click [Next].
   For how to power on the PCIC slot, see "Powering on and off PCI Express slots" in "5.7.2 PCI Express card replacement procedure in detail".
   It is the administrator of your system who power on the PCI Express slot.

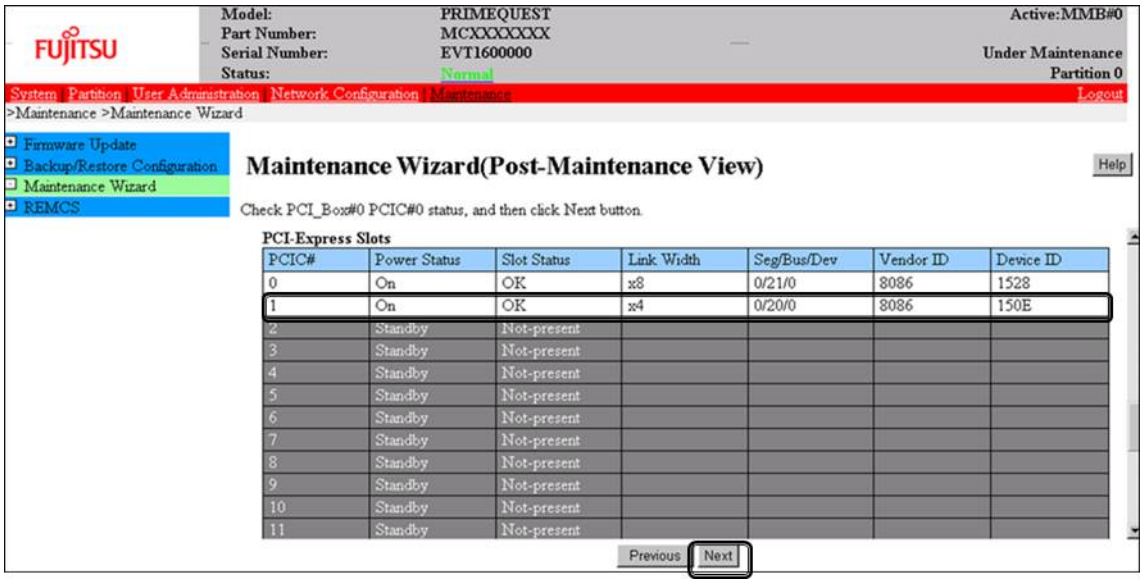


Note
Ask the administrator of your system to power on the PCI Express slot.

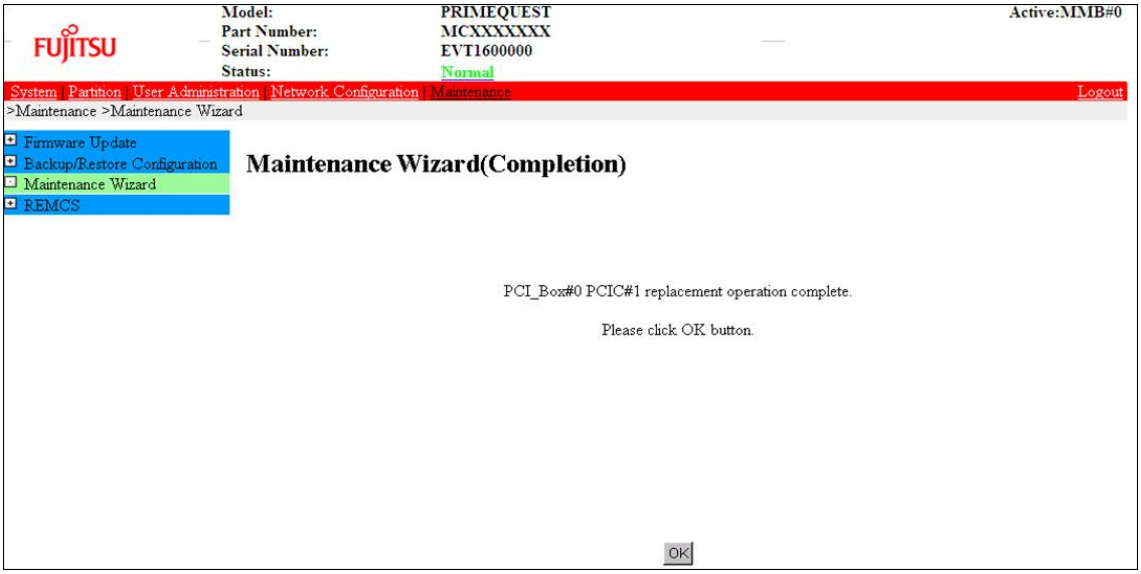
10. The window updating status appears.



11. Check the status of replaced PCIC and click [Next].



12. Confirm that maintenance mode has been released (with information area of MMB Web-UI not gray out) and click [Next].



Post-processing of software using a PCI Express card

After replacing a PCI Express card, restart the software stopped before the PCI Express card replacement or make the software operation applicable again, as needed.

5.7.3 FC card (Fibre Channel card) replacement procedure

The descriptions in this section assume that an FC card is being replaced.
Notes

- The FC card used for SAN boot does not support hot plugging.
- Although you can hot replace FC card used for dump device of sadump, collecting dump of memory fails until reconfiguring HBA UEFI or extended BIOS with the partition inactive after replacing the FC card.
- This section does not cover configuration changes in peripherals (e.g., UNIT addition or removal for a SAN disk device).
- This manual does not describe how to change the configuration of peripherals such as expanding and removing the unit of SAN disk device.
- To prevent a device name mismatch due to the failure, addition, removal, or replacement of an FC card, access the SAN disk unit by using the by-id name (/dev/disk/by-id/...) for the device name.
- If all the paths in a mounted disk become hidden when an FC card is hot replaced, unmount the disk. Then, execute PCI hot plug.

FC card replacement procedure

The procedure for replacing only a faulty FC card without replacing other peripherals is as follows.

1. Make the necessary preparations.
   Stop access to the faulty FC card, such as by stopping applications.
2. Confirm the slot number of the PCI Express slot.
   See ‘Confirming the slot number of a PCI Express slot’ in “5.7.2 PCI Express card replacement procedure in detail”.
3. Power off the PCI Express slot.
   See ‘Powering on and off PCI Express slots’ in “5.7.2 PCI Express card replacement procedure in detail”.
4. Physically replace the target card by using MMB Maintenance Wizard. This step is performed by the field engineer in charge of your system.
   For details on the operation of replacement, see step 1 to 7 of ‘Operation for Hot replacement of PCI Express card by Maintenance Wizard’ in “5.7.2 PCI Express card replacement procedure in detail”.

5. Reconfigure the peripheral according to its manual.
   For example, suppose that the storage device used is ETERNUS and that the host affinity function is used (to set the access right for each server). Their settings would need to be changed as a result of FC card replacement.

6. Power on the PCI Express slot.
   See 'Powering on and off PCI Express slots' in "5.7.2 PCI Express card replacement procedure in detail".

7. Check whether there is an error in added FC card by MMB Maintenance Wizard.
   This step is performed by the field engineer in charge of your system.
   For details on the operation of replacement, see step 8 to 11 of 'Operation for Hot replacement of PCI Express card by Maintenance Wizard' in "5.7.2 PCI Express card replacement procedure in detail".

8. Check the version of the firmware
   It is required that the firmware version of new FC card is same as the FC card which had been replaced.
   If the firmware version of new FC card is same as the FC card which had been replaced (current firmware version), it is not necessary to update the firmware version of new FC card to current firmware version.
   If the firmware version of new FC card is not same as the FC card which had been replaced (current firmware version), update the firmware version of new FC card to current firmware version.
   For how to update the firmware version, see Firmware update manual for fibre channel card.
   Note
   If you cannot confirm the firmware version of the FC card before replacing due to the fault of the FC card, check the firmware version of the FC card which is same type as the faulty one to update firmware version.

9. Confirm the incorporation results.
   'Confirming the FC card incorporation results' describes the confirmation method. Start operation with the FC card again by restarting applications as needed or by other such means.

10. Perform the necessary post-processing.
    If you stopped any other application in step 1, restart it too as needed.

Confirming the FC card incorporation results

Confirm successful incorporation of the FC card and the corresponding driver in the following method. Then, take appropriate action. Check the log. (The following example shows a log of FC card hot plugging.)
As shown below, the output of an FC card incorporation message and device found message as the log output to /var/log/messages after the PCI Express slot containing the mounted FC card is enabled means that the FC card was successfully incorporated.

```
scsi10:Emulex LPe1250-F8 8Gb PCIe Fibre Channel ¥
       Adapter on PCI bus 0f device 08 irq 59 ...(*1)
       lpfc 0000:0d:00.0: 0:1303 Link Up Event x1 received ¥
       Data: x1 x0 x10 x0 x0 x0 0 ...(*2)
       scsi 2:0:0:0: Direct-Access FUJITSU E4000 ¥
0000 PQ: 1 ANSI: 5        ...(*3)
```

The ¥ at the end of a line indicates that there is no line feed.

If only the message in (*1) is displayed but the next line is not displayed or if the message in (*1) is not displayed, the FC card replacement itself was unsuccessful. (See Note below.) In this case, power off the slot once. Then, check the following points again:

- Whether the FC card is correctly inserted into the PCI Express slot
- Whether the latch is correctly set

Eliminate the problem, power on the slot again, and check the log.
If the message in (*1) is displayed but the FC linkup message in (*2) is not displayed, the FC cable may be disconnected or the FC path may not be set correctly. Power off the slot once. Confirm the following points again.

- Confirm the FC driver setting.
  The definition file containing a description of the driver option of the FC driver (lpfc) is identified with the following command.
  Example: Description in /etc/modprobe.d/lpfc.conf

```
# grep -l lpfc /etc/modprobe.d/*

/etc/modprobe.d/lpfc.conf
```

Confirm that the driver option of the FC driver (lpfc) is correctly set. For details, contact the distributor where you purchased your product, or your sales representative.

- Check the FC cable connection status.
- Confirm the Storage FC settings.
  Confirm that the settings that conform to the actual connection format (Fabric connection or Arbitrated Loop connection) were made.
  If the messages in (*1) and (*2) are displayed but the messages in (*3) are not displayed, the storage is not yet found. Check the following points again. These are not card problems, so you need not power off the slot for work.
  - Review FC-Switch zoning settings.
  - Review storage zoning settings.
  - Review storage LUN Mapping settings.

    Also, confirm that the storage can be correctly viewed from LUN0.
    Eliminate the problem. Then, confirm the settings and recognize the system by using the following procedure.

1. Confirm the host number of the incorporated FC card from the message at (*1).
   xx in scsixx (xx is a numerical value) in the message at (*1) is a host number. In the above example, the host number is 10.
2. Scan the device by executing the following command.

```
# echo "-" "-" "-" > /sys/class/scsi_host/hostxx/scan
(# is command prompt)

(xx in hostxx is the host number entered in step 1.)
```

   The command for the above example is as follows.

```
# echo "-" "-" "-" > /sys/class/scsi_host/host10/scan
```

3. Confirm that a message like (*3) was output to /var/log/messages.
   If this message is not displayed, confirm the settings again.

   Note
   In specific releases of RHEL, a message like (*1) for confirming FC card incorporation may be output in the following format with card name information omitted.

```
scsi10 : on PCI bus 0f device 08 irq 59
```

   In this case, check for the relevant message on the FC card incorporation by using the following procedure.

   a. Confirm the host number.
      xx in scsixx (xx is a numerical value) in the message is a host number. In the above example, the host number is 10.

   b. Check whether the following file exists by using the host number.

```
/sys/class/scsi_host/hostxx/modeldesc
(xx in hostxx is the host number entered in step 1.)
```

      If the file does not exist, the judgment is that no such message was output from the FC card.

   c. If the file exists, check the file contents by using the following operation.

```
# cat /sys/class/scsi_host/hostxx/modeldesc
Emulex LPe1250-F8 8Gb PCIe Fibre Channel Adapter

(xx in hostxx is the host number entered in step 1.)
```

      If the output is like the above, the judgment is that the relevant message was output by the incorporation of the FC card.

5.7.4 Network card replacement procedure

Network card (referred to as NIC below) replacement using hot plugging needs specific processing before and after PCI Express slot power-on or power-off. Its procedure also includes the common PCI Express card replacement procedure.
The procedure describes operations where a single NIC is configured as one interface. It also describes cases where multiple NICs are bonded together to configure one interface (bonding configuration). For bonding multiple NIC by using PRIMECLUSTER Global Link Services (GLS), see manual of PRIMECLUSTER Global Link Services. Although name form of NIC differs depending on mounting location of the NIC in RHEL7, conventional 'ethX' is used in below description. 'ethX' should be replaced to actual name of the NIC as necessary.

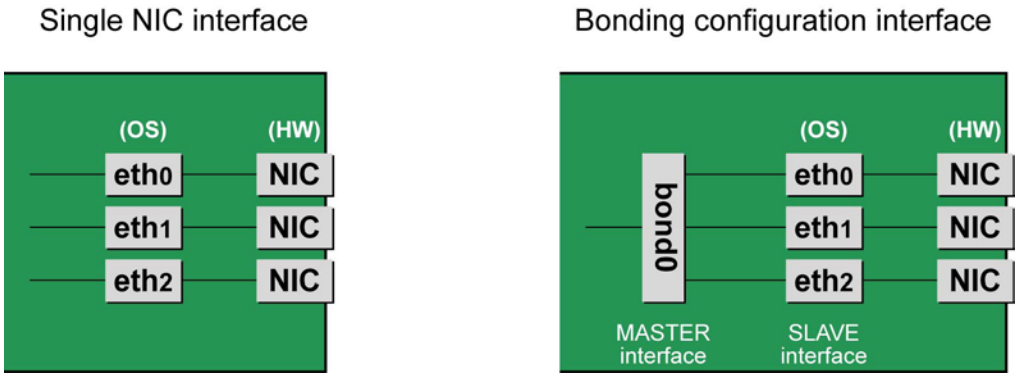


FIGURE 5.2 Single NIC interface and bonding configuration interface

NIC replacement procedure

This section describes the procedure for NIC replacement.
Notes

- When replacing multiple NICs, be sure to replace them one by one. If you replace multiple cards at the same time, they may not be correctly configured.
- To perform hot replacement in a system where a bonding device is installed, design the system so that it specifies ONBOOT=YES in all interface configuration files (the /etc/sysconfig/network-scripts/ifcfg-eth*files and the /etc/sysconfig/network-scripts/ifcfg-bond*files), regardless of whether the NIC to be replaced is a configuration interface of the bonding device.
  An IP address need not to be assigned to unused interfaces. This procedure is to prevent the device name of the replacement target NIC from being changed after hot replacement. If ONBOOT=NO also exists, the procedure described here may not work properly.

1. Confirm the slot number of the PCI Express slot that has the mounted interface.
   Confirm the interface mounting location through the configuration file information and the operating system information. First, confirm the bus address of the PCI Express slot that has the mounted interface to be replaced.
   Example: eth0 interface

```
# ls -l /sys/class/net/eth0/device
lrwxrwxrwx 1 root root 0 Sep 29 10:17 ¥
/sys/class/net/eth0/device
->../../../0000:00:01.2/0000:08:00.2/0000:0b:01.0
```

   The ¥ at the end of a line indicates that there is no line feed.

   Excluding the rest of the directory path, check the part corresponding to the file name in the symbolic link destination file of the output results. In the above example, the underlined part shows the bus address. ("0000:0b:01" in the example)
   Note
   You will use the bus address obtained here in steps 2 and 11. Record the bus address so that you can reference it later.

   Next, check the PCI Express slot number for this bus address.

```
# grep -il 0000:0b:01 /sys/bus/pci/slots/*/address
/sys/bus/pci/slots/20/address
```

   Read the output file path as shown below, and confirm the PCI Express slot number.

```
/sys/bus/pci/slots/<slot number>/address
```

Notes
If the above file path is not output, it indicates that the NIC is not mounted in a PCI Express slot (e.g., GbE port in the IOU).
With the PCI Express slot number confirmed here, see 'D.2 Correspondence between PCI Slot Mounting Locations and Slot Numbers'PCI Express slot to check the mounting location, and see also 'B.1 Physical Mounting Locations of Components' to identify the physical mounting location corresponding to the PCI Express slot number. You can confirm that it matches the mounting location of the operational target NIC.

2. Collect information about interfaces on the same NIC.
For a NIC that has more than one interface, you will need to deactivate all the interfaces on the NIC. Use the following procedure to check each interface that has the same bus address as that confirmed in step 1. Then, make a table with information including the interface name, hardware address, and bus address.
Note
Collect the following information even if the NIC has only one interface.

- Confirm the correspondence between the bus address and interface name.
Execute the following command, and confirm the correspondence between the bus address and interface name.
Example: The bus address is "0000:0b:01".

```
# ls -l /sys/class/net/*/device | grep "0000:0b:01"
lrwxrwxrwx 1 root root 0 Sep 29 10:17 ¥
/sys/class/net/eth0/device
->../../../0000:00:01.2/0000:08:00.2/0000:0b:01.0
lrwxrwxrwx 1 root root 0 Sep 29 10:17 ¥
/sys/class/net/eth1/device
->../../../0000:00:01.2/0000:08:00.2/0000:0b:01.1
```

The ¥ at the end of a line indicates that there is no line feed.

The following table shows the correspondence between the bus addresses and interface names from the above output example.

TABLE 5.6 Correspondence between bus addresses and interface names

Interface name	Hardware address	Bus address	Slot number
eth0		0000:0b:01.0	20
eth1		0000:0b:01.1	20
...		...	...

Note
When recording a bus address, include the function number (number after the period).

- Confirm the correspondence between the interface name and hardware address.
Execute the following command, and confirm the correspondence between the interface name and hardware address.
Example: eth0 [For a single interface]

```
# cat /sys/class/net/eth0/address
00:0e:0c:70:c3:38
```

Example: eth0 [For a bonding interface]
The bonding driver rewrites the values for the slave interface of the bonding device. Confirm the hardware address by executing the following command.

```
# cat /proc/net/bonding/bondY

Ethernet Channel Bonding Driver .........
.
.
Slave interface: eth0
.
Permanent HW addr: 00:0e:0c:70:c3:38
.
.
```

You can use this procedure only when the bonding device is active. If the bonding device is not active or the slave has not been incorporated, use the same procedure as for a single interface.Confirm the

hardware address of other interfaces by repeating the operation with the same command. The following table lists examples of descriptions.

TABLE 5.7 Hardware address description examples

Interface name	Hardware address	Bus address	Slot number
eth0	00:0e:0c:70:c3:38	0000:0b:01.0	20
eth1	00:0e:0c:70:c3:39	0000:0b:01.1	20
...	...	...	...

The step above is used in creating the correspondence table in step 12. Prepare a table here so that you can reference it later.

Note

In a replacement due to a device failure, the information in the table showing the correspondence between the interface and the hardware address, bus address, and slot number may be inaccessible depending on the failure condition. We strongly recommend that a table showing the correspondence between the interface and the hardware address, bus address, and slot number be created for all interfaces at system installation.

3. Execute the higher-level application processing required before NIC replacement.
   Stop all access to the interface as follows. Stop the application that was confirmed in step 2 as using the interface, or exclude the interface from the target of use by the application.

4. Deactivate the NIC.
   Execute the following command to deactivate all the interfaces that you confirmed in step 2.
   The applicable command depends on whether the target interface is a single NIC interface or the SLAVE interface of a bonding device.
   [For a single NIC interface]

```
# /sbin/ifdown ethX
```

   If the single NIC interface has a VLAN device, you also need to remove the VLAN interface. Perform the following operations (before deactivating the real interface).

```
# /sbin/ifdown ethX.Y
# /sbin/vconfig rem ethX.Y
```

   [For the SLAVE interface of a bonding device]
   If the bonding device is operating in mode 1, use the following steps to exclude SLAVE interface to be replaced from the bonding configuration. In any other mode, removing it immediately should not cause any problems.
   Confirm that the SLAVE interface to be replaced is the interface currently being used for communication. First, confirm the interface currently being used for communication by executing the following command.

```
# cat /sys/class/net/bondY/bonding/active_slave
```

   If the displayed interface matches the SLAVE interface being replaced, execute the following command to switch the current communication interface to another SLAVE interface.

```
# /sbin/ifenslave -c bondY ethZ
(ethZ: Interface that composes bondY and does not perform
hot replacement)
```

   Finally, remove the SLAVE interface being replaced, from the bonding configuration. Immediately after being removed, the interface is automatically no longer used.

```
# /sbin/ifenslave -d bondY ethX
```

5. Power off the PCI Express slot.

   - For the partition with Dynamic Reconfiguration utility installed
     Execute /opt/FJSVdr-util/sbin/dr rm pcie<slot number> command on the shell of OS.
     The PCI Express card is disabled and has become to be ready for removal. The LED turns off.
     Example: Making the PCI Express slot with PCI Express slot number 20 power off

```
# /opt/FJSVdr-util/sbin/dr rm pcie20
```

     This operation removes the device associated with the relevant adapter from the system.

   - For the partition without Dynamic Reconfiguration utility installed
     Confirm that the /sys/bus/pci/slots directory contains a directory for the target slot information, which

will be referenced and otherwise used. Below, the slot number confirmed in step 1 is shown at <slot number> in the directory path in the following format, where the directory is the operational target.

```
/sys/bus/pci/slots/<slot number>
```

To disable a PCI Express card and make it ready for removal, write "0" to the "power" file in the directory corresponding to the target slot. The LED turns off. The interface (ethX) is removed at the same time.

```
# echo 0 > /sys/bus/pci/slots/<slot number>/power
```

6. Save the interface configuration file.
   Save all the interface configuration files that you checked in step 2 by executing the following command. Configuration scripts may reference the contents of files in /etc/sysconfig/network-scripts. For this reason, create a save directory and save these files to the directory so that the configuration scripts will not reference them.

```
# cd /etc/sysconfig/network-scripts
# mkdir temp
# mv ifcfg-ethX temp
(following also executed for bonding configuration)
# mv ifcfg-bondX temp
```

7. Physically replace the NIC by using MMB Maintenance Wizard. This step is performed by the field engineer in charge of your system.
   For details on the operation of replacement, see step 1 to 7 of ‘Operation for Hot replacement of PCI Express card by Maintenance Wizard’ in “5.7.2 PCI Express card replacement procedure in detail”.

8. Power on the PCI Express slot.
   See ‘Powering on and off PCI Express slots’ in “5.7.2 PCI Express card replacement procedure in detail”.

9. Check whether there is an error in added FC card by MMB Maintenance Wizard.
   This step is performed by the field engineer in charge of your system.
   For details on the operation of replacement, see step 8 to 11 of ‘Operation for Hot replacement of PCI Express card by Maintenance Wizard’ in “5.7.2 PCI Express card replacement procedure in detail”.

10. Collect the information associated with an interface on the replaced NIC.
    An interface (ethX) is created for the replaced NIC at the power-on time. Make a table with information about each interface created for the replaced NIC. Such information includes the interface name, hardware address, and bus address. Use the bus address confirmed in step 1 and the same procedure as in step 2.

TABLE 5.8 Example of interface information about the replaced NIC

Interface name	Hardware address	Bus address	Slot number
eth1	00:0e:0c:70:c3:40	0000:0b:01.0	20
eth0	00:0e:0c:70:c3:41	0000:0b:01.1	20
...	...	...	...

Confirm that a new hardware address is defined for the bus address. Also confirm that the assigned interface name is the same as that before the NIC replacement.
Note
The correspondence between the bus address and interface name may be different from that before NIC replacement. In such cases, just proceed with the work. This is explained in step 13.

11. Deactivate each newly created interface.
    The interfaces created for the replaced NIC may be active because power is on to the PCI Express slot. In such cases, you need to deactivate them before changing the interface configuration file.
    Execute the following command for all the interface names confirmed in step 11.
    Example: eth0

```
# /sbin/ifconfig eth0 down
```

12. Confirm the correspondence between the interface names before and after the NIC replacement.
    From the interface information created before and after the NIC replacement in steps 2 and 10, confirm the correspondence between the interface names before replacement and the new interface names.

    a. Confirm the correspondence between the bus address and interface name on each line in the table created in step 2.

    b. Likewise, confirm the correspondence between the bus addresses and interface names in the table created in step 10.

c. Match the interface names to the same bus addresses before and after the NIC replacement.

d. In the table created in step 10, enter values corresponding to the interface names before and after the NIC replacement.

TABLE 5.9 Example of entered values corresponding to the interface names before and after NIC replacement

Interface name After replacement (-> Before replacement)	Hardware address	Bus address	Slot number
eth1 (-> eth0)	00:0e:0c:70:c3:40	0000:0b:01.0	20
eth0 (-> eth1)	00:0e:0c:70:c3:41	0000:0b:01.1	20
...	...	...	...

13. Edit the saved interface configuration file.
Write a new hardware address to replace the old one. In "HWADDR," set the hardware address of the replaced NIC in 'TABLE 5.9 Example of entered values corresponding to the interface names before and after NIC replacement''. Also, for SLAVE under bonding, the file contents are partly different, but the lines to be set are the same.

```
(Example)
DEVICE=eth0
NM_CONTROLLED=no BOOTPROTO=static HWADDR=00:0E:0C:70:C3:40
BROADCAST=192.168.16.255
IPADDR=192.168.16.1
NETMASK=255.255.255.0
NETWORK=192.168.16.0
ONBOOT=yes
TYPE=Ethernet
```

Do this editing for all the saved interfaces.

14. Restore the saved interface configuration file to the original file.
Restore the interface configuration file saved to the save directory to the original file by executing the following command.

```
# cd /etc/sysconfig/network-scripts/temp
# mv ifcfg-ethX   ..
(following also executed for bonding configuration)
# mv ifcfg-bondX   ..
```

15. Activate the replaced interface.
The method for activating a single NIC interface differs from that for activating the SLAVE interfaces under bonding.
[For a single NIC interface]
Execute the following command to activate the interface. Activate all the necessary interfaces.

```
# /sbin/ifup ethX
```

Also, if the single NIC interface has a VLAN device and the VLAN interface was temporarily removed, restore the VLAN interface. If the priority option has changed, set it again.

```
# /sbin/vconfig add ethX Y
# /sbin/ifup ethX.Y
(enter command to set VLAN option as needed)
```

[For SLAVE under bonding]
Execute the following command to incorporate the SLAVE interface into the existing bonding configuration. Incorporate all the necessary interfaces.

```
# /sbin/ifenslave bondY ethX
```

The VLAN-related operation is normally not required because a VLAN is created on the bonding device.

16. Mount all cables connected to the particular PCIC.
This step is performed by the field engineer in charge of your system.
Note
In GLS configuration with NIC switching way, you do not need to perform this step.

17. Remove the directory to which the interface configuration file was saved.
After all the interfaces to be replaced have been replaced, remove the save directory created in step 6 by executing the following command.

```
# rmdir /etc/sysconfig/network-scripts/temp
```

18. Execute the higher-level application processing required after NIC replacement.
    Perform the necessary post processing (such as starting an application or restoring changed settings) for the operations performed for the higher-level applications in step 3.

5.7.5 Hot replacement procedure for iSCSI (NIC)

When performing hot replacement of NICs used for iSCSI connection, use the following procedures.

- 5.7.1 Overview of common replacement procedures for PCI Express cards
- 5.7.2 PCI Express card replacement procedure in detail
- 5.7.4 Network card replacement procedure

A supplementary explanation of the procedure follows.

Prerequisites for iSCSI (NIC) hot replacement

- The prerequisites for iSCSI (NIC) hot replacement are as follows.
- The storage connection is established on a multipath using DM-MP (Device-Mapper Multipath) or ETERNUS multidriver (EMPD).
- To replace more than one iSCSI card, one card at a time will be replaced.
- A single NIC is configured as one interface.

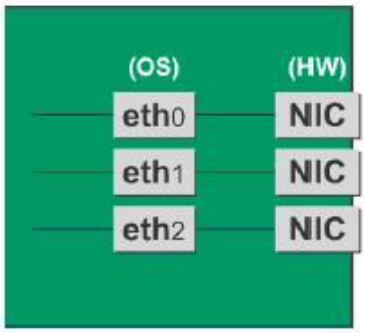


FIGURE 5.3 Example of single NIC interface

Work to be performed before iSCSI (NIC) replacement

For iSCSI (NIC) hot replacement, be sure to follow the procedure below when performing Step 3 of the 'NIC replacement procedure' in '5.7.4 Network card replacement procedure'

1. Perform the work for suppressing access to the iSCSI connection interface.
   a. Confirm the state of multiple path by DM-MP (*1) or EMPD (*2).
   b. Use the iscsiadm command to log out from the path (iqn) through which the iSCSI card to be replaced is routed, and disconnect the session.
      Example which confirms the state of session before disconnecting:

```
# /sbin/iscsiadm -m session
tcp: [1] 192.168.1.64:3260,1 iqn.2000-
09.com.fujitsu:storage-system.eternus-
dx400:00001049.cm0ca0p0
tcp: [2] 192.168.2.66:3260,3 iqn.2000-
09.com.fujitsu:storage-system.eternus-
dx400:00001049.cm1ca0p0
```

      Example which logout path going through a NIC to be replaced:

```
# /sbin/iscsiadm -m node -T iqn.2000-09.com.fujitsu:storage-
system.eternus-dx400:00001049.cm1ca0p0 -p 192.168.2.66:3260
--logout
```

c. Use the iscsiadm command to confirm that the target session has been disconnected.
Example which confirms the state of session after disconnecting

```
# /sbin/iscsiadm -m session
tcp: [1] 192.168.1.64:3260,1 iqn.2000-
09.com.fujitsu:storage-system.eternus-
dx400:00001049.cm0ca0p0
```

d. You can confirm the disconnection of sessions on multipath products using DM-MP or ETERNUS multidriver.
*1: Write down the DM-MP display contents at the session disconnection.
Example of DM-MP display before disconnecting path

```
# /sbin/multipath -ll
mpath1 (36000b5d0006a0000006a104900000000) dm-0
FUJITSU,ETERNUS_DX400
[size=50G][features=0][hwhandler=0][rw]
¥_ round-robin 0 [prio=2][active]
 ¥_ 3:0:0:0 sdb 8:16  [active][ready]
 ¥_ 4:0:0:0 sdc 8:32  [active][ready]
```

Example of DM-MP display after disconnecting path

```
# /sbin/multipath -ll
mpath1 (36000b5d0006a0000006a104900000000) dm-0
FUJITSU,ETERNUS_DX400
[size=50G][features=0][hwhandler=0][rw]
¥_ round-robin 0 [prio=1][enabled]
 ¥_ 3:0:0:0 sdb 8:16  [active][ready]
```

*2: See the ETERNUS Multipath Driver User's Guide (For Linux).

Work to be performed after NIC replacement

For iSCSI (NIC) hot replacement, be sure to follow the procedure below when Step 19 of the NIC replacement procedure in 5.7.4 Network card replacement procedure.

1. To restore access to the iSCSI connection interface, perform the following.

   a. Confirm the state of multiple path by DM-MP (*1) or EMPD (*2).

   b. Use the iscsiadm command to log in to the path (iqn) through which the replacement iSCSI card is routed, and reconnect the session.
   Example which confirms the state of session before connecting:

```
# /sbin/iscsiadm -m session
tcp: [1] 192.168.1.64:3260,1 iqn.2000-
09.com.fujitsu:storage-system.eternus-
dx400:00001049.cm0ca0p0
```

   Example which login path going through a NIC to be replaced:

```
# /sbin/iscsiadm -m node -T iqn.2000-09.com.fujitsu:storage-
system.eternus-dx400:00001049.cm1ca0p0 -p 192.168.2.66:3260
–-login
```

   c. Use the iscsiadm command to confirm that the target session has been activated.
   Example which confirms the state of session after connecting

```
# /sbin/iscsiadm -m session
tcp: [1] 192.168.1.64:3260,1 iqn.2000-
09.com.fujitsu:storage-system.eternus-
dx400:00001049.cm0ca0p0
tcp: [3] 192.168.2.66:3260,3 iqn.2000-
09.com.fujitsu:storage-system.eternus-
dx400:00001049.cm1ca0p0
```

   d. You can confirm the activation of sessions on multipath products using DM-MP or ETERNUS multidriver.
   *1: Write down the DM-MP display contents at the session activation.
   Example of DM-MP display before connecting path

```
# /sbin/multipath -ll
```

```
mpath1 (36000b5d0006a0000006a104900000000) dm-0
FUJITSU,ETERNUS_DX400
[size=50G][features=0][hwhandler=0][rw]
¥_ round-robin 0 [prio=1][active]
 ¥_ 3:0:0:0 sdb 8:16  [active][ready]
```

Example of DM-MP display after connecting path

```
# /sbin/multipath -ll
mpath1 (36000b5d0006a0000006a104900000000) dm-0
FUJITSU,ETERNUS_DX400
[size=50G][features=0][hwhandler=0][rw]
¥_ round-robin 0 [prio=2][enabled]
 ¥_ 3:0:0:0 sdb 8:16  [active][ready]
 ¥_ 5:0:0:0 sdc 8:32  [active][ready]
```

*2: See the ETERNUS Multipath Driver User's Guide (For Linux).

5.8 Hot Addition of PCI Express cards

This section describes the PCI Express card addition procedure with the PCI Hot Plug function.
The procedure includes common steps for all PCI Express cards and the additional steps required for a specific card function or driver.
Thus, the descriptions cover both the common operations required for all cards (e.g., power supply operations) and the specific procedures required for certain types of card. For details on addition of the cards not described in this section, see the respective product manuals.
There are two ways to perform PCI hot plug:

- Operation by using sysfs
- Operation by using dr commands

You can perform the operation by using dr commands if Dynamic Reconfiguration utility is installed in the partition. If not, be sure to use the operation by using sysfs. Although you can perform the operation by using sysfs even if Dynamic Reconfiguration utility is installed in the partition, it is recommended to perform the operation by using dr commands to prevent wrong operation.
Hereafter, description about the operation by using dr commands starts at ‘For the partition with Dynamic Reconfiguration utility installed’ and description about the operation by sysfs starts at ‘For the partition without Dynamic Reconfiguration utility installed’.

Notes

- If you hot add PCI Express cards into an IOU, see ‘5.5 Hot add of IOU’.
- If the Extended Partitioning is enabled, dr command is not supported for PCI Express card hot replacement.

5.8.1 Common addition procedures for all PCI Express cards

1. Performing the required operating system and software operations depending on the PCI card type
2. Confirming that the PCI Express slot power is off
3. Adding a PCI card
   This step is performed by the field engineer in charge of your system.
4. Powering on a PCI Express slot.
5. Performing the required operating system and software operations depending on the PCI card type

Notes
This section describes instructions for the operating system and subsystems (e.g., commands, configuration file editing). Be sure to refer to the respective product manuals to confirm the command syntax and impact on the system before performing tasks with those instructions.
The following sections describe card addition with the required instructions (e.g., commands, configuration file editing) for the operating system and subsystems, together with the actual hardware operations. Step 3 is performed by the field engineer in charge of your system.

5.8.2 PCI Express card addition procedure in detail

This section describes operations that must be performed in the PCI Express card addition procedure.

Confirming the slot number of a PCI Express slot

See 'Confirming the slot number of a PCI Express slot' in "5.7.2 PCI Express card replacement procedure in detail".

Checking the power status of a PCI Express slot

See 'Checking the power status of a PCI Express slot' in "5.7.2 PCI Express card replacement procedure in detail".

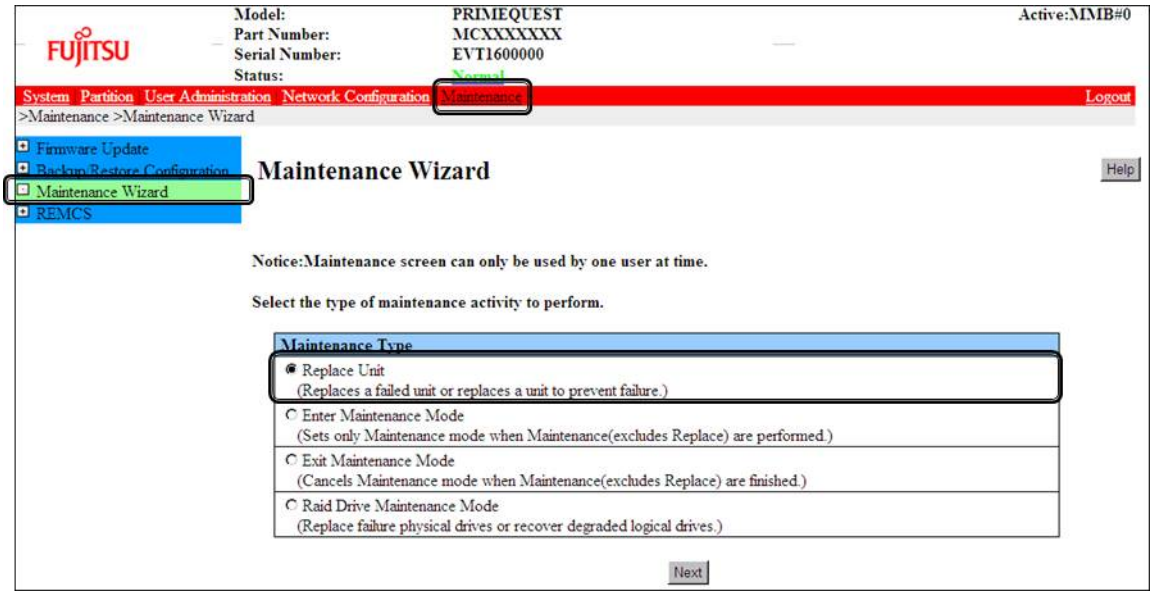
Powering on and off PCI Express slots

See 'Powering on and off PCI Express slots' in "5.7.2 PCI Express card replacement procedure in detail".

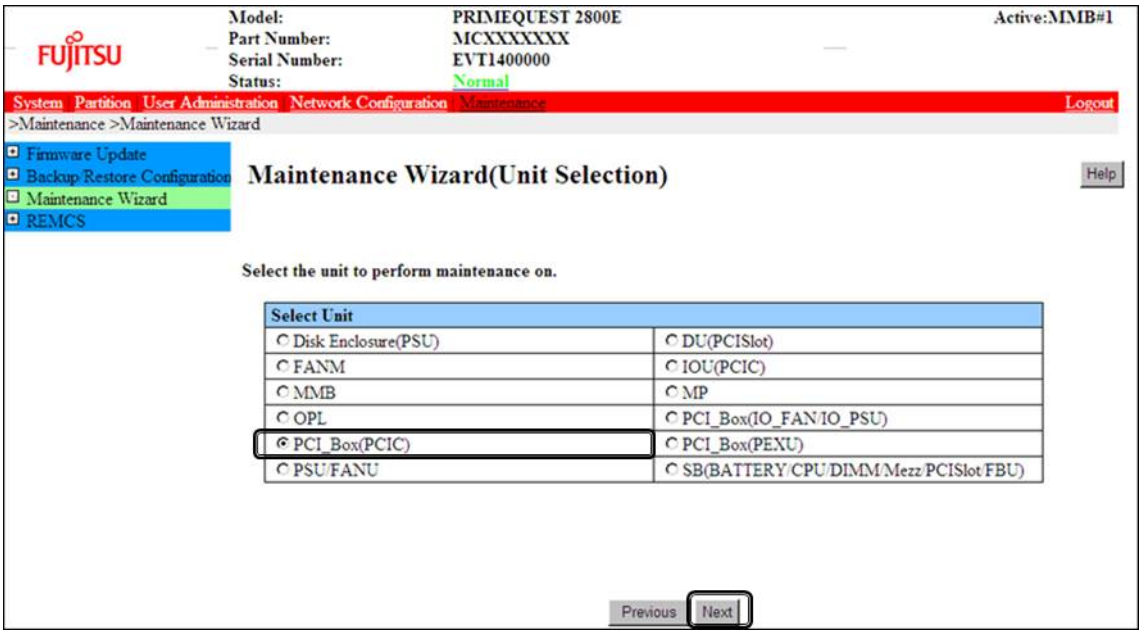
Operation for Hot add of PCI Express card by Maintenance Wizard

This item describes Operation for Hot add of PCI Express card (PCIC) by Maintenance Wizard.
Below works are performed by the field engineer in charge of your system.

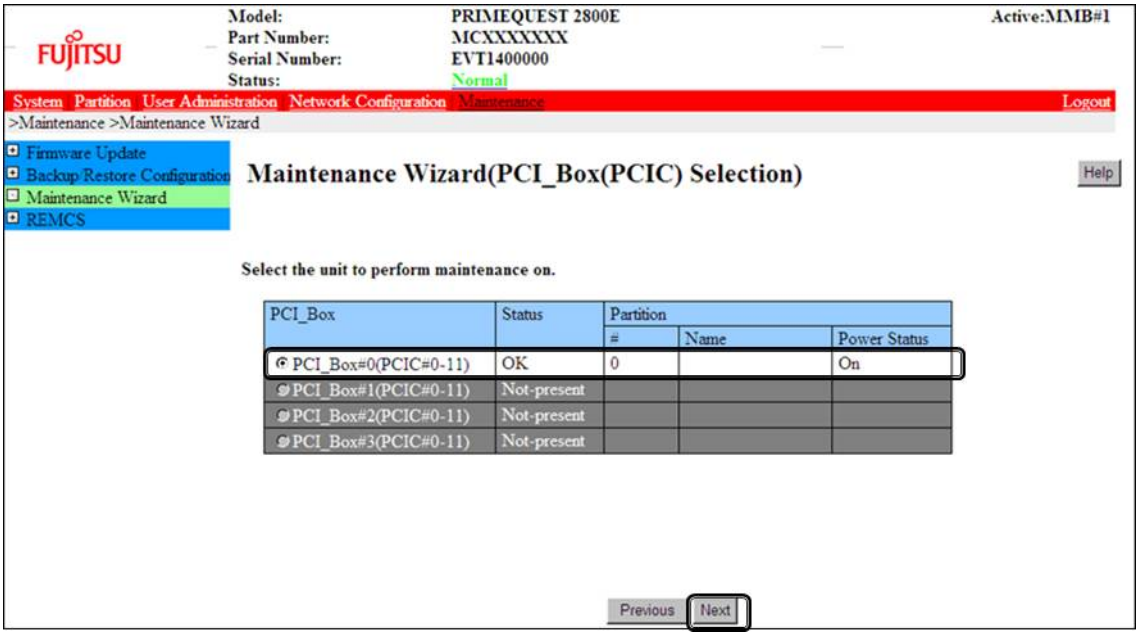
1. Start [Maintenance Wizard] menu by MMB Web-UI and display [Maintenance Wizard] view.
2. Select [Replace Unit] and click [Next].



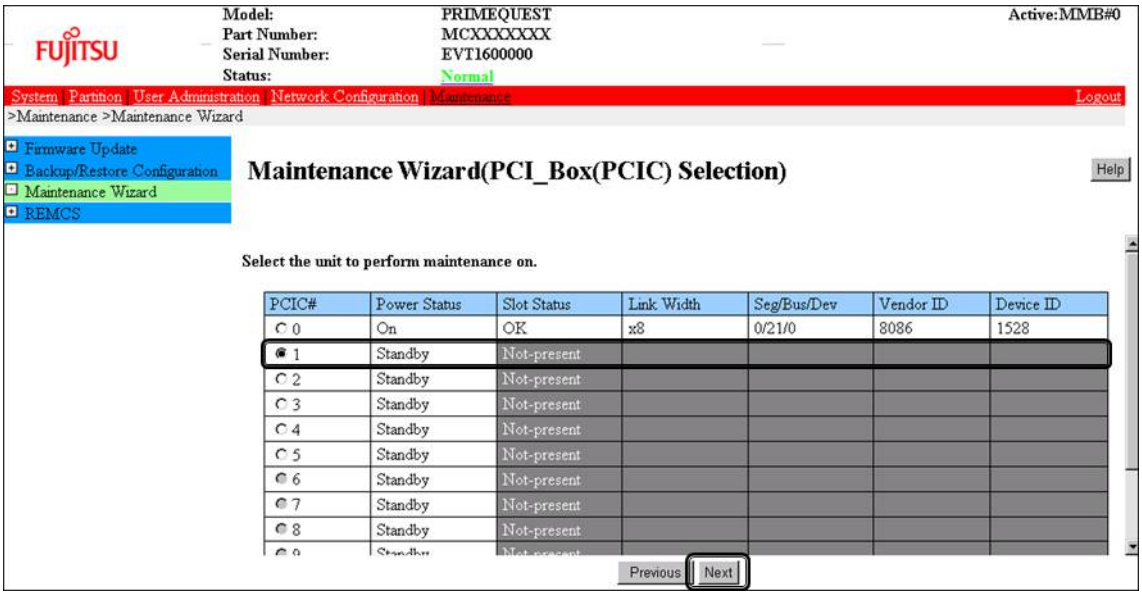
3. Select [PCI_Box(PCIC)], click [Next].



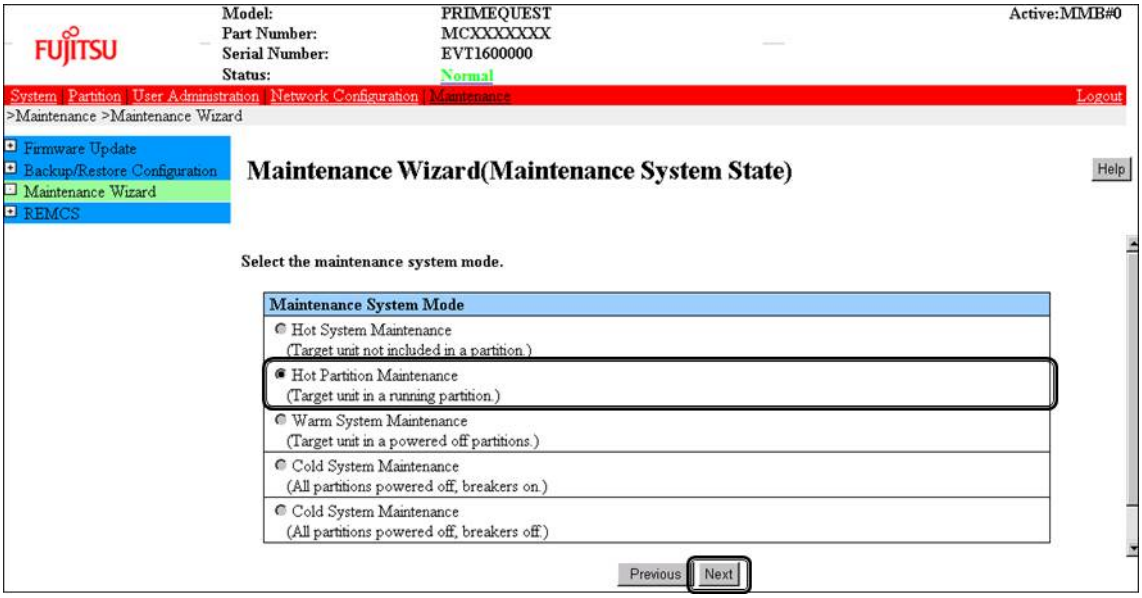
4. Select the radio button of PCI_Box with the particular number, click [Next]
   Example of operation for hot replacing PCI Express card of PCIC#1 mounted on PCI_Box#0



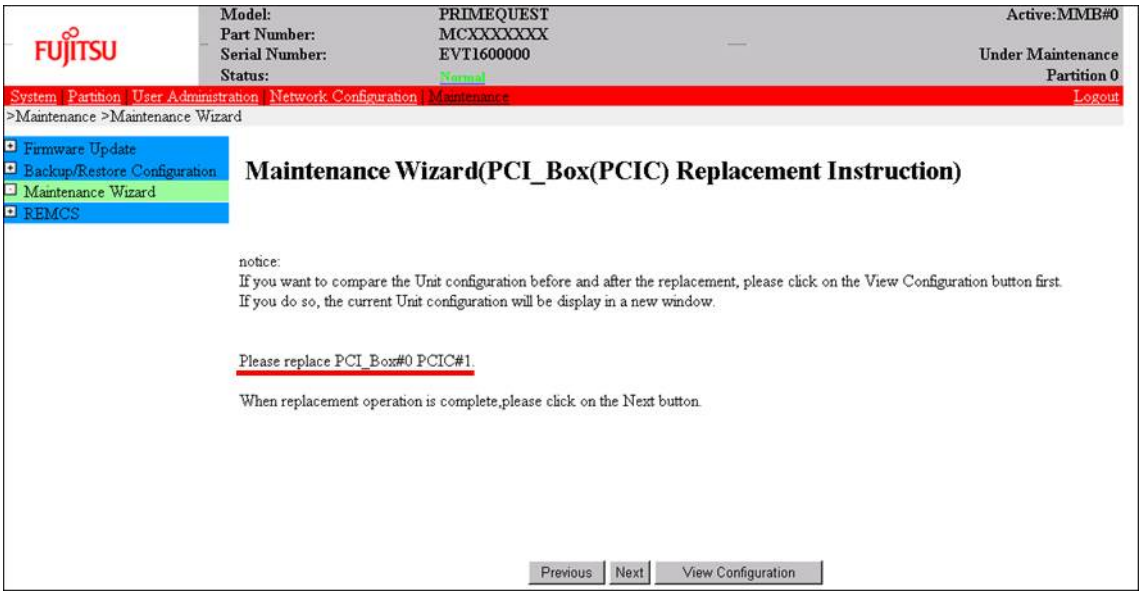
5. Select the radio button of the particular PCIC number and click [Next]



6. Select [Hot Partition Maintenance (Target unit in a running partition.)] and click [Next]



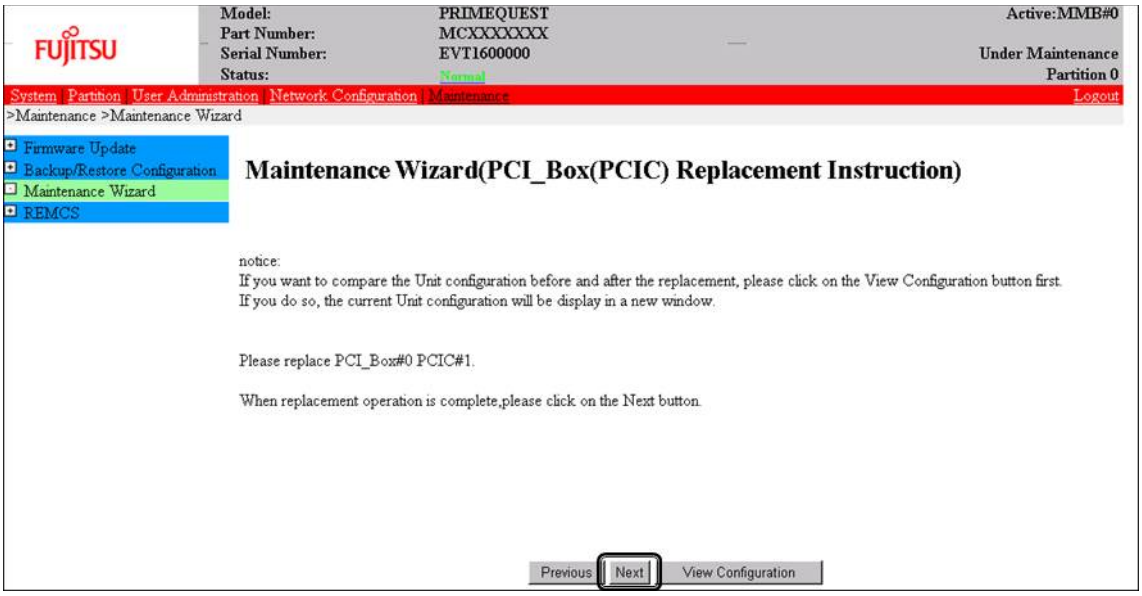
7. Maintenance mode is set (with information area of MMB Web-UI gray out) and then replacement instruction for the particular PCIC appears. Add a new PCI Express card with this window displayed. See the figure in 'B.1 Physical Mounting Locations of Components' to confirm the location of the PCI Express card to be replaced.



Note
Do NOT click [Next] until adding the PCIC.

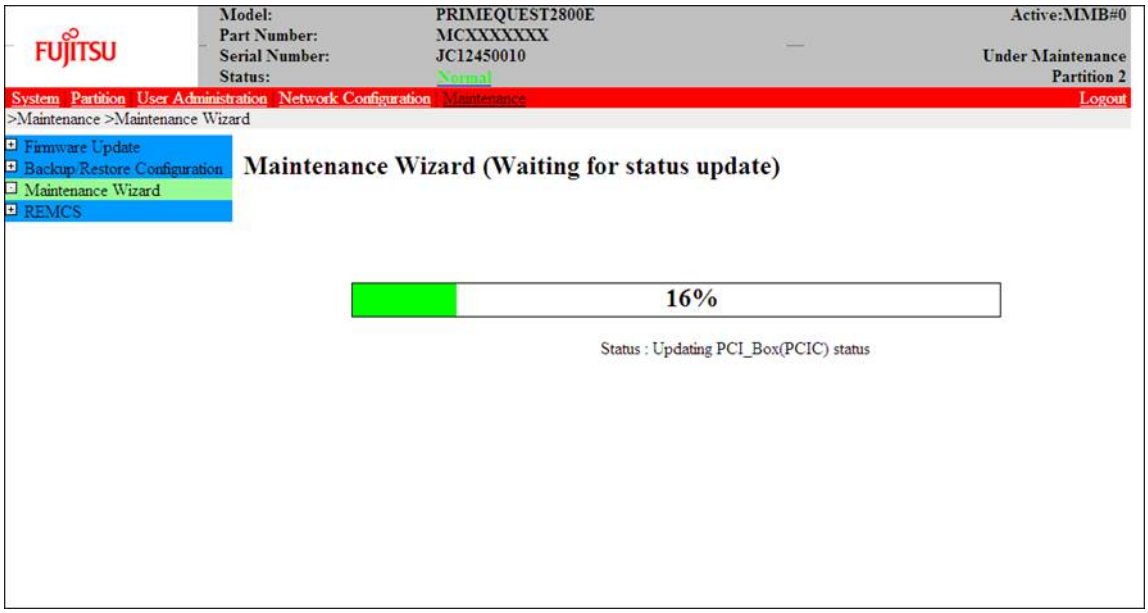
8. After adding the particular PCIC, mount cables other than LAN cables.
Note
In GLS configuration with NIC switching way, mount also LAN cables.

9. Powering on the particular PCIC slot, click [Next].
For how to power on the PCIC slot, see "Powering on and off PCI Express slots" in "5.8.2 PCI Express card addition procedure in detail".
It is the administrator of your system who power on the PCI Express slot.

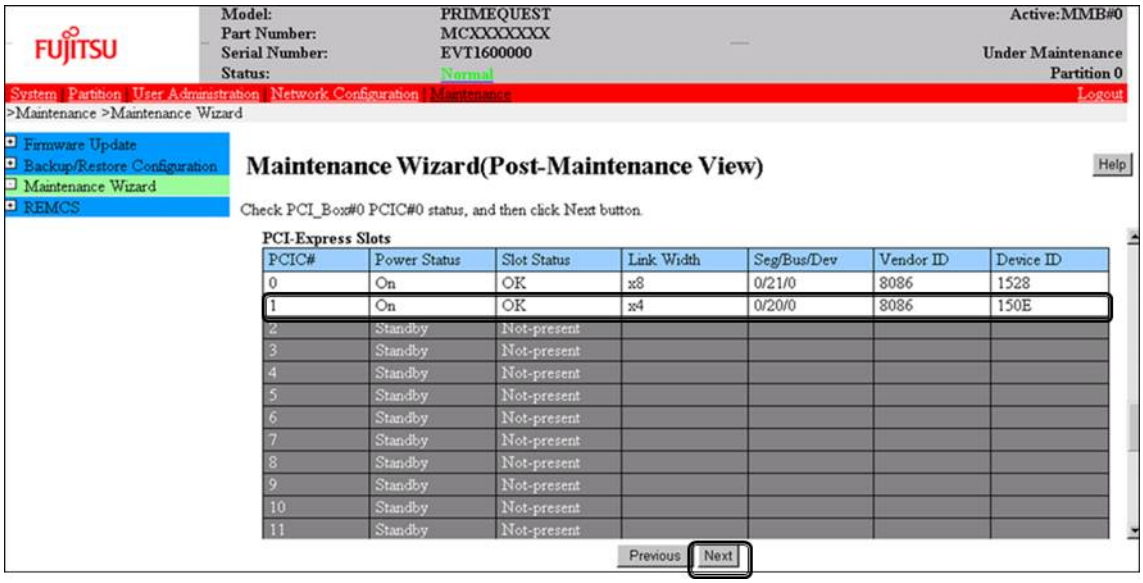


Note
Ask the administrator of your system to power on the PCI Express slot.

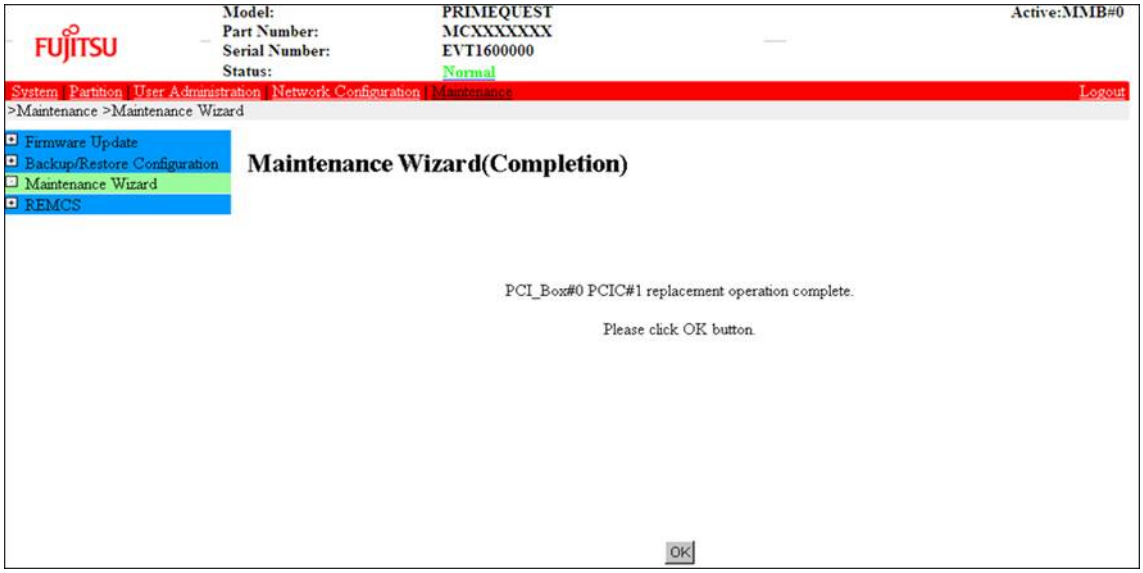
10. The window updating status appears.



11. Check the status of added PCIC and click [Next].



12. Confirm that maintenance mode has been released (with information area of MMB Web-UI not gray out) and click [Next].



5.8.3 FC card (Fibre Channel card) addition procedure

The descriptions in this section assume that an FC card is being added.
Notes

- The FC card used for SAN boot does not support hot plugging.
- Although you can hot replace FC card used for dump device of sadump, collecting dump of memory fails until reconfiguring HBA UEFI or extended BIOS with the partition inactive after replacing the FC card.
- This section does not cover configuration changes in peripherals (e.g., UNIT addition or removal for a SAN disk device).
- This manual does not describe how to change the configuration of peripherals such as expanding and removing the unit of SAN disk device.
- To prevent a device name mismatch due to the failure, addition, removal, or replacement of an FC card, access the SAN disk unit by using the by-id name (/dev/disk/by-id/...) for the device name.
- If all the paths in a mounted disk become hidden when an FC card is hot replaced, unmount the disk. Then, execute PCI hot plug.

FC card addition procedure

The procedure for adding new FC cards and peripherals is as follows.

1. Confirm the slot number of the PCI slot by using the following procedure.
   See ‘Confirming the slot number of a PCI Express slot’ in “5.7.2 PCI Express card replacement procedure in detail”.
2. Confirm that power status of the PCI Express slot is off.
   See ‘Checking the power status of a PCI Express slot’ in “5.7.2 PCI Express card replacement procedure in detail”.
3. Physically add the target card by using MMB Maintenance Wizard.
   For details on the operation of replacement, see step 1 to 7 of ‘Operation for Hot replacement of PCI Express card by Maintenance Wizard’ in “5.8.2 PCI Express card addition procedure in detail”.
4. Reconfigure the peripheral according to its manual.
   For example, suppose that the storage device used is ETERNUS and that the host affinity function is used (to set the access right for each server). Their settings would need to be changed as a result of FC card replacement.
5. Connect the FC card cable.

6. Power on the PCI Express slot.
   See ‘Powering on and off PCI Express slots’ in “5.7.2 PCI Express card replacement procedure in detail”.
7. Check whether there is an error in added FC card by MMB Maintenance Wizard.
   This step is performed by the field engineer in charge of your system.
   For details on the operation of replacement, see step 8 to 11 of ‘Operation for Hot replacement of PCI Express card by Maintenance Wizard’ in “5.8.2 PCI Express card addition procedure in detail”.
8. Check the version of the firmware
   It is required that the firmware version of new FC card is same as the FC card which had been replaced.
   If the firmware version of new FC card is same as the FC card which had been replaced (current firmware version), it is not necessary to update the firmware version of new FC card to current firmware version.
   If the firmware version of new FC card is not same as the FC card which had been replaced (current firmware version), update the firmware version of new FC card to current firmware version.
   For how to update the firmware version, see Firmware update manual for fibre channel card.
   Note
   If you cannot confirm the firmware version of the FC card before replacing due to the fault of the FC card, check the firmware version of the FC card which is same type as the faulty one to update firmware version.
9. Confirm the incorporation results
   The method of confirming is the same as that is performed in the replacement of FC card. See ‘Confirming the FC card incorporation results’ in ‘5.7.3 FC card (Fibre Channel card) replacement procedure’.

5.8.4 Network card addition procedure

NIC (network card) addition using hot plugging needs specific processing before and after PCI slot power-on or power-off. Its procedure also includes the common PCI Express card addition procedure.
The procedure describes operations where a single NIC is configured as one interface. It also describes cases where multiple NICs are bonded together to configure one interface (bonding configuration). For bonding multiple NIC by using PRIMECLUSTER Global Link Services (GLS), see manual of PRIMECLUSTER Global Link Services. Although name form of NIC differs depending on mounting location of the NIC in RHEL7, conventional ‘ethX’ is used in below description. ‘ethX’ should be replaced to actual name of the NIC as necessary.

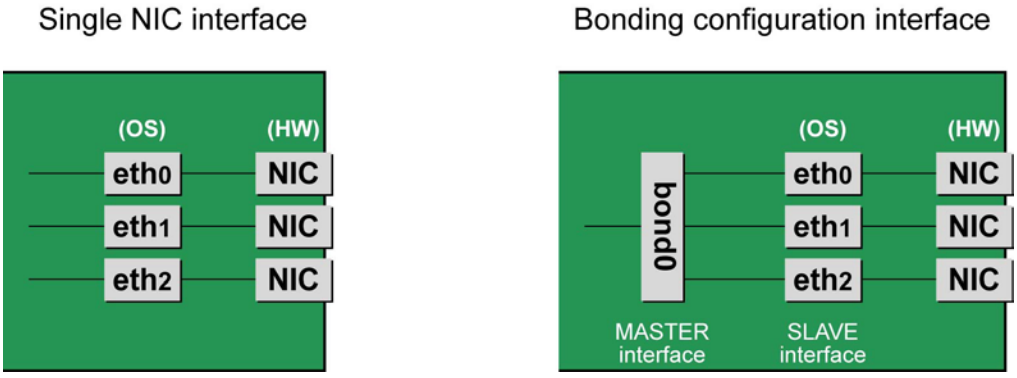


FIGURE 5.4 Single NIC interface and bonding configuration interface

NIC addition procedure

This section describes the procedure for hot plugging only a network card.
Note
When adding multiple NICs, be sure to add them one by one. If you do this with multiple cards at the same time, the correct settings may not be made.

1. Confirm the existing interface names.
   To confirm the interface names, execute the following command.
   Example: eth0 is the only interface on the NIC.

```
# /sbin/ifconfig -a
eth0  Link encap:Ethernet HWaddr 00:0E:0C:70:C3:38
BROADCAST MULTICAST MTU:1500 Metric:1
RX packets:0 errors:0 dropped:0 overruns:0 frame:0
```

```
TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:1000
RXbytes:0 (0.0 b) TX bytes:0 (0.0 b)

Lo  Link encap:Local Loopback
inet addr:127.0.0.1 Mask:255.0.0.0
UP LOOPBACK RUNNING MTU:16436 Metric:1
RX packets:0 errors:0 dropped:0 overruns:0 frame:0
TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:0
RXbytes:0 (0.0 b) TX bytes:0 (0.0 b)
```

2. Confirm the slot number of the PCI Express slot by using the following procedure.
   See 'Confirming the slot number of a PCI Express slot' in "5.7.2 PCI Express card replacement procedure in detail".

3. Confirm that power status of the PCI Express slot
   See 'Checking the power status of a PCI Express slot' in "5.7.2 PCI Express card replacement procedure in detail".

4. Physically add the target NIC by using MMB Maintenance Wizard.
   For details on the operation of replacement, see step 1 to 7 of 'Operation for Hot replacement of PCI Express card by Maintenance Wizard' in "5.8.2 PCI Express card addition procedure in detail"
   This step is performed by the field engineer in charge of your system.

5. Power on the PCI Express slot.
   See 'Powering on and off PCI Express slots' in "5.7.2 PCI Express card replacement procedure in detail".

6. Check whether there is an error in added FC card by MMB Maintenance Wizard.
   This step is performed by the field engineer in charge of your system.
   For details on the operation of replacement, see step 8 to 11 of 'Operation for Hot replacement of PCI Express card by Maintenance Wizard' in "5.8.2 PCI Express card addition procedure in detail".

7. Confirm the newly added interface name.
   Powering on the slot creates an interface (ethX) for the added NIC. Execute the following command.
   Compare its results with those of step 1 to confirm the created interface name.

```
# /sbin/ifconfig –a
```

8. Confirm the hardware address of the newly added interface.
   Confirm the hardware address (HWaddr) and the created interface by executing the ifconfig command.
   For a single NIC with multiple interfaces, confirm the hardware addresses of all the created interfaces.
   Example: eth1 is a new interface created for the added NIC.

```
# /sbin/ifconfig -a
eth0  Link encap:Ethernet HWaddr 00:0E:0C:70:C3:38
BROADCAST MULTICAST MTU:1500 Metric:1
RX packets:0 errors:0 dropped:0 overruns:0 frame:0
TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:1000
RXbytes:0 (0.0 b) TX bytes:0 (0.0 b)

eth1  Link encap:Ethernet HWaddr 00:0E:0C:70:C3:40
BROADCAST MULTICAST MTU:1500 Metric:1
RX packets:0 errors:0 dropped:0 overruns:0 frame:0
TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:1000
RXbytes:0 (0.0 b) TX bytes:0 (0.0 b)

lo  Link encap:Local Loopback
inet addr:127.0.0.1 Mask:255.0.0.0
UP LOOPBACK RUNNING MTU:16436 Metric:1
RX packets:0 errors:0 dropped:0 overruns:0 frame:0
TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:0
RXbytes:0 (0.0 b) TX bytes:0 (0.0 b)
```

9. Create an interface configuration file.
   Create an interface configuration file (/etc/sysconfig/network-scripts/ifcfg-ethX) for the newly created

interface as follows. In "HWADDR," set the hardware address confirmed in step 8.
If multiple NICs are added or if a NIC where multiple interfaces exist is added, create a file for all the interfaces.

The explanation here assumes, as an example, that a name automatically assigned by the system is used. To install a new interface, you can use a new interface name different from the one automatically assigned by the system. Normally, there is no requirement on the name specified for a new interface. To use an interface name other than the one automatically assigned by the system, follow the instructions in step 14 of the 'NIC replacement procedure' in '5.7.4 Network card replacement procedure'.

The contents differ slightly depending on whether the interface is a single NIC interface or a SLAVE interface of the bonding configuration.
[For a single NIC interface]

```
(Example)
DEVICE=eth1              <- Specified interface name
confirmed in step g
NM_CONTROLLED=no
BOOTPROTO=static
HWADDR=00:0E:0C:70:C3:40
BROADCAST=192.168.16.255
IPADDR=192.168.16.1
NETMASK=255.255.255.0
NETWORK=192.168.16.0
ONBOOT=yes
TYPE=Ethernet
```

[SLAVE interface of the bonding configuration]

```
(Example)
DEVICE=eth1              <- Specified interface name
confirmed in step g
NM_CONTROLLED=no
BOOTPROTO=static
HWADDR=00:0E:0C:70:C3:40
MASTER=bondY
SLAVE=yes
ONBOOT=yes
```

Note
Adding the bonding interface itself also requires the MASTER interface configuration file of the bonding configuration.

10. To add a bonding interface, configure the bonding interface driver settings.
    If the bonding interface has already been installed, execute the following command to check the descriptions in the configuration file and confirm the setting corresponding to the bonding interface and driver.
    Example: Description in /etc/modprobe.d/bonding.conf

```
# grep -l bonding /etc/modprobe.d/*
/etc/modprobe.d/bonding.conf
```

Note
If the configuration file is not found or if you are performing an initial installation of the bonding interface, create a configuration file with an arbitrary file name with the ".conf" extension (e.g., /etc/modprobe.d/bonding.conf) in the /etc/modprobe.d directory).
After specifying the target configuration file, add the setting for the newly created bonding interface.

```
alias bondY bonding      <- Add (bondY: Name of the newly
added bonding interface)
```

You can specify options of the bonding driver in this file. Normally, the BONDING_OPTS line in each ifcfg- bondY file is used. Options can be specified to the bonding driver.

11. Activate the added interface.
    Execute the following command to activate the interface. Activate all the necessary interfaces. The activation method depends on the configuration.
    [For a single NIC interface]
    Execute the following command to activate the interface. Activate all the necessary interfaces.

```
# /sbin/ifup ethX
```

[For the bonding configuration]
For a SLAVE interface added to an existing bonding configuration, execute the following command to incorporate it into the bonding configuration.
Example: bondY is the bonding interface name, and ethX is the name of the interface to be incorporated.

```
# /sbin/ifenslave bondY ethX
```

For a newly added bonding interface with a SLAVE interface, execute the following command to activate the interfaces. You need not execute the ifenslave command individually for the SLAVE interface.

```
# /sbin/ifup bondY
```

12. Mount all cables connected to the particular PCIC.
    This step is performed by the field engineer in charge of your system.
    Note
    In GLS configuration with NIC switching way, you do not need to perform this step.

5.9 Removing PCI Express cards

This section describes the PCI Express card removal procedure with the PCI Hot Plug function.
The procedure includes common steps for all PCI Express cards and the additional steps required for a specific card function or driver.
Thus, the descriptions cover both the common operations required for all cards (e.g., power supply operations) and the specific procedures required for certain types of card. For details on removal of the cards not described in this section, see the respective product manuals.
There are two ways to perform PCI hot plug:

- Operation by using sysfs
- Operation by using dr commands

You can perform the operation by using dr commands if Dynamic Reconfiguration utility is installed in the partition. If not, be sure to use the operation by using sysfs. Although you can perform the operation by using sysfs even if Dynamic Reconfiguration utility is installed in the partition, it is recommended to perform the operation by using dr commands to prevent wrong operation.
Hereafter, description about the operation by using dr commands starts at ‘For the partition with Dynamic Reconfiguration utility installed’ and description about the operation by sysfs starts at ‘For the partition without Dynamic Reconfiguration utility installed’.
Note

- If you hot remove PCI Express cards from an IOU, see ‘5.6 IOU hot remove’.
- In hot removal of PCI Express cards, if you reboot the partition on OS without hot adding new PCI card to same PCI Express slot after you performed hot remove command, you cannot hot add a PCI Express card to the PCI Express slot unless you power off the partition.
  If you reboot the partition on OS before hot adding, you must power off the partition and replace the PCI Express card.
- If the Extended Partitioning is enabled, dr command is not supported for PCI Express card hot replacement.

5.9.1 Common removal procedures for all PCI Express cards

1. Performing the required operating system and software operations depending on the PCI Express card type
2. Powering off a PCI slot
3. Removing a PCI Express card
4. Performing the required operating system and software operations depending on the PCI Express card type

Note
This section describes instructions for the operating system and subsystems (e.g., commands, configuration file editing). Be sure to refer to the respective product manuals to confirm the command syntax and impact on the system before performing tasks with those instructions.

The following sections describe card removal with the required instructions (e.g., commands, configuration file editing) for the operating system and subsystems, together with the actual hardware operations. Step 3 is performed by the field engineer in charge of your system.

5.9.2 PCI Express card removal procedure in detail

This section describes operations that must be performed in the PCI Express card removal procedure.

Preparing the software using a PCI Express card

See 'Preparing the software using a PCI Express card' in "5.7.2 PCI Express card replacement procedure in detail".

Confirming the slot number of a PCI Express slot

See 'Confirming the slot number of a PCI Express slot' in "5.7.2 PCI Express card replacement procedure in detail".

Checking the power status of a PCI Express slot

See 'Checking the power status of a PCI Express slot' in "5.7.2 PCI Express card replacement procedure in detail".

Powering off PCI Express slots

See 'Powering on and off PCI Express slots' in "5.7.2 PCI Express card replacement procedure in detail".

5.9.3 FC card (Fibre Channel card) removal procedure

The descriptions in this section assume that an FC card is being removed.
Notes

- The FC card used for SAN boot does not support hot plugging.
- This manual does not describe how to change the configuration of peripherals such as expanding and removing the unit of SAN disk device.

FC card removal procedure

The procedure for removing an FC card and peripherals is as follows.

1. Make the necessary preparations.
   Stop access to the FC card by stopping applications or by other such means.
2. Confirm the slot number of the PCI slot by using the following procedure.
   See 'Confirming the slot number of a PCI Express slot' in "5.7.2 PCI Express card replacement procedure in detail".
3. Power off the PCI Express slot.
   See 'Powering on and off PCI Express slots' in "5.7.2 PCI Express card replacement procedure in detail".
4. After taking off all cables connected to the target card, physically remove the target card.

5.9.4 Network card removal procedure

Network card (referred to as NIC below) removal using hot plugging needs specific processing before and after PCI slot power-on or power-off. Its procedure also includes the common PCI Express card removal procedure.
The procedure describes operations where a single NIC is configured as one interface. It also describes cases where multiple NICs are bonded together to configure one interface (bonding configuration). For bonding multiple NIC by using PRIMECLUSTER Global Link Services (GLS), see manual of PRIMECLUSTER Global Link Services. Although name form of NIC differs depending on mounting location of the NIC in RHEL7, conventional 'ethX' is used in below description. 'ethX' should be replaced to actual name of the NIC as necessary.

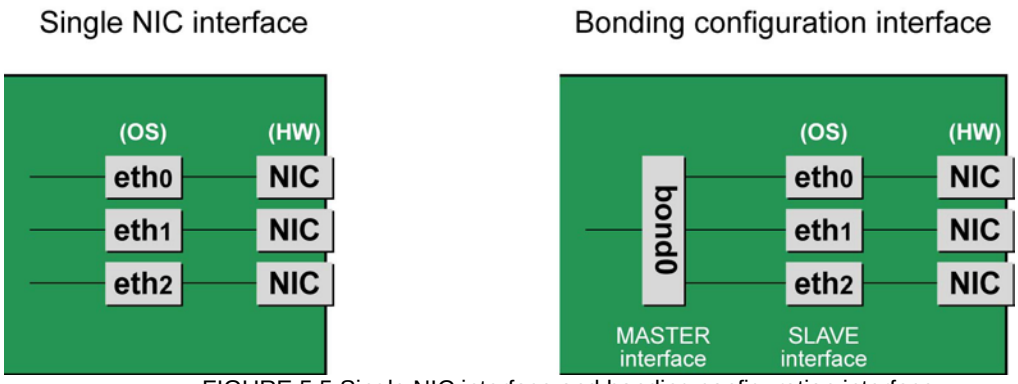


FIGURE 5.5 Single NIC interface and bonding configuration interface

NIC removal procedure

This section describes the procedure for hot plugging only a network card.

Note

When removing multiple NICs, be sure to remove them one by one. If you do this with multiple cards at the same time, the correct settings may not be made.

1. Confirm the slot number of the PCI slot that has the mounted interface.
   Confirm the interface mounting location through the configuration file information and the operating system information.
   First, confirm the bus address of the PCI slot that has the mounted interface to be removed.

```
# ls -l /sys/class/net/eth0/device
lrwxrwxrwx 1 root root 0 Sep 29 09:26 /sys/class/net ¥
/eth0/device
->../../../0000:00:01.2/0000:08:00.2/0000:0b:01.0
```

   The ¥ at the end of a line indicates that there is no line feed.

   Excluding the rest of the directory path, check the part corresponding to the file name in the symbolic link destination file of the output results. In the above example, the underlined part shows the bus address. ("0000:0b:01" in the example)

   Next, check the PCI slot number for this bus address.

```
# grep -il 0000:0b:01 /sys/bus/pci/slots/*/address
/sys/bus/pci/slots/20/address
```

   Read the output file path as shown below, and confirm the PCI slot number.

```
/sys/bus/pci/slots/<slot number>/address
```

   Notes

   If the above file path is not output, it indicates that the NIC is not mounted in a PCI slot (e.g., GbE port in the IOU).

   With the PCI slot number confirmed here, see ‘D.2 Correspondence between PCI Slot Mounting Locations and Slot Numbers’ to check the mounting location, and see also ‘B.1 Physical Mounting Locations of Components’ to identify the physical mounting location corresponding to the PCI slot number. You can confirm that it matches the mounting location of the operational target NIC.

2. Confirm each interface on the same NIC.
   If the NIC has multiple interfaces, you need to remove all of them. Confirm that all the interfaces that have the same bus address in a subsequent command.

```
# ls -l /sys/class/net/*/device | grep "0000:0b:01"
lrwxrwxrwx 1 root root 0 Sep 29 09:26 /sys/class/net ¥
/eth0/device
->../../../0000:00:01.2/0000:08:00.2/0000:0b:01.0
lrwxrwxrwx 1 root root 0 Sep 29 09:26 /sys/class/net ¥
/eth1/device
->../../../0000:00:01.2/0000:08:00.2/0000:0b:01.1
```

   The ¥ at the end of a line indicates that there is no line feed.
   As the above example shows, when more than one interface is displayed, they are on the same NIC.

3. Execute the higher-level application processing required before NIC removal.
   Stop all access to the interface as follows. Stop the application that was confirmed in step 2 as using the interface, or exclude the interface from the target of use by the application.

4. Deactivate the NIC.
   Execute the following command to deactivate all the interfaces that you confirmed in step 2.
   The applicable command depends on whether the target interface is a single NIC interface or the SLAVE interface of a bonding device.

   [For a single NIC interface]

   ```
   # /sbin/ifdown ethX
   ```

   If the single NIC interface has a VLAN device, you also need to remove the VLAN interface. Perform the following operations. (These operations precede deactivation of the physical interface.)

   ```
   # /sbin/ifdown ethX.Y
   # /sbin/vconfig rem ethX.Y
   ```

   [For the interface under bonding]
   If the bonding device is operating in mode 1, use the following steps to exclude SLAVE interface to be replaced from the bonding configuration. In any other mode, removing it immediately should not cause any problems. Confirm that the SLAVE interface is the interface currently being used for communication.

   ```
   # cat /sys/class/net/bondY/bonding/active_slave
   ```

   If the displayed interface name corresponds to the SLAVE interface to be removed, execute the following command to switch to communicating now with the other SLAVE interface.

   ```
   # /sbin/ifenslave -c bondY ethZ
   (ethZ: bondY-configured interface not subject to hot
   replacement)
   ```

   Finally, remove the SLAVE interface being replaced, from the bonding configuration. Immediately after being removed, the interface is automatically no longer used.

   ```
   # /sbin/ifenslave -d bondY ethX
   ```

   To remove the interfaces, including the bonding device, deactivate them collectively by executing the following command.

   ```
   # /sbin/ifdown bondY
   ```

5. Power off the PCI slot.
   See ‘Powering on and off PCI Express slots’ in “5.7.2 PCI Express card replacement procedure in detail”.

6. After taking of all cables connected to the NIC, remove the NIC from the PCI Express slot.

7. Remove the interface configuration file.
   Delete the configuration files of all the interfaces confirmed in step 2, by executing the following command.

   ```
   # rm /etc/sysconfig/network-scripts/ifcfg-ethX
   ```

   When deleting a bonding device, also delete the related bonding items (ifcfg-bondY files).

8. If the removed interface includes any bonding interface, delete the driver setting of the interface.
   When removing a bonding interface, be sure to delete the setting corresponding to the bonding interface and driver. Execute the following command to check the descriptions in the configuration file, and confirm the setting corresponding to the bonding interface and driver.

   Example: Description in /etc/modprobe.d/bonding.conf

   ```
   # grep -l bonding /etc/modprobe.d/*

   /etc/modprobe.d/bonding.conf
   ```

   Edit the file that describes the setting, and delete the setting of the removed bonding interface.

   ```
   alias bondY bonding        <- Delete
   ```

   bondY: Name of the removed bonding interface
   Note
   There are no means to dynamically remove the MASTER interface (bondY) of the bonding configuration.

If you want to remove the entire bonding interface, you can disable the bonding configuration and remove all the SLAVE interfaces but the MASTER interface itself remains.

9. Execute the higher-level application processing required after NIC removal.
   Perform the necessary post processing (such as changing application settings or restarting an application) for the operations performed for the higher-level applications in step 3.

5.9.5 Hot removal procedure for iSCSI (NIC)

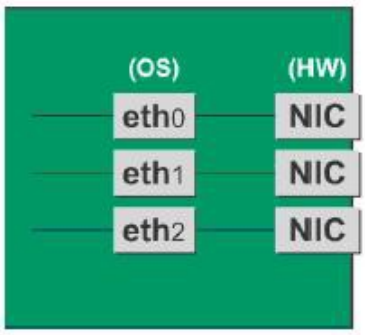
When performing hot replacement of NICs used for iSCSI connection, use the following procedures.

- 5.9.1 Common removal procedures for all PCI Express cards
- 5.9.2 PCI Express card removal procedure in detail
- 5.9.4 Network card removal procedure

A supplementary explanation of the procedure follows.

Prerequisites for iSCSI (NIC) hot removal

- The prerequisites for iSCSI (NIC) hot replacement are as follows.
- The storage connection is established on a multipath using DM-MP (Device-Mapper Multipath) or ETERNUS multidriver (EMPD).
- To replace more than one iSCSI card, one card at a time will be replaced.
- A single NIC is configured as one interface.



Work to be performed before iSCSI (NIC) removal

For iSCSI (NIC) hot replacement, be sure to follow the procedure below when performing Step 3 of the 'NIC removal procedure' in '5.9.4 Network card removal procedure'

1. Perform the work for suppressing access to the iSCSI connection interface.
   a. Confirm the state of multiple path by DM-MP (*1) or EMPD (*2).
   b. Use the iscsiadm command to log out from the path (iqn) through which the iSCSI card to be replaced is routed, and disconnect the session.
      Example which confirms the state of session before disconnecting:

```
# /sbin/iscsiadm -m session
tcp: [1] 192.168.1.64:3260,1 iqn.2000-
09.com.fujitsu:storage-system.eternus-
dx400:00001049.cm0ca0p0
tcp: [2] 192.168.2.66:3260,3 iqn.2000-
09.com.fujitsu:storage-system.eternus-
dx400:00001049.cm1ca0p0
```

      Example which logout path going through a NIC to be replaced:

```
# /sbin/iscsiadm -m node -T iqn.2000-09.com.fujitsu:storage-
system.eternus-dx400:00001049.cm1ca0p0 -p 192.168.2.66:3260
–-logout
```

   c. Use the iscsiadm command to confirm that the target session has been disconnected.
      Example which confirms the state of session after disconnecting

```
# /sbin/iscsiadm -m session
tcp: [1] 192.168.1.64:3260,1 iqn.2000-
09.com.fujitsu:storage-system.eternus-
dx400:00001049.cm0ca0p0
```

d. You can confirm the disconnection of sessions on multipath products using DM-MP or ETERNUS multidriver.
*1: Write down the DM-MP display contents at the session disconnection.
Example of DM-MP display before disconnecting path

```
# /sbin/multipath -ll
mpath1 (36000b5d0006a0000006a104900000000) dm-0
FUJITSU,ETERNUS_DX400
[size=50G][features=0][hwhandler=0][rw]
¥_ round-robin 0 [prio=2][active]
 ¥_ 3:0:0:0 sdb 8:16  [active][ready]
 ¥_ 4:0:0:0 sdc 8:32  [active][ready]
```

Example of DM-MP display after disconnecting path

```
# /sbin/multipath -ll
mpath1 (36000b5d0006a0000006a104900000000) dm-0
FUJITSU,ETERNUS_DX400
[size=50G][features=0][hwhandler=0][rw]
¥_ round-robin 0 [prio=1][enabled]
 ¥_ 3:0:0:0 sdb 8:16  [active][ready]
```

*2: See the ETERNUS Multipath Driver User's Guide (For Linux).

CHAPTER 6 PCI Card Hot Maintenance in SUSE Linux Enterprise Server 11

This chapter describes hot maintenance of PCI cards in SUSE Linux Enterprise Server 11.

6.1 Hot Replacement of PCI Express Cards

This section describes the following methods of PCI Express card replacement with the PCI Hot Plug (PHP) function:

- Common replacement operations for all PCI Express cards such as power supply operations
- Specific operations added to procedures to use a specified card function or a driver for installation.

Notes
In hot replacement of PCI Express cards, if you reboot the partition on OS without hot adding new PCI card to same PCI Express slot after you performed hot remove command, you cannot hot add a PCI Express card to the PCI Express slot unless you power off the partition.
If you reboot the partition on OS before hot adding, you must power off the partition and replace the PCI Express card.

Remarks
For details on the card replacement procedures not described in this chapter, see the respective product manuals.

6.1.1 Overview of common replacement procedures for PCI Express cards

This section provides an overview of common replacement procedures for all PCI Express cards.

1. Performing the required operating system and software operations depending on the PCI Express card type
2. Powering off a PCI slot
3. Replacing a PCI card
   This step is performed by the field engineer in charge of your system.
4. Powering on a PCI slot
5. Performing the required operating system and software operations depending on the PCI card type

Note
This chapter provides instructions (e.g., commands, configuration file editing) for the operating system and subsystems. Be sure to refer to the respective product manuals to confirm the command syntax and impact on the system before performing tasks with those instructions.

The following sections describe card addition, removal, and replacement with the required instructions (e.g., commands, configuration file editing) for the operating system and subsystems, together with the actual hardware operations. Step 3 is performed by the field engineer in charge of your system.

6.1.2 PCI Express card replacement procedure in detail

This section describes how to replace a PCI Express card.

Preparing the software using a PCI Express card

When a PCI Express card is replaced or removed, there must be no software using the PCI Express card. For this reason, before replacing or removing the PCI Express card, stop the software using the PCI Express card or make the software operations inapplicable.

Confirming the installation of the PCI Hot Plug driver

The Hot Plug driver must be installed on the system before you hot plug individual cards.
Hot plug driver module for PCI Express cards: pciehp
Confirm the installation of the Hot Plug driver by using the following procedure.

1. Execute the lsmod command. Confirm that the PCI Hot Plug driver module is installed.

```
# /sbin/lsmod | grep pciehp
Pciehp                37458 0
```

2. If it is not installed, incorporate the PCI Hot Plug driver module into the system by executing the modprobe command.

```
# /sbin/modprobe pciehp
```

Executing the modprobe command automatically incorporates all relevant modules into the kernel.

Confirming the slot number of a PCI Express slot

When replacing, adding or removing a PCI Express card, you need to power on/off the appropriate slot, through the operating system. First, use the following procedure to obtain the slot number from the mounting location of the PCI Express slot for the card. It will be used to manipulate the power supply.

1. Identify the mounting location of the PCI Express card.
   See the figure in "B.1 Physical Mounting Locations of Components" to check the mounting location (board and slot) of the PCI Express card to be replaced.
2. Obtain the slot number of the mounting location.
   Check the table in "D.2 Correspondence between PCI Slot Mounting Locations and Slot Numbers", and obtain the slot number that is unique in the cabinet and assigned to the confirmed mounting locations. This slot number is the identification information for operating the slot of the PCI Express card to be replaced.

Note
The four-digit decimal numbers shown in <Slot number> in D.2 Correspondence between PCI Slot Mounting Locations and Slot Numbers have the leading digits filled with zeroes. The actual slot numbers do not include the zeroes in the leading digits.

Checking the power status of a PCI Express slot

Using the PCI Express slot number confirmed in "Confirming the slot number of a PCI Express slot", confirm that the /sys/bus/pci/ slots directory contains a directory for this slot information, which will be referenced and otherwise used. Below, the PCI Express slot number confirmed in Confirming the slot number of a PCI Express slot is shown at <slot number> location in the directory path in the following format, where the directory is the operational target.

```
/sys/bus/pci/slots/<slot number>
```

Confirm that the PCI Express card in the slot is enabled or disabled by displaying the "power" file contents in this directory.

```
# cat /sys/bus/pci/slots/<slot number>/power
```

When displayed, "0" means disabled, and "1" means enabled.

Powering on and off PCI Express slots

You can power on and off a PCI Express slot through an operation on the file confirmed in "Checking the power status of a PCI Express slot".
To disable a PCI Express card and make it ready for removal, write "0" to the "power" file in the directory corresponding to the target slot. The LED turns off.

```
# echo 0 > /sys/bus/pci/slots/<slot number>/power
```

This operation removes the device associated with the relevant adapter from the system.

To enable the card again and make it available, write "1" to the "power" file in the directory corresponding to the disabled slot.

```
# echo 1 > /sys/bus/pci/slots/<slot number>/power
```

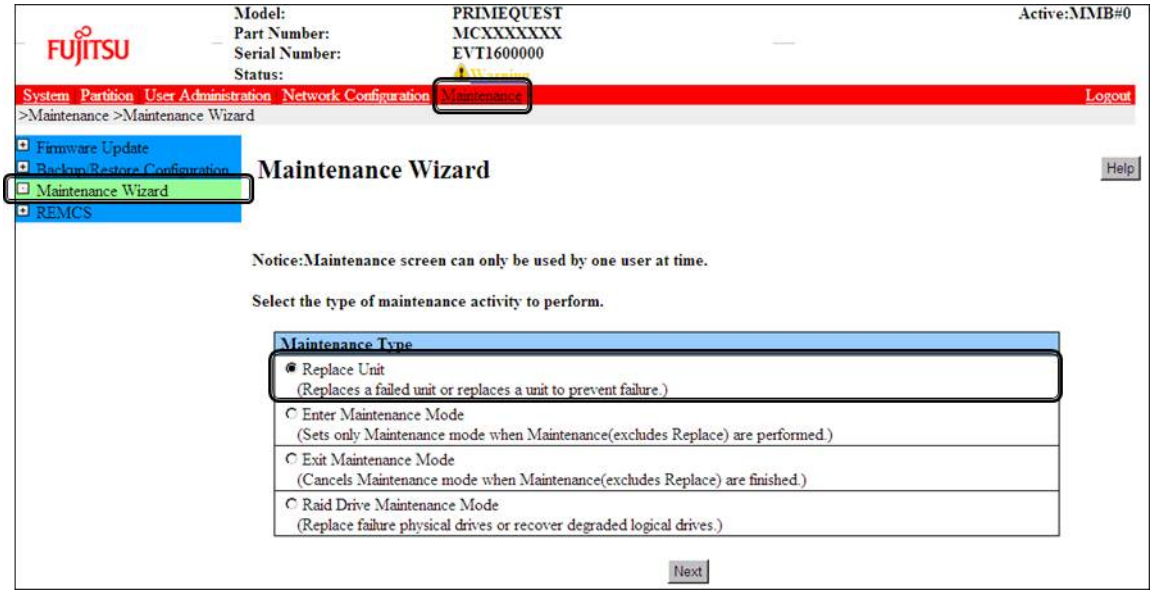
This operation installs the device associated with the relevant adapter on the system.

Note
After power-on, you need to confirm that the card and driver are correctly installed. The procedures vary depending on the card and driver specifications. For the appropriate procedures, see the respective manuals.

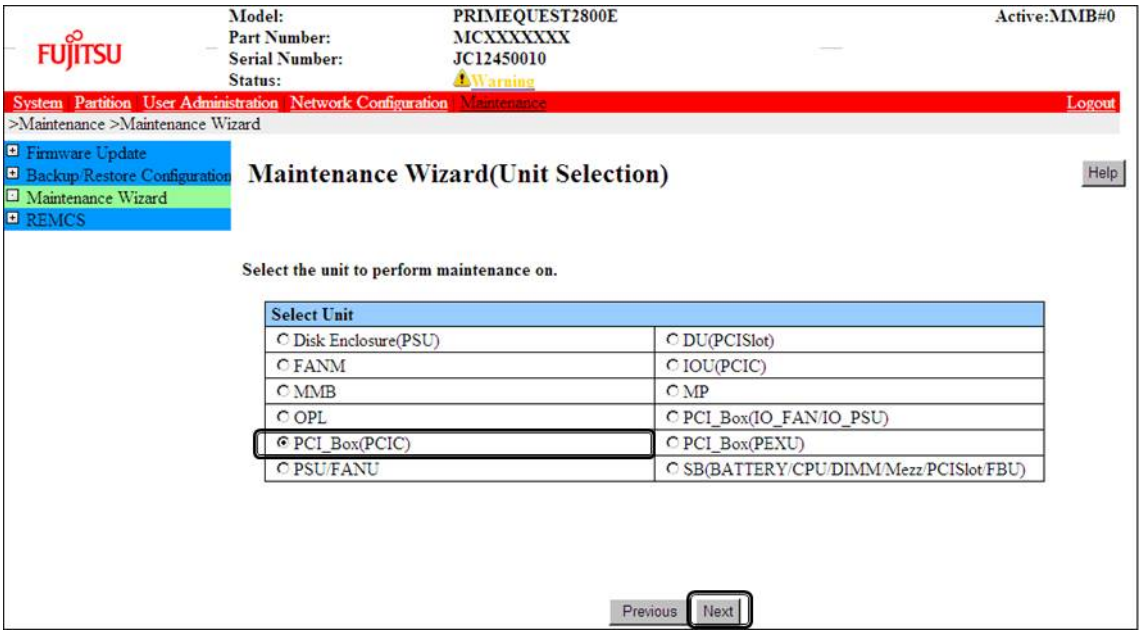
Operation for Hot replacement of PCI Express card by Maintenance Wizard

This item describes Operation for Hot replacement of PCI Express card (PCIC) by Maintenance Wizard Below works are performed by the field engineer in charge of your system.

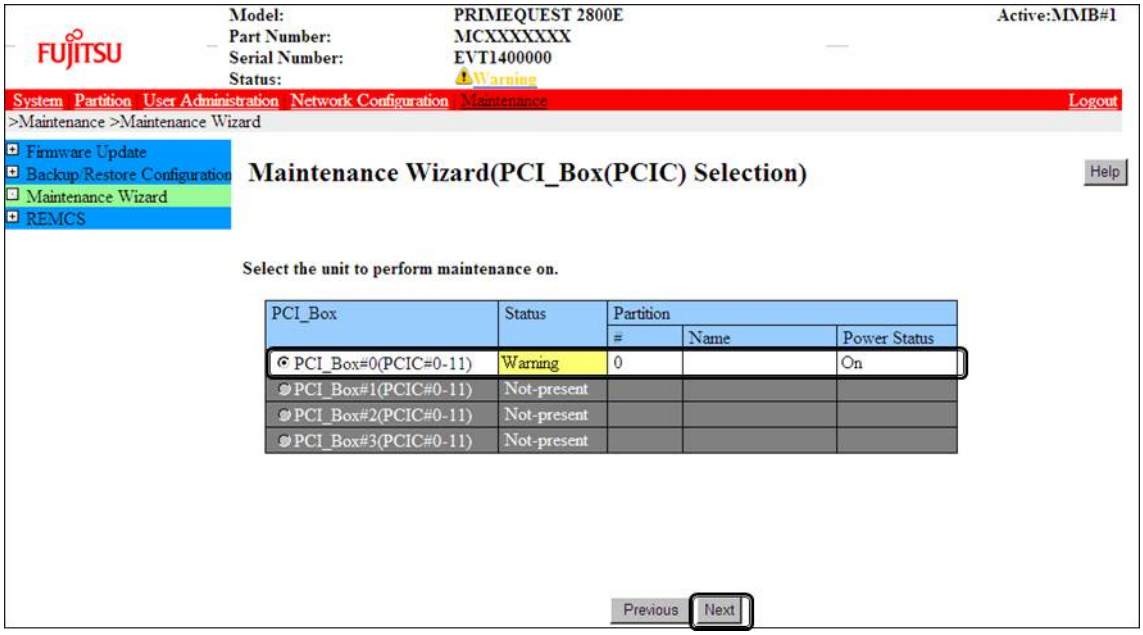
1. Start [Maintenance Wizard] menu by MMB Web-UI and display [Maintenance Wizard] view.
2. Select [Replace Unit] and click [Next].



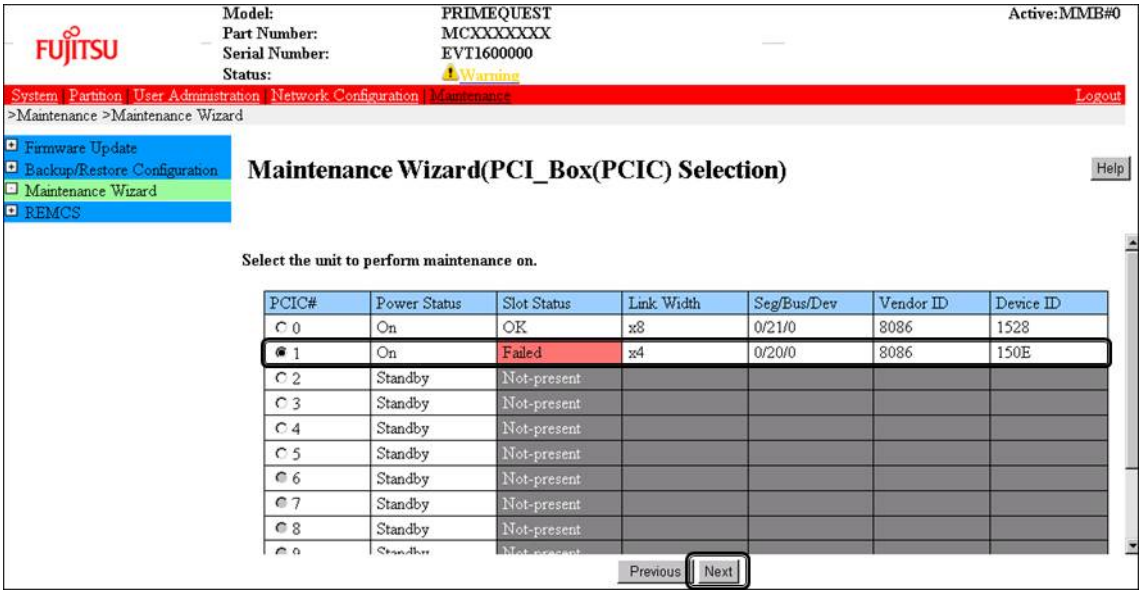
3. Select [PCI_Box(PCIC)], click [Next].



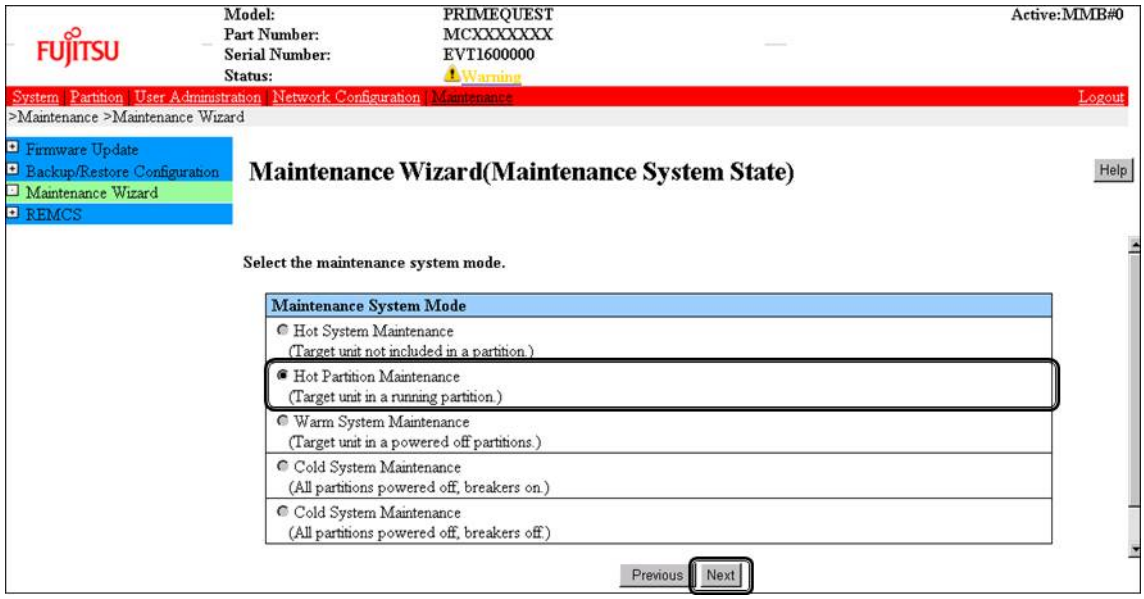
4. Select the radio button of PCI_Box with the particular number, click [Next]
   Example of operation for hot replacing PCI Express card of PCIC#1 mounted on PCI_Box#0



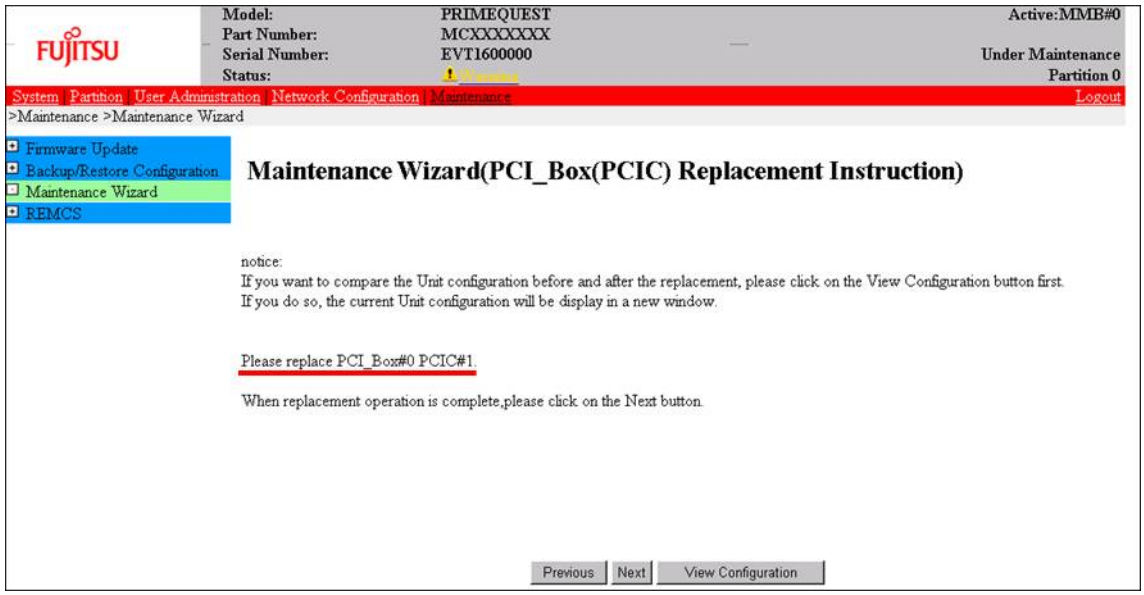
5. Select the radio button of the particular PCIC number and click [Next]



6. Select [Hot Partition Maintenance (Target unit in a running partition.)] and click [Next]



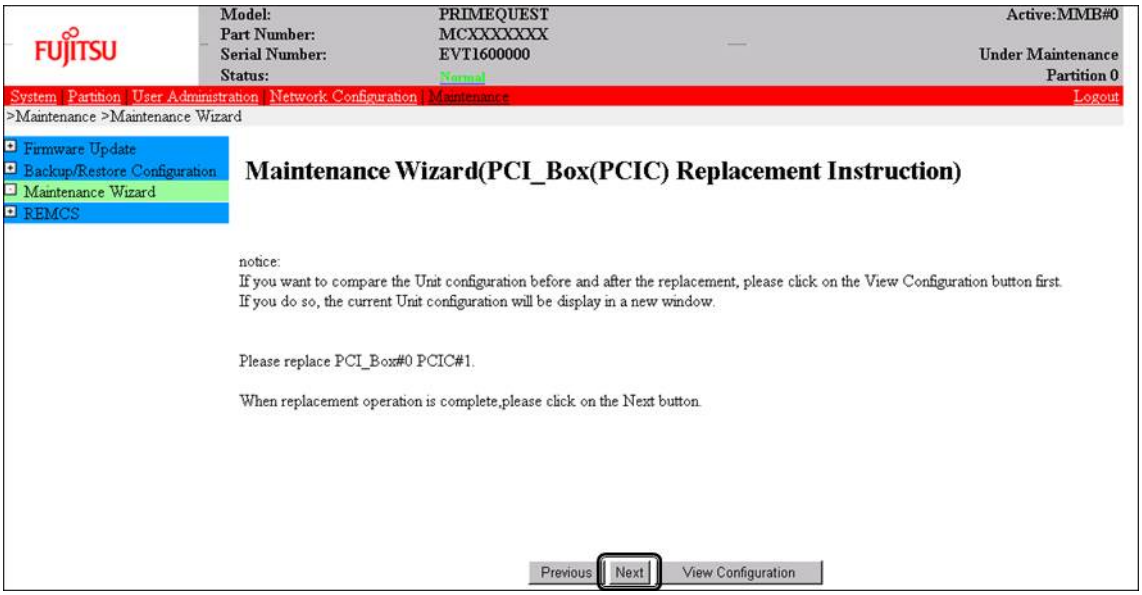
7. Maintenance mode is set (with information area of MMB Web-UI gray out) and then replacement instruction for the particular PCIC appears. Take off all cables such as LAN cable and FC cable connected to the particular PCIC and replace the particular PCIC with this window displayed.
See the figure in 'B.1 Physical Mounting Locations of Components' to confirm the location of the PCI Express card to be replaced.



Note
Do NOT click [Next] until replacing the PCIC.

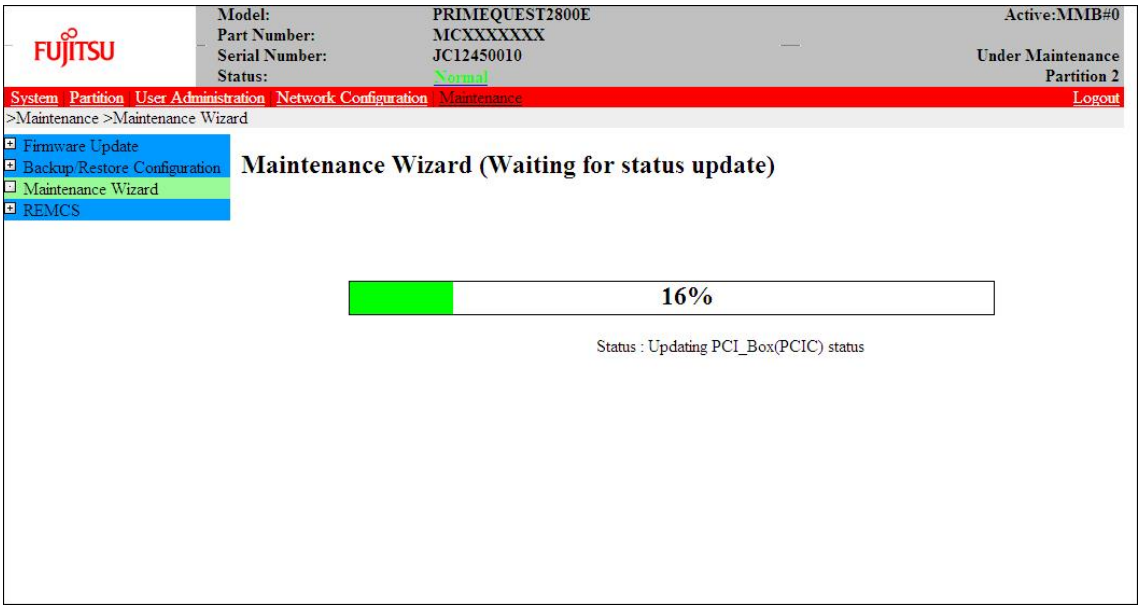
8. After replacing the particular PCIC, mount cables other than LAN cables.
Note
In GLS configuration with NIC switching way, mount also LAN cables.

9. After replacing the particular PCIC and powering on the particular PCIC slot, click [Next].
   For how to power on the PCIC slot, see “Powering on and off PCI Express slots” in “6.1.2 PCI Express card replacement procedure in detail”.
   It is the administrator of your system who power on the PCI Express slot.

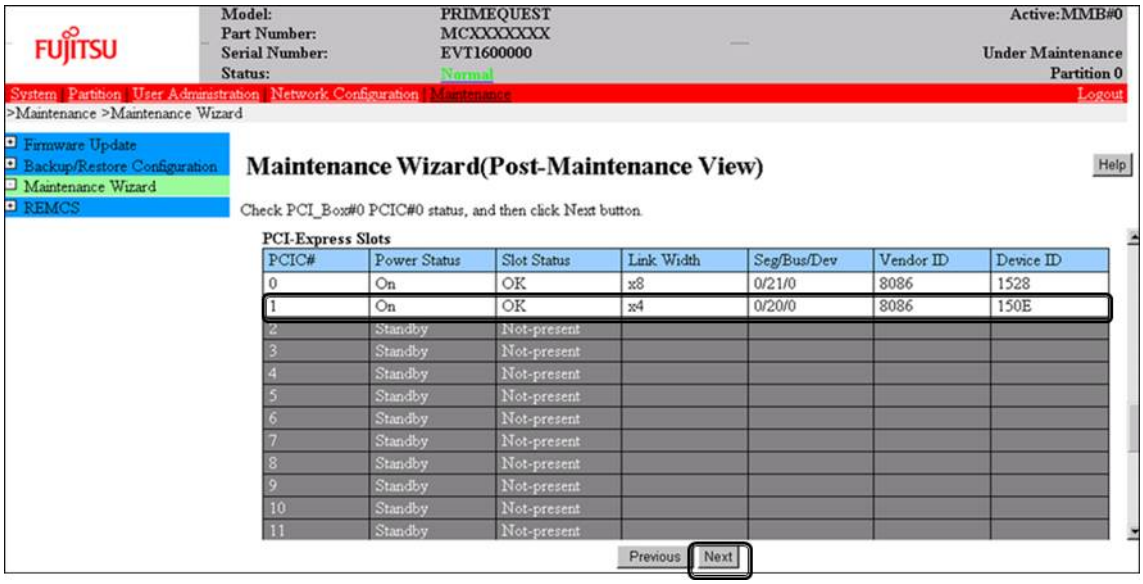


Note
Ask the administrator of your system to power on the PCI Express slot.

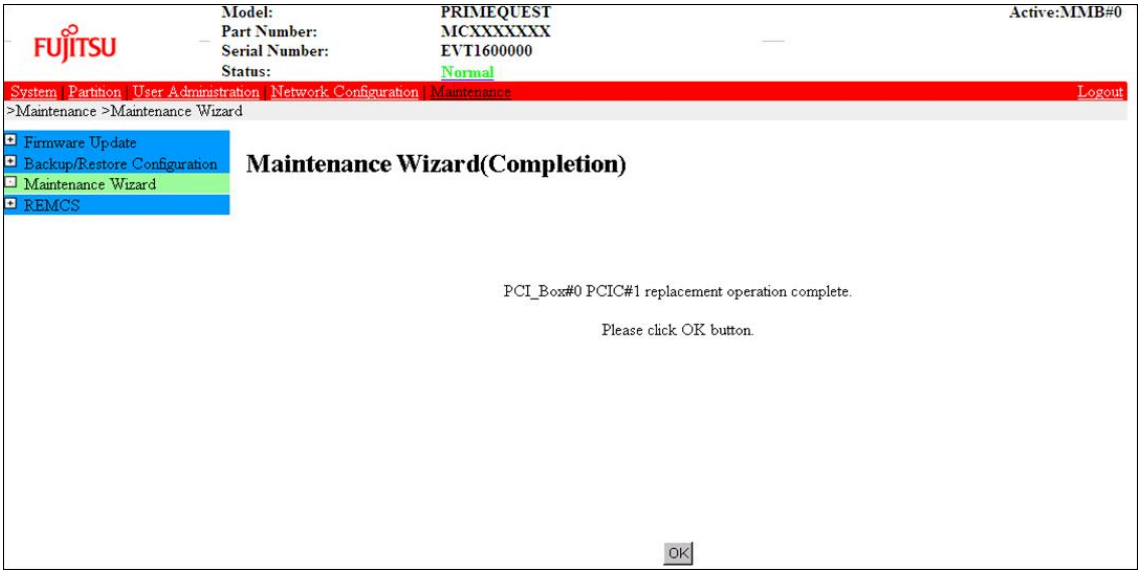
10. The window updating status appears.



11. Check the status of replaced PCIC and click [Next].



12. Confirm that maintenance mode has been released (with information area of MMB Web-UI not gray out) and click [Next].



Post-processing of software using a PCI Express card

After replacing a PCI Express card, restart the software stopped before the PCI Express card replacement or make the software operation applicable again, as needed.

6.1.3 FC card (Fibre Channel card) replacement procedure

The descriptions in this section assume that an FC card is being replaced.

Notes

- The FC card used for SAN boot does not support hot plugging.
- This section does not cover configuration changes in peripherals (e.g., UNIT addition or removal for a SAN disk device).
- This manual does not describe how to change the configuration of peripherals such as expanding and removing the unit of SAN disk device.

- To prevent a device name mismatch due to the failure, addition, removal, or replacement of an FC card, access the SAN disk unit by using the by-id name (/dev/disk/by-id/...) for the device name.
- If all the paths in a mounted disk become hidden when an FC card is hot replaced, unmount the disk. Then, execute PCI hot plug.

FC card replacement procedure

The procedure for replacing only a faulty FC card without replacing other peripherals is as follows.

1. Make the necessary preparations.
   Stop access to the faulty FC card, such as by stopping applications.
2. Confirming the installation of the PCI Hot Plug driver
   See 'Confirming the installation of the PCI Hot Plug driver' in "6.1.2 PCI Express card replacement procedure in detail".
3. Confirm the slot number of the PCI Express slot.
   See 'Confirming the slot number of a PCI Express slot' in "6.1.2 PCI Express card replacement procedure in detail".
4. Power off the PCI Express slot.
   See 'Powering on and off PCI Express slots' in "6.1.2 PCI Express card replacement procedure in detail".
5. Physically replace the target card by using MMB Maintenance Wizard. This step is performed by the field engineer in charge of your system.
   For details on the operation of replacement, see step 1 to 7 of 'Operation for Hot replacement of PCI Express card by Maintenance Wizard' in "6.1.2 PCI Express card replacement procedure in detail".
6. Reconfigure the peripheral according to its manual.
   For example, suppose that the storage device used is ETERNUS and that the host affinity function is used (to set the access right for each server). Their settings would need to be changed as a result of FC card replacement.
7. Power on the PCI Express slot.
   See 'Powering on and off PCI Express slots' in "6.1.2 PCI Express card replacement procedure in detail".
8. Check whether there is an error in added FC card by MMB Maintenance Wizard.
   This step is performed by the field engineer in charge of your system.
   For details on the operation of replacement, see step 8 to 11 of 'Operation for Hot replacement of PCI Express card by Maintenance Wizard' in "6.1.2 PCI Express card replacement procedure in detail".
9. Check the version of the firmware
   It is required that the firmware version of new FC card is same as the FC card which had been replaced.
   If the firmware version of new FC card is same as the FC card which had been replaced (current firmware version), it is not necessary to update the firmware version of new FC card to current firmware version.
   If the firmware version of new FC card is not same as the FC card which had been replaced (current firmware version), update the firmware version of new FC card to current firmware version.
   For how to update the firmware version, see Firmware update manual for fibre channel card.
   Note
   If you cannot confirm the firmware version of the FC card before replacing due to the fault of the FC card, check the firmware version of the FC card which is same type as the faulty one to update firmware version.
10. Confirm the incorporation results.
    'Confirming the FC card incorporation results' describes the confirmation method. Start operation with the FC card again by restarting applications as needed or by other such means.
11. Perform the necessary post-processing.
    If you stopped any other application in step 1, restart it too as needed.

Confirming the FC card incorporation results

Confirm successful incorporation of the FC card and the corresponding driver in the following method. Then, take appropriate action. Check the log. (The following example shows a log of FC card hot plugging.)
As shown below, the output of an FC card incorporation message and device found message as the log output to /var/log/messages after the PCI Express slot containing the mounted FC card is enabled means that the FC card was successfully incorporated.

```
scsi10:Emulex LPe1250-F8 8Gb PCIe Fibre Channel ¥
       Adapter on PCI bus 0f device 08 irq 59 ...(*1)
       lpfc 0000:0d:00.0: 0:1303 Link Up Event x1 received ¥
```

```
       Data: x1 x0 x10 x0 x0 x0 0 ...(*2)
       scsi 2:0:0:0: Direct-Access FUJITSU E4000 ¥
0000 PQ: 1 ANSI: 5        ...(*3)
```

The ¥ at the end of a line indicates that there is no line feed.

If only the message in (*1) is displayed but the next line is not displayed or if the message in (*1) is not displayed, the FC card replacement itself was unsuccessful. (See Note below.) In this case, power off the slot once. Then, check the following points again:

- Whether the FC card is correctly inserted into the PCI Express slot
- Whether the latch is correctly set

Eliminate the problem, power on the slot again, and check the log.
If the message in (*1) is displayed but the FC linkup message in (*2) is not displayed, the FC cable may be disconnected or the FC path may not be set correctly. Power off the slot once. Confirm the following points again.

- Confirm the FC driver setting.
  The definition file containing a description of the driver option of the FC driver (lpfc) is identified with the following command.
  Example: Description in /etc/modprobe.d/lpfc.conf

  ```
  # grep -l lpfc /etc/modprobe.d/*

  /etc/modprobe.d/lpfc.conf
  ```

  Confirm that the driver option of the FC driver (lpfc) is correctly set. For details, contact the distributor where you purchased your product, or your sales representative.
- Check the FC cable connection status.
- Confirm the Storage FC settings.
  Confirm that the settings that conform to the actual connection format (Fabric connection or Arbitrated Loop connection) were made.
  If the messages in (*1) and (*2) are displayed but the messages in (*3) are not displayed, the storage is not yet found. Check the following points again. These are not card problems, so you need not power off the slot for work.
  - Review FC-Switch zoning settings.
  - Review storage zoning settings.
  - Review storage LUN Mapping settings.

    Also, confirm that the storage can be correctly viewed from LUN0.
    Eliminate the problem. Then, confirm the settings and recognize the system by using the following procedure.

1. Confirm the host number of the incorporated FC card from the message at (*1).
   xx in scsixx (xx is a numerical value) in the message at (*1) is a host number. In the above example, the host number is 10.
2. Scan the device by executing the following command.

   ```
   # echo "-" "-" "-" > /sys/class/scsi_host/hostxx/scan
   (# is command prompt)

   (xx in hostxx is the host number entered in step 1.)
   ```

   The command for the above example is as follows.

   ```
   # echo "-" "-" "-" > /sys/class/scsi_host/host10/scan
   ```

3. Confirm that a message like (*3) was output to /var/log/messages.
   If this message is not displayed, confirm the settings again.

   Note
   In specific releases of SLES, a message like (*1) for confirming FC card incorporation may be output in the following format with card name information omitted.

   ```
   scsi10 : on PCI bus 0f device 08 irq 59
   ```

In this case, check for the relevant message on the FC card incorporation by using the following procedure.

a. Confirm the host number.
xx in scsixx (xx is a numerical value) in the message is a host number. In the above example, the host number is 10.

b. Check whether the following file exists by using the host number.

```
/sys/class/scsi_host/hostxx/modeldesc
(xx in hostxx is the host number entered in step 1.)
```

If the file does not exist, the judgment is that no such message was output from the FC card.

c. If the file exists, check the file contents by using the following operation.

```
# cat /sys/class/scsi_host/hostxx/modeldesc
Emulex LPe1250-F8 8Gb PCIe Fibre Channel Adapter

(xx in hostxx is the host number entered in step 1.)
```

If the output is like the above, the judgment is that the relevant message was output by the incorporation of the FC card.

6.1.4 Network card replacement procedure

Network card (referred to as NIC below) replacement using hot plugging needs specific processing before and after PCI Express slot power-on or power-off. Its procedure also includes the common PCI Express card replacement procedure.
The procedure describes operations where a single NIC is configured as one interface. It also describes cases where multiple NICs are bonded together to configure one interface (bonding configuration). For bonding multiple NIC by using PRIMECLUSTER Global Link Services (GLS), see 'PRIMECLUSTER Global Link Service Configuration and Administration Guide Redundant Line Control Function for Linux' (J2UZ-7781).

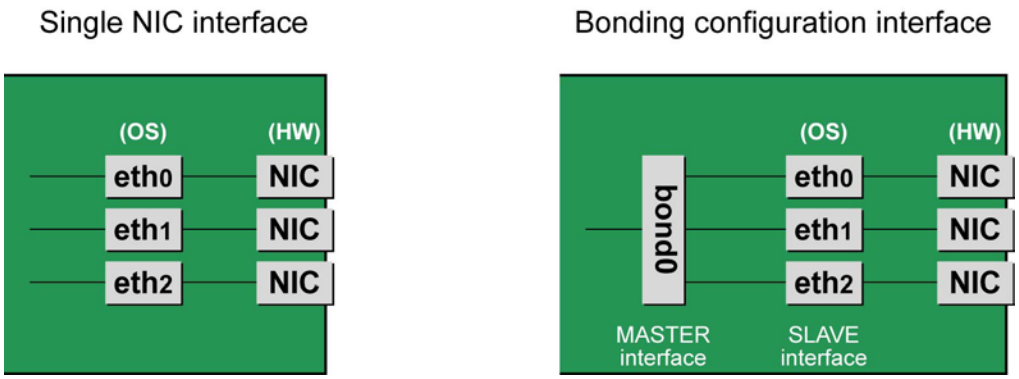


FIGURE 6.1 Single NIC interface and bonding configuration interface

NIC replacement procedure

This section describes the procedure for NIC replacement.
Notes

- When replacing multiple NICs, be sure to replace them one by one. If you replace multiple cards at the same time, they may not be correctly configured.
- To perform hot replacement in a system where a bonding device is installed, design the system so that it specifies ONBOOT=YES in all interface configuration files (the /etc/sysconfig/network/ifcfg-eth*files and the /etc/sysconfig/network/ifcfg-bond*files), regardless of whether the NIC to be replaced is a configuration interface of the bonding device.
An IP address need not to be assigned to unused interfaces. This procedure is to prevent the device name of the replacement target NIC from being changed after hot replacement. If ONBOOT=NO also exists, the procedure described here may not work properly.

1. Confirming the installation of the PCI Hot Plug driver
See 'Confirming the installation of the PCI Hot Plug driver' in "6.1.2 PCI Express card replacement procedure in detail".

2. Confirm the slot number of the PCI Express slot that has the mounted interface.
   Confirm the interface mounting location through the configuration file information and the operating system information. First, confirm the bus address of the PCI Express slot that has the mounted interface to be replaced.
   Example: eth0 interface

```
# ls -l /sys/class/net/eth0/device
lrwxrwxrwx 1 root root 0 Sep 29 10:17 ¥
/sys/class/net/eth0/device
->../../../0000:00:01.2/0000:08:00.2/0000:0b:01.0
```

   The ¥ at the end of a line indicates that there is no line feed.

   Excluding the rest of the directory path, check the part corresponding to the file name in the symbolic link destination file of the output results. In the above example, the underlined part shows the bus address. ("0000:0b:01" in the example)
   Note
   You will use the bus address obtained here in steps 3 and 12. Record the bus address so that you can reference it later.

   Next, check the PCI Express slot number for this bus address.

```
# grep -il 0000:0b:01 /sys/bus/pci/slots/*/address
/sys/bus/pci/slots/20/address
```

   Read the output file path as shown below, and confirm the PCI Express slot number.

```
/sys/bus/pci/slots/<slot number>/address
```

   Notes
   If the above file path is not output, it indicates that the NIC is not mounted in a PCI Express slot (e.g., GbE port in the IOU).
   With the PCI Express slot number confirmed here, see 'D.2 Correspondence between PCI Slot Mounting Locations and Slot Numbers'PCI Express slot to check the mounting location, and see also 'B.1 Physical Mounting Locations of Components' to identify the physical mounting location corresponding to the PCI Express slot number. You can confirm that it matches the mounting location of the operational target NIC.

3. Collect information about interfaces on the same NIC.
   For a NIC that has more than one interface, you will need to deactivate all the interfaces on the NIC. Use the following procedure to check each interface that has the same bus address as that confirmed in step 2. Then, make a table with information including the interface name, hardware address, and bus address.
   Note
   Collect the following information even if the NIC has only one interface.

   - Confirm the correspondence between the bus address and interface name.
     Execute the following command, and confirm the correspondence between the bus address and interface name.
     Example: The bus address is "0000:0b:01".

```
# ls -l /sys/class/net/*/device | grep "0000:0b:01"
lrwxrwxrwx 1 root root 0 Sep 29 10:17 ¥
/sys/class/net/eth0/device
->../../../0000:00:01.2/0000:08:00.2/0000:0b:01.0
lrwxrwxrwx 1 root root 0 Sep 29 10:17 ¥
/sys/class/net/eth1/device
->../../../0000:00:01.2/0000:08:00.2/0000:0b:01.1
```

     The ¥ at the end of a line indicates that there is no line feed.

     The following table shows the correspondence between the bus addresses and interface names from the above output example.

     TABLE 6.1 Correspondence between bus addresses and interface names

Interface name	Hardware address	Bus address	Slot number
eth0		0000:0b:01.0	20
eth1		0000:0b:01.1	20
...		...	...

     Note
     When recording a bus address, include the function number (number after the period).

- Confirm the correspondence between the interface name and hardware address.
  Execute the following command, and confirm the correspondence between the interface name and hardware address.
  Example: eth0 [For a single interface]

```
# cat /sys/class/net/eth0/address
00:0e:0c:70:c3:38
```

  Example: eth0 [For a bonding interface]
  The bonding driver rewrites the values for the slave interface of the bonding device. Confirm the hardware address by executing the following command.

```
# cat /proc/net/bonding/bondY

Ethernet Channel Bonding Driver .........
.
.
Slave interface: eth0
.
Permanent HW addr: 00:0e:0c:70:c3:38
.
.
```

  You can use this procedure only when the bonding device is active. If the bonding device is not active or the slave has not been incorporated, use the same procedure as for a single interface.

  Also, the correspondence between the interface name and hardware address is automatically registered by the system in the udev function rule file, /etc/udev/rules.d/70-persistent-net.rules. Confirm that the ATTR{address} and NAME items have the same definitions as in the above output.
  Example: eth0

```
grep eth0 /etc/udev/rules.d/70-persistent-net.rules

SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*", ¥
ATTR{address}=="00:0e:0c:70:c3:38", ATTR{type}=="1", ¥
KERNEL=="eth*", NAME="eth0"
```

  The ¥ at the end of a line indicates that there is no line feed.

  You can always obtain the correct hardware address from the description in etc/udev/rules.d/70-persistent-net.rules regardless of whether the interface is incorporated in bonding.
  Confirm the hardware address of other interfaces by repeating the operation with the same command.
  The following table lists examples of descriptions.

TABLE 6.2 Hardware address description examples

Interface name	Hardware address	Bus address	Slot number
eth0	00:0e:0c:70:c3:38	0000:0b:01.0	20
eth1	00:0e:0c:70:c3:39	0000:0b:01.1	20
...	...	...	...

  The step above is used in creating the correspondence table in step 13. Prepare a table here so that you can reference it later.
  Note
  In a replacement due to a device failure, the information in the table showing the correspondence between the interface and the hardware address, bus address, and slot number may be inaccessible depending on the failure condition. We strongly recommend that a table showing the correspondence between the interface and the hardware address, bus address, and slot number be created for all interfaces at system installation.

4. Execute the higher-level application processing required before NIC replacement.
   Stop all access to the interface as follows. Stop the application that was confirmed in step 3 as using the interface, or exclude the interface from the target of use by the application.

5. Deactivate the NIC.
   Execute the following command to deactivate all the interfaces that you confirmed in step 3.
   The applicable command depends on whether the target interface is a single NIC interface or the SLAVE interface of a bonding device.
   [For a single NIC interface]

```
# /sbin/ifdown ethX
```

If the single NIC interface has a VLAN device, you also need to remove the VLAN interface. Perform the following operations (before deactivating the real interface).

```
# /sbin/ifdown ethX.Y
# /sbin/vconfig rem ethX.Y
```

[For the SLAVE interface of a bonding device]
If the bonding device is operating in mode 1, use the following steps to exclude SLAVE interface to be replaced from the bonding configuration. In any other mode, removing it immediately should not cause any problems.
Confirm that the SLAVE interface to be replaced is the interface currently being used for communication. First, confirm the interface currently being used for communication by executing the following command.

```
# cat /sys/class/net/bondY/bonding/active_slave
```

If the displayed interface matches the SLAVE interface being replaced, execute the following command to switch the current communication interface to another SLAVE interface.

```
# /sbin/ifenslave -c bondY ethZ
(ethZ: Interface that composes bondY and does not perform
hot replacement)
```

Finally, remove the SLAVE interface being replaced, from the bonding configuration. Immediately after being removed, the interface is automatically no longer used.

```
# /sbin/ifenslave -d bondY ethX
```

6. Power off the PCI Express slot.

   Confirm that the /sys/bus/pci/slots directory contains a directory for the target slot information, which will be referenced and otherwise used. Below, the slot number confirmed in step 2 is shown at <slot number> in the directory path in the following format, where the directory is the operational target.

   ```
   /sys/bus/pci/slots/<slot number>
   ```

   To disable a PCI Express card and make it ready for removal, write "0" to the "power" file in the directory corresponding to the target slot. The LED turns off. The interface (ethX) is removed at the same time.

   ```
   # echo 0 > /sys/bus/pci/slots/<slot number>/power
   ```

7. Save the interface configuration file.
   Save all the interface configuration files that you checked in step 3 by executing the following command. udevd and configuration scripts may reference the contents of files in /etc/sysconfig/network. For this reason, create a save directory and save these files to the directory so that udevd and the configuration scripts will not reference them.

   ```
   # cd /etc/sysconfig/network
   # mkdir temp
   # mv ifcfg-ethX temp
   (following also executed for bonding configuration)
   # mv ifcfg-bondX temp
   ```

8. Physically replace the NIC by using MMB Maintenance Wizard. This step is performed by the field engineer in charge of your system.
   For details on the operation of replacement, see step 1 to 7 of ‘Operation for Hot replacement of PCI Express card by Maintenance Wizard’ in “6.1.2 PCI Express card replacement procedure in detail”.

9. Delete the entries associated with the replaced NIC from the udev function rule file.
   Each entry for the new NIC is automatically added to the udev function rule file, /etc/udev/rules.d/70-persistent-net.rules, when the NIC is detected. However, the entries of a NIC are not automatically deleted even if the NIC is removed. Leaving the entries of the removed NIC may have the following impact.

   - The interface names defined in the entries of the removed NIC cannot be assigned to the replaced NIC or an added NIC.

   For this reason, delete or comment out the entries of the removed NIC from the udev function rule file.

   a. Confirm the correspondence between the interface name and hardware address in the table created in step 3.

b. Edit the udev function rule file, /etc/udev/rules.d/70-persistent-net.rules, to delete or comment out the entry lines of all the interface names and hardware addresses confirmed in the above step 2.

The following example shows editing of the udev function rule file.
[Example of descriptions in the file before editing]

```
# PCI device 0x****:0x**** (e1000)
SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*", ¥
ATTR{address}=="00:0e:0c:70:c3:38", ATTR{type}=="1", ¥
KERNEL=="eth*", NAME="eth0"
# PCI device 0x****:0x**** (e1000)
SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*", ¥
ATTR{address}=="00:0e:0c:70:c3:39", ATTR{type}=="1", ¥
KERNEL=="eth*", NAME="eth1"
  :
  :
```

The ¥ at the end of a line indicates that there is no line feed.

[Example of descriptions in the file after editing]
(In the example, eth0 was deleted, and eth1 is commented out.)

```
# PCI device 0x****:0x**** (e1000)
# SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*", ¥
ATTR{address}=="00:0e:0c:70:c3:39", ATTR{type}=="1", ¥
KERNEL=="eth*", NAME="eth1"
  :
  :
```

The ¥ at the end of a line indicates that there is no line feed.

Do this editing for all the interfaces listed in the table created in step 3.

10. Reflect the edited rules in udev.
udevd reads the rules described in the rule file at its start time and then retains the rules in memory. Simply changing the rule file does not mean the changed rules are reflected. Take action as follows to reflect the new rules in udev.

```
# udevadm control --reload-rules
```

11. Power on the PCI Express slot.
See ‘Powering on and off PCI Express slots’ in “6.1.2 PCI Express card replacement procedure in detail”.

12. Check whether there is an error in added FC card by MMB Maintenance Wizard.
This step is performed by the field engineer in charge of your system.
For details on the operation of replacement, see step 8 to 11 of ‘Operation for Hot replacement of PCI Express card by Maintenance Wizard’ in “6.1.2 PCI Express card replacement procedure in detail”.

13. Collect the information associated with an interface on the replaced NIC.
An interface (ethX) is created for the replaced NIC at the power-on time. Make a table with information about each interface created for the replaced NIC. Such information includes the interface name, hardware address, and bus address. Use the bus address confirmed in step 2 and the same procedure as in step 3.

TABLE 6.3 Example of interface information about the replaced NIC

Interface name	Hardware address	Bus address	Slot number
eth1	00:0e:0c:70:c3:40	0000:0b:01.0	20
eth0	00:0e:0c:70:c3:41	0000:0b:01.1	20
...	...	...	...

Confirm that a new hardware address is defined for the bus address. Also confirm that the assigned interface name is the same as that before the NIC replacement.

Also confirm that the relevant entries in the above-described table were automatically added to the udev function rule file, /etc/udev/rules.d/70-persistent-net.rules.
Note
The correspondence between the bus address and interface name may be different from that before NIC replacement. In such cases, just proceed with the work. This is explained in step 14.

14. Deactivate each newly created interface.
    The interfaces created for the replaced NIC may be active because power is on to the PCI Express slot. In such cases, you need to deactivate them before changing the interface configuration file.
    Execute the following command for all the interface names confirmed in step 12.
    Example: eth0

```
# /sbin/ifconfig eth0 down
```

15. Confirm the correspondence between the interface names before and after the NIC replacement.
    From the interface information created before and after the NIC replacement in steps 3 and 12, confirm the correspondence between the interface names before replacement and the new interface names.

    a. Confirm the correspondence between the bus address and interface name on each line in the table created in step 3.

    b. Likewise, confirm the correspondence between the bus addresses and interface names in the table created in step 12.

    c. Match the interface names to the same bus addresses before and after the NIC replacement.

    d. In the table created in step 12, enter values corresponding to the interface names before and after the NIC replacement.

TABLE 6.4 Example of entered values corresponding to the interface names before and after NIC replacement

Interface name After replacement (-> Before replacement)	Hardware address	Bus address	Slot number
eth1 (-> eth0)	00:0e:0c:70:c3:40	0000:0b:01.0	20
eth0 (-> eth1)	00:0e:0c:70:c3:41	0000:0b:01.1	20
...	...	...	...

16. If an interface name is switched before and after the NIC replacement, make the interface name correspond to the same bus address as before the NIC replacement by using the following procedure.
    Note
    Confirm that the interface name is the same before and after the NIC replacement. Then, proceed to step 16.

    a. Power off the PCI Express slot again.
       Repeat the process done in step 6 to power off the PCI Express slot.

    b. Correct the interface name that is not the same before and after the NIC replacement in the entries of the udev function rule file, /etc/udev/rules.d/70-persistent-net.rules. Make the interface name the same as before the NIC replacement.
       [Example of descriptions in the file before editing]

```
# PCI device 0x****:0x**** (e1000)
SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*", ¥
ATTR{address}=="00:0e:0c:70:c3:40", ATTR{type}=="1", ¥
KERNEL=="eth*", NAME="eth1"
# PCI device 0x****:0x**** (e1000)
SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*", ¥
ATTR{address}=="00:0e:0c:70:c3:41", ATTR{type}=="1", ¥
KERNEL=="eth*", NAME="eth0"
 :
 :
```

       The ¥ at the end of a line indicates that there is no line feed.

       [Example of descriptions in the file after editing]
       (eth1, the name after replacement, has been corrected to eth0, the name before replacement.)

```
# PCI device 0x****:0x**** (e1000)
SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*", ¥
ATTR{address}=="00:0e:0c:70:c3:40", ATTR{type}=="1", ¥
KERNEL=="eth*", NAME="eth0"
# PCI device 0x****:0x**** (e1000)

SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*", ¥
ATTR{address}=="00:0e:0c:70:c3:41", ATTR{type}=="1", ¥
KERNEL=="eth*", NAME="eth1"
```

```
   :
   :
```

The ¥ at the end of a line indicates that there is no line feed.

c. Reflect the edited rules again.
Repeat the process done in step 10 to reflect the rules.

```
# udevadm control --reload-rules
```

d. Power on the PCI Express slot.
Repeat the process done in step 11 to power on the PCI Express slot.
The interfaces created for the replaced NIC may be active because power is on to the PCI Express slot. At this stage, since we recommend proceeding with the work with the interface on the replaced NIC deactivated, repeat the operation in step 13.

e. Collect the information about interfaces on the NIC again, and create a table.
Use the same procedure as in step 3 to update the interface name information in the table from step 14 showing the correspondence of the interface before and after NIC replacement.
Note
Confirm that each specified interface name is the same as before the NIC replacement.

TABLE 6.5 Confirmation of interface names

Interface name	Hardware address	Bus address	Slot number
eth0	00:0e:0c:70:c3:40	0000:0b:01.0	20
eth1	00:0e:0c:70:c3:41	0000:0b:01.1	20
...	...	...	...

17. Edit the saved interface configuration file.
Write a new hardware address to replace the old one. In "HWADDR," set the hardware address of the replaced NIC in 'TABLE 6.4 Example of entered values corresponding to the interface names before and after NIC replacement'' or 'TABLE 6.5 Confirmation of interface names'. Also, for SLAVE under bonding, the file contents are partly different, but the lines to be set are the same.

```
(Example)
DEVICE=eth0
NM_CONTROLLED=no BOOTPROTO=static HWADDR=00:0E:0C:70:C3:40
BROADCAST=192.168.16.255
IPADDR=192.168.16.1
NETMASK=255.255.255.0
NETWORK=192.168.16.0
ONBOOT=yes
TYPE=Ethernet
```

Do this editing for all the saved interfaces.

18. Restore the saved interface configuration file to the original file.
Restore the interface configuration file saved to the save directory to the original file by executing the following command.

```
# cd /etc/sysconfig/network/temp
# mv ifcfg-ethX   ..
(following also executed for bonding configuration)
# mv ifcfg-bondX   ..
```

19. Activate the replaced interface.
The method for activating a single NIC interface differs from that for activating the SLAVE interfaces under bonding.
[For a single NIC interface]
Execute the following command to activate the interface. Activate all the necessary interfaces.

```
# /sbin/ifup ethX
```

Also, if the single NIC interface has a VLAN device and the VLAN interface was temporarily removed, restore the VLAN interface. If the priority option has changed, set it again.

```
# /sbin/vconfig add ethX Y
# /sbin/ifup ethX.Y
(enter command to set VLAN option as needed)
```

[For SLAVE under bonding]
Execute the following command to incorporate the SLAVE interface into the existing bonding configuration. Incorporate all the necessary interfaces.

```
# /sbin/ifenslave bondY ethX
```

The VLAN-related operation is normally not required because a VLAN is created on the bonding device.

20. Mount all cables connected to the particular PCIC.
    This step is performed by the field engineer in charge of your system.
    Note
    In GLS configuration with NIC switching way, you do not need to perform this step.

21. Remove the directory to which the interface configuration file was saved.
    After all the interfaces to be replaced have been replaced, remove the save directory created in step 7 by executing the following command.

```
# rmdir /etc/sysconfig/network/temp
```

22. Execute the higher-level application processing required after NIC replacement.
    Perform the necessary post processing (such as starting an application or restoring changed settings) for the operations performed for the higher-level applications in step 4.

6.1.5 Hot replacement procedure for iSCSI (NIC)

When performing hot replacement of NICs used for iSCSI connection, use the following procedures.

- 6.1.1 Overview of common replacement procedures for PCI Express cards
- 6.1.2 PCI Express card replacement procedure in detail
- 6.1.4 Network card replacement procedure

A supplementary explanation of the procedure follows.

Prerequisites for iSCSI (NIC) hot replacement

- The prerequisites for iSCSI (NIC) hot replacement are as follows.
- The storage connection is established on a multipath using DM-MP (Device-Mapper Multipath) or ETERNUS multidriver (EMPD).
- To replace more than one iSCSI card, one card at a time will be replaced.
- A single NIC is configured as one interface.

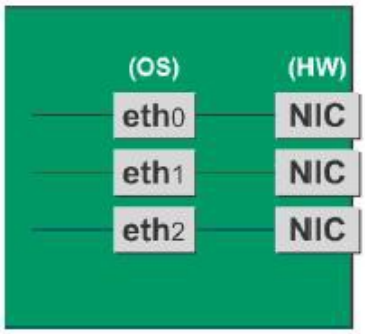


FIGURE 6.2 Example of single NIC interface

Work to be performed before iSCSI (NIC) replacement

For iSCSI (NIC) hot replacement, be sure to follow the procedure below when performing Step 3 of the ‘NIC replacement procedure’ in ‘6.1.4 Network card replacement procedure’

1. Perform the work for suppressing access to the iSCSI connection interface.
   a. Confirm the state of multiple path by DM-MP (*1) or EMPD (*2).

b. Use the iscsiadm command to log out from the path (iqn) through which the iSCSI card to be replaced is routed, and disconnect the session.
Example which confirms the state of session before disconnecting:

```
# /sbin/iscsiadm -m session
tcp: [1] 192.168.1.64:3260,1 iqn.2000-
09.com.fujitsu:storage-system.eternus-
dx400:00001049.cm0ca0p0
tcp: [2] 192.168.2.66:3260,3 iqn.2000-
09.com.fujitsu:storage-system.eternus-
dx400:00001049.cm1ca0p0
```

Example which logout path going through a NIC to be replaced:

```
# /sbin/iscsiadm -m node -T iqn.2000-09.com.fujitsu:storage-
system.eternus-dx400:00001049.cm1ca0p0 -p 192.168.2.66:3260
--logout
```

c. Use the iscsiadm command to confirm that the target session has been disconnected.
Example which confirms the state of session after disconnecting

```
# /sbin/iscsiadm -m session
tcp: [1] 192.168.1.64:3260,1 iqn.2000-
09.com.fujitsu:storage-system.eternus-
dx400:00001049.cm0ca0p0
```

d. You can confirm the disconnection of sessions on multipath products using DM-MP or ETERNUS multidriver.
*1: Write down the DM-MP display contents at the session disconnection.
Example of DM-MP display before disconnecting path

```
# /sbin/multipath -ll
mpath1 (36000b5d0006a0000006a104900000000) dm-0
FUJITSU,ETERNUS_DX400
[size=50G][features=0][hwhandler=0][rw]
¥_ round-robin 0 [prio=2][active]
 ¥_ 3:0:0:0 sdb 8:16  [active][ready]
 ¥_ 4:0:0:0 sdc 8:32  [active][ready]
```

Example of DM-MP display after disconnecting path

```
# /sbin/multipath -ll
mpath1 (36000b5d0006a0000006a104900000000) dm-0
FUJITSU,ETERNUS_DX400
[size=50G][features=0][hwhandler=0][rw]
¥_ round-robin 0 [prio=1][enabled]
 ¥_ 3:0:0:0 sdb 8:16  [active][ready]
```

*2: See the ETERNUS Multipath Driver User's Guide (For Linux).

Work to be performed after NIC replacement

For iSCSI (NIC) hot replacement, be sure to follow the procedure below when Step 19 of the NIC replacement procedure in 6.1.4 Network card replacement procedure.

1. To restore access to the iSCSI connection interface, perform the following.

   a. Confirm the state of multiple path by DM-MP (*1) or EMPD (*2).

   b. Use the iscsiadm command to log in to the path (iqn) through which the replacement iSCSI card is routed, and reconnect the session.
   Example which confirms the state of session before connecting:

```
# /sbin/iscsiadm -m session
tcp: [1] 192.168.1.64:3260,1 iqn.2000-
09.com.fujitsu:storage-system.eternus-
dx400:00001049.cm0ca0p0
```

Example which login path going through a NIC to be replaced:

```
# /sbin/iscsiadm -m node -T iqn.2000-09.com.fujitsu:storage-
system.eternus-dx400:00001049.cm1ca0p0 -p 192.168.2.66:3260
```

```
--login
```

c. Use the iscsiadm command to confirm that the target session has been activated.
Example which confirms the state of session after connecting

```
# /sbin/iscsiadm -m session
tcp: [1] 192.168.1.64:3260,1 iqn.2000-
09.com.fujitsu:storage-system.eternus-
dx400:00001049.cm0ca0p0
tcp: [3] 192.168.2.66:3260,3 iqn.2000-
09.com.fujitsu:storage-system.eternus-
dx400:00001049.cm1ca0p0
```

d. You can confirm the activation of sessions on multipath products using DM-MP or ETERNUS multidriver.
*1: Write down the DM-MP display contents at the session activation.
Example of DM-MP display before connecting path

```
# /sbin/multipath -ll
mpath1 (36000b5d0006a0000006a104900000000) dm-0
FUJITSU,ETERNUS_DX400
[size=50G][features=0][hwhandler=0][rw]
¥_ round-robin 0 [prio=1][active]
 ¥_ 3:0:0:0 sdb 8:16  [active][ready]
```

Example of DM-MP display after connecting path

```
# /sbin/multipath -ll
mpath1 (36000b5d0006a0000006a104900000000) dm-0
FUJITSU,ETERNUS_DX400
[size=50G][features=0][hwhandler=0][rw]
¥_ round-robin 0 [prio=2][enabled]
 ¥_ 3:0:0:0 sdb 8:16  [active][ready]
 ¥_ 5:0:0:0 sdc 8:32  [active][ready]
```

*2: See the ETERNUS Multipath Driver User's Guide (For Linux).

6.2 Hot Addition of PCI Express cards

This section describes the PCI Express card addition procedure with the PCI Hot Plug function.
The procedure includes common steps for all PCI Express cards and the additional steps required for a specific card function or driver.
Thus, the descriptions cover both the common operations required for all cards (e.g., power supply operations) and the specific procedures required for certain types of card. For details on addition of the cards not described in this section, see the respective product manuals.

6.2.1 Common addition procedures for all PCI Express cards

1. Performing the required operating system and software operations depending on the PCI card type
2. Confirming that the PCI Express slot power is off
3. Adding a PCI card
   This step is performed by the field engineer in charge of your system.
4. Powering on a PCI Express slot.
5. Performing the required operating system and software operations depending on the PCI card type

Notes
This section describes instructions for the operating system and subsystems (e.g., commands, configuration file editing). Be sure to refer to the respective product manuals to confirm the command syntax and impact on the system before performing tasks with those instructions.

The following sections describe card addition with the required instructions (e.g., commands, configuration file editing) for the operating system and subsystems, together with the actual hardware operations. Step 3 is performed by the field engineer in charge of your system.

6.2.2 PCI Express card addition procedure in detail

This section describes operations that must be performed in the PCI Express card addition procedure.

Confirming the installation of the PCI Hot Plug driver

See 'Confirming the installation of the PCI Hot Plug driver' in "6.1.2 PCI Express card replacement procedure in detail".

Confirming the slot number of a PCI Express slot

See 'Confirming the slot number of a PCI Express slot' in "6.1.2 PCI Express card replacement procedure in detail".

Checking the power status of a PCI Express slot

See 'Checking the power status of a PCI Express slot' in "6.1.2 PCI Express card replacement procedure in detail".

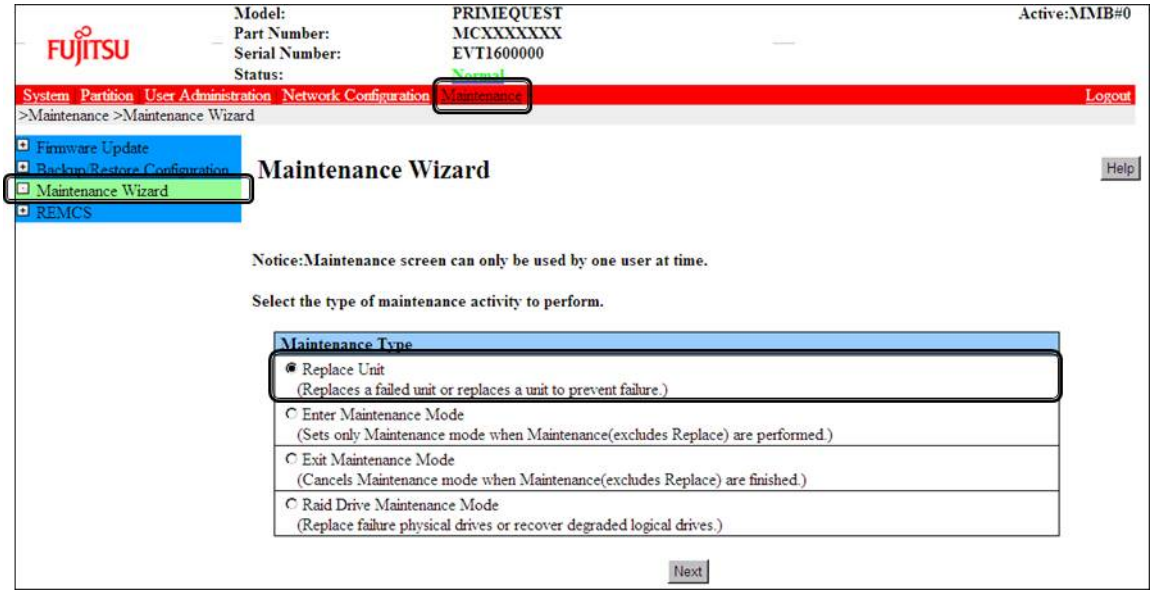
Powering on and off PCI Express slots

See 'Powering on and off PCI Express slots' in "6.1.2 PCI Express card replacement procedure in detail".

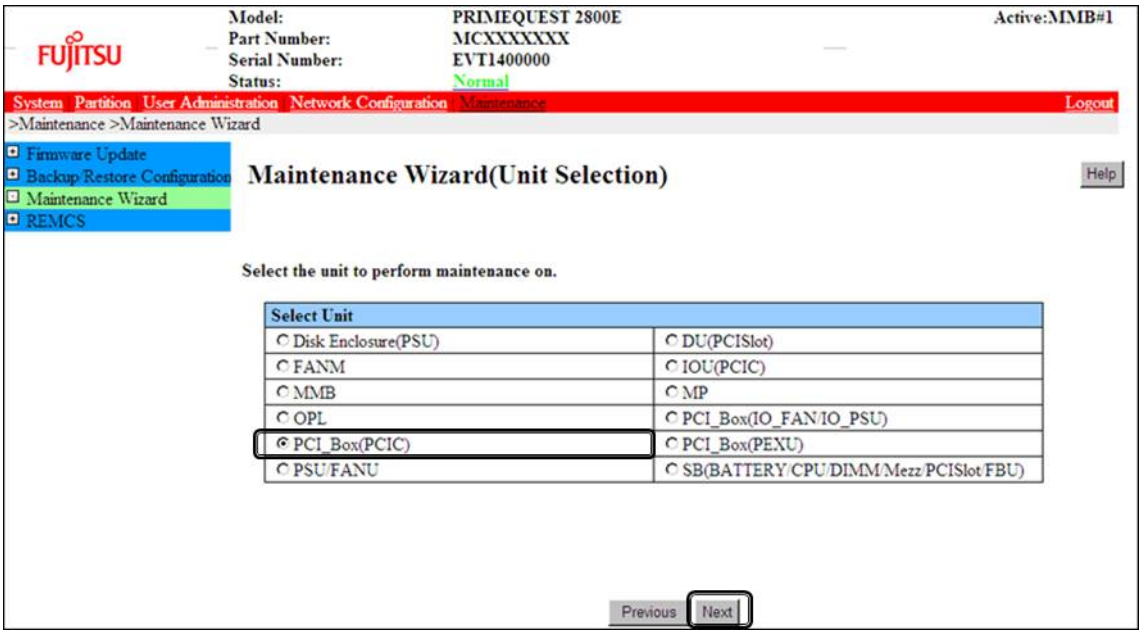
Operation for Hot add of PCI Express card by Maintenance Wizard

This item describes Operation for Hot add of PCI Express card (PCIC) by Maintenance Wizard.
Below works are performed by the field engineer in charge of your system.

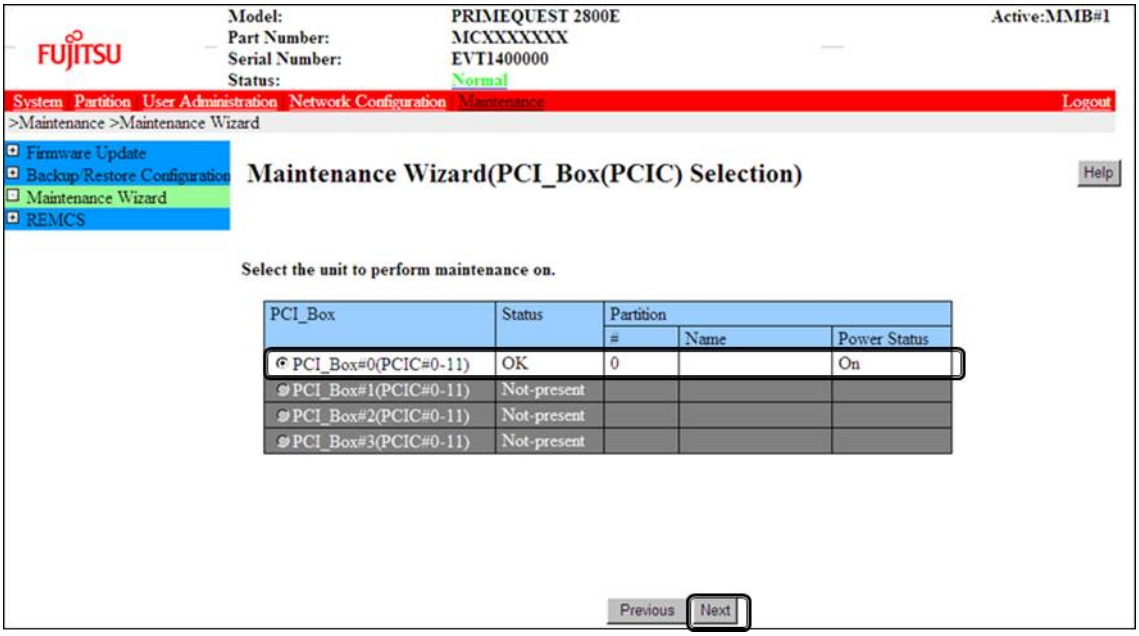
1. Start [Maintenance Wizard] menu by MMB Web-UI and display [Maintenance Wizard] view.
2. Select [Replace Unit] and click [Next].



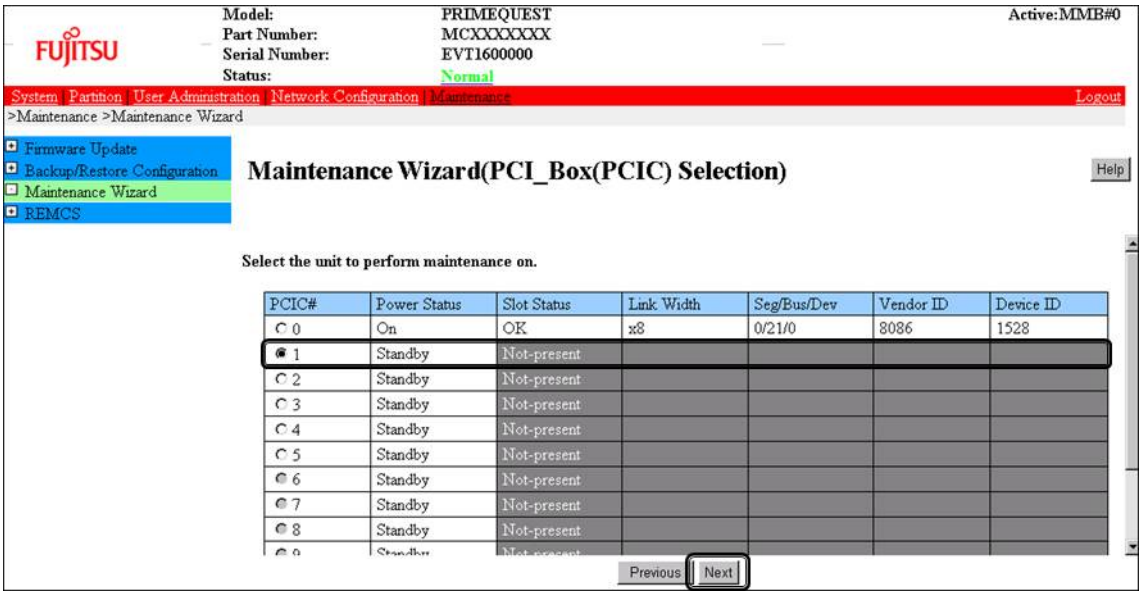
3. Select [PCI_Box(PCIC)], click [Next].



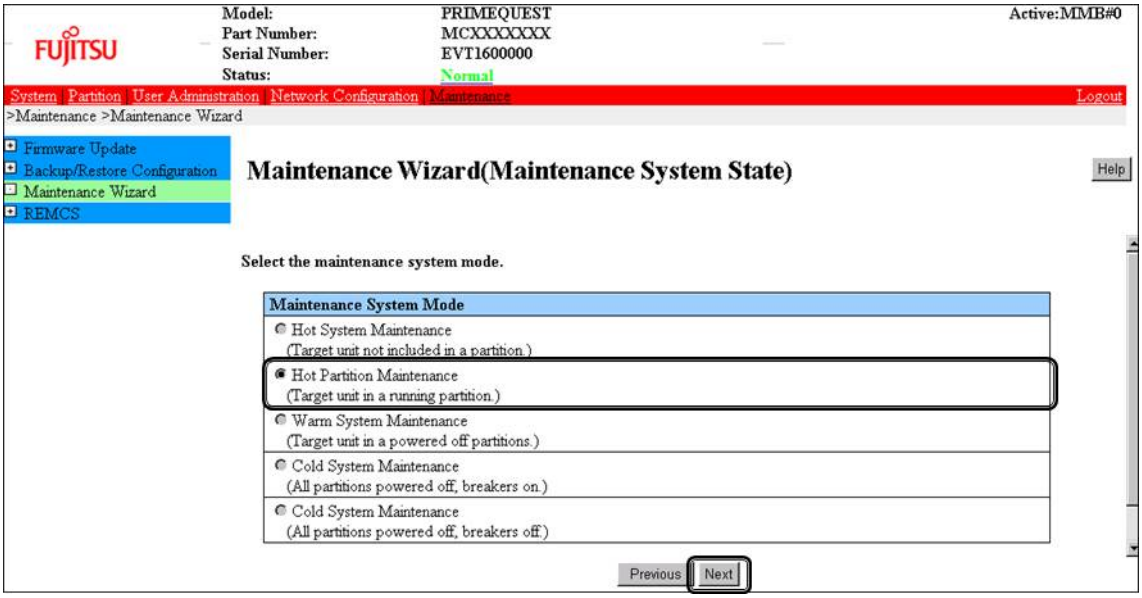
4. Select the radio button of PCI_Box with the particular number, click [Next]
   Example of operation for hot replacing PCI Express card of PCIC#1 mounted on PCI_Box#0



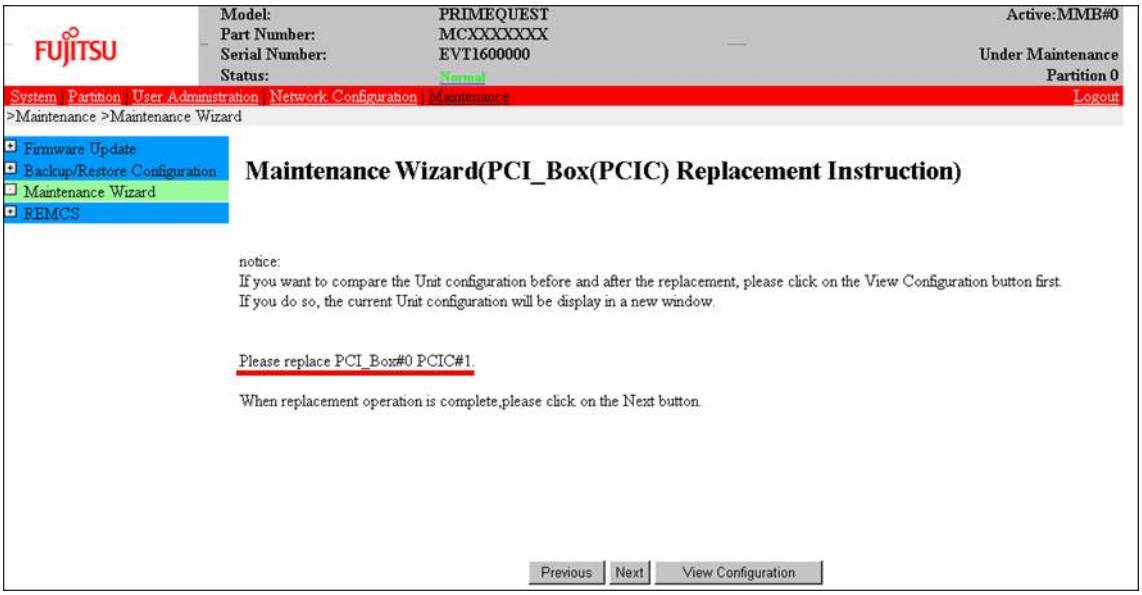
5. Select the radio button of the particular PCIC number and click [Next]



6. Select [Hot Partition Maintenance (Target unit in a running partition.)] and click [Next]



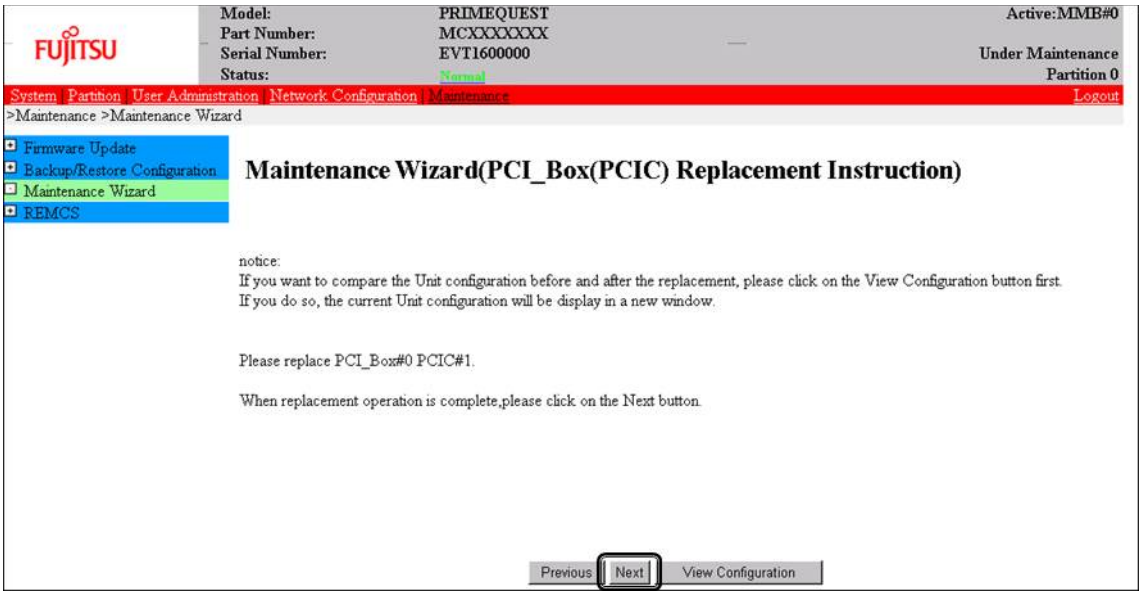
7. Maintenance mode is set (with information area of MMB Web-UI gray out) and then replacement instruction for the particular PCIC appears. Add a new PCI Express card with this window displayed. See the figure in 'B.1 Physical Mounting Locations of Components' to confirm the location of the PCI Express card to be replaced.



Note
Do NOT click [Next] until adding the PCIC.

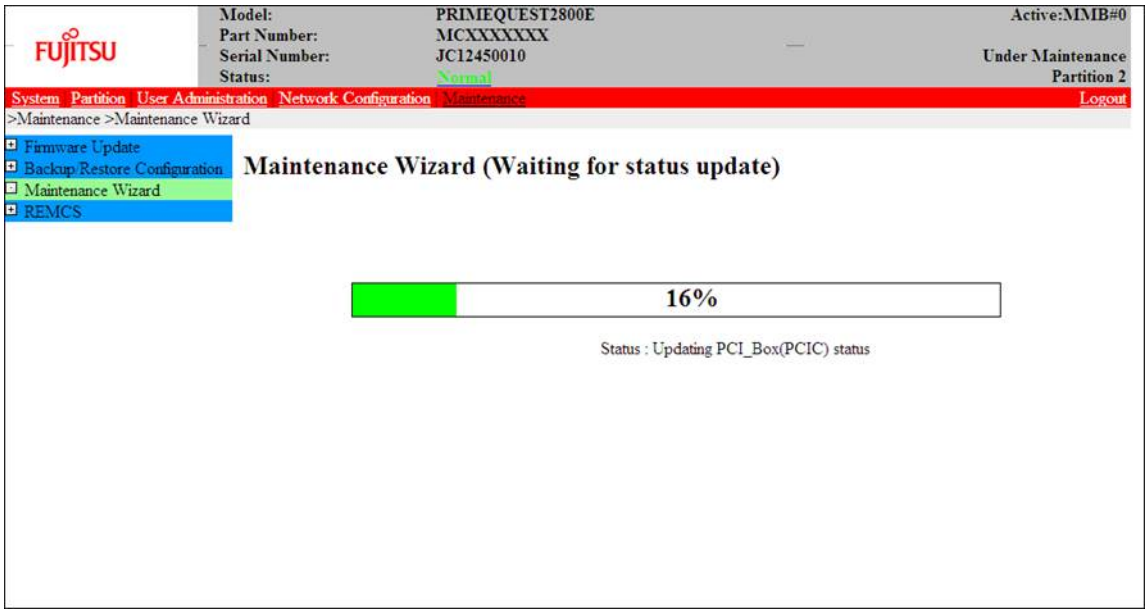
8. After adding the particular PCIC, mount cables other than LAN cables.
Note
In GLS configuration with NIC switching way, mount also LAN cables.

9. After replacing the particular PCIC and powering on the particular PCIC slot, click [Next].
For how to power on the PCIC slot, see "Powering on and off PCI Express slots" in "6.1.2 PCI Express card replacement procedure in detail".
It is the administrator of your system who power on the PCI Express slot.

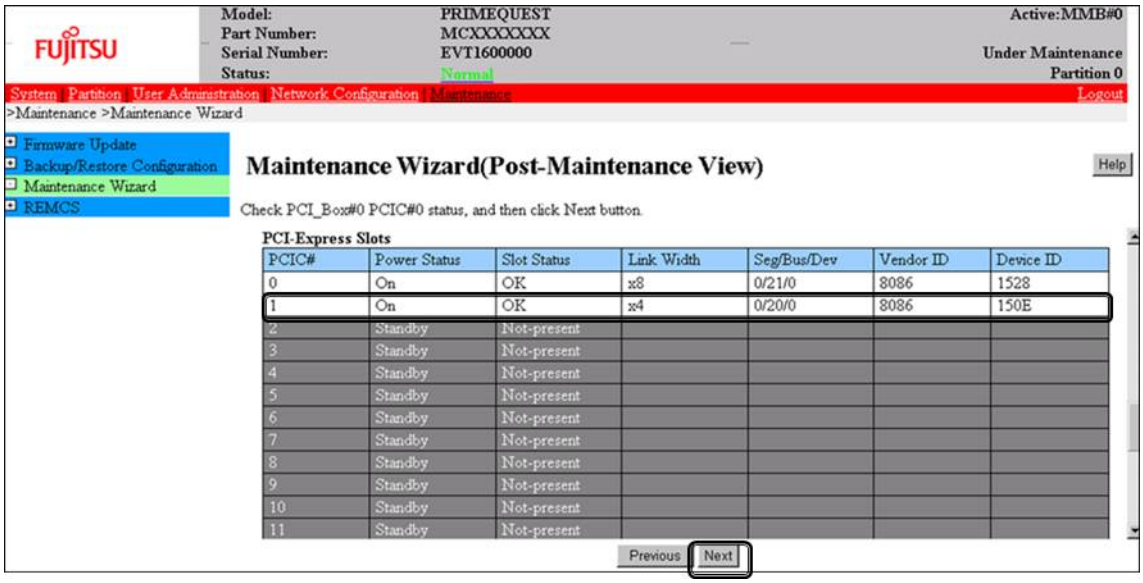


Note
Ask the administrator of your system to power on the PCI Express slot.

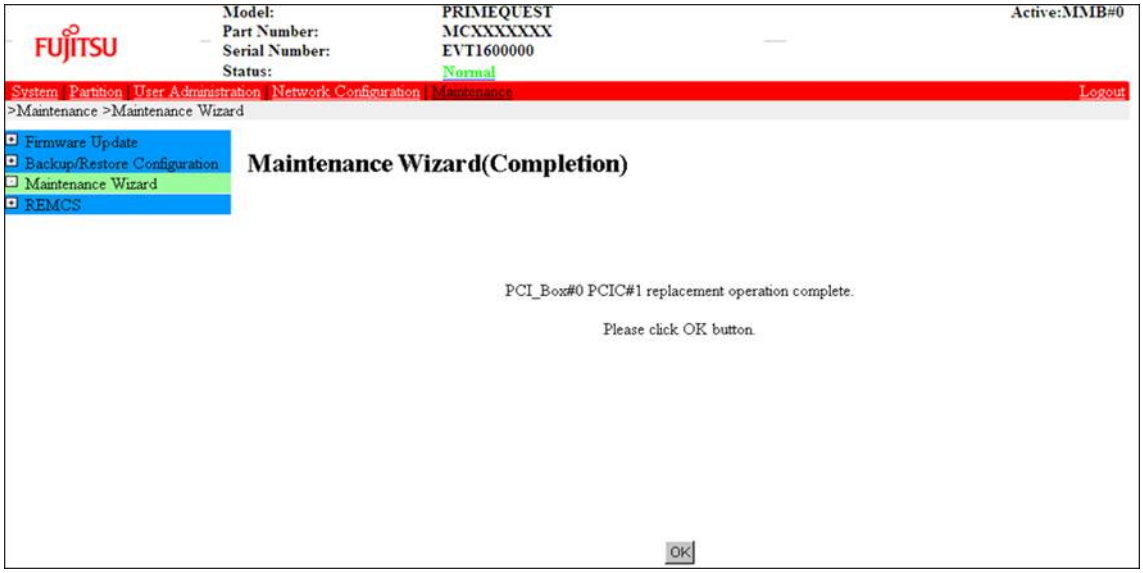
10. The window updating status appears.



11. Check the status of added PCIC and click [Next].



12. Confirm that maintenance mode has been released (with information area of MMB Web-UI not gray out) and click [Next].



6.2.3 FC card (Fibre Channel card) addition procedure

The descriptions in this section assume that an FC card is being added.
Notes

- The FC card used for SAN boot does not support hot plugging.
- This section does not cover configuration changes in peripherals (e.g., UNIT addition or removal for a SAN disk device).
- This manual does not describe how to change the configuration of peripherals such as expanding and removing the unit of SAN disk device.
- To prevent a device name mismatch due to the failure, addition, removal, or replacement of an FC card, access the SAN disk unit by using the by-id name (/dev/disk/by-id/...) for the device name.
- If all the paths in a mounted disk become hidden when an FC card is hot replaced, unmount the disk. Then, execute PCI hot plug.

FC card addition procedure

The procedure for adding new FC cards and peripherals is as follows.

1. Confirming the installation of the PCI Hot Plug driver
   See ‘Confirming the installation of the PCI Hot Plug driver’ in “6.1.2 PCI Express card replacement procedure in detail”.
2. Confirm the slot number of the PCI slot by using the following procedure.
   See ‘Confirming the slot number of a PCI Express slot’ in “6.1.2 PCI Express card replacement procedure in detail”.
3. Confirm that power status of the PCI Express slot is off.
   See ‘Checking the power status of a PCI Express slot’ in “6.1.2 PCI Express card replacement procedure in detail”.
4. Physically add the target card by using MMB Maintenance Wizard.
   For details on the operation of replacement, see step 1 to 7 of ‘Operation for Hot replacement of PCI Express card by Maintenance Wizard’ in “6.2.2 PCI Express card addition procedure in detail”.
5. Reconfigure the peripheral according to its manual.
   For example, suppose that the storage device used is ETERNUS and that the host affinity function is used (to set the access right for each server). Their settings would need to be changed as a result of FC card replacement.
6. Connect the FC card cable.

7. Power on the PCI Express slot.
   See ‘Powering on and off PCI Express slots’ in “6.1.2 PCI Express card replacement procedure in detail”.
8. Check whether there is an error in added FC card by MMB Maintenance Wizard.
   This step is performed by the field engineer in charge of your system.
   For details on the operation of replacement, see step 8 to 11 of ‘Operation for Hot replacement of PCI Express card by Maintenance Wizard’ in “6.2.2 PCI Express card addition procedure in detail”.
9. Check the version of the firmware
   It is required that the firmware version of new FC card is same as the FC card which had been replaced.
   If the firmware version of new FC card is same as the FC card which had been replaced (current firmware version), it is not necessary to update the firmware version of new FC card to current firmware version.
   If the firmware version of new FC card is not same as the FC card which had been replaced (current firmware version), update the firmware version of new FC card to current firmware version.
   For how to update the firmware version, see Firmware update manual for fibre channel card.
   Note
   If you cannot confirm the firmware version of the FC card before replacing due to the fault of the FC card, check the firmware version of the FC card which is same type as the faulty one to update firmware version.
10. Confirm the incorporation results
    The method of confirming is the same as that is performed in the replacement of FC card. See ‘Confirming the FC card incorporation results’ in ‘6.1.3 FC card (Fibre Channel card) replacement procedure’.

6.2.4 Network card addition procedure

NIC (network card) addition using hot plugging needs specific processing before and after PCI slot power-on or power-off. Its procedure also includes the common PCI Express card addition procedure.
The procedure describes operations where a single NIC is configured as one interface. It also describes cases where multiple NICs are bonded together to configure one interface (bonding configuration). For bonding multiple NIC by using PRIMECLUSTER Global Link Services (GLS), see 'PRIMECLUSTER Global Link Service Configuration and Administration Guide Redundant Line Control Function' (J2UZ-7781).

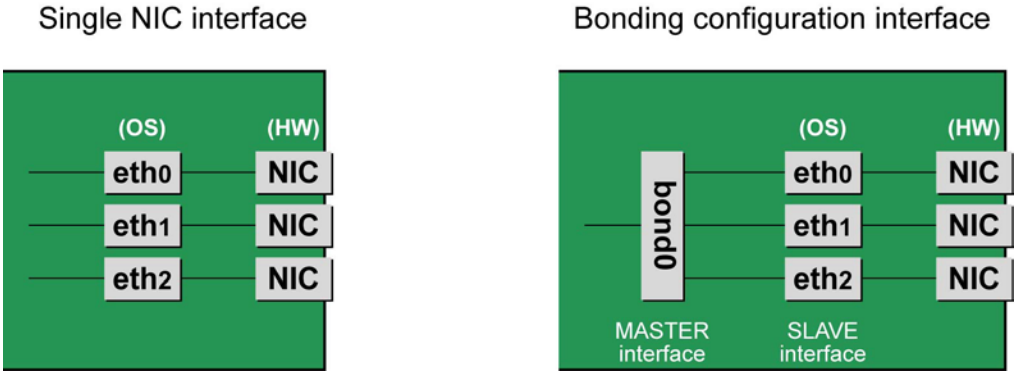


FIGURE 6.3 Single NIC interface and bonding configuration interface

NIC addition procedure

This section describes the procedure for hot plugging only a network card.
Note
When adding multiple NICs, be sure to add them one by one. If you do this with multiple cards at the same time, the correct settings may not be made.

1. Confirming the installation of the PCI Hot Plug driver
   See ‘Confirming the installation of the PCI Hot Plug driver’ in “6.1.2 PCI Express card replacement procedure in detail”.
2. Confirm the existing interface names.
   To confirm the interface names, execute the following command.
   Example: eth0 is the only interface on the NIC.

```
# /sbin/ifconfig -a
eth0  Link encap:Ethernet HWaddr 00:0E:0C:70:C3:38
BROADCAST MULTICAST MTU:1500 Metric:1
```

```
RX packets:0 errors:0 dropped:0 overruns:0 frame:0
TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:1000
RXbytes:0 (0.0 b) TX bytes:0 (0.0 b)

Lo  Link encap:Local Loopback
inet addr:127.0.0.1 Mask:255.0.0.0
UP LOOPBACK RUNNING MTU:16436 Metric:1
RX packets:0 errors:0 dropped:0 overruns:0 frame:0
TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:0
RXbytes:0 (0.0 b) TX bytes:0 (0.0 b)
```

3. Confirm the slot number of the PCI Express slot by using the following procedure.
   See 'Confirming the slot number of a PCI Express slot' in "6.1.2 PCI Express card replacement procedure in detail".
4. Confirm that power status of the PCI Express slot
   See 'Checking the power status of a PCI Express slot' in "6.1.2 PCI Express card replacement procedure in detail".
5. Physically add the target NIC by using MMB Maintenance Wizard.
   For details on the operation of replacement, see step 1 to 7 of 'Operation for Hot replacement of PCI Express card by Maintenance Wizard' in "6.2.2 PCI Express card addition procedure in detail"
   This step is performed by the field engineer in charge of your system.
6. Power on the PCI Express slot.
   See 'Powering on and off PCI Express slots' in "6.1.2 PCI Express card replacement procedure in detail".
7. Check whether there is an error in added FC card by MMB Maintenance Wizard.
   This step is performed by the field engineer in charge of your system.
   For details on the operation of replacement, see step 8 to 11 of 'Operation for Hot replacement of PCI Express card by Maintenance Wizard' in "6.2.2 PCI Express card addition procedure in detail".
8. Confirm the newly added interface name.
   Powering on the slot creates an interface (ethX) for the added NIC. Execute the following command.
   Compare its results with those of step 1 to confirm the created interface name.

   ```
   # /sbin/ifconfig –a
   ```

9. Confirm the hardware address of the newly added interface.
   Confirm the hardware address (HWaddr) and the created interface by executing the ifconfig command.
   For a single NIC with multiple interfaces, confirm the hardware addresses of all the created interfaces.
   Example: eth1 is a new interface created for the added NIC.

```
# /sbin/ifconfig -a
eth0  Link encap:Ethernet HWaddr 00:0E:0C:70:C3:38
BROADCAST MULTICAST MTU:1500 Metric:1
RX packets:0 errors:0 dropped:0 overruns:0 frame:0
TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:1000
RXbytes:0 (0.0 b) TX bytes:0 (0.0 b)

eth1  Link encap:Ethernet HWaddr 00:0E:0C:70:C3:40
BROADCAST MULTICAST MTU:1500 Metric:1
RX packets:0 errors:0 dropped:0 overruns:0 frame:0
TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:1000
RXbytes:0 (0.0 b) TX bytes:0 (0.0 b)

lo  Link encap:Local Loopback
inet addr:127.0.0.1 Mask:255.0.0.0
UP LOOPBACK RUNNING MTU:16436 Metric:1
RX packets:0 errors:0 dropped:0 overruns:0 frame:0
TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:0
RXbytes:0 (0.0 b) TX bytes:0 (0.0 b)
```

10. Create an interface configuration file.
    Create an interface configuration file (/etc/sysconfig/network/ifcfg-ethX) for the newly created interface as follows. In "HWADDR," set the hardware address confirmed in step 9.
    If multiple NICs are added or if a NIC where multiple interfaces exist is added, create a file for all the interfaces.

    The explanation here assumes, as an example, that a name automatically assigned by the system is used. To install a new interface, you can use a new interface name different from the one automatically assigned by the system. Normally, there is no requirement on the name specified for a new interface. To use an interface name other than the one automatically assigned by the system, follow the instructions in step 15 of the 'NIC replacement procedure' in '6.1.4 Network card replacement procedure'.

    The contents differ slightly depending on whether the interface is a single NIC interface or a SLAVE interface of the bonding configuration.
    [For a single NIC interface]

```
(Example)
DEVICE=eth1              <- Specified interface name
confirmed in step g
NM_CONTROLLED=no
BOOTPROTO=static
HWADDR=00:0E:0C:70:C3:40
BROADCAST=192.168.16.255
IPADDR=192.168.16.1
NETMASK=255.255.255.0
NETWORK=192.168.16.0
ONBOOT=yes
TYPE=Ethernet
```

    [SLAVE interface of the bonding configuration]

```
(Example)
DEVICE=eth1              <- Specified interface name
confirmed in step g
NM_CONTROLLED=no
BOOTPROTO=static
HWADDR=00:0E:0C:70:C3:40
MASTER=bondY
SLAVE=yes
ONBOOT=yes
```

    Note
    Adding the bonding interface itself also requires the MASTER interface configuration file of the bonding configuration.

11. To add a bonding interface, configure the bonding interface driver settings.
    If the bonding interface has already been installed, execute the following command to check the descriptions in the configuration file and confirm the setting corresponding to the bonding interface and driver.
    Example: Description in /etc/modprobe.d/bonding.conf

```
# grep -l bonding /etc/modprobe.d/*
/etc/modprobe.d/bonding.conf
```

    Note
    If the configuration file is not found or if you are performing an initial installation of the bonding interface, create a configuration file with an arbitrary file name with the ".conf" extension (e.g., /etc/modprobe.d/bonding.conf) in the /etc/modprobe.d directory).
    After specifying the target configuration file, add the setting for the newly created bonding interface.

```
alias bondY bonding      <- Add (bondY: Name of the newly
added bonding interface)
```

    You can specify options of the bonding driver in this file. Normally, the BONDING_OPTS line in each ifcfg- bondY file is used. Options can be specified to the bonding driver.

12. Activate the added interface.
    Execute the following command to activate the interface. Activate all the necessary interfaces. The activation method depends on the configuration.

[For a single NIC interface]
Execute the following command to activate the interface. Activate all the necessary interfaces.

```
# /sbin/ifup ethX
```

[For the bonding configuration]
For a SLAVE interface added to an existing bonding configuration, execute the following command to incorporate it into the bonding configuration.
Example: bondY is the bonding interface name, and ethX is the name of the interface to be incorporated.

```
# /sbin/ifenslave bondY ethX
```

For a newly added bonding interface with a SLAVE interface, execute the following command to activate the interfaces. You need not execute the ifenslave command individually for the SLAVE interface.

```
# /sbin/ifup bondY
```

13. Mount all cables connected to the particular PCIC.
    This step is performed by the field engineer in charge of your system.
    Note
    In GLS configuration with NIC switching way, you do not need to perform this step.

6.3 Removing PCI Express cards

This section describes the PCI Express card removal procedure with the PCI Hot Plug function.
The procedure includes common steps for all PCI Express cards and the additional steps required for a specific card function or driver.
Thus, the descriptions cover both the common operations required for all cards (e.g., power supply operations) and the specific procedures required for certain types of card. For details on removal of the cards not described in this section, see the respective product manuals.

Notes
In hot removal of PCI Express cards, if you reboot the partition on OS without hot adding new PCI card to same PCI Express slot after you performed hot remove command, you cannot hot add a PCI Express card to the PCI Express slot unless you power off the partition.
If you reboot the partition on OS before hot adding, you must power off the partition and replace the PCI Express card.

6.3.1 Common removal procedures for all PCI Express cards

1. Performing the required operating system and software operations depending on the PCI Express card type
2. Powering off a PCI slot
3. Removing a PCI Express card
4. Performing the required operating system and software operations depending on the PCI Express card type

Note
This section describes instructions for the operating system and subsystems (e.g., commands, configuration file editing). Be sure to refer to the respective product manuals to confirm the command syntax and impact on the system before performing tasks with those instructions.

The following sections describe card removal with the required instructions (e.g., commands, configuration file editing) for the operating system and subsystems, together with the actual hardware operations. Step 3 is performed by the field engineer in charge of your system.

6.3.2 PCI Express card removal procedure in detail

This section describes operations that must be performed in the PCI Express card removal procedure.

Preparing the software using a PCI Express card

See ‘Preparing the software using a PCI Express card’ in “6.1.2 PCI Express card replacement procedure in detail”.

Confirming the installation of the PCI Hot Plug driver

See ‘Confirming the installation of the PCI Hot Plug driver’ in “6.1.2 PCI Express card replacement procedure in detail”.

Confirming the slot number of a PCI Express slot

See ‘Confirming the slot number of a PCI Express slot’ in “6.1.2 PCI Express card replacement procedure in detail”.

Checking the power status of a PCI Express slot

See ‘Checking the power status of a PCI Express slot’ in “6.1.2 PCI Express card replacement procedure in detail”.

Powering off PCI Express slots

See ‘Powering on and off PCI Express slots’ in “6.1.2 PCI Express card replacement procedure in detail”.

6.3.3 FC card (Fibre Channel card) removal procedure

The descriptions in this section assume that an FC card is being removed.
Notes

- The FC card used for SAN boot does not support hot plugging.
- If all the paths in a mounted disk become hidden when an FC card is hot replaced, unmount the disk. Then, execute

FC card removal procedure

The procedure for removing an FC card and peripherals is as follows.

1. Make the necessary preparations.
   Stop access to the FC card by stopping applications or by other such means.
2. Confirming the installation of the PCI Hot Plug driver
   See ‘Confirming the installation of the PCI Hot Plug driver’ in “6.1.2 PCI Express card replacement procedure in detail”.
3. Confirm the slot number of the PCI slot by using the following procedure.
   See ‘Confirming the slot number of a PCI Express slot’ in “6.1.2 PCI Express card replacement procedure in detail”.
4. Power off the PCI Express slot.
   See ‘Powering on and off PCI Express slots’ in “6.1.2 PCI Express card replacement procedure in detail”.
5. After taking off all cables connected to the target card, physically remove the target card.

6.3.4 Network card removal procedure

Network card (referred to as NIC below) removal using hot plugging needs specific processing before and after PCI slot power-on or power-off. Its procedure also includes the common PCI Express card removal procedure.
The procedure describes operations where a single NIC is configured as one interface. It also describes cases where multiple NICs are bonded together to configure one interface (bonding configuration). For bonding multiple NIC by using PRIMECLUSTER Global Link Services (GLS), see 'PRIMECLUSTER Global Link Service Configuration and Administration Guide Redundant Line Control Function' (J2UZ-7781).

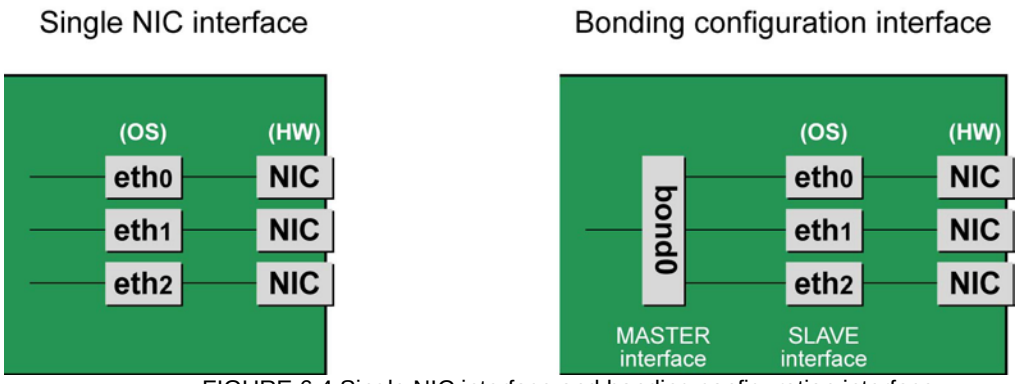


FIGURE 6.4 Single NIC interface and bonding configuration interface

NIC removal procedure

This section describes the procedure for hot plugging only a network card.

Note

When removing multiple NICs, be sure to remove them one by one. If you do this with multiple cards at the same time, the correct settings may not be made.

1. Confirming the installation of the PCI Hot Plug driver
   See 'Confirming the installation of the PCI Hot Plug driver' in "6.1.2 PCI Express card replacement procedure in detail".

2. Confirm the slot number of the PCI slot that has the mounted interface.
   Confirm the interface mounting location through the configuration file information and the operating system information.
   First, confirm the bus address of the PCI slot that has the mounted interface to be removed.

```
# ls -l /sys/class/net/eth0/device
lrwxrwxrwx 1 root root 0 Sep 29 09:26 /sys/class/net ¥
/eth0/device
->../../../0000:00:01.2/0000:08:00.2/0000:0b:01.0
```

   The ¥ at the end of a line indicates that there is no line feed.

   Excluding the rest of the directory path, check the part corresponding to the file name in the symbolic link destination file of the output results. In the above example, the underlined part shows the bus address. ("0000:0b:01" in the example)

   Next, check the PCI slot number for this bus address.

```
# grep -il 0000:0b:01 /sys/bus/pci/slots/*/address
/sys/bus/pci/slots/20/address
```

   Read the output file path as shown below, and confirm the PCI slot number.

```
/sys/bus/pci/slots/<slot number>/address
```

   Notes

   If the above file path is not output, it indicates that the NIC is not mounted in a PCI slot (e.g., GbE port in the IOU).

   With the PCI slot number confirmed here, see 'D.2 Correspondence between PCI Slot Mounting Locations and Slot Numbers' to check the mounting location, and see also 'B.1 Physical Mounting Locations of Components' to identify the physical mounting location corresponding to the PCI slot number. You can confirm that it matches the mounting location of the operational target NIC.

3. Confirm each interface on the same NIC.
   If the NIC has multiple interfaces, you need to remove all of them. Confirm that all the interfaces that have the same bus address in a subsequent command.

```
# ls -l /sys/class/net/*/device | grep "0000:0b:01"
lrwxrwxrwx 1 root root 0 Sep 29 09:26 /sys/class/net ¥
/eth0/device
->../../../0000:00:01.2/0000:08:00.2/0000:0b:01.0
lrwxrwxrwx 1 root root 0 Sep 29 09:26 /sys/class/net ¥
/eth1/device
->../../../0000:00:01.2/0000:08:00.2/0000:0b:01.1
```

The ¥ at the end of a line indicates that there is no line feed.
As the above example shows, when more than one interface is displayed, they are on the same NIC.

4. Execute the higher-level application processing required before NIC removal.
   Stop all access to the interface as follows. Stop the application that was confirmed in step 3 as using the interface, or exclude the interface from the target of use by the application.

5. Deactivate the NIC.
   Execute the following command to deactivate all the interfaces that you confirmed in step 3.
   The applicable command depends on whether the target interface is a single NIC interface or the SLAVE interface of a bonding device.

   [For a single NIC interface]

   ```
   # /sbin/ifdown ethX
   ```

   If the single NIC interface has a VLAN device, you also need to remove the VLAN interface. Perform the following operations. (These operations precede deactivation of the physical interface.)

   ```
   # /sbin/ifdown ethX.Y
   # /sbin/vconfig rem ethX.Y
   ```

   [For the interface under bonding]
   If the bonding device is operating in mode 1, use the following steps to exclude SLAVE interface to be replaced from the bonding configuration. In any other mode, removing it immediately should not cause any problems. Confirm that the SLAVE interface is the interface currently being used for communication.

   ```
   # cat /sys/class/net/bondY/bonding/active_slave
   ```

   If the displayed interface name corresponds to the SLAVE interface to be removed, execute the following command to switch to communicating now with the other SLAVE interface.

   ```
   # /sbin/ifenslave -c bondY ethZ
   (ethZ: bondY-configured interface not subject to hot
   replacement)
   ```

   Finally, remove the SLAVE interface being replaced, from the bonding configuration. Immediately after being removed, the interface is automatically no longer used.

   ```
   # /sbin/ifenslave -d bondY ethX
   ```

   To remove the interfaces, including the bonding device, deactivate them collectively by executing the following command.

   ```
   # /sbin/ifdown bondY
   ```

6. Power off the PCI slot.
   See ‘Powering on and off PCI Express slots’ in “6.1.2 PCI Express card replacement procedure in detail”.

7. After taking of all cables connected to the NIC, remove the NIC from the PCI Express slot.

8. Remove the interface configuration file.
   Delete the configuration files of all the interfaces confirmed in step 2, by executing the following command.

   ```
   # rm /etc/sysconfig/network/ifcfg-ethX
   ```

   When deleting a bonding device, also delete the related bonding items (ifcfg-bondY files).

9. Edit the settings in the udev function rule file.
   The entries of the interface assigned to the removed NIC still remain in the udev function rule file, /etc/udev/ rules.d/70-persistent-net.rules. Leaving the entries will affect the determination of interface names for replacement cards or added cards in the future. For this reason, delete or comment out those entries.
   The following example shows editing of the udev function rule file, /etc/udev/rules.d/70-persistent-net.rules. (In this example, the file is edited when the eth10 interface is removed.)
   [Example of descriptions in the file before editing]

   ```
   SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*", ¥
   ATTR{address}=="00:0e:0c:70:c3:38", ATTR{type}=="1", ¥
   KERNEL=="eth*", NAME="eth0"
    :
    :
   SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*", ¥
   ```

```
ATTR{address}=="00:0e:0c:70:c3:40", ATTR{type}=="1", ¥
KERNEL=="eth*", NAME="eth10"
```

The ¥ at the end of a line indicates that there is no line feed.

[Example of descriptions in the file after editing]
The entries for the eth10 interface are commented out.

```
SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*", ¥
ATTR{address}=="00:0e:0c:70:c3:38", ATTR{type}=="1", ¥
KERNEL=="eth*", NAME="eth0"
 :
 :
# SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*", ¥
ATTR{address}=="00:0e:0c:70:c3:40", ATTR{type}=="1", ¥
KERNEL=="eth*", NAME="eth10"
```

The ¥ at the end of a line indicates that there is no line feed.
Do this editing for all the interfaces confirmed in step 3.

10. Reflect the udev function rules.
    Since rules are not automatically reflected in udev at the removal time, take action to reflect the new rules in udev.

    ```
    # udevadm control --reload-rules
    ```

11. If the removed interface includes any bonding interface, delete the driver setting of the interface.
    When removing a bonding interface, be sure to delete the setting corresponding to the bonding interface and driver. Execute the following command to check the descriptions in the configuration file, and confirm the setting corresponding to the bonding interface and driver.

    Example: Description in /etc/modprobe.d/bonding.conf

    ```
    # grep -l bonding /etc/modprobe.d/*

    /etc/modprobe.d/bonding.conf
    ```

    Edit the file that describes the setting, and delete the setting of the removed bonding interface.

    ```
    alias bondY bonding        <- Delete
    ```

    bondY: Name of the removed bonding interface
    Note
    There are no means to dynamically remove the MASTER interface (bondY) of the bonding configuration. If you want to remove the entire bonding interface, you can disable the bonding configuration and remove all the SLAVE interfaces but the MASTER interface itself remains.

12. Execute the higher-level application processing required after NIC removal.
    Perform the necessary post processing (such as changing application settings or restarting an application) for the operations performed for the higher-level applications in step 4.

6.3.5 Hot removal procedure for iSCSI (NIC)

When performing hot replacement of NICs used for iSCSI connection, use the following procedures.

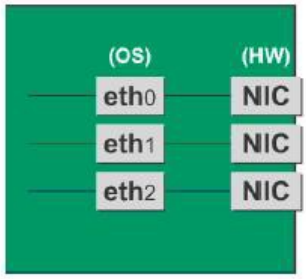
- 6.3.1 Common removal procedures for all PCI Express cards
- 6.3.2 PCI Express card removal procedure in detail
- 6.3.4 Network card removal procedure

A supplementary explanation of the procedure follows.

Prerequisites for iSCSI (NIC) hot removal

- The prerequisites for iSCSI (NIC) hot replacement are as follows.
- The storage connection is established on a multipath using DM-MP (Device-Mapper Multipath) or ETERNUS multidriver (EMPD).
- To replace more than one iSCSI card, one card at a time will be replaced.

- A single NIC is configured as one interface.



Work to be performed before iSCSI (NIC) removal

For iSCSI (NIC) hot replacement, be sure to follow the procedure below when performing Step 4 of the 'NIC removal procedure' in '6.3.4 Network card removal procedure'

2. Perform the work for suppressing access to the iSCSI connection interface.

   a. Confirm the state of multiple path by DM-MP (*1) or EMPD (*2).

   b. Use the iscsiadm command to log out from the path (iqn) through which the iSCSI card to be replaced is routed, and disconnect the session.
   Example which confirms the state of session before disconnecting:

```
# /sbin/iscsiadm -m session
tcp: [1] 192.168.1.64:3260,1 iqn.2000-
09.com.fujitsu:storage-system.eternus-
dx400:00001049.cm0ca0p0
tcp: [2] 192.168.2.66:3260,3 iqn.2000-
09.com.fujitsu:storage-system.eternus-
dx400:00001049.cm1ca0p0
```

   Example which logout path going through a NIC to be replaced:

```
# /sbin/iscsiadm -m node -T iqn.2000-09.com.fujitsu:storage-
system.eternus-dx400:00001049.cm1ca0p0 -p 192.168.2.66:3260
--logout
```

   c. Use the iscsiadm command to confirm that the target session has been disconnected.
   Example which confirms the state of session after disconnecting

```
# /sbin/iscsiadm -m session
tcp: [1] 192.168.1.64:3260,1 iqn.2000-
09.com.fujitsu:storage-system.eternus-
dx400:00001049.cm0ca0p0
```

   d. You can confirm the disconnection of sessions on multipath products using DM-MP or ETERNUS multidriver.
   *1: Write down the DM-MP display contents at the session disconnection.
   Example of DM-MP display before disconnecting path

```
# /sbin/multipath -ll
mpath1 (36000b5d0006a0000006a104900000000) dm-0
FUJITSU,ETERNUS_DX400
[size=50G][features=0][hwhandler=0][rw]
¥_ round-robin 0 [prio=2][active]
 ¥_ 3:0:0:0 sdb 8:16  [active][ready]
 ¥_ 4:0:0:0 sdc 8:32  [active][ready]
```

   Example of DM-MP display after disconnecting path

```
# /sbin/multipath -ll
mpath1 (36000b5d0006a0000006a104900000000) dm-0
FUJITSU,ETERNUS_DX400
[size=50G][features=0][hwhandler=0][rw]
¥_ round-robin 0 [prio=1][enabled]
 ¥_ 3:0:0:0 sdb 8:16  [active][ready]
```

   *2: See the ETERNUS Multipath Driver User's Guide (For Linux).

CHAPTER 7 PCI Card Hot Maintenance in SUSE Linux Enterprise Server 12

This chapter describes hot maintenance of System Boards, IOUs and PCI cards in SUSE Linux Enterprise Server 12.

7.1 Dynamic Reconfiguration (DR)

This section describes Dynamic Reconfiguration (DR).
DR function has to be enabled by MMB Web-UI and Dynamic Reconfiguration Utility package has to be installed in the partition to perform hot maintenance of SB and IOU. For hot maintenance of PCI Express card, neither Enabling DR function nor installing Dynamic Reconfiguration Utility package has to be always needed.
For the summary of the DR function, applicable rules and corresponding list and restrictions, see '3.2.3 Dynamic Reconfiguration (DR)'.
For details on the MMB Web-UI/CLI, see respective chapters in "*PRIMEQUEST 2000 series Tool Reference*" (CA92344-0539).
For details on the OS CLI, see '5.1 DR command' in "*PRIMEQUEST 2000 series Tool Reference*" (CA92344-0539).

7.1.1 DR function configuration setting

Enable/Disable is set for the DR function of each partition, from Partition->Partition #x->Mode window of MMB Web-UI. If the settings are changed while the target partition is running, the settings will be reflected at the next partition restart. Items for [Dynamic Reconfiguration] of the [Mode] window can be seen below.

FIGURE 7.1 [Mode] window (Dynamic Reconfiguration)

Item		Description
Dynamic Reconfiguration	current status	Setting status of the current DR function (Enable/Disable)
	setting	Dynamic Reconfiguration function Enable/Disable setting -Enable -Disable (Default)

7.1.2 dr Command Package Install/ Uninstall

This section describes the install /uninstall of the dr command package.
The dr command can be applied using the SVIM application wizard. When installing after building the system, procure the package from Fujitsu Web download site, and install following the procedure below.
<Common install /uninstall>
Use FJSVdr-util-RHEL<Version number>-x.x.x-x-x86_64.tar.gz.
The file name for the SLES12 dr command package is FJSVdr-util-SLES12-x.x.x-x-x86_64.tar.gz. the following files are stored.

FJSVdr-util/RPMS/FJSVdr-util-SLES12-x.x.x-x.noarch.rpm
FJSVdr-util/SRPMS/FJSVdr-util-SLES12-x.x.x-x.noarch.rpm

FJSVdr-util/DOC/README.ja_JP.EUC.txt
FJSVdr-util/DOC/README.ja_JP.SJIS.txt
FJSVdr-util/DOC/README.ja_JP.UTF-8.txt
FJSVdr-util/DOC/README.txt
FJSVdr-util/INSTALL.sh
FJSVdr-util/UNINSTALL.sh

<When installing>
Install FJSVdr-util-SLES12-x.x.x-x.noarch.rpm using the following procedure.

1. Become super user.

```
$ su -
```

2. Execute INSTALL.sh in the FJSVdr-util directory.
   Depending on the status, the rpm package will be installed or uninstalled.

```
# FJSVdr-util/INSTALL.sh
```

3. Restart the partition.

```
# /sbin/shutdown -r    now
```

<During uninstallation>
Perform the uninstallation using the following procedure.

1. Becomes super user.

```
$ su -
```

2. Execute UNSTALL.s in the FJSVdr-util directory.

```
# FJSVdr-util/UNINSTALL.sh
```

3. Restart the partition.

```
# /sbin/shutdown -r now
```

7.2 Hot add of SB

This section describes the hot add of SB.

7.2.1 Preparing for SB hot add

The preparation flow is described below.

1. Arrange the SBs to be added.
An SB to be added must require below conditions.

- The SB to be added and CPU have same product name in the target partition.
- Two CPUs must be mounted on the SB to be added.
- For SB hot add, mount the same number of DIMMs in the SB to be added as that in the Home SB of target partition.

2. Check if the configuration of CPU and DIMMs in arranged SBs to be added is the same as the Home SB in the target partition.

3. Insert the arranged SB into a free SB slot.
   This step will be performed by the field engineer in charge of your system.

4. Confirm the installation of the DR function using the following procedure.

   a. Check if the size of the dump disk save area is sufficient for the memory capacity to be added. For details on how to estimate the size required, contact the distributor where you purchased your product, or your sales representative.

   b. Check if the points/restrictions are clear. For detail, see ‘3.2.3 Dynamic Reconfiguration (DR)’

5. Check for any errors in the SB to be added.
   Example：How to check from the MMB Web-UI
   a. Open System >SB >SB #n window.
   b. Check if the status of the [Board Information] is ‘OK’.
   c. Check if the other statuses displayed in SB #n window are ‘OK’.
   d. Open Partition >Partition Configuration window.
   e. Check if the status of the SB for addition is a Free SB or Reserved SB. The number of the SB for adding is noted down.

7.2.2 DR operation in SB hot add

This section describes the operation of the DR, for performing SB hot add.

1. Log into the MMB Web-UI using Administrator privileges.
2. Execute hotadd command.
   Example：When adding SB2 in partition 1.

```
Administrator > hotadd partition 1 SB 2
Are you sure to continue adding SB#2 to partition#1? [Y/N] Y
DR operation start (1/5)
Assigning SB#2 to partition#1 (2/5)
Testing SB#2 (3/5)
Reconfiguring partition#1 (4/5)
Onlining added Memory/CPU (5/5)
Adding SB#2 to Partition#1 has been completed successfully.
Administrator >
```

3. See Operation Log window or perform “show dynamic_reconfiguration status” command and confirm below messages.
   Example：When adding SB2 in partition 1.

   Operation Log window:
   “I_10110 Partition1 : Hot-add SB#2 Completed.”

   show dynamic_reconfiguration status:
   “Adding SB#2 to Partition#1, completed”

7.2.3 How to deal with timeout while OS is processing SB hot add

If OS does not finish the process of SB hot add within fixed predetermined time, timeout message “DR sequence timeout: SB hot-add OS failure” is shown on MMB CLI.
It means that DR completion message from OS does not arrive at MMB. In such case, some collaboration programs may hang though DR process is still running on OS. Rebooting the partition is recommended because it is difficult to estimate when the process will be completed.
The process of SB hot add by OS can be mainly divided into three parts. Check /var/log/message, analyzing which process takes a lot of time.

- Pre-process of collaboration program
- Activating added resources
- Post-process of collaboration program

1. Checking pre-process of collaboration program
   Process of below messages in /var/log/messages is pre-process of the collaboration program.

```
Dec 17 00:15:33 xxx dr-util[4457]: INFO : 800 : Detected SB
hot-add
Dec 17 00:15:33 xxx dr-util[4457]: INFO : 801 : Added SB3,
Node6,7
Dec 17 00:15:33 xxx dr-util[4457]: INFO : 807 : Execute 1
user programs at ADD_PRE timing
...
Dec 17 00:15:34 xxx dr-util[4457]: 10-FJSVdr-util-kdump-
```

```
restart : INFO : start
...
Dec 17 00:15:34 xxx dr-util[4457]: 10-FJSVdr-util-kdump-
restart : INFO : result: 0
...
Dec 17 00:15:34 xxx dr-util[4457]: INFO : 808 : Executed
user programs at ADD_PRE timing
```

If “INFO : 808 : Executed user programs at ADD_PRE timing” is not output, pre-process of the collaboration program is delayed. Check which collaboration program takes a lot of time by seeing /var/log/messages and ‘collaboration program name.log’ made in /opt/FJSVdr-util/var/log directory, if any. Acquire the information of the collaboration program which takes a lot of time by below rpm command and ask the Fujitsu engineer about the cause of its delay.

(Example) Checking the developer of the collaboration program “10-FJSVdr-util-kdump-restart”

```
$ rpm -qif /opt/FJSVdr-util/user_command/10-FJSVdr-util-
kdump-restart
...
```

Rebooting the partition is recommended because SB hot add process has been imperfect state.

2. Checking the time for activating added resources
   Process of below messages in /var/log/messages is the process of activating added resources.

```
Dec 17 00:15:34 xxx dr-util[4457]: INFO : 802 : Add CPU30-59
(total 30)
Dec 17 00:15:34 xxx dr-util[4457]: INFO : 804 : Add
MEM98304-98559,114688-114943 (total 67108864 kiB)
...
Dec 17 00:15:47 xxx dr-util[4457]: INFO : 809 : Added SB3
```

   If “INFO : 809 : Added SBX” is not output, process of activating added resources is delayed. Check that the process of adding CPU or memory is performed by executing below command at several seconds.

   - Checking the number of CPU

```
$ grep -c processor /proc/cpuinfo
30
```

   - Checking the size of memory

```
$ cat /proc/meminfo |grep MemTotal
MemTotal:       65271964 kB
```

   In case that the number of CPU or the size of memory keeps increasing:

   It is expected that cause of the delay is the load of the partition. The process of SB hot add can be completed sooner by reducing the load of the partition.

   In case that the number of CPU or the size of memory does not increase though they does not reach expected quantity.

3. Checking post-process of collaboration program
   Process of below messages in /var/log/messages is post-process of the collaboration program.

```
Dec 17 00:15:47 xxx dr-util[4457]: INFO : 807 : Execute 1
user programs at ADD_POST timing
...
Dec 17 00:15:48 SB-hotplug dr-util[4457]: 10-FJSVdr-util-
kdump-restart : INFO : start
...
Dec 17 00:15:49 SB-hotplug dr-util[4457]: 10-FJSVdr-util-
kdump-restart : INFO : result: 0
...
Dec 17 00:15:49 xxx dr-util[4457]: INFO : 808 : Executed
user programs at ADD_POST timing
```

   If “INFO : 808 : Executed user programs at ADD_POST timing” is not output, post-process of the collaboration program is delayed. Check which collaboration program takes a lot of time by seeing /var/log/messages and ‘collaboration program name.log’ made in /opt/FJSVdr-util/var/log directory, if any.

The developer of the collaboration program can be confirmed by below rpm command. Ask the developer about the cause of its delay.

(Example) Checking the developer of the collaboration program “10-FJSVdr-util-kdump-restart”

```
$ rpm -qif /opt/FJSVdr-util/user_command/10-FJSVdr-util-
kdump-restart
...
```

Rebooting the partition is recommended because SB hot add process has been imperfect state.

7.2.4 Operation after SB hot add

This section describes the process and operations after SB hot add.
After completing DR command operation, check that the quantity of added resources is correct by opening below files as doing before SB hot add.

(Example) When adding SB2

```
# /opt/FJSVdr-util/sbin/dr show SB2
CPU: 60-119: 60
MEM: 32768-33023,49152-49407: 67108864 kiB
Node: 2,3
```

If below command keeps to be executed, added resources are not reflected. Re-execute the command in order to reflect added resources.

- sar
- iostat
- mpstat

If SVAgent is installed in the partition, perform below command with root privilege.

```
# /usr/sbin/srvmagt restart
```

If CPUs and memories of SB that is added by hot add of SB is used for KVM, change parameter of ‘machine.slice’ control group.

1. Check whether machine.slice control group exists or not.

```
# find /sys/fs/cgroup/cpuset/ -name "machine.slice"
/sys/fs/cgroup/cpuset/machine.slice
```

   If machine.slice control group does not exist, machine.slice control group is created when new guest VM is started. CPU and memory added by SB hot add are reflected to the machine.slice control group. Hence, parameters of machine.slice control group does not need to be changed.

2. Change parameters of machine.slice control group.

```
# cgset -r cpuset.cpus=xxx-yyy machine.slice
# cgset -r cpuset.mems=X-Y machine.slice
```

   Note
   Guest VM which is started after changing parameters of machine.slice control group can use all CPUs and memories on the partition.
   If resources such as CPU which the guest VM can use are fixed in the guest VM, the balance of entire KVM system may be lost because of adding resources.

It is recommended to redesign how to use CPUs and memories in the KVM system.

7.3 Hot remove of SB

This section describes the hot remove of SB.

7.3.1 Preparing for SB hot remove

The preparation flow is described below.

1. Check the SBs to be removed.
Check the SBs to be removed by MMB Web-UI.

   a Open Partition->Partition Configuration window

   b Check the SB to be removed is not Home SB.

2. If processes on operating system are fixed to CPU and node on SB to be removed, change those settings.

   a Check resources of SB to be removed
   Example: When checking resources of SB#2

```
# /opt/FJSVdr-util/sbin/dr show SB2
CPU: 60-119: 60
MEM: 32768-33023,49152-49407: 67108864 kiB
Node: 2,3
```

   b Change settings of services on operating system which are fixed to CPU and node of SB to be removed.
   Example: Changing settings of guest VM (KVM)

   c Check CPU which is fixed to VCPU of guest VM.

```
# virsh vcpupin SLES12GA
VCPU: CPU affinity
----------------------------------
   0: 0-119
   1: 0-119
...
   N-1: 0-119
```

   d Change the setting of CPU fix to all VCPUs of guest VM.
   Example:

```
# virsh vcpupin <guest VM name> <0> 0-59
# virsh vcpupin <guest VM name> <1> 0-59
...
# virsh vcpupin <guest VM name> <N-1> 0-59
```

7.3.2 Confirming the status of SB before SB hot remove

Check free space of swap region and free space of memory by steps below.

1. Check free space of swap region.

```
# free
              total        used        free      shared    buffers     cached
Mem:     132364204   25165476  107198728       10140   14647644     319328
-/+ buffers/cache:   10198504  122165700
Swap:      4194300          0    4194300
```

2. Check whether free space of memory is enough.

   a Check memory capacity of SB to be removed.
   Example: When removing SB#2.

```
# /opt/FJSVdr-util/sbin/dr show SB2 | grep MEM
MEM: 32768-33023,49152-49407: 67108864 kiB
```

   b Calculate free memory capacity after removing SB

```
# cat /proc/meminfo
MemTotal:       132364204 kB
MemFree:        107200452 kB
MemAvailable:   122518540 kB
Buffers:        14647644 kB
Cached:           329468 kB
SwapCached:            0 kB
Active:          7652860 kB
Inactive:       14910268 kB
```

```
Active(anon):    7587292 kB
Inactive(anon):     8864 kB
Active(file):      65568 kB
Inactive(file): 14901404 kB
```

Free memory space = MemFree + Inactive(anon) + Active(file) + Inactive(file)
= 107200452KB + 8864KB + 65568KB + 14901404KB
= 122176288KB

Free memory space after removing SB = “free memory space” - “memory capacity of SB to be removed”.
= 122176288KB - 67108864KB
= 55067424KB

If free memory remains after removal of SB,, SB hot remove can be performed. However, if no free memory space, SB hot remove can be performed if free memory space after removing SB is free space of swap region or less. In such case, system performance becomes strikingly slow because swap out occurs.

7.3.3 DR operation in SB hot remove

This section describes the operation of the DR, for performing SB hot remove.

1. Log into the MMB Web-UI using Administrator privileges.
2. Execute hotremove command.
   Example：When removing SB#2 from partition #1.

```
# hotremove partition 1 SB 2
```

3. Perform “show dynamic_reconfiguration status” command and confirm below messages.
   Example：When removing SB#2 from partition #1.

   show dynamic_reconfiguration status:
   “Removing SB#2 from Partition#1, completed”

7.3.4 Operation after SB hot remove

This section describes the process and operations after SB hot remove.

- Check SB has been removed.
  Example: When removing SB#2

```
# /opt/FJSVdr-util//sbin/dr stat SB
SB0: online
SB1: empty
SB2: empty
SB3: empty
```

  If below command keeps to be executed, added resources are not reflected. Re-execute the command in order to reflect added resources.

  - sar
  - iostat
  - mpstat

If SVAgent is installed in the partition, perform below command with root privilege.

```
# /usr/sbin/srvmagt restart
```

If CPUs and memories of SB that is added by hot add of SB is used for KVM, steps below are required.

1. Using MMB Web-UI, check that SB having been removed is powered off.
   a. Open System -> SB -> SB#n window.
   b. Check that “Power Status” of “Board Information” is ‘standby’.

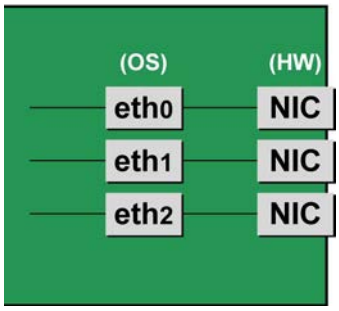
7.4 Hot replacement of IOU

This section describes the hot replacement of the IOU. There are two cases in hot replacement of the IOU:

- Replacing IOU itself due to trouble of IOU itself or trouble of onboard NIC
- Replacing, expanding or removing PCI Express card installed in IOU

For replacing, expanding or removing PCI Express card, IOU itself does not need to be replaced. However, it is needed that the IOU has to be removed from the cabinet for a moment. Then there is the same impact as that of replacing IOU. It is needed to take the same steps as those of replacing IOU.
Note

- If IOU itself is hot replaced, onboard NIC of the IOU is replaced.
  Note that MAC address of onboard NIC is changed after replacing IOU.
- PCI address (bus address) of PCI Express card on IOU may change after hot replacement of IOU. This change may be occurred for replacing, expanding or removing PCI Express card.
- If iSCSI (NIC) is mounted on an IOU, hot replacement of the IOU can be performed only if all of conditions below are satisfied.
  - DM-MP (Device-Mapper Multipath) or ETERNUS multi driver (EMPD) is used for storage connection.
  - Multiple path consists of a NIC on the IOU to be replaced and a NIC on an IOU other than the IOU to be replaced.
  - A NIC on the IOU to be replaced makes an interface independently.
    Example of single interface:



  - If FC card used for SAN boot is mounted on an IOU to be replaced, hot replacement of the IOU cannot be performed.

The step of hot replacement of IOU is described below in order.

7.4.1 Preparation for IOU hot replacement

The description of the flow of preparations is given below.

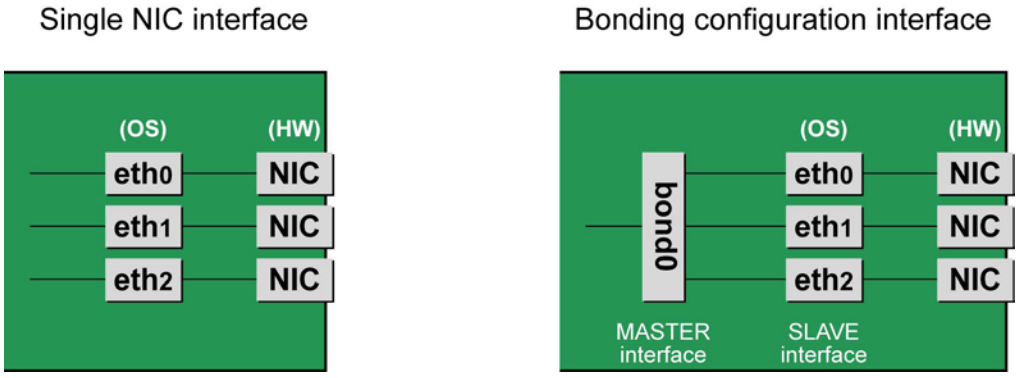
1. Arrange for the IOU for replacement.
   Note
   This step is not needed if the IOU is reused when expanding, replacing or removing PCI Express card. After arranging for the IOU, check whether I/O device of the IOU normally works at free partition. Pre-diagnosis does not performed when IOU is added.
2. For replacing IOU or expanding, replacing or removing PCI Express card in the IOU, it is needed to remove IOU. If IOU is removed, PCI Express card and onboard NIC installed in the IOU are also removed. Check that no software use the PCI Express card to be removed, performing either of below measure.
   a. Stopping the software which uses PCI Express card or onboard NIC in the IOU to be removed before removing.
   b. Preventing the software from operating PCI Express card and onboard NIC.

   Execute the command /opt/FJSVdr-util/sbin/dr show IOU from shell on OS to check resources installed in the IOU.
   Example: checking IOU3

```
# /opt/FJSVdr-util/sbin/dr show IOU3
```

```
0000:82:00.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:83:09.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:84:00.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:85:02.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:85:08.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:85:09.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:85:10.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:85:11.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:89:00.0 Ethernet controller: Intel Corporation I350
Gigabit
Network Connection (rev 01)
0000:89:00.1 Ethernet controller: Intel Corporation I350
Gigabit
Network Connection (rev 01)
0000:8c:00.0 Ethernet controller: Intel Corporation I350
Gigabit
Network Connection (rev 01)
0000:8c:00.1 Ethernet controller: Intel Corporation I350
Gigabit
Network Connection (rev 01)
0000:8f:00.0 Fibre Channel: Emulex Corporation Saturn-X:
LightPulse
Fibre Channel Host Adapter (rev 03)
0000:8f:00.1 Fibre Channel: Emulex Corporation Saturn-X:
LightPulse
Fibre Channel Host Adapter (rev 03)
```

NIC on the IOU (including onboard NIC)
For replacing IOU itself (replacement of onboard NIC) or expanding, replacing or removing NIC on the IOU, not only common procedure of IOU replacement but also special procedure before and after powering on or powering off IOU is needed. Here describes case of replacement of IOU itself. (otherwise add note) The procedure describes operations where a single NIC is configured as one interface. It also describes cases where multiple NICs are bonded together to configure one interface (bonding configuration).
Although name form of NIC differs depending on mounting location of the NIC in SLES12, conventional ‘ethX’ is used in below description. ‘ethX’ should be replaced to actual name of the NIC as necessary.



Notes

- To perform hot replacement in a system where a bonding device is installed, design the system so that it specifies ONBOOT=YES in all interface configuration files (the /etc/sysconfig/network/ifcfg-eth*files and the /etc/sysconfig/network/ifcfg-bond*files), regardless of whether the NIC to be replaced is a configuration interface of the bonding device.
  An IP address need not to be assigned to unused interfaces. This procedure is to prevent the device name of the replacement target NIC from being changed after hot replacement. If ONBOOT=NO also exists, the procedure described here may not work properly.

1. Confirm where the NIC is mounted.
   Confirm the correspondence between PCI Address and interface name of NIC mounted in the IOU which is confirmed by above “dr show IOU” command.
   Example: When PCI Address is “0000:89:00.0”.

```
# ls -l /sys/class/net/*/device | grep "0000:89:00.0"
lrwxrwxrwx. 1 root root 0 Aug 27 16:06 2013
/sys/class/net/eth0/
device ¥
-> ../../../ 0000:89:00.0
```

   The ¥ at the end of a line indicates that there is no line feed.

   In this case, eth0 is the interface name which is correspondent to PCI bus address “0000:89:00.0”.

   Note
   You will use the bus address obtained here in steps 2 and procedure after IOU replacement. Record the bus address so that you can reference it later.

   Next, check the PCI slot number for this PCI bus address.
   Execute “ethtool -p” command, making the LED of NIC blinked. Check IOU or PCI_Box connected to the IOU, checking in which slots the NIC is mounted, (e.g. PCI#0)

   Example: Blinking the LED of the NIC corresponding to interface “eth0” for ten seconds.

```
# /sbin/ethtool -p eth0 10
```

2. Make a table with information including interface name, hardware address and PCI bus address of NIC mounted on IOU to be replaced.
   Make a below table with information of IOU to be replaced within information which is got by step 1.

TABLE 7.1 Correspondence between bus addresses and interface names

Interface name	Hardware address	Bus address	Location
eth0		0000:89:01.0	Onboard 0
eth1		0000:89:01.1	Onboard 1
eth2		0000:8c:00.0	PCI#0
...		...	...

   Note
   When recording a bus address, include the function number (number after the period).

   - Confirm the correspondence between the interface name and hardware address
     Execute below command, checking the correspondence between the interface name and the hardware address.
     Example: eth0 for a single interface

```
# cat /sys/class/net/eth0/address
2c:d4:44:f1:44:f0
```

     Example: eth0 for a bonding interface

```
# cat /proc/net/bonding/bondY
Ethernet Channel Bonding Driver .........
.
.
Slave interface: eth0
.
Permanent HW addr: 2c:d4:44:f1:44:f0
.
.
```

     You can use this procedure only when the bonding device is active. If the bonding device is not active or the slave has not been incorporated, use the same procedure as for a single interface.
     Confirm the hardware address of other interfaces by repeating the operation with the same command.
     The following table lists examples of descriptions.

TABLE 7.2 Hardware address description examples

Interface name	Hardware address	Bus address	Location

Interface name	Hardware address	Bus address	Location
eth0	2c:d4:44:f1:44:f0	0000:89:01.0	Onboard 0
eth1	2c:d4:44:f1:44:f1	0000:89:01.1	Onboard 1
eth2	00:19:99:d7:36:5f	0000:8c:00.0	PCI#0
...		...	...

3. Execute the higher-level application processing required before NIC replacement.
   Stop all access to the interface as follows. Stop the application that was confirmed in step 2 as using the interface, or exclude the interface from the target of use by the application.

4. Deactivate the NIC.
   Execute the following command to deactivate all the interfaces that you confirmed in step 2. The applicable command depends on whether the target interface is a single NIC interface or the SLAVE interface of a bonding device.

   For a single NIC interface:

   ```
   # /sbin/ifdown ethX
   ```

   If the single NIC interface has a VLAN device, you also need to remove the VLAN interface. Perform the following operations (before deactivating the real interface).

   ```
   # /sbin/ifdown ethX.Y
   # /sbin/vconfig rem ethX.Y
   ```

   For the SLAVE interface of a bonding device:

   If the bonding device is operating in mode 1, use the following steps to exclude SLAVE interface to be replaced from the bonding configuration. In any other mode, removing it immediately should not cause any problems.
   Confirm that the SLAVE interface to be replaced is the interface currently being used for communication. First, confirm the interface currently being used for communication by executing the following command.

   ```
   # cat /sys/class/net/bondY/bonding/active_slave
   ```

   If the displayed interface matches the SLAVE interface being replaced, execute the following command to switch the current communication interface to another SLAVE interface.

   ```
   # /sbin/ifenslave -c bondY ethZ
   ```
   (ethZ: Interface that composes bondY and does not perform hot replacement)

   Finally, remove the SLAVE interface being replaced, from the bonding configuration. Immediately after being removed, the interface is automatically no longer used.

   ```
   # /sbin/ifenslave -d bondY ethX
   ```

5. Save all the interface configuration files that you checked in step 2 by executing the following command. Configuration scripts may reference the contents of files in /etc/sysconfig/network. For this reason, create a save directory and save these files to the directory so that the configuration scripts will not reference them.

   ```
   # cd /etc/sysconfig/network
   # mkdir temp
   # mv ifcfg-ethX temp
   (following also executed for bonding configuration)
   # mv ifcfg-bondX temp
   ```

iSCSI (NIC) on the IOU
If replace iSCSI (NIC) on the IOU, you have to take not only the same steps of ‘NIC on the IOU (including Onboard NIC)’ but also takes steps below in step 3 of that.

1. Perform the work for suppressing access to the iSCSI connection interface.

   a. Confirm the state of multiple path by DM-MP (*1) or EMPD (*2).

   b. Use the iscsiadm command to log out from the path (iqn) through which the iSCSI card to be replaced is routed, and disconnect the session.
      Example which confirms the state of session before disconnecting:

   ```
   # /sbin/iscsiadm -m session
   tcp: [1] 192.168.1.64:3260,1 iqn.2000-
   09.com.fujitsu:storage-system.eternus-
   ```

```
dx400:00001049.cm0ca0p0
tcp: [2] 192.168.2.66:3260,3 iqn.2000-
09.com.fujitsu:storage-system.eternus-
dx400:00001049.cm1ca0p0
```

Example which logout path going through a NIC to be replaced:

```
# /sbin/iscsiadm -m node -T iqn.2000-09.com.fujitsu:storage-
system.eternus-dx400:00001049.cm1ca0p0 -p 192.168.2.66:3260
–-logout
```

c. Use the iscsiadm command to confirm that the target session has been disconnected.
Example which confirms the state of session after disconnecting

```
# /sbin/iscsiadm -m session
tcp: [1] 192.168.1.64:3260,1 iqn.2000-
09.com.fujitsu:storage-system.eternus-
dx400:00001049.cm0ca0p0
```

d. You can confirm the disconnection of sessions on multipath products using DM-MP or ETERNUS multidriver.
*1: Write down the DM-MP display contents at the session disconnection.
Example of DM-MP display before disconnecting path

```
# /sbin/multipath -ll
mpath1 (36000b5d0006a0000006a104900000000) dm-0
FUJITSU,ETERNUS_DX400
[size=50G][features=0][hwhandler=0][rw]
¥_ round-robin 0 [prio=2][active]
 ¥_ 3:0:0:0 sdb 8:16  [active][ready]
 ¥_ 4:0:0:0 sdc 8:32  [active][ready]
```

Example of DM-MP display after disconnecting path

```
# /sbin/multipath -ll
mpath1 (36000b5d0006a0000006a104900000000) dm-0
FUJITSU,ETERNUS_DX400
[size=50G][features=0][hwhandler=0][rw]
¥_ round-robin 0 [prio=1][enabled]
 ¥_ 3:0:0:0 sdb 8:16  [active][ready]
```

*2: See the ETERNUS Multipath Driver User's Guide (For Linux).

FC card

1. Stop the access to FC card on IOU by such a way as stopping application.

7.4.2 DR operation of IOU hot replacement

This section describes the DR operation for IOU hot replacement.

1. Execute “/opt/FJSVdr-util/sbin/dr rm IOU” command on the shell of OS.
The IOU to be removed is cut off from OS.
Example: Cutting off the IOU 3

```
# /opt/FJSVdr-util/sbin/dr rm IOU3
#
```

2. Execute “/opt/FJSVdr-util/sbin/dr rm IOU” command on the shell of OS.
A list of IOU included in the partition is shown. Check that IOU which is cut off is displayed as ‘offline’.
Example: Cutting off the IOU 3

```
# /opt/FJSVdr-util/sbin/dr stat IOU
IOU0: empty
IOU1: empty
IOU2: empty
IOU3: offline
```

3. Login to MMB console as administrator

4. Execute “hotremove” command on MMB console.
   Example: removing IOU 3 from partition 1

```
Administrator > hotremove partition 1 IOU 3
Are you sure to continue removing IOU#3 from Partition#1?
[Y/N]: Y
DR operation start (1/3)
Remove IOU#3 (2/3)
IOU#3 power-off (3/3)
Removing IOU#3 from partition#1 has been completed
successfully.
Administrator >
```

5. See Operation Log window or perform “show dynamic_reconfiguration status” command and confirm below messages.
   Example：When removing IOU3 from partition 1.

   Operation Log window:
   “I_10110 Partition1 : Hot-remove IOU#3 Completed.”

   show dynamic_reconfiguration status:
   “Removing IOU#3 from Partition#1, completed”

6. Pulling the IOU out from the slot of cabinet
   For replacing IOU itself, insert PCI Express card mounted on old IOU to new one.
   For replacing, expanding or removing PCI Express card on the IOU, do it now.
   This step is performed by the field engineer in charge of your system.

7. Take off all cables such as LAN cable and FC cable connected to the IOU.
   This step is performed by the field engineer in charge of your system.

8. Inserting IOU to the slot of the cabinet.
   This step is performed by the field engineer in charge of your system.

9. Mount cables other than LAN cables.
   This step is performed by the field engineer in charge of your system.

10. Execute “hotadd” command on MMB console.
    Example: Adding IOU 3 to partition 1

```
Administrator > hotadd partition 1 IOU 3
Are you sure to continue adding IOU#3 to Partition#1? [Y/N]
Y
DR operation start (1/3)
Assigning IOU#3 to partition#1 (2/3)
Power on IOU#3 (3/3)
Adding IOU#3 to Partition#1 has been completed successfully.
Administrator >
```

11. See Operation Log window or perform “show dynamic_reconfiguration status” command and confirm below messages.
    Example：When adding IOU3 to partition 1.
    Operation Log window:
    “I_10110 Partition1 : Hot-add IOU#3 Completed.”

    show dynamic_reconfiguration status:
    “Adding IOU#3 to Partition#1, completed”

12. Execute “/opt/FJSVdr-util/sbin/dr stat IOU” command
    A list of IOU included in the partition is shown. Check that added IOU is shown.
    Example: adding IOU 3

```
# /opt/FJSVdr-util/sbin/dr stat IOU
IOU0: empty
IOU1: empty
IOU2: empty
IOU3: offline
```

    IOU added to partition is shown as offline state because it is power-off state at this time.

13. Execute “/opt/FJSVdr-util/sbin/dr add IOU” command on the shell of OS.
    The IOU to be removed will turn on.
    Example: turning on IOU 3

```
# /opt/FJSVdr-util/sbin/dr add IOU3
#
```

7.4.3 Operation after IOU hot replacement

Note

If SVAgent is installed in the partition, perform below command with root privilege.

```
# /usr/sbin/srvmagt restart
```

NIC on the IOU (including onboard NIC)

1. Collect the information associated with NIC on the replaced IOU.
   An interface (ethX) is created for the replaced NIC. Make a table with information including the interface name, hardware address, bus address, and location of the interface made corresponding to NIC mounted on replaced according to step1 and step 2 of the section 7.4.1 Preparation for IOU hot replacement. The interface name, hardware address and PCI bus address may change before and after replacing IOU.

   TABLE 7.3 Example of interface information about interfaces after replacement

Interface name	Hardware address	Bus address	Location
eth0	2c:d4:44:f1:44:d2	0000:86:01.0	Onboard 0
eth1	2c:d4:44:f1:44: d3	0000:86:01.1	Onboard 1
eth2	00:19:99:d7:36:5f	0000:87:00.0	PCI#0
...		...	...

   Note
   If you use standard name for interfaces, you should consider the following.

   - The theory of assignment of PCI bus address is different between BIOS and operating system. Then, PCI bus address which is different from that one assigned before replacement is assigned when hot replacement, and name of interface is changed.
   - After hot replacement, if the partition is reboot, PCI bus address is reassigned. So, new interface name becomes the name which is not identical with PCI Bus address.
   - Not to change the interface name of upper driver or network script and so on, you must do setting that interface name is assigned by the form of ethX after install. For details, see SUSE, Inc’s Administration guide.

2. Edit the saved interface configuration file.
   Write a new hardware address to replace the old one. In "HWADDR," set the hardware address of the replaced NIC in TABLE 5.9 Example of entered values corresponding to the interface names before and after NIC replacement. If the interface name is changed, change also the interface name. (in this case, you must change file name itself.) Also, for SLAVE under bonding, the file contents are partly different, but the lines to be set are the same.
   Example:

```
DEVICE=eth0
NM_CONTROLLED=no
BOOTPROTO=static
HWADDR=2c:d4:44:f1:44:d2
BROADCAST=192.168.16.255
IPADDR=192.168.16.1
NETMASK=255.255.255.0
NETWORK=192.168.16.0
ONBOOT=yes
TYPE=Ethernet
```

   Do this editing for all the saved interfaces except for the interface with no change of hardware address and interface name.

3. Restore the saved interface configuration file to the original file.
   Restore the interface configuration file saved to the save directory to the original file by executing the following command.

```
# cd /etc/sysconfig/network/temp
# mv ifcfg-ethX  ..
(following also executed for bonding configuration)
# mv ifcfg-bondX  ..
```

4. Activate the replaced interface.
   The method for activating a single NIC interface differs from that for activating the SLAVE interfaces under bonding.
   For a single NIC interface:
   Execute the following command to activate the interface. Activate all the necessary interfaces.

   ```
   # /sbin/ifup ethX
   ```

   Also, if the single NIC interface has a VLAN device and the VLAN interface was temporarily removed, restore the VLAN interface. If the priority option has changed, set it again.

   ```
   # /sbin/vconfig add ethX Y
   # /sbin/ifup ethX.Y
   (enter command to set VLAN option as needed)
   ```

   For SLAVE under bonding
   Execute the following command to incorporate the SLAVE interface into the existing bonding configuration. Incorporate all the necessary interfaces.

   ```
   # /sbin/ifenslave bondY ethX
   ```

   The VLAN-related operation is normally not required because a VLAN is created on the bonding device.

5. Mount all cables connected to the particular PCIC.
   This step is performed by the field engineer in charge of your system.

6. Remove the directory to which the interface configuration file was saved.
   After all the interfaces to be replaced have been replaced, remove the save directory created in step 5 in 7.4.1 Preparation for IOU hot replacement by executing the following command.

   ```
   # rmdir /etc/sysconfig/network/temp
   ```

7. Execute the higher-level application processing required after NIC replacement.
   Perform the necessary post processing (such as starting applications or restoring changed settings) for the operations performed for the higher-level applications in step 3 in 7.4.1 Preparation for IOU hot replacement.

iSCSI (NIC) on the IOU

If replace iSCSI (NIC) on the IOU, you have to take not only the same steps of ‘NIC on the IOU (including Onboard NIC)’ but also takes steps below in step 8 of that.

1. To restore access to the iSCSI connection interface, perform the following.

   a. Confirm the state of multiple path by DM-MP (*1) or EMPD (*2).

   b. Use the iscsiadm command to log in to the path (iqn) through which the replacement iSCSI card is routed, and reconnect the session.
      Example which confirms the state of session before connecting:

      ```
      # /sbin/iscsiadm -m session
      tcp: [1] 192.168.1.64:3260,1 iqn.2000-
      09.com.fujitsu:storage-system.eternus-
      dx400:00001049.cm0ca0p0
      ```

      Example which login path going through a NIC to be replaced:

      ```
      # /sbin/iscsiadm -m node -T iqn.2000-09.com.fujitsu:storage-
      system.eternus-dx400:00001049.cm1ca0p0 -p 192.168.2.66:3260
      –-login
      ```

   c. Use the iscsiadm command to confirm that the target session has been activated.
      Example which confirms the state of session after connecting

      ```
      # /sbin/iscsiadm -m session
      tcp: [1] 192.168.1.64:3260,1 iqn.2000-
      09.com.fujitsu:storage-system.eternus-
      dx400:00001049.cm0ca0p0
      ```

```
tcp: [3] 192.168.2.66:3260,3 iqn.2000-
09.com.fujitsu:storage-system.eternus-
dx400:00001049.cm1ca0p0
```

d. You can confirm the activation of sessions on multipath products using DM-MP or ETERNUS multidriver.
*1: Write down the DM-MP display contents at the session activation.
Example of DM-MP display before connecting path

```
# /sbin/multipath -ll
mpath1 (36000b5d0006a0000006a104900000000) dm-0
FUJITSU,ETERNUS_DX400
[size=50G][features=0][hwhandler=0][rw]
¥_ round-robin 0 [prio=1][active]
 ¥_ 3:0:0:0 sdb 8:16  [active][ready]
```

Example of DM-MP display after connecting path

```
# /sbin/multipath -ll
mpath1 (36000b5d0006a0000006a104900000000) dm-0
FUJITSU,ETERNUS_DX400
[size=50G][features=0][hwhandler=0][rw]
¥_ round-robin 0 [prio=2][enabled]
 ¥_ 3:0:0:0 sdb 8:16  [active][ready]
 ¥_ 5:0:0:0 sdc 8:32  [active][ready]
```

*2: See the ETERNUS Multipath Driver User's Guide (For Linux).

FC Card

1. Restart the application which is stop at preparing for IOU hot replacement

Common operation of all PCI Express cards after IOU hot replacement
Execute pciinfo command on MMB CLI.
Example: hot adding IOU#2 into partition#1.

```
Administrator > pciinfo partition 1 iou 2
Are you sure to continue updating IOU#2 in Partition#1?
[Y/N]: y
Update IOU#2 PCI information in Partition#1 has been
completed successfully.
Administrator >
```

7.5 Hot add of IOU

This section describes the hot add of the IOU.

7.5.1 Preparation for IOU hot add

The description of the flow of preparations is given below.

1. Arrange for the IOU for addition.
2. Check if number of IOU required for addition is available.
3. Insert the IOU to be added into a free IOU slot.
   This step is performed by the field engineer in charge of your system.
4. Mount cables other than LAN cables if you also add PCI Express card.
   This step is performed by the field engineer in charge of your system.

Note

- If you add an IOU with PCI Express cards, insert PCI Express cards into the IOU before inserting the IOU into the slot.
  For how to confirm the slot number of the PCI Express slot, see ‘Confirming the slot number of a PCI Express slot’ in ‘7.6.2 PCI Express card replacement procedure in detail’.

- Check if the I/O device is normally operating in the free partition. During addition, I/O pre-diagnostic process is not executed.

7.5.2 DR operation of IOU hot add

This section describes the DR operation for IOU hot add.

1. Log into the MMB Web-UI using Administrator privileges.
2. Execute the hotadd command.

Example：When adding IOU1 in partition1.

```
Administrator > hotadd partition 1 IOU 1
Are you sure to continue adding IOU#1 to Partition#1? [Y/N]
Y
DR operation start (1/3)
Assigning IOU#1 to partition#1 (2/3)
Power on IOU#1 (3/3)
Adding IOU#1 to Partition#1 has been completed successfully.
Administrator >
```

3. See Operation Log window or perform “show dynamic_reconfiguration status” command and confirm below messages.
   Example： When adding IOU1 to partition 1.

   Operation Log window:
   “I_10110 Partition1 : Hot-add IOU#1 Completed.”

   show dynamic_reconfiguration status:
   “Adding IOU#1 to Partition#1, completed”
4. Execute /opt/FJSVdr-util/sbin/dr stat IOU command in the operating system shell.
   The list of IOUs connected to the system is displayed. Check if the IOU that was added is displayed.
   Example：When IOU1 is added.

```
# /opt/FJSVdr-util/sbin/dr stat IOU
IOU0: online
IOU1: offline
IOU2: empty
IOU3: empty
```

   When newly adding an IOU to a partition, it will be displayed as offline since the IOU is not recognized by the operating system.
5. Execute /opt/FJSVdr-util/sbin/dr add IOU1 command in the operating system shell.
   The IOU that was newly added to the partition will be powered on.
   Example：When IOU1 is powered on

```
# /opt/FJSVdr-util/sbin/dr add IOU1
#
```

7.5.3 Operation after IOU hot add

This section describes the process and operation after IOU hot add.

Note

If SVAgent is installed in the partition, perform below command with root privilege.

```
# /usr/sbin/srvmagt restart
```

1. Check the resource that was added.
   Execute the /opt/FJSVdr-util/sbin/dr show IOU command in the operating system shell.
   Example ： When IOU1 was added

```
# /opt/FJSVdr-util/sbin/dr show IOU1
0000:03:00.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
```

```
0000:04:09.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:05:00.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:06:02.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:06:08.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:06:09.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:06:10.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:06:11.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:0a:00.0 Ethernet controller: Intel Corporation I350
Gigabit
Network Connection (rev 01)
0000:0a:00.1 Ethernet controller: Intel Corporation I350
Gigabit
Network Connection (rev 01)
0000:0d:00.0 Ethernet controller: Intel Corporation I350
Gigabit
Network Connection (rev 01)
0000:0d:00.1 Ethernet controller: Intel Corporation I350
Gigabit
Network Connection (rev 01)
0000:10:00.0 Fibre Channel: Emulex Corporation Saturn-X:
LightPulse
Fibre Channel Host Adapter (rev 03)
0000:10:00.1 Fibre Channel: Emulex Corporation Saturn-X:
LightPulse
Fibre Channel Host Adapter (rev 03)
0000:27:00.0 PCI bridge: PLX Technology, Inc. Device 8764
(rev aa)
0000:28:01.0 PCI bridge: PLX Technology, Inc. Device 8764
(rev aa)
0000:28:04.0 PCI bridge: PLX Technology, Inc. Device 8764
(rev aa)
0000:28:05.0 PCI bridge: PLX Technology, Inc. Device 8764
(rev aa)
0000:28:08.0 PCI bridge: PLX Technology, Inc. Device 8764
(rev aa)
0000:28:09.0 PCI bridge: PLX Technology, Inc. Device 8764
(rev aa)
0000:28:0c.0 PCI bridge: PLX Technology, Inc. Device 8764
(rev aa)
0000:28:0d.0 PCI bridge: PLX Technology, Inc. Device 8764
(rev aa)
```

2. Make the configuration file for being able to use added resources on OS.

   - Setting of FC card
     Perform step 3 or later in ‘7.7.3 FC card (Fibre Channel card) addition procedure.
   - Setting of NIC (including onboard NIC)
     Perform step 4 or later in ‘7.7.4 Network card addition procedure’.

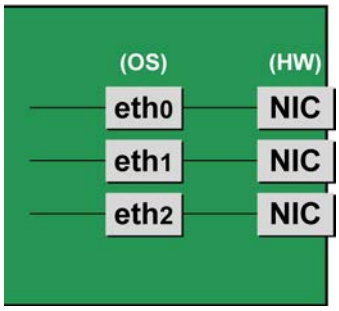
Common operation of all PCI Express cards after IOU hot replacement
Execute pciinfo command on MMB CLI.
Example: hot adding IOU#2 into partition#1.

```
Administrator > pciinfo partition 1 iou 2
Are you sure to continue updating IOU#2 in Partition#1?
[Y/N]: y
Update IOU#2 PCI information in Partition#1 has been
completed successfully.
Administrator >
```

7.6 IOU hot remove

The description of the flow of the preparation is as follows.
Note

- If iSCSI (NIC) is mounted on an IOU, hot replacement of the IOU can be performed only if all of below conditions are satisfied.
  - DM-MP (Device-Mapper Multipath) or ETERNUS multi driver (EMPD) is used for storage connection.
  - Multiple path consists of a NIC on the IOU to be replaced and a NIC on an IOU other than the IOU to be replaced.
  - A NIC on the IOU to be replaced makes an interface independently.
    Example of single interface:



  - If FC card used for SAN boot is mounted on an IOU to be replaced, hot replacement of the IOU cannot be performed.

7.6.1 Preparation for IOU hot remove

The description of the flow of the preparation is as follows.

Note
When the disk connected via the IOU to be removed is used as the dump saving area if kdump, the dump environment is changed to enable the use of another disk.

1. When the IOU is removed, the PCI Express card, which is mounted on the IOU is also removed. Confirm that there is no software where the PCI Express card is used, and implement any of the following measures.

   a. Before removing, stop the software in which the PCI Express card to be removed is being used.

   b. The PCI Express card is to be outside the software operation target.

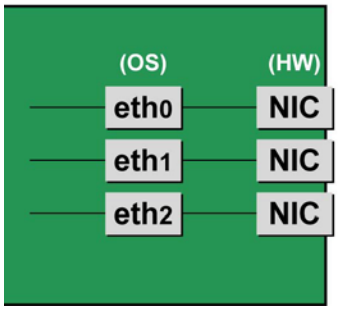
   To confirm the resources mounted on the target IOU, execute /opt/FJSVdr-util/sbin/dr show IOU command from the operating system shell.
   Example：When checking IOU3.

```
# /opt/FJSVdr-util/sbin/dr show IOU3
0000:82:00.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:83:09.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:84:00.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:85:02.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:85:08.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:85:09.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:85:10.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
0000:85:11.0 PCI bridge: PLX Technology, Inc. Device 8748
(rev ca)
```

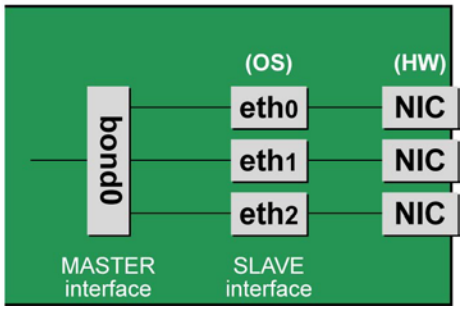
```
0000:89:00.0 Ethernet controller: Intel Corporation I350
Gigabit
Network Connection (rev 01)
0000:89:00.1 Ethernet controller: Intel Corporation I350
Gigabit
Network Connection (rev 01)
0000:8c:00.0 Ethernet controller: Intel Corporation I350
Gigabit
Network Connection (rev 01)
0000:8c:00.1 Ethernet controller: Intel Corporation I350
Gigabit
Network Connection (rev 01)
0000:8f:00.0 Fibre Channel: Emulex Corporation Saturn-X:
LightPulse
Fibre Channel Host Adapter (rev 03)
0000:8f:00.1 Fibre Channel: Emulex Corporation Saturn-X:
LightPulse
Fibre Channel Host Adapter (rev 03)
```

NIC on the IOU (including onboard NIC)
The procedure describes operations where a single NIC is configured as one interface. It also describes cases where multiple NICs are bonded together to configure one interface (bonding configuration). Although name form of NIC differs depending on mounting location of the NIC in SLES12, conventional ‘ethX’ is used in below description. ‘ethX’ should be replaced to actual name of the NIC as necessary.

Single NIC interface



Bonding configuration interface



Notes

- To perform hot replacement in a system where a bonding device is installed, design the system so that it specifies ONBOOT=YES in all interface configuration files (the /etc/sysconfig/network/ifcfg-eth*files and the /etc/sysconfig/network/ifcfg-bond*files), regardless of whether the NIC to be replaced is a configuration interface of the bonding device.
  An IP address need not to be assigned to unused interfaces. This procedure is to prevent the device name of the replacement target NIC from being changed after hot replacement. If ONBOOT=NO also exists, the procedure described here may not work properly.

2. Confirm where the NIC is mounted.
   Confirm the correspondence between PCI Address and interface name of NIC mounted in the IOU which is confirmed by above “dr show IOU” command.
   Example: When PCI Address is “0000:89:00.0”.

```
# ls -l /sys/class/net/*/device | grep "0000:89:00.0"
lrwxrwxrwx. 1 root root 0 Aug 27 16:06 2013
/sys/class/net/eth0/
device ¥
-> ../../../ 0000:89:00.0
```

   The ¥ at the end of a line indicates that there is no line feed.

   In this case, eth0 is the interface name which is correspondent to PCI bus address “0000:89:00.0”.

   Note
   You will use the bus address obtained here in steps 2 and procedure after IOU replacement. Record the bus address so that you can reference it later.

   Next, check the PCI slot number for this PCI bus address.

Execute “ethtool -p” command, making the LED of NIC blinked. Check IOU or PCI_Box connected to the IOU, checking in which slots the NIC is mounted, (e.g. PCI#0)

Example: Blinking the LED of the NIC corresponding to interface “eth0” for ten seconds.

```
# /sbin/ethtool -p eth0 10
```

3. Make a table with information including interface name, hardware address and PCI bus address of NIC mounted on IOU to be replaced.
   Make a below table with information of IOU to be replaced within information which is got by step 1.

TABLE 7.4 Correspondence between bus addresses and interface names

Interface name	Hardware address	Bus address	Location
eth0		0000:89:01.0	Onboard 0
eth1		0000:89:01.1	Onboard 1
eth2		0000:8f:00.0	PCI#0
...		...	...

Note
When recording a bus address, include the function number (number after the period).

- Confirm the correspondence between the interface name and hardware address
  Execute below command, checking the correspondence between the interface name and the hardware address.
  Example: eth0 for a single interface

```
# cat /sys/class/net/eth0/address
2c:d4:44:f1:44:f0
```

Example: eth0 for a bonding interface

```
# cat /proc/net/bonding/bondY
Ethernet Channel Bonding Driver .........
.
.
Slave interface: eth0
.
Permanent HW addr: 2c:d4:44:f1:44:f0
.
.
```

You can use this procedure only when the bonding device is active. If the bonding device is not active or the slave has not been incorporated, use the same procedure as for a single interface.

Confirm the hardware address of other interfaces by repeating the operation with the same command. The following table lists examples of descriptions.

TABLE 7.5 Hardware address description examples

Interface name	Hardware address	Bus address	Location
eth0	2c:d4:44:f1:44:f0	0000:89:01.0	Onboard 0
eth1	2c:d4:44:f1:44:f1	0000:89:01.1	Onboard 1
eth2	00:19:99:d7:36:5f	0000:8f:00.0	PCI#0
...		...	...

4. Execute the higher-level application processing required before NIC replacement.
   Stop all access to the interface as follows. Stop the application that was confirmed in step 2 as using the interface, or exclude the interface from the target of use by the application.

5. Deactivate the NIC.
   Execute the following command to deactivate all the interfaces that you confirmed in step 2. The applicable command depends on whether the target interface is a single NIC interface or the SLAVE interface of a bonding device.

   For a single NIC interface:

```
# /sbin/ifdown ethX
```

If the single NIC interface has a VLAN device, you also need to remove the VLAN interface. Perform the following operations (before deactivating the real interface).

```
# /sbin/ifdown ethX.Y
# /sbin/vconfig rem ethX.Y
```

For the SLAVE interface of a bonding device:

If the bonding device is operating in mode 1, use the following steps to exclude SLAVE interface to be replaced from the bonding configuration. In any other mode, removing it immediately should not cause any problems.
Confirm that the SLAVE interface to be replaced is the interface currently being used for communication. First, confirm the interface currently being used for communication by executing the following command.

```
# cat /sys/class/net/bondY/bonding/active_slave
```

If the displayed interface matches the SLAVE interface being replaced, execute the following command to switch the current communication interface to another SLAVE interface.

```
# /sbin/ifenslave -c bondY ethZ
```

(ethZ: Interface that composes bondY and does not perform hot replacement)

Finally, remove the SLAVE interface being replaced, from the bonding configuration. Immediately after being removed, the interface is automatically no longer used.

```
# /sbin/ifenslave -d bondY ethX
```

6. Remove the interface configuration file..
   Delete the configuration files of all the interfaces confirmed in step 2, by executing the following command.

```
# rm /etc/sysconfig/network/ifcfg-ethX
```

iSCSI (NIC) on the IOU
If replace iSCSI (NIC) on the IOU, you have to take not only the same steps of 'NIC on the IOU (including Onboard NIC)' but also takes steps below in step 3 of that.

1. Perform the work for suppressing access to the iSCSI connection interface.
   a. Confirm the state of multiple path by DM-MP (*1) or EMPD (*2).
   b. Use the iscsiadm command to log out from the path (iqn) through which the iSCSI card to be replaced is routed, and disconnect the session.
      Example which confirms the state of session before disconnecting:

```
# /sbin/iscsiadm -m session
tcp: [1] 192.168.1.64:3260,1 iqn.2000-
09.com.fujitsu:storage-system.eternus-
dx400:00001049.cm0ca0p0
tcp: [2] 192.168.2.66:3260,3 iqn.2000-
09.com.fujitsu:storage-system.eternus-
dx400:00001049.cm1ca0p0
```

      Example which logout path going through a NIC to be replaced:

```
# /sbin/iscsiadm -m node -T iqn.2000-09.com.fujitsu:storage-
system.eternus-dx400:00001049.cm1ca0p0 -p 192.168.2.66:3260
–-logout
```

   c. Use the iscsiadm command to confirm that the target session has been disconnected.
      Example which confirms the state of session after disconnecting

```
# /sbin/iscsiadm -m session
tcp: [1] 192.168.1.64:3260,1 iqn.2000-
09.com.fujitsu:storage-system.eternus-
dx400:00001049.cm0ca0p0
```

   d. You can confirm the disconnection of sessions on multipath products using DM-MP or ETERNUS multidriver.
      *1: Write down the DM-MP display contents at the session disconnection.
      Example of DM-MP display before disconnecting path

```
# /sbin/multipath -ll
mpath1 (36000b5d0006a0000006a104900000000) dm-0
FUJITSU,ETERNUS_DX400
[size=50G][features=0][hwhandler=0][rw]
¥_ round-robin 0 [prio=2][active]
```

```
 ¥_ 3:0:0:0 sdb 8:16  [active][ready]
 ¥_ 4:0:0:0 sdc 8:32  [active][ready]
```

Example of DM-MP display after disconnecting path

```
# /sbin/multipath -ll
mpath1 (36000b5d0006a0000006a104900000000) dm-0
FUJITSU,ETERNUS_DX400
[size=50G][features=0][hwhandler=0][rw]
¥_ round-robin 0 [prio=1][enabled]
 ¥_ 3:0:0:0 sdb 8:16  [active][ready]
```

*2: See the ETERNUS Multipath Driver User's Guide (For Linux).

FC card

1. Stop the access to FC card on IOU by such a way as stopping application.

7.6.2 DR operation of IOU hot remove

This section describes DR operation for executing IOU hot remove.

1. Execute the /opt/FJSVdr-util/sbin/dr rm IOU command from the operating system shell. The IOU to be removal will be powered off.
   Example：To power off IOU3.

```
# /opt/FJSVdr-util/sbin/dr rm IOU3
#
```

2. Execute “/opt/FJSVdr-util/sbin/dr rm IOU” command on the shell of OS.
   A list of IOU included in the partition is shown. Check that IOU which is cut off is displayed as ‘offline’.
   Example: Cutting off the IOU 3

```
# /opt/FJSVdr-util/sbin/dr stat IOU
IOU0: empty
IOU1: empty
IOU2: empty
IOU3: offline
```

3. Log into the MMB Web-UI using Administrator privileges.
4. Execute hotremove command.
   Example：When removing IOU3 from partition1

```
Administrator > hotremove partition 1 IOU 3
Are you sure to continue removing IOU#3 from Partition#1?
[Y/N]: Y
DR operation start (1/3)
Remove IOU#3 (2/3)
IOU#3 power-off (3/3)
Removing IOU#3 from partition#1 has been completed
successfully.
Administrator >
```

5. See Operation Log window or perform “show dynamic_reconfiguration status” command and confirm below messages.
   Example：When removing IOU3 from partition 1.

   Operation Log window:
   “I_10110 Partition1 : Hot-remove IOU#3 Completed.”

   show dynamic_reconfiguration status:
   “Removing IOU#3 from Partition#1, completed”

7.6.3 Operation after IOU hot remove

This section describes the process and operation after IOU hot remove.
Note

If SVAgent is installed in the partition, perform below command with root privilege.

```
# /usr/sbin/srvmagt restart
```

IOU removed from the partition has become “free state” where it does not belong to any partition. You can perform below operations:

- Pull up the IOU from the cabinet physically.
- Integrate the IOU into other inactive partition.
- Hot add the IOU into other active partition.

Perform the necessary post processing (such as re-starting an application) for the operations performed for the higher-level applications in 7.4.1 Preparation for IOU hot replacement.

NIC on the IOU (including onboard NIC)

1. Restart the application which is stop at preparing for IOU hot replacement

FC Card

1. Restart the application which is stop at preparing for IOU hot replacement

7.7 Hot Replacement of PCI Express Cards

This section describes the following methods of PCI Express card replacement with the PCI Hot Plug (PHP) function:

- Common replacement operations for all PCI Express cards such as power supply operations
- Specific operations added to procedures to use a specified card function or a driver for installation.

There are two ways to perform PCI hot plug:

- Operation by using sysfs
- Operation by using dr commands

You can perform the operation by using dr commands if Dynamic Reconfiguration utility is installed in the partition. If not, be sure to use the operation by using sysfs. Although you can perform the operation by using sysfs even if Dynamic Reconfiguration utility is installed in the partition, it is recommended to perform the operation by using dr commands to prevent wrong operation.
Hereafter, description about the operation by using dr commands starts at ‘For the partition with Dynamic Reconfiguration utility installed’ and description about the operation by sysfs starts at ‘For the partition without Dynamic Reconfiguration utility installed’.

Notes

- If you replace PCI Express cards on an IOU, see ‘7.4 Hot replacement of IOU’.
- In hot replacement of PCI Express cards, if you reboot the partition on OS without hot adding new PCI card to same PCI Express slot after you performed hot remove command, you cannot hot add a PCI Express card to the PCI Express slot unless you power off the partition.
  If you reboot the partition on OS before hot adding, you must power off the partition and replace the PCI Express card.

Remarks
For details on the card replacement procedures not described in this chapter, see the respective product manuals.

7.7.1 Overview of common replacement procedures for PCI Express cards

This section provides an overview of common replacement procedures for all PCI Express cards.

1. Performing the required operating system and software operations depending on the PCI Express card type

2. Powering off a PCI slot
3. Replacing a PCI card
   This step is performed by the field engineer in charge of your system.
4. Powering on a PCI slot
5. Performing the required operating system and software operations depending on the PCI card type

Note
This chapter provides instructions (e.g., commands, configuration file editing) for the operating system and subsystems. Be sure to refer to the respective product manuals to confirm the command syntax and impact on the system before performing tasks with those instructions.

The following sections describe card addition, removal, and replacement with the required instructions (e.g., commands, configuration file editing) for the operating system and subsystems, together with the actual hardware operations. Step 3 is performed by the field engineer in charge of your system.

7.7.2 PCI Express card replacement procedure in detail

This section describes how to replace a PCI Express card.

Preparing the software using a PCI Express card

When a PCI Express card is replaced or removed, there must be no software using the PCI Express card. For this reason, before replacing or removing the PCI Express card, stop the software using the PCI Express card or make the software operations inapplicable.

Confirming the slot number of a PCI Express slot

When replacing, adding or removing a PCI Express card, you need to power on/off the appropriate slot, through the operating system. First, use the following procedure to obtain the slot number from the mounting location of the PCI Express slot for the card. It will be used to manipulate the power supply.

1. Identify the mounting location of the PCI Express card.
   See the figure in "B.1 Physical Mounting Locations of Components" to check the mounting location (board and slot) of the PCI Express card to be replaced.
2. Obtain the slot number of the mounting location.
   Check the table in "D.2 Correspondence between PCI Slot Mounting Locations and Slot Numbers", and obtain the slot number that is unique in the cabinet and assigned to the confirmed mounting locations. This slot number is the identification information for operating the slot of the PCI Express card to be replaced.

Note
The four-digit decimal numbers shown in <Slot number> in D.2 Correspondence between PCI Slot Mounting Locations and Slot Numbers have the leading digits filled with zeroes. The actual slot numbers do not include the zeroes in the leading digits.

Checking the power status of a PCI Express slot

- For the partition with Dynamic Reconfiguration utility installed
  Execute /opt/FJSVdr-util/sbin/dr stat pcie command on the shell of OS.
  After the list of the power status of PCI Express slots is shown, see the power status of the slot with the slot number which you confirmed at "Confirming the slot number of a PCI Express slot"
  Example:

```
# /opt/FJSVdr-util/sbin/dr stat pcie
pcie20: online
pcie21: offline
pcie22: empty
```

- For the partition without Dynamic Reconfiguration utility installed
  Using the PCI Express slot number confirmed in "Confirming the slot number of a PCI Express slot", confirm that the /sys/bus/pci/ slots directory contains a directory for this slot information, which will be referenced and otherwise used. Below, the PCI Express slot number confirmed in Confirming the slot number of a PCI Express slot is shown at <slot number> location in the directory path in the following format, where the directory is the operational target.

```
/sys/bus/pci/slots/<slot number>
```

Confirm that the PCI Express card in the slot is enabled or disabled by displaying the "power" file contents in this directory.

```
# cat /sys/bus/pci/slots/<slot number>/power
```

When displayed, "0" means disabled, and "1" means enabled.

Powering on and off PCI Express slots

When you insert a PCI Express card into the slot, the target slot is automatically powered on depending on the version of SLES 12. You have to confirm the power status of the target slot by procedure in ‘Checking the power status of a PCI Express slot’. If the target slot has already been powered on, it is not necessary to perform following operation of powering on the PCI Express slot.

- Powering on PCI Express slots:
  - For the partition with Dynamic Reconfiguration utility installed
    When you execute /opt/FJSVdr-util/sbin/dr add pcie<slot number> command on the shell of OS to power on the target slot, the PCI Express card becomes available and the LED turns on.
    Example: Making the PCI Express slot with PCI Express slot number 20 power on

    ```
    # /opt/FJSVdr-util/sbin/dr add pcie20
    ```

  - For the partition without Dynamic Reconfiguration utility installed
    When you write "1" to the "power" file in the directory corresponding to the target slot, the PCI Express card becomes available and the LED turns on.
    Example: Making the PCI Express slot with PCI Express slot number 20 power on

    ```
    # echo 1 > /sys/bus/pci/slots/<slot number>/power
    ```

    This operation installs the device associated with the relevant adapter on the system.

    Note
    You need to confirm that the card and driver are correctly installed. The procedures vary depending on the card and driver specifications. For the appropriate procedures, see the respective manuals.

- Powering off PCI Express slots:
  - For the partition with Dynamic Reconfiguration utility installed
    When you execute /opt/FJSVdr-util/sbin/dr rm pcie<slot number> command on the shell of OS, the PCI Express card is disabled and has become to be ready for removal and the LED turns off.
    Example: Making the PCI Express slot with PCI Express slot number 20 power off

    ```
    # /opt/FJSVdr-util/sbin/dr rm pcie20
    ```

  - For the partition without Dynamic Reconfiguration utility installed
    When you write "0" to the "power" file in the directory corresponding to the target slot, the PCI Express card is disabled and has become to be ready for removal and the LED turns off.
    Example: Making the PCI Express slot with PCI Express slot number 20 power off

    ```
    # echo 0 > /sys/bus/pci/slots/<slot number>/power
    ```

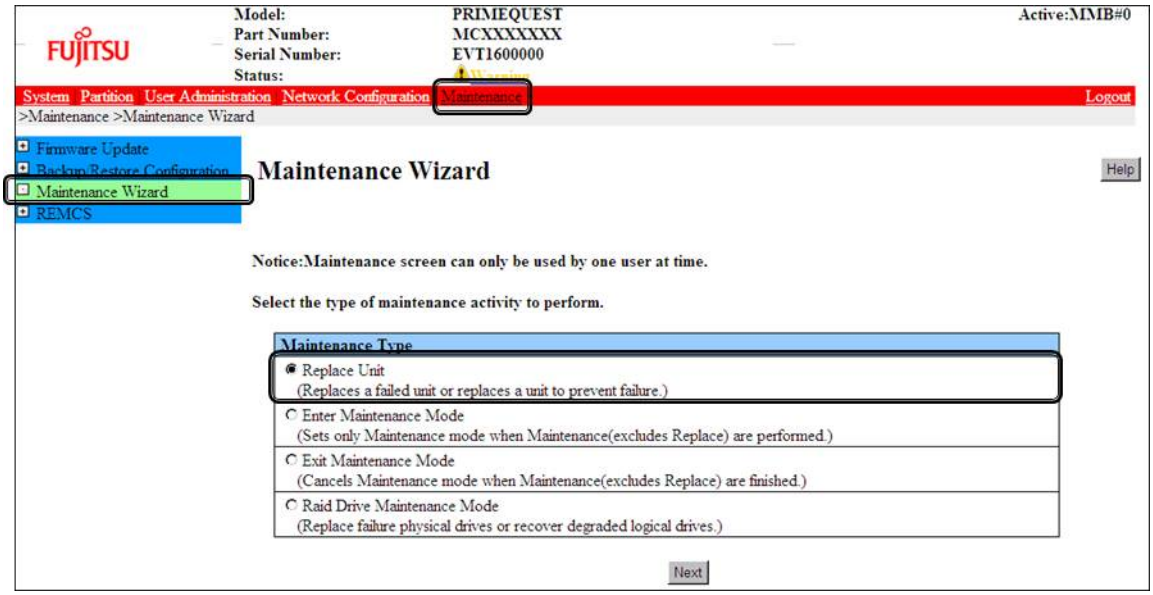
    This operation installs the device associated with the relevant adapter on the system.

Operation for Hot replacement of PCI Express card by Maintenance Wizard

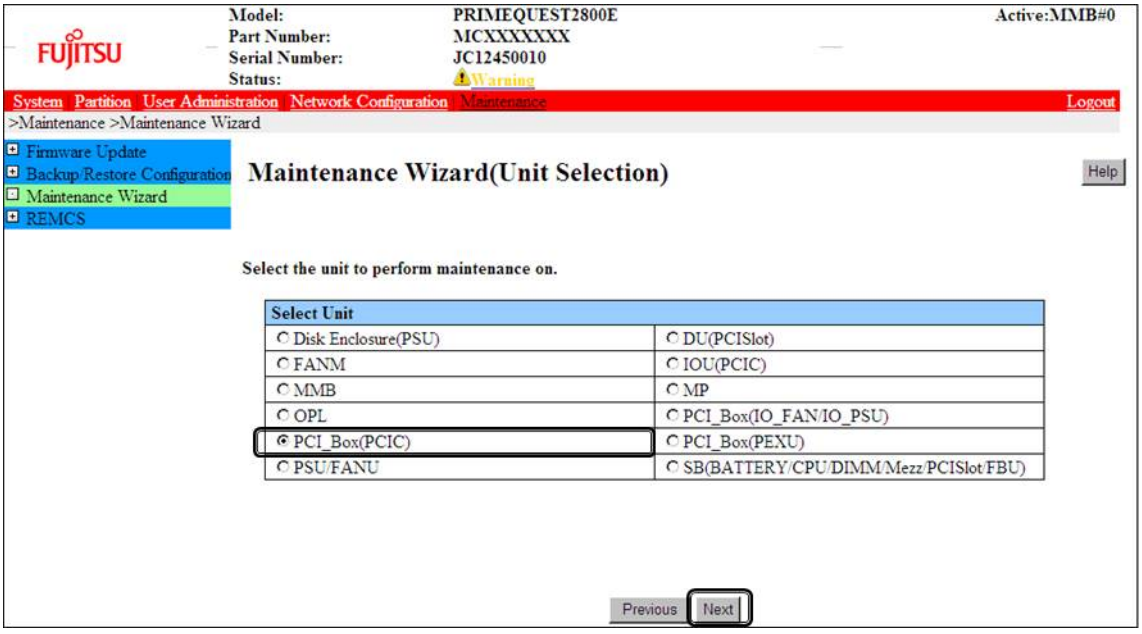
This item describes Operation for Hot replacement of PCI Express card (PCIC) by Maintenance Wizard Below works are performed by the field engineer in charge of your system.

1. Start [Maintenance Wizard] menu by MMB Web-UI and display [Maintenance Wizard] view.

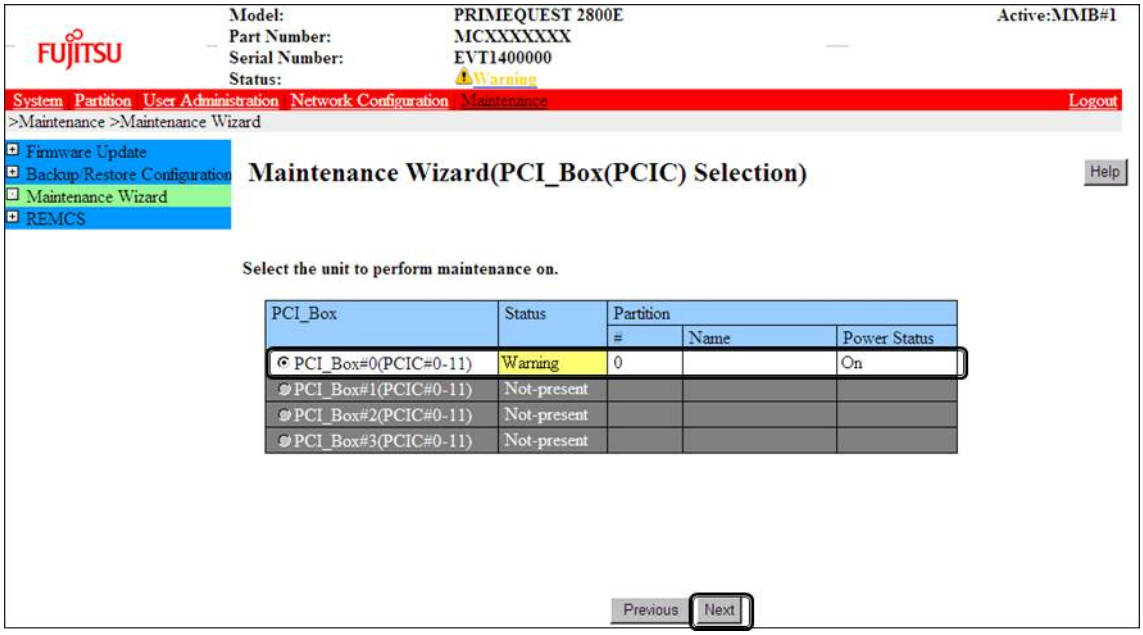
2. Select [Replace Unit] and click [Next].



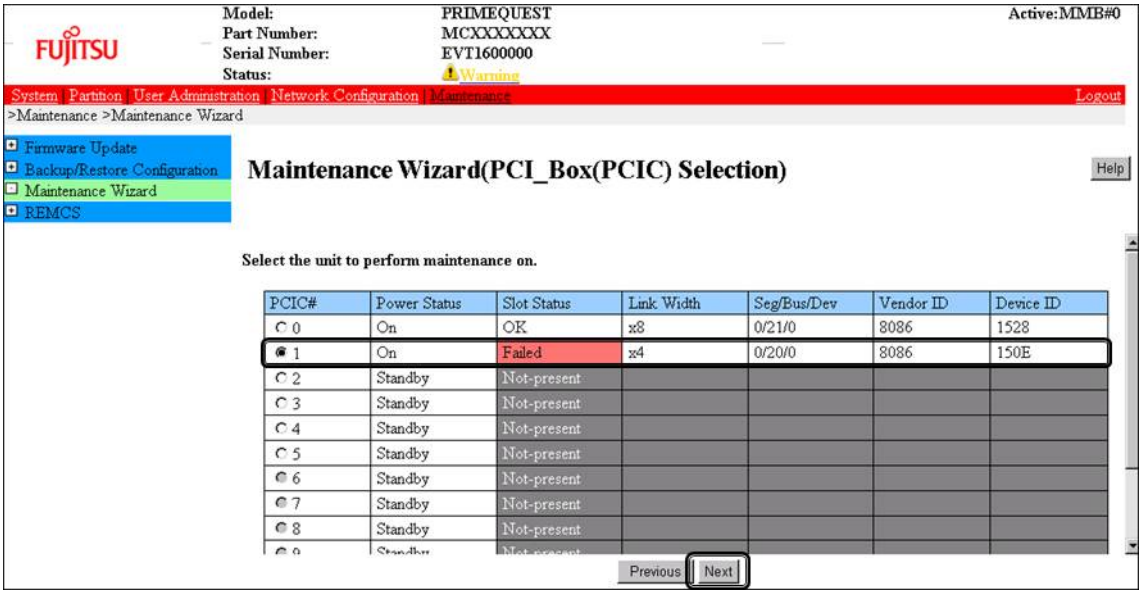
3. Select [PCI_Box(PCIC)], click [Next].



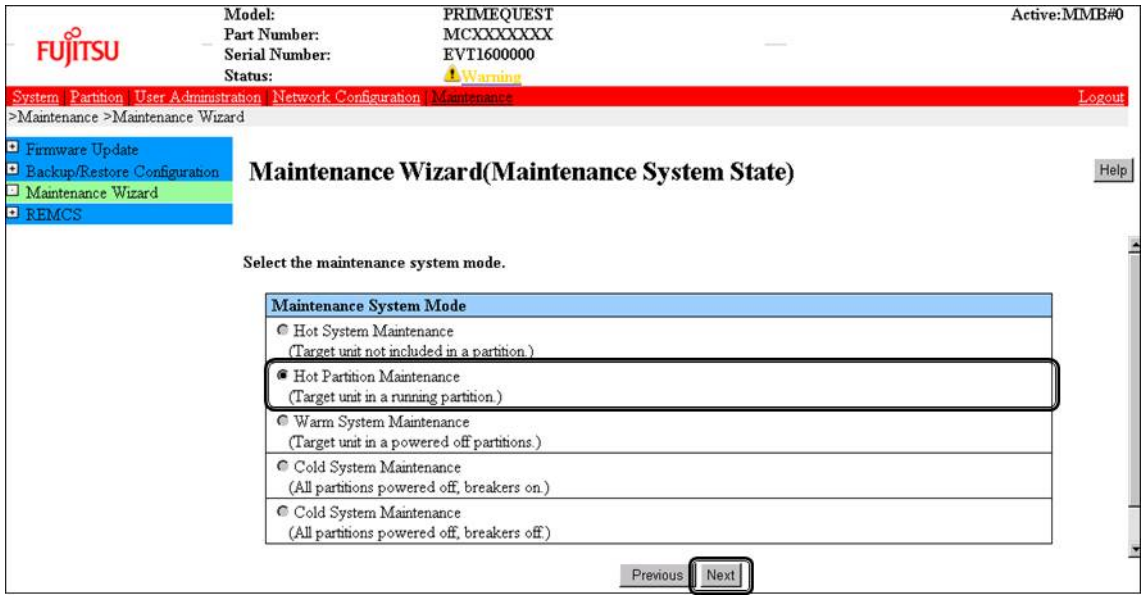
4. Select the radio button of PCI_Box with the particular number, click [Next]
   Example of operation for hot replacing PCI Express card of PCIC#1 mounted on PCI_Box#0



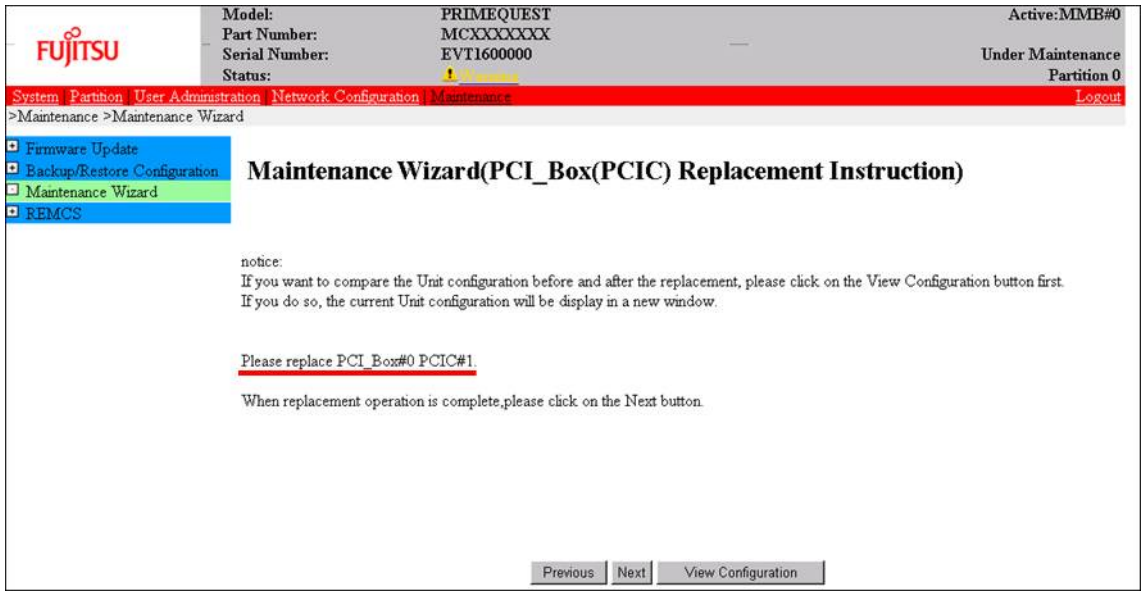
5. Select the radio button of the particular PCIC number and click [Next]



6. Select [Hot Partition Maintenance (Target unit in a running partition.)] and click [Next]



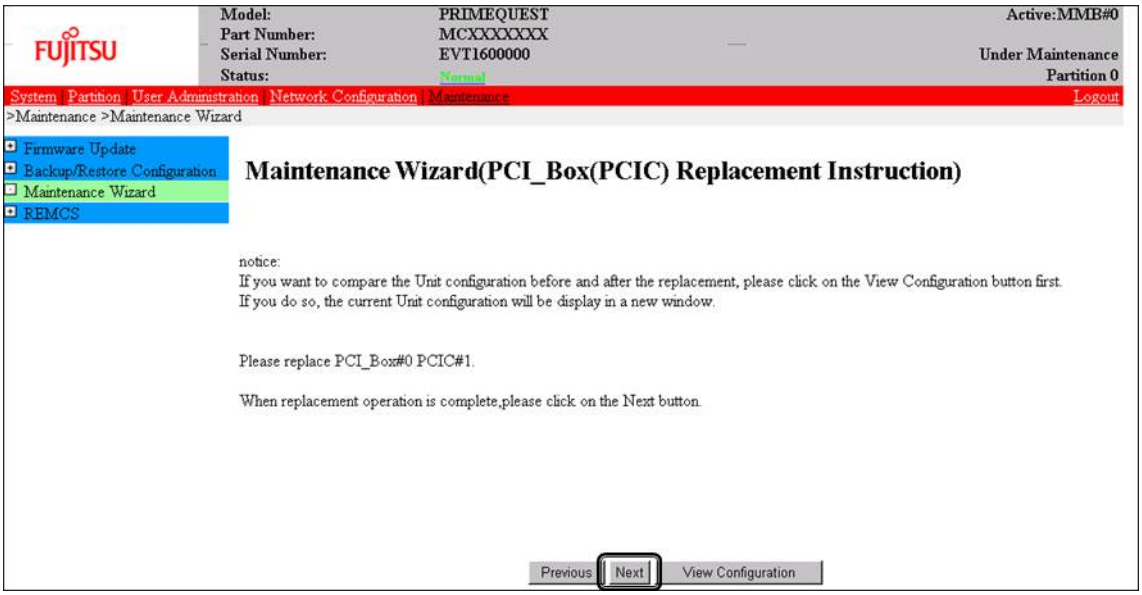
7. Maintenance mode is set (with information area of MMB Web-UI gray out) and then replacement instruction for the particular PCIC appears. Take off all cables such as LAN cable and FC cable connected to the particular PCIC and replace the particular PCIC with this window displayed.
   See the figure in 'B.1 Physical Mounting Locations of Components' to confirm the location of the PCI Express card to be replaced.



Note
Do NOT click [Next] until replacing the PCIC.

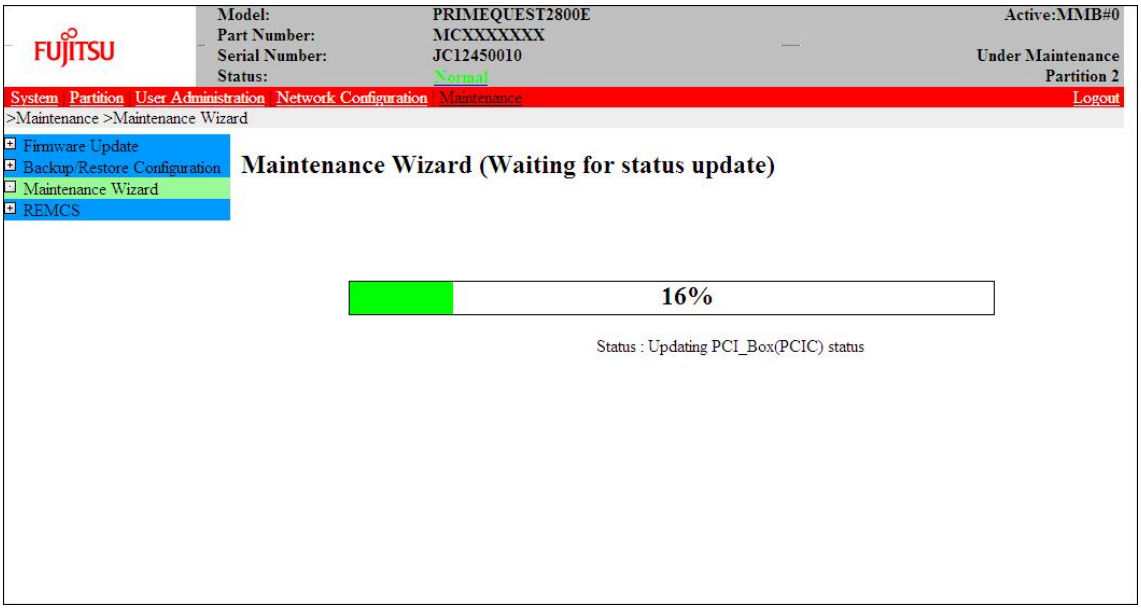
8. After replacing the particular PCIC, mount cables other than LAN cables.
   Note
   In GLS configuration with NIC switching way, mount also LAN cables.

9. After replacing the particular PCIC and powering on the particular PCIC slot, click [Next].
   For how to power on the PCIC slot, see “Powering on and off PCI Express slots” in “7.1.2 PCI Express card replacement procedure in detail”.
   It is the administrator of your system who power on the PCI Express slot.

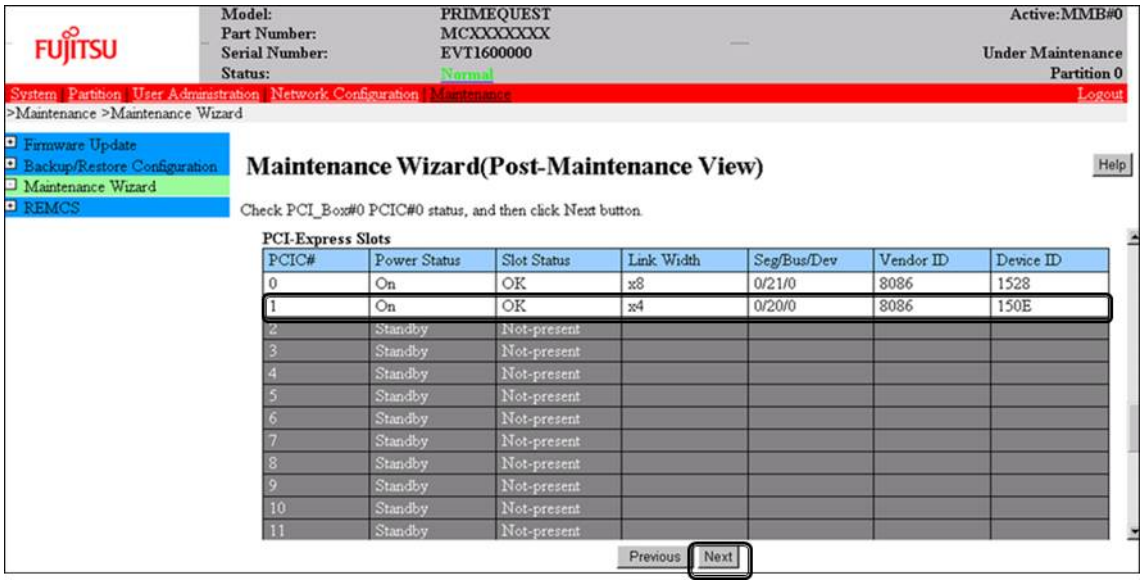


Note
Ask the administrator of your system to power on the PCI Express slot.

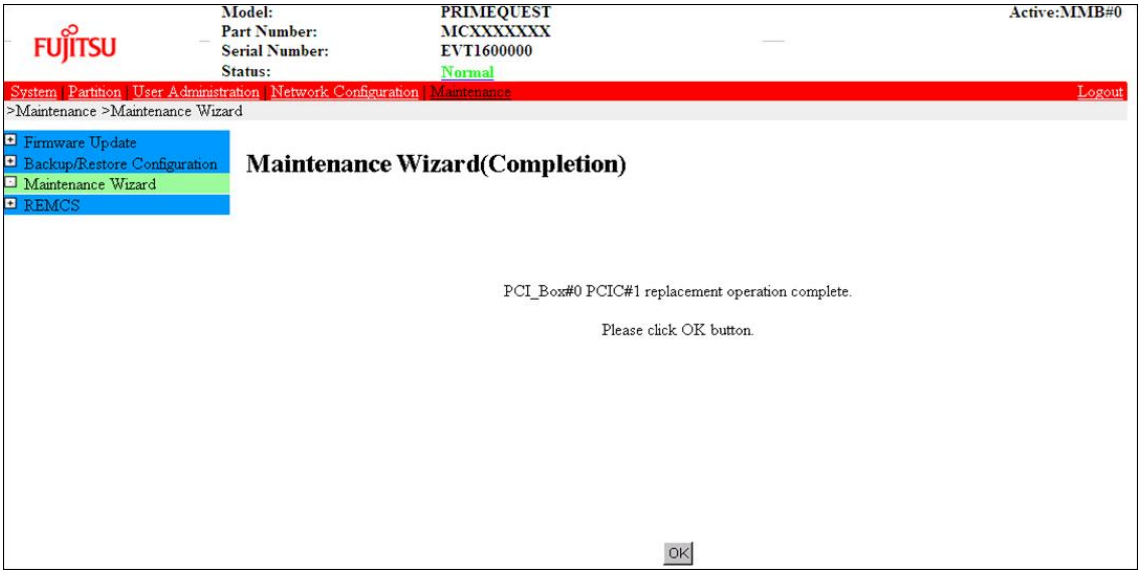
10. The window updating status appears.



11. Check the status of replaced PCIC and click [Next].



12. Confirm that maintenance mode has been released (with information area of MMB Web-UI not gray out) and click [Next].



Post-processing of software using a PCI Express card

After replacing a PCI Express card, restart the software stopped before the PCI Express card replacement or make the software operation applicable again, as needed.

7.7.3 FC card (Fibre Channel card) replacement procedure

The descriptions in this section assume that an FC card is being replaced.
Notes

- The FC card used for SAN boot does not support hot plugging.
- This section does not cover configuration changes in peripherals (e.g., UNIT addition or removal for a SAN disk device).
- This manual does not describe how to change the configuration of peripherals such as expanding and removing the unit of SAN disk device.

- To prevent a device name mismatch due to the failure, addition, removal, or replacement of an FC card, access the SAN disk unit by using the by-id name (/dev/disk/by-id/...) for the device name.
- If all the paths in a mounted disk become hidden when an FC card is hot replaced, unmount the disk. Then, execute PCI hot plug.

FC card replacement procedure

The procedure for replacing only a faulty FC card without replacing other peripherals is as follows.

1. Make the necessary preparations.
   Stop access to the faulty FC card, such as by stopping applications.
2. Confirm the slot number of the PCI Express slot.
   See 'Confirming the slot number of a PCI Express slot' in "7.1.2 PCI Express card replacement procedure in detail".
3. Power off the PCI Express slot.
   See 'Powering on and off PCI Express slots' in "7.1.2 PCI Express card replacement procedure in detail".
4. Physically replace the target card by using MMB Maintenance Wizard. This step is performed by the field engineer in charge of your system.
   For details on the operation of replacement, see step 1 to 7 of 'Operation for Hot replacement of PCI Express card by Maintenance Wizard' in "7.1.2 PCI Express card replacement procedure in detail".
5. Reconfigure the peripheral according to its manual.
   For example, suppose that the storage device used is ETERNUS and that the host affinity function is used (to set the access right for each server). Their settings would need to be changed as a result of FC card replacement.
6. Power on the PCI Express slot.
   See 'Powering on and off PCI Express slots' in "7.1.2 PCI Express card replacement procedure in detail".
7. Check whether there is an error in added FC card by MMB Maintenance Wizard.
   This step is performed by the field engineer in charge of your system.
   For details on the operation of replacement, see step 8 to 11 of 'Operation for Hot replacement of PCI Express card by Maintenance Wizard' in "7.1.2 PCI Express card replacement procedure in detail".
8. Check the version of the firmware
   It is required that the firmware version of new FC card is same as the FC card which had been replaced.
   If the firmware version of new FC card is same as the FC card which had been replaced (current firmware version), it is not necessary to update the firmware version of new FC card to current firmware version.
   If the firmware version of new FC card is not same as the FC card which had been replaced (current firmware version), update the firmware version of new FC card to current firmware version.
   For how to update the firmware version, see Firmware update manual for fibre channel card.
   Note
   If you cannot confirm the firmware version of the FC card before replacing due to the fault of the FC card, check the firmware version of the FC card which is same type as the faulty one to update firmware version.
9. Confirm the incorporation results.
   'Confirming the FC card incorporation results' describes the confirmation method. Start operation with the FC card again by restarting applications as needed or by other such means.
10. Perform the necessary post-processing.
    If you stopped any other application in step 1, restart it too as needed.

Confirming the FC card incorporation results

Confirm successful incorporation of the FC card and the corresponding driver in the following method. Then, take appropriate action. Check the log. (The following example shows a log of FC card hot plugging.)
As shown below, the output of an FC card incorporation message and device found message as the log output to /var/log/messages after the PCI Express slot containing the mounted FC card is enabled means that the FC card was successfully incorporated.

```
scsi10:Emulex LPe1250-F8 8Gb PCIe Fibre Channel ¥
       Adapter on PCI bus 0f device 08 irq 59 ...(*1)
       lpfc 0000:0d:00.0: 0:1303 Link Up Event x1 received ¥
       Data: x1 x0 x10 x0 x0 x0 0 ...(*2)
       scsi 2:0:0:0: Direct-Access FUJITSU E4000 ¥
0000 PQ: 1 ANSI: 5        ...(*3)
```

The ¥ at the end of a line indicates that there is no line feed.

If only the message in (*1) is displayed but the next line is not displayed or if the message in (*1) is not displayed, the FC card replacement itself was unsuccessful. (See Note below.) In this case, power off the slot once. Then, check the following points again:

- Whether the FC card is correctly inserted into the PCI Express slot
- Whether the latch is correctly set

Eliminate the problem, power on the slot again, and check the log.
If the message in (*1) is displayed but the FC linkup message in (*2) is not displayed, the FC cable may be disconnected or the FC path may not be set correctly. Power off the slot once. Confirm the following points again.

- Confirm the FC driver setting.
  The definition file containing a description of the driver option of the FC driver (lpfc) is identified with the following command.
  Example: Description in /etc/modprobe.d/lpfc.conf

```
# grep -l lpfc /etc/modprobe.d/*

/etc/modprobe.d/lpfc.conf
```

  Confirm that the driver option of the FC driver (lpfc) is correctly set. For details, contact the distributor where you purchased your product, or your sales representative.

- Check the FC cable connection status.
- Confirm the Storage FC settings.
  Confirm that the settings that conform to the actual connection format (Fabric connection or Arbitrated Loop connection) were made.
  If the messages in (*1) and (*2) are displayed but the messages in (*3) are not displayed, the storage is not yet found. Check the following points again. These are not card problems, so you need not power off the slot for work.
  - Review FC-Switch zoning settings.
  - Review storage zoning settings.
  - Review storage LUN Mapping settings.

    Also, confirm that the storage can be correctly viewed from LUN0.
    Eliminate the problem. Then, confirm the settings and recognize the system by using the following procedure.

1. Confirm the host number of the incorporated FC card from the message at (*1).
   xx in scsixx (xx is a numerical value) in the message at (*1) is a host number. In the above example, the host number is 10.
2. Scan the device by executing the following command.

```
# echo "-" "-" "-" > /sys/class/scsi_host/hostxx/scan
(# is command prompt)

(xx in hostxx is the host number entered in step 1.)
```

   The command for the above example is as follows.

```
# echo "-" "-" "-" > /sys/class/scsi_host/host10/scan
```

3. Confirm that a message like (*3) was output to /var/log/messages.
   If this message is not displayed, confirm the settings again.

   Note
   In specific releases of SLES, a message like (*1) for confirming FC card incorporation may be output in the following format with card name information omitted.

```
scsi10 : on PCI bus 0f device 08 irq 59
```

   In this case, check for the relevant message on the FC card incorporation by using the following procedure.

a. Confirm the host number.
xx in scsixx (xx is a numerical value) in the message is a host number. In the above example, the host number is 10.

b. Check whether the following file exists by using the host number.

```
/sys/class/scsi_host/hostxx/modeldesc
(xx in hostxx is the host number entered in step 1.)
```

If the file does not exist, the judgment is that no such message was output from the FC card.

c. If the file exists, check the file contents by using the following operation.

```
# cat /sys/class/scsi_host/hostxx/modeldesc
Emulex LPe1250-F8 8Gb PCIe Fibre Channel Adapter

(xx in hostxx is the host number entered in step 1.)
```

If the output is like the above, the judgment is that the relevant message was output by the incorporation of the FC card.

7.7.4 Network card replacement procedure

Network card (referred to as NIC below) replacement using hot plugging needs specific processing before and after PCI Express slot power-on or power-off. Its procedure also includes the common PCI Express card replacement procedure.
The procedure describes operations where a single NIC is configured as one interface. It also describes cases where multiple NICs are bonded together to configure one interface (bonding configuration). For bonding multiple NIC by using PRIMECLUSTER Global Link Services (GLS), see 'PRIMECLUSTER Global Link Service Configuration and Administration Guide Redundant Line Control Function for Linux' (J2UZ-7781).

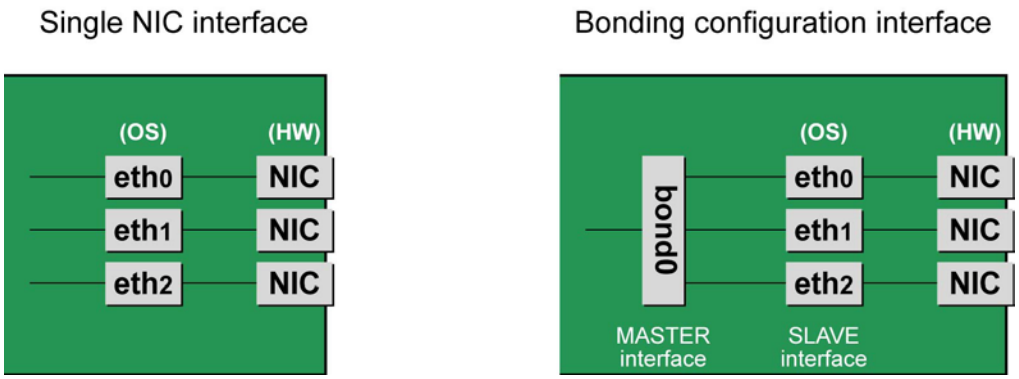


FIGURE 7.2 Single NIC interface and bonding configuration interface

NIC replacement procedure

This section describes the procedure for NIC replacement.
Notes

- When replacing multiple NICs, be sure to replace them one by one. If you replace multiple cards at the same time, they may not be correctly configured.
- To perform hot replacement in a system where a bonding device is installed, design the system so that it specifies ONBOOT=YES in all interface configuration files (the /etc/sysconfig/network/ifcfg-eth*files and the /etc/sysconfig/network/ifcfg-bond*files), regardless of whether the NIC to be replaced is a configuration interface of the bonding device.
An IP address need not to be assigned to unused interfaces. This procedure is to prevent the device name of the replacement target NIC from being changed after hot replacement. If ONBOOT=NO also exists, the procedure described here may not work properly.

1. Confirm the slot number of the PCI Express slot that has the mounted interface.
Confirm the interface mounting location through the configuration file information and the operating system information. First, confirm the bus address of the PCI Express slot that has the mounted interface to be replaced.
Example: eth0 interface

```
# ls -l /sys/class/net/eth0/device
lrwxrwxrwx 1 root root 0 Sep 29 10:17 ¥
/sys/class/net/eth0/device
->../../../0000:00:01.2/0000:08:00.2/0000:0b:01.0
```

The ¥ at the end of a line indicates that there is no line feed.

Excluding the rest of the directory path, check the part corresponding to the file name in the symbolic link destination file of the output results. In the above example, the underlined part shows the bus address. ("0000:0b:01" in the example)

Note

You will use the bus address obtained here in steps 2 and 11. Record the bus address so that you can reference it later.

Next, check the PCI Express slot number for this bus address.

```
# grep -il 0000:0b:01 /sys/bus/pci/slots/*/address
/sys/bus/pci/slots/20/address
```

Read the output file path as shown below, and confirm the PCI Express slot number.

```
/sys/bus/pci/slots/<slot number>/address
```

Notes

If the above file path is not output, it indicates that the NIC is not mounted in a PCI Express slot (e.g., GbE port in the IOU).

With the PCI Express slot number confirmed here, see 'D.2 Correspondence between PCI Slot Mounting Locations and Slot Numbers'PCI Express slot to check the mounting location, and see also 'B.1 Physical Mounting Locations of Components' to identify the physical mounting location corresponding to the PCI Express slot number. You can confirm that it matches the mounting location of the operational target NIC.

2. Collect information about interfaces on the same NIC.
For a NIC that has more than one interface, you will need to deactivate all the interfaces on the NIC. Use the following procedure to check each interface that has the same bus address as that confirmed in step 1. Then, make a table with information including the interface name, hardware address, and bus address.

Note

Collect the following information even if the NIC has only one interface.

- Confirm the correspondence between the bus address and interface name.
Execute the following command, and confirm the correspondence between the bus address and interface name.
Example: The bus address is "0000:0b:01".

```
# ls -l /sys/class/net/*/device | grep "0000:0b:01"
lrwxrwxrwx 1 root root 0 Sep 29 10:17 ¥
/sys/class/net/eth0/device
->../../../0000:00:01.2/0000:08:00.2/0000:0b:01.0
lrwxrwxrwx 1 root root 0 Sep 29 10:17 ¥
/sys/class/net/eth1/device
->../../../0000:00:01.2/0000:08:00.2/0000:0b:01.1
```

The ¥ at the end of a line indicates that there is no line feed.

The following table shows the correspondence between the bus addresses and interface names from the above output example.

TABLE 7.6 Correspondence between bus addresses and interface names

Interface name	Hardware address	Bus address	Slot number
eth0		0000:0b:01.0	20
eth1		0000:0b:01.1	20
...		...	...

Note

When recording a bus address, include the function number (number after the period).

- Confirm the correspondence between the interface name and hardware address.
Execute the following command, and confirm the correspondence between the interface name and hardware address.
Example: eth0 [For a single interface]

```
# cat /sys/class/net/eth0/address
00:0e:0c:70:c3:38
```

Example: eth0 [For a bonding interface]
The bonding driver rewrites the values for the slave interface of the bonding device. Confirm the hardware address by executing the following command.

```
# cat /proc/net/bonding/bondY

Ethernet Channel Bonding Driver .........
.
.
Slave interface: eth0
.
Permanent HW addr: 00:0e:0c:70:c3:38
.
.
```

You can use this procedure only when the bonding device is active. If the bonding device is not active or the slave has not been incorporated, use the same procedure as for a single interface.

Also, the correspondence between the interface name and hardware address is automatically registered by the system in the udev function rule file, /etc/udev/rules.d/70-persistent-net.rules. Confirm that the ATTR{address} and NAME items have the same definitions as in the above output.
Example: eth0

```
grep eth0 /etc/udev/rules.d/70-persistent-net.rules

SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*", ¥
ATTR{address}=="00:0e:0c:70:c3:38", ATTR{type}=="1", ¥
KERNEL=="eth*", NAME="eth0"
```

The ¥ at the end of a line indicates that there is no line feed.

You can always obtain the correct hardware address from the description in etc/udev/rules.d/70-persistent-net.rules regardless of whether the interface is incorporated in bonding.
Confirm the hardware address of other interfaces by repeating the operation with the same command. The following table lists examples of descriptions.

TABLE 7.7 Hardware address description examples

Interface name	Hardware address	Bus address	Slot number
eth0	00:0e:0c:70:c3:38	0000:0b:01.0	20
eth1	00:0e:0c:70:c3:39	0000:0b:01.1	20
...	...	...	...

The step above is used in creating the correspondence table in step 12. Prepare a table here so that you can reference it later.
Note
In a replacement due to a device failure, the information in the table showing the correspondence between the interface and the hardware address, bus address, and slot number may be inaccessible depending on the failure condition. We strongly recommend that a table showing the correspondence between the interface and the hardware address, bus address, and slot number be created for all interfaces at system installation.

3. Execute the higher-level application processing required before NIC replacement.
   Stop all access to the interface as follows. Stop the application that was confirmed in step 2 as using the interface, or exclude the interface from the target of use by the application.

4. Deactivate the NIC.
   Execute the following command to deactivate all the interfaces that you confirmed in step 2.
   The applicable command depends on whether the target interface is a single NIC interface or the SLAVE interface of a bonding device.
   [For a single NIC interface]

   ```
   # /sbin/ifdown ethX
   ```

   If the single NIC interface has a VLAN device, you also need to remove the VLAN interface. Perform the following operations (before deactivating the real interface).

```
# /sbin/ifdown ethX.Y
# /sbin/vconfig rem ethX.Y
```

[For the SLAVE interface of a bonding device]
If the bonding device is operating in mode 1, use the following steps to exclude SLAVE interface to be replaced from the bonding configuration. In any other mode, removing it immediately should not cause any problems.
Confirm that the SLAVE interface to be replaced is the interface currently being used for communication. First, confirm the interface currently being used for communication by executing the following command.

```
# cat /sys/class/net/bondY/bonding/active_slave
```

If the displayed interface matches the SLAVE interface being replaced, execute the following command to switch the current communication interface to another SLAVE interface.

```
# /sbin/ifenslave -c bondY ethZ
(ethZ: Interface that composes bondY and does not perform
hot replacement)
```

Finally, remove the SLAVE interface being replaced, from the bonding configuration. Immediately after being removed, the interface is automatically no longer used.

```
# /sbin/ifenslave -d bondY ethX
```

5. Power off the PCI Express slot.

   - For the partition with Dynamic Reconfiguration utility installed
     Execute /opt/FJSVdr-util/sbin/dr rm pcie<slot number> command on the shell of OS.
     The PCI Express card is disabled and has become to be ready for removal. The LED turns off.
     Example: Making the PCI Express slot with PCI Express slot number 20 power off

     ```
     # /opt/FJSVdr-util/sbin/dr rm pcie20
     ```

     This operation removes the device associated with the relevant adapter from the system.

   - For the partition without Dynamic Reconfiguration utility installed
     Confirm that the /sys/bus/pci/slots directory contains a directory for the target slot information, which will be referenced and otherwise used. Below, the slot number confirmed in step 1 is shown at <slot number> in the directory path in the following format, where the directory is the operational target.

     ```
     /sys/bus/pci/slots/<slot number>
     ```

     To disable a PCI Express card and make it ready for removal, write "0" to the "power" file in the directory corresponding to the target slot. The LED turns off. The interface (ethX) is removed at the same time.

     ```
     # echo 0 > /sys/bus/pci/slots/<slot number>/power
     ```

6. Save the interface configuration file.
   Save all the interface configuration files that you checked in step 2 by executing the following command. udevd and configuration scripts may reference the contents of files in /etc/sysconfig/network. For this reason, create a save directory and save these files to the directory so that udevd and the configuration scripts will not reference them.

   ```
   # cd /etc/sysconfig/network
   # mkdir temp
   # mv ifcfg-ethX temp
   (following also executed for bonding configuration)
   # mv ifcfg-bondX temp
   ```

7. Physically replace the NIC by using MMB Maintenance Wizard. This step is performed by the field engineer in charge of your system.
   For details on the operation of replacement, see step 1 to 7 of ‘Operation for Hot replacement of PCI Express card by Maintenance Wizard’ in “7.1.2 PCI Express card replacement procedure in detail”.

8. Delete the entries associated with the replaced NIC from the udev function rule file.
   Each entry for the new NIC is automatically added to the udev function rule file, /etc/udev/rules.d/70-persistent-net.rules, when the NIC is detected. However, the entries of a NIC are not automatically deleted even if the NIC is removed. Leaving the entries of the removed NIC may have the following impact.

- The interface names defined in the entries of the removed NIC cannot be assigned to the replaced NIC or an added NIC.

For this reason, delete or comment out the entries of the removed NIC from the udev function rule file.

a. Confirm the correspondence between the interface name and hardware address in the table created in step 2.

b. Edit the udev function rule file, /etc/udev/rules.d/70-persistent-net.rules, to delete or comment out the entry lines of all the interface names and hardware addresses confirmed in the above step 1.

The following example shows editing of the udev function rule file.
[Example of descriptions in the file before editing]

```
# PCI device 0x****:0x**** (e1000)
SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*", ¥
ATTR{address}=="00:0e:0c:70:c3:38", ATTR{type}=="1", ¥
KERNEL=="eth*", NAME="eth0"
# PCI device 0x****:0x**** (e1000)
SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*", ¥
ATTR{address}=="00:0e:0c:70:c3:39", ATTR{type}=="1", ¥
KERNEL=="eth*", NAME="eth1"
  :
  :
```

The ¥ at the end of a line indicates that there is no line feed.

[Example of descriptions in the file after editing]
(In the example, eth0 was deleted, and eth1 is commented out.)

```
# PCI device 0x****:0x**** (e1000)
# SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*", ¥
ATTR{address}=="00:0e:0c:70:c3:39", ATTR{type}=="1", ¥
KERNEL=="eth*", NAME="eth1"
  :
  :
```

The ¥ at the end of a line indicates that there is no line feed.

Do this editing for all the interfaces listed in the table created in step 2.

9. Reflect the edited rules in udev.
udevd reads the rules described in the rule file at its start time and then retains the rules in memory. Simply changing the rule file does not mean the changed rules are reflected. Take action as follows to reflect the new rules in udev.

```
# udevadm control --reload-rules
```

10. Power on the PCI Express slot.
See ‘Powering on and off PCI Express slots’ in “7.1.2 PCI Express card replacement procedure in detail”.

11. Check whether there is an error in added FC card by MMB Maintenance Wizard.
This step is performed by the field engineer in charge of your system.
For details on the operation of replacement, see step 8 to 11 of ‘Operation for Hot replacement of PCI Express card by Maintenance Wizard’ in “7.1.2 PCI Express card replacement procedure in detail”.

12. Collect the information associated with an interface on the replaced NIC.
An interface (ethX) is created for the replaced NIC at the power-on time. Make a table with information about each interface created for the replaced NIC. Such information includes the interface name, hardware address, and bus address. Use the bus address confirmed in step 1 and the same procedure as in step 2.

TABLE 7.8 Example of interface information about the replaced NIC

Interface name	Hardware address	Bus address	Slot number
eth1	00:0e:0c:70:c3:40	0000:0b:01.0	20
eth0	00:0e:0c:70:c3:41	0000:0b:01.1	20
...	...	...	...

Confirm that a new hardware address is defined for the bus address. Also confirm that the assigned interface name is the same as that before the NIC replacement.

Also confirm that the relevant entries in the above-described table were automatically added to the udev function rule file, /etc/udev/rules.d/70-persistent-net.rules.
Note
The correspondence between the bus address and interface name may be different from that before NIC replacement. In such cases, just proceed with the work. This is explained in step 13.

13. Deactivate each newly created interface.
The interfaces created for the replaced NIC may be active because power is on to the PCI Express slot. In such cases, you need to deactivate them before changing the interface configuration file.
Execute the following command for all the interface names confirmed in step 11.
Example: eth0

```
# /sbin/ifconfig eth0 down
```

14. Confirm the correspondence between the interface names before and after the NIC replacement.
From the interface information created before and after the NIC replacement in steps 2 and 11, confirm the correspondence between the interface names before replacement and the new interface names.

    a. Confirm the correspondence between the bus address and interface name on each line in the table created in step 2.

    b. Likewise, confirm the correspondence between the bus addresses and interface names in the table created in step 11.

    c. Match the interface names to the same bus addresses before and after the NIC replacement.

    d. In the table created in step 11, enter values corresponding to the interface names before and after the NIC replacement.

TABLE 7.9 Example of entered values corresponding to the interface names before and after NIC replacement

Interface name After replacement (-> Before replacement)	Hardware address	Bus address	Slot number
eth1 (-> eth0)	00:0e:0c:70:c3:40	0000:0b:01.0	20
eth0 (-> eth1)	00:0e:0c:70:c3:41	0000:0b:01.1	20
...	...	...	...

15. If an interface name is switched before and after the NIC replacement, make the interface name correspond to the same bus address as before the NIC replacement by using the following procedure.
Note
Confirm that the interface name is the same before and after the NIC replacement. Then, proceed to step 15.

    a. Power off the PCI Express slot again.
    Repeat the process done in step 5 to power off the PCI Express slot.

    b. Correct the interface name that is not the same before and after the NIC replacement in the entries of the udev function rule file, /etc/udev/rules.d/70-persistent-net.rules. Make the interface name the same as before the NIC replacement.
    [Example of descriptions in the file before editing]

```
# PCI device 0x****:0x**** (e1000)
SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*", ¥
ATTR{address}=="00:0e:0c:70:c3:40", ATTR{type}=="1", ¥
KERNEL=="eth*", NAME="eth1"
# PCI device 0x****:0x**** (e1000)
SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*", ¥
ATTR{address}=="00:0e:0c:70:c3:41", ATTR{type}=="1", ¥
KERNEL=="eth*", NAME="eth0"
 :
 :
```

The ¥ at the end of a line indicates that there is no line feed.

[Example of descriptions in the file after editing]
(eth1, the name after replacement, has been corrected to eth0, the name before replacement.)

```
# PCI device 0x****:0x**** (e1000)
SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*", ¥
ATTR{address}=="00:0e:0c:70:c3:40", ATTR{type}=="1", ¥
```

```
KERNEL=="eth*", NAME="eth0"
# PCI device 0x****:0x**** (e1000)

SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*", ¥
ATTR{address}=="00:0e:0c:70:c3:41", ATTR{type}=="1", ¥
KERNEL=="eth*", NAME="eth1"
  :
  :
```

The ¥ at the end of a line indicates that there is no line feed.

c. Reflect the edited rules again.
Repeat the process done in step 9 to reflect the rules.

```
# udevadm control --reload-rules
```

d. Power on the PCI Express slot.
Repeat the process done in step 10 to power on the PCI Express slot.
The interfaces created for the replaced NIC may be active because power is on to the PCI Express slot. At this stage, since we recommend proceeding with the work with the interface on the replaced NIC deactivated, repeat the operation in step 12.

e. Collect the information about interfaces on the NIC again, and create a table.
Use the same procedure as in step 2 to update the interface name information in the table from step 13 showing the correspondence of the interface before and after NIC replacement.
Note
Confirm that each specified interface name is the same as before the NIC replacement.

TABLE 7.10 Confirmation of interface names

Interface name	Hardware address	Bus address	Slot number
eth0	00:0e:0c:70:c3:40	0000:0b:01.0	20
eth1	00:0e:0c:70:c3:41	0000:0b:01.1	20
...	...	...	...

16. Edit the saved interface configuration file.
Write a new hardware address to replace the old one. In "HWADDR," set the hardware address of the replaced NIC in ‘TABLE 6.4 Example of entered values corresponding to the interface names before and after NIC replacement’’ or ‘TABLE 6.5 Confirmation of interface names’. Also, for SLAVE under bonding, the file contents are partly different, but the lines to be set are the same.

```
(Example)
DEVICE=eth0
NM_CONTROLLED=no BOOTPROTO=static HWADDR=00:0E:0C:70:C3:40
BROADCAST=192.168.16.255
IPADDR=192.168.16.1
NETMASK=255.255.255.0
NETWORK=192.168.16.0
ONBOOT=yes
TYPE=Ethernet
```

Do this editing for all the saved interfaces.

17. Restore the saved interface configuration file to the original file.
Restore the interface configuration file saved to the save directory to the original file by executing the following command.

```
# cd /etc/sysconfig/network/temp
# mv ifcfg-ethX   ..
(following also executed for bonding configuration)
# mv ifcfg-bondX   ..
```

18. Activate the replaced interface.
The method for activating a single NIC interface differs from that for activating the SLAVE interfaces under bonding.
[For a single NIC interface]
Execute the following command to activate the interface. Activate all the necessary interfaces.

```
# /sbin/ifup ethX
```

Also, if the single NIC interface has a VLAN device and the VLAN interface was temporarily removed, restore the VLAN interface. If the priority option has changed, set it again.

```
# /sbin/vconfig add ethX Y
# /sbin/ifup ethX.Y
(enter command to set VLAN option as needed)
```

[For SLAVE under bonding]
Execute the following command to incorporate the SLAVE interface into the existing bonding configuration. Incorporate all the necessary interfaces.

```
# /sbin/ifenslave bondY ethX
```

The VLAN-related operation is normally not required because a VLAN is created on the bonding device.

19. Mount all cables connected to the particular PCIC.
    This step is performed by the field engineer in charge of your system.
    Note
    In GLS configuration with NIC switching way, you do not need to perform this step.

20. Remove the directory to which the interface configuration file was saved.
    After all the interfaces to be replaced have been replaced, remove the save directory created in step 6 by executing the following command.

```
# rmdir /etc/sysconfig/network/temp
```

21. Execute the higher-level application processing required after NIC replacement.
    Perform the necessary post processing (such as starting an application or restoring changed settings) for the operations performed for the higher-level applications in step 3.

7.7.5 Hot replacement procedure for iSCSI (NIC)

When performing hot replacement of NICs used for iSCSI connection, use the following procedures.

- 7.1.1 Overview of common replacement procedures for PCI Express cards
- 7.1.2 PCI Express card replacement procedure in detail
- 7.1.4 Network card replacement procedure

A supplementary explanation of the procedure follows.

Prerequisites for iSCSI (NIC) hot replacement

- The prerequisites for iSCSI (NIC) hot replacement are as follows.
- The storage connection is established on a multipath using DM-MP (Device-Mapper Multipath) or ETERNUS multidriver (EMPD).
- To replace more than one iSCSI card, one card at a time will be replaced.
- A single NIC is configured as one interface.

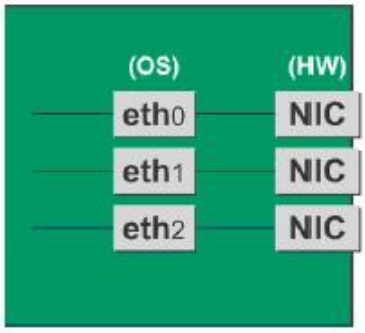


FIGURE 7.3 Example of single NIC interface

Work to be performed before iSCSI (NIC) replacement

For iSCSI (NIC) hot replacement, be sure to follow the procedure below when performing Step 2 of the ‘NIC replacement procedure’ in ‘7.1.4 Network card replacement procedure’

1. Perform the work for suppressing access to the iSCSI connection interface.

   a. Confirm the state of multiple path by DM-MP (*1) or EMPD (*2).

   b. Use the iscsiadm command to log out from the path (iqn) through which the iSCSI card to be replaced is routed, and disconnect the session.
   Example which confirms the state of session before disconnecting:

```
# /sbin/iscsiadm -m session
tcp: [1] 192.168.1.64:3260,1 iqn.2000-
09.com.fujitsu:storage-system.eternus-
dx400:00001049.cm0ca0p0
tcp: [2] 192.168.2.66:3260,3 iqn.2000-
09.com.fujitsu:storage-system.eternus-
dx400:00001049.cm1ca0p0
```

   Example which logout path going through a NIC to be replaced:

```
# /sbin/iscsiadm -m node -T iqn.2000-09.com.fujitsu:storage-
system.eternus-dx400:00001049.cm1ca0p0 -p 192.168.2.66:3260
--logout
```

   c. Use the iscsiadm command to confirm that the target session has been disconnected.
   Example which confirms the state of session after disconnecting

```
# /sbin/iscsiadm -m session
tcp: [1] 192.168.1.64:3260,1 iqn.2000-
09.com.fujitsu:storage-system.eternus-
dx400:00001049.cm0ca0p0
```

   d. You can confirm the disconnection of sessions on multipath products using DM-MP or ETERNUS multidriver.
   *1: Write down the DM-MP display contents at the session disconnection.
   Example of DM-MP display before disconnecting path

```
# /sbin/multipath -ll
mpath1 (36000b5d0006a0000006a104900000000) dm-0
FUJITSU,ETERNUS_DX400
[size=50G][features=0][hwhandler=0][rw]
¥_ round-robin 0 [prio=2][active]
 ¥_ 3:0:0:0 sdb 8:16  [active][ready]
 ¥_ 4:0:0:0 sdc 8:32  [active][ready]
```

   Example of DM-MP display after disconnecting path

```
# /sbin/multipath -ll
mpath1 (36000b5d0006a0000006a104900000000) dm-0
FUJITSU,ETERNUS_DX400
[size=50G][features=0][hwhandler=0][rw]
¥_ round-robin 0 [prio=1][enabled]
 ¥_ 3:0:0:0 sdb 8:16  [active][ready]
```

   *2: See the ETERNUS Multipath Driver User's Guide (For Linux).

Work to be performed after NIC replacement

For iSCSI (NIC) hot replacement, be sure to follow the procedure below when Step 18 of the NIC replacement procedure in 7.1.4 Network card replacement procedure.

1. To restore access to the iSCSI connection interface, perform the following.

   a. Confirm the state of multiple path by DM-MP (*1) or EMPD (*2).

   b. Use the iscsiadm command to log in to the path (iqn) through which the replacement iSCSI card is routed, and reconnect the session.
   Example which confirms the state of session before connecting:

```
# /sbin/iscsiadm -m session
tcp: [1] 192.168.1.64:3260,1 iqn.2000-
09.com.fujitsu:storage-system.eternus-
dx400:00001049.cm0ca0p0
```

   Example which login path going through a NIC to be replaced:

```
# /sbin/iscsiadm -m node -T iqn.2000-09.com.fujitsu:storage-
system.eternus-dx400:00001049.cm1ca0p0 -p 192.168.2.66:3260
–-login
```

c. Use the iscsiadm command to confirm that the target session has been activated.
Example which confirms the state of session after connecting

```
# /sbin/iscsiadm -m session
tcp: [1] 192.168.1.64:3260,1 iqn.2000-
09.com.fujitsu:storage-system.eternus-
dx400:00001049.cm0ca0p0
tcp: [3] 192.168.2.66:3260,3 iqn.2000-
09.com.fujitsu:storage-system.eternus-
dx400:00001049.cm1ca0p0
```

d. You can confirm the activation of sessions on multipath products using DM-MP or ETERNUS multidriver.
*1: Write down the DM-MP display contents at the session activation.
Example of DM-MP display before connecting path

```
# /sbin/multipath -ll
mpath1 (36000b5d0006a0000006a104900000000) dm-0
FUJITSU,ETERNUS_DX400
[size=50G][features=0][hwhandler=0][rw]
¥_ round-robin 0 [prio=1][active]
 ¥_ 3:0:0:0 sdb 8:16  [active][ready]
```

Example of DM-MP display after connecting path

```
# /sbin/multipath -ll
mpath1 (36000b5d0006a0000006a104900000000) dm-0
FUJITSU,ETERNUS_DX400
[size=50G][features=0][hwhandler=0][rw]
¥_ round-robin 0 [prio=2][enabled]
 ¥_ 3:0:0:0 sdb 8:16  [active][ready]
 ¥_ 5:0:0:0 sdc 8:32  [active][ready]
```

*2: See the ETERNUS Multipath Driver User's Guide (For Linux).

7.8 Hot Addition of PCI Express cards

This section describes the PCI Express card addition procedure with the PCI Hot Plug function.
The procedure includes common steps for all PCI Express cards and the additional steps required for a specific card function or driver.
Thus, the descriptions cover both the common operations required for all cards (e.g., power supply operations) and the specific procedures required for certain types of card. For details on addition of the cards not described in this section, see the respective product manuals.
There are two ways to perform PCI hot plug:

- Operation by using sysfs
- Operation by using dr commands

You can perform the operation by using dr commands if Dynamic Reconfiguration utility is installed in the partition. If not, be sure to use the operation by using sysfs. Although you can perform the operation by using sysfs even if Dynamic Reconfiguration utility is installed in the partition, it is recommended to perform the operation by using dr commands to prevent wrong operation.
Hereafter, description about the operation by using dr commands starts at ‘For the partition with Dynamic Reconfiguration utility installed’ and description about the operation by sysfs starts at ‘For the partition without Dynamic Reconfiguration utility installed’.
Notes
If you hot add PCI Express cards into an IOU, see ‘7.5 Hot add of IOU’.

7.8.1 Common addition procedures for all PCI Express cards

1. Performing the required operating system and software operations depending on the PCI card type
2. Confirming that the PCI Express slot power is off

3. Adding a PCI card
   This step is performed by the field engineer in charge of your system.
4. Powering on a PCI Express slot.
5. Performing the required operating system and software operations depending on the PCI card type

Notes
This section describes instructions for the operating system and subsystems (e.g., commands, configuration file editing). Be sure to refer to the respective product manuals to confirm the command syntax and impact on the system before performing tasks with those instructions.

The following sections describe card addition with the required instructions (e.g., commands, configuration file editing) for the operating system and subsystems, together with the actual hardware operations. Step 3 is performed by the field engineer in charge of your system.

7.8.2 PCI Express card addition procedure in detail

This section describes operations that must be performed in the PCI Express card addition procedure.

Confirming the slot number of a PCI Express slot

See ‘Confirming the slot number of a PCI Express slot’ in “7.1.2 PCI Express card replacement procedure in detail”.

Checking the power status of a PCI Express slot

See ‘Checking the power status of a PCI Express slot’ in “7.1.2 PCI Express card replacement procedure in detail”.

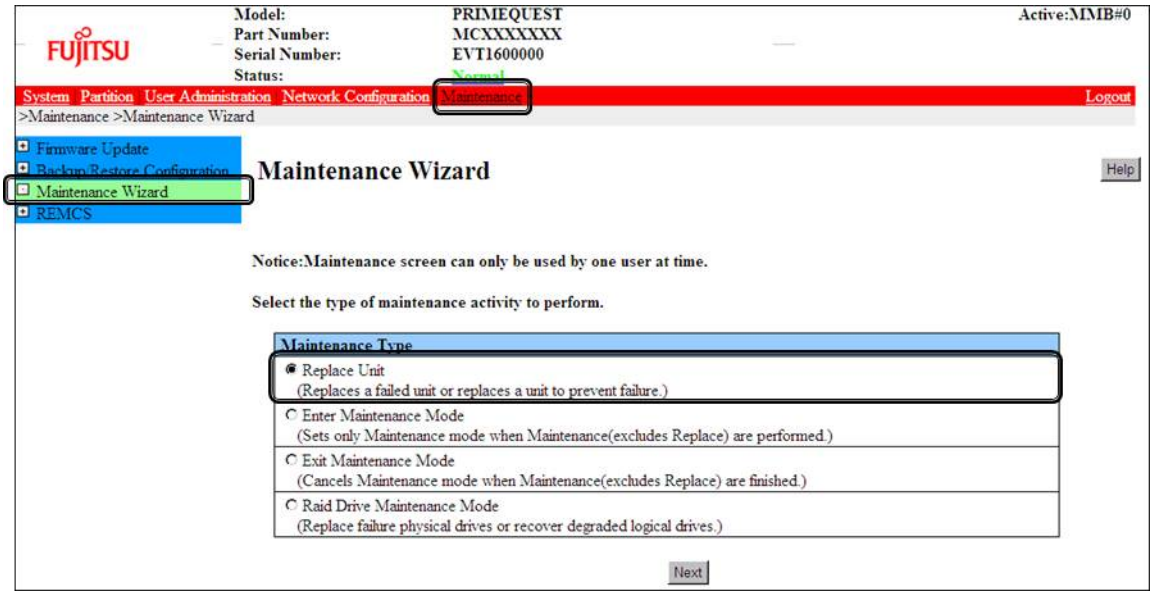
Powering on and off PCI Express slots

See ‘Powering on and off PCI Express slots’ in “7.1.2 PCI Express card replacement procedure in detail”.

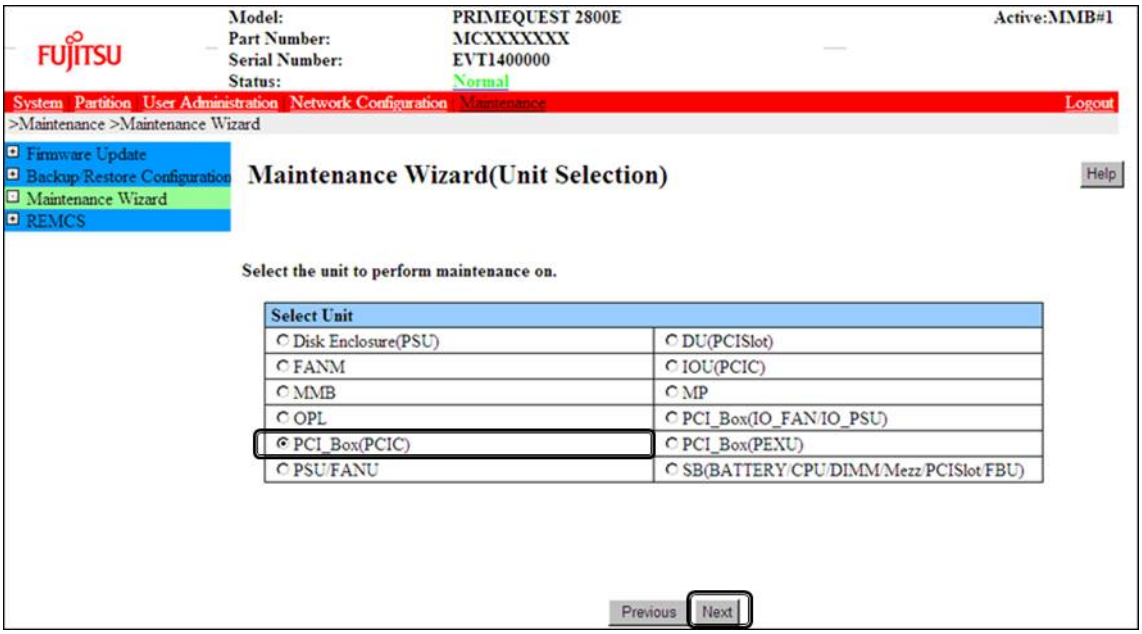
Operation for Hot add of PCI Express card by Maintenance Wizard

This item describes Operation for Hot add of PCI Express card (PCIC) by Maintenance Wizard.
Below works are performed by the field engineer in charge of your system.

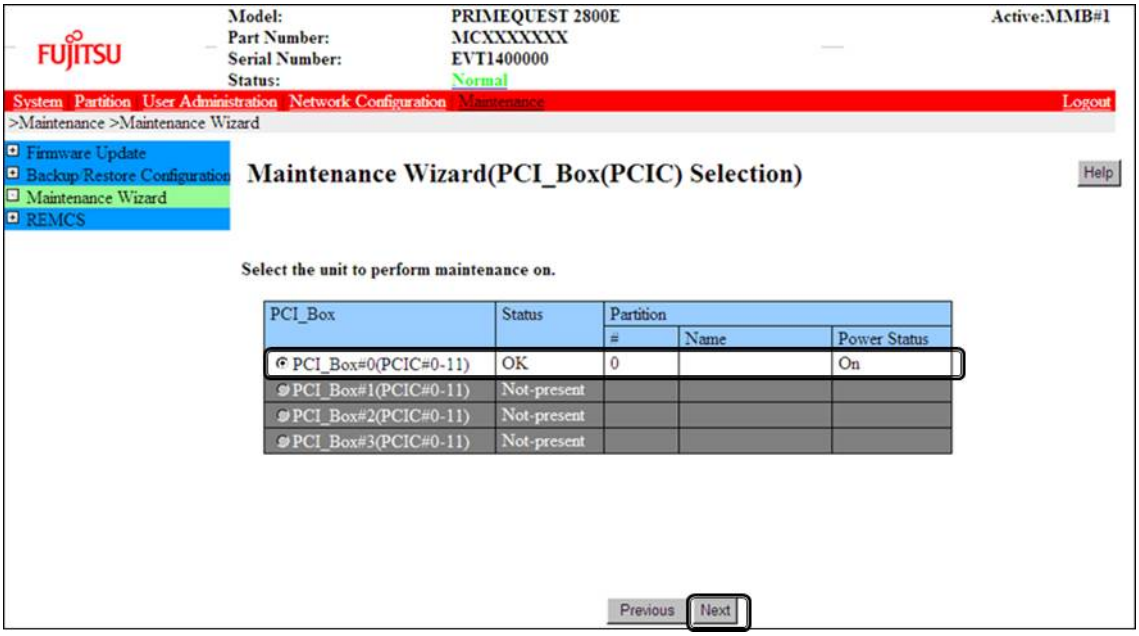
1. Start [Maintenance Wizard] menu by MMB Web-UI and display [Maintenance Wizard] view.
2. Select [Replace Unit] and click [Next].



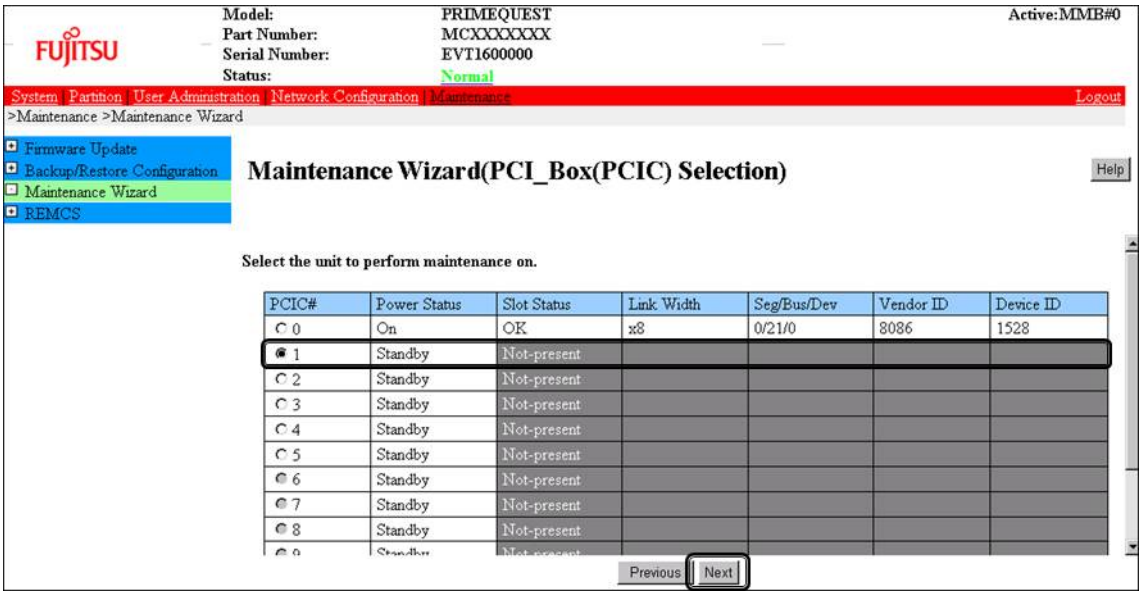
3. Select [PCI_Box(PCIC)], click [Next].



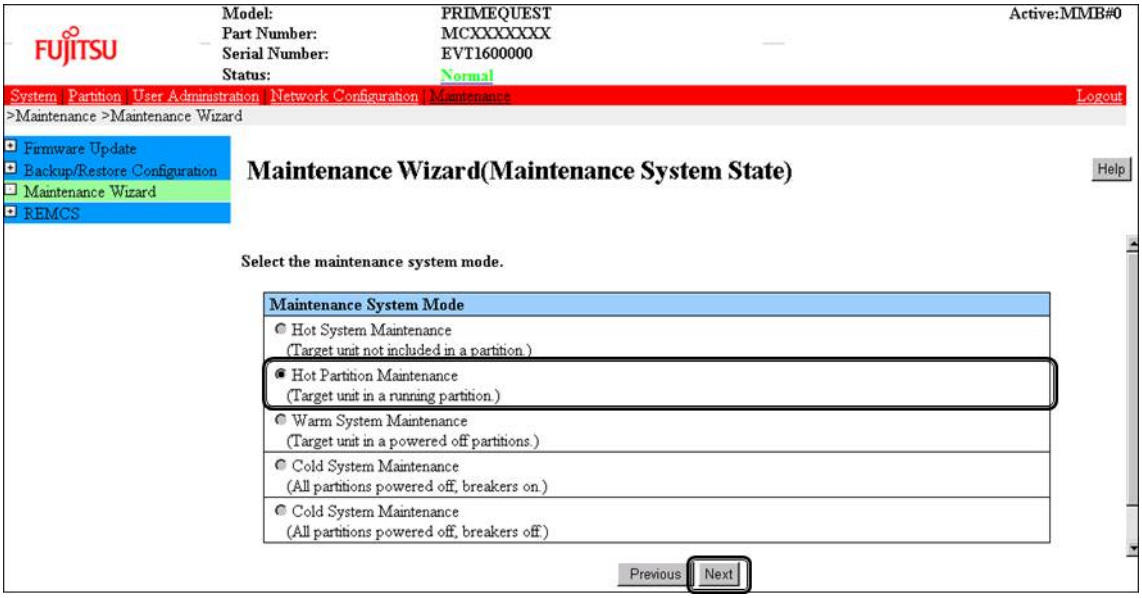
4. Select the radio button of PCI_Box with the particular number, click [Next]
   Example of operation for hot replacing PCI Express card of PCIC#1 mounted on PCI_Box#0



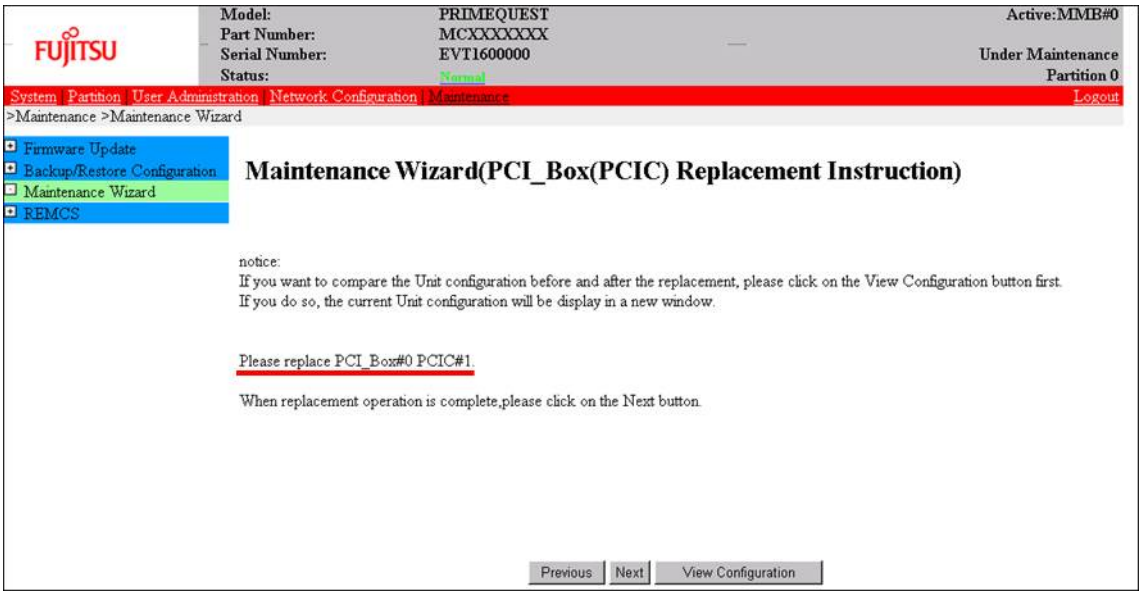
5. Select the radio button of the particular PCIC number and click [Next]



6. Select [Hot Partition Maintenance (Target unit in a running partition.)] and click [Next]



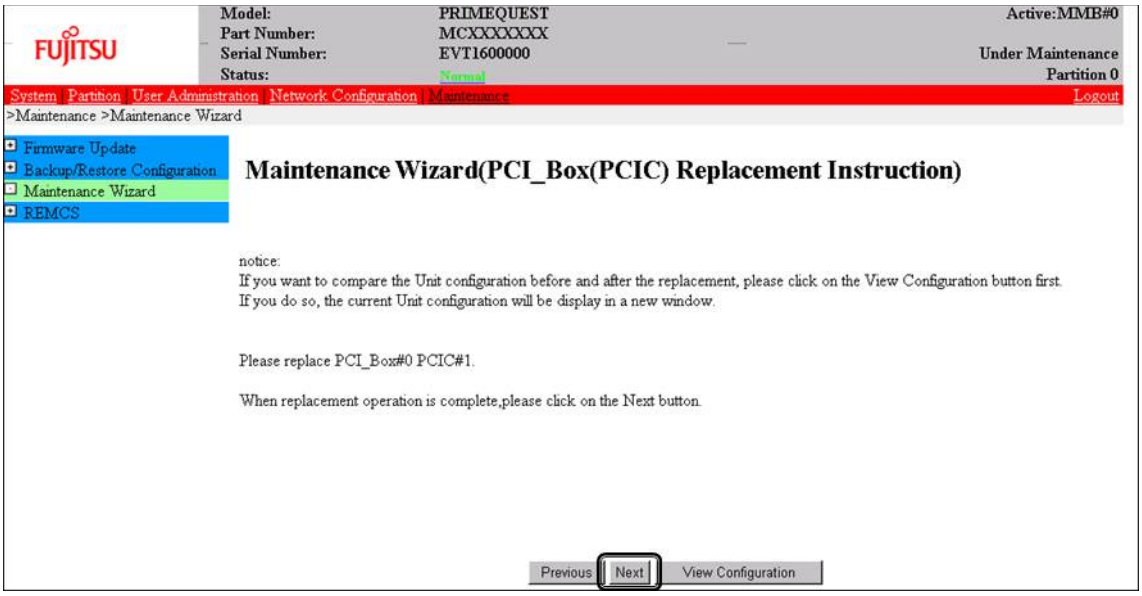
7. Maintenance mode is set (with information area of MMB Web-UI gray out) and then replacement instruction for the particular PCIC appears. Add a new PCI Express card with this window displayed. See the figure in 'B.1 Physical Mounting Locations of Components' to confirm the location of the PCI Express card to be replaced.



Note
Do NOT click [Next] until adding the PCIC.

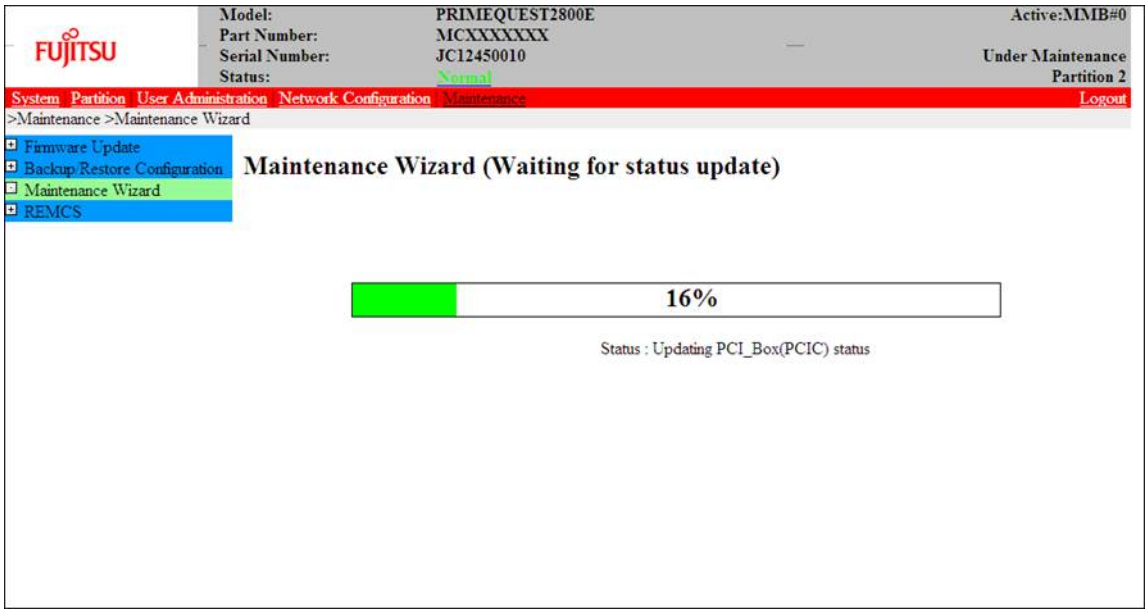
8. After adding the particular PCIC, mount cables other than LAN cables.
Note
In GLS configuration with NIC switching way, mount also LAN cables.

9. After replacing the particular PCIC and powering on the particular PCIC slot, click [Next].
For how to power on the PCIC slot, see "Powering on and off PCI Express slots" in "7.1.2 PCI Express card replacement procedure in detail".
It is the administrator of your system who power on the PCI Express slot.

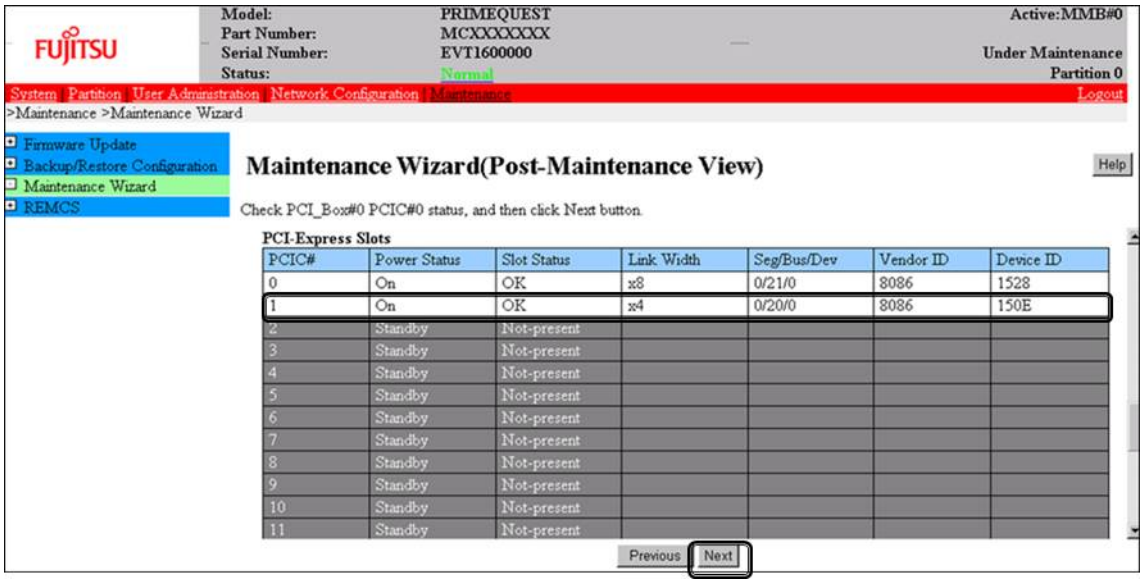


Note
Ask the administrator of your system to power on the PCI Express slot.

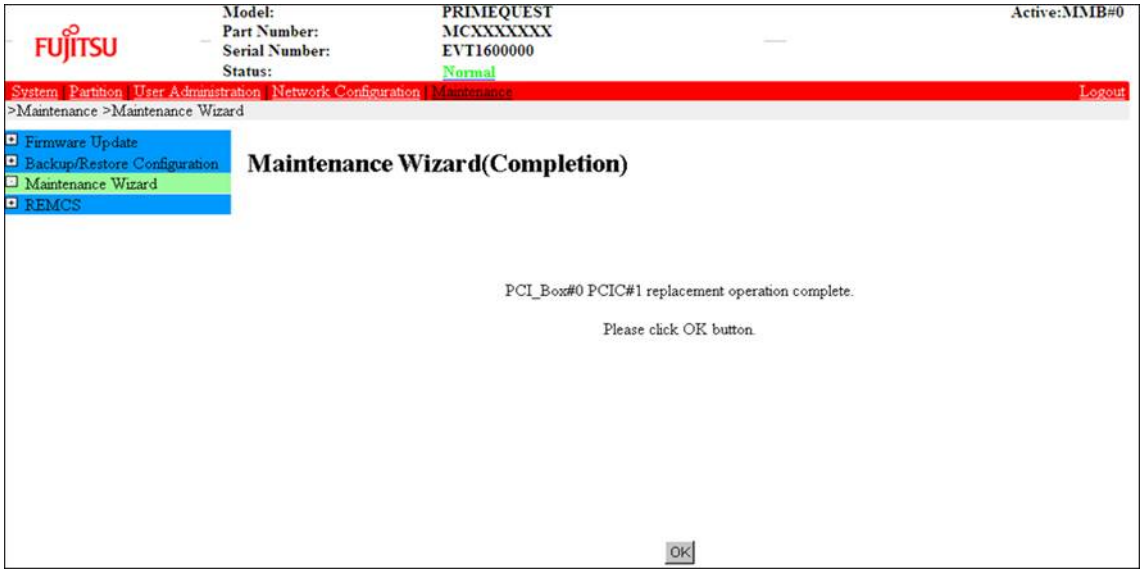
10. The window updating status appears.



11. Check the status of added PCIC and click [Next].



12. Confirm that maintenance mode has been released (with information area of MMB Web-UI not gray out) and click [Next].



7.8.3 FC card (Fibre Channel card) addition procedure

The descriptions in this section assume that an FC card is being added.
Notes

- The FC card used for SAN boot does not support hot plugging.
- This section does not cover configuration changes in peripherals (e.g., UNIT addition or removal for a SAN disk device).
- This manual does not describe how to change the configuration of peripherals such as expanding and removing the unit of SAN disk device.
- To prevent a device name mismatch due to the failure, addition, removal, or replacement of an FC card, access the SAN disk unit by using the by-id name (/dev/disk/by-id/...) for the device name.
- If all the paths in a mounted disk become hidden when an FC card is hot replaced, unmount the disk. Then, execute PCI hot plug.

FC card addition procedure

The procedure for adding new FC cards and peripherals is as follows.

1. Confirm the slot number of the PCI slot by using the following procedure.
   See ‘Confirming the slot number of a PCI Express slot’ in “7.1.2 PCI Express card replacement procedure in detail”.
2. Confirm that power status of the PCI Express slot is off.
   See ‘Checking the power status of a PCI Express slot’ in “7.1.2 PCI Express card replacement procedure in detail”.
3. Physically add the target card by using MMB Maintenance Wizard.
   For details on the operation of replacement, see step 1 to 7 of ‘Operation for Hot replacement of PCI Express card by Maintenance Wizard’ in “7.2.2 PCI Express card addition procedure in detail”.
4. Reconfigure the peripheral according to its manual.
   For example, suppose that the storage device used is ETERNUS and that the host affinity function is used (to set the access right for each server). Their settings would need to be changed as a result of FC card replacement.
5. Connect the FC card cable.
6. Power on the PCI Express slot.
   See ‘Powering on and off PCI Express slots’ in “7.1.2 PCI Express card replacement procedure in detail”.

7. Check whether there is an error in added FC card by MMB Maintenance Wizard.
   This step is performed by the field engineer in charge of your system.
   For details on the operation of replacement, see step 8 to 11 of 'Operation for Hot replacement of PCI Express card by Maintenance Wizard' in "7.2.2 PCI Express card addition procedure in detail".

8. Check the version of the firmware
   It is required that the firmware version of new FC card is same as the FC card which had been replaced.
   If the firmware version of new FC card is same as the FC card which had been replaced (current firmware version), it is not necessary to update the firmware version of new FC card to current firmware version.
   If the firmware version of new FC card is not same as the FC card which had been replaced (current firmware version), update the firmware version of new FC card to current firmware version.
   For how to update the firmware version, see Firmware update manual for fibre channel card.
   Note
   If you cannot confirm the firmware version of the FC card before replacing due to the fault of the FC card, check the firmware version of the FC card which is same type as the faulty one to update firmware version.

9. Confirm the incorporation results
   The method of confirming is the same as that is performed in the replacement of FC card. See 'Confirming the FC card incorporation results' in '7.1.3 FC card (Fibre Channel card) replacement procedure'.

7.8.4 Network card addition procedure

NIC (network card) addition using hot plugging needs specific processing before and after PCI slot power-on or power-off. Its procedure also includes the common PCI Express card addition procedure.
The procedure describes operations where a single NIC is configured as one interface. It also describes cases where multiple NICs are bonded together to configure one interface (bonding configuration). For bonding multiple NIC by using PRIMECLUSTER Global Link Services (GLS), see 'PRIMECLUSTER Global Link Service Configuration and Administration Guide Redundant Line Control Function' (J2UZ-7781).

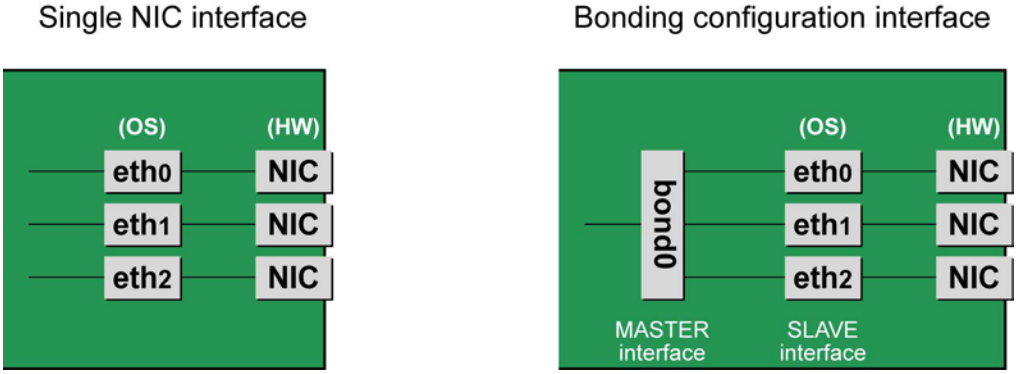


FIGURE 7.4 Single NIC interface and bonding configuration interface

NIC addition procedure

This section describes the procedure for hot plugging only a network card.
Note
When adding multiple NICs, be sure to add them one by one. If you do this with multiple cards at the same time, the correct settings may not be made.

1. Confirm the existing interface names.
   To confirm the interface names, execute the following command.
   Example: eth0 is the only interface on the NIC.

```
# /sbin/ifconfig -a
eth0  Link encap:Ethernet HWaddr 00:0E:0C:70:C3:38
BROADCAST MULTICAST MTU:1500 Metric:1
RX packets:0 errors:0 dropped:0 overruns:0 frame:0
TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:1000
RXbytes:0 (0.0 b) TX bytes:0 (0.0 b)

Lo   Link encap:Local Loopback
```

```
inet addr:127.0.0.1 Mask:255.0.0.0
UP LOOPBACK RUNNING MTU:16436 Metric:1
RX packets:0 errors:0 dropped:0 overruns:0 frame:0
TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:0
RXbytes:0 (0.0 b) TX bytes:0 (0.0 b)
```

2. Confirm the slot number of the PCI Express slot by using the following procedure.
   See ‘Confirming the slot number of a PCI Express slot’ in “7.1.2 PCI Express card replacement procedure in detail”.

3. Confirm that power status of the PCI Express slot
   See ‘Checking the power status of a PCI Express slot’ in “7.1.2 PCI Express card replacement procedure in detail”.

4. Physically add the target NIC by using MMB Maintenance Wizard.
   For details on the operation of replacement, see step 1 to 7 of ‘Operation for Hot replacement of PCI Express card by Maintenance Wizard’ in “7.2.2 PCI Express card addition procedure in detail”
   This step is performed by the field engineer in charge of your system.

5. Power on the PCI Express slot.
   See ‘Powering on and off PCI Express slots’ in “7.1.2 PCI Express card replacement procedure in detail”.

6. Check whether there is an error in added FC card by MMB Maintenance Wizard.
   This step is performed by the field engineer in charge of your system.
   For details on the operation of replacement, see step 8 to 11 of ‘Operation for Hot replacement of PCI Express card by Maintenance Wizard’ in “7.2.2 PCI Express card addition procedure in detail”.

7. Confirm the newly added interface name.
   Powering on the slot creates an interface (ethX) for the added NIC. Execute the following command.
   Compare its results with those of step 1 to confirm the created interface name.

   ```
   # /sbin/ifconfig –a
   ```

8. Confirm the hardware address of the newly added interface.
   Confirm the hardware address (HWaddr) and the created interface by executing the ifconfig command.
   For a single NIC with multiple interfaces, confirm the hardware addresses of all the created interfaces.
   Example: eth1 is a new interface created for the added NIC.

   ```
   # /sbin/ifconfig -a
   eth0  Link encap:Ethernet HWaddr 00:0E:0C:70:C3:38
   BROADCAST MULTICAST MTU:1500 Metric:1
   RX packets:0 errors:0 dropped:0 overruns:0 frame:0
   TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
   collisions:0 txqueuelen:1000
   RXbytes:0 (0.0 b) TX bytes:0 (0.0 b)

   eth1  Link encap:Ethernet HWaddr 00:0E:0C:70:C3:40
   BROADCAST MULTICAST MTU:1500 Metric:1
   RX packets:0 errors:0 dropped:0 overruns:0 frame:0
   TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
   collisions:0 txqueuelen:1000
   RXbytes:0 (0.0 b) TX bytes:0 (0.0 b)

   lo  Link encap:Local Loopback
   inet addr:127.0.0.1 Mask:255.0.0.0
   UP LOOPBACK RUNNING MTU:16436 Metric:1
   RX packets:0 errors:0 dropped:0 overruns:0 frame:0
   TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
   collisions:0 txqueuelen:0
   RXbytes:0 (0.0 b) TX bytes:0 (0.0 b)
   ```

9. Create an interface configuration file.
   Create an interface configuration file (/etc/sysconfig/network/ifcfg-ethX) for the newly created interface as follows. In "HWADDR," set the hardware address confirmed in step 8.
   If multiple NICs are added or if a NIC where multiple interfaces exist is added, create a file for all the interfaces.

   The explanation here assumes, as an example, that a name automatically assigned by the system is

used. To install a new interface, you can use a new interface name different from the one automatically assigned by the system. Normally, there is no requirement on the name specified for a new interface. To use an interface name other than the one automatically assigned by the system, follow the instructions in step 14 of the 'NIC replacement procedure' in '7.1.4 Network card replacement procedure'.

The contents differ slightly depending on whether the interface is a single NIC interface or a SLAVE interface of the bonding configuration.
[For a single NIC interface]

```
(Example)
DEVICE=eth1              <- Specified interface name
confirmed in step g
NM_CONTROLLED=no
BOOTPROTO=static
HWADDR=00:0E:0C:70:C3:40
BROADCAST=192.168.16.255
IPADDR=192.168.16.1
NETMASK=255.255.255.0
NETWORK=192.168.16.0
ONBOOT=yes
TYPE=Ethernet
```

[SLAVE interface of the bonding configuration]

```
(Example)
DEVICE=eth1              <- Specified interface name
confirmed in step g
NM_CONTROLLED=no
BOOTPROTO=static
HWADDR=00:0E:0C:70:C3:40
MASTER=bondY
SLAVE=yes
ONBOOT=yes
```

Note
Adding the bonding interface itself also requires the MASTER interface configuration file of the bonding configuration.

10. To add a bonding interface, configure the bonding interface driver settings.
    If the bonding interface has already been installed, execute the following command to check the descriptions in the configuration file and confirm the setting corresponding to the bonding interface and driver.
    Example: Description in /etc/modprobe.d/bonding.conf

```
# grep -l bonding /etc/modprobe.d/*
/etc/modprobe.d/bonding.conf
```

Note
If the configuration file is not found or if you are performing an initial installation of the bonding interface, create a configuration file with an arbitrary file name with the ".conf" extension (e.g., /etc/modprobe.d/bonding.conf) in the /etc/modprobe.d directory).
After specifying the target configuration file, add the setting for the newly created bonding interface.

```
alias bondY bonding      <- Add (bondY: Name of the newly
added bonding interface)
```

You can specify options of the bonding driver in this file. Normally, the BONDING_OPTS line in each ifcfg- bondY file is used. Options can be specified to the bonding driver.

11. Activate the added interface.
    Execute the following command to activate the interface. Activate all the necessary interfaces. The activation method depends on the configuration.
    [For a single NIC interface]
    Execute the following command to activate the interface. Activate all the necessary interfaces.

```
# /sbin/ifup ethX
```

[For the bonding configuration]
For a SLAVE interface added to an existing bonding configuration, execute the following command to

incorporate it into the bonding configuration.
Example: bondY is the bonding interface name, and ethX is the name of the interface to be incorporated.

```
# /sbin/ifenslave bondY ethX
```

For a newly added bonding interface with a SLAVE interface, execute the following command to activate the interfaces. You need not execute the ifenslave command individually for the SLAVE interface.

```
# /sbin/ifup bondY
```

12. Mount all cables connected to the particular PCIC.
    This step is performed by the field engineer in charge of your system.
    Note
    In GLS configuration with NIC switching way, you do not need to perform this step.

7.9 Removing PCI Express cards

This section describes the PCI Express card removal procedure with the PCI Hot Plug function.
The procedure includes common steps for all PCI Express cards and the additional steps required for a specific card function or driver.
Thus, the descriptions cover both the common operations required for all cards (e.g., power supply operations) and the specific procedures required for certain types of card. For details on removal of the cards not described in this section, see the respective product manuals.
There are two ways to perform PCI hot plug:

- Operation by using sysfs
- Operation by using dr commands

You can perform the operation by using dr commands if Dynamic Reconfiguration utility is installed in the partition. If not, be sure to use the operation by using sysfs. Although you can perform the operation by using sysfs even if Dynamic Reconfiguration utility is installed in the partition, it is recommended to perform the operation by using dr commands to prevent wrong operation.
Hereafter, description about the operation by using dr commands starts at ‘For the partition with Dynamic Reconfiguration utility installed’ and description about the operation by sysfs starts at ‘For the partition without Dynamic Reconfiguration utility installed’.
Notes

- If you hot remove PCI Express cards from an IOU, see ‘7.6 IOU hot remove’.
- In hot removal of PCI Express cards, if you reboot the partition on OS without hot adding new PCI card to same PCI Express slot after you performed hot remove command, you cannot hot add a PCI Express card to the PCI Express slot unless you power off the partition.
  If you reboot the partition on OS before hot adding, you must power off the partition and replace the PCI Express card.

7.9.1 Common removal procedures for all PCI Express cards

1. Performing the required operating system and software operations depending on the PCI Express card type
2. Powering off a PCI slot
3. Removing a PCI Express card
4. Performing the required operating system and software operations depending on the PCI Express card type

Note
This section describes instructions for the operating system and subsystems (e.g., commands, configuration file editing). Be sure to refer to the respective product manuals to confirm the command syntax and impact on the system before performing tasks with those instructions.

The following sections describe card removal with the required instructions (e.g., commands, configuration file editing) for the operating system and subsystems, together with the actual hardware operations. Step 3 is performed by the field engineer in charge of your system.

7.9.2 PCI Express card removal procedure in detail

This section describes operations that must be performed in the PCI Express card removal procedure.

Preparing the software using a PCI Express card

See ‘Preparing the software using a PCI Express card’ in “7.1.2 PCI Express card replacement procedure in detail”.

Confirming the slot number of a PCI Express slot

See ‘Confirming the slot number of a PCI Express slot’ in “7.1.2 PCI Express card replacement procedure in detail”.

Checking the power status of a PCI Express slot

See ‘Checking the power status of a PCI Express slot’ in “7.1.2 PCI Express card replacement procedure in detail”.

Powering off PCI Express slots

See ‘Powering on and off PCI Express slots’ in “7.1.2 PCI Express card replacement procedure in detail”.

7.9.3 FC card (Fibre Channel card) removal procedure

The descriptions in this section assume that an FC card is being removed.
Notes

- The FC card used for SAN boot does not support hot plugging.
- If all the paths in a mounted disk become hidden when an FC card is hot replaced, unmount the disk. Then, execute

FC card removal procedure

The procedure for removing an FC card and peripherals is as follows.

1. Make the necessary preparations.
   Stop access to the FC card by stopping applications or by other such means.
2. Confirm the slot number of the PCI slot by using the following procedure.
   See ‘Confirming the slot number of a PCI Express slot’ in “7.1.2 PCI Express card replacement procedure in detail”.
3. Power off the PCI Express slot.
   See ‘Powering on and off PCI Express slots’ in “7.1.2 PCI Express card replacement procedure in detail”.
4. After taking off all cables connected to the target card, physically remove the target card.

7.9.4 Network card removal procedure

Network card (referred to as NIC below) removal using hot plugging needs specific processing before and after PCI slot power-on or power-off. Its procedure also includes the common PCI Express card removal procedure.
The procedure describes operations where a single NIC is configured as one interface. It also describes cases where multiple NICs are bonded together to configure one interface (bonding configuration). For bonding multiple NIC by using PRIMECLUSTER Global Link Services (GLS), see 'PRIMECLUSTER Global Link Service Configuration and Administration Guide Redundant Line Control Function' (J2UZ-7781).

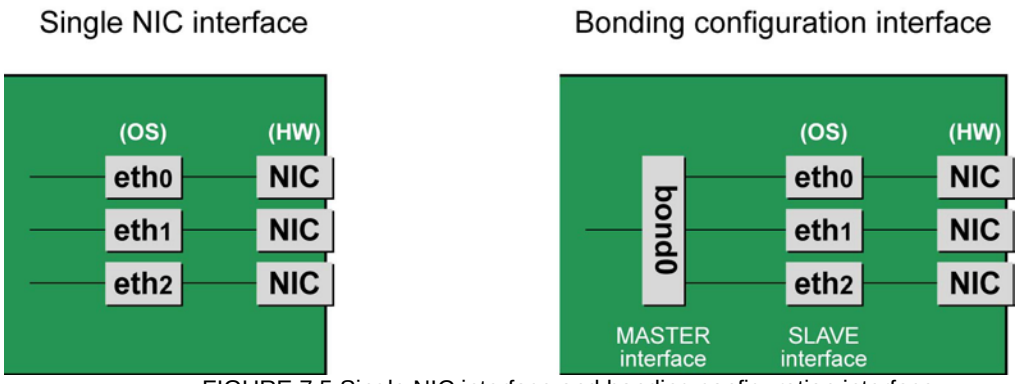


FIGURE 7.5 Single NIC interface and bonding configuration interface

NIC removal procedure

This section describes the procedure for hot plugging only a network card.

Note

When removing multiple NICs, be sure to remove them one by one. If you do this with multiple cards at the same time, the correct settings may not be made.

1. Confirm the slot number of the PCI slot that has the mounted interface.
   Confirm the interface mounting location through the configuration file information and the operating system information.
   First, confirm the bus address of the PCI slot that has the mounted interface to be removed.

```
# ls -l /sys/class/net/eth0/device
lrwxrwxrwx 1 root root 0 Sep 29 09:26 /sys/class/net ¥
/eth0/device
->../../../0000:00:01.2/0000:08:00.2/0000:0b:01.0
```

   The ¥ at the end of a line indicates that there is no line feed.

   Excluding the rest of the directory path, check the part corresponding to the file name in the symbolic link destination file of the output results. In the above example, the underlined part shows the bus address. ("0000:0b:01" in the example)

   Next, check the PCI slot number for this bus address.

```
# grep -il 0000:0b:01 /sys/bus/pci/slots/*/address
/sys/bus/pci/slots/20/address
```

   Read the output file path as shown below, and confirm the PCI slot number.

```
/sys/bus/pci/slots/<slot number>/address
```

   Notes

   If the above file path is not output, it indicates that the NIC is not mounted in a PCI slot (e.g., GbE port in the IOU).

   With the PCI slot number confirmed here, see 'D.2 Correspondence between PCI Slot Mounting Locations and Slot Numbers' to check the mounting location, and see also 'B.1 Physical Mounting Locations of Components' to identify the physical mounting location corresponding to the PCI slot number. You can confirm that it matches the mounting location of the operational target NIC.

2. Confirm each interface on the same NIC.
   If the NIC has multiple interfaces, you need to remove all of them. Confirm that all the interfaces that have the same bus address in a subsequent command.

```
# ls -l /sys/class/net/*/device | grep "0000:0b:01"
lrwxrwxrwx 1 root root 0 Sep 29 09:26 /sys/class/net ¥
/eth0/device
->../../../0000:00:01.2/0000:08:00.2/0000:0b:01.0
lrwxrwxrwx 1 root root 0 Sep 29 09:26 /sys/class/net ¥
/eth1/device
->../../../0000:00:01.2/0000:08:00.2/0000:0b:01.1
```

   The ¥ at the end of a line indicates that there is no line feed.
   As the above example shows, when more than one interface is displayed, they are on the same NIC.

3. Execute the higher-level application processing required before NIC removal.
   Stop all access to the interface as follows. Stop the application that was confirmed in step 2 as using the interface, or exclude the interface from the target of use by the application.

4. Deactivate the NIC.
   Execute the following command to deactivate all the interfaces that you confirmed in step 2.
   The applicable command depends on whether the target interface is a single NIC interface or the SLAVE interface of a bonding device.

   [For a single NIC interface]

   ```
   # /sbin/ifdown ethX
   ```

   If the single NIC interface has a VLAN device, you also need to remove the VLAN interface. Perform the following operations. (These operations precede deactivation of the physical interface.)

   ```
   # /sbin/ifdown ethX.Y
   # /sbin/vconfig rem ethX.Y
   ```

   [For the interface under bonding]
   If the bonding device is operating in mode 1, use the following steps to exclude SLAVE interface to be replaced from the bonding configuration. In any other mode, removing it immediately should not cause any problems. Confirm that the SLAVE interface is the interface currently being used for communication.

   ```
   # cat /sys/class/net/bondY/bonding/active_slave
   ```

   If the displayed interface name corresponds to the SLAVE interface to be removed, execute the following command to switch to communicating now with the other SLAVE interface.

   ```
   # /sbin/ifenslave -c bondY ethZ
   (ethZ: bondY-configured interface not subject to hot
   replacement)
   ```

   Finally, remove the SLAVE interface being replaced, from the bonding configuration. Immediately after being removed, the interface is automatically no longer used.

   ```
   # /sbin/ifenslave -d bondY ethX
   ```

   To remove the interfaces, including the bonding device, deactivate them collectively by executing the following command.

   ```
   # /sbin/ifdown bondY
   ```

5. Power off the PCI slot.
   See ‘Powering on and off PCI Express slots’ in “7.1.2 PCI Express card replacement procedure in detail”.

6. After taking of all cables connected to the NIC, remove the NIC from the PCI Express slot.

7. Remove the interface configuration file.
   Delete the configuration files of all the interfaces confirmed in step 1, by executing the following command.

   ```
   # rm /etc/sysconfig/network/ifcfg-ethX
   ```

   When deleting a bonding device, also delete the related bonding items (ifcfg-bondY files).

8. Edit the settings in the udev function rule file.
   The entries of the interface assigned to the removed NIC still remain in the udev function rule file, /etc/udev/ rules.d/70-persistent-net.rules. Leaving the entries will affect the determination of interface names for replacement cards or added cards in the future. For this reason, delete or comment out those entries.
   The following example shows editing of the udev function rule file, /etc/udev/rules.d/70-persistent-net.rules. (In this example, the file is edited when the eth10 interface is removed.)
   [Example of descriptions in the file before editing]

   ```
   SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*", ¥
   ATTR{address}=="00:0e:0c:70:c3:38", ATTR{type}=="1", ¥
   KERNEL=="eth*", NAME="eth0"
    :
    :
   SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*", ¥
   ATTR{address}=="00:0e:0c:70:c3:40", ATTR{type}=="1", ¥
   KERNEL=="eth*", NAME="eth10"
   ```

The ¥ at the end of a line indicates that there is no line feed.

[Example of descriptions in the file after editing]
The entries for the eth10 interface are commented out.

```
SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*", ¥
ATTR{address}=="00:0e:0c:70:c3:38", ATTR{type}=="1", ¥
KERNEL=="eth*", NAME="eth0"
 :
 :
# SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*", ¥
ATTR{address}=="00:0e:0c:70:c3:40", ATTR{type}=="1", ¥
KERNEL=="eth*", NAME="eth10"
```

The ¥ at the end of a line indicates that there is no line feed.
Do this editing for all the interfaces confirmed in step 2.

9. Reflect the udev function rules.
   Since rules are not automatically reflected in udev at the removal time, take action to reflect the new rules in udev.

```
# udevadm control --reload-rules
```

10. If the removed interface includes any bonding interface, delete the driver setting of the interface.
    When removing a bonding interface, be sure to delete the setting corresponding to the bonding interface and driver. Execute the following command to check the descriptions in the configuration file, and confirm the setting corresponding to the bonding interface and driver.

    Example: Description in /etc/modprobe.d/bonding.conf

```
# grep -l bonding /etc/modprobe.d/*

/etc/modprobe.d/bonding.conf
```

    Edit the file that describes the setting, and delete the setting of the removed bonding interface.

```
alias bondY bonding        <- Delete
```

    bondY: Name of the removed bonding interface
    Note
    There are no means to dynamically remove the MASTER interface (bondY) of the bonding configuration. If you want to remove the entire bonding interface, you can disable the bonding configuration and remove all the SLAVE interfaces but the MASTER interface itself remains.

11. Execute the higher-level application processing required after NIC removal.
    Perform the necessary post processing (such as changing application settings or restarting an application) for the operations performed for the higher-level applications in step 3.

7.9.5 Hot removal procedure for iSCSI (NIC)

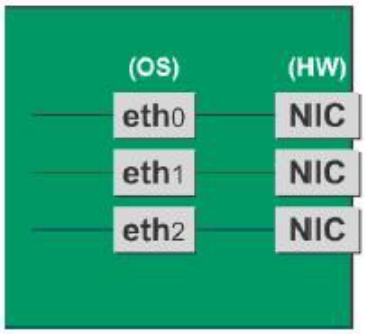
When performing hot replacement of NICs used for iSCSI connection, use the following procedures.

- 7.3.1 Common removal procedures for all PCI Express cards
- 7.3.2 PCI Express card removal procedure in detail
- 7.3.4 Network card removal procedure

A supplementary explanation of the procedure follows.

Prerequisites for iSCSI (NIC) hot removal

- The prerequisites for iSCSI (NIC) hot replacement are as follows.
- The storage connection is established on a multipath using DM-MP (Device-Mapper Multipath) or ETERNUS multidriver (EMPD).
- To replace more than one iSCSI card, one card at a time will be replaced.
- A single NIC is configured as one interface.



Work to be performed before iSCSI (NIC) removal

For iSCSI (NIC) hot replacement, be sure to follow the procedure below when performing Step 3 of the 'NIC removal procedure' in '7.3.4 Network card removal procedure'

1. Perform the work for suppressing access to the iSCSI connection interface.

   a. Confirm the state of multiple path by DM-MP (*1) or EMPD (*2).

   b. Use the iscsiadm command to log out from the path (iqn) through which the iSCSI card to be replaced is routed, and disconnect the session.
   Example which confirms the state of session before disconnecting:

```
# /sbin/iscsiadm -m session
tcp: [1] 192.168.1.64:3260,1 iqn.2000-
09.com.fujitsu:storage-system.eternus-
dx400:00001049.cm0ca0p0
tcp: [2] 192.168.2.66:3260,3 iqn.2000-
09.com.fujitsu:storage-system.eternus-
dx400:00001049.cm1ca0p0
```

   Example which logout path going through a NIC to be replaced:

```
# /sbin/iscsiadm -m node -T iqn.2000-09.com.fujitsu:storage-
system.eternus-dx400:00001049.cm1ca0p0 -p 192.168.2.66:3260
--logout
```

   c. Use the iscsiadm command to confirm that the target session has been disconnected.
   Example which confirms the state of session after disconnecting

```
# /sbin/iscsiadm -m session
tcp: [1] 192.168.1.64:3260,1 iqn.2000-
09.com.fujitsu:storage-system.eternus-
dx400:00001049.cm0ca0p0
```

   d. You can confirm the disconnection of sessions on multipath products using DM-MP or ETERNUS multidriver.
   *1: Write down the DM-MP display contents at the session disconnection.
   Example of DM-MP display before disconnecting path

```
# /sbin/multipath -ll
mpath1 (36000b5d0006a0000006a104900000000) dm-0
FUJITSU,ETERNUS_DX400
[size=50G][features=0][hwhandler=0][rw]
¥_ round-robin 0 [prio=2][active]
 ¥_ 3:0:0:0 sdb 8:16  [active][ready]
 ¥_ 4:0:0:0 sdc 8:32  [active][ready]
```

   Example of DM-MP display after disconnecting path

```
# /sbin/multipath -ll
mpath1 (36000b5d0006a0000006a104900000000) dm-0
FUJITSU,ETERNUS_DX400
[size=50G][features=0][hwhandler=0][rw]
¥_ round-robin 0 [prio=1][enabled]
 ¥_ 3:0:0:0 sdb 8:16  [active][ready]
```

   *2: See the ETERNUS Multipath Driver User's Guide (For Linux).

CHAPTER 8 Replacement of HDD/SSD

This chapter describes how to replace Hard Disk Drives (HDD) or Solid State Drives (SSD).
In PRIMEQUEST 2400E3/2800E3/2800B3/2400E2/2800E2/2800B2, it is required to use HII Configuration Utility for replacing a HDD or SSD. For details on HII Configuration Utility, see 'SAS3 12 Gb/s MegaRAID SAS Software'. For how to start HII Configuration Utility, see "*PRIMEQUEST 2000 series Installation Manual*" (CA92344-0536)
In PRIMEQUEST 2400E/2800E/2800B, it is required to use WebBIOS for replacing a HDD or SSD. For details on WebBIOS, see 'WebBIOS Configuration Utility' in 'MegaRAID SAS Software'. For how to start WebBIOS, see "*PRIMEQUEST 2000 series Installation Manual*" (CA92344-0536)

8.1 Hot replacement of HDD/SSD with Hardware RAID configuration

This section describes how to replace Hard Disk Drives (HDD) or Solid State Drives (SSD) with Hardware RAID configuration.

8.1.1 Hot replacement of failed HDD/SSD with RAID0 configuration

This section describes the workflow of hot replacement of HDD or SSD with RAID0 configuration when one HDD or SSD fails.
Remarks

- Hot replacement of HDD or SSD can be performed only when HDDs or SSDs are mirror configuration by using software such as PRIMECLUSTER GDS.
- Step1 and Step2 are performed by field engineers in charge of your system.

1. Replace HDD or SSD with the Alarm LED on by using MMB Maintenance Wizard.
2. Create a logical drive with RAID0 configuration by using MMB Maintenance Wizard.
3. Confirm whether [Status] of replaced HDD or SSD has been already 'Operational' by MMB Web-UI. How to confirm the status differs depending on whether the HDD or SSD is included in an SB or in a DU.
   - For replacement of a HDD or SSD included in an SB
     Confirm whether [Status] of replaced HDD or SSD has been already 'Operational' by [System] – [SB] – [SBx] window of MMB Web-UI. For details on [SBx] window, see '1.2.13 [SB] menu' in "PRIMEQUEST 2000 series *Tool Reference*" (CA92344-0539).
   - For replacement of a HDD or SSD included in a DU
     Confirm whether [Status] of replaced HDD or SSD has been already 'Operational' by [System] – [DU] – [DUx] window of MMB Web-UI. For details on [SBx] window, see '1.2.15 [DU] menu' in "PRIMEQUEST 2000 series *Tool Reference*" (CA92344-0539).

8.1.2 Hot replacement of failed HDD/SSD with RAID 1, RAID 1E, RAID 5, RAID 6, or RAID 10 configuration

This section describes the workflow of hot replacement of HDD or SSD with RAID 1, RAID 1E, RAID 5, RAID 6, or RAID 10 configuration when one HDD or SSD fails.
Remarks

- Step1 is performed by field engineers in charge of your system.
- Copy back may run after rebuild has been completed.

1. Replace the HDD or SSD with the Alarm LED on by using MMB Maintenance Wizard.
   Note
   When set a spare disk, set the HDD or SSD to the spare disk by using Maintenance Wizard if the status of the replaced HDD or SSD is 'Available'.

2. Confirm whether a rebuild of the HDD or SSD has been already completed by using the steps below depending on whether a spare disk is set or not.

   - If not set a spare disk
     A rebuild is automatically performed to replaced HDD or SSD. Then, the Alarm LED of the HDD or SSD starts blinking.
     Confirm whether a rebuild of replaced HDD or SSD has been already completed by MMB Web-UI. How to confirm the status differs depending on whether the HDD or SSD is included in an SB or in a DU.

     - For replacement of a HDD or SSD included in an SB
       Confirm whether [Status] of replaced HDD or SSD has been already 'Operational' by [System] – [SB] – [SBx] window of MMB Web-UI. For details on [SBx] window, see '1.2.13 [SB] menu' in "PRIMEQUEST 2000 series *Tool Reference*" (CA92344-0539).

     - For replacement of a HDD or SSD included in a DU
       Confirm whether [Status] of replaced HDD or SSD has been already 'Operational' by [System] – [DU] – [DUx] window of MMB Web-UI. For details on [SBx] window, see '1.2.15 [DU] menu' in "PRIMEQUEST 2000 series *Tool Reference*" (CA92344-0539).

   - If set a spare disk:
     A rebuild has been already automatically performed to the HDD or SSD set as a spare disk. The replaced HDD or SSD automatically becomes a spare disk. The Alarm LED of the HDD or SSD goes out.
     Confirm whether [Status] of replaced HDD or SSD has been already 'Hot spare' by MMB Web-UI. How to confirm the status differs depending on whether the HDD or SSD is included in an SB or in a DU.

     - For replacement of a HDD or SSD included in an SB
       Confirm whether [Status] of replaced HDD or SSD has been already 'Hot Spare' by [System] – [SB] – [SBx] window of MMB Web-UI. For details on [SBx] window, see '1.2.13 [SB] menu' in "PRIMEQUEST 2000 series *Tool Reference*" (CA92344-0539).

     - For replacement of a HDD or SSD included in a DU
       Confirm whether [Status] of replaced HDD or SSD has been already 'Hot Spare' by [System] – [DU] – [DUx] window of MMB Web-UI. For details on [SBx] window, see '1.2.15 [DU] menu' in "PRIMEQUEST 2000 series *Tool Reference*" (CA92344-0539).

8.2 Preventive replacement of HDD/SSD with Hardware RAID configuration

This section describes how to perform the preventive replacement of Hard Disk Drives (HDD) or Solid State Drives (SSD) with Hardware RAID configuration.

8.2.1 Preventive replacement of failed HDD/SSD with RAID0 configuration

This section describes the workflow of preventive replacement of HDD or SSD with RAID0 configuration.

For mirror configuration

Hot preventive replacement can be performed if HDDs or SSDs are mirror configuration by software such as PRIMECLUSTER GDS.

Remarks

- Step1 and Step2 are performed by field engineers in charge of your system.
- If HDD or SSD other than target HDD or SSD for preventive replacement fails in step3, field engineers in charge of your system replace the failed HDD or SSD.

1. Replace HDD or SSD with the Alarm LED on by using MMB Maintenance Wizard.
2. Create a logical drive with RAID0 configuration by using MMB Maintenance Wizard.
3. Confirm whether [Status] of replaced HDD or SSD has been already 'Operational' by MMB Web-UI. How to confirm the status differs depending on whether the HDD or SSD is included in an SB or in a DU.

   - For replacement of a HDD or SSD included in an SB
     Confirm whether [Status] of replaced HDD or SSD has been already 'Operational' by [System] – [SB] –

[SBx] window of MMB Web-UI. For details on [SBx] window, see '1.2.13 [SB] menu' in "PRIMEQUEST 2000 series *Tool Reference*" (CA92344-0539).

- For replacement of a HDD or SSD included in a DU
  Confirm whether [Status] of replaced HDD or SSD has been already 'Operational' by [System] – [DU] – [DUx] window of MMB Web-UI. For details on [SBx] window, see '1.2.15 [DU] menu' in "PRIMEQUEST 2000 series *Tool Reference*" (CA92344-0539).

For non-mirror configuration (replacement with the partition power off)

If HDDs or SSDs are not mirror configuration, preventive replacement of a HDD or SSD has to be performed with the partition power off
Remarks

- If HDD or SSD other than target HDD or SSD for preventive replacement fails in step3, field engineers in charge of your system replace the failed HDD or SSD.
- Step7 is performed by the field engineer in charge of your system.

1. Back up data in all HDDs or SSDs connected to the RAID controller card to which the target HDD or SSD for preventive replacement is connected.
2. Confirm the HDD or SSD which S.M.A.R.T. has predicted to fail by MMB Web-UI checking mounting location. How to confirm the status differs depending on whether the HDD or SSD is included in an SB or in a DU.
   - When S.M.A.R.T predicted to fail a HDD or SSD included in an SB
     A HDD or SSD which S.M.A.R.T has predicted to fail is a HDD or SSD with its [status] 'SMART error' in [System] – [SB] – [SBx] window of MMB Web-UI. For details on [SBx] window, see '1.2.13 [SB] menu' in "PRIMEQUEST 2000 series *Tool Reference*" (CA92344-0539).
   - When S.M.A.R.T predicted to fail a HDD or SSD included in a DU
     A HDD or SSD which S.M.A.R.T has predicted to fail is a HDD or SSD with its [status] 'SMART error' in [System] – [DU] – [DUx] window of MMB Web-UI. For details on [DUx] window, see '1.2.13 [SB] menu' in "PRIMEQUEST 2000 series *Tool Reference*" (CA92344-0539).
3. If HDD or SSD other than target HDD or SSD for preventive replacement fails, replace the failed HDD or SSD prior to perform preventive replacement
4. Restart the partition.
   In PRIMEQUEST 2400E3/2800E3/2800B3/2400E2/2800E2/2800B2, start HII Configuration Utility from Boot Manager front page.
   In PRIMEQUEST 2400E/2800E/2800B, Start WebBIOS from Boot Manager front page.
5. In PRIMEQUEST 2400E3/2800E3/2800B3/2400E2/2800E2/2800B2, perform Clear Confguration.
   Selet [Clear Configuration] from [Configuration Utility] in [HII Configuration Utility].
   Note
   If you perform [Clear Configuration], all data are deleted.

   In PRIMEQUEST 2400E/2800E/2800B, perform Clear Configuration or delete a VD.
   - For there is only one VD with RAID 0:
     - Select [Clear Configuration] from [Configuration Wizard] in [WebBIOS] and click [Next].
     - If below massage appears, click [Yes].
       "This is Destructive Operation.
       Original configuration and data will be lost.
       Select Yes, if desired so."
       Note
       If you perform [Clear Configuration], all data are deleted. [Configuration Preview] window appears.
   - For the VD number of RAID 0 group is the most biggest among the environment where there are multiple VDs:
     Select the particular VD and delete it.
6. When the data has been erased, exit WebBIOS and power off the partition.
7. Replace the HDD or SSD which S.M.A.R.T. predicted to fail.
8. Start the partition.
   In PRIMEQUEST 2400E3/2800E3/2800B3/2400E2/2800E2/2800B2, start HII Configuration Utility from

the Boot Manager front page.
In PRIMEQUEST 2400E/2800E/2800B, start WebBIOS from the Boot Manager front page.

9. Create an array configuration.
   In PRIMEQUEST 2400E3/2800E3/2800B3/2400E2/2800E2/2800B2, create an array configuration with HII Configuration Utility.
   In PRIMEQUEST 2400E/2800E/2800B, create an array configuration with WebBIOS.
10. Restore backup data or reinstall the operating system.

8.2.2 Preventive replacement of failed HDD/SSD with RAID 1, RAID 1E, RAID 5, RAID 6, or RAID 10 configuration

This section describes the workflow of preventive replacement of HDD or SSD with RAID 1, RAID 1E, RAID 5, RAID 6, or RAID 10 configuration.

Remarks

From step1 to step6 are performed by the field engineer in charge of your system.

1. Make data consistent by MMB Maintenance Wizard to make the HDD or SSD no error.
2. Turn on Alarm LED of the HDD or SSD which S.M.A.R.T. predicted to fail by MMB Maintenance Wizard.
3. Confirm the location of the HDD or SSD, tuning off the Alarm LED by MMB Maintenance Wizard.
4. Make the target HDD or SSD offline by MMB Maintenance Wizard
5. Confirm that [Status] of the target HDD or SSD is ‘Failed’ or ‘Available’.
6. Replace the HDD or SSD of which you confirmed in step2 that Alarm LED turns on.
   Note
   When set a spare disk, set the HDD or SSD to the spare disk by using Maintenance Wizard if the status of the replaced HDD or SSD is ‘Available’.
7. Confirm whether a rebuild of the HDD or SSD has been already completed by using the steps below depending on whether a spare disk is set or not.

   - If not set a spare disk
     A rebuild is automatically performed to replaced HDD or SSD. Then, the Alarm LED of the HDD or SSD starts blinking.
     Confirm whether a rebuild of replaced HDD or SSD has been already completed by MMB Web-UI. How to confirm the status differs depending on whether the HDD or SSD is included in an SB or in a DU.

     - For replacement of a HDD or SSD included in an SB
       Confirm whether [Status] of replaced HDD or SSD has been already ‘Operational’ by [System] – [SB] – [SBx] window of MMB Web-UI. For details on [SBx] window, see ‘1.2.13 [SB] menu’ in “PRIMEQUEST 2000 series *Tool Reference*” (CA92344-0539).
     - For replacement of a HDD or SSD included in a DU
       Confirm whether [Status] of replaced HDD or SSD has been already ‘Operational’ by [System] – [DU] – [DUx] window of MMB Web-UI. For details on [SBx] window, see ‘1.2.15 [DU] menu’ in “PRIMEQUEST 2000 series *Tool Reference*” (CA92344-0539).

   - If set a spare disk:
     A rebuild has been already automatically performed to the HDD or SSD set as a spare disk. The replaced HDD or SSD automatically becomes a spare disk. The Alarm LED of the HDD or SSD goes out.
     Confirm whether [Status] of replaced HDD or SSD has been already ‘Hot spare’ by MMB Web-UI. How to confirm the status differs depending on whether the HDD or SSD is included in an SB or in a DU.

     - For replacement of a HDD or SSD included in an SB
       Confirm whether [Status] of replaced HDD or SSD has been already ‘Hot Spare’ by [System] – [SB] – [SBx] window of MMB Web-UI. For details on [SBx] window, see ‘1.2.13 [SB] menu’ in “PRIMEQUEST 2000 series *Tool Reference*” (CA92344-0539).
     - For replacement of a HDD or SSD included in a DU
       Confirm whether [Status] of replaced HDD or SSD has been already ‘Hot Spare’ by [System] – [DU] – [DUx] window of MMB Web-UI. For details on [SBx] window, see ‘1.2.15 [DU] menu’ in “PRIMEQUEST 2000 series *Tool Reference*” (CA92344-0539).

8.3 Replacement of HDD/SSD in case hot replacement cannot be performed

In below cases, hot replacement of the failed HDD or SSD cannot be performed.

- Case where multiple deadlock occurs
  Multiple deadlock occurs when more than one hard disk fail to be recognized at the same time.
- The HDD or SSD is RAID0 configuration and it is not mirror configuration by PRIMECLUSTER GDS.
  If a HDD or SSD fails in this case, it is required to reconfigure the Hardware RAID after replacing HDD or SSD. Recover from back up data because data in failed HDD or SSD is not guaranteed.

When replacing the HDD or SSD, it is has to be done with the partition power off. The workflow is described below.

Remarks

Step2 is performed by the field engineer in charge of your system.

1. Turn off the power to the partition.
2. Replace the HDD or SSD.
3. Restart the partition.
   In PRIMEQUEST 2400E3/2800E3/2800B3/2400E2/2800E2/2800B2, start HII Confguration Utility from Boot Manager front page.
   In PRIMEQUEST 2400E/2800E/2800B, start WebBIOS from the Boot Manager front page.
4. Create the array configuration.
   In PRIMEQUEST 2400E3/2800E3/2800B3/2400E2/2800E2/2800B2, create the array configuration with HII Configuration Utility.
   In PRIMEQUEST 2400E/2800E/2800B, create the array configuration with WebBIOS.
5. Restore the data for backup.

CHAPTER 9 PCI Express card Hot Maintenance in Windows

This chapter describes the hot plugging procedure for PCI Express cards in Windows. This procedure is for the PRIMEQUEST 2400E3/2800E3/2800B3/2400E2/2800E2/2800B2/2400E/2800E/2800B.

9.1 Overview of Hot Maintenance

The hot plugging procedure includes the common steps for all PCI Express cards and the additional steps required for a card function or driver. This section describes both the operations required for all cards and the operations required for combinations with a specific card and specific software.

Overview of hot plugging

You can add and replace cards by using the hot plugging supported by Windows. This chapter describes the operating system commands required for card replacement, together with the actual hardware operations. For details on the overall flow, see 9.1.1 Overall flow.

Common hot plugging procedure for PCI Express cards

This chapter concretely describes the required tasks in the common replacement procedure for all PCI Express cards. For details on the common hot plugging procedure for PCI Express cards, see 9.2 Common Hot Plugging Procedure for PCI Express cards.

Hot plugging procedure for each type of card

This chapter describes procedures with the required additional steps for certain cards. The section contains procedures for NICs (network cards) and FC cards (Fibre Channel cards). For details on NIC hot plugging, see 9.3 NIC Hot Plugging. For details on FC card hot plugging, see 9.4 FC Card Hot Plugging.

For the respective procedures required for cards other than the above cards, see the related hardware and software manuals as well as this chapter. Usually, these cards (NICs and FC cards) are used in a combination with duplication software (Intel PROSET/ETERNUS multipath driver). This chapter describes the procedure needed for a NIC or FC card used in combination with such duplication software, and the procedure needed for a NIC or FC card used alone.

Note

The procedures include operations for related software. Depending on the configuration, the procedures may differ or require additional operations. When doing the actual work, be sure to see the related product manuals.

9.1.1 Overall flow

This section shows the overall flow of hot plugging.
The following procedures are required for all types of cards for PCI Hot Plug support in the current version of Windows Server 2008 R2, 2012 and 2012 R2. If an operation is required for a specific type of PCI Express card, the operation is described in the relevant procedure. The contents of an operation depend on the software to be combined with the card.

Preparing the software using a PCI Express card

When a PCI Express card is replaced, there must be no software and service using the PCI Express card. For this reason, before replacing the PCI Express card, stop the software and service using the PCI Express card or make the software and service operations inapplicable.

Replacement procedure

1. Confirm the physical location, segment number, and bus number.
2. Disable PCI cards to be replaced by using Device Manager.
3. Stop PCI cards to be replaced by using safely remove devices from computer.

4. Replace PCI card by using MMB Maintenance Wizard.
   This step is performed by the field engineer in charge of your system.
5. Confirm the replaced card by using Device Manager.

Note
In case of multi-function card, there are some cards that have same segment number, same bus number, and different function numbers.
In this case, please perform step 2 and step 3 of follows respectively.

Addition procedure

1. Confirm physical location of added PCI card.
2. Add PCI card by using MMB Maintenance Wizard.
   This step is performed by the field engineer in charge of your system.
3. Confirm added PCI card by using Device Manager.

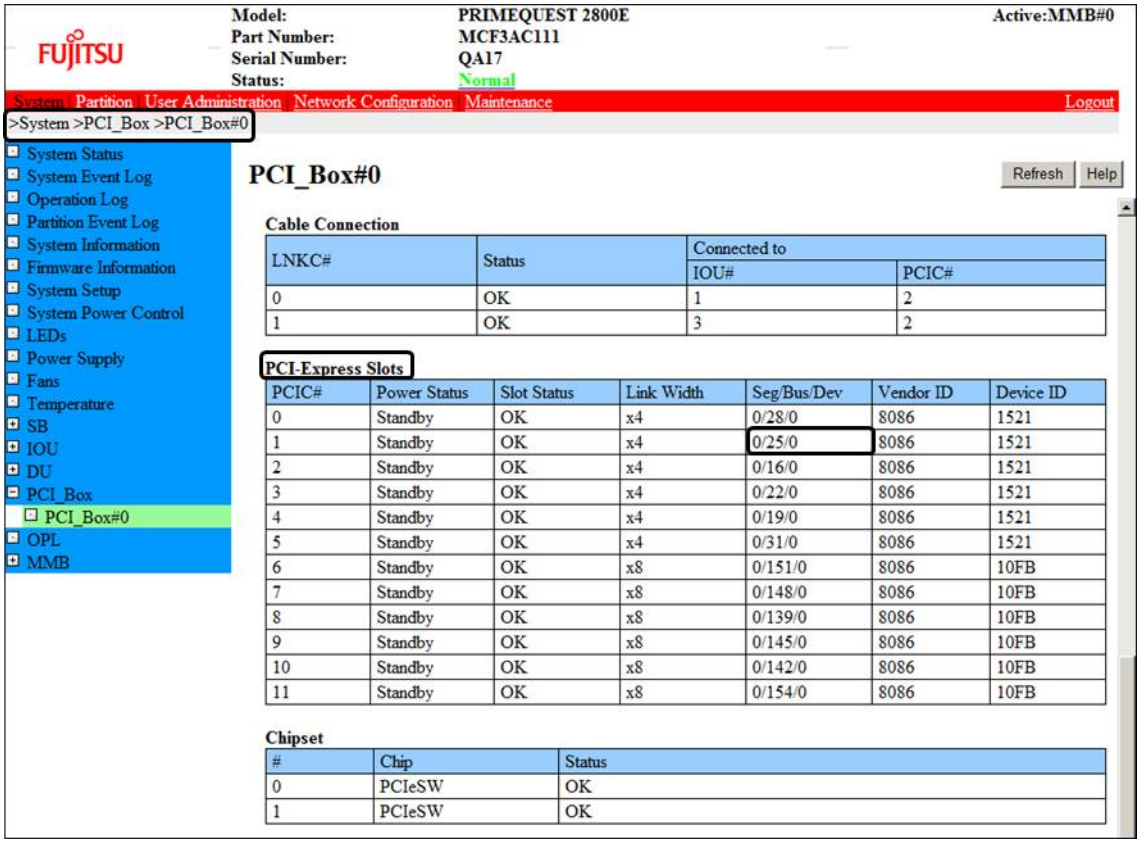
Note
Step 4 of replacement procedure and step 2 of addition procedure are performed by the field engineer in charge of your system.

9.2 Common Hot Plugging Procedure for PCI Express cards

This section describes the PCI Express card replacement procedure that does not involve additional steps (e.g., when a redundant application is not used).
Note
Insert the PCI Express card securely.

9.2.1 Replacement procedure

1. Confirm the physical location, segment number, and bus number.
   a Identify the mounting location of the PCI card to be replaced.
   See the figure in B.1 Physical Mounting Locations of Components to check the mounting location (board and slot) of the PCI card to be replaced.
   b Confirm segment number and bus number.
   Open component information corresponded to confirmed physical location with step a by using MMB Web-UI.
   For this example, it is explained the method to confirm segment number and bus number of PCI slot#1 in PCI_Box#0. Select [System] – [PCI_Box] – [PCI_Box#0] in MMB Web-UI, and see Seg/Bus/Dev of PCIC#1 at PCI-Express Slots in [PCI_Box#0] information.
   'Seg' is segment number, and 'Bus' is Bus number in Seg/Bus/Dev information.
   This segment number and bus number is the information to confirm by using Device Manager.



FUJITSU

Model: PRIMEQUEST 2800E
Part Number: MCF3AC111
Serial Number: QA17
Status: Normal
Active:MMB#0

System | Partition | User Administration | Network Configuration | Maintenance | Logout

>System >PCI_Box >PCI_Box#0

- System Status
- System Event Log
- Operation Log
- Partition Event Log
- System Information
- Firmware Information
- System Setup
- System Power Control
- LEDs
- Power Supply
- Fans
- Temperature
- SB
- IOU
- DU
- PCI_Box
  - PCI_Box#0
- OPL
- MMB

PCI_Box#0

Refresh Help

Cable Connection

LNKC#	Status	Connected to	
		IOU#	PCIC#
0	OK	1	2
1	OK	3	2

PCI-Express Slots

PCIC#	Power Status	Slot Status	Link Width	Seg/Bus/Dev	Vendor ID	Device ID
0	Standby	OK	x4	0/28/0	8086	1521
1	Standby	OK	x4	0/25/0	8086	1521
2	Standby	OK	x4	0/16/0	8086	1521
3	Standby	OK	x4	0/22/0	8086	1521
4	Standby	OK	x4	0/19/0	8086	1521
5	Standby	OK	x4	0/31/0	8086	1521
6	Standby	OK	x8	0/151/0	8086	10FB
7	Standby	OK	x8	0/148/0	8086	10FB
8	Standby	OK	x8	0/139/0	8086	10FB
9	Standby	OK	x8	0/145/0	8086	10FB
10	Standby	OK	x8	0/142/0	8086	10FB
11	Standby	OK	x8	0/154/0	8086	10FB

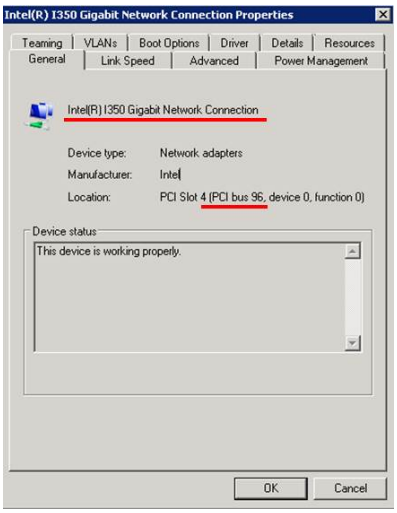
Chipset

#	Chip	Status
0	PCIeSW	OK
1	PCIeSW	OK

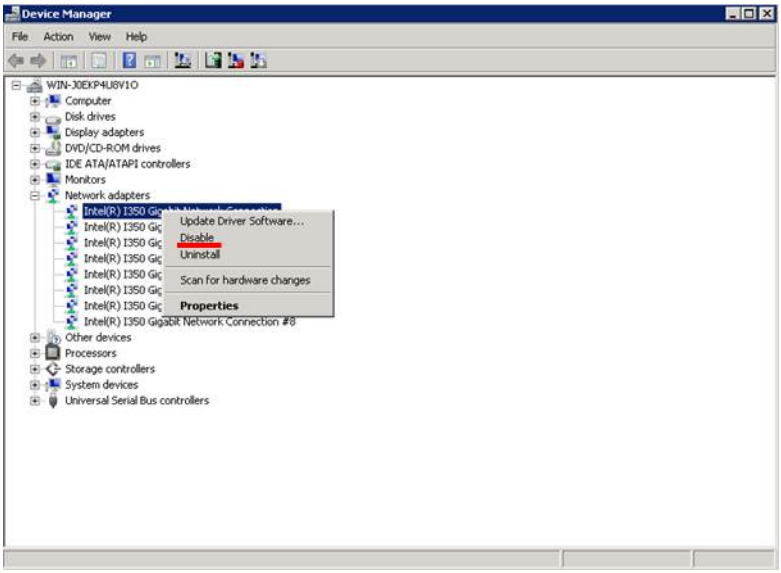
Note
In case of multi-function card, there are some cards that have same segment number, same bus number, and different function numbers.
In this case, please perform Step.2 and Step.3 of follows respectively.

2. Disable target PCI cards by using Device manager.

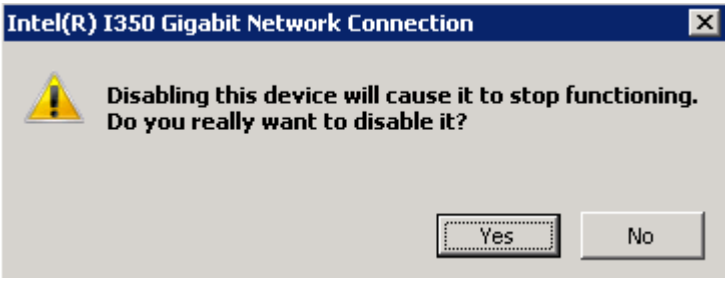
   a Confirm target PCI card in Device Manager.
   Open Device Manager, and identify target device with confirmed segment number and bus number in step 1-b.
   Select interface of the type of replaced PCI card, and reference property.
   Select [General], see [Location], and confirm that the segment number and bus number is corresponded to target device or not. You need target device name in step 3, confirm it in advance.



   b Disable replaced PCI card with Device Manager.
   Select target identified device in step a, and disable it by using Device Manager.



Follow dialog will be opened, and click [Yes].



3. Stop target PCI card by using safely remove devices from computer.

   a Click Icon of Safely remove devices from computer at information zone in lower-right of desktop display.

   b Click target identified device name with step 2-a in displayed list, and disable PCI card.

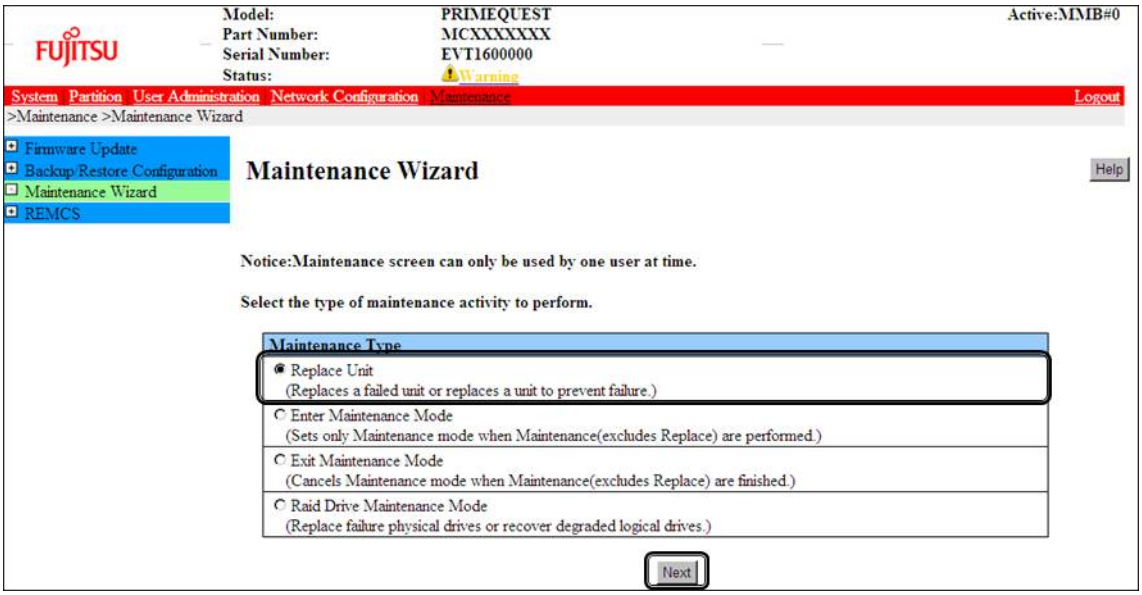
   Note
   If there are plural devices with same device name and you cannot identify the device, identify the device to be removed by steps below.

   1. Open ‘Devices and Printers’ by using ‘Open Devices and Printers’ in ‘Safely Remove Hardware’ or ‘Control Panel’.
   2. Right-click on target device and open ‘Properties’
   3. Open ‘Hardware’ tab and click ‘Properties’ and check if selected device is target device.
   4. Right-click on the device and click ‘Remove device’.

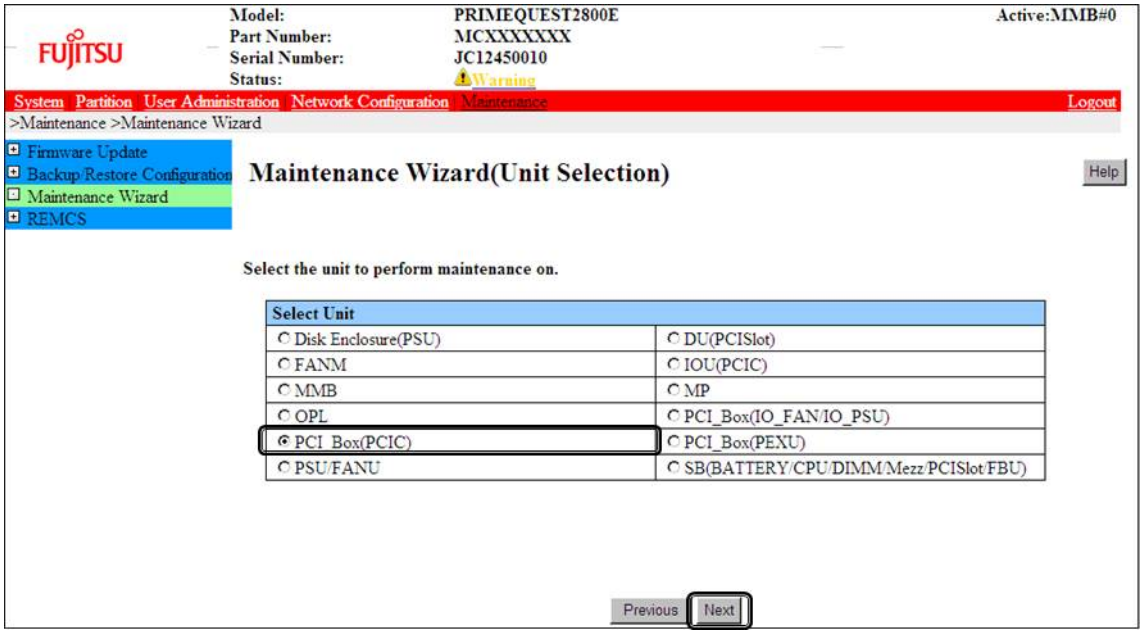
4. Replace PCI card by using MMB Maintenance Wizard.
   This section describes the step of hot replacement of PCI cards (PCIC) using Maintenance Wizard. This step is performed by the field engineer in charge of you system.

   1. Open [Maintenance Wizard] menu in MMB Web-UI, and open [Maintenance Wizard].

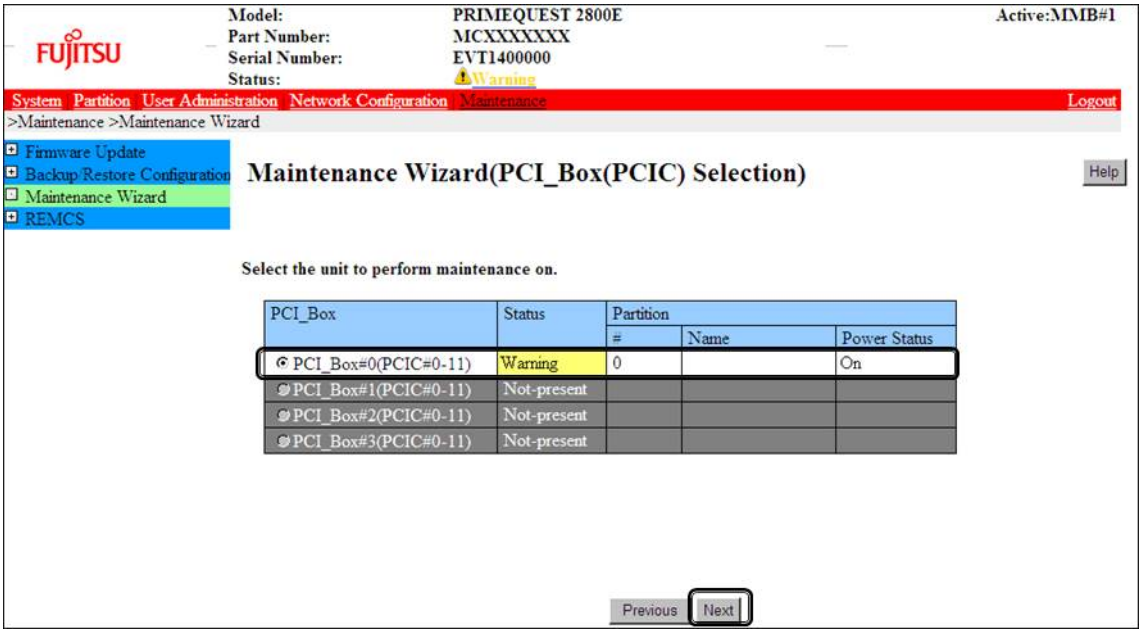
2. Check [Replace Unit] button, and click [Next] button.



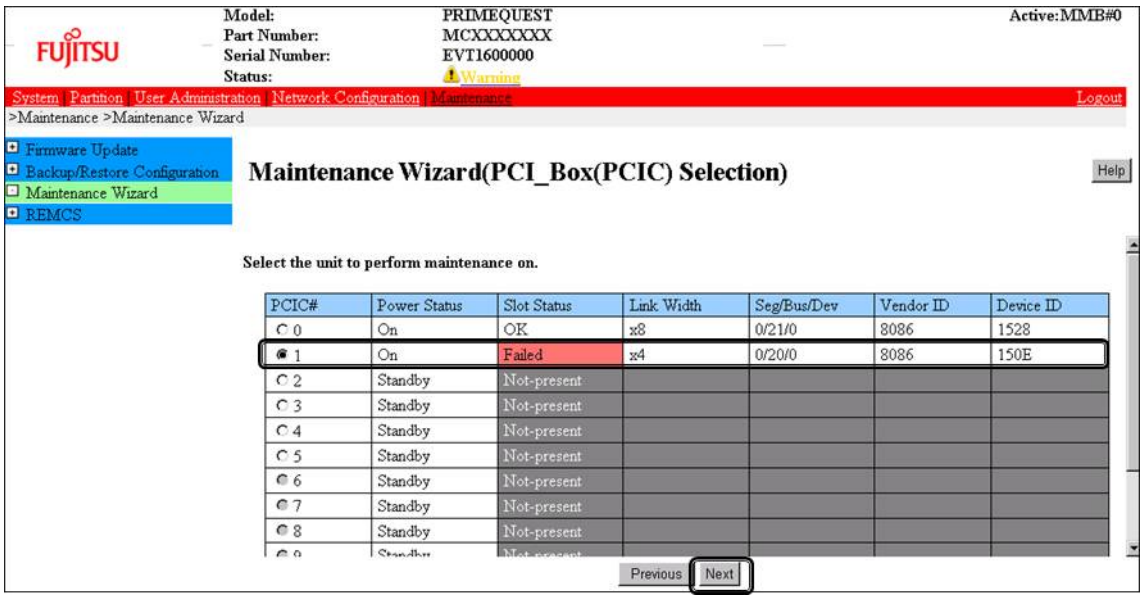
3. Check [PCI_Box(PCIC)] button, and click [Next] button.



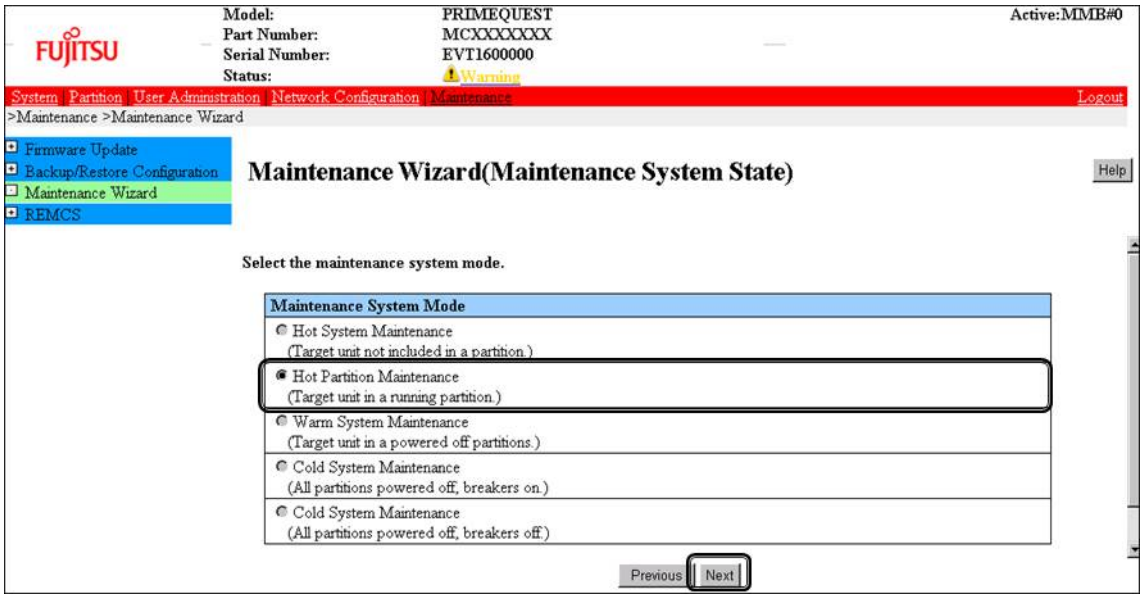
4. Check the button of the target PCI_Box number, and click [Next] button.
   For this example, it is a procedure of hot replacement of a PCI card at PCIC#1 mounted in PCI_Box#0.



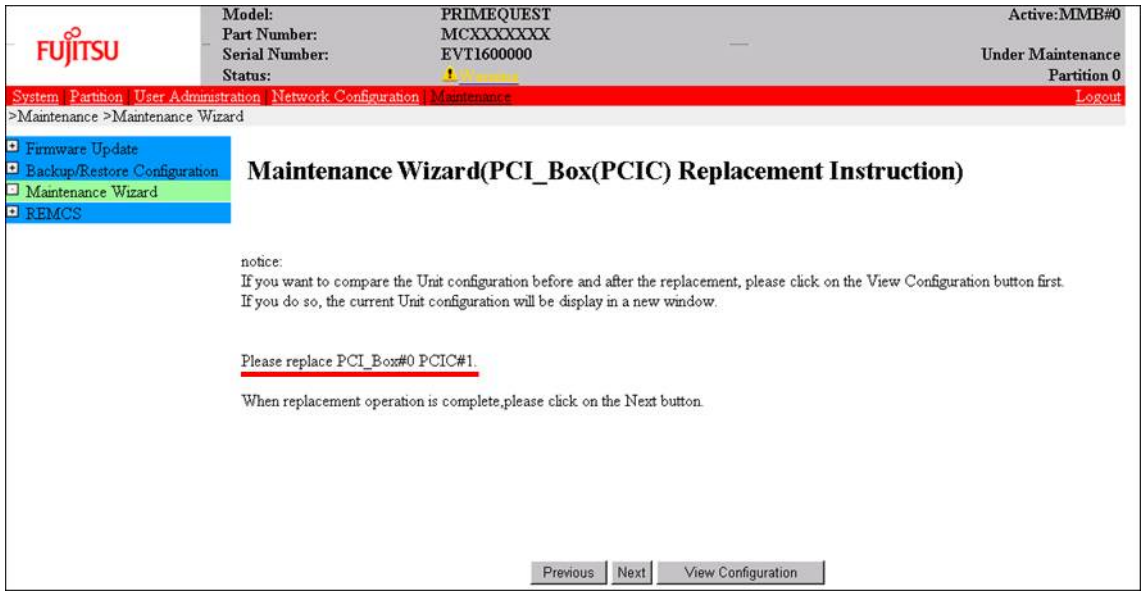
5. Check button of target PCIC number for replacing, and click [Next] button.



6. Check [Hot Partition Maintenance(Target unit in a running partition.)] button, and click [Next] button.

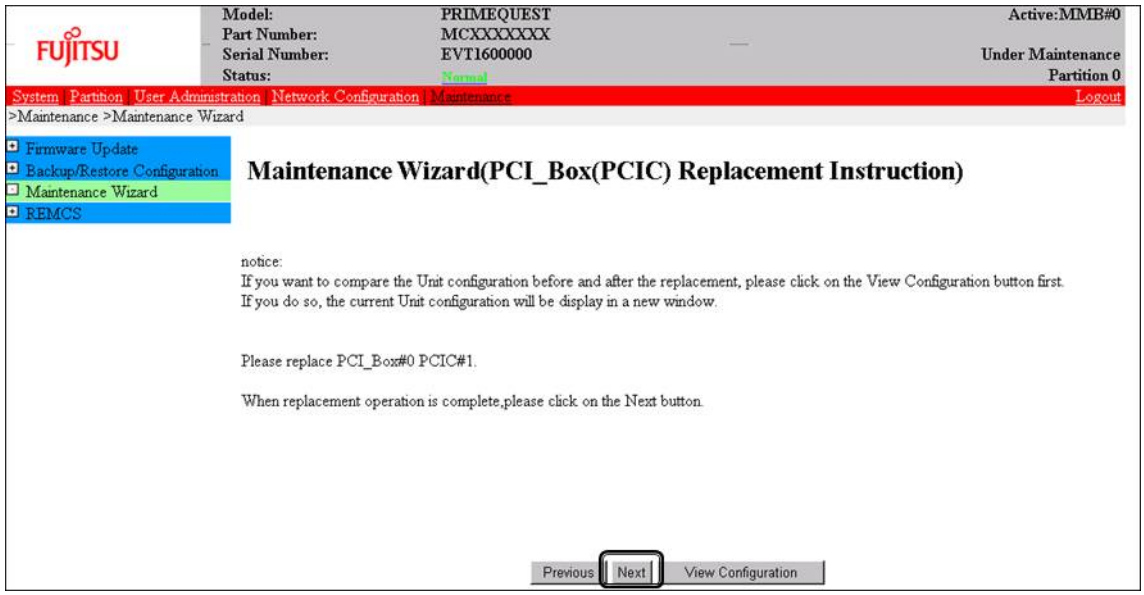


7. It will be Maintenance mode (Information zone: gray background), and instruction pages to remove target PCI card will be opened. Take off all cables such as LAN cable and FC cable connected the particular PCIC and replace PCI card with opening this page.

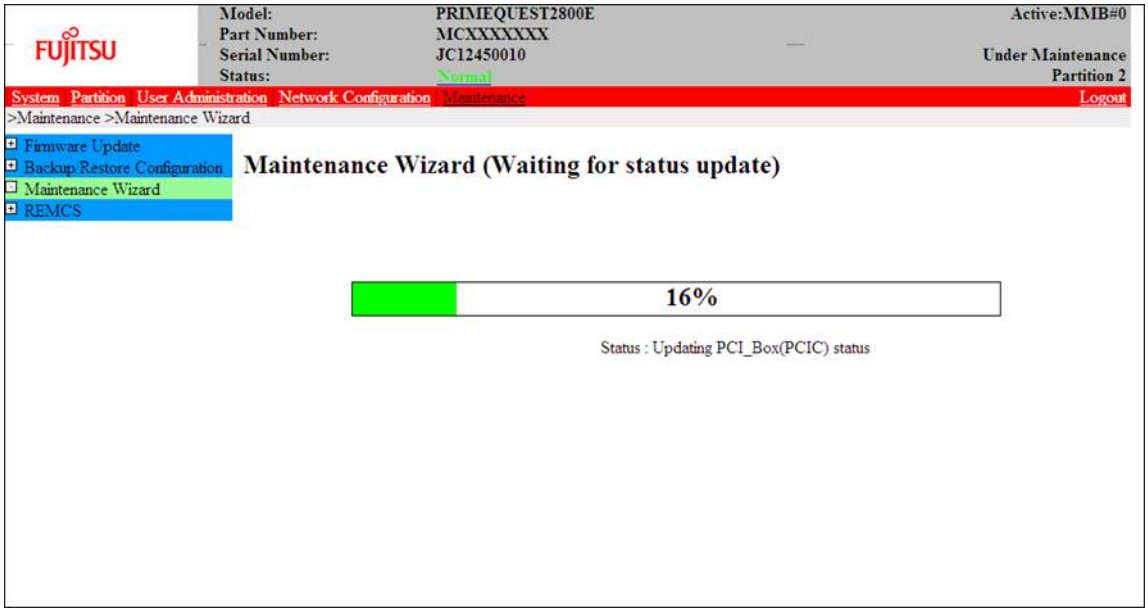


Note
Don't click [Next] Button before replacing PCI card.

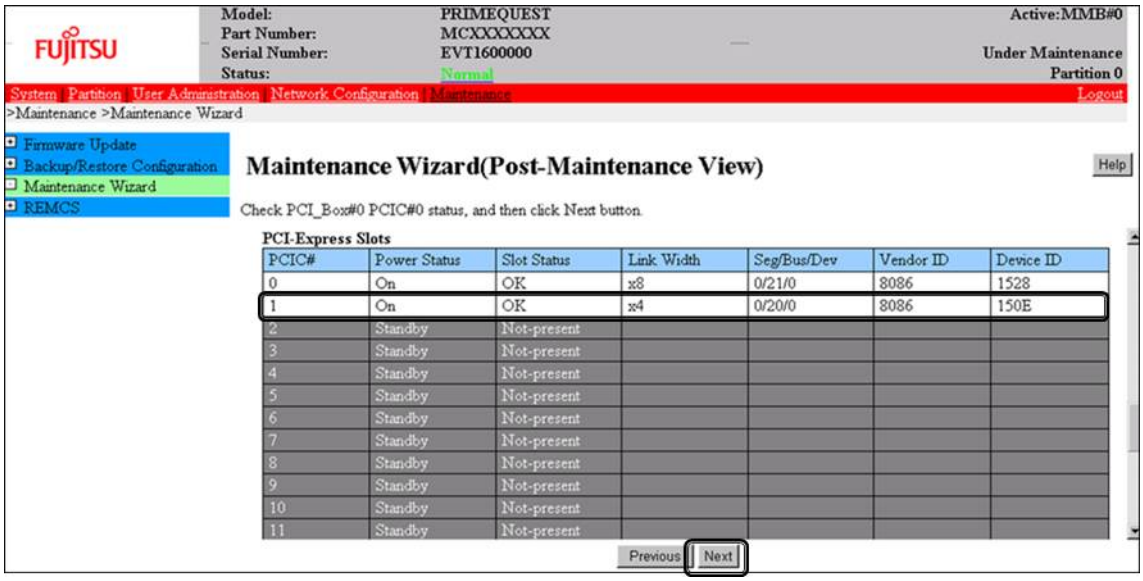
8. After replacing target PCI card, mount cables other than LAN cables and click [Next] button.



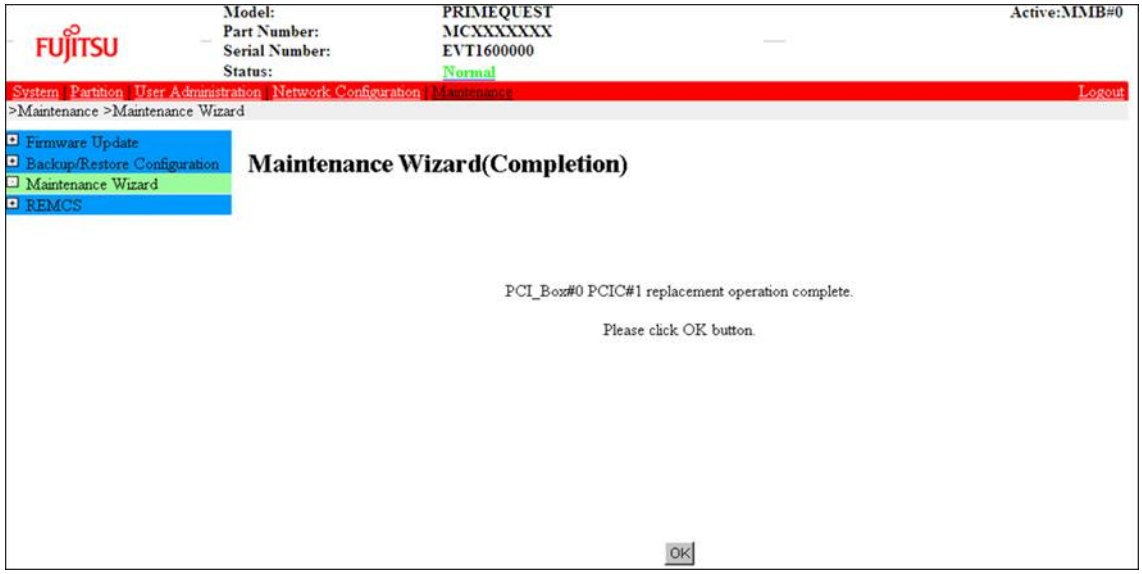
9. Status updating menu will be opened.



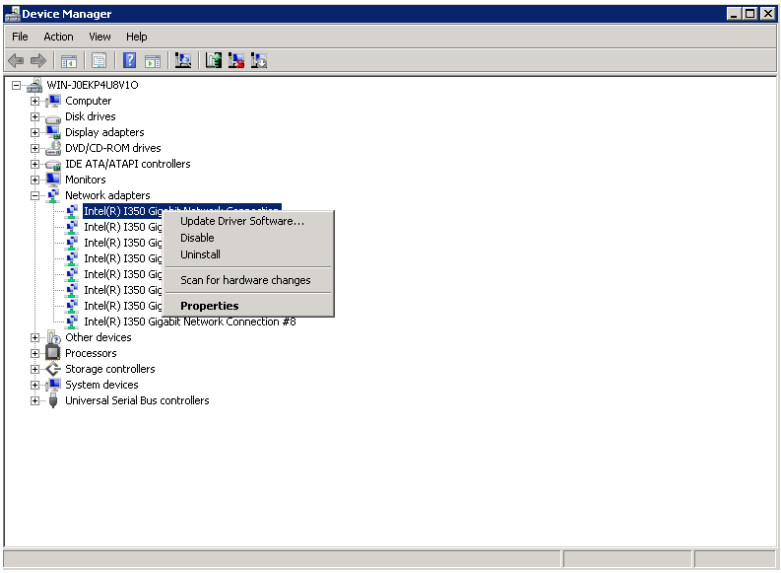
10. Confirm status of target replaced PCI card, and click [Next] button.



11. Confirm Maintenance Mode is released (information zone: non-gray background), and click [OK] button.



5. Confirm replaced PCI card by using Device Manager.
   After replacement of target PCI card, open Device Manager, and confirm that the target device is recognized correctly.
   Note
   As the follow, right-click target device in Device Manager, if there are [Enable] in displayed menu, check [Enable].
   (In case of [Disable], this work is not necessary)



6. Mount all cables connected to the particular PCI card.
   This step is performed by the field engineer in charge of your system.

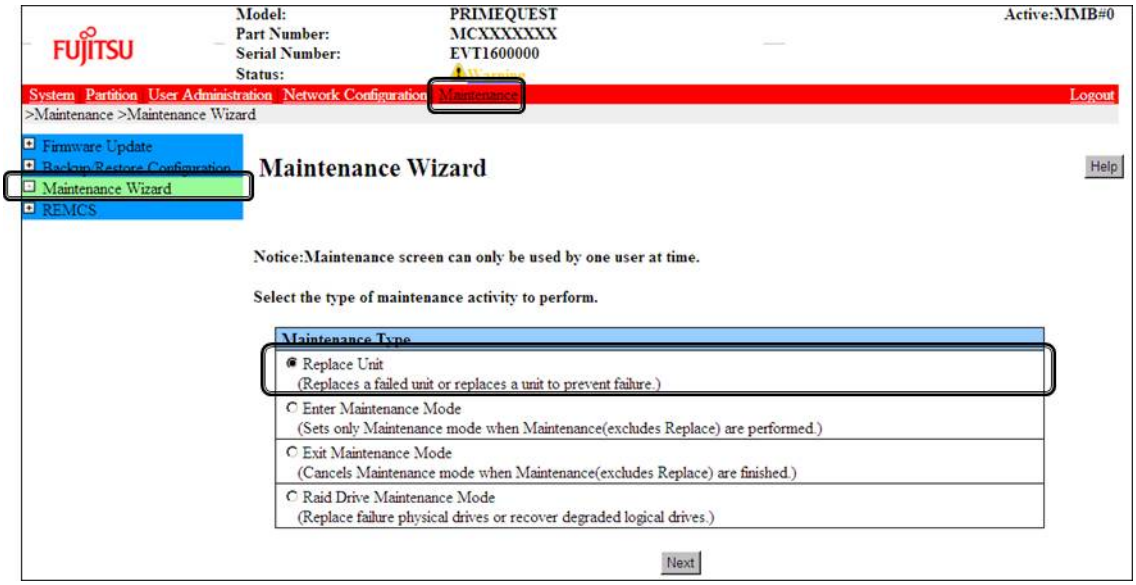
9.2.2 Addition procedure

1. Confirm the physical location, segment number, and bus number.
   Confirm the mounting location of the PCI card.
   See the figure in B.1 Physical Mounting Locations of Components to check the mounting location (board and slot) of the PCI card.

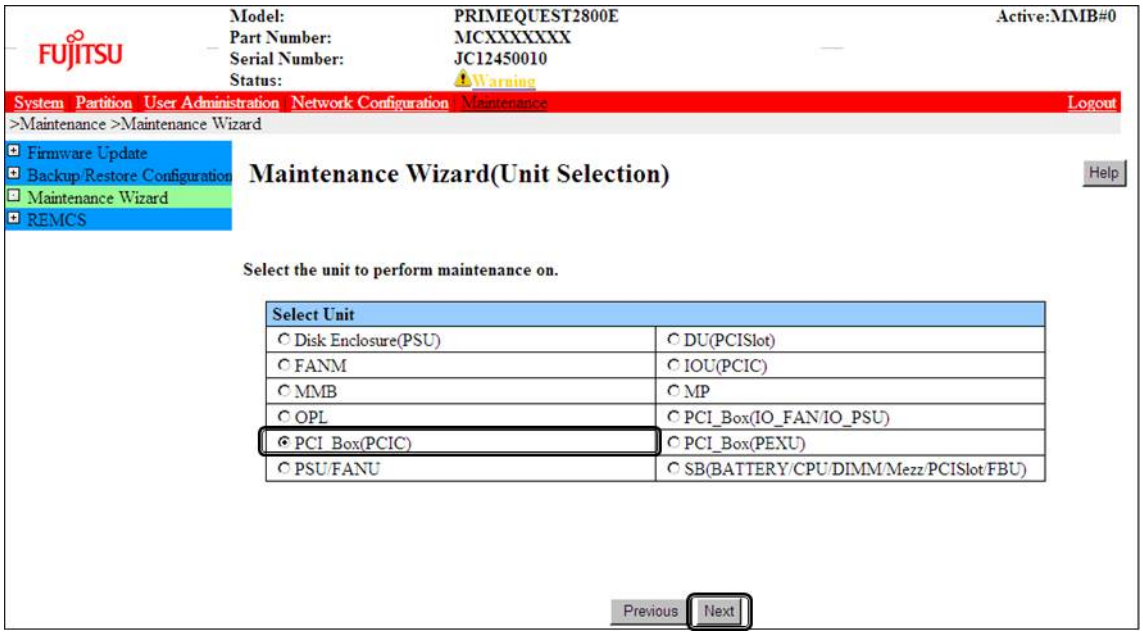
2. Add PCI card by using MMB Maintenance Wizard.
   This section describes the procedures of hot addition of PCI cards (PCIC) using Maintenance Wizard.
   This step is performed by the field engineer in charge of your system.

   1. Open [Maintenance Wizard] menu in MMB Web-UI, and open [Maintenance Wizard].

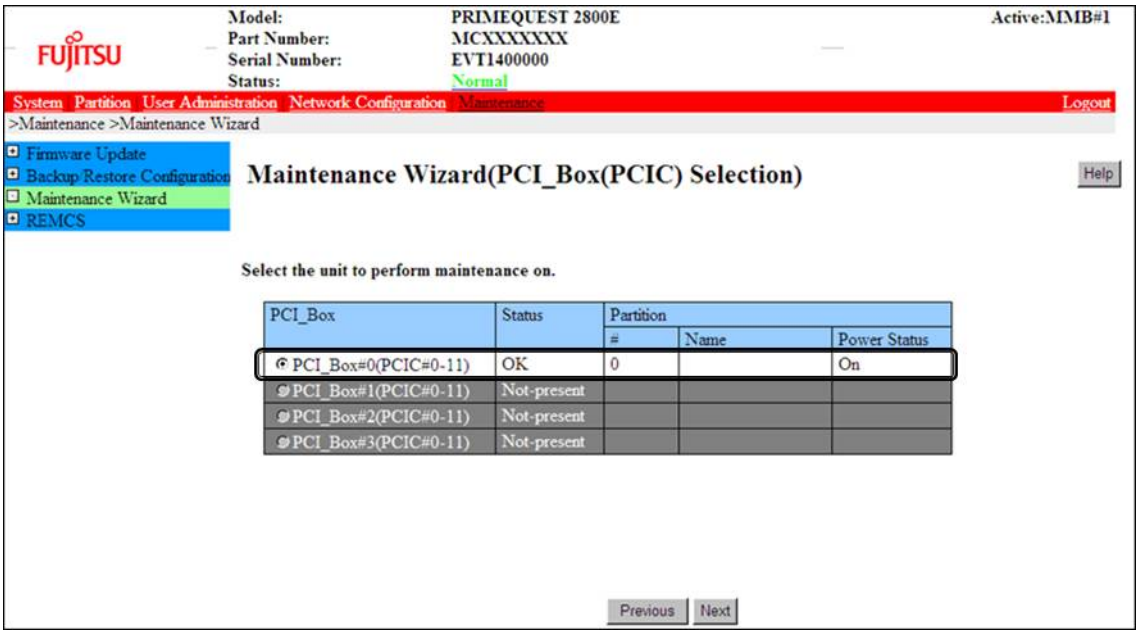
   2. Check [Replace Unit] button, and click [Next] button.



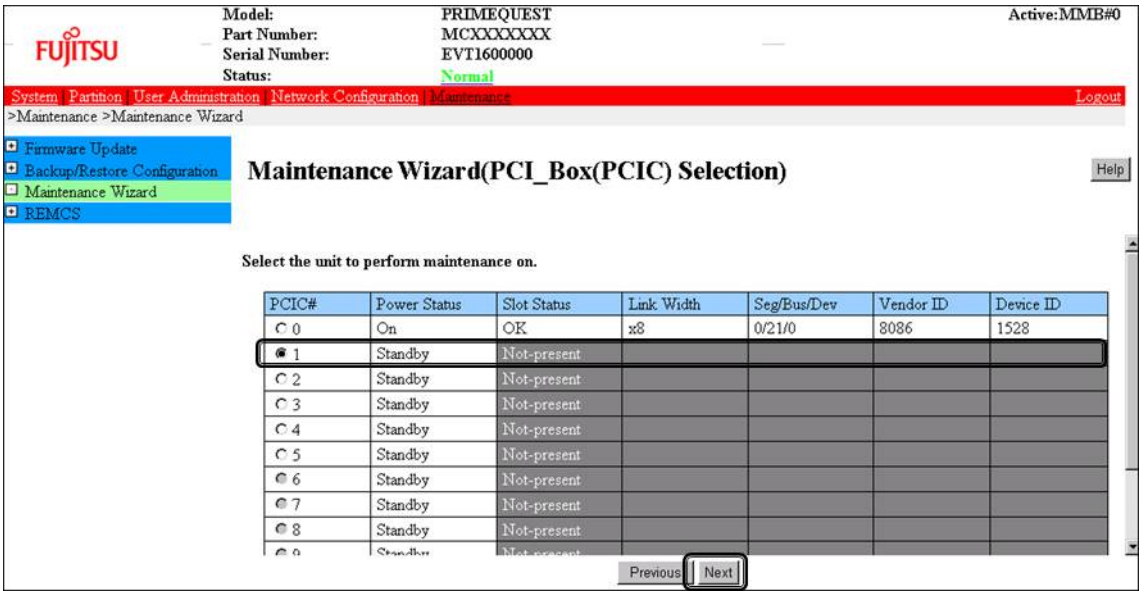
3. Check [PCI_Box(PCIC)] button, and click [Next] button.



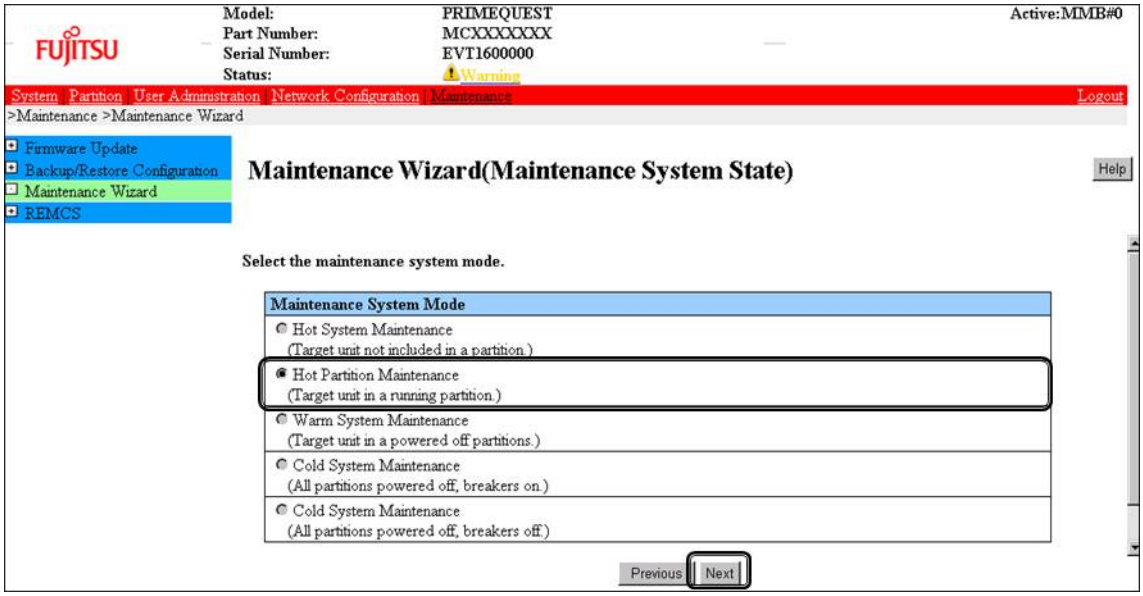
4. Check the button of the target PCI_Box number, and click [Next] button.
   For this example, it is a procedure of hot addition of a PCI card at PCIC#1 mounted in PCI_Box#0.



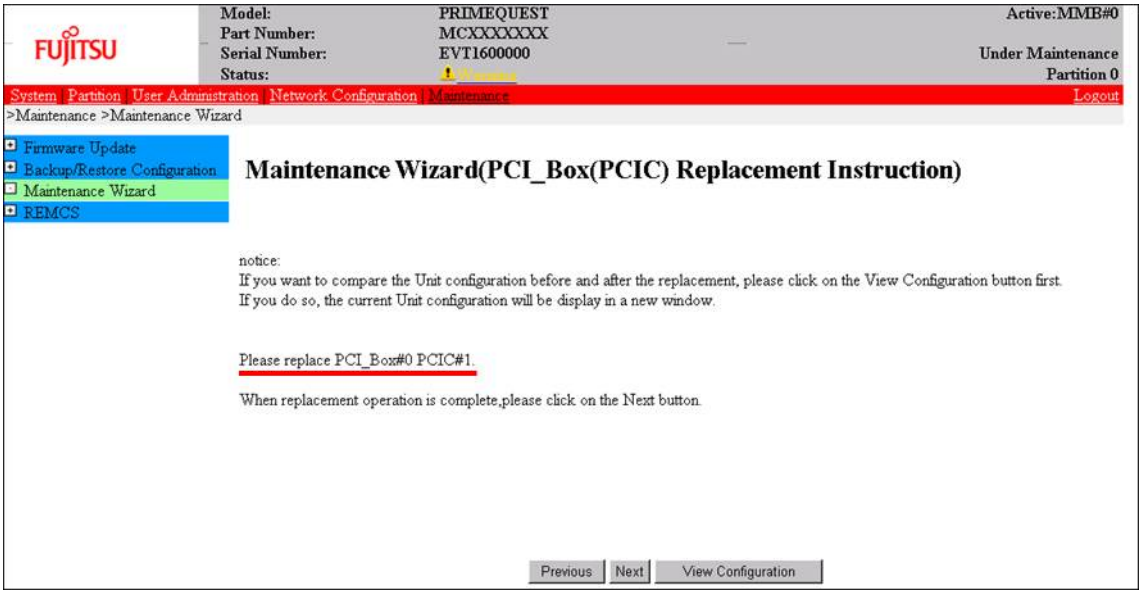
5. Check button of target PCIC number for adding, and click [Next] button.



6. Check [Hot Partition Maintenance (Target unit in a running partition.)] button, and click [Next] button.

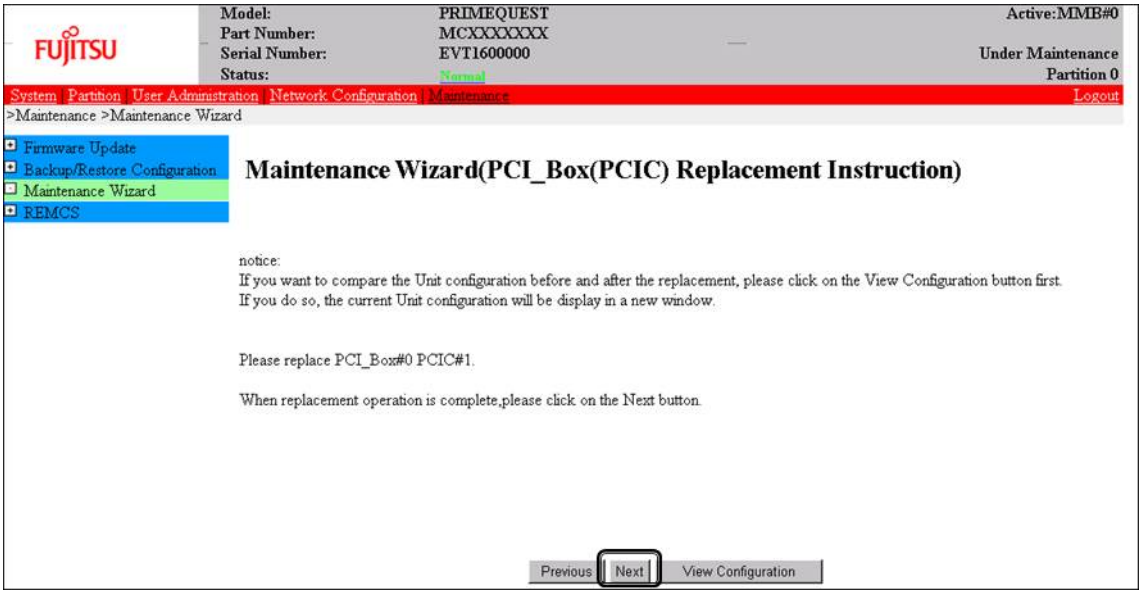


7. It will be Maintenance mode (Information zone: gray background), and instruction pages to add target PCI card will be opened. Add PCI card with opening this page.

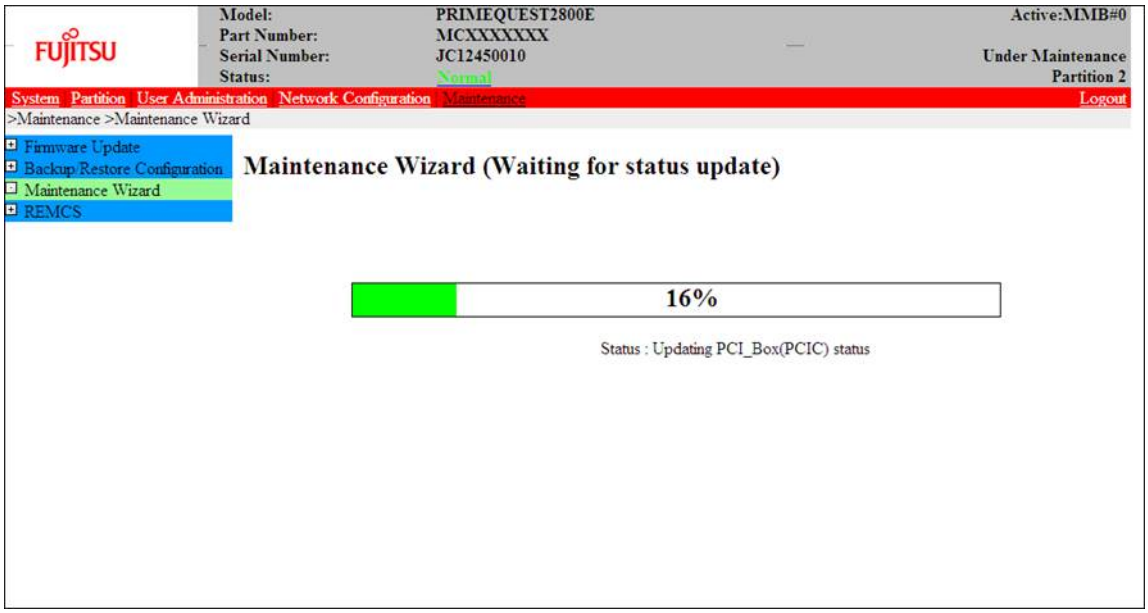


Note
Don't click [Next] Button before adding PCI card.

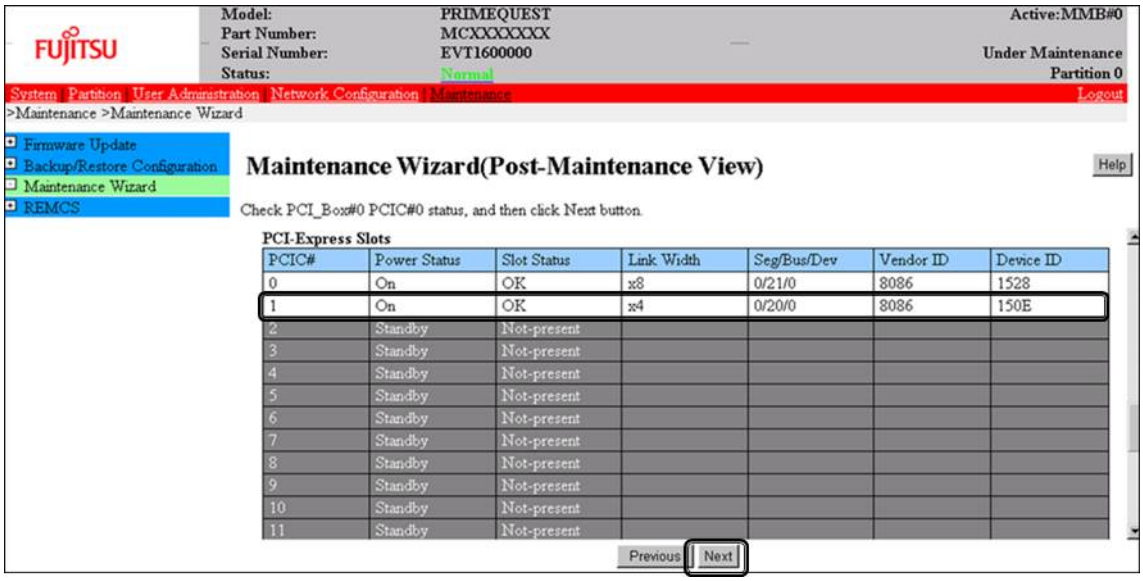
8. Add target PCI card and click [Next] button.



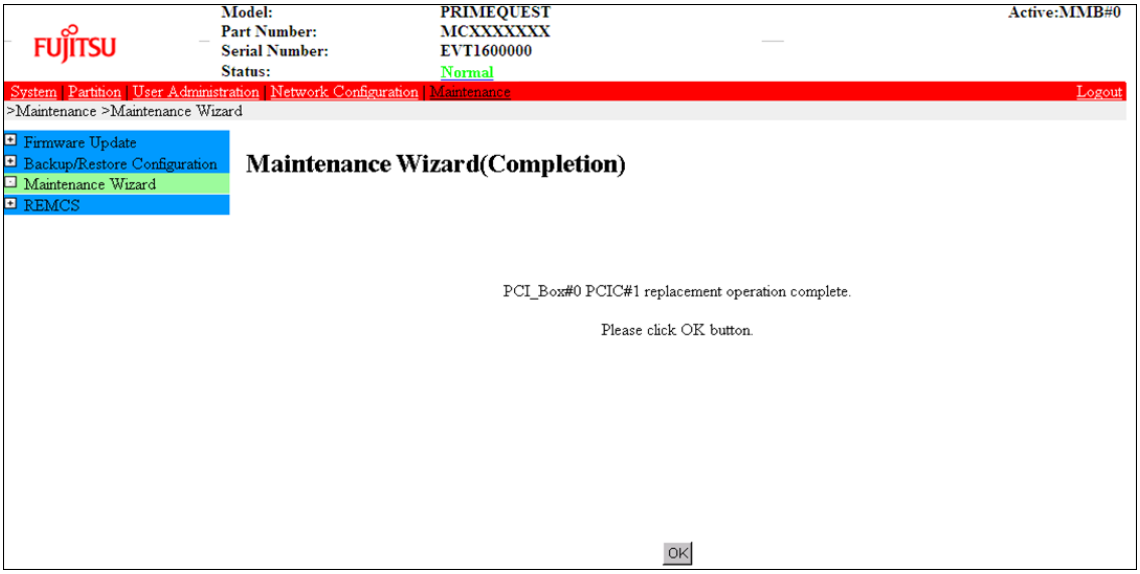
9. Status updating menu will be opened.



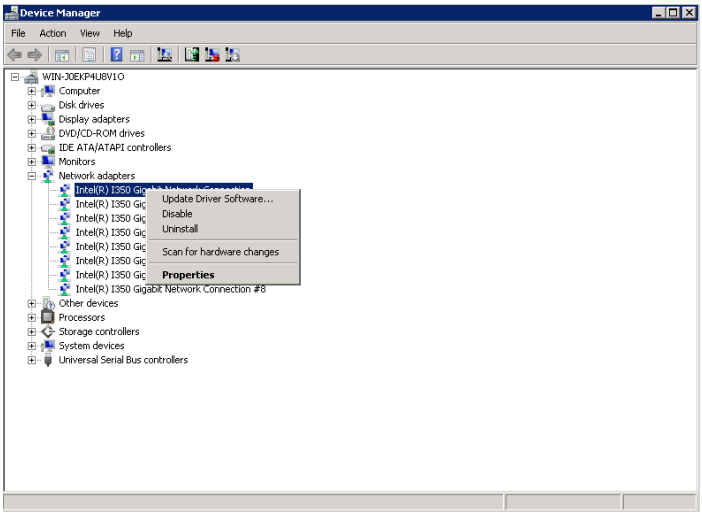
10. Confirm status of target added PCI card, and click [Next] button.



11. Confirm Maintenance Mode is released. (information zone: non-gray background), and click [OK] button.



3. Confirm replaced PCI card by using Device Manager.
   After replacement of target PCI card, open Device Manager, and confirm that the target device is recognized correctly.
   Note
   As the follow, right-click target device in Device Manager, if there are [Enable] in displayed menu, check [Enable].
   (In case of [Disable], this work is not necessary)



9.2.3 About removal

Note
Windows does not support PCI card removal.

9.3 NIC Hot Plugging

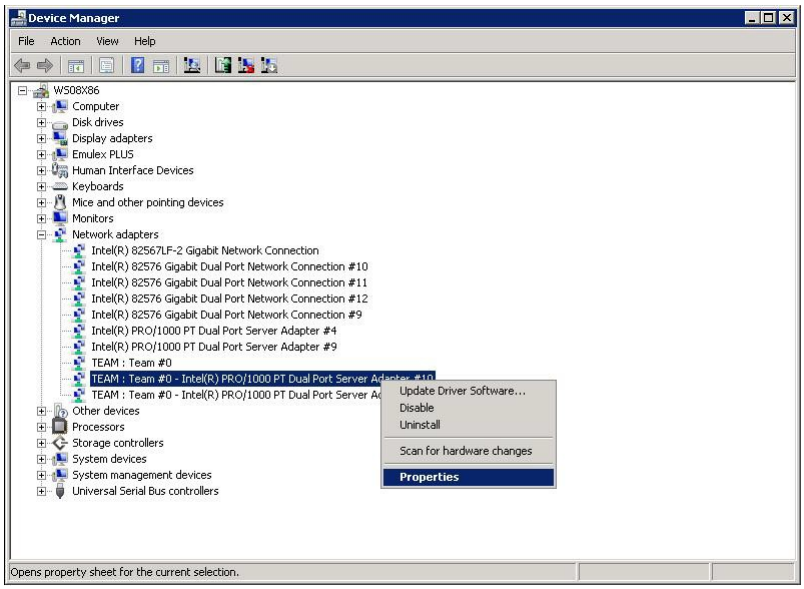
For NIC hot plugging (replacement), you need to especially consider other matters in addition to the procedure described in '9.2 Common Hot Plugging Procedure for PCI Express cards'.
This section describes NIC hot plugging combined with teaming.

9.3.1 Hot plugging a NIC incorporated into teaming

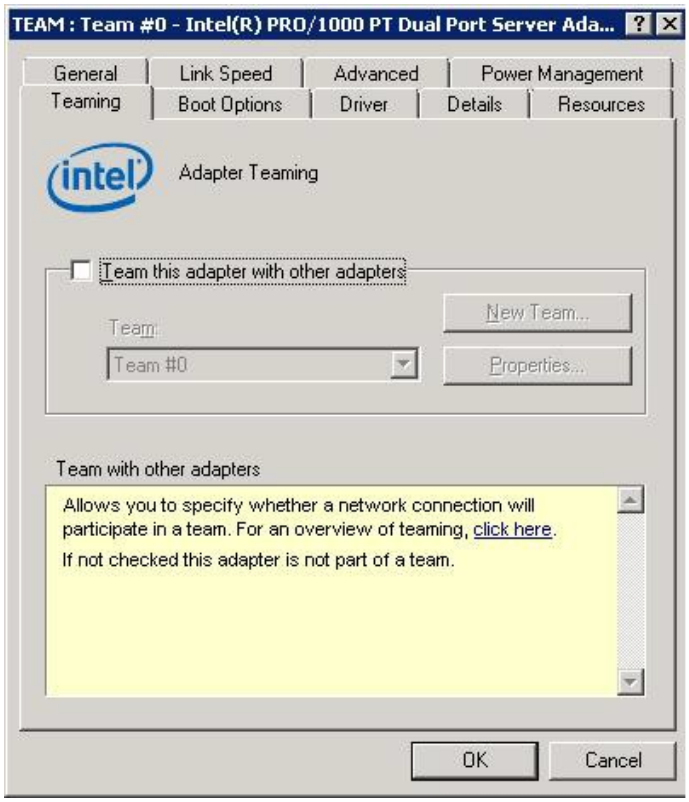
This section describes the hot plugging procedure for a NIC incorporated into teaming.
Note

- Be sure to perform hot plugging after removing the card. If the card is not removed, the operating system may stop.
- There are some precautions on teaming with Intel PROSet(R). For details on the precautions, see 'G.8 NIC (Network Interface Card)'.

1. Confirm physical location, segment number and bus number of NIC to be replaced.
   Confirm the physical location, segment number and bus number with step 1 at '9.2.1 Replacement procedure' in '9.2 Common Hot Plugging Procedure for PCI Express cards'.
   Note
   In case of multi-function card, there are some cards that have same segment number, same bus number, and different function numbers.
   In this case, please perform step.2 to step.7 of follows respectively.
2. Confirm target NIC in Device Manager.
   Confirm NIC with step 2-a at '9.2.1 Replacement procedure' in '9.2 Common Hot Plugging Procedure for PCI Express cards'.
3. Select the interface in Device Manager, and open Properties.

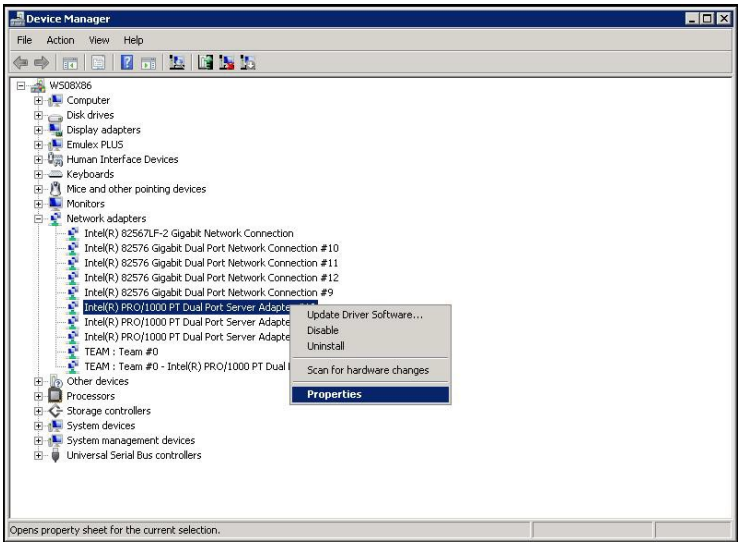


4. Click the [Teaming] tab, uncheck the [Team this adapter with other adapters] check box, and click the [OK] button.

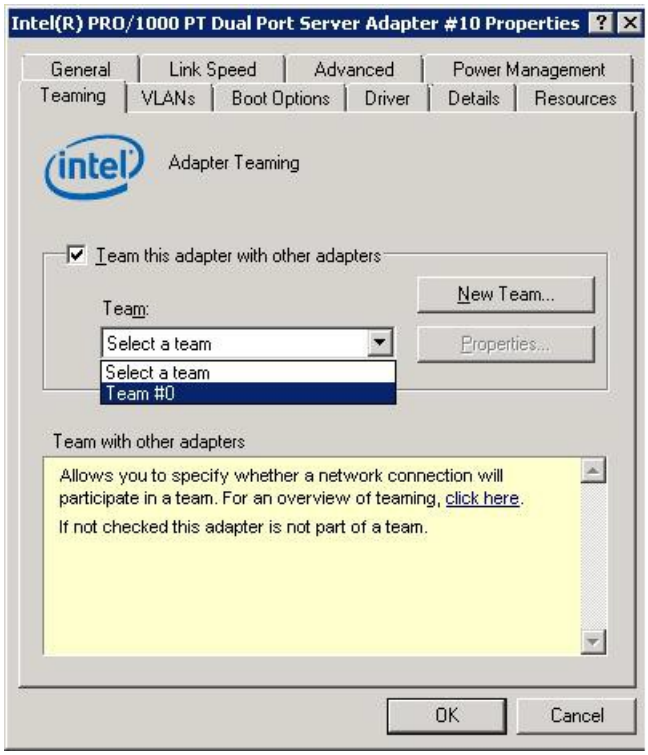


5. The following message appears. Click the [Yes] button.

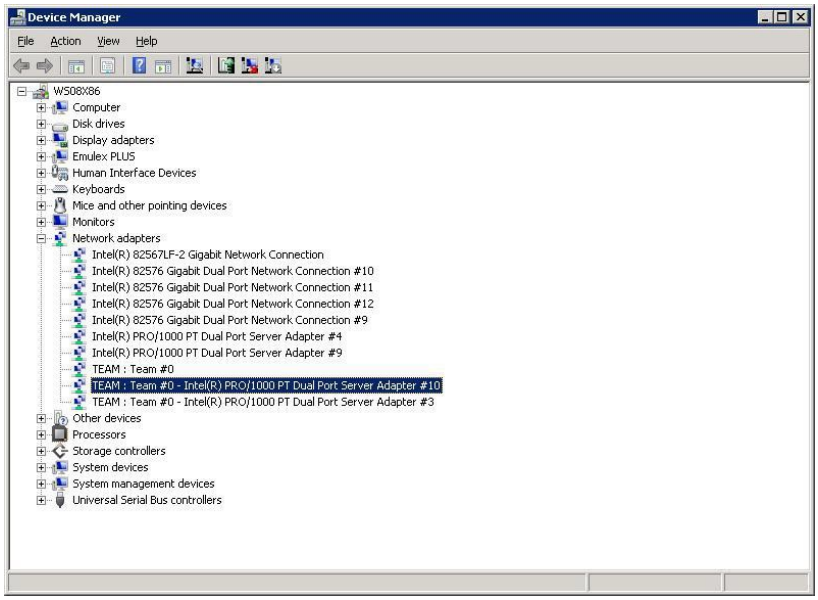
6. Disable target NIC in Device manager.
   Disable NIC with step 2-b at '9.2.1 Replacement procedure' in '9.2 Common Hot Plugging Procedure for PCI Express cards'.
7. Stop target NIC by using safely remove devices from computer.
   Stop NIC with step 3 at '9.2.1 Replacement procedure' in '9.2 Common Hot Plugging Procedure for PCI Express cards'.
8. Replace NIC by using MMB Maintenance Wizard.
   Replace NIC with step 4 at '9.2.1 Replacement procedure' in '9.2 Common Hot Plugging Procedure for PCI Express cards'. This step is performed by the field engineer in charge of your system.
9. Confirm the replaced card by using Device Manager.
   After replacement, open Device Manager, and confirm that the target device is recognized correctly.
10. After completing the replacement, open the Device Manager and open the properties dialog box of the NIC to be incorporated into teaming.



11. On the [Teaming] tab, check [Team this adapter with other adapters], select the team into which the adapter was incorporated before the replacement, and click the [OK] button.



12. In the Device Manager, confirm that the NIC is incorporated into the team.
    Note
    As the follow, right-click target device in Device Manager, if there are [Enable] in displayed menu, check [Enable].
    (In case of [Disable], this work is not necessary)



13. Mount all cables connected to the particular PCI card (PCIC).
    This step is performed by the field engineer in charge of your system.

9.3.2 Hot plugging a non-redundant NIC

This section describes the hot plugging procedure in networks without redundancy (a NIC is not incorporated into teaming).
Replace NIC with '9.2.1 Replacement procedure' in '9.2 Common Hot Plugging Procedure for PCI Express cards'.

9.3.3 NIC addition procedure

Referring to '9.2 Common Hot Plugging Procedure for PCI Express cards', add a NIC.

9.4 FC Card Hot Plugging

For FC card hot plugging (replacement), you need to especially consider other matters in addition to the procedure described in '9.2 Common Hot Plugging Procedure for PCI Express cards'.
The hot plugging of an FC card changes the WWN of the FC card if the WWN is set on an FC switch or RAID device (ETERNUS). For details on how to set the WWN again for a new card, see the respective device manuals.
It is required that the firmware version of new FC card is same as the FC card which had been replaced. If the firmware version of new FC card is coincident with that of the FC card which had been replaced (current firmware version), it is not necessary to update the firmware version of new FC card to current firmware version.
If the firmware version of new FC card is not coincident with that of the FC card which had been replaced (current firmware version), update the firmware version of new FC card to current firmware version.
For how to update the firmware version, see firmware update manual for fibre channel card.
This section describes hot plugging of an FC card combined with ETERNUS MPD (multipath driver).
Notes

- SAN boot paths are not valid.
- LTO library devices are not supported.
- Depending on the Windows specifications, if the FC card connection destination has a Page File or other such paging scheme, FC card hot plugging may not be supported.
- In case of using SVAS or SVagent, "Source: SVAS or SVagent, ID: 25004 Error massage" is logged in SEL when replacing, it is no problem.

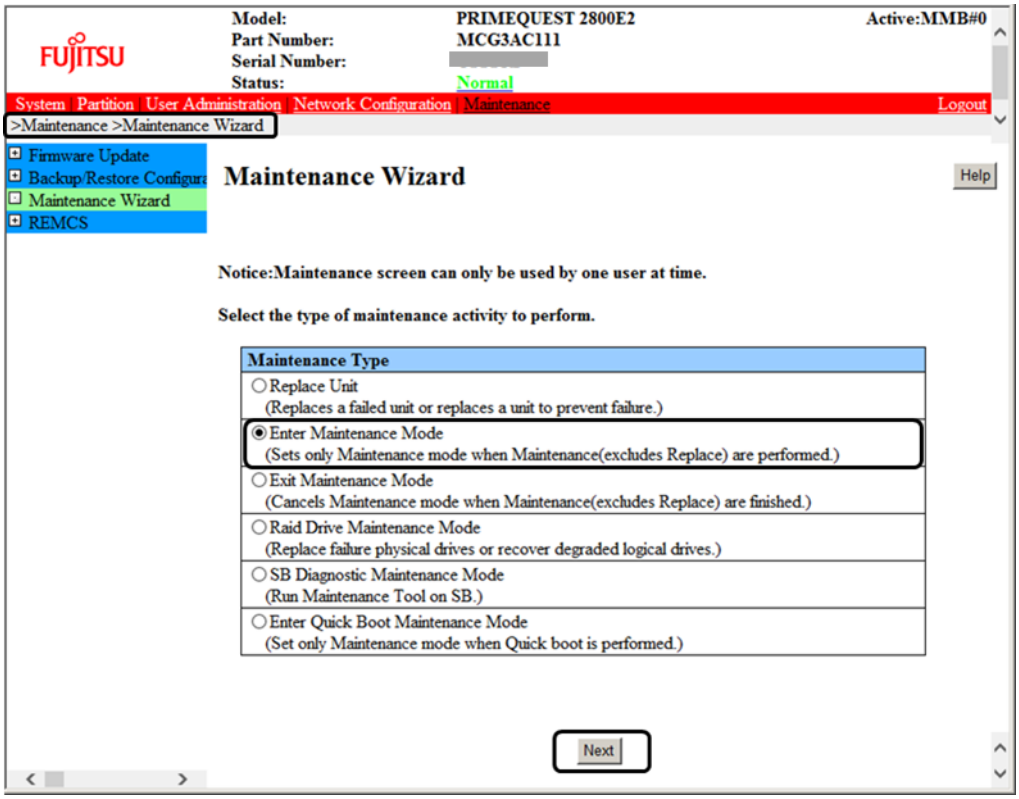
9.4.1 Hot plugging an FC card incorporated with the ETERNUS multipath driver

This section describes the hot plugging procedure for an FC card incorporated with the ETERNUS multipath driver.

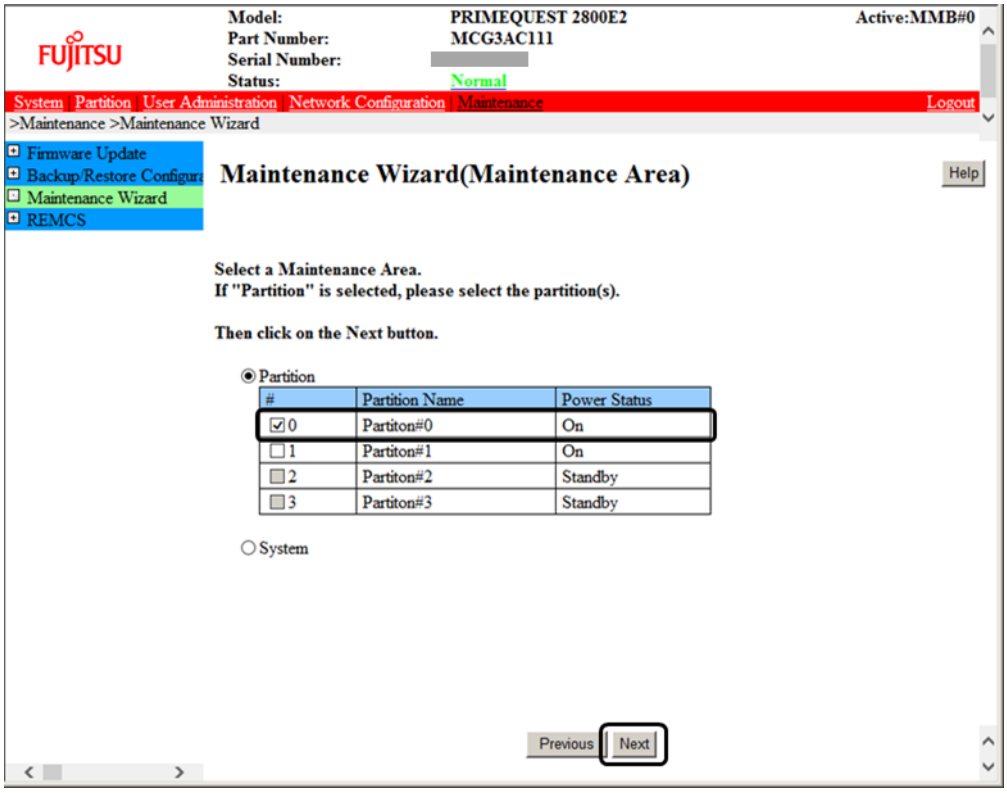
1. Make the necessary preparations.
   Stop access to the faulty FC card, such as by stopping applications.

2. Enter Maintenance Mode in MMB Maintenance Wizard.
   Administrater privilege is needed for this work. Log in MMB as Administrator.

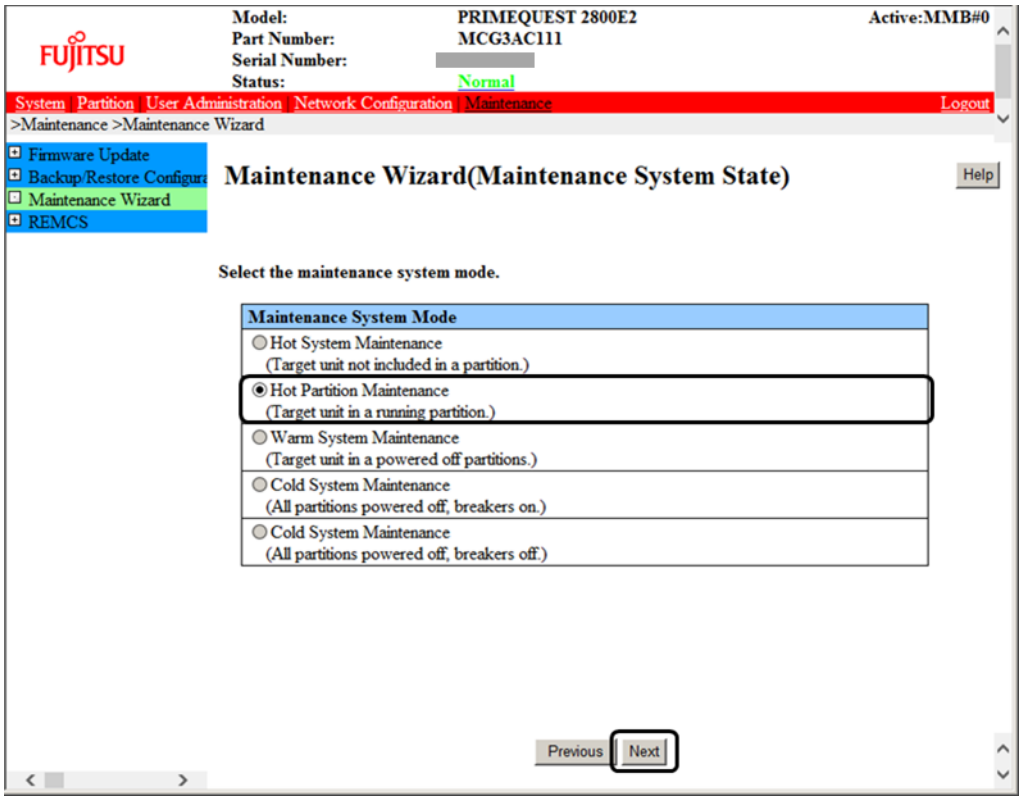
   a Enter Maintenance Mode.
   Start [Maintenance Wizard] menu in MMB Web-UI. [Maintenance Wizard] window appears. Select [Enter Maintenance Mode] in Maintenance Type, and click [Next] button.



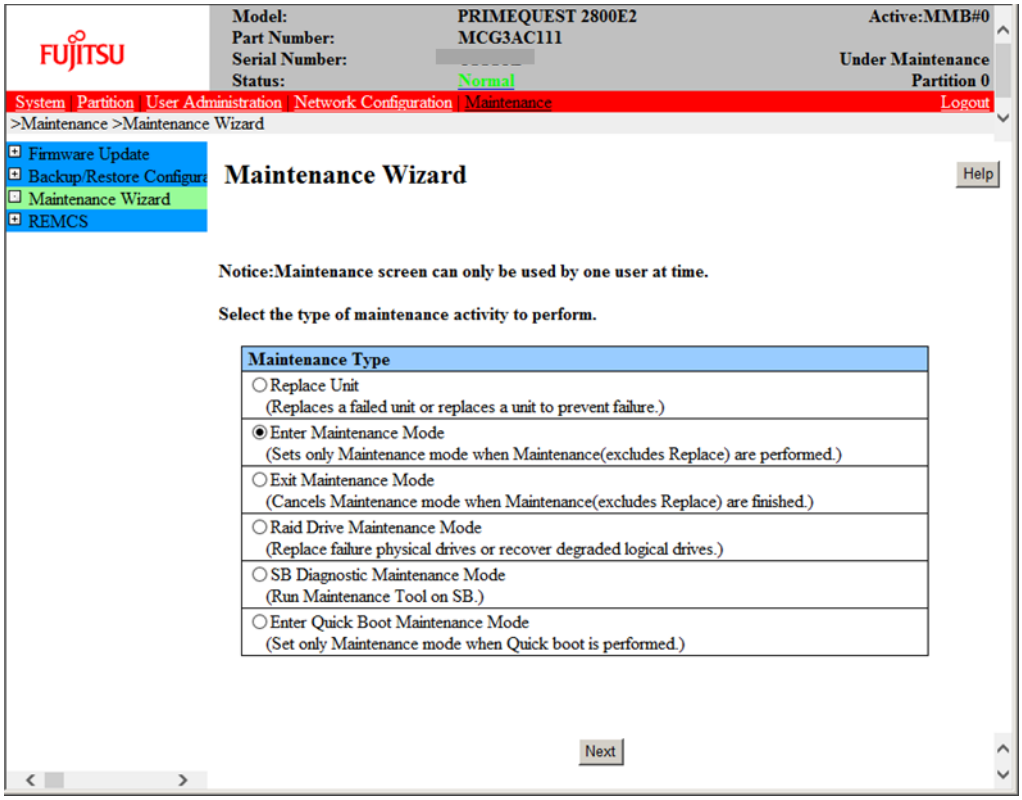
   b Select Maintenance Area.
   Hot plug of PCI slot for Partition#0 is explained as example. Select [Partition], check Partition#0, and click [Next] button.



c Select Maintenance System Mode.
Select [Hot Partition Maintenance], and click [Next] button.



d Confirm entering Maintenace Mode.
Maintenance Mode is set. Information area is shown in grey.

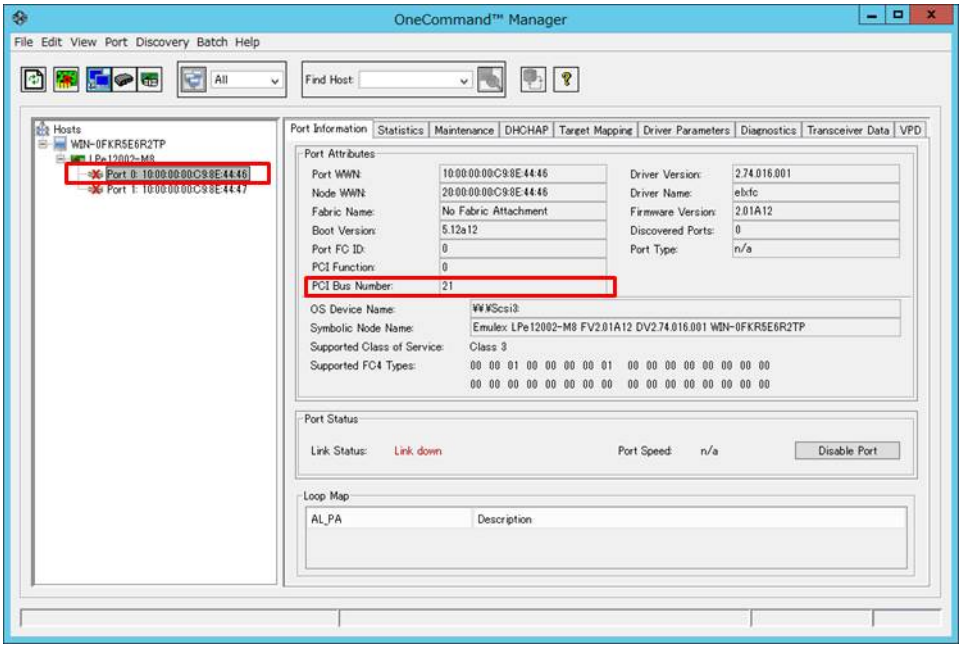


3. Confirm physical location, segment number and bus number of target NIC.
   Confirm the physical location, segment number and bus number with step 1 at '9.2.1 Replacement procedure' in '9.2 Common Hot Plugging Procedure for PCI Express cards'.
   Note
   In case of multi-function card, there are some cards that have same segment number, same bus number, and different function numbers.
   In this case, please perform Step.4 to Step.8 of follows respectively.

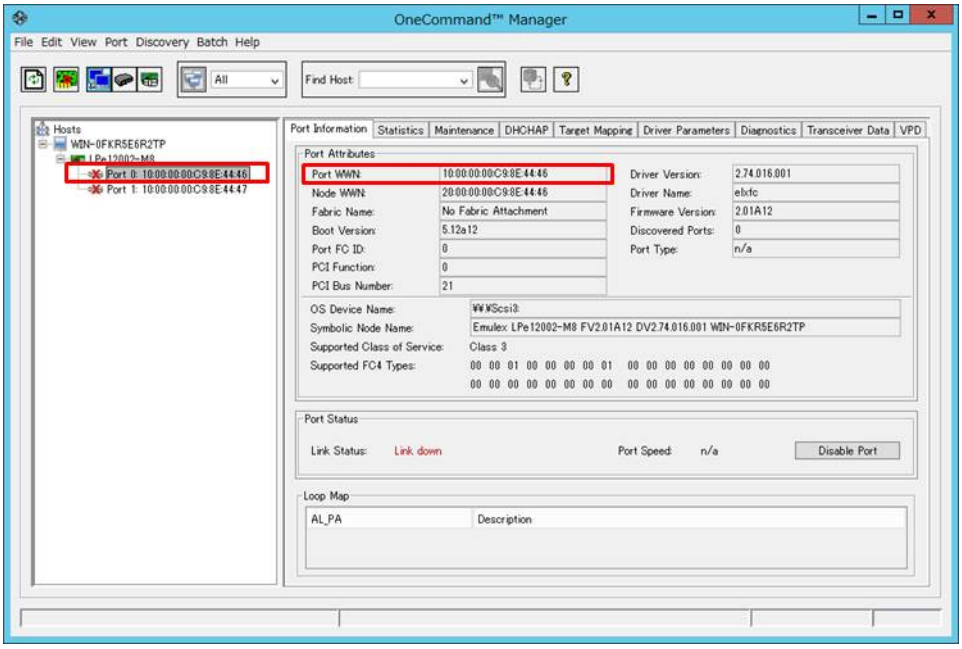
4. Confirm target device by using administration manager of the FC card, and confirm WWN, port number, and firmware version.

   Case: Emulex FC card

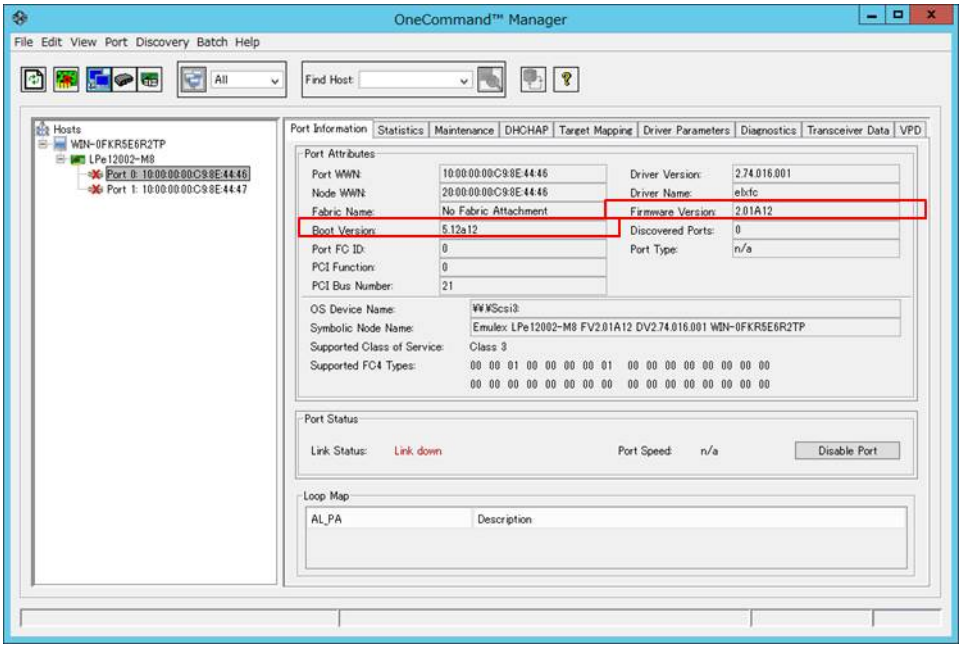
   a Open OneCommand Manager, confirm target device with step 3.
   Select Port WWN as the same type of target FC card in left pane, and select [Port Information] tab in right pane.
   See "PCI Bus Number" in [Port Attributes], and look for the device which has same bus number you confirmed in step 3.



b See WWN and port number of target device.
Select Port WWN of target FC card in left pane, and select [port Information] tab in right pane. WWN is written at “Port WWN” in [Port Attributes].



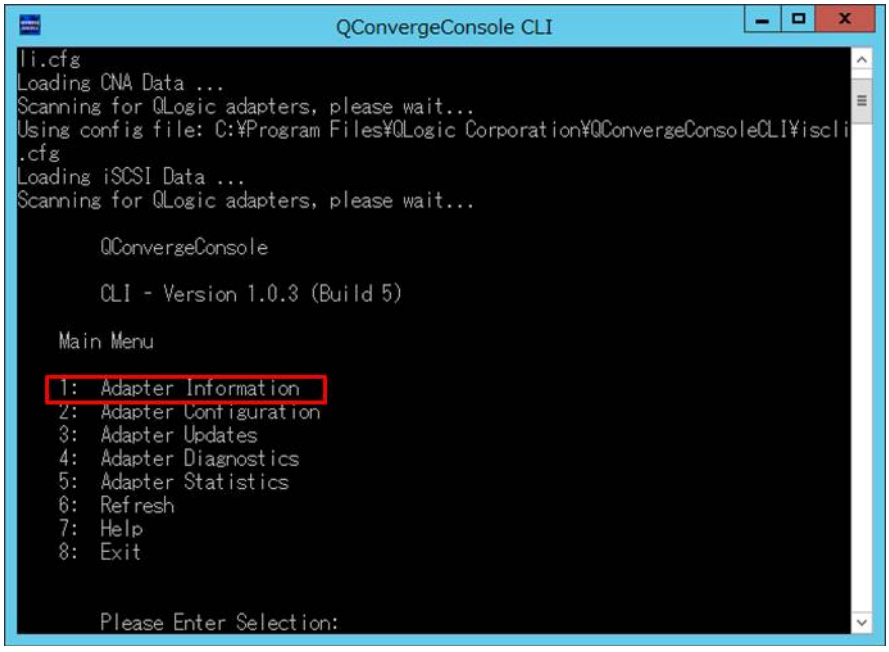
c Confirm firmware version of target device.
Select the device name of target FC card in left pane, and see [Port Information] in right pane. The firmware version is written at “Boot Version:” and “Firmware Version” in [Port Attributes].



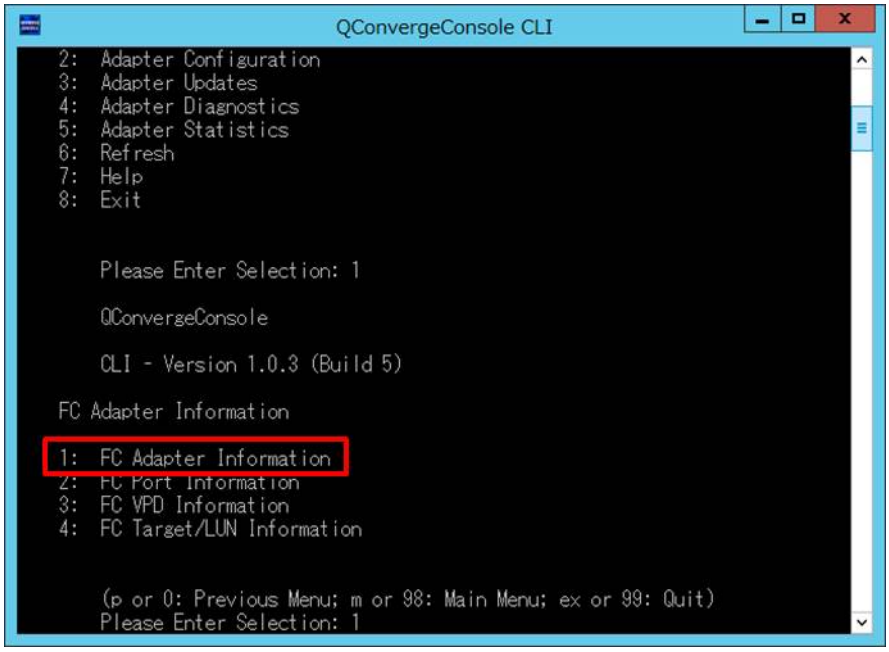
d Close OneCommand Manager.

Case: Qlogic FC card

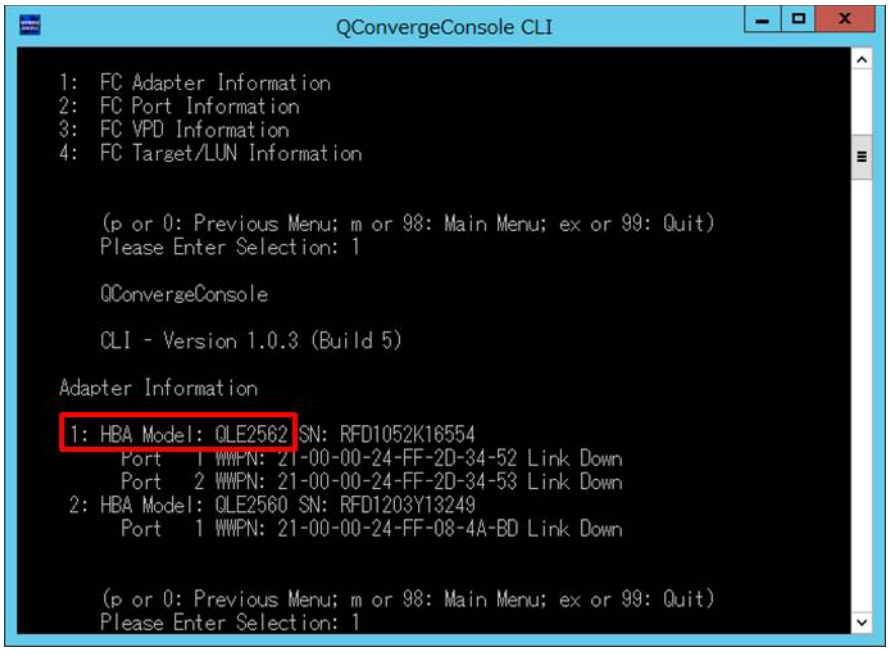
a. Open QConverge Console CLI, and identify target device from the bus number in step 3. Select “1: Adapter Information” in [Main Menu].



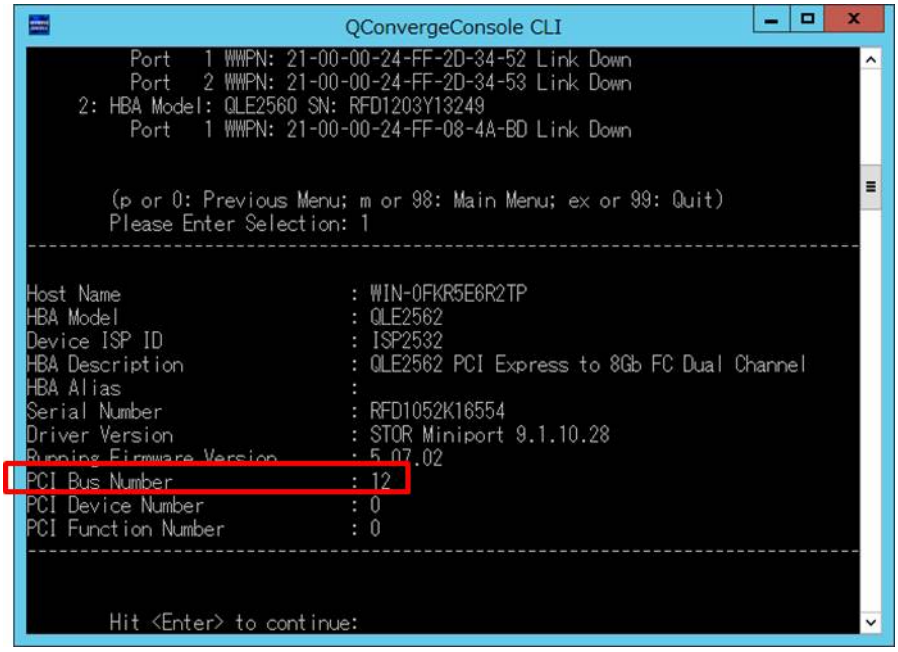
b. Select “e1: FC Adapter Information” in [FC Adapter Information].



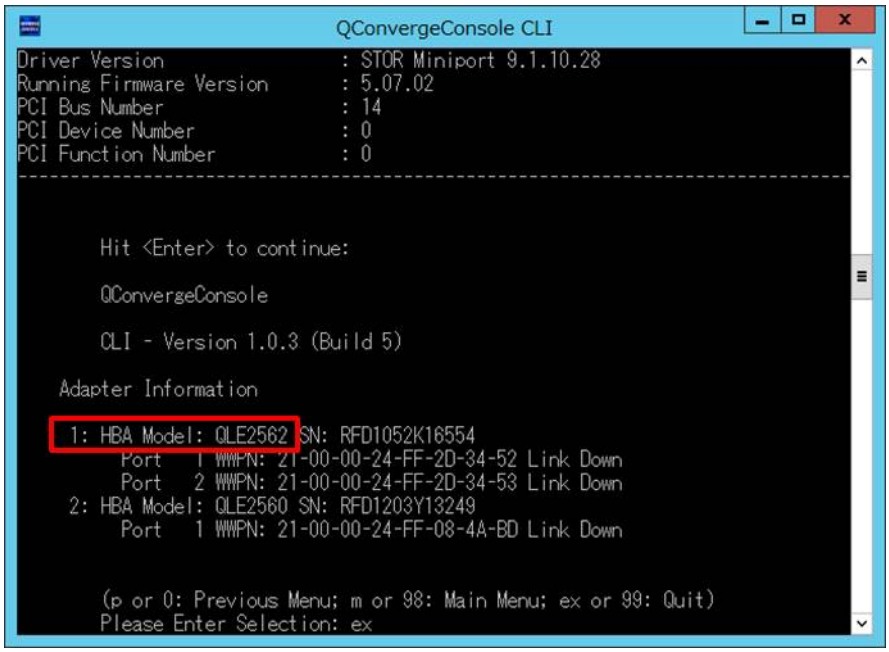
c. Select the device of the same type of target FC card in [Adapter Information].



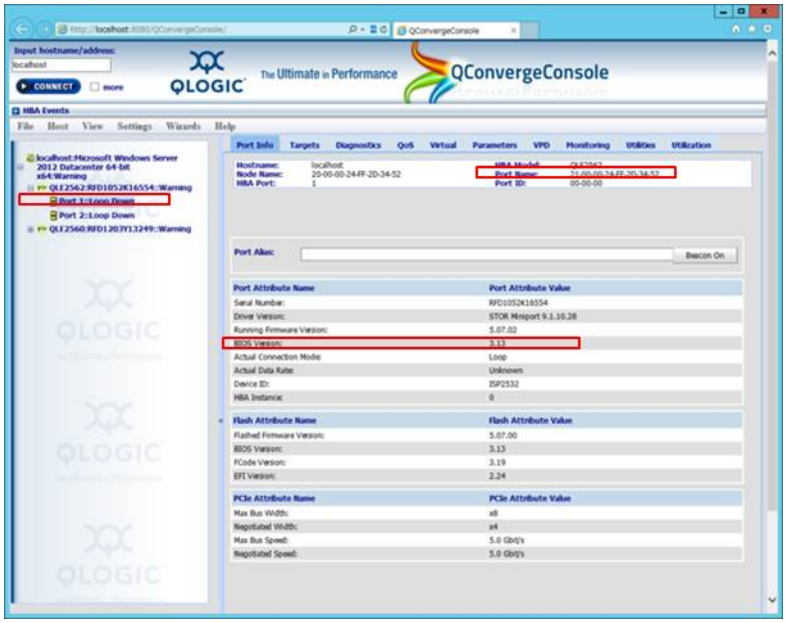
d. Confirm “PCI Bus Number” of FC card, and look for the device which has same bus number you confirmed in step 3.



e Confirm WWN and port number of target device.
WWN is the information described as “WWPN:” of target FC card in [Adapter Information].

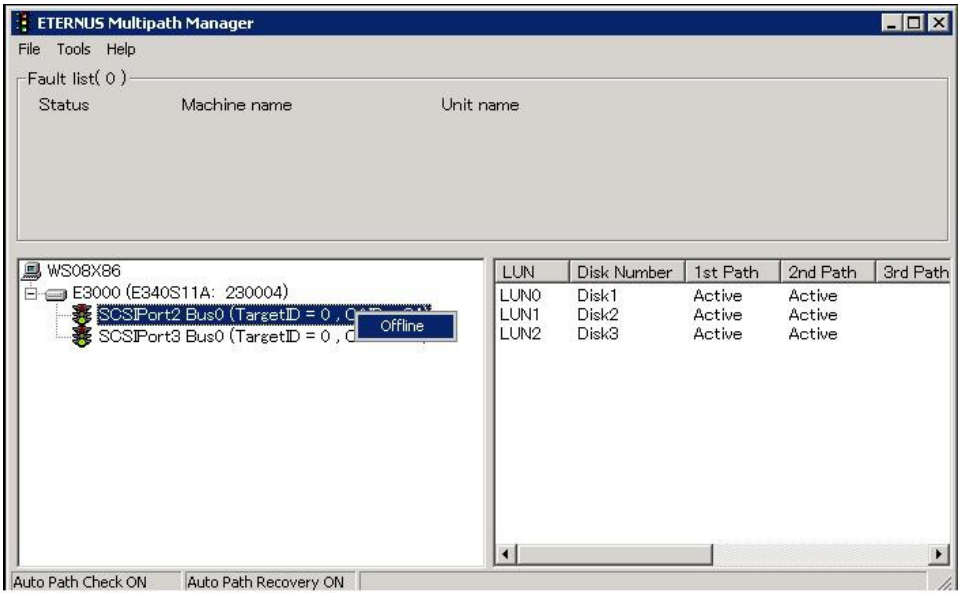


f Confirm firmware version of target device.
QConverge Console GUI, and select device name of target FC card in left pane, and see [Port Info].
The firmware version is the information described as “BIOS Version:” in [Port Attribute Name].



g Close QConverge Console CLI/GUI.

5. Open ETERNUS Multipath Manager and place all the devices to be replaced offline.
Make all devices which match port numbers checked at step 4-b offline and close ETERNUS multipath manager.



6. Confirm target FC card by using Device Manager.
Confirm FC card with step 2-a at '9.2.1 Replacement procedure' in '9.2 Common Hot Plugging Procedure for PCI Express cards'.

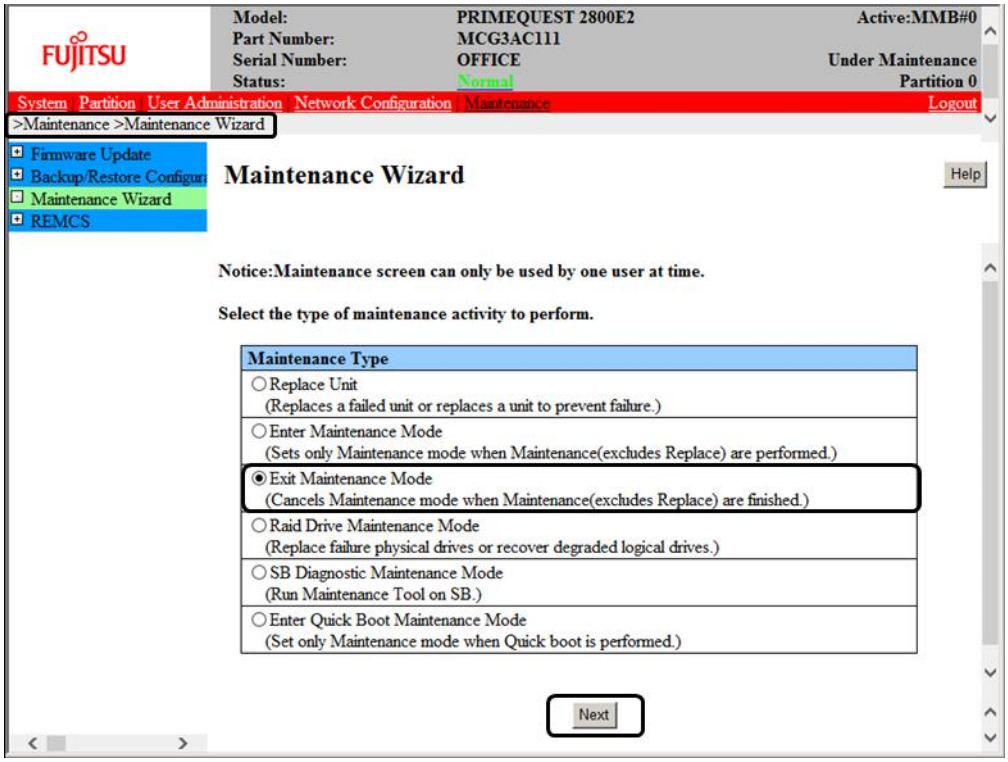
- Case: Emulex FC card
Go to step 7.
- Case: Qlogic FC card
Using 'Services' window in 'Computer Management', stop 'QLogic Management Suite Java Agent'.
Go to step 8.
Note
Do not perform step 7.

7. Disable target FC card by using Device Manager.
Disable FC card with step 2-a at '9.2.1 Replacement procedure' in '9.2 Common Hot Plugging Procedure for PCI Express cards'.

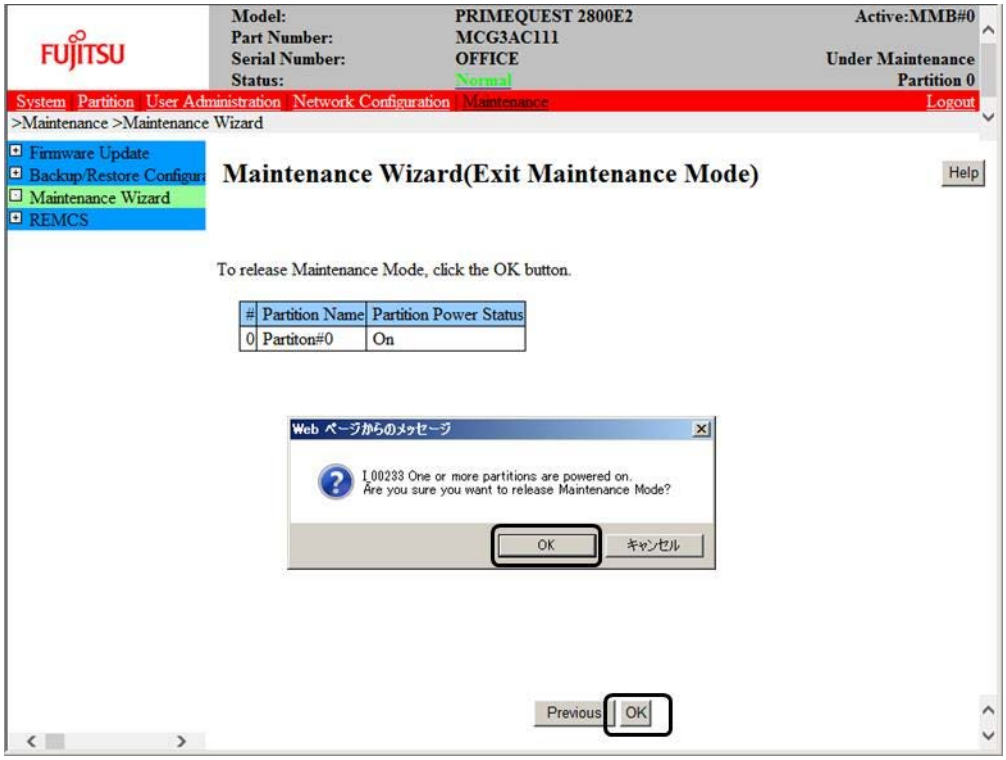
8. Stop target FC card by using safely remove device from computer.
   Stop FC card with step 2-a at '9.2.1 Replacement procedure' in '9.2 Common Hot Plugging Procedure for PCI Express cards'.

9. Release Maintenance Mode in MMB Maintenance Wizard.

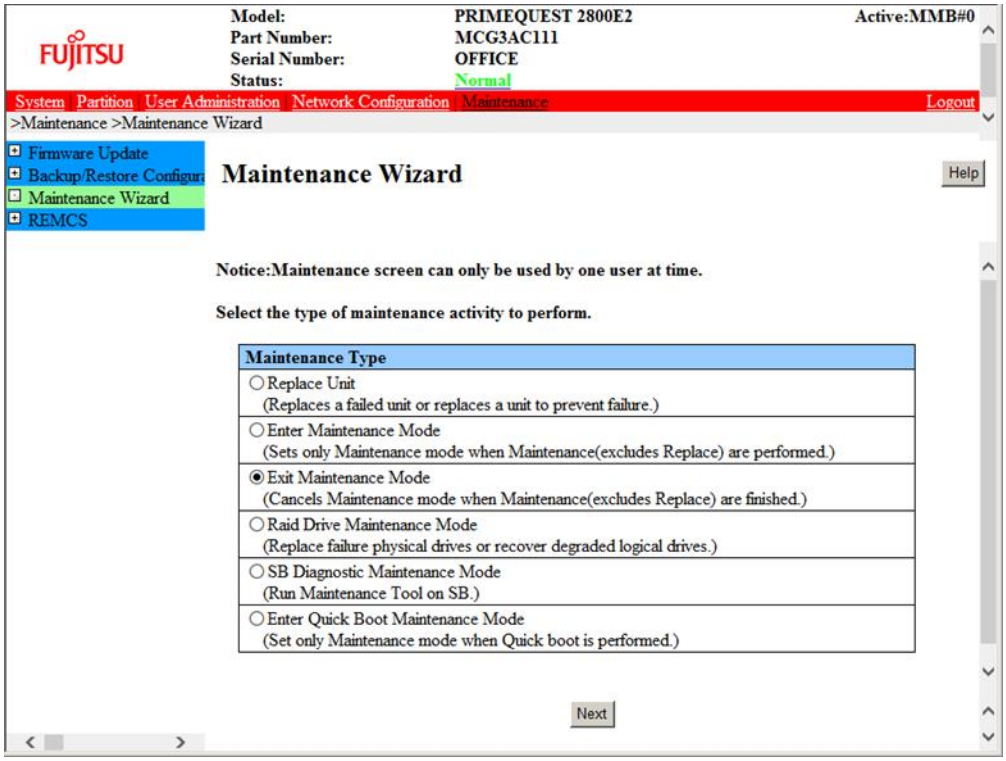
   a Start release of Maintenance Mode.
   Start [MaintenanceWizard] in MMB Web-UI. [Maintenance Wizard] window appears. Select [Exit Maintenance Mode] in Maintenance Type, and click [Next] button.



b Release Maintenance Mode.
Information of the partition where you release Maintenance Mode is shown. Confirm whether the partition is the particular partition or not. Pop-up of confirmation appears. Click [Next] button.



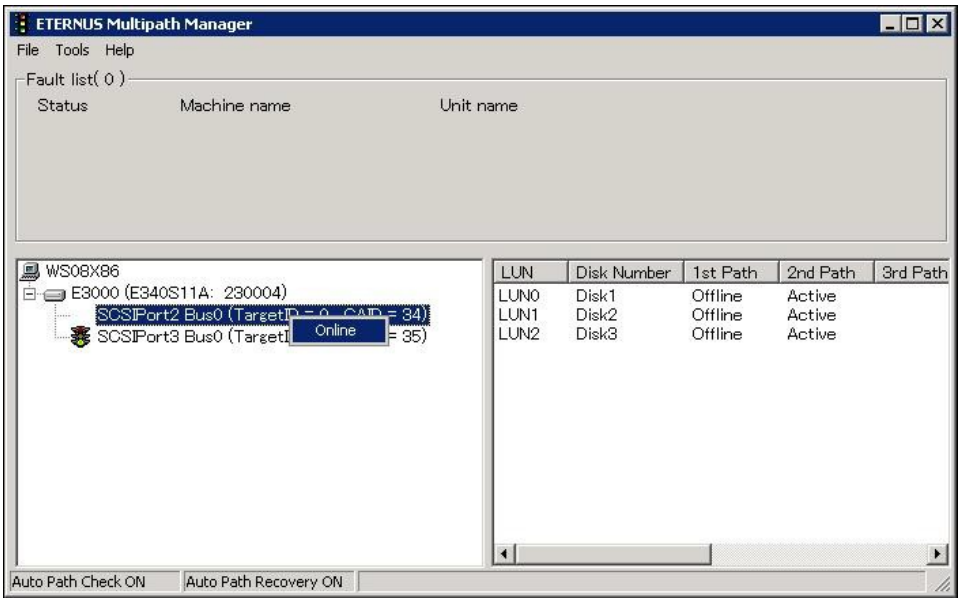
c Confirm the release of Maintenance Mode.
Confirm that Maintenance Mode is released (Information area: not grey-out).



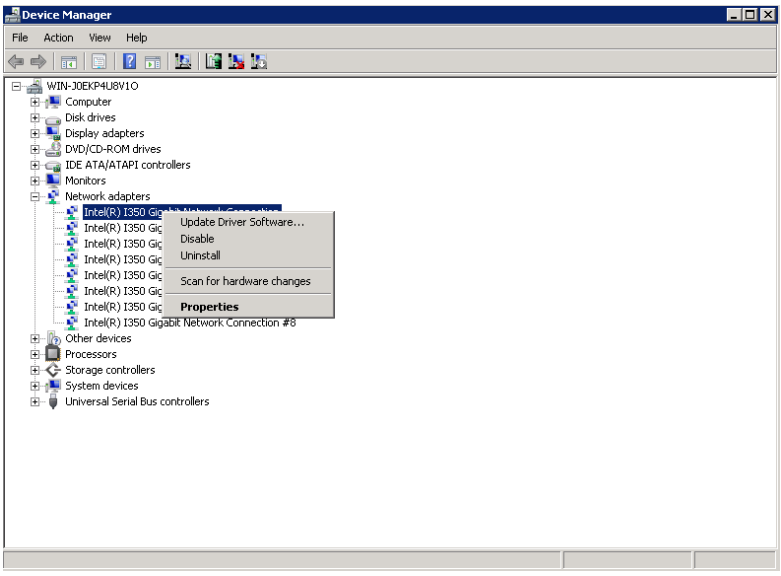
10. Replace FC card by using MMB Maintenance Wizard.
Replace FC card with step 2-a at '9.2.1 Replacement procedure' in '9.2 Common Hot Plugging Procedure for PCI Express cards'. This step is performed by the field engineer in charge of your system.

11. Confirm firmware version of replaced FC card.
    It is required that the firmware version of new FC card is same as the FC card which had been replaced.
    If the firmware version of new FC card is coincident with that of the FC card which had been replaced (current firmware version), it is not necessary to update the firmware version of new FC card to current firmware version.
    If the firmware version of new FC card is not coincident with that of the FC card which had been replaced (current firmware version), update the firmware version of new FC card to current firmware version.
    For how to update the firmware version, see firmware update manual for fibre channel card.
    Note
    If you cannot confirm the firmware version of the FC card before replacing due to the fault of the FC card, check the firmware version of the FC card which is same type as the faulty one to update firmware version.

12. Start ETERNUS Multipath Manager and place all the replaced devices online. Confirm that the devices are normally incorporated with the multipath driver.



13. Confirm replaced FC card by using Device Manager.
    Open Device Manager, and confirm that the target device is recognized correctly.
    Note
    As the follow, right-click target device in Device Manager, if there are [Enable] in displayed menu, check [Enable].
    (In case of [Disable], this work is not necessary)



14. Restart services for only Qlogic FC cards.
    Using ‘Services’ window in ‘Computer Management’, restart ‘QLogic Management Suite Java Agent’.

9.4.2 FC card addition procedure

Referring to 9.2 Common Hot Plugging Procedure for PCI Express cards, add an FC card.

9.5 Hot Replacement Procedure for iSCSI

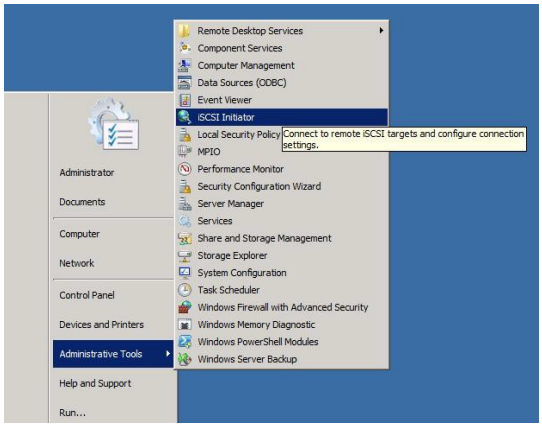
The prerequisites for iSCSI (NIC) hot replacement are as follows.

- The maintenance person has the Administrator privileges required for operations.
- The ETERNUS multipath driver (MPD) has been applied.
- To replace more than one card, one card at a time will be replaced.

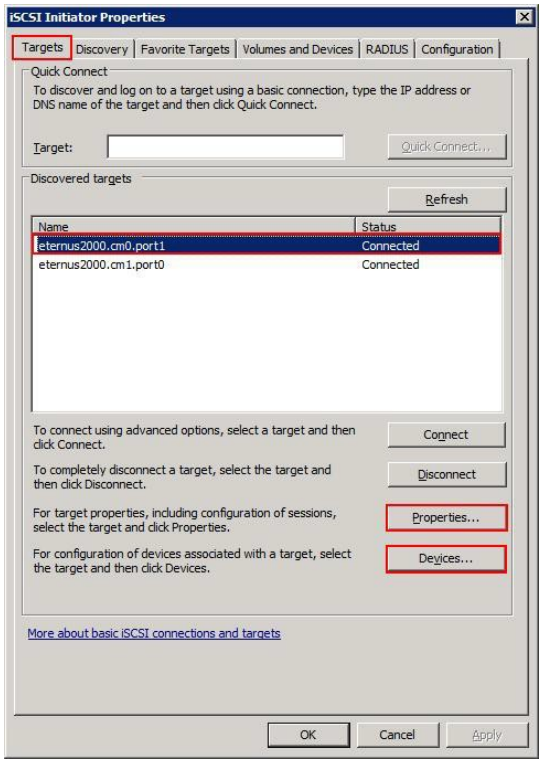
9.5.1 Confirming the incorporation of a card with MPD

This section describes the procedure for confirming that a card has been incorporated with MPD.

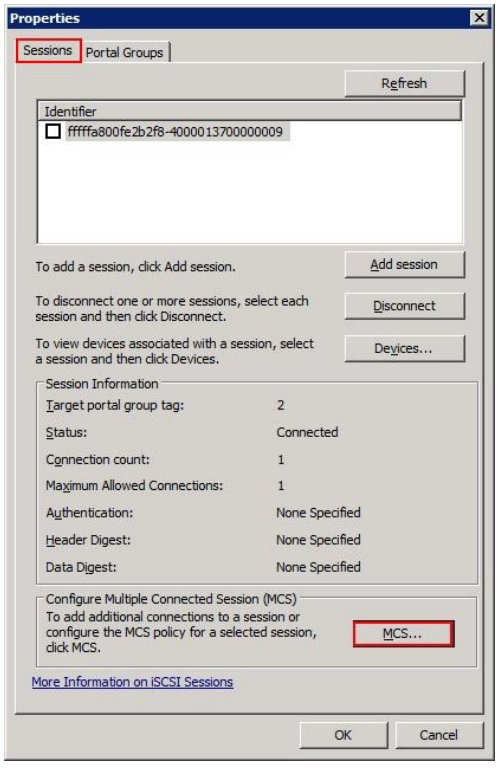
1. Confirm physical location, segment number and bus number of target NIC.
   Confirm the physical location, segment number and bus number with step 1 at 9.2.1 Replacement procedure in 9.2 Common Hot Plugging Procedure for PCI Express cards.
   Note
   In case of multi-function card, there are some cards that have same segment number, same bus number, and different function numbers.
   In this case, please perform Step.2 to Step.7 of follows respectively.
2. Confirm target NIC in Device Manager.
   Confirm NIC with step 2-a at 9.2.1 Replacement procedure in 9.2 Common Hot Plugging Procedure for PCI Express cards.
3. Record IP address of target replaced NIC.
   Open Command Prompt, command “ipconfig/all”, and record information that is necessary to reconfigure IP address, subnet mask and so on of NIC after replacement.
4. Open iSCSI initiator.



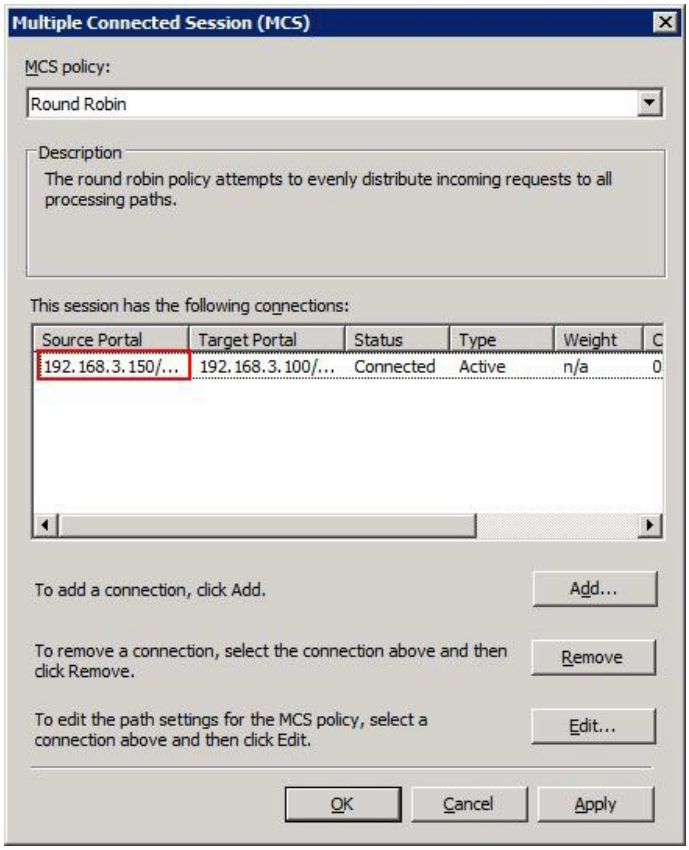
5. Click the [Targets] tab in the [iSCSI Initiator Properties] window. One of the targets displayed in [Discovered targets] is connected to the NIC to be replaced. If you know which target, select the target, click the [Devices] button, and proceed to step 10.
   If you do not know, select any target, click the [Properties] button, and proceed to step 7.



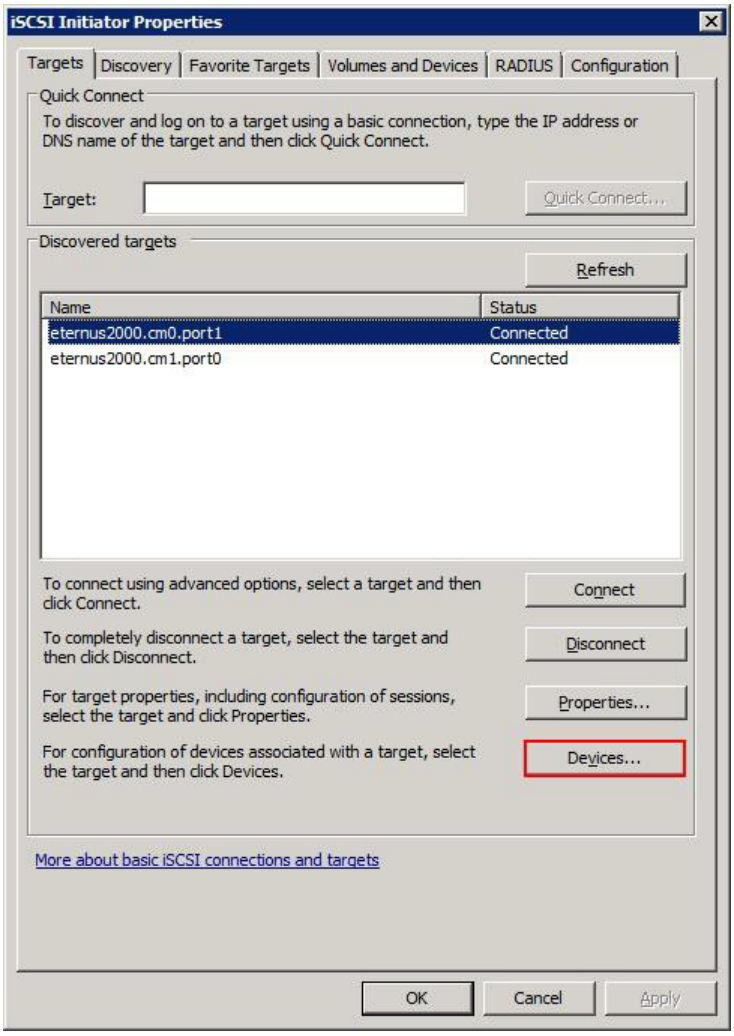
6. Click the [Sessions] tab in the [Properties] window, and click the [MCS] button.



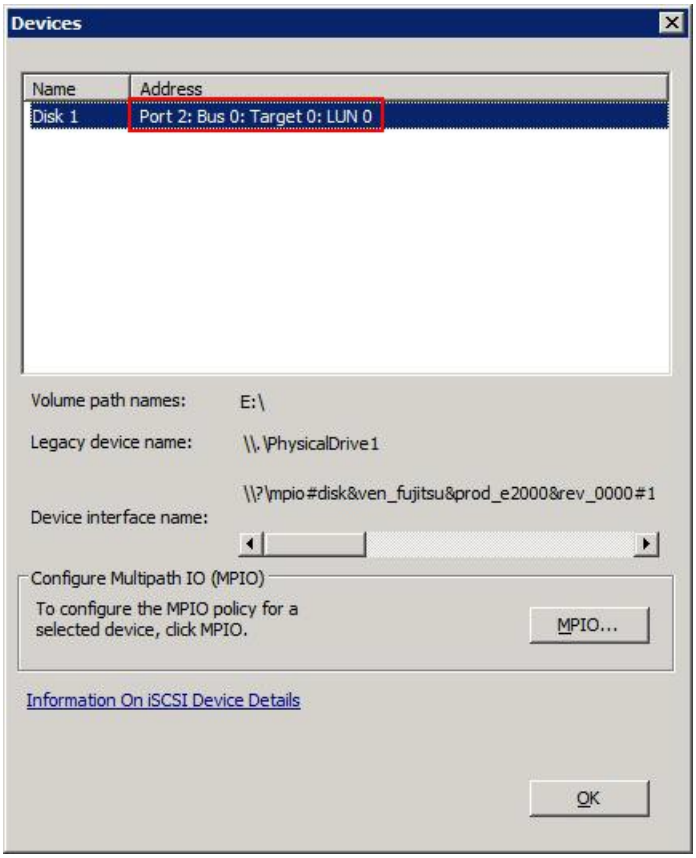
7. The [Source Portal] column in the [Multiple Connected Session (MCS)] window displays IP addresses. Check whether any IP address matches that recorded in step 3.
   If an IP address matches (192.168.3.150, in this example), this is the target connected to the device to be replaced.



8. Click the [Cancel] button to return to [Properties] window shown in step 5, and click the [Cancel] button again to return to the [iSCSI Initiator Properties] window shown in step 5.
9. If no IP address in step 6 matches, select the next target, and repeat step 4 or later.
   Otherwise, click the [Devices] button.



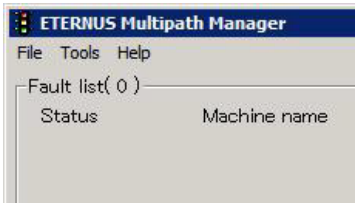
10. Record the values displayed in the [Address] column in the [Devices] window (Port 2: Bus 0: Target 0: LUN 0, in this example).



9.5.2 Disconnecting MPD

This section describes the procedure for disconnecting MPD.

1. Start ETERNUS Multipath Manager.
2. Confirm the address value recorded in step 10 in 9.5.1 Confirming the incorporation of a card with MPD. Then, place the target device offline. For a multifunction card, it is necessary to place more than one device offline.

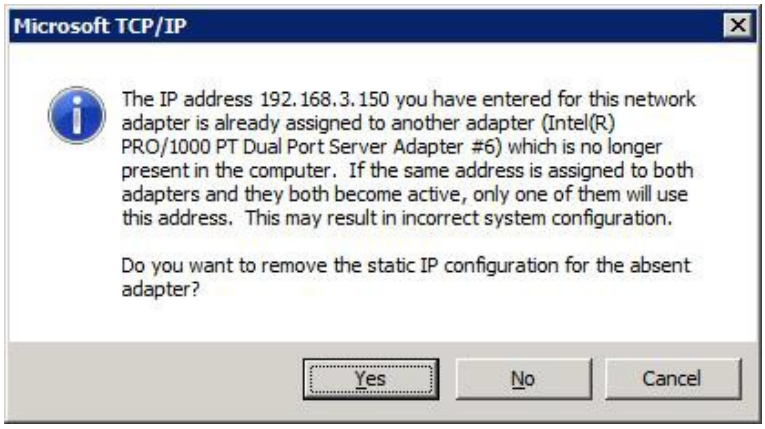


Note
In case of multi-function card, there are some cards that have same segment number, same bus number, and different function numbers.
In this case, please perform step.3 to step.5 of follows respectively.

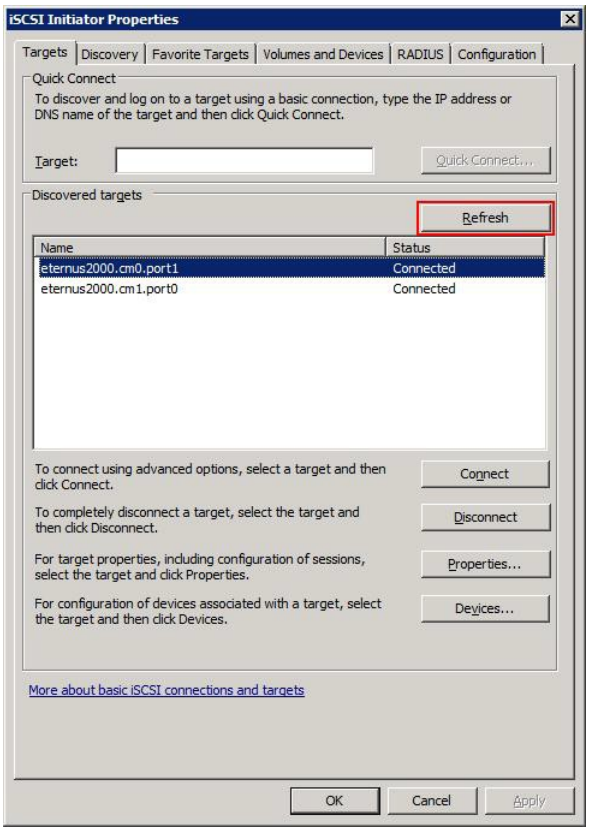
3. Confirm target NIC in Device Manager.
Confirm NIC with step 2-a at 9.2.1 Replacement procedure in 9.2 Common Hot Plugging Procedure for PCI Express cards.
4. Disable target NIC in Device manager.
Disable NIC with step 2-b at 9.2.1 Replacement procedure in 9.2 Common Hot Plugging Procedure for PCI Express cards.
5. Stop target NIC by using safely remove devices from computer.
Stop NIC with step 3 at 9.2.1 Replacement procedure in 9.2 Common Hot Plugging Procedure for PCI Express cards.

6. Replace NIC by using MMB Maintenance Wizard.
   Replace NIC with step 4 at 9.2.1 Replacement procedure in 9.2 Common Hot Plugging Procedure for PCI Express cards. This step is performed by the field engineer in charge of your system.
   Note
   In case of using SVagent, “Source:Svagent, ID: 25004 Error massage” is logged in SEL when replacing, it is no problem.

7. Set an IP address for the replacement device.
   Set the IP address and subnet mask recorded in step 2.
   Remarks
   If the following message appears when you set the IP address, select [Yes].



8. Click the [Refresh] button on the [Targets] tab in the [iSCSI Initiator Properties] window. Confirm that the target status becomes [Connected].



CHAPTER 10 Backup and Restore

This chapter describes the backup and the restore operations required for restoring server data.

10.1 Backing Up and Restoring Configuration Information

The PRIMEQUEST 2000 series has partitioning functions. These functions provide the user with partitions acting as independent servers. The user must configure the UEFI (Unified Extensible Firmware Interface) for each partition. The user can make these settings with operations on the MMB. The MMB has BIOS configuration information for each partition. It also has backup and restore functions for the configuration information on the MMB.

Notes

- Configuration information on the server must be backed up ahead of time. The backup enables restoration of the original information if the system becomes damaged or an operational error erases data on the server. Be sure to periodically backup server configuration information in case of such events.
- The PRIMEQUEST 2000 series server cannot be connected to an FDD (floppy disk) for backup, restore, or other such operations. To use an FDD, connect it to a remote PC or another server connected to the PRIMEQUEST 2000 series server.

This section describes the backup and the restore operations for UEFI configuration information and MMB configuration information.
For details on the backup and restore windows, see Chapter 1 MMB Web-UI (Web User Interface) Operations in the *PRIMEQUEST 2000 Series Tool Reference* (CA92344-0539).

10.1.1 Backing up and restoring UEFI configuration information

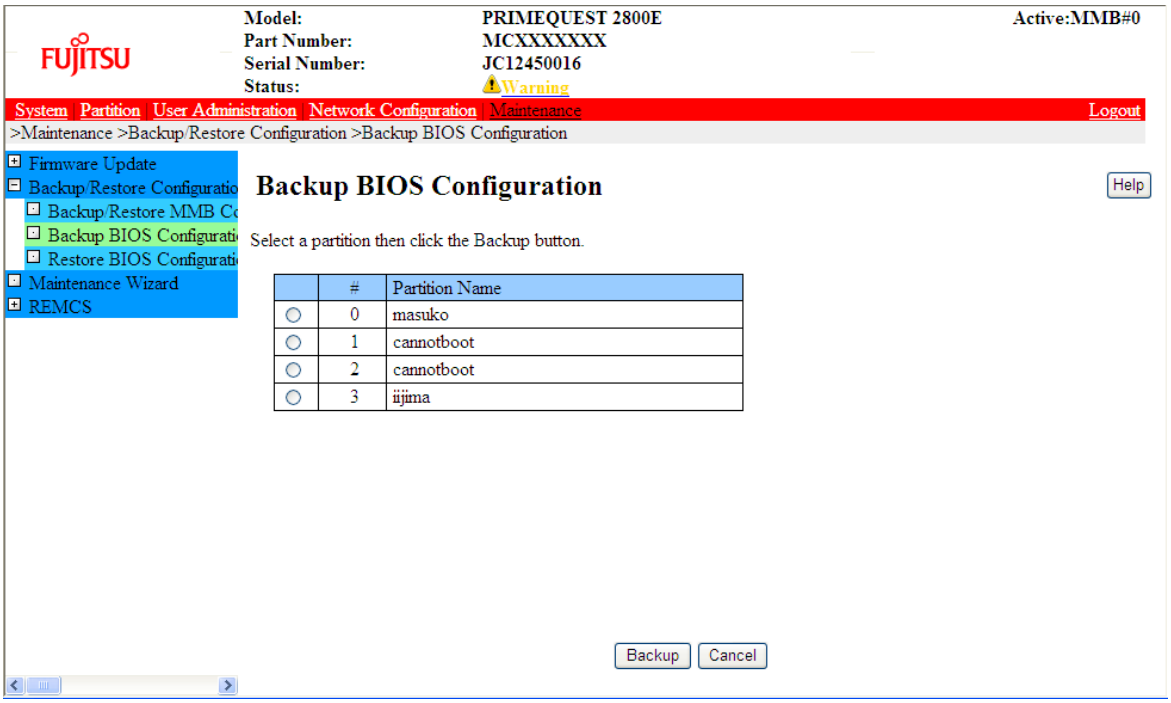
Users can perform the following processes with the backup and restore functions for UEFI configuration information:

- Backing up all items that are set in the UEFI window
- Backing up the specified UEFI configuration information in a UEFI window for one partition from the MMB.
- Restoring backed-up UEFI configuration information during replacement of a faulty SB

Notes
Backup UEFI configuration information of a Partition cannot be applied to other partitions.

A remote terminal can store the saved information. The data saved to the remote terminal can be restored. In the [Backup BIOS Configuration] window of the MMB Web-UI, back up UEFI configuration information to the PC running your browser. The procedure is as follows.

FIGURE 10.1 [Backup BIOS Configuration] window



Backing up UEFI configuration information

1. Select the radio button of the partition for which to back up the configuration information. Then, click the [Backup] button.
   The save destination dialog box of the browser appears.
2. Select the save destination path. Then, click the [OK] button.
   Download of the file begins.
   The default BIOS Configuration file name for the backup is as follows:
   Partition number_save date_BIOS version.dat

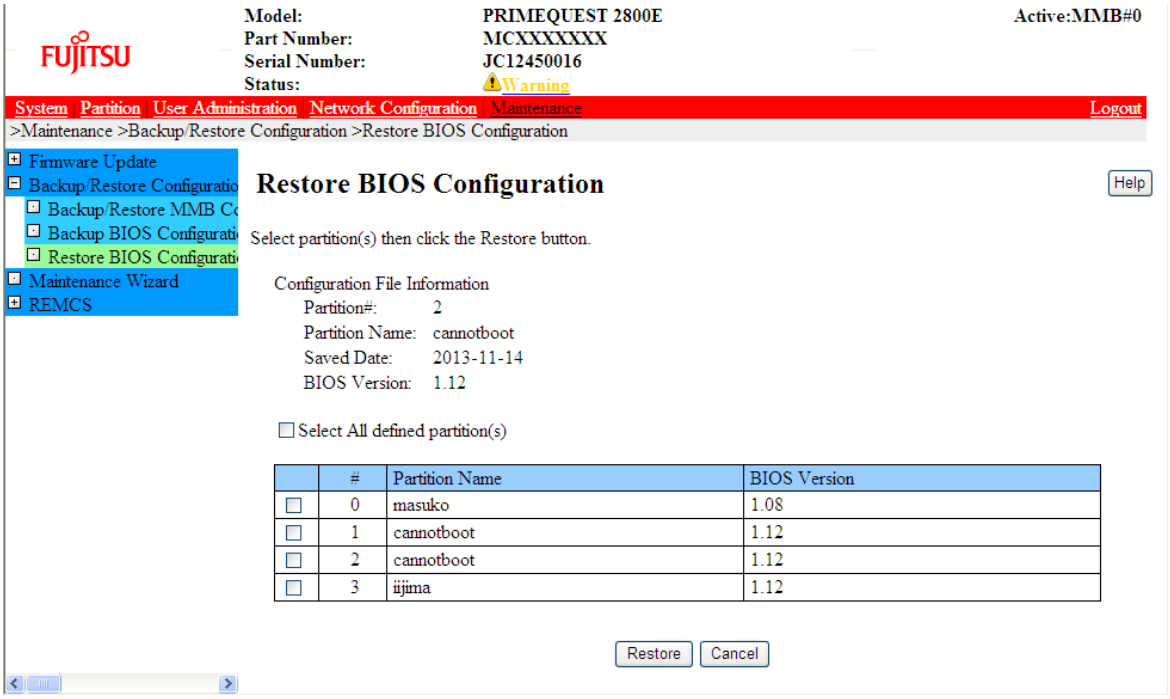
Restoring UEFI configuration information

From the [Restore BIOS Configuration] window, restore BIOS configuration information.

FIGURE 10.2 [Restore BIOS Configuration] window

1. Select the backup BIOS Configuration file stored on the remote PC. Then, click the [Upload] button.
   File transfer to the MMB begins.
   The following window appears when the file transfer is completed.

FIGURE 10.3 [Restore BIOS Configuration] window (partition selection)



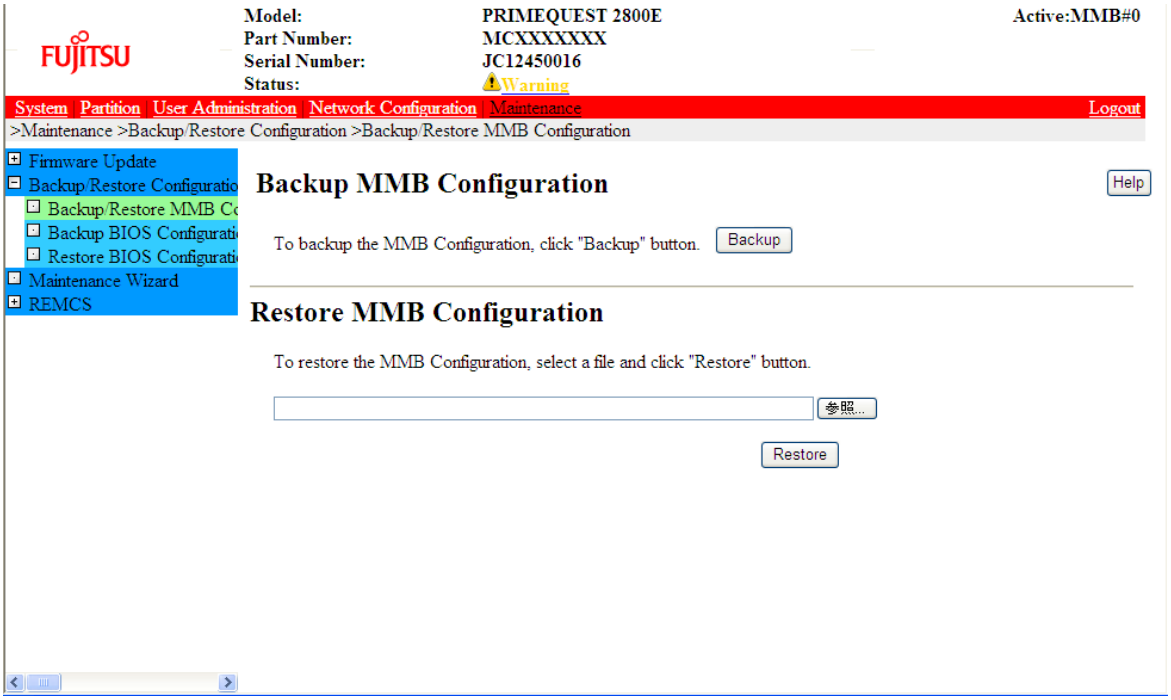
2. Select the partition to restore. Then, click the [Restore] button.

Note
When you back up and restore UEFI configuration information of Extended Partition, also back up and restore UEFI configuration information of the physical partition which is divided into those Extended Partitions.

10.1.2 Backing up and restoring MMB configuration information

From the Backup/Restore MMB Configuration window, you can back up and restore MMB configuration information. The procedure is as follows.

FIGURE 10.4 [Backup/Restore MMB Configuration] window



Backing up MMB configuration information

1. Click the [Backup] button.
   The browser dialog box for selecting the save destination appears.
2. Select the save destination path. Then, click the [OK] button.
   Download of the file begins. The default MMB Configuration file name for the backup is as follows:
   MMB_(*save date*)_(*MMB version*).dat

Restoring MMB configuration information

1. Confirm that the system has stopped completely.
2. Select the backup MMB Configuration file stored on the Remote PC. Then, click the [Restore] button.
   File transfer to the MMB begins. A restore confirmation dialog box appears when the file transfer is completed.

FIGURE 10.5 Restore confirmation dialog box

3. To restore MMB configuration information, click the [OK] button. To cancel restoration, click the [Cancel] button.

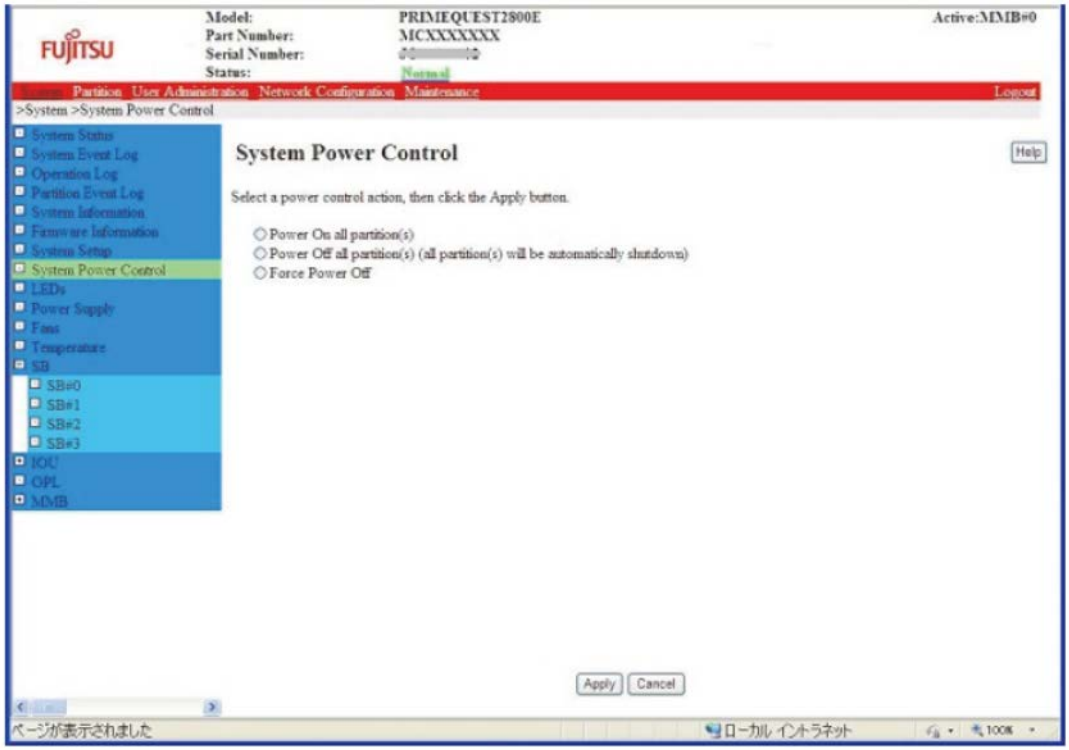
CHAPTER 11 Chapter System Startup/Shutdown and Power Control

This section describes the startup, shutdown and the power control in PRIMEQUEST 2000 series.

11.1 Power On and Power Off the Whole System

This section describes the power on and power off operations which are supported by the system.
The power control of the whole system is operated from the [System Power Control] window of the MMB.

FIGURE 11.1 [System Power Control] window



For details on the [System Power Control] window, see “1.2.8 [System Power Control] window in “PRIMEQUEST 2000 series Tool Reference” (CA92344-0539)

11.2 Partition Power on and Power off

This section describes various procedures of power on and Power off for the partition and explains the method of checking power supply.

11.2.1 Various Methods for Powering On the Partition

There are three methods for powering on the partition, which are as follows.

1. Operation through the MMB Web-UI or MMB CLI.
   The partition can be powered on through the MMB Web-U or MMB CLI operation. In this method, power on can be specified for all the partitions or specified in the partition unit.
2. Scheduled operation (Automatic operation according to a set schedule)
   A partition can be powered on by a scheduled operation (Automatic operation function). A partition unit can be powered on automatically by recording the time of power on in advance by the scheduled operation function.

3. Wake On LAN (WOL)
   The partition can be power on with WOL. In this method, power on can be specified for the relevant partition containing the IOU.

Notes

- You can enable or disable WOL of LAN ports on IOU per IOU by MMB Web-UI. Default value of WOL is 'disable'. If you use WOL of LAN port on IOU, set Onboard LAN Mode to 'Enabled' (WOL enable). For details on [Mode] window, see '[Mode] window' in "PRIMEQUEST2000 series *Tool Reference*" (CA92344-0539).
- If the power supply is stopped or IOU is pulled out, the setting of WOL is initialized.
  Restore the setting of WOL with Operating System.
- Enable or Disable WOL is set from both BIOS and the operating system.
  To enable WOL in Windows, following settings are required for each port of the device manager Check the [Wake On Magic Packet from the powered off state] checkbox in [Device Manager] – [Network Adaptor] – [INTEL ® 82576 Gigabit Dual Port Network Connection] – [Property] – [Power Management].
  In case of setting in windows, "Intel PROSet" of the supplied driver must be installed.
  To enable WOL in BIOS, following setting is required for each port:
  Enable [Wake on LAN] in the menu [Device Manager]-[Network Device List]-[NIC Configuration]
  Note
  To display [Network Device List] menu, set the NIC to 'PXE/iSCSI' in [LAN Remote Boot Configuration] menu.
- In Legacy Boot (ROM Priority is Legacy), operating system cannot boot from a HDD included an SB other than Home SB. Move the HDD installing operating system into HDD slot on Home SB or set the SB including the HDD installing operating system as Home SB.
- After switching Home SB, the number of 'Reset' registered in SEL increase by one only first time when the particular partition starts.

11.2.2 Partition Power on unit

The units that can be powered on and the power on methods are given below. For details on the privileges of the partition power on operation, see '1.1 WEB-UI Menu List' in "PRIMEQUEST 2000 series Tool Reference" (CA92344-0539).

TABLE 11.1 Power on method and power on unit

Power on method	Power on unit: Entire partition	Power on unit: Single partition	Remarks
MMB Web-UI, MMB CLI	Power on is posssible	Power on is posssible	
Scheduled operation	Power on is not possible	Power on is posssible	Automatic operation
Wake On LAN (WOL)	Power on is not possible	Power on is posssible	Corresponding partition unit which includes IOU.

11.2.3 Types of Power off Method of Partition

The three methods to power off the partition are as follows.

1. Shutdown from the operating system (Recommended)
   Shutdown the operating system by using the operating system commands. When powering off the partition, perform the shutdown from the operating system. For the operating system shutdown commands, refer to the manual of each operating system.
2. Powering off of the partition using the [MMB Web-UI] window or the MMB CLI.
   The power can be turned off by the Web window operation of an external terminal, or the MMB CLI. In such operations, all partitions can be powered off, or a partition unit can be powered off. .
3. Powering off a partition by a scheduled operation.
   A partition can be powered off by a scheduled operation (Automatic operation function). A partition unit can be automatically powered off by registering the powering off time in advance by a scheduled operation function.

11.2.4 Powering Off Partition Units

The units that can be powered off and how to power off a partition unit is shown below. For details on the operation privileges for powering off partitions, see '1.1 Menu list of WEB-UI' in "PRIMEQUEST 2000 series Tool Reference" (CA92344-0539).

TABLE 11.2 Power on method and Power on unit

Power off method	Power on unit: All partitions	Power on unit: Single partition	Remarks
MMB Web-UI, MMB CLI	Power off is possible	Power off is possible	
Schedule operation	Power off is not possible	Power off is not possible	Automatic operation

Notes
In the following cases, confirm the details according to '13.2 Troubleshooting'. If the error recurs, contact your sales representative or field engineer.
Before contacting, confirm the model name and serial number shown on the label affixed on the main unit.
Until the problem is solved, do not execute [Reset], [Force Power Off] for the partition.

- When [Power Off], [Reset], or [Force Power Off] is executed for partition, or when shutting down from the operating system, the MMB Web-UI (Information area) status changes to "Error".
- When the MMB Web-UI displays the status of each component, "Read Error" will be displayed in the Part number and Serial number.

11.2.5 Procedure for Partition Power On and Power Off

There are single as well as multiple partitions. Power on /Power off operation is also the same in case of multiple partitions. If multiple partitions share one external device, first turn off the power source for multiple partitions; and then power off the external device. The privileges for powering on and powering off the partitions are as follows.

TABLE 11.3 Privilege for power on and power off

User Privilege	Power on and power off privilege
Administrator	Has permission for all partitions.
Operator	Has permission for all partitions.

TABLE 11.4 Privilege for power on and power off (continued)

User Privilege	Power on and power off privilege
Partition Operator	Has permission for only the partition authorized for the user.
User	Does not have permission for any partition
CE	Does not have permission for any partition

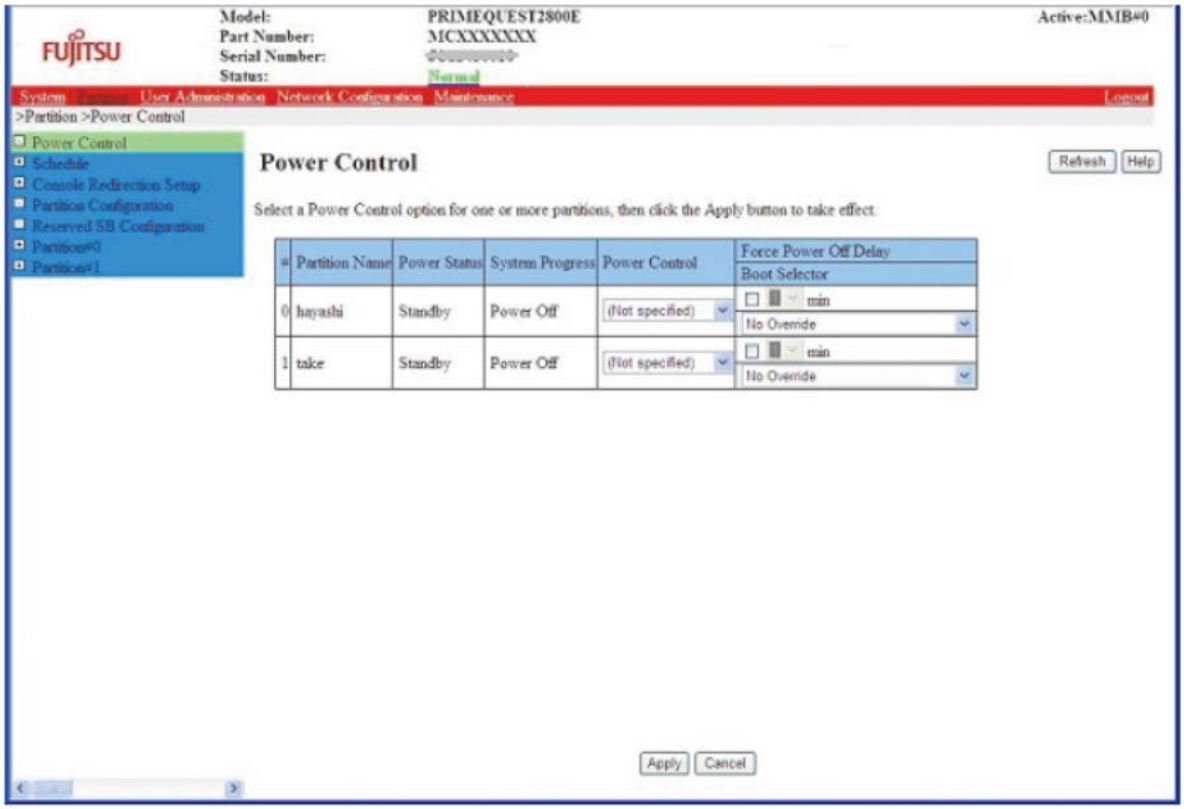
For the details on the user privileges of the MMB Web-UI menu, see '1.1 Menu list of Web-UI' in "PRIMEQUEST 2000 series Tool Reference" (CA92344-0539).

11.2.6 Partition Power on by MMB

This section describes the procedure of powering on the partition by MMB.

1. Log into the MMB Web-UI.
   -> [MMB Web-UI] window appears.
2. Click [Partition] – [Power Control].
   -> [Power Control] window appears. This window displays only the partitions having an SB/Memory Scale-up Board or IOU.

FIGURE 11.2 [Power Control] window



"#" column has the partition number.
For the details of [Power Control] window, see '1.3.1 [Power Control] window' in "PRIMEQUEST 2000 series Tool Reference" (CA92344-0539).

3. Click the [Apply] button after the [Power Control] of the partition to be powered on is set to [Power-On].
   -> A confirmation dialog box appears.

4. Click the [OK] button to execute, and click the [Cancel] button to cancel.

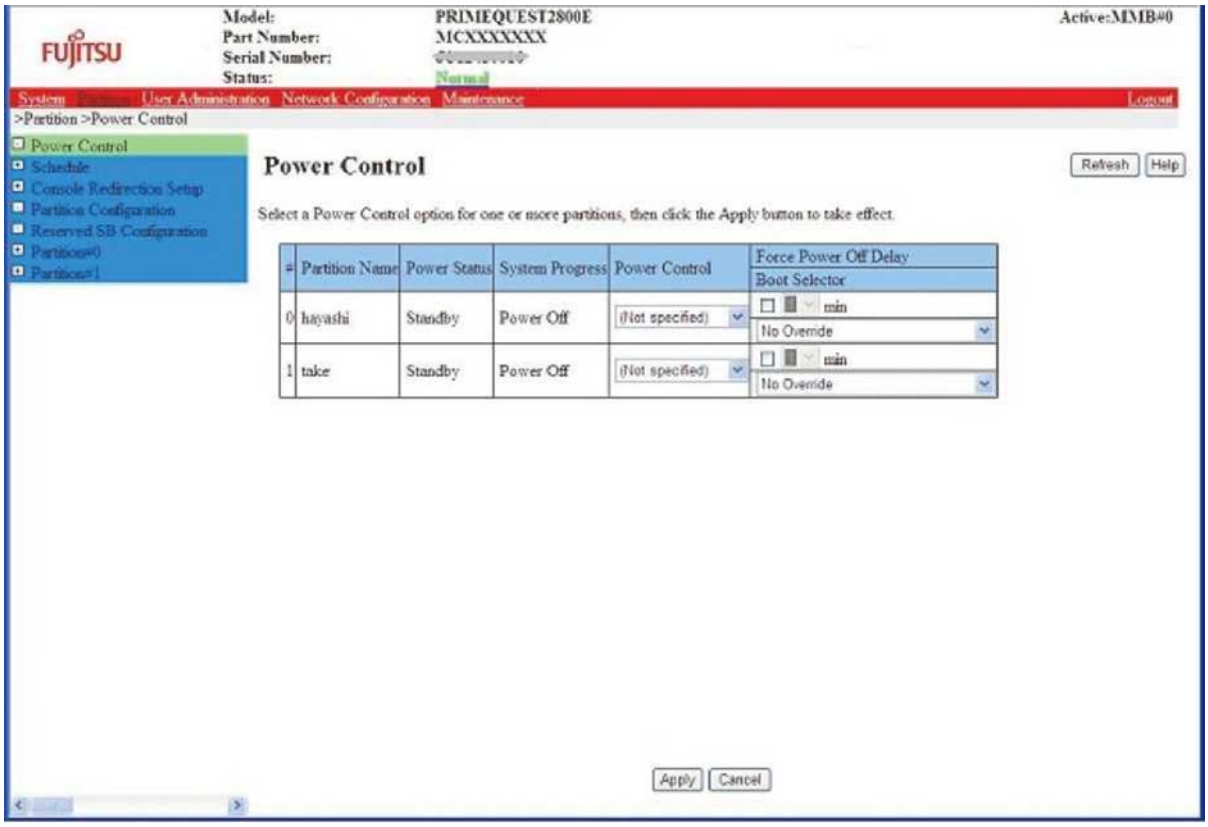
Remarks
A warning message appears if the partition is already powered on, or if the specified control fails because the power is turned off.
For the details on the display and setting items, see '1.3.1 [Power Control] window' in "PRIMEQUEST 2000 series Tool Reference" (CA92344-0539).

11.2.7 Controlling Partition Startup by using the MMB

Only users with Administrators or Operator privileges can set partition boot control. This section describes the partition startup control procedure using the MMB.

1. Click [Partition] – [Power Control].
   -> The [Power Control] window appears.

FIGURE 11.3 [Power Control] Window



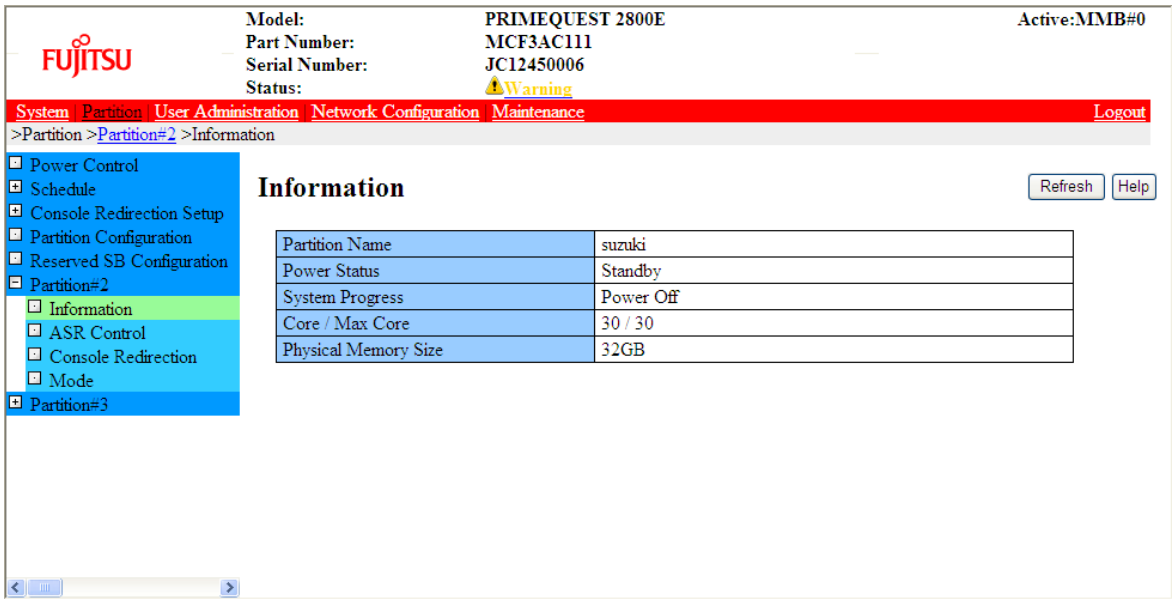
For the details on the contents and setting items of the [Power Control] window, see ‘1.3.1 [Power Control] Window’ in “PRIMEQUEST 2000 series Tool Reference” (CA92344-0539).

11.2.8 Checking the Partition Power status by using the MMB

This section describes the procedure by which power status of partition is confirmed.

1. Log in MMB Web-UI.
   -> The MMB Web-UI window appears.
2. Click [Partition] – [Partition#x] – [Information] from menu of Web-UI.
   -> The [Information] window appears.

FIGURE 11.4 [Information] window



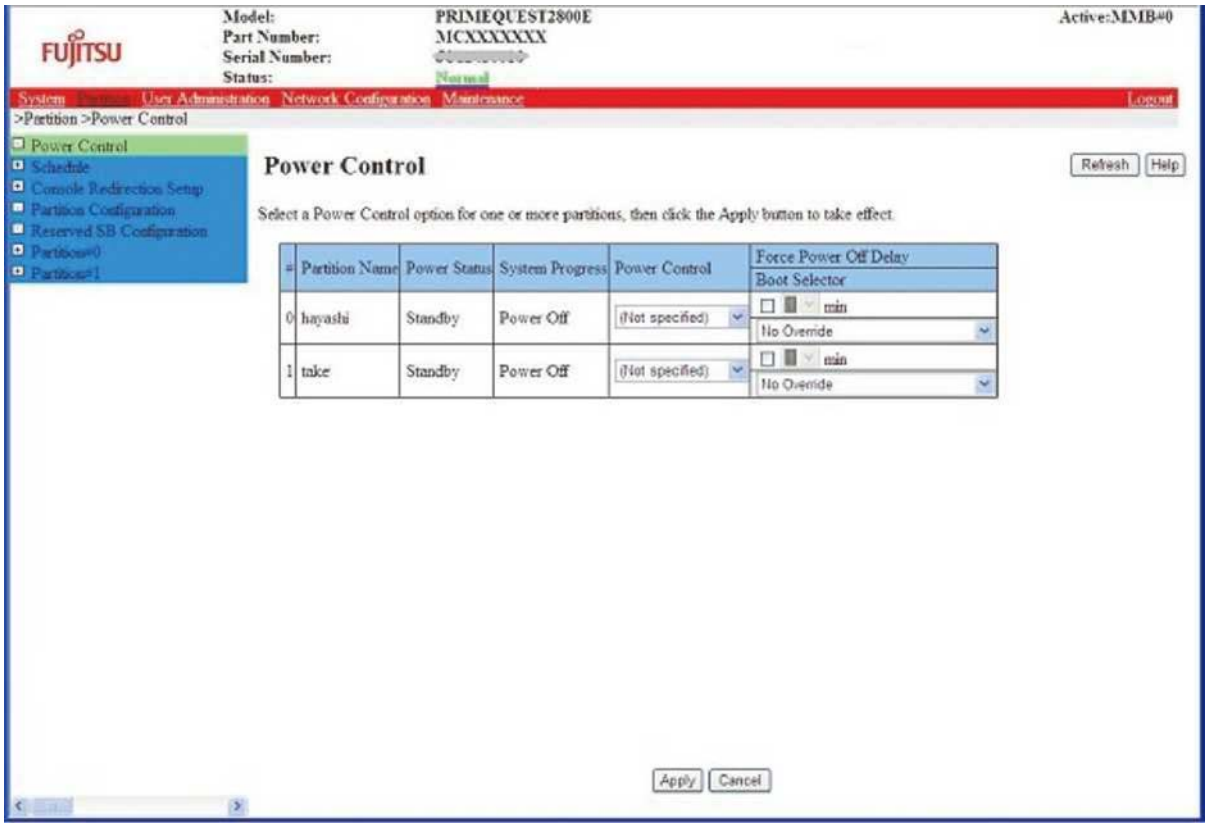
The power status of the partition is displayed in [Power Status].
For details on the contents and setting items of the [Information] window, see '1.3.9 [Partition#x] menu' in "PRIMEQUEST 2000 series Tool Reference" (CA92344-0539).

Powering off a partition by using the MMB

This section describes the powering off procedure using the [MMB Web-UI] window.

- Log into the MMB Web-UI.
  -> The MMB Web-UI window appears.
- Click [Partition] – [Power Control] from the menu of the Web-UI.
  -> The [Power Control] window appears

FIGURE 11.5 [Power Control] window



The “#” column has the partition number.
For details on the [Power Control] window, see ‘1.3.1 [Power Control] window’ in “PRIMEQUEST 2000 series Tool Reference” (CA92344-0539).

3. Set the ‘Power Control’ of the partition number to be powered off to [Power Off], and click the [Apply] button.
   -> The specified partition will be powered off.

Remarks
In Windows, Server View Agent is required when shutdown is executed from the MMB Web-UI. For details on the method of setting the Server View Agent, see the description of ‘System shutdown’ tab in the “Server View Operations Manager Installation Server View Agents for Windows”.
In Vmware, shutdown cannot be performed by Vmware. Perform shutdown on Vmware.

11.3 Scheduled operations

This section describes scheduled operations.

11.3.1 Powering on a partition by scheduled operation

When a scheduled operation is set for a partition, power is turned on, at the set time.
Daily, weekly, monthly, specific date or a combination of these options can be set as a schedule.
Note
The times recorded in the SEL may lag behind the scheduled operation as can be seen below.

- After the configuration check and preparation for the startup has been carried out, the power is turned on. It takes a while to start. In such case, the display of the SEL may be delayed by six to eight seconds, from the scheduled operation time.
- Shutdown instruction from the MMB to the operating system is executed within few seconds from the set time. However, the time shown below may change under various conditions, like setting, configuration, etc.

- Time till the instruction reaches the operating system from the MMB
- Time until the operating system shutdown is started and time until the start of the operating system shutdown is notified to the MMB
- Even if the [Power on Delay] is set to 0 seconds, it may take 30 ~ 70 seconds from the time of turning on the power and starting, up to reset.

For the scheduled setting, see '1.3.2 [Schedule] menu' in "PRIMEQUEST 2000 series Tool Reference" (CA92344-0539).

11.3.2 Power off a Partition by scheduled operation

When a scheduled operation is set for a partition set, power is turned off at the set time.
A daily, weekly, monthly, specific date or a combination of these options can be set a schedule.
For the details on schedule settings, see '1.3.2 [Schedule] menu' in "PRIMEQUEST 2000 series Tool Reference" (CA92344-0539).

11.3.3 Relation of scheduled operation and power restoration function

In the PRIMEQUEST 2000 series, scheduled operation and power restoration function are linked when power restoration mode is set to "Schedule Sync".

TABLE 11.5 Relationship between scheduled operation and partition power restoration mode

No.	When there is power failure	When the power is restored	Always OFF (*1)	Always ON (*1)	Restore (*1)	Schedule Sync (*1)
1	Outside the operation time	Within the operation time	OFF	ON	OFF	ON
2	Within the operation time	Within the operation time	OFF	ON	ON	ON
3	Outside the operation time	Outside the operation time	OFF	ON	OFF	OFF
4	Within the operation time	Outside the operation time	OFF	ON	ON	OFF

ON: Partition Power On, OFF: Partition Power Off

Notes

Operations indicated by (*1) in the table, assume normal shutdown when a power failure occurs. If there is an abnormal power off because the UPS had not been used, the partition will not automatically start (= OFF mode operation) in a restoration operation, irrespective of the operation settings.

11.3.4 Scheduled operation support conditions

The description of power on/off items, scheduled operation support conditions and menu items are listed in the table below.

TABLE 11.6 Power on/off

Menu Item	Scheduled operations	Description
All Partition Power On	Not supported	Powers on all partitions.
All Partition Power Off	Not supported	Powers off all the partitions which are in powered on, following an operating system shutdown.
Partition Power On	Supported	Powers on any partition.
Partition Power Off	Supported	Powers off any partition following an operating system shutdown.
Partition Force Power Off	Not supported	Forcibly powers off any partition without an operating system shutdown. This is used, to forcibly power off a partition, when the shutdown from the operating system is disabled.
Power Cycle	Not supported	Powers off and then powers on any partition. The partition is forcibly powered off without an operating system shutdown.

Menu Item	Scheduled operations	Description
Reset	Not supported	Resets any partition. This reset is not followed by a reboot of the operating system.
NMI	Not supported	Issues an NMI interrupt for any partition.
Sadump	Not supported	Instructs sadump for a partition.

For details on setting for Windows shutdown, see 'Appendix I Windows Shutdown Settings'.

11.4 Automatic Partition Restart Settings

This section describes the setting of automatic partition restart.
Users with Administrators/Operator privilege can set all the partitions, however, only users with Partition Operator privilege can set the permitted partitions.

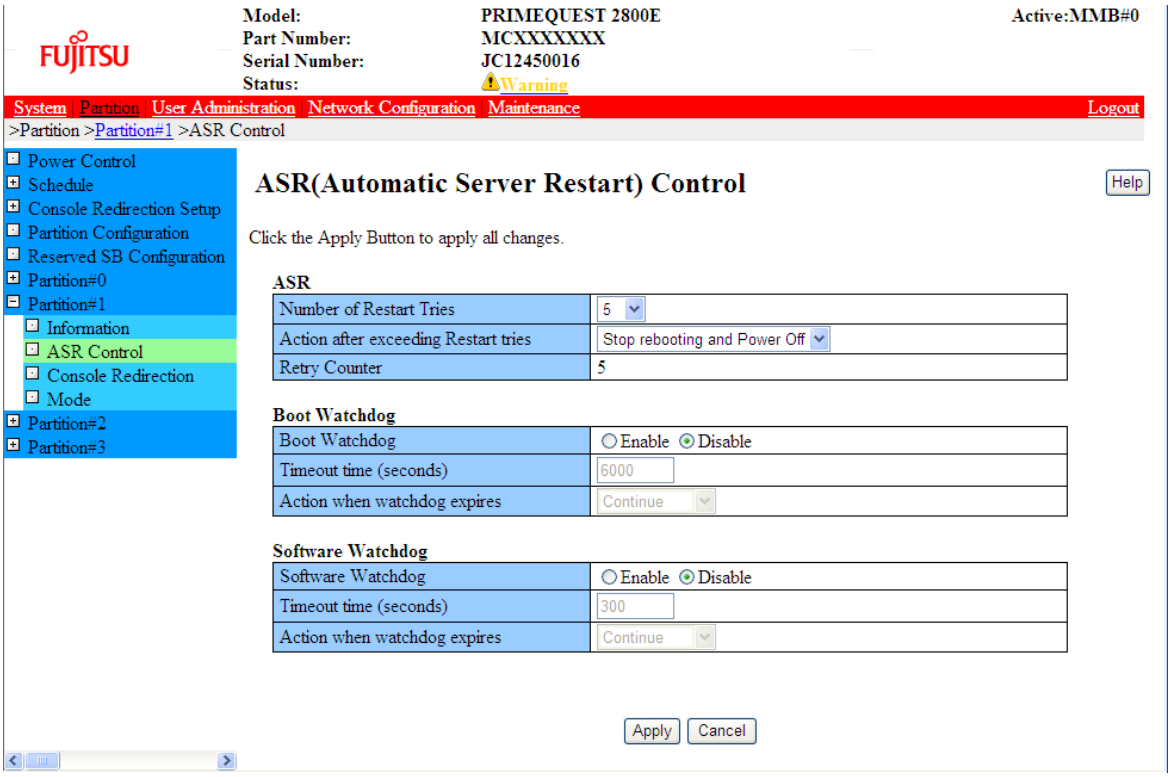
Note

- If you perform following operations, disable 'Boot Watchdog'..
  - Installation of operating system
  - Starting in the single user mode
  - Backup/ restoration by System cast Wizard Professional
    When the above mentioned operations are executed with the Boot Watchdog in the [Enable] status, the specified action (Stop rebooting and Power Off or Stop rebooting or Diagnostic Interrupt assert) will be executed after repeating automatic partition restart for specified number of times. The number of retries to restart the partition automatically and the action to be executed depend on the settings in the [ASR (Automatic Server Restart) Control] window of the MMB.
    At that time, Boot Watchdog can be forcibly set to [Disable] by checking the check box of [Cancel Boot Watchdog] and clicking the Apply button in the [ASR (Automatic Server Restart) Control] window.

The procedure of automatic restart setting of the partition is as follows.

1. Click [Partition] – [Partition#x] – [ASR Control].
   -> The [ASR Control] window appears.

FIGURE 11.6 [ASR (Automatic Server Restart) Control] window



2. Set the automatic restart conditions.
   The setting items of the [ASR Control] window are listed in the table below.

TABLE 11.7 [ASR Control] window display / setting items

Items	Description
ASR	
Number of Restart Tries	Set the number of retries for restarting the partition automatically when there is time out by Boot Watchdog, or Software Watchdog of SVAS, or the hardware error occurs and OS shuts down. The number of times can be set up to 0-10 times. When 0 is specified, the partition does not restart automatically, and the action which is set in 'Action After exceeding Restart tres' is executed. Default is five times. **Notes** - When you use Reserved SB function, set a value which is greater than or equal to 1. - When you set a value which is greater than or equal to 1 in [Number of Restart Tries] of the [ASR Control] window, a failed SB is replaced to a Reserved SB at first automatic restart of the partition.
Action after exceeding Restart tries	Repeat the restart by Watchdog Timeout and sets the action when the above-mentioned retry number is exceeded. The actions are as below. - Stop rebooting and Power Off: Reboot process is stopped, power supply of partition is cut off. - Stop rebooting: Reboot process is stopped, and the partition is stopped. - Diagnostic Interrupt assert: Reboot process is stopped, instructs the NMI interruption for partition. Tries to collect the data for investigation (damp) for the investigating the cause of stoppage, of the partition which has stopped. Default setting is 'Stop rebooting and Power Off'
Retry Counter	Displays the number of actual possible retries.
Boot Watchdog	
Boot Watchdog	Enable/disable of the Boot Watchdog function of ServerView is set. The start of OS is observed when setting it to Enable. After OS starts, Boot Watchdog is stopped by ServerView. Default is Disable.
Timeout time (seconds)	Time until Boot Watchdog does timeout is set. The range of 1-6000 can be set. Default is 6000 seconds (=100 minutes).
Action when watchdog expires	Action when Boot Watchdog does timeout is set. In Action, there is the following. - Continue - Reset - Power Cycle
Software Watchdog	
Software Watchdog	Enable/disable of the Software Watchdog function of ServerView is set. After OS starts, the operation of OS is observed by ServerView when setting it to Enable. Default is Disable.
Timeout time (seconds)	Time until Software Watchdog does timeout is set. The range of 1-6000 can be set. (for Linux, Windows) The range of 240-6000 can be set (for VMware) Default is 300 seconds (=5 minutes).
Action when watchdog expires	Action when Software Watchdog does timeout is set. In Action, there is the following. - Continue - Reset - Power Cycle - NMI

Items	Description
	Note For VMware, you can select only 'Continue'.

3. Disable 'Boot Watchdog' to cancel the Boot Watchdog function.
4. Click [Apply] button.
   Set the operating system Boot monitoring cancellation.

For details on the operation of [ASR Control] window, see '1.3.9 [Partition#x] menu' in "PRIMEQUEST 2000 series Tool Reference" (CA92344-0539).

11.5 Power Restoration

In the PRIMEQUEST 2000 series, the system operations for power restoration can be set in the chassis unit. This can be set by MMB Web-UI.

11.5.1 Settings for Power Restoration

When using a UPS, the following items can be set when a power failure is detected. The default is "Restore".

TABLE 11.8 Power Restoration Policy

Item	System operation
Always Off	Continues the power off status after the power is restored.
Always On	Power on the partition after restoring the power irrespective of the status of the power failure.
Restore	Returns to the state at the time when the power failure occurred. Powers on the partitions that were On when the power failure occurred, and retains the power off status for partitions that were powered off when the power failure occurred.
Schedule Sync	Automatically powers on the partition, according to the scheduled operation settings when a power failure had occurred during working hours. (*1)

*1: For details on the scheduled operations, see '11.3 Scheduled operations'.

If the startup of an external SAN unit connected to the UPS and such unit is slow during power restoration, then the SAN device does not become usable if the partition is powered on by the server. Therefore, SAN boot may fail. In that case, "Partition Power On Delay" (units of seconds: 0 to 9999 seconds, default = 0 seconds) can be set in addition to the above mentioned settings.
For details on the method of settings for power failure/restoration, see '1.2.7 [System Setup] window' in "PRIMEQUEST 2000 series Tool Reference" (CA92344-0539).

11.6 Remote shutdown (Windows)

Windows with versions of Windows XP onwards, comes with a 'shutdown.exe' command. This command can be used for remote shutdown from a management terminal.

11.6.1 Prerequisites for remote shutdown

The following are the prerequisites for using the remote shutdown (Windows).

- The operating system of the management terminal should be one of the following.
  - Windows Server 2016
  - Windows 10
  - Windows 8.1
  - Windows 8
  - Windows Server 2012 R2
  - Windows Server 2012

- Windows 7
- Windows Server 2008 R2
- Windows Server 2008
- Windows Server 2003 R2
- Windows Server 2003
- Windows Vista

- The management terminal to be shutdown should be connected to Windows through a network.
- Firewall settings of the target Windows to be restarted.
  In the [Exception] settings of the firewall, [File and Printer Sharing] check box must be checked.
- When target Windows to be restarted is work group environment
  The user name and password of the management terminal must match those of the target Windows to be shut down.
- When the target Windows to be restarted is an Active Directory environment
  A user with administrative privileges for the Windows to be shut down must log in to the management terminal.

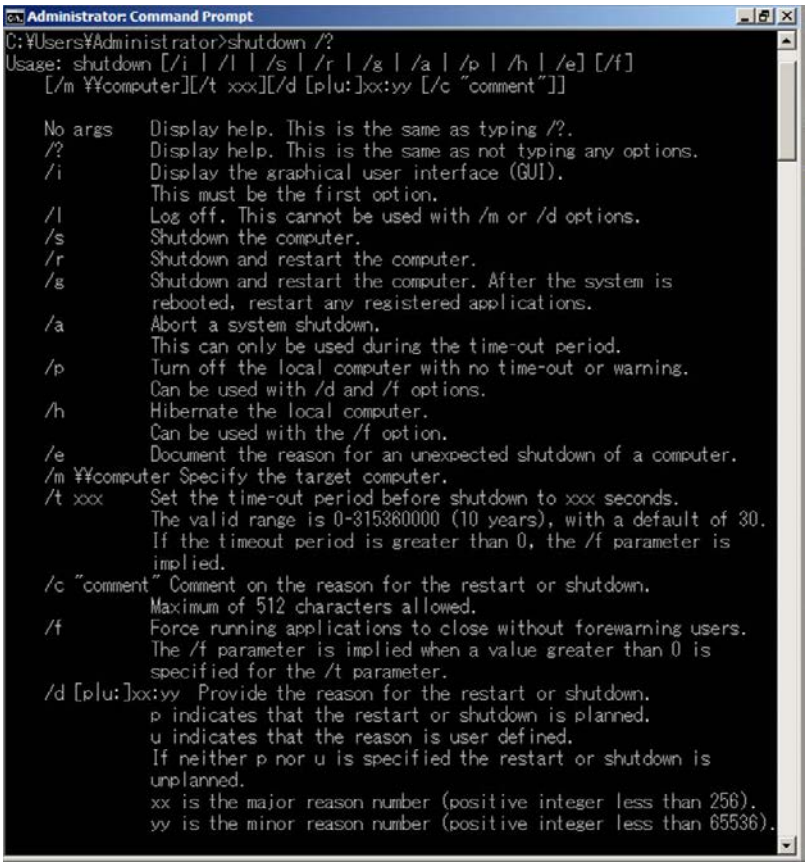
11.6.2 How to use remote shutdown

To perform remote shutdown, log in to the management terminal and execute the shutdown command in command prompt started as an administrator.

```
Shutdown /s /m ¥¥ <Server Name>
```

In <Server Name>, specify the computer name of the Windows to be shut down.
For details on other options of the shutdown command, see 'Help'.
When the shutdown command is executed by using /? Option displays a simplified help.

FIGURE 11.7 Simplified help for the shutdown command



CHAPTER 12 Configuration and Status Checking (Contents, Methods, and Procedures)

This chapter describes functions for checking the configuration and status of the PRIMEQUEST 2000 series server. The functions are broken down by firmware (or other software) and by tool.

12.1 MMB Web-UI

The PRIMEQUEST 2000 series unifies server management via the MMB Web-UI. The following lists the functions provided by the MMB Web-UI.
For details on the functions, see the reference sections in the PRIMEQUEST 2000 Series Tool Reference (CA92344-0539).

TABLE 12.1 Functions provided by the MMB Web-UI

Function	Reference sections in the PRIMEQUEST 2000 Series Tool Reference (CA92344-0539)
Displays the status of the whole system.	1.2.1 [System Status] window
Displays the events stored in the SEL (System Event Log) of the MMB.	1.2.2 [System Event Log] window
Displays logs related to Web-UI and CLI settings and operations.	1.2.3 [Operation Log] window
Displays hardware problem information (REMCS notification target message).	1.2.4 [Partition Event Log] window
Displays information related to the PRIMEQUEST 2000 series system. Sets the name of the PRIMEQUEST 2000 series system (cabinet). Sets an Asset Tag (asset management number).	1.2.5 [System Information] window
Displays a firmware version.	1.2.6 [Firmware Information] window
Sets a system configuration.	1.2.7 [System Setup] window
Controls the system power.	1.2.8 [System Power Control] window
Displays the LED status.	1.2.9 [LEDs] window
Displays the PSU status. Displays the action taken in response to a PSU failure.	1.2.10 [Power Supply] window
Displays the fan status. Displays the reaction response to a fan failure.	1.2.11 [Fans] window
Displays the temperature of the temperature sensor in the system. Displays the reaction response to a temperature error.	1.2.12 [Temperature] window
Displays and sets the SB#x board.	1.2.13 [SB] menu
Displays and sets the IOU#x board.	1.2.14 [IOU] menu
Displays and sets the status of DU #x.	1.2.15 [DU] menu
Displays the status of the PCI_Box connected to the system	1.2.16 [PCI_Box] menu
Displays the OPL status.	1.2.17 [OPL] window
Displays information related to the MMB.	1.2.18 [MMB] menu
Controls the partition power supply.	1.3.1 [Power Control] window
Sets a schedule for each partition.	1.3.2 [Schedule] menu
The video redirection for each Ipv4/Ipv6 is set.	1.3.3 [Console Redirection Setup] window

Function	Reference sections in the PRIMEQUEST 2000 Series Tool Reference (CA92344-0539)
Sets the SB and IOU that configure a partition.	1.3.4 [Partition Configuration] window
Sets a Reserved SB.	1.3.5 [Reserved SB Configuration] window
Power Limiting of each partition is set.	1.3.6 [Power Management Setup] window
Displays the partition status and various information related to the partition.	1.3.9 [Partition#x] menu
Sets conditions for automatically restarting the partition (ASR (Automatic Server Restart) Control).	1.3.9 [Partition#x] menu
Starts video redirection.	1.3.9 [Partition#x] menu
Sets various modes for the partition.	1.3.9 [Partition#x] menu
+ Displays information on the currently registered user account.	1.4.1 [User List] window
Changes the password of the currently logged-in user.	1.4.2 [Change Password] window
Displays a list of users connected to the MMB via Serial, Telnet/SSH, and Web-UI.	1.4.3 [Who] window
Sets the MMB date and time.	1.5.1 [Date/Time] window
Sets the IP address and other values for MMB access.	1.5.2 [Network Interface] menu
Sets Speed/Duplex of each port on the MMB board.	1.5.3 [Management LAN Port Configuration] window
Sets the network protocol of the MMB.	1.5.4 [Network Protocols] window
Configures automatic update for Web-UI windows whose status changes.	1.5.5 [Refresh Rate] window
Makes settings related to SNMP.	1.5.6 [SNMP Configuration] menu
Sets an SNMP trap destination.	1.5.6 [SNMP Configuration] menu
Sets the Engine ID and makes user settings specific to SNMP v3.	1.5.6 [SNMP Configuration] menu
Creates a secret key and the corresponding CSR (signature request).	1.5.7 [SSL] menu
Retrieves the secret key or CSR (signature request) stored on the MMB.	1.5.7 [SSL] menu
Imports the signed electronic certificate sent from the certificate authority to the MMB.	1.5.7 [SSL] menu
Creates a self-signed certificate.	1.5.7 [SSL] menu
Creates a private key for the SSH server.	1.5.8 [SSH] menu
Makes the user settings required for control of the MMB via RMCP from the remote server.	1.5.9 [Remote Server Management] window
Operates access control for network protocols.	1.5.10 [Access Control] window
Sets e-mail notification for when an event occurs.	1.5.11 [Alarm E-Mail] window
Executes the batch firmware update process.	1.6.1 [Firmware Update] menu
Backs up and restores MMB/UEFI configuration information.	1.6.2 [Backup/Restore Configuration] menu
Provides support in the form of a wizard for device maintenance.	1.6.3 [Maintenance Wizard] window
Operates REMCS and makes settings related to REMCS.	1.6.4 REMCS menu

12.2 MMB CLI

You can access the MMB CLI via the MMB serial port or the management LAN. The commands that you can use from the MMB CLI include those for display and settings.
For details on MMB command lines, see Chapter 2 MMB CLI (Command Line Interface) Operations in the *PRIMEQUEST 2000 Series Tool Reference* (CA92344-0539).
For details on functions provided by the MMB CLI, see the reference sections in the *PRIMEQUEST 2000 Series Tool Reference* (CA92344-0539).

TABLE 12.2 Functions provided by the MMB CLI

Function	Reference sections in the *PRIMEQUEST 2000 Series Tool Reference* (CA92344-0539)
Sets information.	2.2 Setting Commands
Displays information.	2.3 Display Commands
Updates firmware.	2.4.1 update ALL
Displays the version and update status of firmware.	2.4.2 show update_status

12.3 UEFI

The following lists the functions provided by the UEFI. For details on the UEFI provided commands, see Chapter 4 UEFI Command Operations in the *PRIMEQUEST 2000 Series Tool Reference* (CA92344-0539).

TABLE 12.3 Functions provided by the UEFI

Function	Reference sections in the *PRIMEQUEST 2000 Series Tool Reference* (CA92344-0539)
Displays menus for migration to boot processing, Boot Manager, Device Manager, and Boot Maintenance Manager.	3.1 Boot Manager Front Page
Sends processing into automatic operating system startup and performs boot processing in the currently set boot sequence.	3.2 [Continue] Menu
Sets the boot devices.	3.3 [Boot Manager] Menu
Makes settings such as whether to assign an I/O space to each I/O device, CPU settings, and whether to enable PXE boot.	3.4 [Device Manager] Menu
Makes settings such as addition and deletion of boot options and boot priority changes.	3.5 [Boot Maintenance Manager] Menu
Setting of sadump environment	6 Setting of sadump environment

12.4 ServerView Suite

You can use ServerView Suite to visually confirm the PRIMEQUEST 2000 series configuration and the status of each part.
For details on how to operate ServerView, see the *ServerView Suite ServerView Operations Manager Server Management*.

CHAPTER 13 Error Notification and Maintenance (Contents, Methods, and Procedures)

This chapter describes the maintenance functions provided by the PRIMEQUEST 2000 series. It also describes the actions to take for any problems that occur.

13.1 Maintenance

The PRIMEQUEST 2000 series supports hot maintenance of PSUs and fans. This enables maintenance of the system as it continues operating. For PRIMEQUEST 2400E3/2800E3/2400E2/2800E2/2400E/2800E, the DR fiction and PCI Hot Plug function can be used for hot maintenance of SB, IOU, HDD/SSD and PCI Express cards. For PRIMEQUEST 2800B3/2800B2/2800B, PCI Hot Plug function can be used for hot maintenance of HDD/SSD and PCI Express cards.
For details and a list of the replaceable components, see 'CHAPTER 3 Component Configuration and Replacement (Add, Remove)'.
Remarks
Field engineers perform the maintenance on the PRIMEQUEST 2000 series server.

13.1.1 Maintenance using the MMB

The MMB provides system maintenance functions through the [Maintenance] menu of the Web-UI.
You can use the [Maintenance] menu to back up and restore system configuration information.
For details on the [Maintenance] menu, see 1.6 [Maintenance] Menu in the *PRIMEQUEST 2000 Series Tool Reference* (CA92344-0539).

13.1.2 Maintenance method

Maintenance is performed with the Maintenance Wizard on the MMB Web-UI from a terminal such as a PC connected to the MMB in the PRIMEQUEST 2000 series server.
The MMB provides a dedicated Maintenance LAN port for field engineers. To perform maintenance using the Maintenance Wizard, a field engineer connects an FST (PC used by the field engineer) to the Maintenance LAN port of the MMB of the maintenance target system.
Note
Field engineers perform the maintenance on the PRIMEQUEST 2000 series server.
Below settings are required for maintenance by the field engineers.

- Video redirection and virtual media are available.
  For details on this setting, see '1.3.6 [Console Redirection Setup] window' in "*PRIMEQUEST 2000 series Tool Reference*" (CA92344-0539).
- Telnet or SSH is available.
  For details on this setting, see '1.5.4 [Network Protocols] window' in "*PRIMEQUEST 2000 series Tool Reference*" (CA92344-0539).

13.1.3 Maintenance modes

The PRIMEQUEST 2000 series has several maintenance modes.
Only field engineers are allowed to execute operations related to power control such as power off and power on in maintenance mode which can prevent error during this operations. The maintenance modes provide the following advantages:

- They prevent someone other than the field engineer from executing operations related to power control so that the system does not change to unexpected status.
- They prevent error reporting caused by a maintenance error (or maintenance work).

The following table lists the maintenance modes and their functions. Note that Operation mode is the normal operation mode and not a maintenance mode.

TABLE 13.1 Maintenance modes

Mode	Meaning
Operation [Normal operation]	Normal operation
Hot System Maintenance [Active for work (system)]	For maintenance work performed while the system power is on
Hot Partition Maintenance [Active for work (partition)]	For maintenance work performed while the target partition power is on
Warm System Power Off [Partition stopped for maintenance]	For maintenance work performed while the system power is on and the maintenance target partition power is off
Cold System Maintenance (breaker on) [Stopped for work (standby)]	For maintenance work performed while the system power is off and the AC power supply is on
Cold System Maintenance (breaker off) [Stopped for work (AC off)]	For maintenance work performed while the system power is off and the AC power supply is off

TABLE 13.2 Maintenance mode functions

Item		Operation mode	Maintenance mode				
			Hot System	Hot Partition	Warm System	Cold System (breaker on)	Cold System (breaker off)
Power supply operation	Administrator	Permitted	Permitted	Suppressed (*1)	Suppressed (*1)	Suppressed	Suppressed
	Field engineer	Suppressed	Suppressed	Permitted (*1)	Permitted (*1)	Permitted	Permitted
Wake On LAN (WOL)		Permitted	Permitted	Suppressed (*1)	Suppressed (*1)	Suppressed	Suppressed
Calendar function		Permitted	Permitted	Suppressed (*1)	Suppressed (*1)	Suppressed	Suppressed
OS boot		Permitted	Permitted	Suppressed Stops at BIOS (*1)	Suppressed Stops at BIOS (*1)	Suppressed Stops at BIOS (*1)	Suppressed Stops at BIOS
REMCS report		Permitted	Suppressed (*2)	Suppressed (*1)	Suppressed (*1)	Suppressed	Suppressed
DR function		Permitted	Suppressed	Suppressed (*1)	Suppressed (*1)	Suppressed	Suppressed

*1 This pertains only to the maintenance target partition.
*2 Suppresses the REMCS report upon system failure (but reports partition failures).

13.1.4 Maintenance of the MMB

If the server with single MMB fails in MMB, take actions below.

1. Shut down the operating system (LAN) from a remote terminal. (*1)
2. Turn off the chassis AC power.
3. Replace the MMB.
4. Turn on the chassis AC power.

(*1) If you use only port of MMB to login the operating system, it is recommended to duplicate MMB. If MMB fails, you cannot login to the operating system.

Remarks
In a single MMB configuration, hot replacement of the MMB is not possible.

13.1.5 Maintenance of the PCI_BOX (PEXU)

The following concerning maintenance when PCI box (PEXU).

1. The system administrator stops all partitions that belong to the maintenance object.
2. Those who maintain it confirm all partitions that the PCI box belongs have stopped, and exchange PCI boxes (PEXU).

Remarks
It can be confirmed whether all partitions in the PCI box have stopped when Maintenance Wizard is used. Maintenance Wizard is recommended to use and to be exchanged (Only the charge maintenance member uses it).

13.1.6 Maintenance policy/preventive maintenance

For details on the maintenance policy/preventive maintenance for the PRIMEQUEST 2000 series, see 9.1 Maintenance Policy/Preventive Maintenance in the *PRIMEQUEST 2000 Series General Description* (CA92344-0534).

13.1.7 REMCS service overview

REMCS (Remote Customer Support System) connects your server to the REMCS Center through the Internet to enable the system to send server configuration information and automatically report failures when they occur.
REMCS is thus intended to facilitate prompt responses and solutions to problems.
The REMCS function of the PRIMEQUEST 2000 series are implemented by the following components:

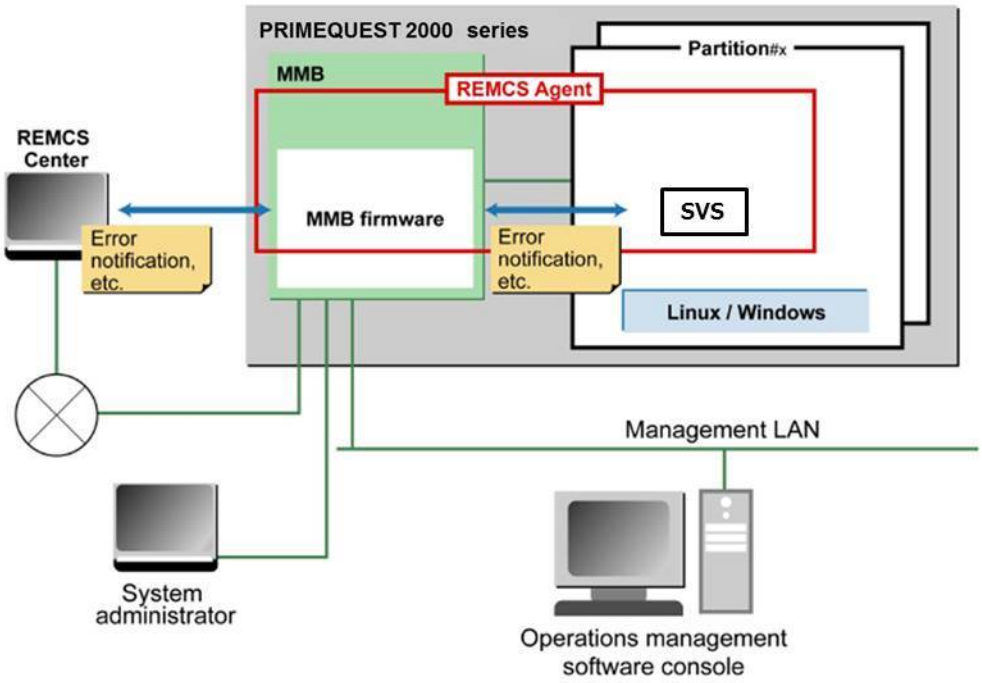
- MMB:
  Collects hardware configuration information of the entire server, monitors the server for problems, and reports thereon to the REMCS Center.
- QSS:
  Collects troubleshooting information when a software failure occurs in a partition.

Communication with the REMCS Center is handled by the MMB. The MMB summarizes the information from each partition and sends it to the REMCS Center.
To receive the REMCS service, contact your sales representative.

13.1.8 REMCS linkage

This function reports resource information or problems in a partition to the REMCS Center in linkage with the MMB.
REMCS Agent reports error information, log information, and other information of the PRIMEQUEST 2000 series system to the REMCS Center via the Internet or P-P connection.
REMCS Agent of the PRIMEQUEST 2000 series consists of the MMB firmware as well as SVS installed in each partition. As the REMCS linkage in the figure shows, the MMB firmware monitors the entire system for problems, and reports them to the REMCS Center when it detects them. SVS notifies the REMCS Center of hardware problem information and hardware configuration information detected by the operating system in the partition via the MMB firmware.
For details on REMCS, see the *PRIMEQUEST 2000 Series REMCS Installation Manual* (CA92344-0542).

FIGURE 13.1 REMCS linkage



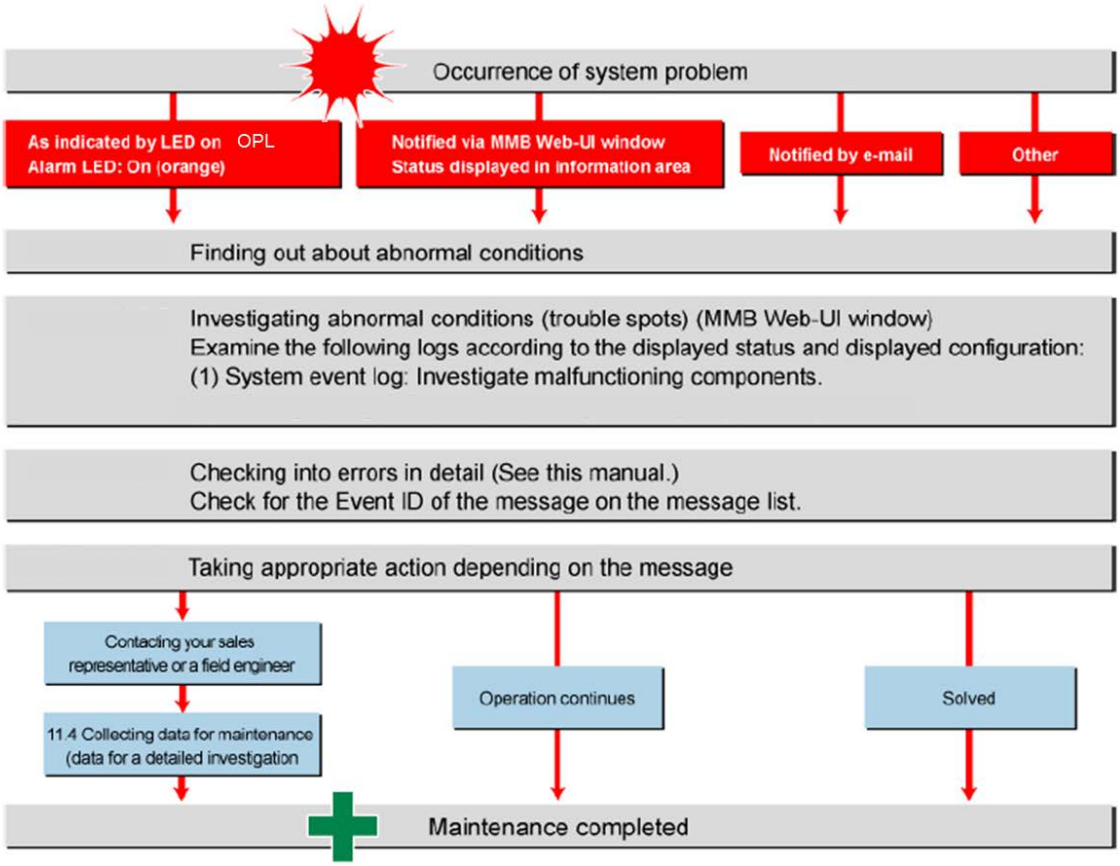
13.2 Troubleshooting

This section describes how to troubleshoot system problems.

13.2.1 Troubleshooting overview

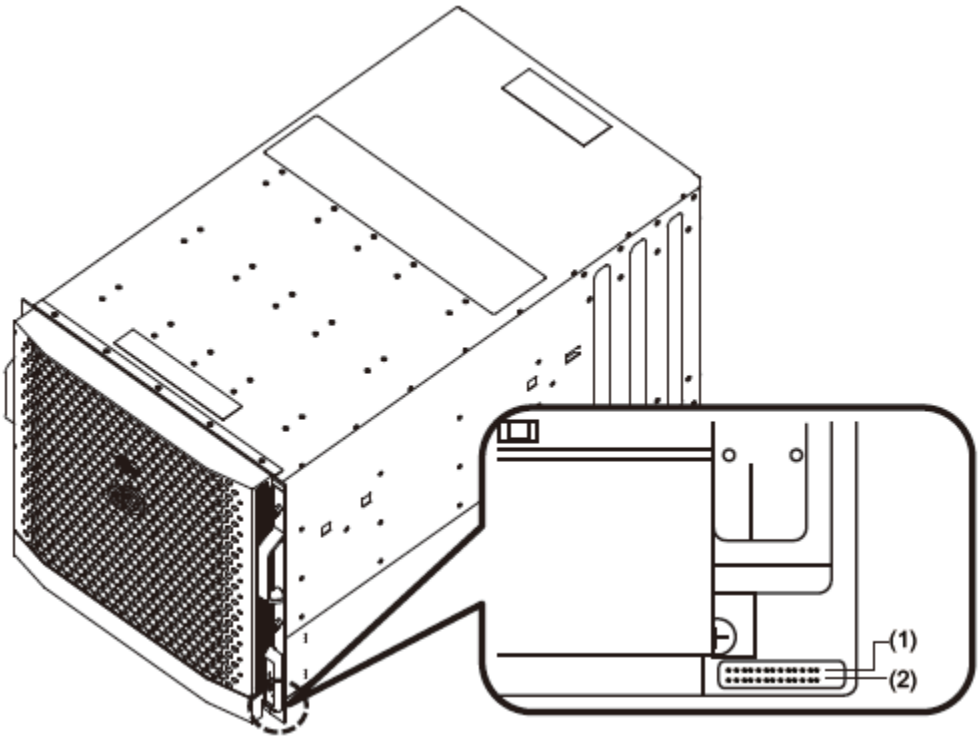
The following shows the basic procedure for troubleshooting.

FIGURE 13.2 Troubleshooting overview



If a problem occurs in this product, troubleshoot the problem according to the displayed message.
If the error recurs, contact your sales representative or a field engineer.
Before making contact, confirm the unit, source, part number, event ID, and description of the error as well as the model name and serial number shown on the label affixed to the main unit.

FIGURE 13.3 Label location



No.	Description
(1)	Model name
(2)	Serial number

13.2.2 Items to confirm before contacting a sales representative

Before contacting your sales representative, confirm the following details.
Print the sheet in Appendix L Failure Report Sheet, and enter the necessary information.

- Items to confirm
  Model name and type of the main unit.
  - You can confirm the model name and type with the MMB Web-UI. You can also confirm them from the label affixed to the main unit.
  - Hardware configuration (types and locations of the supplied built-in options)
  - Configuration information (BIOS setup utility settings)
  - OS used
  - LAN/WAN system configuration
  - Symptoms (e.g., what happened at the time, message displayed)
    Sample messages:
    System event log: See FIGURE 13.8 System event log display .
  - Occurrence date and time
  - Server installation environment
  - Status of various lamps

13.2.3 Sales representative (contact)

Contact your sales representative in the following cases:

- For a repair not under any support service contract

- For a repair under warranty during the warranty period
- For a repair not under any support service contract after expiration of the warranty period
  - Our authorized service engineer will repair the product on site. The service engineer will go to your premises on the next business day after the contact date.
  - The service charge (including the technical fee, parts costs, and transportation expenses) for each request depends on the product and work time.
  - Note that some products are outside the service range. Confirm that we will be able to repair your product when you contact us.

13.2.4 Finding out about abnormal conditions

If a problem occurs in the system, use the LEDs on the front of the device, any report on the MMB Web-UI windows, and any e-mail notification to understand the situation. E-mail notification requires settings made in advance.

Remarks

If [Part Number] or [Serial Number] (the content or information area) in the MMB Web-UI window displays "Read Error," contact a field engineer or your sales representative.

Before making contact, confirm the model name and serial number shown on the label affixed to the main unit.

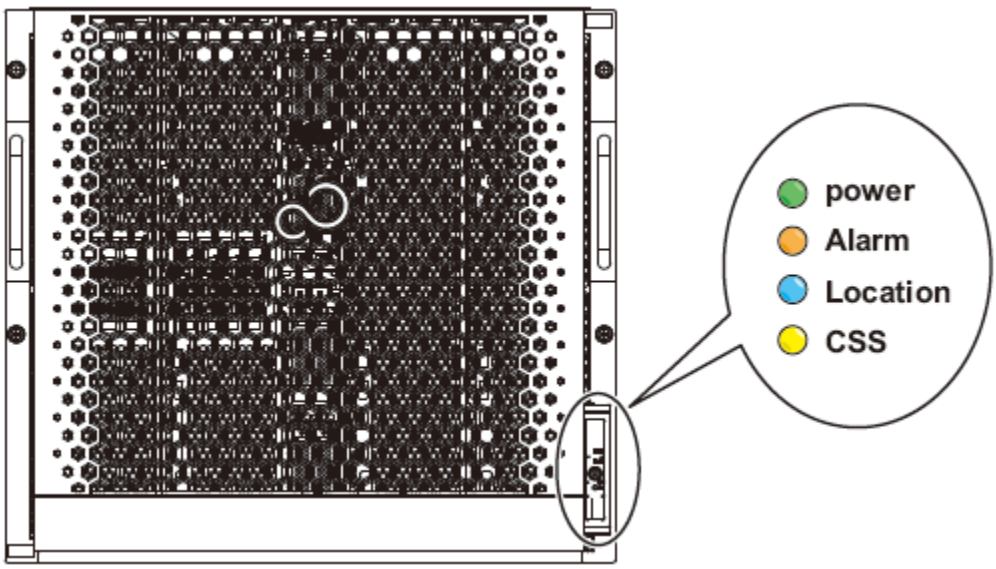
LED display

The following figure shows the LEDs located on the front panel of the device. The Alarm LED indicates a problem inside the device.

If a problem occurs inside the device, the Alarm LED goes on (orange).

The Alarm LED stays off when the device is operating normally.

FIGURE 13.4 Alarm LED on the front panel of the device



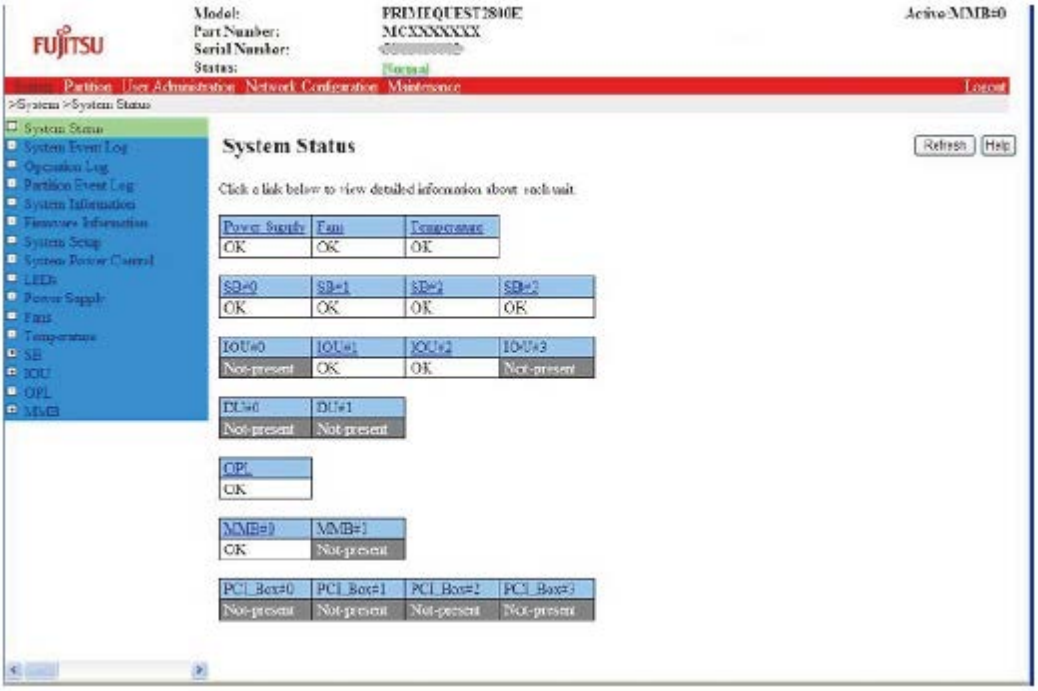
As long as a problem remains inside the device, the Alarm LED is on. This indication does not change even if multiple problems have occurred.

Note that the front panel of the device also has the MMB-Ready LED. The MMB-Ready LED stays on in green when the device is operating normally. To start the MMB, select [System] – [MMB] on the Web-UI when the MMB-Ready LED is off. Select [Enable] in [Enable/Disable MMB] in the [MMB] window. Then, click the [Apply] button.

MMB Web-UI window

As shown in the following figure, you can use the MMB Web-UI window to check for any problems.

FIGURE 13.5 System status display in the MMB Web-UI window



No.	Description
Status in information area	Displays the system status

The MMB Web-UI window always displays the information area. [Status] in the information area displays the system status. The following table lists the Normal, Warning, and Error status indicators. You can view the details of a message about a trouble spot by clicking the displayed icon to jump to the [System Event Log] window.

TABLE 13.3 Icons indicating the system status

Status	Display color	Icon	
Normal (normal status)	Green	None	
Warning (warning status)	Yellow		A black! Mark in a yellow triangle
Error (critical status)	Red		A white x mark in a red circle

Remarks
If [Part Number] or [Serial Number] (the content or information area) in the MMB Web-UI window displays "Read Error," contact a field engineer or your sales representative.
Before making contact, confirm the model name and serial number shown on the label affixed to the main unit.

Alarm E-Mail notification

Alarm E-Mail notification can inform you of system problems.
You can configure Alarm E-Mail notification for problem occurrences by selecting [Network Configuration] – [Alarm E-Mail] from the MMB menu.
You can also filter the notification, such as by error status type, partition, or target component.

FIGURE 13.6 Alarm E-Mail settings window

Miscellaneous

Problems related to system startup or drivers may occur.
For details on these problems, see the *PRIMEQUEST 2000 Series Message Reference* (CA92344-0540).
If the status is one of the MMB error or warning statuses listed in the following operation interrupt criteria, stop the system and contact a field engineer or your sales representative.
Before making contact, confirm the model name and serial number shown on the label affixed to the main unit.

- Operation interrupt criteria
  - The Alarm LED of the MMB is on.
  - The Active LEDs of MMB#0 and MMB#1 are both off.
  - You cannot connect to the MMB Web-UI.
  - The Alarm LEDs of multiple boards in the device are on.
  - The MMB Web-UI displays [Read Error].
  - The [System Status] window of the MMB Web-UI displays [Not Present] for the status of every unit.

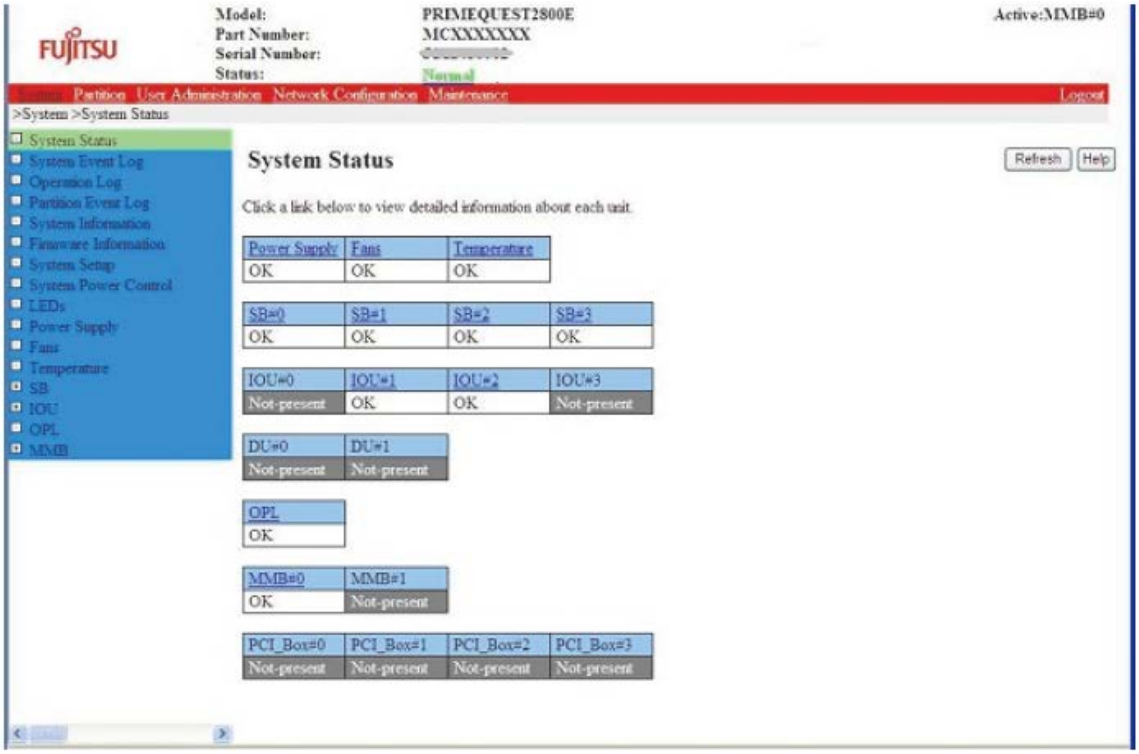
13.2.5 Investigating abnormal conditions

Investigate trouble spots. First, check the component (e.g., SB, IOU) and the partition where the problem occurred.
The corrective action varies depending on various factors, including the location of the trouble spot, error level, and the system operation mode.

Finding out about a faulty component

Investigate the entire system component configuration and the faulty component.
Select [System] – [System Status] in the [MMB] menu window to display the window shown in the following figure.
You can find out the status of each component.

FIGURE 13.7 System status display



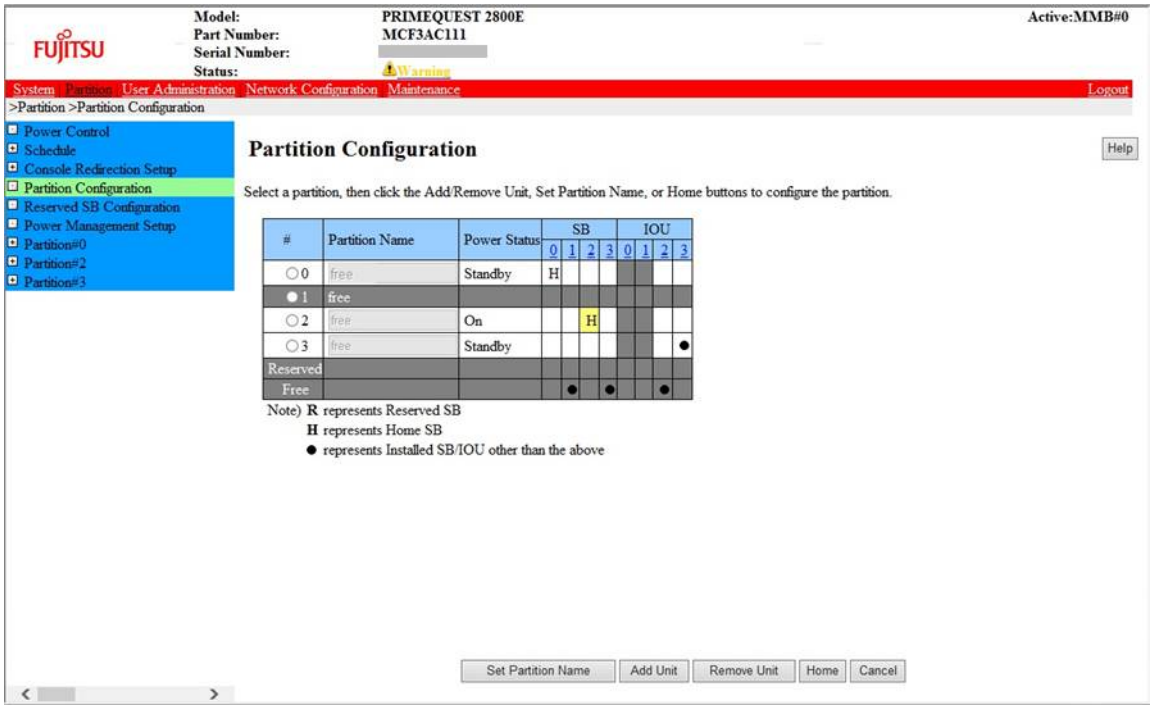
Click the icon displayed for an existing trouble spot to display a window showing the component status. If [Part Number] or [Serial Number] (the content or information area) in the MMB Web-UI window displays “Read Error,” contact a field engineer or your sales representative.
You can view the component status and system event log (SEL) contents by selecting [System] – [System Event Log] to open the [System Event Log] window.
The SEL information is important for an investigation, so first click the [Download] button at the bottom of the window to save the information. The information will be needed when you contact a field engineer or your sales representative.
For details on how to read system event log messages, see Chapter 1 Message Overview in the *PRIMEQUEST 2000 Series Message Reference* (CA92344-0540).

FIGURE 13.8 System event log display

Finding out about a faulty partition

Investigate the entire system partition configuration and the faulty partition in PRIMEQUEST 2400E3/2800E3/2400E2/2800E2/2400E/2800E.
Select [Partition] – [Partition Configuration] in the [MMB] menu window. You can find out the status of each partition.

FIGURE 13.9 [Partition Configuration] window



Finding out the partition error status

Examine the partition error status in PRIMEQUEST 2400E3/2800E3/2400E2/2800E2/2400E/2800E.
Select [System] – [Partition Event Log] in the [MMB] menu window.

On the [Partition Event Log] window, you can find out about problems in the partition from the displayed log. For details on how to read agent log messages, see *PRIMEQUEST 2000 Series Message Reference* (CA92344-0540).
The *Message Reference* lists the meanings of messages and corrective actions in order of event IDs. The [Partition Event Log] or the [Agent Log] window lists event IDs and message details to inform you of problems.

FIGURE 13.10 [Partition Event Log] window

13.2.6 Checking into errors in detail

Check the details of messages to take appropriate action.
According to the message ID in the displayed log, check the message details in the list of messages in the *PRIMEQUEST 2000 Series Message Reference* (CA92344-0540). Then, take appropriate action.

- System event messages detected by the MMB: Chapter 2 MMB Messages in the *PRIMEQUEST 2000 Series Message Reference* (CA92344-0540)
- Messages detected by the partition: Chapter 3 sadump Messages in the *PRIMEQUEST 2000 Series Message Reference* (CA92344-0540)

Remarks

- Be sure to write down the message ID and message details because they will be needed when you contact a field engineer or your sales representative.
- If the list of messages in the *PRIMEQUEST 2000 Series Message Reference* (CA92344-0540) does not include the displayed message, contact a field engineer or your sales representative.

13.2.7 Problems related to the main unit or a PCI_Box

This section describes problems related to the main unit or a PCI_Box. It also describes how to correct the problems.

A LED on the main unit does not go on, or the orange LED is on.

- Cause: The main unit may have failed.
  Corrective action: Contact your sales representative or a field engineer. Before making contact, confirm the model name and serial number shown on the label affixed to the main unit.

An error message appears on your display.

- Cause: An error occurred in the device.
  Corrective action: Confirm the error message, and take action according to the description of the error.

The keyboard and mouse do not work.

- Cause: The cables are not correctly connected to the USB ports of the Home SB.
  Corrective action: Connect the cables correctly to the USB ports of the Home SB.

[Part Number] or [Serial Number] in the MMB Web-UI displays [Read Error].

- Cause: A failure occurred and prevents the part or serial numbers from being read.
  Corrective action: Contact your sales representative or a field engineer. Do not execute [Reset] or [Force Power Off] on the partition until the problem is solved. Before making contact, confirm the model name and serial number shown on the label affixed to the main unit.

13.2.8 MMB-related problems

This section describes MMB-related problems and how to correct the problems.

No connection to the PRIMEQUEST 2000 series server can be established using the Web-UI.

- Cause 1: The setting of the IP address, subnet mask, or gateway is wrong.
  Corrective action: Referring to 3.3.3 Setting up the connection environment for actual operation in the *PRIMEQUEST 2000 Series Installation Manual* (CA92344-0536), set the correct value.
- Cause 2: A failure occurred in the network between the MMB console PC and the MMB USER port.
  Corrective action: Replace the faulty network device or LAN cable.
- Cause 3: A problem occurred in the internal network (e.g., internal hub) of the MMB.
  Corrective action: Switch the active MMB by using the following procedure:
  1. Log in to the standby MMB via telnet/ssh.
  2. Execute the set active_mmb command to switch the active MMB. For details on the set active_mmb command, see 2.2.12 set active_mmb in the *PRIMEQUEST 2000 Series Tool Reference* (CA92344-0539).

The MMB windows do not appear.

- Cause 1: The MMB LAN port is not enabled.
  Corrective action: Enable the LAN port.
- Cause 2: The MMB console PC is not correctly connected to the MMB USER port.
  Corrective action: Connect them correctly.
- Cause 3: The browser version is not supported.
  Corrective action: The MMB supports the following browsers:
  - Microsoft Internet Explorer version 9 or later
  - Mozilla FireFox version 20 or later
- Cause 4: JavaScript is not enabled in the browser.
  Corrective action: The MMB Web-UI uses JavaScript. Enable JavaScript in the browser.

13.2.9 Problems with partition operations

- [Status] in the information area of the MMB Web-UI changes to “Error” when [Power Off], [Reset], or [Force Power Off] is executed on the partition or when the partition is shut down from the operating system. Also, the MMB Web-UI displays [Read Error] in [Part Number] and [Serial Number] of each component.

- Cause: Hardware may have failed.
  Corrective action: Contact your sales representative or a field engineer. Do not execute [Reset] or [Force Power Off] on the partition until the problem is solved. Before making contact, confirm the model name and serial number shown on the label affixed to the main unit.
- During the partition power-on sequence from the beginning of power-on until execution of the reset process, if another partition is powered on in a scheduled operation, the booting of the partition powered on earlier may not complete.
- Cause: An MMB firmware restriction causes this problem.
  Corrective action: Execute [Force Power Off] on the partition causing the problem, and execute [Power On] again.

13.3 Notes on Troubleshooting

This section provides notes on troubleshooting.

- In the PRIMEQUEST 2000 series, if you unplug all the AC power cables while the device is in standby mode, the system event log records AC Lost (Severity: Info). This is neither a problem nor a failure. It is a normal situation.
  The following example shows this type of message.

(Item): Severity Unit Source EventID Description
--------- : ----------
(Display): Info PSU#*** ******** Power Supply input lost during the cabinet power off

13.4 Collecting Maintenance Data

System problems include cases where the partition abnormally stops and cases where the partition is running but hangs. In all such cases, you need to collect data for investigation to troubleshoot the problem.
Be sure to configure the memory dump before starting to use the PRIMEQUEST 2000 series server. Fujitsu uses this information to identify the cause of the system problem and solve it quickly.

TABLE 13.4 System problems and memory dump collection

System status	Memory dump collection	See
Partition stopped abnormally	A memory dump for the partition has already been collected.	13.4.2 Collecting data for investigation (Windows) 13.4.3 Setting up the dump environment (Windows)
Partition hung up, not stopped	Acquire memory dump by sadump	13.4.1 Logs that can be collected by the MMB

13.4.1 Logs that can be collected by the MMB

The MMB Web-UI can collect the events that occur in the PRIMEQUEST 2000 series system.
The SEL (system event log) can hold up to 32,000 events. When the SEL is full, each new entry will replace the oldest entry in the SEL.
You can filter the event logs to display, download event log stored in the SEL, and clear all the stored event logs in the SEL from the [System Event Log] window.
This section describes operations with the SEL.

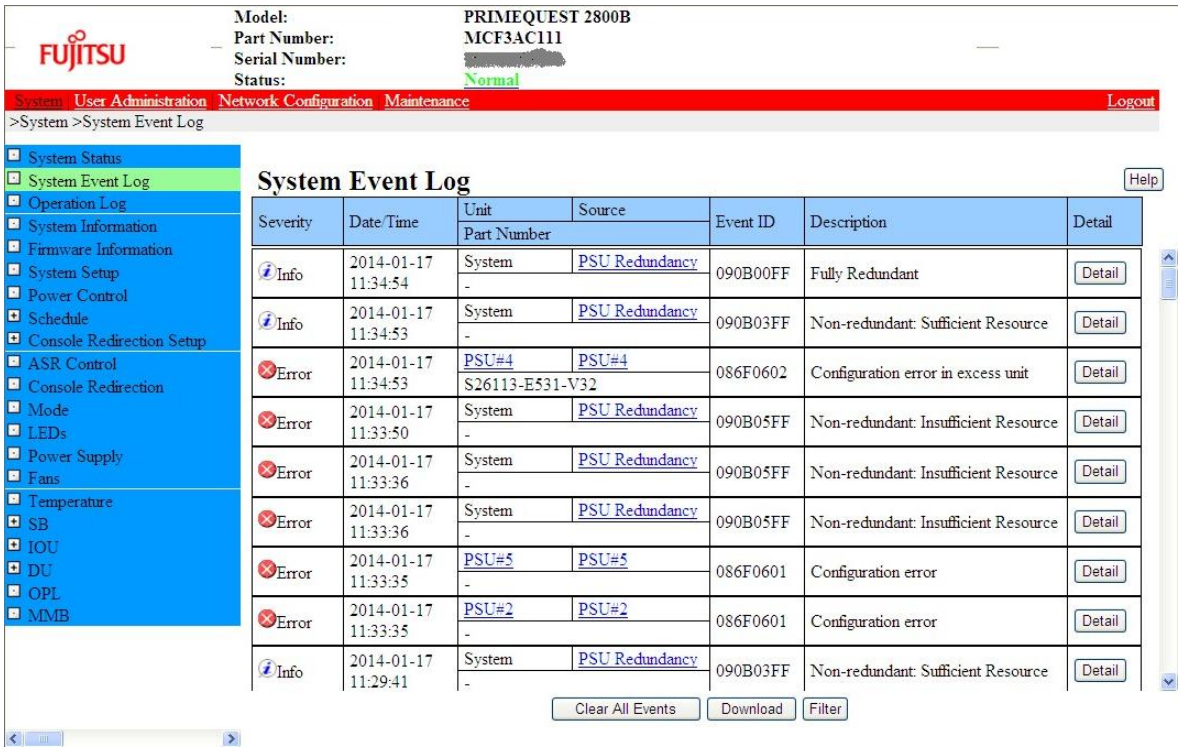
Checking the event log

Procedure

1. Click [System] – [System Event Log].
   The [System Event Log] window appears.

FIGURE 13.11 [System Event Log] window in PRIMEQUEST 2400E3/2800E3/2400E2/2800E2/2400E/2800E

FIGURE 13.12 [System Event log] window in PRIMEQUEST 2800B3/2800B2/2800B



2. Confirm the displayed contents.
   Click the [Download] button to download the event data stored in the SEL. Alternatively, click the [Filter] button to filter the events to display.
   Click the [Detail] button of an event to display details of the event. Click the [Cancel] button to clear settings and restore their previous values.
   Note

Be sure to check with a field engineer before clearing events stored in the SEL.
Remarks

- If a problem occurs during operation, e-mail notification is sent. For details on how to specify whether to use e-mail notification and how to set the error level and e-mail destination for e-mail notification, see 1.5.11 [Alarm E-Mail] window in the *PRIMEQUEST 2000 Series Tool Reference* (CA92344-0539).
- For an explanation of display items in the [System Event Log] window, see 1.2.2 [System Event Log] window in the *PRIMEQUEST 2000 Series Tool Reference* (CA92344-0539).
- To get the log of RAID card by downloading SEL, it is required that the partition mounting the particular RAID card is power on state.

Downloading the event data stored in the SEL

A Fujitsu certified service engineer needs the event data stored in the SEL to analyze the system status. Therefore, we may ask you to download the event data and submit it to a Fujitsu certified service engineer.
Procedure

1. Click the [Download] button in the [System Event Log] window.
   A dialog box for specifying the storage file and path appears.
2. Enter the pathname.
   The event data stored in the SEL is downloaded to the PC displaying the [Web-UI] window.

Filtering the events to display

Procedure

1. Click the [Filter] button in the [System Event Log] window.
   The [System Event Log Filtering Condition] window appears.

FIGURE 13.13 [System Event Log Filtering Condition] window in PRIMEQUEST 2400E3/2800E3/2400E2/2800E2/2400E/2800E

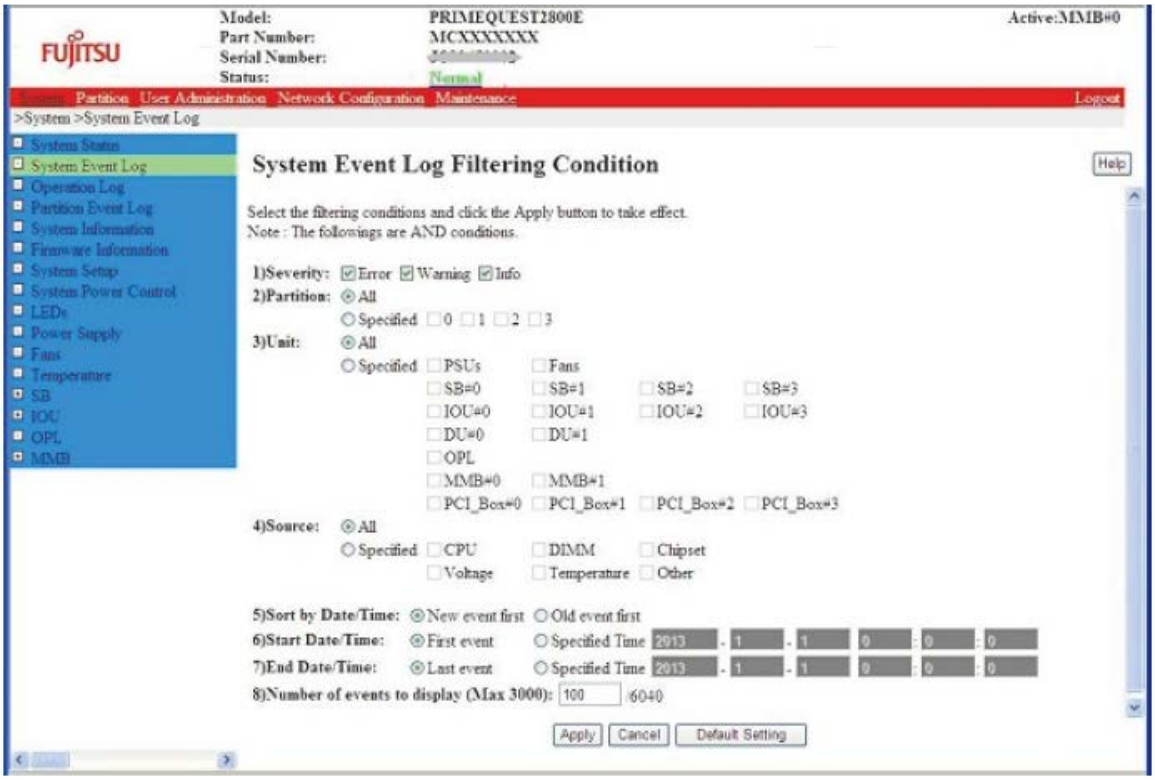
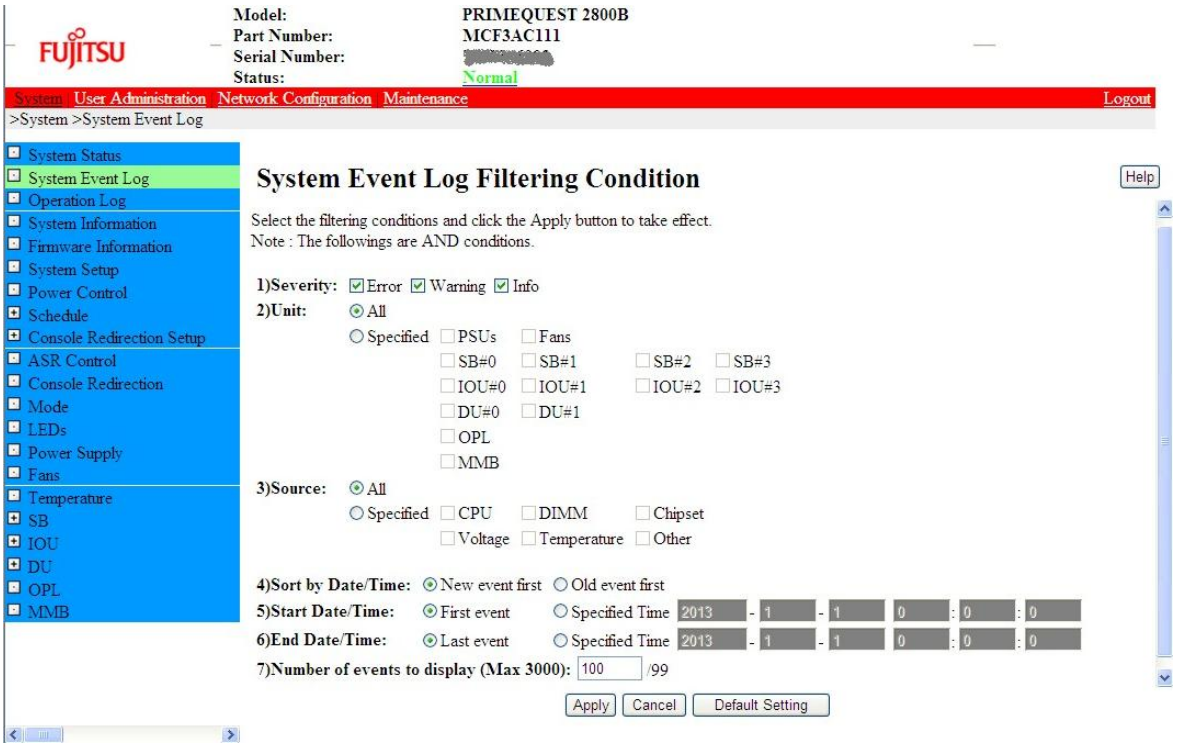


FIGURE 13.14 [System Event Log Filtering Condition] window in PRIMEQUEST 2800B3/2800B2/2800B



2. Specify the condition to filter events. Then, click the [Apply] button.
   The [System Event Log] window appears again. The window displays the events matching the specified conditions.
   To clear the specified conditions and return to the [System Event Log] window, click the [Cancel] button.
   To clear the specified conditions and restore the default values, click the [Default Setting] button.

TABLE 13.5 Setting and display items in the [System Event Log Filtering Condition] window

Item	Description
Severity	Select the severity of events to display by using the following check boxes. You can check multiple check boxes. - Error - Warning - Info All check boxes are checked by default.
Partition (*1)	Select the partition to display. Select the [All] or [Specified] radio button. If you select [All], filtering by partition will not be applied. In this case, the check boxes for partitions in [Specified] are grayed out and cannot be checked. If you select [Specified], you can check the check boxes for selecting a partition. Even after a switch to [All] and back to [Specified], the window retains the selections made with the [Specified] check boxes [All] is grayed out and cannot be selected for users with Partition Operator accounts. Also, they can select partition filtering only for the target partition. The default settings are as follows: - For other than Partition Operator, [All] radio button. - For Partition Operator, [Specified] radio button and target partition.
Unit	Select the units to display. Select the [All] or [Specified] radio button. If you select [All], filtering by unit is not applied. If you select [Specified], you can set filtering by unit. Check the check box of a unit to display the events of that unit. Even after a switch to [All] and back to [Specified], the window retains the selections made with the [Specified] check boxes.

Item	Description
	The default is [All].
Sort by Date/Time	Select ascending or descending order for displaying events by using the radio buttons. The default is [New event first].
Start Date/Time	Select the first event or an event of the specified time by using the radio buttons. If you select [Specified Time], you can enter the start time. Even after a switch to [First Event] and back to [Specified Time], the window retains the time data entered in [Specified Time]. The default is [First event]. The default for [Specified Time] is 2013/01/01 00:00:00.
End Date/Time	Select the last event or an event of the specified time by using the radio buttons. If you select [Specified Time], you can enter the last time. Even after a switch to [Last Event] and back to [Specified Time], the window retains the time data entered in [Specified Time]. The default is [Last event]. The default for [Specified Time] is 2013/01/01 00:00:00.
Number of events to display	Specify the number of events to display. The denominator represents the total number of events logged. The specifiable maximum value is 3000. The default is 100.

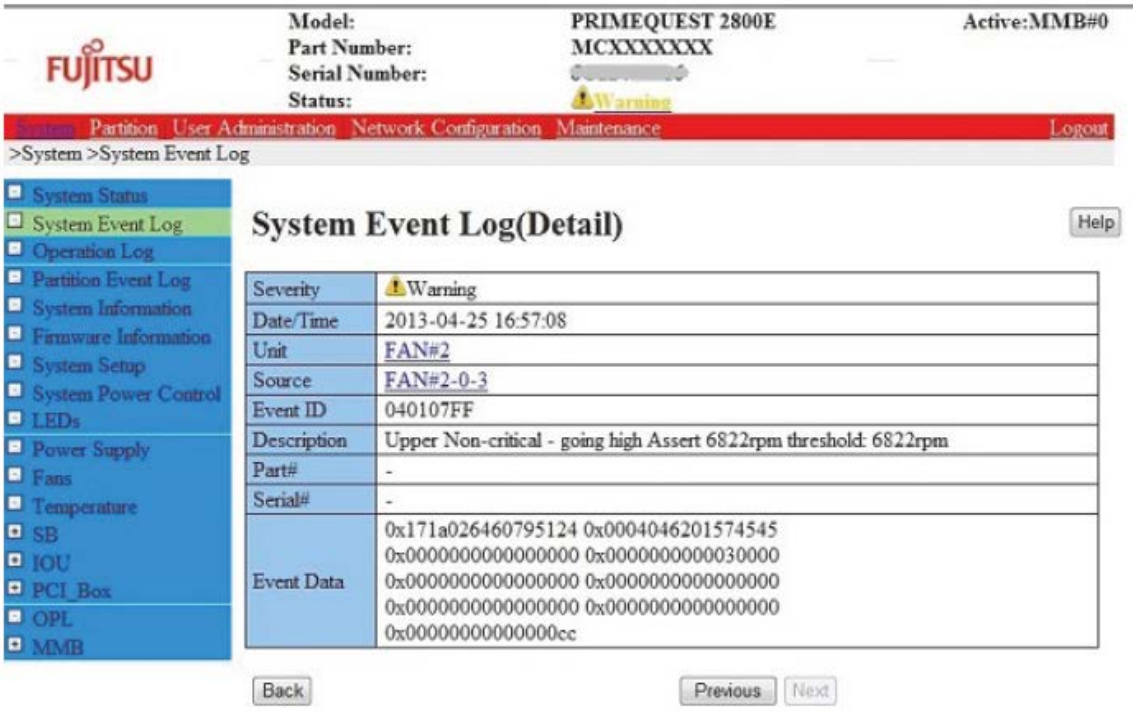
*1: The item of Partition is displayed in PRIMEQUEST 2400E3/2800E3/2400E2/2800E2/2400E/2800E. It is not displayed in PRIMEQUEST 2800B3/2800B2/2800B.

Displaying details of an event

Procedure

1. Click the [Detail] button of the event to display its details.
   The [System Event Log (Detail)] window appears.

FIGURE 13.15 [System Event Log (Detail)] window



2. Click the button of the chosen operation.
   [Back] button: The display returns to the [System Event Log] window.
   [Previous] button: The window displays the previous event according to the display order in the [System Event Log] window. Note that the order of events displayed in the [System Event Log] window is not the actual order of stored events in the SEL.

[Next] button: The window displays the next event according to the display order in the [System Event Log] window.

TABLE 13.6 Setting and display items in the [System Event Log (Detail)] window

Item	Description
Severity	Displays the severity of the event or error. - Error: Serious problem such as a hardware failure - Warning: Event that is not necessarily serious but is a potential problem in the future - Info: Event such as a partition power-on, reported for informational purposes
Date/Time	Displays the local time of occurrence of the event or error. Format: YYYY-MM-DD HH:MM:SS
Source	Displays the name of the sensor indicating the occurrence of the event or error.
Unit	Displays the unit whose sensor indicated the occurrence of an event or error. For example, if an error occurs at CPU#0 on SB#0, this item will display “SB#0.” To identify the unit, the FRU in control of the sensor was identified from the event ID of the sensor. Then, the associated parent entry was retrieved from the Entity Association Record. The displayed name is the Board/Unit Name written in the FRU Record of the parent entry. Each unit has a link to a webpage for information on the unit. (You can see the part number and serial number of the unit there.)
Event ID	Displays the ID (8-digit hexadecimal value) that identifies the event details. For details on Event ID assignment, see Chapter 2 MMB Messages in the PRIMEQUEST 2000 Series Message Reference (CA92344-0540).
Description	Displays the details of the event or error. If the sensor recorded data other than Trig Offset in Event Data, this item also displays that Event Data. For example, the R and T values recorded by the sensor are displayed as the Reading Value and Threshold Value at the event occurrence time. However, for an event related to the mounting or removal of a board, this item displays the part number and serial number of the board.
Part#	Displays the Part# value stored in the SEL. If no Part# value is stored, this item displays “-“.
Serial#	Displays the serial number of the component where the event occurred.
Event Data	Displays [Event Data] values in hexadecimal.

13.4.2 Collecting data for investigation (Windows)

If a problem occurs in Windows, data on the situation is required for ensuring a prompt and correct investigation.
This section describes frequently required investigation data and how to acquire the data.

Software Support Guide and DSNAP

SSG and DSNAP are support tools for collecting the data necessary for investigation of software problems. If a problem occurs in your system, SSG and DSNAP enable your Fujitsu certified service engineer to correctly determine the system software configuration. This leads to a smooth investigation. (The engineer uses this information to determine how the system is configured and deployed. It includes a list of installed software programs, operating system settings, and event logs.)
SSG and DSNAP are executed from the administrator command prompt.
For details on how to use them, see the following references:
DSNAP: README_JP.TXT file in the *operating system installation drive*:¥DSNAP folder
SSG (QSS acquisition tool): Help for SSG

Memory dump

A memory dump is an exact copy of the memory contents at time of occurrence of a problem. A memory dump is very useful in following cases.

- Windows itself hangs during system operation. (For example, the desktop screen freezes, or you cannot operate the mouse or keyboard.)
- Performance deteriorates during system operation when the responsiveness of the mouse or keyboard is too slow.

- Fatal Errors such as STOP error.

For details on memory dump file settings, see 13.4.3 Setting up the dump environment (Windows).
To acquire memory dump, select [Partition] and then the [Power Control] window of the MMB Web-UI. Specify [NMI] for the target partition.
Remarks

- Forced acquisition of a memory dump causes the server to stop.
- Collection of a memory dump may take a long time depending on the environment.

13.4.3 Setting up the dump environment (Windows)

Memory dump is a standard operating system function in Windows. However, before you can acquire dumps, you need to allocate an area for them on the disk.
This section describes how to set up the environment to acquire memory dumps in Windows. To ensure system recovery from a failure, configure the following to set up the memory dump environment before starting to use memory dumps:

Memory dump files and paging files

Memory dump and paging files are described below.
A memory dump file stores debug information on a STOP error (fatal system error) that occurred in the system.
After installing the operating system and applications for operations, make settings for acquiring memory dumps.

Different information collected by a memory dump

The PRIMEQUEST 2000 series enables you to acquire the following five types of memory dump. Each type of memory dump gathers different information.

- Complete memory dump
  A complete memory dump records all the physical memory contents at the time when the system stops. It requires free space equivalent to the physical memory size plus about 300 MB. The system can store only one dump at a time. The new file would overwrite any existing dump file at the specified storage location.
- Active memory dump
  Active memory dump is new function of Windows Server 2016 or later, which records the contents of the memory space only where the operating system is using. The size varies depending on the situation. The system can store only one dump at a time. The new file will overwrite an existing dump file at the specified storage location. The size of active memory dump is smaller than that of Complete memory dump. So, disk usage is reduced and active memory dump is maked more quickly. However, Active memory dump may not be enough to investigate the cause of trouble in rare cases.
- Kernel memory dump
  A kernel memory dump records the contents of the Kernel memory space only. For 32 bit windows, size of dump file is up to 2GB. For 64 bit windows, size of dump file is up to 8TB. The size varies depending on the situation. The system can store only one dump at a time. The new file will overwrite an existing dump file at the specified storage location.
- Minimum memory dump
  A minimum memory dump records the minimum required data to identify the problem. Memory dump file with 128KB or 256KB is created per one minimum memory dump. With this option, the dump function creates a new file each time the system stops unexpectedly.
- Automatic memory dump
  Automatic memory dump is new function of Windows Server 2012 or later, which records the contents of the Kernel memory space only just like Kernel memory dump. Difference between Kernel memory dump and Automatic memory dump is that Automatic memory dump can be created in the default size of paging file which is smaller than mounted memory. However, if all kernel space information could not be recorded, memory dump acquisition fails. The paging file size is automatically expanded at the next start time.

TABLE 13.7 Memory dump types and default value

Memory dump type	Memory dump file size	Save method
Complete memory dump	Physical memory size + 300 MB (*1)	Overwrite (*2)

Memory dump type	Memory dump file size	Save method
Active memory dump	Depends on memory space during system operation (Even max size of Active memory dump never become larger than Complete memory dump)	Overwrite (*2)
Kernel memory dump	Depends on memory space during system operation (32bit windows:max 2 GB, 64bit windows max 8 TB).	Overwrite (*2)
Minimum memory dump	32bit windows: 128 KB 64bit windows: 256 KB	Create new file
Automatic memory dump	Depends on memory space during system operation (max 8TB).	Overwrite (*2)

*1 In a system using the Memory Mirror function, it is half the size of the mounted physical memory
*2 Although you can change this setting to not overwrite the dump file, no new dump file would be created in such cases. If you create new memory dump file, save existing memory dump file.

Notes

- Be sure to reserve enough free space on the HDD/SSD before acquiring a memory dump.
- Select the optimum settings for system operation by taking the following into account:
  - The causes of some problems may not be identified because kernel memory dumps do not record user mode information.
  - The time taken to create a complete memory dump is proportional to the memory size, and the down time before a system restart is longer. Also, the saved dump file requires freer disk space.
  - The memory dump file cannot be stored in the iSCSI connection destination. However, only when the paging file is arranged on the iSCSI boot disk, it is possible to store it in booting it iSCSI.

Memory dump configuration methods

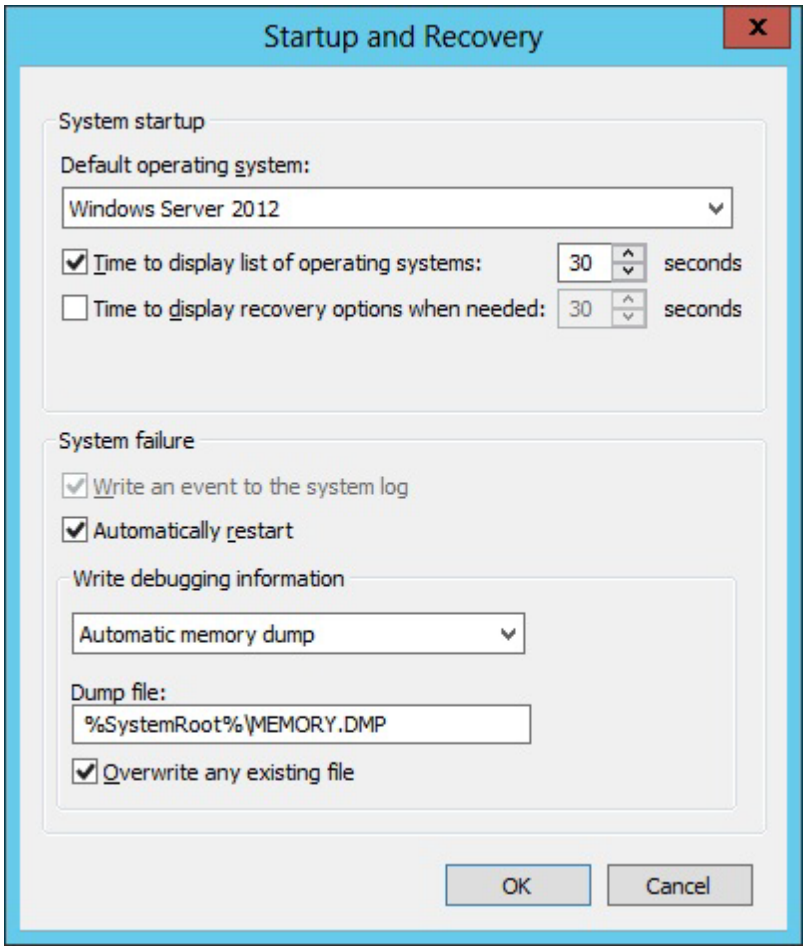
The methods of configuring memory dumps are described below.

<For Windows Server 2012, Windows Server 2012 R2 or Windows Server 2016>

Configure the memory dump file in the following procedure.

1. Log in to the server with Administrator privileges.
2. Confirm the free space on the drive to store the memory dump file.
3. Click [Control Panel] – [System and Security] – [System] – [Advanced system settings].
4. Click [Settings] under [Startup and Recovery] on the [Advanced] tab.
   The [Startup and Recovery] dialog box appears.

FIGURE 13.16 [Startup and Recovery] dialog box



5. Specify the following values.
   Select the type of memory dump file from [Write debugging information]. Set the dump file storage location in [Dump file].
6. Click the [OK] button to close the [Startup and Recovery] dialog box.
7. Click the [OK] button to close the [System Properties] dialog box.
8. Restart the partition.
   After the partition restart, the settings take effect. Then, make the following settings.

Configuring a complete memory dump of Windows Server 2008 R2

The dump of a complete memory of Windows Server 2008 R2 cannot be set from the start and the recovery dialog boxes of the system. After it sets the dump file preservation ahead in the start and the recovery dialog boxes, the value of the registry is changed as follows.

HKEY_LOCAL_MACHINE¥System¥CurrentControlSet¥Control¥CrashControl “CrashDumpEnabled” (Kind: REG_DWORD and data: 0x1)

Please reboot a system after the setting. Please refer to above-mentioned “Memory dump configuration methods of Windows Server 2012” for the preservation passing of the dump file and the setting of the superscription.

Creating a memory dump file in iSCSI boot

Set the setting of “iSCSI Boot Crash Dump” to “Enabled” in IntelPROSet.

Confirming the memory dump configuration

Acquire a memory dump. Confirm that dump was created correctly. Also, measure the time taken to output the dump and restart the system so as to estimate the time required until business could resume. Then, reconsider the type of dump to acquire, as needed.

To acquire a memory dump, select [Partition] and then the [Power Control] window of the MMB Web-UI. Then, specify [NMI] for the target partition.
For details on the procedure, see Chapter 1 MMB Web-UI (Web User Interface) Operations in the *PRIMEQUEST 2000 Series Tool Reference* (CA92344-0539).

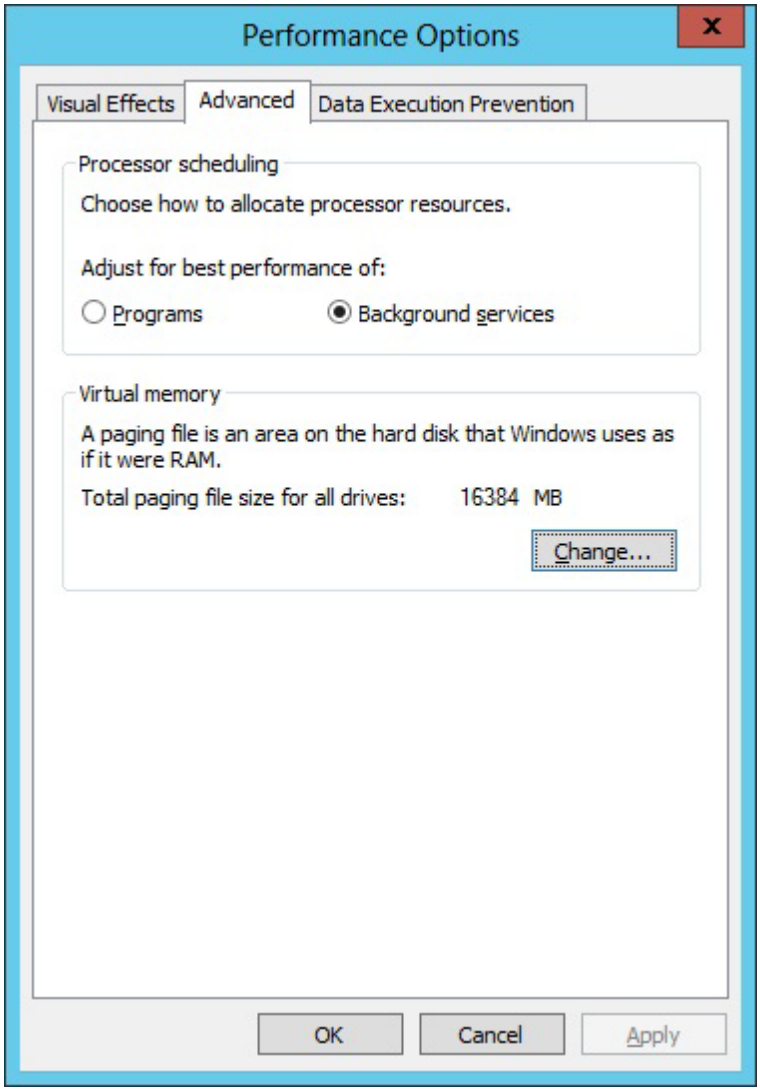
Configuring the paging file

<For Windows Server 2012, Windows Server 2012 R2 or Windows Server 2016>

Configure the paging file in the following procedure.

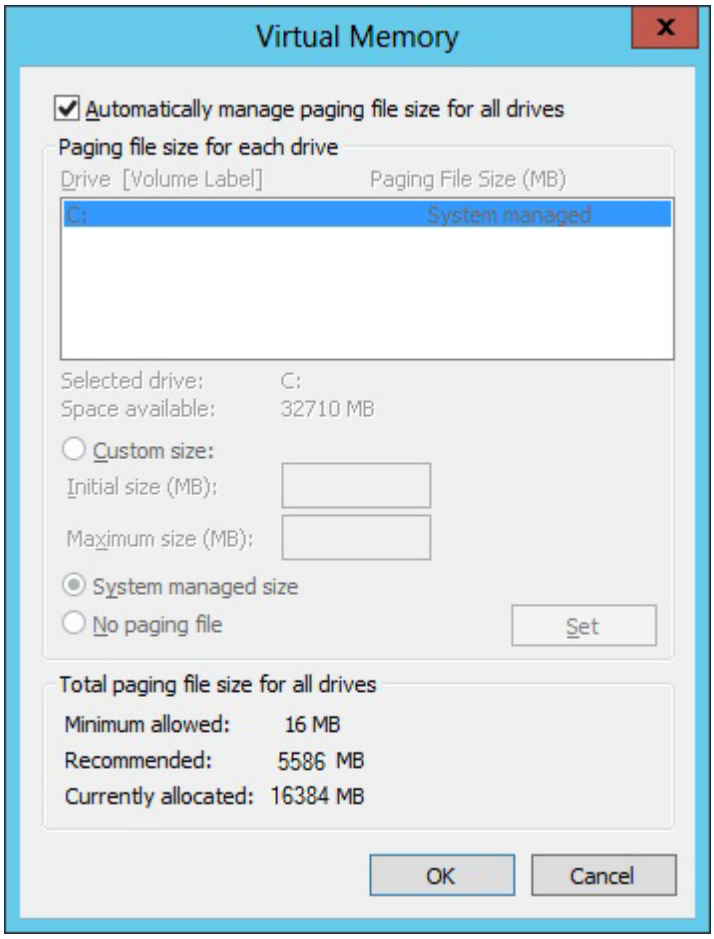
1. Log in to the server with Administrator privileges.
2. Click [Control Panel] – [System and Security] – [System] – [Advanced system settings].
3. Click [Settings] under [Performance] on the [Advanced] tab.
   The [Performance Options] dialog box appears.
4. Click the [Advanced] tab.

FIGURE 13.17 [Advanced] tab of the dialog box



5. Click [Change] under [Virtual memory].
   The [Virtual Memory] dialog box appears.

FIGURE 13.18 [Virtual Memory] dialog box



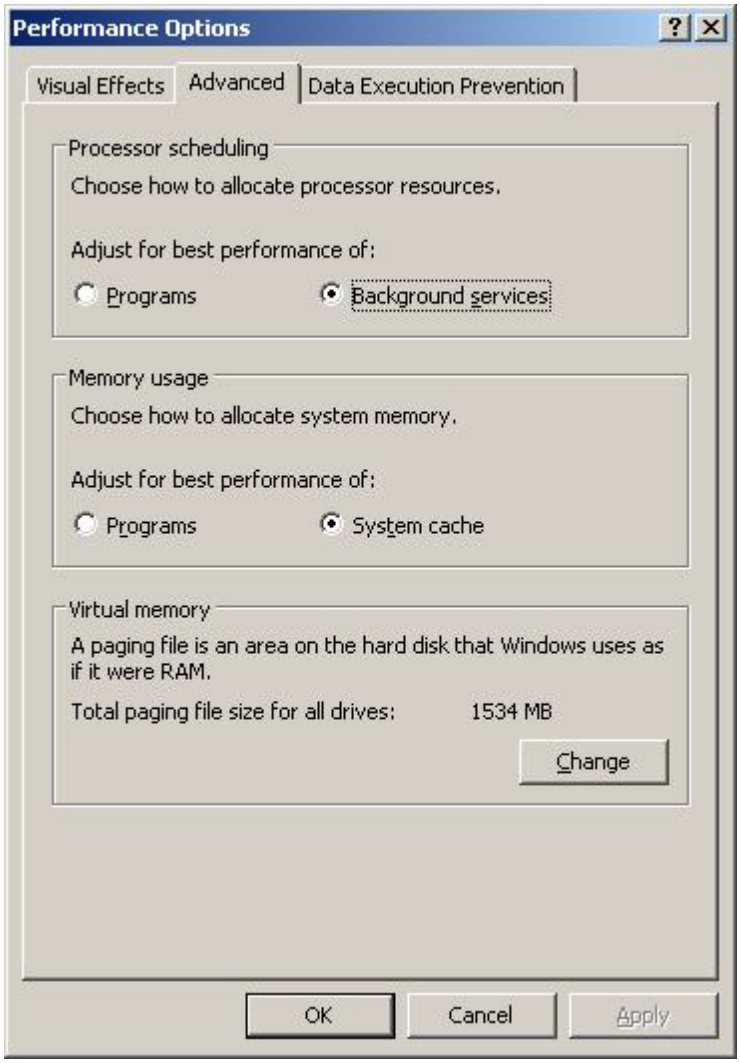
6. Uncheck [Automatically manage paging file size for all drives]. [Drive] specifies the drives on which paging files are created.
   The selected drive under [Drive] of [Paging file size for selected drive] is displayed.
   Notes
   - No dump files and paging files can be stored at the iSCSI connection destination during internal disk boot and SAN (FC) boot.
   - The file system for ReFS volumes cannot store paging files.
7. Select [Custom size], and enter a value in [Initial size].
   The specified size must be greater than the size of mounted memory plus 1 MB in order to acquire memory dumps normally. The recommended size is approximately 1.5 times the size of mounted memory.
   Notes
   - Check [Automatically manage paging file size for all drives].
   - Select [System managed size].
8. Enter a value in [Maximum size].
   Specify a value that is the same as or larger than [Initial size]. The recommended size is the same as [Initial size].
9. Save settings.
   Click [Set] under [Paging file size for selected drive].
   The settings are saved, and [Paging File Size] of [Drive] displays the set values.
10. Click the [OK] button to close the [Virtual Memory] dialog box.
    The message [You must restart your computer to apply these changes] appears. Click the [OK] button to close the message box.
11. Click the [OK] button to close the [Performance Options] dialog box.

12. Click the [OK] button to close the [System Properties] dialog box.
13. Restart the partition.
    After the partition restart, the settings take effect.

<For Windows Server 2008 R2>
Configure the paging file in the following procedure.

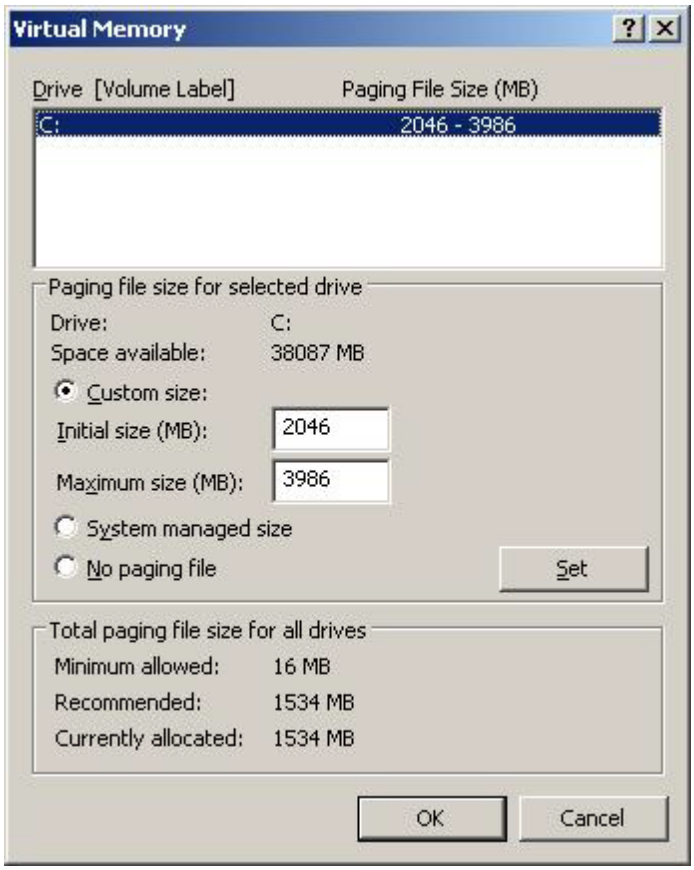
1. Log in to the server with Administrator privileges.
2. Select [Control Panel] – [System].
   The [System Properties] dialog box appears.
3. Click the [Advanced] tab. Then, click [Performance] – [Settings].
   The [Performance Options] dialog box appears.
4. Click the [Advanced] tab.

FIGURE 13.19 Advanced options dialog box



5. Click [Change] in [Virtual Memory].
   The [Virtual Memory] dialog box appears.

FIGURE 13.20 [Virtual Memory] dialog box



6. Specify the drive on which to create the paging file.
   Select the system installation drive in [Drive].
   [Drive] in [Paging file size for selected drive] displays the selected drive.
7. Select a value in [Custom size]. Enter a value in [Initial size].
   To correctly acquire a memory dump, the specified size must be equivalent to the size of mounted memory plus 1 MB or more. About 1.5 times the size of the mounted memory is recommended.
8. Enter a value in [Maximum size].
   Be sure to specify a value larger than or equal to [Initial size]. The same size as [Initial size] is recommended.
9. Save the settings.
   Click [Set] in [Paging file size for selected drive].
   This saves the settings. [Paging file size] in [Drive] displays the entered values.
10. Click the [OK] button to close the [Virtual Memory] dialog box.
11. Click the [OK] button to close the [Performance Options] dialog box.
12. Click the [OK] button to close the [System Properties] dialog box.
13. Restart the partition.
    After the partition restart, the settings take effect.

13.4.4 Acquiring data for investigation (RHEL)

If a problem occurs in RHEL, data on the situation is required for ensuring a prompt and correct investigation. For details on setting of dump environment, contact the distributor where you purchased your product, or your sales representative.

13.4.5 sadump

If a problem occurs in the partition which is operating on RHEL, memory dump is acquired as shown 13.4.4 Acquiring data for investigation (RHEL). However, acquiring memory dump sometimes fail. In such cases, memory dump is acquired by sadump in PRIMEQUEST 2400E3/2800E3/2400E2/2800E2/2400E/2800E. PRIMEQUEST 2800B3/2800B2/2800B does not support sadump.

Steps below are how to acquire memory dump by sadump where partition does not operate due to hung-up of operating system and so on.

1. Select [Power Control] from [Partition] menu in MMB Web-UI.
   [Power Control] window appears
2. Select [NMI] and click [Apply] button in [Power Control] window.
   OS panic occurs and kdump runs.
3. When kdump cannot be acquired, select [sadump] and click [Apply] button in [Power Control] window.
   The partition status changes to [Dumping].
   Below window appears during memory dump

```
ACPI(PNP0A03,0)/PCI(7,0)/ACPI(PNP0F03,0):
#########################                                    x.x%]
```

- When acquiring memory dump completes, the partition becomes to either of below state.
- The partition automatically starts to re-start.
  The partition status changes to [Halt] and system also becomes to halt state.
  In this case, restart the partition manually.
  When acquiring memory dump completes, below window appears.

```
ACPI(PNP0A03,0)/PCI(7,0)/ACPI(PNP0F03,0):
                                                          [100.0%]
Dumping Complete. Waiting for reboot...
```

Make the acquired memory dump portable and submit it to distributor where you purchased your product, or your sales representative. For the way how to make memory dump portable, see the manual of operating system.
Sadump may automatically start in some operating systems. For such cases, see the manual of operating system.

Note

If the first disk fails when dump device is duplicated, memory dump is output into secondary disk. However, memory dump terminates abnormally if the device error is detected during memory dump into first disk.

13.5 Configuring and Checking Log Information

This section describes how to configure and confirm the log information on problems that occurred in the system.

13.5.1 List of log information

This section lists the types of log information that can be acquired.

- Available log information
- System event log
- Syslog and event log
- Agent log
- Partition Event Log
- Hardware error log
- BIOS error log
- Information on factors in partition power supply control
- Network configuration log information

- NTP client log information
- REMCS configuration log information
- Operation log information
- Physical inventory (including PCI_Boxes) information
- System and partition configuration information
- System and partition configuration file
- Information on internal rack sensor definitions

13.6 Firmware Updates

The PRIMEQUEST 2000 series server is configured with BIOS, BMC, and MMB firmware.
Each firmware is managed as a total version integrating different versions.
The firmware is updated from the MMB in batch (applying to all the firmware at all locations within the system).

For details on firmware updates, see 1.6.1 [Firmware Update] menu in the *PRIMEQUEST 2000 Series Tool Reference* (CA92344-0539).

13.6.1 Notes on updating firmware

If the MMB or SB/Memory Scale-up Board fails, perform maintenance on it before updating the firmware. Do not update the firmware in a configuration containing a faulty MMB or SB/Memory Scale-up Board.
Firmware update can be performed regardless of power status of the partition.
If the partition is not power off, new firmware is applied after power off of the partition.
Note
If the firmware update fails, update the firmware again by ‘Firmware Update’ menu of MMB Web-UI.

Appendix A Functions Provided by the PRIMEQUEST 2000 Series

This appendix lists the functions provided by the PRIMEQUEST 2000 series. It also lists management network specifications.

A.1 Function List

The following lists the functions provided by the PRIMEQUEST 2000 series.

A.1.1 Action

TABLE A.1 Action

Operation	Minor item	Description
User operation	User operation setting	Operation privilege setting for each user account
		Account synchronization between duplicate MMBs via LDAP
	GUI	Web user interface
	CLI	MMB command line interface
		SVS command line interface
External interface	KVM (local)	Local VGA, USB
Remote console	Console redirection	Serial console over LAN
	Video redirection	Function that uses PC connected to management LAN as graphical console
	Virtual media	Function that assumes drive of drive partition side of management LAN connection PC etc
UEFI	UEFI interface	UEFI shell
		Boot Manager

A.1.2 Operation

TABLE A.2 Operations

operation	Minor item	Description
System construction	Management LAN setting	MMB management LAN setting
		Maintenance LAN (REMCS/CE port) setting
		Network setting internal LAN
	Operating privilege/range setting	User account management
	Partition configuration	Partition creation/editing/removal
		CPU/DIMM configuration check
	Memory Operation Mode	- Performance Mode(per partition) - Normal Mode(per partition) - Partial Memory Mirror Mode(per partition) - Full Mirror Mode(per partition) - Spare Mode(per partition)
	PCI_Box control	PCI_Box management, allocation to partitions
	Virtualization	MAC address fixing of internal LAN PCH
System operation/ power control	Start	Power-on by Web-UI, CLI or Wake On LAN
	Stop	Shutdown or forced power-off from Web-UI, CLI or OS
	Restart	Reboot from Web-UI or OS, partition reset

operation	Minor item	Description
	Power recovery processing	Power-on control when power is restored from AC Lost
	Boot control	Boot device selection in Web-UI
		Diagnosis mode selection at boot
		Boot device selection by UEFI Boot Manager, boot option setting
	Scheduled operation	Automatic power-on/off at specified date and time specification
	Wake On LAN	Power-on via network
Automatic recovery	Degraded operation	Automatic degraded operation on CPU, DIMM, SB, Memory Scale-up Board, etc
	Reserved SB	SB automatic switching from faulty SB to Reserved SB
	ASR	Automatic restart of partition when failure occurs
Continuous operation	Continuous operation	Processing takeover between duplicate MMBs
		Recovery by MMB or BMC reset, continuous partition operation
Ecological operation	Power consumption management	Cabinet power consumption monitoring, notification to higher-level software
	PSU power-on count control	PSU power-on control only as needed
	FAN speed control	Optimum control of FAN speed
Extended Partitioning	Partition division	The hardware resource divided by a physical partition is divided further.
Dynamic Reconfiguration (DR)	Add/Remove	The configuration change is possible compared with the partition OS's operating.
Time synchronization	NTP client	NTP client

A.1.3 Monitoring and reporting functions

TABLE A.3 Monitoring and reporting functions

operation	Minor item	Description
Hardware monitoring and reporting	Hardware problem monitoring	Hardware problem monitoring by MMB/BMC/UEFI
	Partition problem monitoring	Watchdog Timer monitoring by MMB/UEFI
	Power control problem monitoring	Power control sequence problem monitoring
	FAN speed problem monitoring	Fan speed problem monitoring
	Voltage problem monitoring	Voltage problem monitoring
	Temperature problem monitoring	Temperature problem monitoring
	Hardware proactive monitoring	Proactive monitoring of CPU, DIMM, and HDD hardware failures
	External reporting	External reporting by e-mail, SNMP, or REMCS
	Event monitoring	Sensor-detected event monitoring
	Threshold monitoring	Threshold monitoring of temperature, power voltage, and fan speed
Status display	LED display	Display of MMB and system status
		Location display (Location LED)
		Faulty component display
	Eco-related status display	Cabinet power consumption display
		FAN speed display
		PSU/DDC power-on status display

operation	Minor item	Description
		Temperature display
		Eco status acquisition from higher-level software (SNMP)
Log	Log type	Expand contents and enhance history information of MMB-collected log - System event log - Hardware and UEFI error log - Power control and factor information - Network setting and log - MMB operation log, login record - Firmware version - Mounting unit information - Partition configuration and setting - Sensor information - Various firmware log dumps
	Log download	Batch download of MMB-collected logs (SEL download)
Hardware error processing	Fault location	Faulty component indication
	WHEA support	Support of Windows Hardware Error Architecture

A.1.4 Maintenance

TABLE A.4 Maintenance functions

operation	Minor item	Description
Component replacement	Replacement target	Cold replacement, non-hot/hot-system/hot maintenance
		Hot maintenance support by the hot plug
	Replacement target component indication	Replacement target component indicated by SEL or LED
	Hot Plug	PCI Express card, HDD/SSD
		Replacement SB by DR
FRU management	FRU management	FRU information management for FRU management target components Serial No., part No., product name, etc.
		System information management and backup by FRU
Log management	Log collection	Log collection and generation management by MMB
	Log clear	MMB log clear
Firmware management	Generation management	Management at one generation
	Version display	Overall version display
	Firmware update	Batch firmware update in Web-UI/CLI
		Version matching between SBs/Memory Scale-up Boards by MMB (BIOS/BMC)
		SB/Memory Scale-up Board version confirmation at power-off
Configuration setting information management	Configuration setting information save and restore	Save and restoration of MMB/UEFI/REMCS information
Maintenance guidance	Maintenance wizard	Component replacement procedure instructions on Web-UI
Failure cause search	Internal log trace	MMB/BMC internal log acquisition
	Dump function	MMB core dump
		sadump
	Hardware log	CPU/chip set hardware log
Remote maintenance	REMCS	REMCS - Hardware failure information notification

operation	Minor item	Description
		- System configuration information notification

A.1.5 Redundancy functions

TABLE A.5 Redundancy functions

operation	Minor item	Description
Network	Management LAN duplication	Management LAN duplication switching
Power supply	Dual power feed	Dual power feed monitoring
	PSU redundancy	PSU N+1 redundancy monitoring and control
Unit	FAN redundancy	Fan redundancy monitoring and control
	MMB duplication (*1)	MMB duplication control
		Return of reset and doubling after switch anomaly detection
	SB redundancy (*1)	Faulty SB/Memory Scale-up Board switching with Reserved SB
Component and module	DIMM duplication	Memory Mirror mode (each partition)
	DINN spare	Memory Spare Mode (each partition)
	Firmware storing memory duplication	FWH duplication
System clock	Clock multiplexing	PRIMEQUEST 2000 series server has oscillator on each SB. Distribution from Home SB
System	Cluster in cabinet	Independent clock in each partition

*1: Available for only PRIMEQUEST 2400E3/2800E3/2400E2/2800E2/2400E/2800E.

A.1.6 External linkage functions

TABLE A.6 External linkage functions

operation	Minor item	Description
External IF/API	IPMI/RMCP	IPMI/RMCP interface
	SNMP	SNMP interface
	telnet/ssh	Access to MMB CLI via telnet/ssh
	http/https	Access to MMB Web-UI via http/https
	NTP	Time synchronization with NTP client of MMB
EMS linkage	ServerView Suite linkage	Linkage with ServerView Suite
	Other management software linkage	Linkage with server management software of each company
CLUSTER linkage	PRIMECLUSTER linkage	Linkage with PRIMECLUSTER
UPS linkage	Power failure control	Coordinated support with UPS device in power failure shutdown processing
		User script execution support before power failure shuts down
External file device linkage	Increase file device	Support of increase file device
Installer linkage	OS install support	Support of ServerView Installation Manager
GDS linkage	GDS linkage	Support of software RAID (RHEL)
PXM linkage	PXM linkage	Support of PXM (XSP emulation)

A.1.7 Security functions

TABLE A.7 Security functions

operation	Minor item	Description
Security setting	External IF security setting	Network security setting (SSL, SSH, etc.)

operation	Minor item	Description
User management/ authentication	User authentication	MMB login account management
	User authentication linkage	Synchronization of the account between doubling MMB
Audit trail	Operating log	Records such as MMB operating log and login history, etc.
TPM	TPM	Support of TPM function

A.2 Correspondence between Functions and Interfaces

The following shows the correspondence between the functions provided by PRIMEQUEST 2000 series and interfaces.

A.2.1 System information display

TABLE A.8 System information display

Function	MMB Web-UI	MMB CLI	UEFI
System status display (Error, Warning)	Supported		
System event log (SEL) display	Supported		
System event log (SEL) download	Supported		
MMB Web-UI/CLI operating log display	Supported		
System information display (P/N, S/ N)	Supported		
Firmware version display	Supported	Supported	

A.2.2 System settings

TABLE A.9 System settings

Function	MMB Web-UI	MMB CLI	UEFI
Primary and secondary power feed	Supported	Supported	
Power-on setting at power recovery	Supported	Supported	
Start delay time at power recovery	Supported	Supported	
Installation altitude	Supported	Supported	
PSU redundancy setting	Supported	Supported	
It sets it to Reserved SB at the maximum waiting time until Force Power Off of Partition including correspondence SB at the switch is begun	Supported		
Effective and invalid setting of Power Saving function as the entire System	Supported		
Power consumption threshold (Limit value) setting of the entire System	Supported		

A.2.3 System operation

TABLE A.10 System operation

Function	MMB Web-UI	MMB CLI	UEFI
System power control (On/Off/Force P-off)	Supported	Supported	

A.2.4 Hardware status display

TABLE A.11 Hardware status display

Function	MMB Web-UI	MMB CLI	UEFI
LED status display	Supported		
LED operation (on, clear, blinking)	Supported		
PSU (power supply unit) power-on count and status display	Supported		
System power consumption display	Supported		
FAN status monitoring and FAN speed display	Supported		
Temperature monitoring and display	Supported		
Voltage monitoring and display	Supported		
SB status display (CPU, DIMM, Mezzanine, RAID slot, HDD/SDD, Chipset, TPM, BMC, FBU, clock)	Supported		
Memory Scale-up Board status display (DIMM, Mezzanine, Chipset, BMC, clock)	Supported		
IOU status display	Supported		
DU status display	Supported		
OPL status display	Supported		
MMB status display	Supported		
PCI_Box status display	Supported		

A.2.5 Display of partition configuration information and partition status

TABLE A.12 Display of partition configuration information and partition status

Function	MMB Web-UI	MMB CLI	UEFI
Partition status display (number of CPUs, COREs, memory size, power status)	Supported		

A.2.6 Partition configuration and operation setting

TABLE A.13 Partition configuration and operation setting

Function	MMB Web-UI	MMB CLI	UEFI
Partition configuration	Supported	Supported	
Reserved SB allocation	Supported	Supported	
CPU setting			Supported
Flexible I/O mode		Supported	
ASR (Automatic Server Restart) setting for partitions	Supported		
I/O space allocation to I/O device			Supported
Memory Operation Mode	Supported	Supported	
Memory Mirror RAS Mode	Supported	Supported	
PCI Address Mode	Supported	Supported	
Dynamic Reconfiguration (DR)	Supported	Supported	
TPM			Supported

A.2.7 Partition operation

TABLE A.14 Partition operation

Function	MMB Web-UI	MMB CLI	UEFI
Video redirection/ Virtual media	Supported		
Console redirection		Supported	
UEFI shell			Supported

A.2.8 Partition power control

TABLE A.15 Partition power control

Function	MMB Web-UI	MMB CLI	UEFI
Power-on	Supported	Supported	
Power-off (shutdown)	Supported	Supported	
Reset	Supported	Supported	
NMI	Supported	Supported	
Forced power-off	Supported	Supported	
sadump	Supported	Supported	
Diagnosis mode selection at power on	Supported		
Scheduled operation	Supported		

A.2.9 OS boot settings

TABLE A.16 OS boot settings

Function	MMB Web-UI	MMB CLI	UEFI
OS boot device selection			Supported
OS boot priority setting			Supported
OS boot option setting			Supported
OS boot delay time setting			Supported
PXE/iSCSI boot network device setting			Supported
Boot control (boot setting override)	Supported		

A.2.10 MMB user account control

TABLE A.17 MMB user account control

Function	MMB Web-UI	MMB CLI	UEFI
MMB user account setting and Display	Supported	Supported	
MMB login user display	Supported	Supported	

A.2.11 Server management network settings

TABLE A.18 Server management network settings

Function	MMB Web-UI	MMB CLI	UEFI
Setting of MMB date, time, and time zone	Supported	Supported	
MMB time synchronization (NTP) setting	Supported		
MMB management LAN setting	Supported	Supported	
Internal LAN setting	Supported		
Maintenance LAN setting	Supported	Supported	

Function	MMB Web-UI	MMB CLI	UEFI
MMB LAN port setting	Supported		
MMB network protocol setting	Supported	Supported	
SNMP setting	Supported	Supported	
SNMP setting (V3)	Supported		
SSL setting	Supported		
SSH setting	Supported	Supported	
Remote Server Management user setting (RMCP)	Supported		
Access control setting	Supported		
Alarm E-Mail setting	Supported		
MMB network status display command		Supported	

A.2.12 Maintenance

TABLE A.19 Maintenance

Function	MMB Web-UI	MMB CLI	UEFI
Batch firmware update	Supported	Supported	
MMB configuration information save and restore	Supported		
BIOS configuration information save and restore	Supported		
Maintenance wizard: Component Replacement	Supported		
Maintenance wizard: Maintenance mode setting and cancellation	Supported		
SB hot addition		Supported	
IOU hot addition		Supported	

A.3 Management Network Specifications

The following lists the management network specifications of the PRIMEQUEST 2000 series.

TABLE A.20 Management network specifications

Component (A)	Communication direction	Component (B)	USER port	CE port	REMCS port	Partition LAN port	Protocol (Port No.)	Port No.
Terminal software	Duplex	(MMB)	Used	Used	Not used	Not used	telnet (TCP23)	Changeable
	Duplex						ssh (TCP 22)	Changeable
Video Redirection/ Virtual media	Duplex	MMB/ BMC	Used	Used	Not used	Not used	VNC (TCP80)	
FST	Duplex	MMB	Used	Used	Not used	Not used	telnet (TCP23)	Changeable
	Duplex						ssh (TCP 22)	Changeable
	Duplex						RMCP (UDP623)	
REMCS Center	From B to A	MMB	Used	Used	Used	Not used	SMTP	Changeable
NTP server (clock device)	Duplex	MMB (client)	Used	Used	Not used	Not used	NTP (UDP123)	

Component (A)	Communication direction	Component (B)	USER port	CE port	REMCS port	Partition LAN port	Protocol (Port No.)	Port No.
Web browser	Duplex	MMB	Used	Used	Not used	Not used	http/https (TCP 8081)	Changeable
SVOM	Duplex	(MMB)	Used	Used	Not used	Not used	telnet (TCP23)	Changeable
	Duplex						ssh (TCP 22)	Changeable
	Duplex						snmp (UDP161)	Changeable
	From B to A						snmp trap (UDP 162)	Changeable
	Duplex						RMCP (UDP623)	

TABLE A.21 Management network specifications

Component (A)	Communication direction	Component (B)	USER port	CE port	REMCS port	Partition LAN port	Protocol (Port No.)	Port No.
SVOM	Duplex	ServerView Agent	Not used	Not used	Not used	Used	snmp (UDP161)	
	From B to A						snmp trap	
	Duplex						SERVERVIEW-RM (TCP/UDP 3172)	
	Duplex	PING	Used	Used	Not used	Used	ICMP	
	Duplex	SMTP Server	Not used	Not used	Not used	Used	SMTP (TCP/UDP 25)	
	Duplex	PostgreSQLDB	Not used	Not used	Not used	Used	PostgreSQL(TCP/UDP9212)	
	Duplex	MS SQL DB	Not used	Not used	Not used	Used	MS-SQL-S(TCP/UDP1433)	
							MS-SQL-M(TCP/UDP1434)	

Appendix B Physical Mounting Locations and Port Numbers

This appendix describes the physical mounting locations of components, and shows MMB and IOU port numbers.

B.1 Physical Mounting Locations of Components

This section describes the physical mounting locations of components.

Note

In PRIMEQUEST 2400E3/2400E2, total of SB and Memory Scale-up Board can be installed up to four boards. Up to two SBs and up to three Memory Scale-up Boards can be installed. SB and Memory Scale-up Board can be installed in any slot.

FIGURE B.1 Physical mounting locations in the PRIMEQUEST 2400E3/2400E2

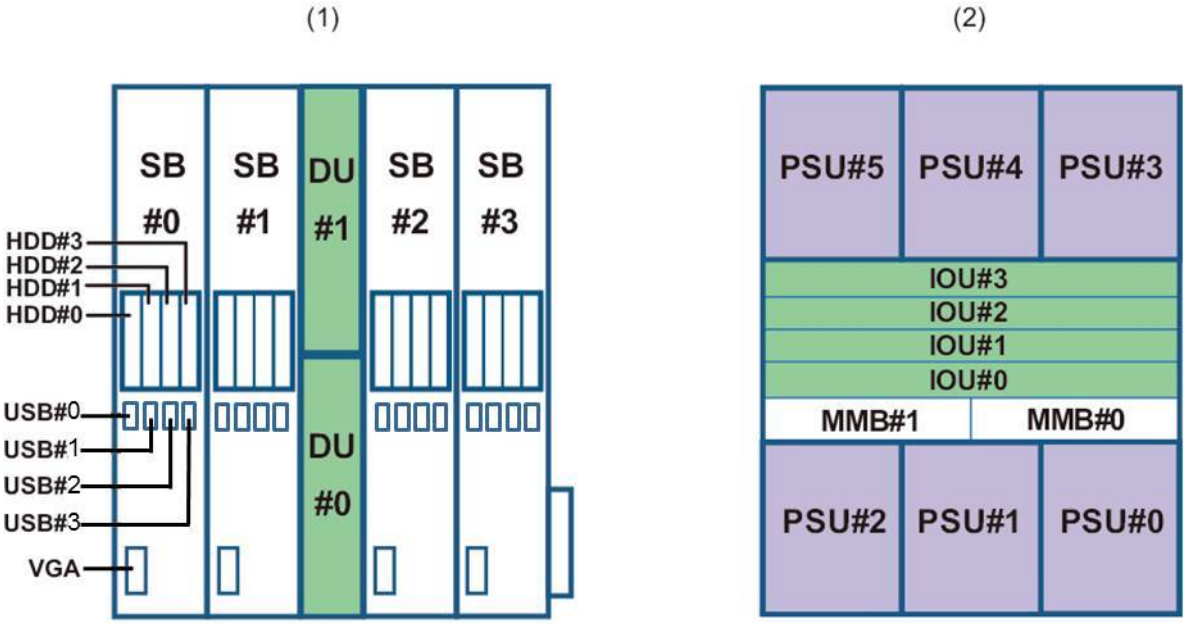


FIGURE B.2 Physical mounting locations in the PRIMEQUEST 2800E3/2800E2

(1) (2)

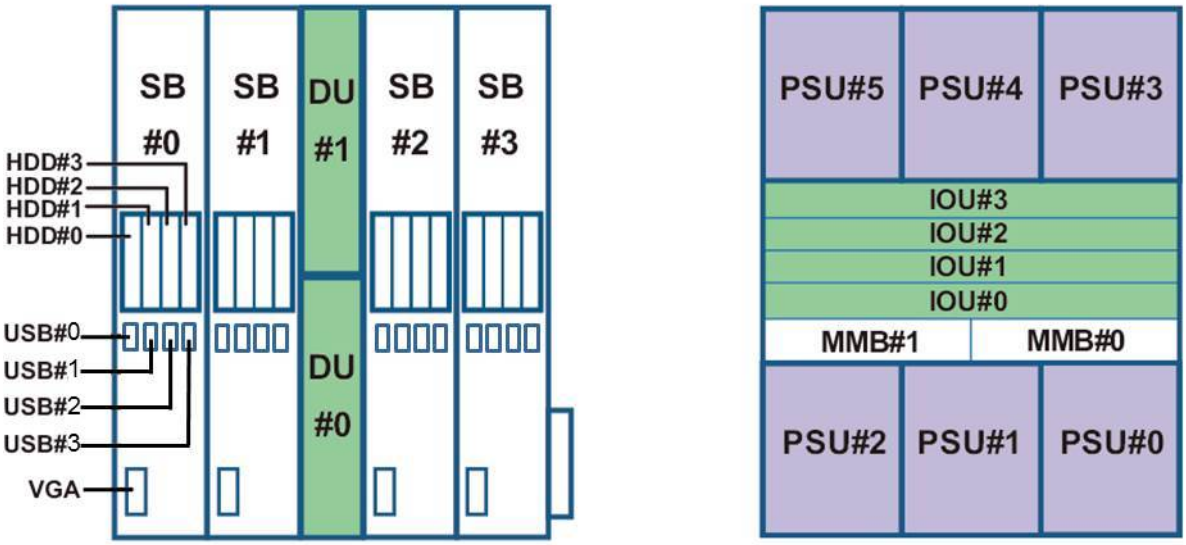


FIGURE B.3 Physical mounting locations in the PRIMEQUEST 2800B3/2800B2

(1) (2)

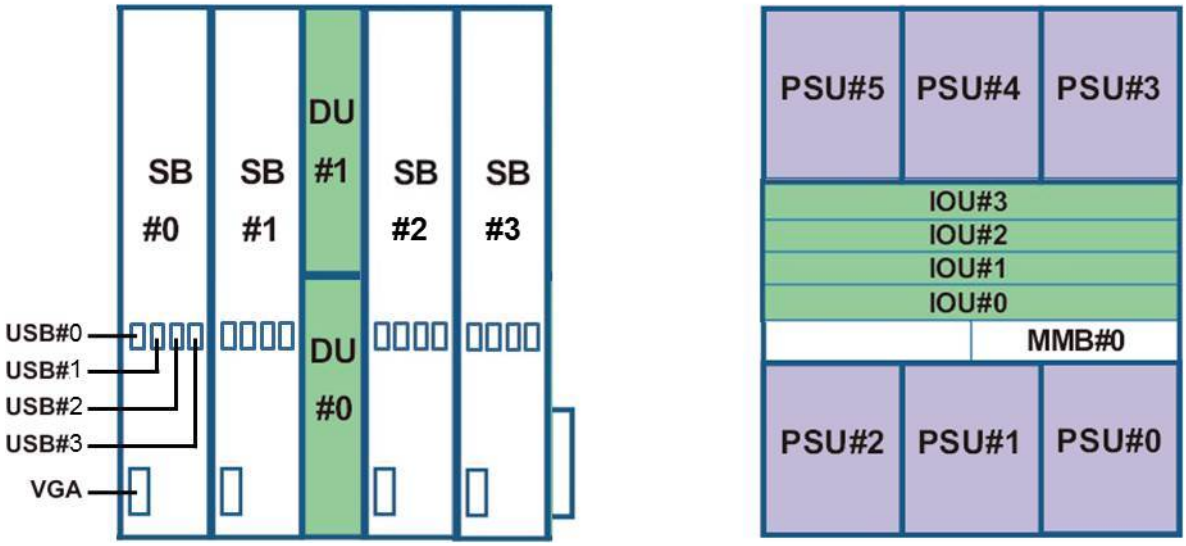
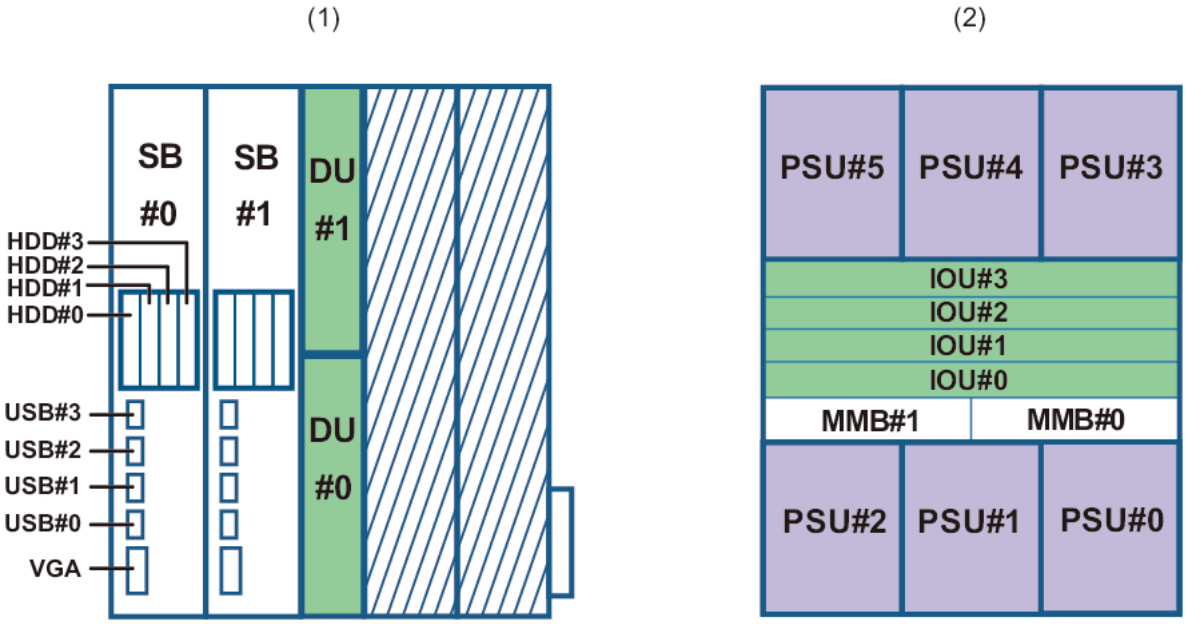
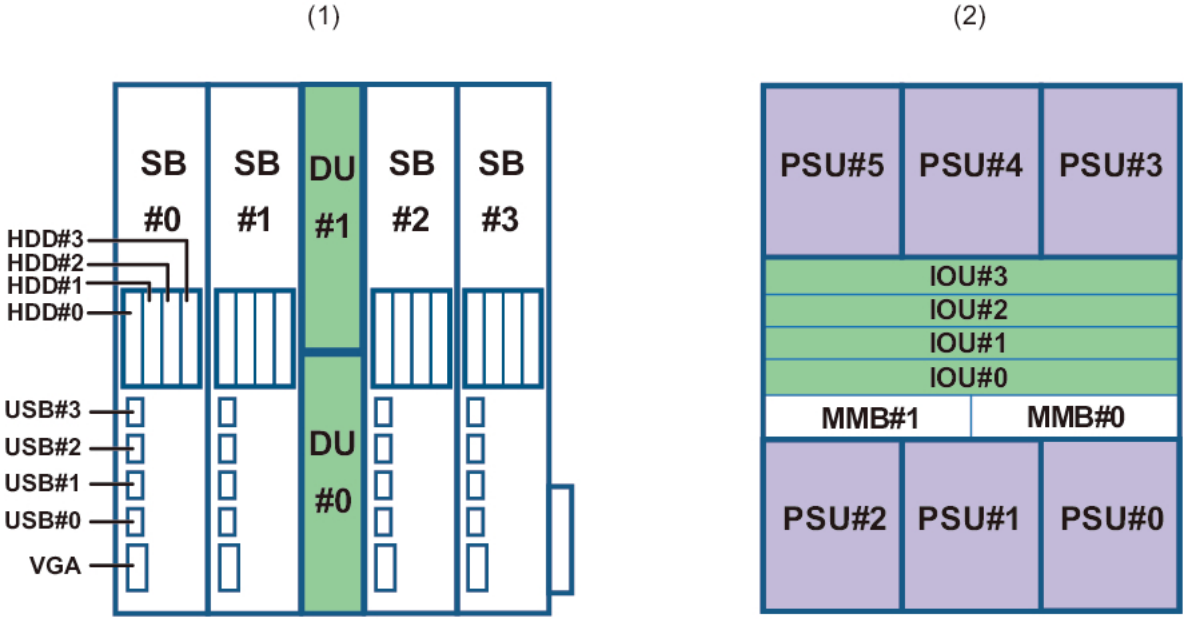


FIGURE B.4 Physical mounting locations in the PRIMEQUEST 2400E



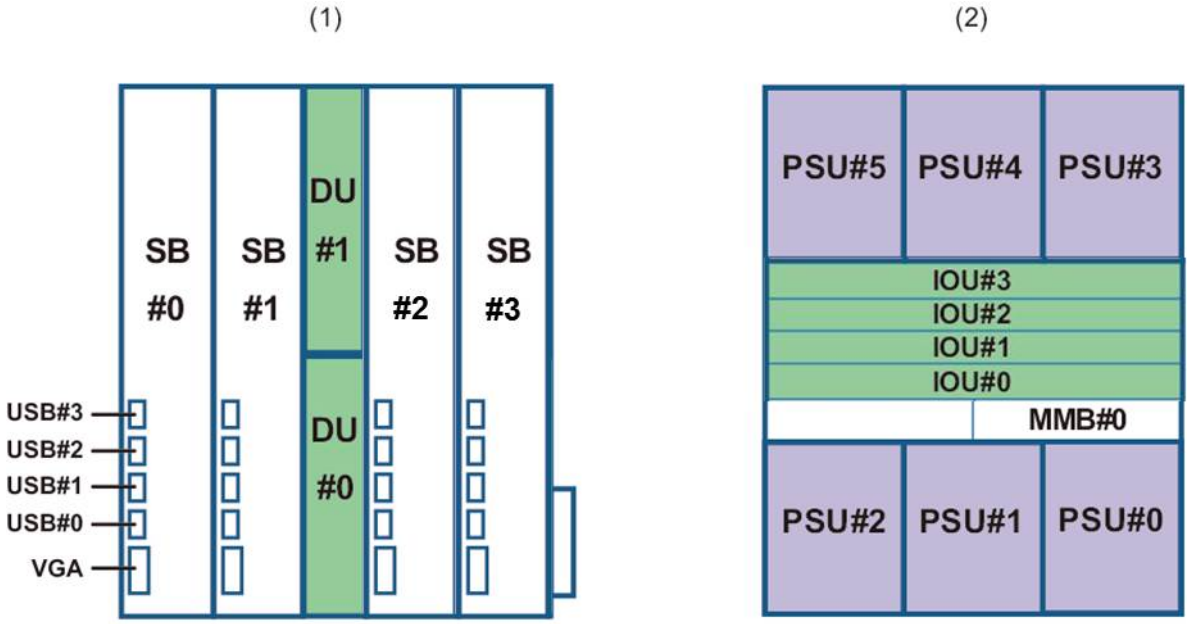
No.	Explanation
(1)	Front
(2)	Rear

FIGURE B.5 Physical mounting locations in the PRIMEQUEST 2800E



No.	Explanation
(1)	Front
(2)	Rear

FIGURE B.6 Physical mounting locations in the PRIMEQUEST 2800B



No.	Explanation
(1)	Front
(2)	Rear

FIGURE B.7 Physical mounting locations in the DU

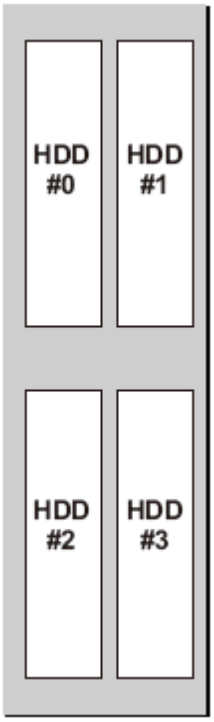
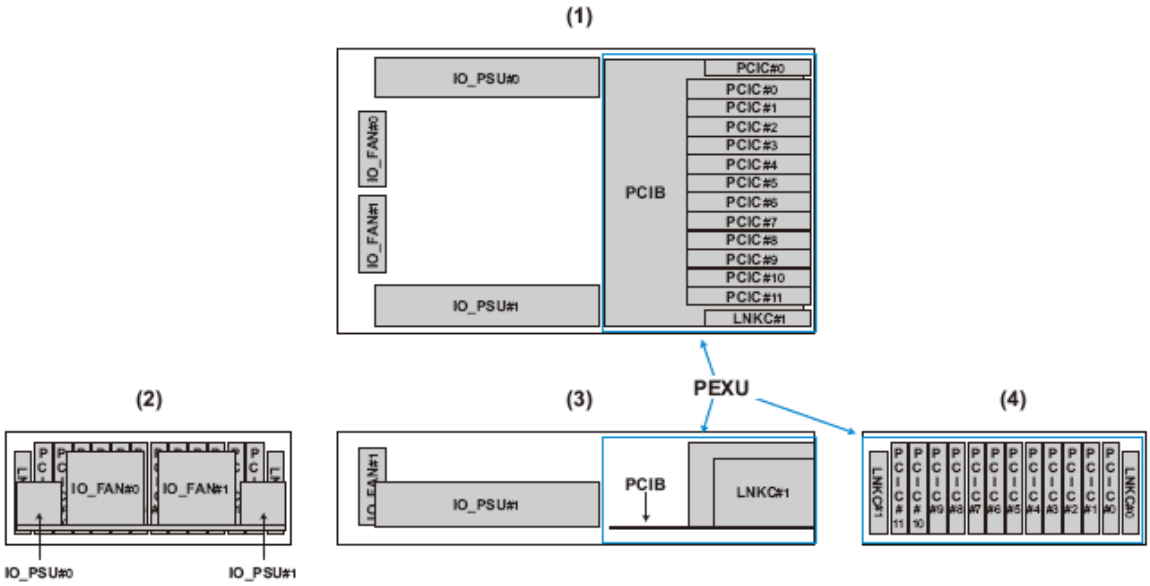


FIGURE B.8 Physical mounting locations in the PCI_Box



No.	Explanation
(1)	Upper side
(2)	Front
(3)	Right side
(4)	Rear

B.2 Port Numbers

This section shows the numbering policy of each MMB and IOU port.

Remarks

The character strings used in numbering are the port numbers as viewed from firmware. These port numbers differ from the character strings in the port identification printed, stamped, or otherwise marked on units. FIGURE B.9 MMB port numbers shows MMB port numbering. “FIGURE B.7 IOU_1GbE port numbers” and “FIGURE B.8 IOU_10GbE port numbers” shows MMB port numbering.

FIGURE B.9 MMB port numbers

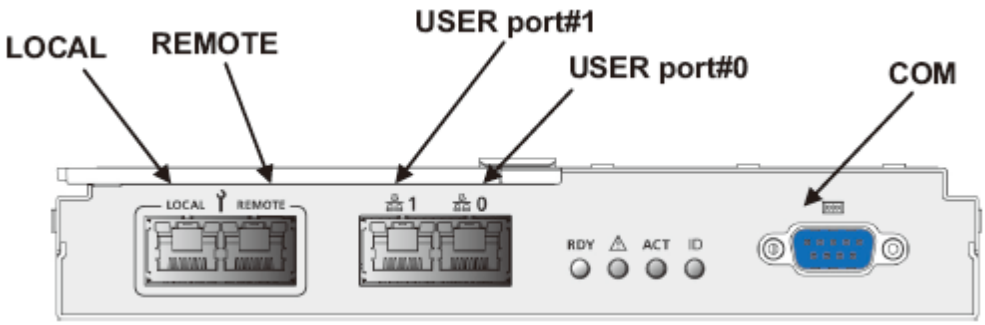


FIGURE B.10 IOU_1GbE port numbers

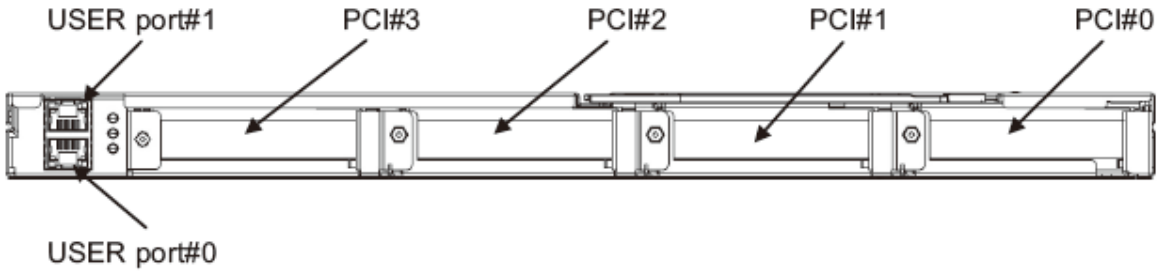
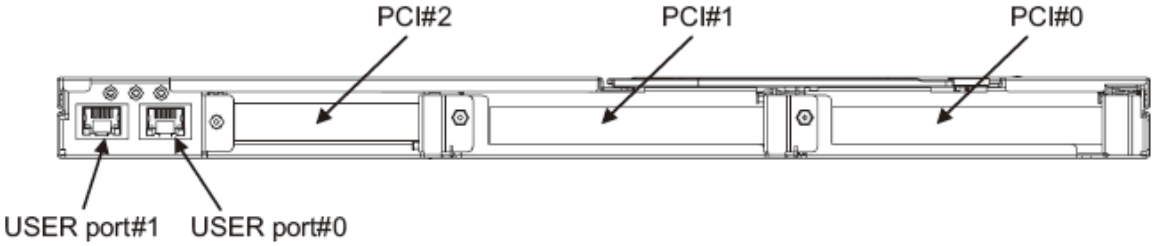


FIGURE B.11 IOU_10GbE port numbers



Appendix C Lists of External Interfaces Physical

This appendix describes the external interfaces of the PRIMEQUEST2000 series.

C.1 List of External System Interfaces

The following lists the external system interfaces.

TABLE C.1 External system interfaces

IO interface	Mounting component	Number of ports	Location	Remarks
USB	SB	4	Front	USB 2.0
VGA	SB	1	Front	Max.1600 x 1200 dots, 65536 colors
PCI Express Slot (SB)	SB	1	(*1)	RAID card
HDD/SSD (*3)	SB	4	Front	2.5inch HDD/SSD
LAN (IOU)	IOU_1GbE	2	Rear	GbE
	IOU_10GbE	2	Rear	10GbE
HDD/SSD	DU	4	Front	2.5inch HDD/SSD
PCI_Box (*3) interface (PCNC mounting IOU)	IOU_1GbE	2(*2)	Rear	PCI Express Gen3 8Lane
	IOU_10GbE	1(*2)	Rear	PCI Express Gen3 8Lane
PCI Box (*3) Interface (PCI_Box)	PCI Box	2	Rear	PCI Express Gen3 8Lane
PCI Express Slot (IOU)	IOU_1GbE	4	Rear	
	IOU_10GbE	3	Rear	
PCI Express Slot (PCI_Box) (*3)	PCI Box	12	Rear	

*1: It has the PCI Express slot in SB. A physical interface does not go out outside of the case.
*2: It provides with the interface to the PCI box by installing PCNC in the PCI Express slot.
*3: Available for only PRIMEQUEST 2400E3/2800E3/2400E2/2800E2/2400E/2800E.

C.2 List of External MMB Interfaces

The following lists the external MMB interfaces.

TABLE C.2 External MMB interfaces

External interface		Number of ports	Location	Remarks
LAN (MMB)	1000Base-T	2	Rear	User Port(Management LAN)
	100Base-TX	1	Rear	Maintenance LAN Port
	100Base-TX	1	Rear	REMCS Port
COM		1	Rear	Connector Type: Dsub 9pin

Appendix D Physical Locations and BUS Numbers of Built-in I/O, and PCI Slot Mounting Locations and Slot Numbers

This appendix shows the correspondence between the physical locations and BUS numbers of built-in I/O in the PRIMEQUEST 2000 series server. It also shows the correspondence between PCI slot mounting locations and slot numbers.

D.1 Physical Locations and BUS Numbers of Internal I/O Controllers of the PRIMEQUEST 2000 Series

The following table shows physical location and BUS numbers of SB internal I/O controllers.
.

TABLE D.1 physical locations of SB internal I/O controllers and BUS numbers

Internal I/O	BUS:DEV:FUNC	Remarks
Home SB-USB EHCI controller	00:1A:0	USB Port #0
		USB Port #1
	00:1D:0	USB Port #2
		USB Port #3
		Video redirection
		Virtual media

D.2 Correspondence between PCI Slot Mounting Locations and Slot Numbers

The following table shows the correspondence between PCI slot mounting locations and slot numbers.

TABLE D.2 Correspondence between PCI Slot Mounting Locations and Slot Numbers

Mounting location		Slot number (decimal number)		
Board	Slot	PRIMEQUEST 2400E	PRIMEQUEST 2400E3/2400E2/ 2800E3/2800E2/2800E	PRIMEQUEST 2800B3/2800B2/2800B
SB#0	Port to IOU#0 (*1)	4097	4097	4097
	Port to IOU#1 (*1)	4098	4098	4098
	Port to IOU#2 (*1)	4099	4099	4099
	Port to IOU#3 (*1)	4100	4100	4100
SB#1	Port to IOU#0 (*1)	4113	4113	4113
	Port to IOU#1 (*1)	4114	4114	4114
	Port to IOU#2 (*1)	4115	4115	4115
	Port to IOU#3 (*1)	4116	4116	4116
SB#2	Port to IOU#0 (*1)	-	4129	4129
	Port to IOU#1 (*1)	-	4130	4130
	Port to	-	4131	4131

Mounting location		Slot number (decimal number)		
Board	Slot	PRIMEQUEST 2400E	PRIMEQUEST 2400E3/2400E2/ 2800E3/2800E2/2800E	PRIMEQUEST 2800B3/2800B2/2800B
	IOU#2 (*1)			
	Port to IOU#3 (*1)	-	4132	4132
SB#3	Port to IOU#0 (*1)	-	4145	4145
	Port to IOU#1 (*1)	-	4146	4146
	Port to IOU#2 (*1)	-	4147	4147
	Port to IOU#3 (*1)	-	4148	4148
IOU#0	PCIC#0	2	2	2
	PCIC#1	3	3	3
	PCIC#2	4	4	4
	PCIC#3 (*2)	5	5	5
IOU#1	PCIC#0	18	18	18
	PCIC#1	19	19	19
	PCIC#2	20	20	20
	PCIC#3 (*2)	21	21	21
IOU#2	PCIC#0	34	34	34
	PCIC#1	35	35	35
	PCIC#2	36	36	36
	PCIC#3 (*2)	37	37	37
IOU#3	PCIC#0	50	50	50
	PCIC#1	51	51	51
	PCIC#2	52	52	52
	PCIC#3 (*2)	53	53	53
DU#0	PCIC#0	1	1	1
	PCIC#1	17	17	17
DU#1	PCIC#0	33	33	33
	PCIC#1	49	49	49
PCI_BOX#0 (*3)	PCIC#0	65	65	N/A
	PCIC#1	66	66	N/A
	PCIC#2	67	67	N/A
	PCIC#3	68	68	N/A
	PCIC#4	69	69	N/A
	PCIC#5	70	70	N/A
	PCIC#6	71	71	N/A
	PCIC#7	72	72	N/A
	PCIC#8	73	73	N/A
	PCIC#9	74	74	N/A
	PCIC#10	75	75	N/A
	PCIC#11	76	76	N/A
PCI_Box#1 (*3)	PCIC#0	81	81	N/A
	PCIC#1	82	82	N/A
	PCIC#2	83	83	N/A
	PCIC#3	84	84	N/A
	PCIC#4	85	85	N/A
	PCIC#5	86	86	N/A
	PCIC#6	87	87	N/A
	PCIC#7	88	88	N/A
	PCIC#8	89	89	N/A
	PCIC#9	90	90	N/A
	PCIC#10	91	91	N/A
	PCIC#11	92	92	N/A
PCI_BOX#2 (*3)	PCIC#0	97	97	N/A
	PCIC#1	98	98	N/A
	PCIC#2	99	99	N/A

Mounting location		Slot number (decimal number)		
Board	Slot	PRIMEQUEST 2400E	PRIMEQUEST 2400E3/2400E2/ 2800E3/2800E2/2800E	PRIMEQUEST 2800B3/2800B2/2800B
	PCIC#3	100	100	N/A
	PCIC#4	101	101	N/A
	PCIC#5	102	102	N/A
	PCIC#6	103	103	N/A
	PCIC#7	104	104	N/A
	PCIC#8	105	105	N/A
	PCIC#9	106	106	N/A
	PCIC#10	107	107	N/A
	PCIC#11	108	108	N/A
PCI_Box#3 (*3)	PCIC#0	113	113	N/A
	PCIC#1	114	114	N/A
	PCIC#2	115	115	N/A
	PCIC#3	116	116	N/A
	PCIC#4	117	117	N/A
	PCIC#5	118	118	N/A
	PCIC#6	119	119	N/A
	PCIC#7	120	120	N/A
	PCIC#8	121	121	N/A
	PCIC#9	122	122	N/A
	PCIC#10	123	123	N/A
	PCIC#11	124	124	N/A

N/A: Not applicable
*1: If DR is ‘Disabled’, the slot number is not allocated.
*2: IOU_10GbE does not have PCI Slot #3.
*3: PCI_Box can be available for only PRIMEQUES 2400E2/2800E/2400/2800E.

Appendix E PRIMEQUEST 2000 Series Cabinets

For details on PRIMEQUEST 2000 series cabinets and components and PCI_Box cabinets and components, see Chapter 1 Installation Information in the PRIMEQUEST 2000 Series Hardware Installation Manual (CA92344-0535).

Appendix F Status Checks with LEDs

This appendix describes the types of mounted LEDs for the PRIMEQUEST 2000 series. It also describes how to check the status with LEDs.

F.1. LED Type

The PRIMEQUEST 2000 series has
Customer Self Service (CSS) LED, System Alarm LED, and Location LED on front side of the cabinet. CSS LED and System Alarm LED indicate faulty status of entire system. Location LED indicates physical location of the system.
The PRIMEQUEST 2000 series also has Power LED, Alarm LED, and Location LED in components. Power LED indicates power status in the component. Alarm LED indicates whether there is an error in the component. Location LED indicates the mounting location of the component. Location LED can be set to on and off. When you replace the component by using Maintenance Wizard, Location LED helps your work.

F1.1 Power LED, Alarm LED, and Location LED

In principle, each component for the PRIMEQUEST 2000 series comes equipped with the following LEDs.

TABLE F.1 Power LED, Alarm LED, and Location LED

LED type	Color	Function
Power	Green	Indicates the power status of the component.
Alarm	Orange	Indicates whether there is an error in the component.
Location	Blue	- Identifies the component (location). - Can be arbitrarily set to blink or turned off by the user. - Indicates the component undergoing maintenance when Maintenance Wizard is running.

F.1.2 PSU

The PSU comes equipped with the following LED.

TABLE F.2 PSU LED

LED type	Color	Function
FANM#0 Alarm	Orange	Indicates state of FANM#0.
Power/Alarm	Yellow/Green	Indicates whether there is AC input to each PSU, whether there is an error in the PSU, and the PSU on/off status.
FANM#1 Alarm	Orange	Indicates state of FANM#1

TABLE F.3 Power status and PSU LED display

Status	FANM#0 Alarm	Power/Alarm	FANM#1 Alarm	OPL CSS (*2)
PSU AC input is off.	Off	Off	Off	Off
AC input is on, and the PSU is off.	Off	Blinking in green	Off	Off
AC input is on, and the PSU is on.	Off	On (green)	Off	Off
PSU temperature error is predicted.	Off	On (green)	Off	On (yellow)
PSU temperature error is detected or the power system error in a PSU is predicted.	Off	Blinking in green	Off	On (yellow)
The power system of a PSU failed.	Off	On (yellow)	Off	On (yellow)
FANM#0 error occurs	Off or On (Orange) (*1)	Off	Off	On (yellow)
FANM#1 error occurs	Off	Off	Off or On (Orange) (*1)	On (yellow)

(*1) If Alarm LED is turning on orange, the FANM with the particular LED fails. Even though Alarm LED remains off, SEL may be displayed which indicates the FANM error due to detecting not enough fan rotation by preventive fan monitoring function.

(*2) There is a CSS LED on an OPL, not a PSU.

F.1.3 FANU

The FANU comes equipped with the following LED.

TABLE F.4 FAN LED

LED type	Color	Function
FANM#0 Alarm	Orange	Indicates state of FANM#0.
Power/Alarm	Green	Indicates power state of PSU supplying power to FANU.
FANM#1 Alarm	Orange	Indicates state of FANM#1

TABLE F.5 Power status and FANU LED display

Status	FANM#0 Alarm	Power/Alarm	FANM#1 Alarm	OPL CSS (*2)
PSU AC input is off.	Off	Off	Off	Off
AC input is on, and the PSU is off.	Off	Blinking in green	Off	Off
AC input is on, and the PSU is on.	Off	On (green)	Off	Off
FANU temperature error is predicted.	Off	On (green)	Off	On (yellow)
FANU temperature error is detected or the power system error in a PSU is predicted.	Off	Blinking in green	Off	On (yellow)
The power system of a FANU failed.	Off	On (yellow)	Off	On (yellow)
FANM#0 error occurs	Off or On (Orange) (*1)	Off	Off	On (yellow)
FANM#1 error occurs	Off	Off	Off or On (Orange) (*1)	On (yellow)

(*1) If Alarm LED is turning on orange, the FANM with the particular LED fails. Even though Alarm LED remains off, SEL may be displayed which indicates the FANM error due to detecting not enough fan rotation by preventive fan monitoring function.

(*2) There is a CSS LED on an OPL, not a PSU.

F.1.4 SB

SB comes equipped with the following LED.

TABLE F.6 SB LED

LED type	Color	Function
Power	Green	Indicates power state in an SB.
Alarm	Orange	Indicates whether there is error or not in an SB.
Location	Blue	Specifies an SB. - Can be arbitrarily set to blink or turned off by the user. - Indicates the component undergoing maintenance when Maintenance Wizard is running.

TABLE F.7 SB status and SB LED display

Status	Power	Alarm	Location
AC off and partition power Off	Off	Off	Off
Partition including SB Power On	On (green)		
Error of SB		On (orange)	
Identifying SB (Turn on by Maintenance Wizard)			On (blue)

F.1.5 Memory Scale-up Board

Memory Scale-up Board comes equipped with the following LED.

TABLE F.8 MEMORY SCALE-UP BOARD LED

LED type	Color	Function
Power	Green	Indicates power state in a Memory Scale-up Board.
Alarm	Orange	Indicates whether there is error or not in a Memory Scale-up Board.
Location	Blue	Specifies a Memory Scale-up Board. - Can be arbitrarily set to blink or turned off by the user. - Indicates the component undergoing maintenance when Maintenance Wizard is running.

TABLE F.9 Memory Scale-up Board status and Memory Scale-up Board LED display

Status	Power	Alarm	Location
AC off and partition power Off	Off	Off	Off
Partition including Memory Scale-up Board Power On	On (green)		
Error of Memory Scale-up Board		On (orange)	
Identifying Memory Scale-up Board (Turn on by Maintenance Wizard)			On (blue)

F.1.6 IOU

IOU which is IOU_1GbE or IOU_10GbE comes equipped with the following LED.

TABLE F.10 IOU LED

LED type	Color	Function
Power	Green	Indicates power state in an IOU.
Alarm	Orange	Indicates whether there is error or not in an IOU.
Location	Blue	Specifies an IOU. - Can be arbitrarily set to blink or turned off by the user. - Indicates the component undergoing maintenance when Maintenance Wizard is running.

TABLE F.11 IOU status and IOU LED display

Status	Power	Alarm	Location
AC off and partition power Off	Off	Off	Off
Partition including IOU Power On	On (green)		
Error of IOU		On (orange)	
Identifying IOU (Turn on by Maintenance Wizard)			On (blue)

F.1.7 PCI Express slot of IOU

There is no LED in PCI Express slots of IOU.
To mount and unmounts PCI Express card in an IOU physically, take off the IOU from a cabinet.

F.1.8 DU

DU comes equipped with the following LED. Only Power LED is used. Attention LED is not used.

TABLE F.12 IOU LED

LED type	Color	Function
Power Left	Green	Indicates power state in a DU.
Alarm Right	Green	Indicates power state in a DU.
Attention Left	Orange	Not used.
Attention Right	Orange	Not used.

TABLE F.13 IOU status and IOU LED display

Status	Power Left	Power Right	Attention Left	Attention Right
Partition including PCI Express slot #0 off	On (green)		Off	Off
Partition including PCI Express slot #1 off		On (green)	Off	Off

F.1.9 HDD/SSD

The HDD or SSD comes equipped with the following LEDs.
HDD or SSD in an SB and HDD or SSD in a DU have same LEDs.

TABLE F.14 HDD/SSD LED

LED type	Color	Function	Note
HDD/SSD Access	Green	Indicates the HDD or SSD access status.	Mounted in only HDD or SSD.
HDD/SSD Alarm	Orange	Indicates whether there is an error in the HDD or SSD and the hot operation status.	Mounted in only HDD or SSD.

TABLE F.15 HDD/SSD status and LED display

HDD/SSD status	HDD/SSD Access	HDD/SSD Alarm	Note
Accessing to HDD or SSD	Blinking	Off	
Error of HDD or SSD	Off	On	When RAID configuration breaks. When Agent is offline.
Indicating location of HDD or SSD	Off	Blinking periodically with 3 Hz	When using SAS RAID card.
Rebuilding array	Blinking	Blinking periodically with 1 Hz	When using SAS RAID card.

F.1.10 MMB

The MMB comes equipped with the Active LED, Ready LED and Location LED. The Active LED indicates the active MMB, and the Ready LED indicates the MMB firmware status. Location LED is used to specify the MMB.
After the MMB firmware starts, the active MMB turns on the Active LED. The Ready LED blinks while MMB firmware startup is in progress. The Ready LED stays on when the startup is completed.

TABLE F.16 MMB LED

LED type	Color	Function
Ready	Green	Indicates the MMB status.
Alarm	Orange	Indicates whether there is an error in the MMB.
Active	Green	Indicates whether the MMB is the active or standby MMB.
Location (ID)	Blue	Identifies the MMB.

TABLE F.17 MMB (device) status and LED display

MMB status/device status	Ready	Alarm	Active	Location
MMB startup is in progress.	Blinking			
The MMB has started normally (Ready status).	On			
An error occurred in the MMB.		On		
The MMB is the standby MMB.			Off	
The MMB is the active MMB.			On	
The MMB is being located.				On

F.1.11 LAN

The LAN port comes equipped with the following LEDs. LAN ports in an IOU and LAN ports in a MMB have same LEDs.

TABLE F.18 LAN LEDs

LED type	Color	Function	Note
100M LAN Link/Act	Green	Indicates the Link status and Activity status of a 100M LAN.	Mounted only on the MMB
100M LAN	Green	Indicates the communication speed of a 100M	Mounted only on the MMB

LED type	Color	Function	Note
Speed		LAN.	
GbE LAN Link/Act (*1)	Green	Indicates the Link status and Activity status of a GbE LAN.	Mounted only on the IOU_1GbE
GbE LAN Speed (*1)	Green/Orange	Indicates the communication speed of a GbE LAN.	Mounted only on the IOU_1GbE
10GbE LAN Link/Act (*1)	Green	Indicates the Link status and Activity status of a 10GbE LAN.	Mounted only on the IOU_10GbE
10GbE LAN Speed (*1)	Green/Orange	Indicates the communication speed of a 10GbE LAN.	Mounted only on the IOU_10GbE

(*1) It is not enough to confirm the 'Link' state by only checking that Link LED is turning on. You can confirm that the LAN port is Link 'state' by not only checking that Link LED is turning on but also checking that the particular LAN port is 'Enabled' by MMB Web-UI.

TABLE F.19 LAN LED and Linkup Speed

NIC	Speed			
	10M	100M	1G	10G
GbE	Off	Green	Yellow	-
10GbE	-	Off	Yellow	Green

F.1.12 OPL

The OPL comes equipped with an LED indicating the status of entire system, the MMB Ready LED, and the System Alarm LED. From the OPL LED display, you can check the power status of the entire device, check for any problem, and check the MMB firmware status.

TABLE F.20 OPL LED

LED type	Color	Function
System Power	Green	Indicates the power status of the system.
CSS	Yellow	Indicates whether there is a Warning or an Error in the component which user can maintain.
System Alarm	Orange	Indicates whether there is a Warning or an Error in the component which user cannot maintain.
System Location	Blue	Identifies the system. - Can be arbitrarily turned on, set to blink, or turned off by the user.

TABLE F.21 System status and LED display

System status	System Power	CSS	System Alarm	Location
The system power status is standby. Standby status means that MMB is running and all partitions are off.	On (orange)			
Any of partition is on.	On (green)			
Warning or Error of CSS components in the system.		On		
Warning or Error of components other than CSS components in the system.			On	
Identifying the system.				On

F.1.13 PCI_Box

PCI_Box comes equipped with following LEDs.

TABLE F.22 PCI_Box LED

LED type	Color	Function
Power	Green	Indicates power state in a PCI_Box.
Alarm	Orange	Indicates whether there is error or not in a PCI_Box.

LED type	Color	Function
Location	Blue	Identifies a PCI_Box. - Can be arbitrarily set to blink or turned off by the user. - Indicates the component undergoing maintenance when Maintenance Wizard is running.

TABLE F.23 PCI_Box status and PCI_Box LED display

Status	Power	Alarm	Location
AC off and partition power Off	Off	Off	Off
Partition including PCI_Box Power On	On (green)		
Error of PCI_Box		On (orange)	
Identifying PCI_Box (Turn on by Maintenance Wizard)			On (blue)

F.1.14 PCI Express slot in PCI_Box

For PCI Express slot in a PCI_Box, Alarm LED turns on per a slot. LED display of PCI Express slot conforms to the standard of PCI Express.

TABLE F.24 PCI Express card status and LED display

PCI Express card status	Power	Alarm
Normal state of PCI Express card	On	Off
Error of PCI Express card		On
Inserting PCI Express card	Blinking	

F.1.15 IO_PSU

The IO_PSU comes equipped with the following LEDs.

TABLE F.25 IO_PSU LED

LED type	Color	Function	Note
AC	Green	Indicates whether there is AC input to the individual PSU.	IO_PSU control
DC	Green	Indicates the on/off status of each IO_PSU.	IO_PSU control
CHECK	Orange	Indicates whether there is an error in the IO_PSU.	MMB-FW control

TABLE F.26 IO_PSU status and LED display

Status	AC	DC	CHECK
AC input to all IO_PSUs is off.	Off	Off	Off
AC input to the IO_PSU is off, and AC input to another IO_PSU is on.	Off	Off	Off
AC input is on, and the IO_PSU is off (+5 V standby being output).	On	Off	Off
AC input is on, and the IO_PSU is on (+5 V standby being output, +12 V being output).	On	On	Off
There is an IO_PSU output error (+5 V standby being output, +12 V output error).	On	Off	On
There is an IO_PSU output error (+5 V standby output error, +12 V being output).	Off	On	On
There is an IO_PSU output error (+5 V standby output error, +12V output error).	Off	Off	On

F.1.16 IO_FAN

The IO_FAN comes equipped with the following LEDs.

TABLE F.27 IO_FAN LED

LED type	Color	Function
Alarm	Orange	Indicates whether there is an error in the IO_FAN.

TABLE F.28 IO_FAN status and LED display

Status	Alarm
Error in IO_FAN	On

F.2 LED Mounting Locations

This section describes the physical LED mounting locations on each component.

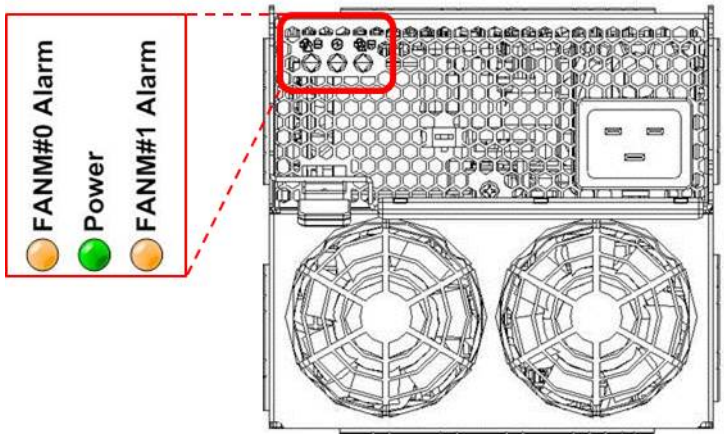
- Components equipped with Power, Alarm, and Location LEDs have the LEDs mounted as follows.
  - The order of mounted LEDs arranged from left to right is as follows: Power, Alarm, Location.
  - The order of mounted LEDs arranged from top to bottom is as follows: Power, Alarm, Location.
- From the standpoint of appearance, components equipped with LAN ports have the Speed LED on the left and the Link/Act LED on the right of each port.

FIGURE F.1 LED mounting locations on components equipped with LAN ports

LEDs

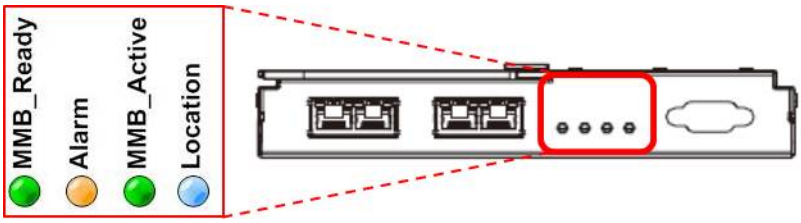
- The order of PSU and FANU LEDs arranged from the left or the top is as follows: FANM#0 Alarm, Power, and FANM#1 Alarm.

FIGURE F.2 Mounting locations of PSU and FANU



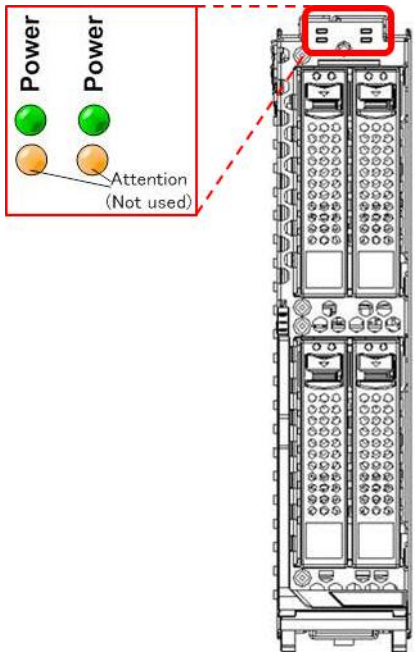
- The order of MMB LEDs arranged from the left or the top is as follows: Ready, Alarm, Active, and Location.

FIGURE F.3 MMB LED mounting locations



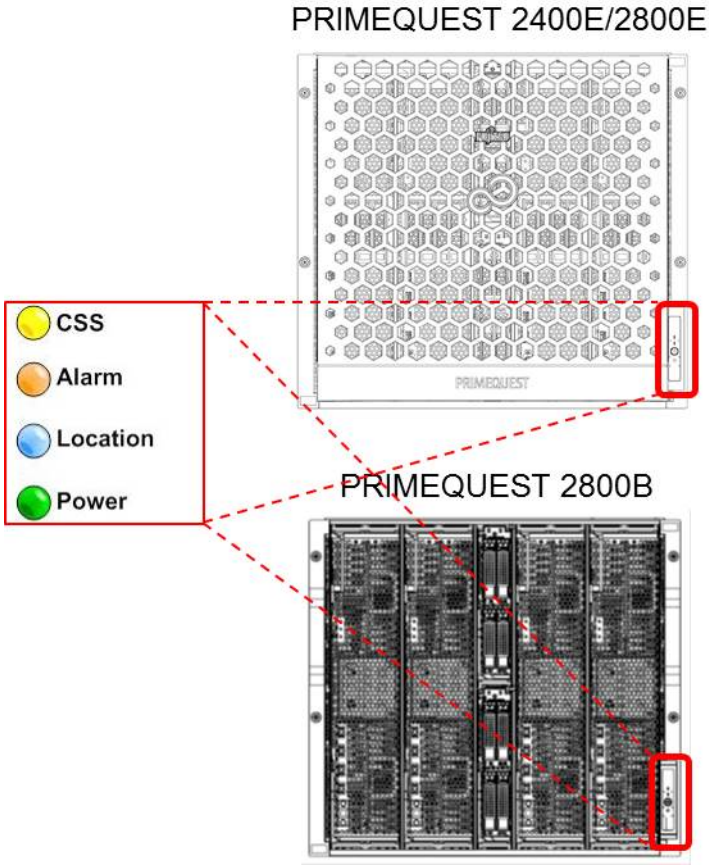
- The order of DU LEDs arranged as follows.

FIGURE F.4 DU LED mounting locations



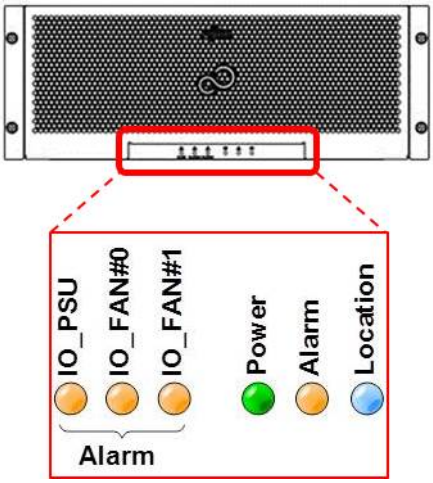
- The order of System LEDs arranged from the left or the top is as follows: Power, Alarm, CSS, Location, MMB_Ready.

FIGURE F.5 System LED mounting locations



- The order of PCI_Box LEDs arranged from the left is as follows: IO_PSU, IO_FAN#0, IO_FAN#1, Power, Alarm, Location.

FIGURE F.6 PCI_Box LED mounting locations



F.3 LED list

The following table lists the mounted LEDs for the PRIMEQUEST 2000 series.

TABLE F.29 LED list (1/3)

Component	LED type	Color	Quantity	Status	Description
PSU	Power/ Alarm	Green/ orange	1	Off	PSU AC input off
				Blinking in green	PSU AC input on and PSU off See also F.1.2 PSU.
				On (green)	PSU AC input on and PSU on See also F.1.2 PSU.
				On (yellow)	Error at PSU
	FANM#0 Alarm	Orange	1	Off	Normal status in FANM#0 See also F.1.2 PSU.
				On	Error at FANM#0
	FANM#1 Alarm	Orange	1	Off	Normal status in FANM#1
				On	Error at FANM#1 See also F.1.2 PSU.
FANU	Power/ Alarm	Green	1	Off	PSU AC input off or no DC output to FANM
				Blinking	PSU AC input on and PSU off See also F.1.3 FANU.
				On	PSU AC input on and any of PSU in system on See also F.1.3 FANU.
	FANM#0 Alarm	Orange	1	Off	Normal status in FANM#0 See also F.1.3 FANU.
				On	Error at FANM#0
	FANM#1 Alarm	Orange	1	Off	Normal status in FANM#1
				On	Error at FANM#1 See also F.1.3 FANU.
SB	Power	Green		Off	SB power off
				On	SB power on
	Alarm	Orange		Off	SB normal
				On	Error in SB
	Location	Blue		Off	
				On	Identify SB
HDD/SSD	Access	Green		Off	Non-active
				On	Active
	Alarm	Orange		Off	HDD/SSD normal
				On	Error in HDD/SSD
				Blinking (low speed (1Hz))	Rebuilding array in RAID
				Blinking (High speed (3Hz))	Indicate location
	Power	Green		Off	Memory Scale-up Board power off
				On	Memory Scale-up Board power on
	Alarm	Orange		Off	Memory Scale-up Board normal
				On	Error in Memory Scale-up Board
	Location	Blue		Off	

				On	Identify Memory Scale-up Board

TABLE F.30 LED list (2/3)

Component		LED type	Color	Quantity	Status		Description
IOU		Power	Green		Off		IOU power off
					On		IOU power on
		Alarm	Orange		Off		IOU normal
					On		Error in IOU
		Location	Blue		Off		
					On or Blinking		Component location
	LAN (IOU_1GbE)	Link/Act	Green		Off		Network not link
					Blinking in green		Network active
					On (green)		Network link
		Speed	Green/ Orange		Off		10Mbps
					On (green)		100Mbps
					On (orange)		1000Mbps
	LAN (IOU_10GbE)	Link/Act	Green		Off		Network not link
					Blinking in green		Network active
					On (green)		Network link
		Speed	Green/ Orange		Off		100Mbps
					On (green)		1000Mbps
					On (orange)		10Gbps
DU		Power	Green		Off		DU power off
					On		DU power on
		Attention	Orange		Off		
	HDD/SSD	Access	Green		Off		Non-active
					On		Active
		Alarm	Orange		Off		HDD/SSD normal
					On		Error in HDD/SSD
					Blinking	low speed (1Hz)	Rebuilding array in RAID
						High speed (3Hz)	Indicate location
MMB		Location	Blue		Off		
					On		Specify the MMB
		Ready	Green		Off		MMB not initialized
					Blinking		MMB initialization in progress
					On		MMB initialization complete (normal MMB operating status)
		Active	Green		Off		
					Blinking in green		Active MMB location
		Alarm	Orange		Off		
					On		Error in MMB
	LAN 100BASE-TX (MMB) (*1)	Link/Act	Green		Off		Network not link
					Blinking in green		Network active
					On (green)		Network link
		Speed	Green/ Orange		Off		10Mbps
					On		100Mbps

(*1) Since MMB does not close its LAN port explicitly, the state where LAN port is disabled is not displayed.

TABLE F.31 LED list (3/3)

Component		LED type	Color	Quantity	Status	Description
OPL		System Power	Green		Off	Power off in all partitions
					On	- Power on in all partitions - PSU on, 12V feed
		System Alarm	Orange		Off	
					On	Error occurrence in cabinet
		System Location (ID)	Blue		Off	
					On	Identify cabinet
		CSS	Yellow		Off	
					On	Error in CSS component
PCI_Box		Power	Green		Off	PCI_Box power off
					On	PCI_Box power on
		Alarm	Orange		Off	PCI_Box normal
					On	Error in PCI_Box
		Location	Blue		Off	
					On	Component location
		IO_PSU_ CHECK (*1)	Orange		Off	IO_PSU normal
					Blinking	Error in IO_PSU
	PCI Express slot	Power	Green		Off	PCI Express slot power off
					Blinking	PCI Express hot replacement in progress
					On	PCI Express slot power on
		Alarm	Orange		Off	PCI Express slot normal
					Blinking	PCI Express slot location
					On	Error at PCI Express slot
	IO_PSU	AC	Green		Off	AC off or 5V SB output stopped
					On	AC on or 5V SB being output
		DC	Green		Off	12V output stopped
					On	12V being output
		CHECK	Orange		Off	IO_PSU normal
					On	Error at IO_PSU
	IO_FAN	Alarm	Orange		Off	IO_FAN normal
					On	Error in IO_ FAN

(*1) OR output of two IO_PSU CHECK LEDs.
If the CHECK LED of even one IO_PSU goes on, the IO_PSU_CHECK LED goes on.

F.4 Button and switch

PRIMEQUEST 2000 series comes equipped with below buttons and switches.

- OPL Location button
  When you push the Location button of OPL, Location LED turns on. Pushing this button again, Location LED turns off.
- DU Attention Button
  Although there is the Attention button in DU, it is not used. Nothing happens if you push this button.
- PCI_Box switch
  You can set 0 to 3 to PCI_Box as PCI_Box number by switch of PCI_Box. If multiple PCI_Boxes are connected in a partition, be sure to set different number to each PCI_Box so that the number of a PCI_Box is not same as other PCI_Boxes.
  Below PCI_Box numbers can be used in each model.

TABLE F.32 Usable PCI_Box number and models

PCI_Box number	Model		
	2400E3/2400E2/2400E	2800E3/2800E2/2800E	2800B3/2800B2/2800B (*1)
0	Usable	Usable	Not usable
1	Usable	Usable	Not usable
2	Usable	Usable	Not usable
3	Usable	Usable	Not usable

(*1) PCI_Box cannot be used in PRIMEQUEST 2800B3/2800B2/2800B.

Appendix G Component Mounting Conditions

This appendix describes the mounting conditions of components for the PRIMEQUEST 2000 series.

G.1 CPU

This section describes the number of CPUs that can be mounted and the criteria for mixing different types of CPU.

CPU mounting criteria

- SB with one CPU is allowed in single SB partition. (*1)
- In PRIMEQUEST 2800E3/2800E2/2800E, only SB with two CPUs is allowed in multiple SB partition.
- CPUs must be mounted starting from CPU#0 on the SB.
- If Memory Scale-up Board is included in a partition, two CPUs are mounted in the SB.
- If CPU mounting order is wrong, SB becomes to be error.
- An SB with no CPU mounted on it will cause an error.

(*1) For PRIMEQUEST 2800B3/2800B2/2800B, only SB with two CPUs is allowed in single SB partition.

The following lists the number of SBs and CPUs per partition for each model.

TABLE G.1 Numbers of SBs and CPUs per partition

Partition configuration	PRIMEQUEST 2400E3/2400E2	PRIMEQUEST 2400E	PRIMEQUEST 2800E3/2800E2/ 2800E	PRIMEQUEST 2800B3/2800B2/ 2800B
1 SB	1 or 2	1 or 2	1 or 2	2
2 SB	2 or 4	2 or 4	4	4
3 SB	Not supported	Not supported	6	6
4 SB	Not supported	Not supported	8	8
1 SB + 1 Memory Scale-up Board	2	Not supported	Not supported	Not supported
1 SB + 2 Memory Scale-up Board	2	Not supported	Not supported	Not supported
1 SB + 3 Memory Scale-up Board	2	Not supported	Not supported	Not supported
2 SB + 1 Memory Scale-up Board	4	Not supported	Not supported	Not supported
2 SB + 2 Memory Scale-up Board	4	Not supported	Not supported	Not supported

CPU mixing condition

- In a partition, all CPUs must have the same frequency, cache size, core number, power, QPI rate, and scale.
- In a system, CPUs which have different frequency, cache size and core number can be mounted.

G.2 DIMM

This section describes the number of DIMMs that can be mounted and the criteria for mixing different types of DIMM.

DIMM mounting conditions and DIMM mixing criteria of SB and Memory Scale-up Board are the same.

DIMM mounting conditions

- At least two DIMMs are required per CPU.
- Up to 24 DIMMs can be mounted per CPU.
- DIMMs must be mounted in the following units:
  two DIMMs when normal mode, four DIMMs when full mirror mode or partial mirror mode, and six DIMMs when spare mode.
  However, if either of below condition is satisfied, unit is eight DIMMs when normal mode, 16 DIMMs when full mirror mode or partial mirror mode, and 24 DIMMs when spare mode:
  - The partition includes total four boards SBs and Memory Scale-up Board.
  - Dynamic Reconfiguration is enabled.
  - Address Range Mirror is enabled.

DIMM mixing criteria

DIMM criteria for PRIMEQUEST 2400E3/2800E3/2800B3.

- 8 GB and 16 GB RDIMMs can be mounted in a single SB or partition.
- 32 GB RDIMMs cannot be mixed with DIMMs of other type and other sizes in an SB or partition.
- 64 GB LRDIMMs cannot be mixed with DIMMs of other type and other sizes in an SB or partition.
- 128 GB LRDIMMs cannot be mixed with DIMMs of other type and other sizes in an SB or partition.

TABLE G.2 Relationship between DIMM size, type and mutual operability (within an SB)

DIMM	8 GB RDIMM	16 GB RDIMM	32 GB RDIMM	64 GB LRDIMM	128 GB LRDIMM
8 GB RDIMM	Supported	Supported	Not supported	Not supported	Not supported
16 GB RDIMM	Supported	Supported	Not supported	Not supported	Not supported
32 GB RDIMM	Not supported	Not supported	Supported	Not supported	Not supported
64 GB LRDIMM	Not supported	Not supported	Not supported	Supported	Not supported
128 GB LRDIMM	Not supported	Not supported	Not supported	Not supported	Supported

TABLE G.3 Relationship between DIMM size, type and mutual operability (within a partition)

DIMM	8 GB RDIMM	16 GB RDIMM	32 GB RDIMM	64 GB LRDIMM	128 GB LRDIMM
8 GB RDIMM	Supported	Supported	Not supported	Not supported	Not supported
16 GB RDIMM	Supported	Supported	Not supported	Not supported	Not supported
32 GB RDIMM	Not supported	Not supported	Supported	Not supported	Not supported
64 GB LRDIMM	Not supported	Not supported	Not supported	Supported	Not supported
128 GB LRDIMM	Not supported	Not supported	Not supported	Not supported	Supported

TABLE G.4 Relationship between DIMM size, type and mutual operability (within a cabinet)

DIMM	8 GB RDIMM	16 GB RDIMM	32 GB RDIMM	64 GB LRDIMM	128 GB LRDIMM
8 GB RDIMM	Supported	Supported	Supported	Supported	Supported
16 GB RDIMM	Supported	Supported	Supported	Supported	Supported
32 GB RDIMM	Supported	Supported	Supported	Supported	Supported
64 GB LRDIMM	Supported	Supported	Supported	Supported	Supported
128 GB LRDIMM	Supported	Supported	Supported	Supported	Supported

DIMM criteria for PRIMEQUEST 2400E2/2800E2/2800B2.

- 8 GB and 16 GB RDIMMs can be mounted in a single SB or partition.
- 32 GB RDIMMs cannot be mixed with DIMMs of other type and other sizes in an SB or partition.
- 32 GB and 64 GB LRDIMMs cannot be mixed with DIMMs of other type and other sizes in an SB or partition.

TABLE G.5 Relationship between DIMM size, type and mutual operability (within an SB)

DIMM	8 GB RDIMM	16 GB RDIMM	32 GB RDIMM	32 GB LRDIMM	64 GB LRDIMM
8 GB RDIMM	Supported	Supported	Not supported	Not supported	Not supported
16 GB RDIMM	Supported	Supported	Not supported	Not supported	Not supported
32 GB RDIMM	Not supported	Not supported	Supported	Not supported	Not supported
32 GB LRDIMM	Not supported	Not supported	Not supported	Supported	Not supported
64 GB LRDIMM	Not supported	Not supported	Not supported	Not supported	Supported

TABLE G.6 Relationship between DIMM size, type and mutual operability (within a partition)

DIMM	8 GB RDIMM	16 GB RDIMM	32 GB RDIMM	32 GB LRDIMM	64 GB LRDIMM
8 GB RDIMM	Supported	Supported	Not supported	Not supported	Not supported
16 GB RDIMM	Supported	Supported	Not supported	Not supported	Not supported
32 GB RDIMM	Not supported	Not supported	Supported	Not supported	Not supported
32 GB LRDIMM	Not supported	Not supported	Not supported	Supported	Not supported
64 GB LRDIM	Not supported	Not supported	Not supported	Not supported	Supported

TABLE G.7 Relationship between DIMM size, type and mutual operability (within a cabinet)

DIMM	8 GB RDIMM	16 GB RDIMM	32 GB RDIMM	32 GB LRDIMM	64 GB LRDIMM
8 GB RDIMM	Supported	Supported	Supported	Supported	Supported
16 GB RDIMM	Supported	Supported	Supported	Supported	Supported
32 GB RDIMM	Supported	Supported	Supported	Supported	Supported
32 GB LRDIMM	Supported	Supported	Supported	Supported	Supported
64 GB LRDIMM	Supported	Supported	Supported	Supported	Supported

DIMM criteria for PRIMEQUEST 2400E/2800E/2800B.

- 8 GB and 16 GB RDIMMs can be mounted in a single SB or partition.
- 32 GB and 64 GB LRDIMMs cannot be mixed with DIMMs of other type and other sizes in an SB or partition.

TABLE G.8 Relationship between DIMM size and mutual operability (within an SB)

DIMM size	8 GB	16 GB	32 GB	64 GB
8 GB	Supported	Supported	Not supported	Not supported
16 GB	Supported	Supported	Not supported	Not supported
32 GB	Not supported	Not supported	Supported	Not supported
64 GB	Not supported	Not supported	Not supported	Supported

TABLE G.9 Relationship between DIMM size and mutual operability (within a partition)

DIMM size	8 GB	16 GB	32 GB	64 GB
8 GB	Supported	Supported	Not supported	Not supported
16 GB	Supported	Supported	Not supported	Not supported
32 GB	Not supported	Not supported	Supported	Not supported
64 GB	Not supported	Not supported	Not supported	Supported

TABLE G.10 Relationship between DIMM size and mutual operability (within a cabinet)

DIMM size	8 GB	16 GB	32 GB	64 GB
8 GB	Supported	Supported	Supported	Supported
16 GB	Supported	Supported	Supported	Supported
32 GB	Supported	Supported	Supported	Supported
64 GB	Supported	Supported	Supported	Supported

G.2.1 DIMM mounting order and DIMM mixed mounting condition

The order of DIMM installation and the condition of DIMM mixed installation are shown below.
However, if any of below condition is satisfied, see next page:

- The partition includes total four boards of SBs and Memory Scale-up Board.
- Dynamic Reconfiguration is enabled.
- Address Range Mirror is enabled.

In tables of DIMM mounting order, DIMMs are installed in order from one with small number.
In tables of DIMM mixed mounting condition, the same symbol indicates the same DIMM.

TABLE G.11 DIMM mounting order in SB

(1 CPU per SB)

	CPU#0							
DIMM Slot#	0A0	0A3	0B0	0B3	0C0	0C3	0D0	0D3
	0A1	0A4	0B1	0B4	0C1	0C4	0D1	0D4
	0A2	0A5	0B2	0B5	0C2	0C5	0D2	0D5
Normal	1	1	3	3	2	2	4	4
	5	5	7	7	6	6	8	8
	9	9	11	11	10	10	12	12
Full or Partial Mirror	1	1	1	1	2	2	2	2
	3	3	3	3	4	4	4	4
	5	5	5	5	6	6	6	6
Spare	1	1	3	3	2	2	4	4
	1	1	3	3	2	2	4	4
	1	1	3	3	2	2	4	4

(2 CPU per SB)

	CPU#0								CPU#1							
DIMM Slot#	0A0	0A3	0B0	0B3	0C0	0C3	0D0	0D3	1A0	1A3	1B0	1B3	1C0	1C3	1D0	0D3
	0A1	0A4	0B1	0B4	0C1	0C4	0D1	0D4	1A1	1A4	1B1	1B4	1C1	1C4	1D1	0D4
	0A2	0A5	0B2	0B5	0C2	0C5	0D2	0D5	1A2	1A5	1B2	1B5	1C2	1C5	1D2	0D5
Normal	1	1	4	4	2	2	6	6	1	1	5	5	3	3	7	7
	8	8	12	12	10	10	14	14	9	9	13	13	11	11	15	15
	16	16	20	20	18	18	22	22	17	17	21	21	19	19	23	23
Full or Partial Mirror	1	1	1	1	2	2	2	2	1	1	1	1	3	3	3	3
	4	4	4	4	6	6	6	6	5	5	5	5	7	7	7	7
	8	8	8	8	10	10	10	10	9	9	9	9	11	11	11	11
Spare	1	1	4	4	2	2	6	6	1	1	5	5	3	3	7	7
	1	1	4	4	2	2	6	6	1	1	5	5	3	3	7	7
	1	1	4	4	2	2	6	6	1	1	5	5	3	3	7	7

TABLE G.12 DIMM mixed mounting condition in SB

(1 CPU per SB)

	CPU#0							
DIMM Slot#	0A0	0A3	0B0	0B3	0C0	0C3	0D0	0D3
	0A1	0A4	0B1	0B4	0C1	0C4	0D1	0D4
	0A2	0A5	0B2	0B5	0C2	0C5	0D2	0D5
Normal	□	□	○	○	△	△	☆	☆
	□	□	○	○	△	△	☆	☆
	□	□	○	○	△	△	☆	☆
Full or Partial Mirror	□	□	□	□	△	△	△	△
	□	□	□	□	△	△	△	△
	□	□	□	□	△	△	△	△
Spare	□	□	○	○	△	△	☆	☆
	□	□	○	○	△	△	☆	☆
	□	□	○	○	△	△	☆	☆

(2 CPU per SB)

	CPU#0								CPU#1							
DIMM Slot#	0A0	0A3	0B0	0B3	0C0	0C3	0D0	0D3	1A0	1A3	1B0	1B3	1C0	1C3	1D0	0D3
	0A1	0A4	0B1	0B4	0C1	0C4	0D1	0D4	1A1	1A4	1B1	1B4	1C1	1C4	1D1	0D4
	0A2	0A5	0B2	0B5	0C2	0C5	0D2	0D5	1A2	1A5	1B2	1B5	1C2	1C5	1D2	0D5
Normal	□	□	○	○	△	△	☆	☆	■	■	●	●	▲	▲	★	★
	□	□	○	○	△	△	☆	☆	■	■	●	●	▲	▲	★	★
	□	□	○	○	△	△	☆	☆	■	■	●	●	▲	▲	★	★
Full or Partial Mirror	□	□	□	□	△	△	△	△	■	■	■	■	▲	▲	▲	▲
	□	□	□	□	△	△	△	△	■	■	■	■	▲	▲	▲	▲
	□	□	□	□	△	△	△	△	■	■	■	■	▲	▲	▲	▲
Spare	□	□	○	○	△	△	☆	☆	■	■	●	●	▲	▲	★	★
	□	□	○	○	△	△	☆	☆	■	■	●	●	▲	▲	★	★
	□	□	○	○	△	△	☆	☆	■	■	●	●	▲	▲	★	★

TABLE G.13 DIMM mounting order in Memory Scale-up Board

	Mounting order															
DIMM Slot#	0A0	0A3	0B0	0B3	0C0	0C3	0D0	0D3	1A0	1A3	1B0	1B3	1C0	1C3	1D0	0D3
	0A1	0A4	0B1	0B4	0C1	0C4	0D1	0D4	1A1	1A4	1B1	1B4	1C1	1C4	1D1	0D4
	0A2	0A5	0B2	0B5	0C2	0C5	0D2	0D5	1A2	1A5	1B2	1B5	1C2	1C5	1D2	0D5
Normal	1	1	4	4	2	2	6	6	1	1	5	5	3	3	7	7
	8	8	12	12	10	10	14	14	9	9	13	13	11	11	15	15
	16	16	20	20	18	18	22	22	17	17	21	21	19	19	23	23
Full or Partial Mirror	1	1	1	1	2	2	2	2	1	1	1	1	3	3	3	3
	4	4	4	4	6	6	6	6	5	5	5	5	7	7	7	7
	8	8	8	8	10	10	10	10	9	9	9	9	11	11	11	11
Spare	1	1	4	4	2	2	6	6	1	1	5	5	3	3	7	7
	1	1	4	4	2	2	6	6	1	1	5	5	3	3	7	7
	1	1	4	4	2	2	6	6	1	1	5	5	3	3	7	7

TABLE G.14 DIMM mixed mounting condition in Memory Scale-up Board

	Mounting pattern															
DIMM Slot#	0A0	0A3	0B0	0B3	0C0	0C3	0D0	0D3	1A0	1A3	1B0	1B3	1C0	1C3	1D0	0D3
	0A1	0A4	0B1	0B4	0C1	0C4	0D1	0D4	1A1	1A4	1B1	1B4	1C1	1C4	1D1	0D4
	0A2	0A5	0B2	0B5	0C2	0C5	0D2	0D5	1A2	1A5	1B2	1B5	1C2	1C5	1D2	0D5
Normal	□	□	○	○	△	△	☆	☆	■	■	●	●	▲	▲	★	★
	□	□	○	○	△	△	☆	☆	■	■	●	●	▲	▲	★	★
	□	□	○	○	△	△	☆	☆	■	■	●	●	▲	▲	★	★
Full or Partial Mirror	□	□	□	□	△	△	△	△	■	■	■	■	▲	▲	▲	▲
	□	□	□	□	△	△	△	△	■	■	■	■	▲	▲	▲	▲
	□	□	□	□	△	△	△	△	■	■	■	■	▲	▲	▲	▲
Spare	□	□	○	○	△	△	☆	☆	■	■	●	●	▲	▲	★	★
	□	□	○	○	△	△	☆	☆	■	■	●	●	▲	▲	★	★
	□	□	○	○	△	△	☆	☆	■	■	●	●	▲	▲	★	★

The order of DIMM installation and the condition of DIMM mixed installation where any of below condition is satisfied are shown below:

- The partition includes four total four boards of SBs and Memory Scale-up Board.
- Dynamic Reconfiguration is enabled.
- Address Range Mirror is enabled.

In tables of DIMM mounting order, DIMMs are installed in order from one with small number.
In tables of DIMM mixed mounting condition, the same symbol indicates the same DIMM.

TABLE G.15 DIMM mounting order in special case in SB

(1 CPU per SB)

	CPU#0							
DIMM Slot#	0A0	0A3	0B0	0B3	0C0	0C3	0D0	0D3
	0A1	0A4	0B1	0B4	0C1	0C4	0D1	0D4
	0A2	0A5	0B2	0B5	0C2	0C5	0D2	0D5
Normal	1	1	2	2	1	1	2	2
	3	3	4	4	3	3	4	4
	5	5	6	6	5	5	6	6
Full or Partial Mirror	1	1	1	1	1	1	1	1
	2	2	2	2	2	2	2	2
	3	3	3	3	3	3	3	3
Spare	1	1	2	2	1	1	2	2
	1	1	2	2	1	1	2	2
	1	1	2	2	1	1	2	2

(2 CPU per SB)

	CPU#0								CPU#1							
DIMM Slot#	0A0	0A3	0B0	0B3	0C0	0C3	0D0	0D3	1A0	1A3	1B0	1B3	1C0	1C3	1D0	0D3
	0A1	0A4	0B1	0B4	0C1	0C4	0D1	0D4	1A1	1A4	1B1	1B4	1C1	1C4	1D1	0D4
	0A2	0A5	0B2	0B5	0C2	0C5	0D2	0D5	1A2	1A5	1B2	1B5	1C2	1C5	1D2	0D5
Normal	1	1	2	2	1	1	2	2	1	1	2	2	1	1	2	2
	3	3	4	4	3	3	4	4	3	3	4	4	3	3	4	4
	5	5	6	6	5	5	6	6	5	5	6	6	5	5	6	6
Full or Partial Mirror	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Spare	1	1	2	2	1	1	2	2	1	1	2	2	1	1	2	2
	1	1	2	2	1	1	2	2	1	1	2	2	1	1	2	2
	1	1	2	2	1	1	2	2	1	1	2	2	1	1	2	2

TABLE G.16 DIMM mixed mounting condition in special case in SB

(1 CPU per SB)

	CPU#0							
DIMM Slot#	0A0	0A3	0B0	0B3	0C0	0C3	0D0	0D3
	0A1	0A4	0B1	0B4	0C1	0C4	0D1	0D4
	0A2	0A5	0B2	0B5	0C2	0C5	0D2	0D5
Normal	□	□	○	○	□	□	○	○
	□	□	○	○	□	□	○	○
	□	□	○	○	□	□	○	○
Full or Partial Mirror	□	□	□	□	□	□	□	□
	□	□	□	□	□	□	□	□
	□	□	□	□	□	□	□	□
Spare	□	□	○	○	□	□	○	○
	□	□	○	○	□	□	○	○
	□	□	○	○	□	□	○	○

(2 CPU per SB)

	CPU#0								CPU#1							
DIMM Slot#	0A0	0A3	0B0	0B3	0C0	0C3	0D0	0D3	1A0	1A3	1B0	1B3	1C0	1C3	1D0	0D3
	0A1	0A4	0B1	0B4	0C1	0C4	0D1	0D4	1A1	1A4	1B1	1B4	1C1	1C4	1D1	0D4
	0A2	0A5	0B2	0B5	0C2	0C5	0D2	0D5	1A2	1A5	1B2	1B5	1C2	1C5	1D2	0D5
Normal	□	□	○	○	□	□	○	○	□	□	○	○	□	□	○	○
	□	□	○	○	□	□	○	○	□	□	○	○	□	□	○	○
	□	□	○	○	□	□	○	○	□	□	○	○	□	□	○	○
Full or Partial Mirror	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□
	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□
	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□
Spare	□	□	○	○	□	□	○	○	□	□	○	○	□	□	○	○
	□	□	○	○	□	□	○	○	□	□	○	○	□	□	○	○
	□	□	○	○	□	□	○	○	□	□	○	○	□	□	○	○

TABLE G.17 DIMM mounting order in special case in Memory Scale-up Board

	Mounting order															
DIMM Slot#	0A0	0A3	0B0	0B3	0C0	0C3	0D0	0D3	1A0	1A3	1B0	1B3	1C0	1C3	1D0	0D3
	0A1	0A4	0B1	0B4	0C1	0C4	0D1	0D4	1A1	1A4	1B1	1B4	1C1	1C4	1D1	0D4
	0A2	0A5	0B2	0B5	0C2	0C5	0D2	0D5	1A2	1A5	1B2	1B5	1C2	1C5	1D2	0D5
Normal	1	1	2	2	1	1	2	2	1	1	2	2	1	1	2	2
	3	3	4	4	3	3	4	4	3	3	4	4	3	3	4	4
	5	5	6	6	5	5	6	6	5	5	6	6	5	5	6	6
Full Mirror, Partial Mirror or Address Range Mirror	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Spare	1	1	2	2	1	1	2	2	1	1	2	2	1	1	2	2
	1	1	2	2	1	1	2	2	1	1	2	2	1	1	2	2
	1	1	2	2	1	1	2	2	1	1	2	2	1	1	2	2

TABLE G.18 DIMM mixed mounting condition in special case in Memory Scale-up Board

	CPU#0								CPU#1							
DIMM Slot#	0A0	0A3	0B0	0B3	0C0	0C3	0D0	0D3	1A0	1A3	1B0	1B3	1C0	1C3	1D0	0D3
	0A1	0A4	0B1	0B4	0C1	0C4	0D1	0D4	1A1	1A4	1B1	1B4	1C1	1C4	1D1	0D4
	0A2	0A5	0B2	0B5	0C2	0C5	0D2	0D5	1A2	1A5	1B2	1B5	1C2	1C5	1D2	0D5
Normal	□	□	○	○	□	□	○	○	□	□	○	○	□	□	○	○
	□	□	○	○	□	□	○	○	□	□	○	○	□	□	○	○
	□	□	○	○	□	□	○	○	□	□	○	○	□	□	○	○
Full Mirror, Partial Mirror or Address Range Mirror	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□
	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□
	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□
Spare	□	□	○	○	□	□	○	○	□	□	○	○	□	□	○	○
	□	□	○	○	□	□	○	○	□	□	○	○	□	□	○	○
	□	□	○	○	□	□	○	○	□	□	○	○	□	□	○	○

G.3 Configuration when using 100 V PSU

PRIMEQUEST 2000 series supports 100 V power supply in case of only PSU_S. Since power efficiency decrease when using 100V PSU, maximum quantity of component may decrease in a system.

G.4 Available internal I/O ports

The following table lists the number of available internal I/O ports.

TABLE G.19 Available internal I/O ports and the quantities

Internal I/O		No.	Remarks
SB	USB	4	Only Home SB can be used.
	VGA	1	Only Home SB can be used.
	HDD/SSD	4	Only Home SB can be used if DR is enabled.
IOU_1GbE	GbE	2	
IOU_10GbE	10GbE	2	
DU	HDD/SSD	4	

G.5 Legacy BIOS Compatibility (CSM)

The PRIMEQUEST 2000 series uses the UEFI, which is firmware that provides the BIOS emulation function. Currently, the following legacy BIOS restrictions are known:

- Option ROM area restriction: The number of PXE-enabled cards that can operate as boot devices is restricted to four.
- I/O space restriction: In a legacy BIOS environment, I/O space is required on a boot device.

Note
In a CSM environment, I/O space must be allocated to a boot device.

G.6 Rack Mounting

For details on installation in a 19-inch rack, see the *PRIMEQUEST 2000 Series Hardware Installation Manual* (CA92344-0535).

G.7 Installation Environment

For details on the environmental conditions for PRIMEQUEST 2000 series installations, see the PRIMEQUEST 2000 Series Hardware Installation Manual (CA92344-0535).

G.8 NIC (Network Interface Card)

Note the following precautions on mounting of a NIC (network interface card).
Notes

- We recommend specifying the members of teaming between LANs of the same type. (We recommend teaming between cards of the same type in the onboard LAN.)
- If the teaming is specified with different types of LAN, the scaling function on the receive side may be off because of differences in the scaling function.
  Consequently, the balance of receive traffic may not be optimized, but this is not a problem for normal operation.
- Depending on the Intel PROSet version used at the time of teaming configuration, a warning may be output about scaling on the receive side being disabled for the above-described reasons. In this event, simply click the [OK] button.
  For details on the scaling function on the receive side or other precautions, see the help for Intel PROSet or check the information at [Device Manager] – [Properties *of the target LAN*] – [Details] – [Receive-Side Scaling].

- For the WOL (Wake on LAN) support conditions of operating systems, see the respective operating system manuals and restrictions. For remote power control in an operating system that does not support WOL, perform operations from the MMB Web-UI.

Appendix H Tree Structure of the MIB Provided with the PRIMEQUEST 2000 Series

This appendix describes the tree structure of the MIB provided with the PRIMEQUEST 2000 series.
If SVAgent options are installed, MIB information of Agent can be acquired by SNMP service on the partition.
For details on the MIB tree of SVS, see the MIB file of SVS.

Note

In PRIMEQUEST 2000 series, SVAgent notify Trap due to only some hardware erros such as monitoring CPU temperature and monitoring the driver of PCI card.

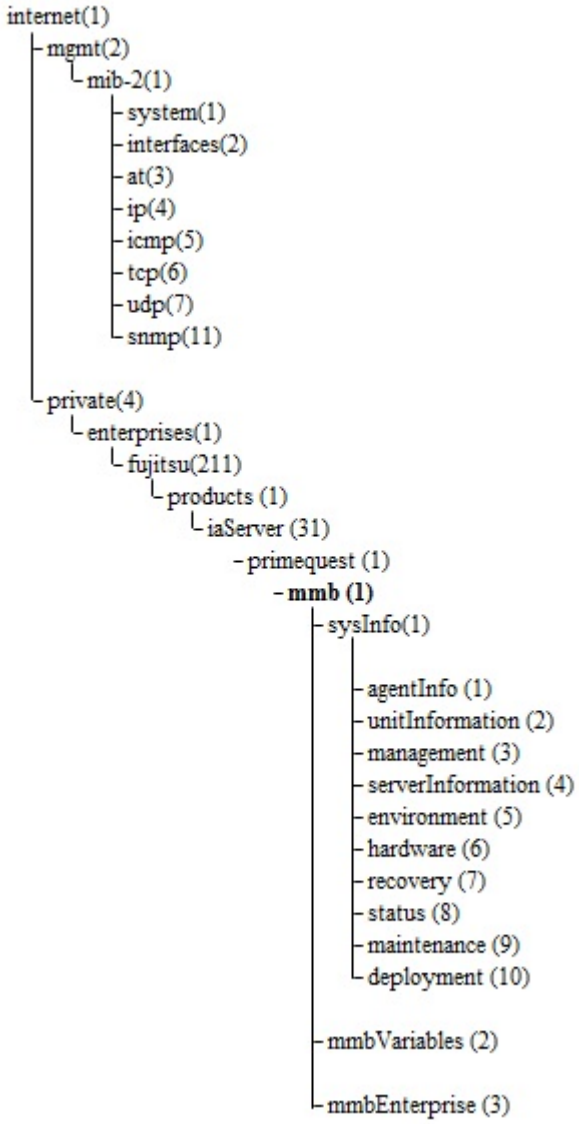
H.1 MIB Tree Structure

You can access to MMB by SNMP to acquire extended MIB information under “mmb(1)”. You can also acquire standard MIB information under “mib-2(1)”
MMB firmware returns MIB information according to definition of MIB file.

Note

The PRIMEQUEST 2000 series uses the SNMP function of the MMB to recognize changes in the partition state when each partition is started or stopped. For an MIB request received at this time from an external manager (e.g., Systemwalker Centric Manager), the MMB temporarily returns an error or time-out. In this case, information can be obtained by reissuing the MIB request.
The following shows the MIB tree structure.

FIGURE H.1 MIB tree structure



H.2 MIB File Contents

The following table lists the contents of MIB files. MIB files can be obtained by "/SVSLocalTools/Japanese/PSA/" in DVD-ROM disk supplied with the product.

TABLE H.1 MIB file contents

	MIB file	Purpose	Description
MMB-MIBs/	MMB-COM-MIB.txt	Reference	MIB information such as the hardware configuration of the entire cabinet
	MMB-ComTrap-MIB.txt	Monitoring	MIB information for hardware failure monitoring across the entire cabinet (MMB SEL event)

Appendix I Windows Shutdown Settings

This appendix describes how to set (arbitrarily) Windows to shut down.

I.1 Shutdown From MMB Web-UI

Windows shutdown from the MMB Web-UI requires ServerView Agent.
For details on how to set ServerView Agent, contact the distributor where you purchased your product or your sales representative.

Appendix J **Systemwalker Centric Manager Linkage**

This appendix describes linkage with Systemwalker Centric Manager.

J.1 Preparation for Systemwalker Centric Manager Linkage

Systemwalker Centric Manager is an application for intensive system and network management according to the life cycle of system deployment.
This section describes preparation for configuration of monitoring by the PRIMEQUEST 2000 series server in linkage with Systemwalker Centric Manager (referred to below as Systemwalker).
Prepare the following files and tools in advance.

TABLE J.1 Files and tools to prepare

Item to prepare	Source	Remarks
Extended MIB file (for traps)	DVD-ROM disk supplied with the product	/SVSLocalTools/Japanese/PQ-MMB-MIBs/ - MMB-ComTrap-MIB.txt
TrapMSG conversion definition file	DVD-ROM disk supplied with the product	/SVSLocalTools/Japanese/PQ-MMB-MIBs/ - mmbComTrap.cnf
SNMP trap conversion definition application command	Systemwalker installation directory	Execute the command on the Windows operations management server: (*1)
		Execute the command on the Linux/Solaris operations management server: (*2)
Menu registration command	Systemwalker installation directory	[install-dir]¥mpwalker.dm¥bin¥mpaplreg.exe (Execute the command on an operations management client (*3).)
Filtering definition template	Systemwalker technical information *4	

*1 Execute the command on the Windows operations management server:
[install-dir]¥MpWalker.dm¥MpCNappl¥MpCNmgr¥bin¥CNSetCnfMg.exe
*2 Execute the command on the Linux/Solaris operations management server:
/opt/FJSVfwntc/MpCNmgr/bin/CNSetCnfMg.exe
*3 Systemwalker Centric Manager implements hierarchical operations management to ensure efficient management. The operations management client is one application.
For details, contact your sales representative or a field engineer.
*4 For details on the Systemwalker technical information, see the manual of Systemwalker Centric Manager.

J.2 Configuring Systemwalker Centric Manager Linkage

This section describes how to configure Systemwalker linkage with various settings.

- MMB node registration
- SNMP trap linkage
- Event monitoring linkage
- GUI linkage
- PRIMEQUEST 2000 series rack grouping linkage
- Linkage with ServerView Suite

J.2.1 MMB node registration

The MMB monitors the hardware of the entire rack. The MMB can be duplicated (optional) so that monitoring can continue even if it fails.

For monitoring by duplicate MMBs in the PRIMEQUEST 2000 series server with Systemwalker, be sure to register two MMB nodes and monitor these two nodes.
See the manual of Systemwalker Centric Manager about how to register the MMB nodes for the PRIMEQUEST 2000 series.

J.2.2 SNMP trap linkage

This section provides an overview of SNMP trap linkage and describes the conversion definition procedure.

Process overview

Define conversion to convert SNMP traps from the PRIMEQUEST 2000 series server into messages that can be read and understood by the monitoring operator. Converted message text is displayed on the Systemwalker console.

Remarks

To ensure that converted text can be identified as a message from the PRIMEQUEST 2000 series server, the keyword
[PRIMEQUEST] is embedded in the text.
Example: A SNMP trap from the PRIMEQUEST 2000 series server is converted and displayed.

```
[PRIMEQUEST] FileServer E 14002 SB#0-DIMM#0A0 DIMM: Uncorrectable ¥
ECC Part-no=0x0101 Serial-no=5023
```

The ¥ at the end of a line indicates that there is no line feed.
Note that to receive SNMP traps, the operations management server must be registered as the SNMP trap destination in the PRIMEQUEST 2000 series server.
For details on how to set an SNMP trap destination, see the following manuals:

- 6.5.2 Configuring SNMP in the *PRIMEQUEST 2000 Series Installation Manual* (CA92344-0536)
- 1.5.6 [SNMP Configuration] menu in the *PRIMEQUEST 2000 Series Tool Reference* (CA92344-0539)

SNMP trap linkage procedure

1. Place the prepared TrapMSG conversion definition file, described in TABLE J.1 Files and tools to prepare, in a directory on the operations management server.
2. Execute the prepared SNMP trap conversion definition application command, described in TABLE J.1 Files and tools to prepare, to include the TrapMSG conversion definition file (see TABLE J.1 Files and tools to prepare) into Systemwalker (to run on the operations management server).
   Move to the command installation directory. Execute the following command. Example of execution on the operations management server (Linux):

```
./CNSetCnfMg.exe –f <TrapMSG conversion definition file name (full
pathname)> -c
```

3. To represent the OID used in trap conversion as characters, use the MIB extended manipulation function of Systemwalker to register the prepared extended MIB file (for traps), described in TABLE J.1 Files and tools to prepare, in Systemwalker. (Use the Systemwalker console screen for the operations management client.) For details, see the manual of Systemwalker Centric Manager.
4. Apply the TrapMSG definition file to Systemwalker by performing the following step.
   For details, see the manual of Systemwalker Centric Manager.

Remarks

- When the TestTrap function is used to confirm trap reception in the MMB Web-UI, the Test Trap message will appear on the Systemwalker console screen. In this case, the target MMB node enters the problem status on the console screen. For how to return it to the normal status, see the manual of Systemwalker Centric Manager.
- If modifying the filtering definition to output Info-level messages (Panic/Stop Error), see the manual of Systemwalker Centric Manager.

To display the TestTrap message on the console screen, the event filtering definition described in J.2.3 Event monitoring linkage must be applied in advance.
For details on the TestTrap function, see the following manuals:

- 6.5.2 Configuring SNMP in the *PRIMEQUEST 2000 Series Installation Manual* (CA92344-0536)
- 1.5.6 [SNMP Configuration] menu in the *PRIMEQUEST 2000 Series Tool Reference* (CA92344-0539)

J.2.3 Event monitoring linkage

This section provides an overview of event monitoring linkage and describes its modification procedure.

Overview of event monitoring linkage

Event monitoring linkage enables the reporting of event alarms monitored and logged by SVS to the operations management server, in linkage with the Systemwalker agent. Only the event alarms recognized by Systemwalker (itself) are reported. An event filtering definition is simple to include. An event filtering definition provided for each model (Systemwalker template, see TABLE J.1 Files and tools to prepare). For details on how to include this template, see the manual of Systemwalker Centric Manager.

J.2.4 GUI linkage

This section provides an overview of GUI linkage and describes the registration procedure.

Overview of GUI linkage

To permit access to the URL of the MMB login window of the PRIMEQUEST 2000 series from Systemwalker, register it from the [Operation] menu.
For a dual MMB configuration, configure GUI linkage for both of the MMB nodes.

GUI linkage procedure

1. Register the menu to start the PRIMEQUEST 2000 series MMB console. Open the command prompt on the operations management client. Execute the following command (see TABLE J.1 Files and tools to prepare) in any directory:

```
mpaplreg.exe –a –m <menu name> -p <node name> -c <URL> -w
```

<menu name>: Menu name displayed on the Systemwalker console
<node name>: Node (host) name of the server to register (Usually, select the MMB node.)
<URL>: URL starting with http:// for the top page of PRIMEQUEST 2000 series system management

2. Reboot the Systemwalker console.

3. After the reboot, confirm that the new menu was added to the [Operation] menu. Display the menu by right- clicking the specified node, and display the webpage with the specified URL.

Remarks
The above configuration must be complete for every registered PRIMEQUEST 2000 series server node.

J.2.5 Rack grouping function linkage

This section provides an overview of the rack grouping function linkage of Systemwalker and describes the procedure.

Overview of rack grouping function linkage

Systemwalker enables automatic grouping per rack by collecting the IP address of the management LAN of each partition node from the MMB node of the PRIMEQUEST 2000 series server. The management LAN must be configured in advance so that its IP address can be obtained from the MMB node.

Procedure for rack grouping function linkage

Log in to the operating system of each partition with Administrator privileges to configure the management LAN. For details on how to configure the management LAN, see *PRIMEQUEST 2000 Series ServerView Mission Critical Option User Manual*
The PRIMEQUEST 2000 series rack grouping function automatically registers PRIMEQUEST nodes. For details on operation of this function, see the *Systemwalker Centric Manager PRIMERGY/PRIMEQUEST Administration Guide.*

J.2.6 Linkage with ServerView

In the PRIMEQUEST 2000 series server, ServerView Agent (SV Agent) is installed on each partition, and SVOM (ServerView Operation Manager) can handle configuration management and problem monitoring.

Systemwalker works together with ServerView to transmit the monitoring results from ServerView to the integrated management server of Systemwalker as well as start the ServerView console from Systemwalker. For details on the linkage procedure, see the *ServerView Operations Manager User's Guide*.

Appendix K Software

For details on bundled software and drivers supplied with the PRIMEQUEST 2000 series hardware, see Chapter 3 Software Configuration in the PRIMEQUEST 2000 Series General Description (CA92344-0534).

Appendix L Failure Report Sheet

This appendix includes the failure report sheet. Use this sheet to report a failure.

L.1 Failure Report Sheet

Model name	□ PRIMEQUEST ( )
OS	□ Red Hat Enterprise Linux (Version:) □ Windows Sever (Version:) □ Vmware (Version:)
Server installation environment	
LAN/WAN system configuration	
Hardware configuration	(Installed option types and locations)
Configuration information	(UEFI Setup Utility settings)
Occurrence date and time	Year Month Day Hour Minute
Frequency	□ Constantly □ Intermittently (times per) □ Unknown
Triggered by	Working before failure occurred? □ Yes □ No Current situation: Work details: Work affected? □ Yes □ No
Symptom	□ Hanging □ Slowdown □ Reboot □ OS panic/stop □ OS startup not possible □ Communication unavailable □ Other ( )
Error message	System event log: Agent log/Driver log: OS message: Other:
Status of various lamps	
Supplementary information	□ Yes □ No

Appendix M Information of PCI Express card

This appendix includes the information of PCI Express card.
For components which cannot be identified by 'Vendor ID' and 'Device ID', see also 'Subsystem ID'.

TABLE M.1 Information of PCI Express card (PRIMEQUEST2400E3/2800E3/2800B3)

Name	Vendor ID	Device ID	Subsystem ID
SAS Card	1000	005D	1212
Dual Channel 12Gbps SAS Card	1000	0072	-
Dual Channel 12Gbps SAS RAID Card	1000	005D	121A
Single Channel 8Gbps Fibre Channel Card	10DF	F015	-
Dual Channel 8Gbps Fibre Channel Card	10DF	F100	-
Single Channel 8Gbps Fibre Channel Card	1077	2532	015C
Dual Channel 8Gbps Fibre Channel Card	1077	2532	015D
Single Channel 16Gbps Fibre Channel Card	10DF	E200	E207
Dual Channel 16Gbps Fibre Channel Card	10DF	E200	E208
Single Channel 16Gbps Fibre Channel Card	1077	2031	0241
Dual Channel 16Gbps Fibre Channel Card	1077	2031	0249
Dual Channel 1000BASE-T Card	8086	1521	00A2
Quad Channel 1000BASE-T Card	8086	1521	00A1
Dual Channel 10G BASE-T Card	8086	1528	-
Dual Channel 10G BASE-T Card	10DF	0720	E863
Dual Channel 10G BASE Card	8086	10FB	-
Dual Channel 10G BASE Card	10DF	0720	E802
Dual Channel CNA card (10Gbps)	10DF	0724 (FCoE) 0722 (iSCSI) 0720 (Ethernet Controller)	-
Single Channel CNA card (40Gbps)	10DF	0720	E868
Single channel 56Gbps Infiniband HCA card	15B3	1003	0022
Dual channel 56Gbps Infiniband HCA card	15B3	1003	0020
Single channel 100Gbps Infiniband HCA card	15B3	1013	0030
Dual channel 100Gbps Infiniband HCA card	15B3	1013	0032

TABLE. M.2 Information of PCI Express card (PRIMEQUEST2400E2/2800E2/2800B2)

Name	Vendor ID	Device ID	Subsystem ID
SAS Card	1000	005D	1212
Dual Channel 12Gbps SAS Card	1000	0072	-
Dual Channel 12Gbps SAS RAID Card	1000	005D	121A
Single Channel 8Gbps Fibre Channel Card	10DF	F015	-
Dual Channel 8Gbps Fibre Channel Card	10DF	F100	-
Single Channel 8Gbps Fibre Channel Card	1077	2532	015C
Dual Channel 8Gbps Fibre Channel Card	1077	2532	015D
Single Channel 16Gbps Fibre Channel Card	10DF	E200	E207
Dual Channel 16Gbps Fibre Channel Card	10DF	E200	E208
Single Channel 16Gbps Fibre Channel Card	1077	2031	0241
Dual Channel 16Gbps Fibre Channel Card	1077	2031	0249
Dual Channel 1000BASE-T Card	8086	1521	00A2
Quad Channel 1000BASE-T Card	8086	1521	00A1
Dual Channel 10G BASE-T Card	8086	1528	-
Dual Channel 10G BASE-T Card	10DF	0720	E863
Dual Channel 10G BASE Card	8086	10FB	-
Dual Channel 10G BASE Card	10DF	0720	E802
Dual Channel CNA card (10Gbps)	10DF	0724 (FCoE) 0722 (iSCSI) 0720 (Ethernet Controller)	-
Single channel 56Gbps Infiniband HCA card	15B3	1003	0022
Dual channel 56Gbps Infiniband HCA card	15B3	1003	0020

TABLE N.1 Information of PCI Express card (PRIMEQUEST2400E/2800E/2800B)

Name	Vendor ID	Device ID	Subsystem ID
SAS Card	1000	005B	11E4
Dual Channel 6Gbps SAS Card	1000	0072	-
Dual Channel 6Gbps SAS RAID Card	1000	005B	9291
Single Channel 8Gbps Fibre Channel Card	10DF	F015	-
Dual Channel 8Gbps Fibre Channel Card	10DF	F100	-
Single Channel 16Gbps Fibre Channel Card	10DF	E200	E207
Dual Channel 16Gbps Fibre Channel Card	10DF	E200	E208
Dual Channel 1000BASE-T Card	8086	1521	11CF
Quad Channel 1000BASE-T Card	8086	1521	11D1
Dual Channel 1000BASE-T Card	8086	1521	00A2
Quad Channel 1000BASE-T Card	8086	1521	00A1
Dual Channel 10G BASE-T Card	8086	1528	-
Dual Channel 10G BASE Card	8086	10FB	-
Dual Channel CNA card (10Gbps)	10DF	0724 (FCoE) 0722 (iSCSI) 0720 (Ethernet Controller)	-
Single channel 40Gbps Infiniband HCA card	15B3	1003	11EE
Dual channel 40Gbps Infiniband HCA card	15B3	1003	11EF
Single channel 56Gbps Infiniband HCA card	15B3	1003	0022
Dual channel 56Gbps Infiniband HCA card	15B3	1003	0020

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