Express5800/320Ma:
System Administrator's Guide

NEC Solutions (America), Inc.
NR014W

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NEC Solutions (America), Inc.
10850 Gold Center Drive, Suite 200
Rancho Cordova, CA 95670

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Preface

Purpose of This Manual

The *Express5800/320Ma: System Administrator's Guide* documents tasks and information for system administrators of Express5800/320Ma systems.

Audience

This manual is intended for anyone who administers or troubleshoots Express5800/320Ma systems.

Notation Conventions

This document uses the notation conventions described in this section.

Warnings, Cautions, and Notes

Warnings, cautions, and notes provide special information and have the following meanings:

⚠ WARNING

A warning indicates a situation where failure to take or avoid a specified action could cause bodily harm or loss of life.

⚠ CAUTION

A caution indicates a situation where failure to take or avoid a specified action could damage a hardware device, program, system, or data.

NOTE

A note provides important information about the operation of an Express5800/320Ma system.

Typographical Conventions

The following typographical conventions are used in ftServer documents:

- The bold font emphasizes words in text or indicates text that you type, the name of a screen object, or the name of a programming element. For example:

  Before handling or replacing system components, make sure that you are properly grounded by using a grounded wrist strap.

  In the **System Properties** dialog box, click the **Hardware** tab.

  Call the **RegisterDeviceNotification** function.

- The italic font introduces new terms and indicates programming and command-line arguments that the user defines. For example:

  Many hardware components are *customer-replaceable units* (CRUs), which can be replaced on-site by system administrators with minimal training or tools.

  copy *filename1 filename2*

  Pass a pointer for the *NotificationFilter* parameter

- The monospace font indicates sample program code and output, including message text. For example:

  ```
  #include <iostream.h>
  ```

  ```
  The operation completed successfully.
  ```

Getting Help

If you have a technical question about Express5800/320Ma hardware or software, try these online resources first:

- **Online support from NEC Technical Support.** You can find the latest technical information about an Express5800/320Ma through online product support at the NEC Technical Support Web site:

  http://support.necsam.com/servers/

- **Online product support for Microsoft® products**. Your primary source for support is the computer manufacturer who provided your software, or an authorized Microsoft Support Provider. You can also find the latest technical information about Microsoft Windows® and other Microsoft products through online product support at the Microsoft Help and Support Web site:

  http://support.microsoft.com/

If you are unable to resolve your questions with the help available at these online sites, and the Express5800/320Ma system is covered by a service agreement, please contact NEC Technical Support (866-269-1239).

Notices

- All regulatory notices are provided in the site planning guide for your system.
- Although this guide documents modem functionality, modems are not available for all systems. Ask your sales representative about modem availability.
- ActiveService Network (ASN) is not currently available, but may be ordered in the future.

Chapter 1
Introduction to System Administration

The following topics provide an introduction to Express5800/320Ma system administration.

Features of Express5800/320Ma system software further support system fault-tolerance for properly configured systems.

If you have a service contract, NEC Solutions (America), Inc. or an authorized service representative provides continuous, remote, system monitoring and diagnosis for ActiveService Network (ASN) management.

Disk-management tools are also available on your Express5800/320Ma system.

System Administration Tools

System administration tools enable you to monitor system performance and system-component status, diagnose errors, and identify failed components. Using the tools, you can take failed components offline and put replacement components online.

These features include Active Upgrade, ftServer Management Console, Software Availability Manager (SAM), ActiveService Network (ASN), Virtual Technician Module (VTM), the VTM console, and disk-management tools.

Active Upgrade

Optional Active Upgrade™ technology enables you to upgrade your Express5800/320Ma system and application software with minimal downtime.

Instead of taking your system offline to run upgrade procedures, you can use the Active Upgrade process to split the system into two independently-running systems, one "side" of which you upgrade while the other side continues to run your applications without interruption. See the *Express5800/320Ma: Active Upgrade User's Guide* or the Active Upgrade online help for more information.

To use Active Upgrade, your system requires a VTM.

ftServer Management Console

The ftServer Management Console (ftSMC) is a graphical user interface that enables you to monitor and manage your system's fault-tolerant software and hardware. See Chapter 3 for details.

Software Availability Manager

The Software Availability Manager (SAM) performs predictive software availability management. SAM monitors system activity to predict possible software failures and to alert you to take action. SAM is a Microsoft Management Console (MMC) snap-in supplied by NEC Solutions (America), Inc.

See the *Express5800/320Ma Software Availability Manager User's Guide* for complete information.

ActiveService Network

Your Express5800/320Ma systems offers an optional, secure network, the ActiveService Network (ASN). ASN enables NEC Technical Support or your authorized service representative to provide remote monitoring, diagnosis, troubleshooting, and problem-resolution services to your systems 24 hours a day, 7 days a week. Access to the ASN requires a service contract with NEC Solutions (America), Inc. or an authorized service representative and is implemented across a modem or over the Internet.

Having ASN connectivity enables:

- Your system to send alerts (call-home alarm messages) to NEC Technical Support or your authorized service representative when unusual events occur on the system
- NEC Technical Support or your authorized service representative to access the system through a connection to the ASN

Your system can connect to the ASN through:

- A modem connected to the system
- The VTM or an *ftGateway system* (a system configured as a gateway for ASN connectivity)
- The Internet

Internet-based ASN connects over a secure path to your authorized service representative. Internet-based ASN does not support ftGateway.

After verifying a hardware problem, your authorized service representative can send out a replacement CRU.

See the *Express5800/320Ma ActiveService Network Configuration Guide* for more information.

Virtual Technician Module

The Virtual Technician Module (VTM) is a system-management module supported on your Express5800/320Ma system. VTMs provide remote-management capabilities using the VTM console (a Web-based console), including:

- Advanced Video Redirection (AVR)
- Access to attached storage
- Diagnosis of a system that is without power
- Power-cycling of a system

VTM is required for the use of Active Upgrade.

AVR enables you to manage the host computer remotely over the Web-based console. Using AVR, you can view the remote system desktop and redirect its local keyboard and mouse.

VTM supports Dynamic Host Configuration Protocol (DHCP). DHCP dynamically assigns IP addresses to the VTMs, and also supports static IP addresses. The two VTMs on each VTM-equipped system require a total of four IP addresses.

VTM Console

The VTM console is the Web-based interface for systems that support VTM. The VTM console enables you, NEC Technical Support, or your authorized service representative to control, monitor, and diagnose the system. You can access the VTM console over a LAN or modem.

Because the VTM console is Web-based, you can use it in a Web browser from any location. You can use the VTM console even if the host system’s operating system is out of operation and its network connections are lost.

Disk-Management Tools

Disk-management tools enable you to monitor disk status, mirror entire physical disks, create logical volumes, mirror volumes across multiple disks, and perform other data-storage operations. For information, see Chapter 4 and the Windows Server 2003 documentation.

See also “Rapid Disk Resync Disk Mirroring” on page 1-5.

System Software Features

Express5800/320Ma System Software has features designed to support fault-tolerant operation and high availability. These features include fault-tolerant, fail-safe software, services, open architecture drivers, and Rapid Disk Resync disk mirroring.

Fail-Safe Software

Express5800/320Ma System Software works in conjunction with lockstep technology to prevent many software errors. Fail-safe software features capture issues and report them to NEC Technical Support or your authorized service representative. Even data in memory can be constantly protected and maintained.

NEC Solutions (America), Inc. also provides drivers that increase the fault tolerance and manageability of third-party drivers for other adapters in the system.

Services

NEC Solutions (America), Inc. provides software fault-tolerant services that run on your system as Windows-based services. These services constantly monitor for, and respond to, hardware problems. Applications do not need customization to support the services.

These services start automatically when the system boots and remain running during normal operation. If a situation requires system administrator intervention, you can use Computer Management to manually start and stop system services. See “Monitoring Stratus Services” on page 2-9 for details.

See the *Express5800/320Ma: Technical Reference Guide* for descriptions of the Stratus services.

Open Driver Architecture

Your Express5800/320Ma system supports both vendor-supplied drivers and NEC-supplied drivers for PCI adapters. For PCI adapters that you supply, your Express5800/320Ma system supports vendor-supplied drivers. For PCI adapters that NEC Solutions (America), Inc. provides, NEC Solutions (America), Inc. supplies drivers that it has enhanced with support for surprise removal.

In addition, your Express5800/320Ma system uses other drivers developed by NEC Solutions (America), Inc. These drivers allow the system and all PCI devices to integrate with the ASN, and provide management of all system devices and device fault-tolerance.

ASN integration provides:

- Automatic reporting of device failures to the NEC Technical Support
- Notification to you by the NEC Technical Support when a device fails
- Inventory reporting to the NEC Technical Support that lists all PCI devices in the system
- Comprehensive debug information about all devices in the system for use by the NEC Technical Support in troubleshooting your system

Management of PCI devices includes:

- On your Express5800/320Ma system, hot-plug support alerts the plug-and-play manager to bring a device into service or take it out of service. You can initiate bring-up or bring-down from ftSMC. Hot-plug support also initiates discovery of newly attached or removed devices.

  NOTE

  You must remove the CPU-I/O enclosure from the system in order to remove a PCI adapter.

- Display of information so that you know whether removing a device will compromise the system. The drivers can set LEDs and values in ftSMC that let you know whether you can safely remove a component.
- Display of information about the device in ftSMC.

Device fault-tolerance includes:

- Automatic restart of failed devices. The device will be restarted after transient faults, until it falls below its mean-time-between faults (MTBF) threshold.
- Tracking the MTBF of a device and management of the device when it experiences faults. You can set parameters to take the device out of service when the device experiences an unacceptable MTBF. You can configure the rules for MTBF management.

Rapid Disk Resync Disk Mirroring

Rapid Disk Resync (RDR) disk-mirroring technology provides faster resynchronization of mirrored disks than other mirroring methods after transient failures or when a single disk is briefly removed from service. For optimal performance, use RDR to mirror disks in internal storage.

Initial Configuration

Configure the following items before you use your system:

- **System Software**. See the *Express5800/320Ma: Software Installation and Configuration Guide* for software installation and configuration details.
- **Disk storage.** Create a backup system disk and mirror the disks in your system. If you are implementing RDR disk mirroring, see the *Express5800/320Ma: Software Installation and Configuration Guide* for details. If you are implementing volume mirroring, see your disk-management tool documentation.
- **Network connections**. Configure Ethernet adapters in teams to achieve increased throughput and fault tolerance. In a team, one adapter is primary and the other adapters in the team are secondary. See the *Express5800/320Ma: Software Installation and Configuration Guide* and the *Express5800/320Ma: PCI Adapter Guide* for details about configuring Ethernet adapter teams.
- **Uninterruptible power supply.** See your system's hardware installation guide for information about connecting a UPS to a system. See the *Express5800/320Ma: Software Installation and Configuration Guide* for information about how to configure a UPS for use with your system.

Documentation

The *Express5800/320Ma: Site Planning Guide* provides lists of Express5800/320Ma system documentation. You can find additional information in the online Help system.

Express5800/320Ma Help System

The Express5800/320Ma Help system consists of the following:

- **General Help.** You can access this help from the **Help** button on an application's menu bar, or by pressing F1.
- **Context-Sensitive Help.** This help is available for certain items within help-enabled applications (such as the ftSMC snap-in). To access this help, select an icon in the ftSMC system inventory tree and press F1. Alternatively, right-click an ftSMC system inventory tree icon, and in the shortcut menu, click **Help.**
- **What's This? Help for ftSMC.** This help is available for items in the details pane of the ftSMC snap-in. To access this help, right-click the question mark (**?**) icon in front of the item, and in the shortcut menu, click **What's this?**. See Figure 3-4 for an example. This help is also available from certain dialog boxes having the What's this? help icon (**?**) in their upper-right corner. For example, in a **Properties**

dialog box in ftSMC, click the help icon (**?**), then click a box, and a pop-up window is displayed.

Windows Documentation

This manual does not document system administration tasks that you perform as an administrator of a Windows-based server unless there are associated tasks that are specific to your systems. System administration tasks include:

- Configuring networks and managing access to network resources
- Configuring Windows Server 2003 services
- Configuring domain controllers
- Implementing and managing Active Directory
- Setting up user accounts and managing users
- Setting up and configuring printers
- Managing server security
- Backing up and restoring data

For help with these kinds of tasks, see the associated Microsoft Help system and the Microsoft documentation provided with Windows Server 2003.

Chapter 2

Operating and Monitoring Your System

For information about system operation, see the following topics:

System Startup and Shutdown

For normal system startup and shutdown, and to completely remove power from the system, see the operation and maintenance guide for your system.

⚠ **CAUTION**

Always shut down the operating system before turning the system power off.

NOTES

1. **Give the system time to recover automatically from problems.** If the system hangs for any reason while it is booting, wait at least ten minutes before intervening manually.
2. If a system contains failed components, it may attempt to boot for an extended period of time. This is because the system makes up to six attempts to boot, each time trying with a different combination of components. You can monitor the boot process on the screen or in a VTM console session.

You can accomplish an orderly shutdown of the system from a remote computer by accessing the Windows desktop and choosing **Shut Down** from the Start menu.

You must physically be at the system to see the message indicating that it is safe to power off the system. To turn off power, use the power button, the standby circuit-breaker switches, or the VTM console. Note, however, that the Windows Shut Down command automatically powers down the system.

Enabling the System Power Button

The system power button performs an orderly shutdown when pressed once. However, if no one is currently logged onto the system, the power button may not work properly on all versions of the Windows operating system. You may need to enable the system power button to operate correctly in the event that no one is logged onto a system.

To enable the system power button to shut down a system onto which no one has yet logged, enable the following Windows Security option:

Shutdown: Allow system to be shutdown without having to log on

For information about enabling this option, refer to the Windows Help topic **To edit a security setting on a Group Policy object** and follow the instructions for a **Local computer** or a **Group Policy object**.

Managing CPU Element Resynchronization

On systems running Windows Server 2003 Standard Edition, a CPU element returning to service must resynchronize with the functioning CPU element. A CPU element requires resynchronization:

- After bringing down and then bringing up a CPU element
- After a transient CPU element error
- After powering down a system and then powering it up
- During online BIOS upgrade

During the resynchronization period, the system will not respond to network connections. Therefore, it is important to set the timeout period and/or number of retries for network applications to be large enough to prevent timeouts during resynchronization. The length of the resynchronization period is proportional to the amount of system memory configured.

By default, resynchronization occurs as soon as the CPU element that was taken out of service is determined to be operational or the failed enclosure is replaced. However, you can defer resynchronization to a more convenient time, such as an off-peak period. See the ftSMC help for information about scheduling CPU bringup.

Managing CPU Element Bringup

You can specify two times of day at which to enable, or to which to defer, the return to service of CPU elements that have been removed from service (*shot*). You use two commands—Enable CpuBoard Bringup and Defer CpuBoard Bringup—which the Windows Scheduler executes. Along with the commands, you specify two times of day: one time when an offline CPU element can be brought up, and another time to which CPU Bringup is deferred. See the ftSMC snapin Help for instructions in setting these commands.

When Scheduler executes the commands, Enable CpuBoard Bringup changes the CpuBringUpPolicy property under the Srabid driver to **Enable Bringup**. This setting enables CPU elements that were removed from service to come back into service. It also brings up any CPUs that are in the Removed from Service state for a reason of Deferred BringUp, as long as they don't exceed the MTBF threshold.

When Scheduler executes the Defer CpuBoard Bringup command, it changes the CpuBringUpPolicy property under the Srabid driver to Defer Bringup. With this setting, if a CPU element is removed from service, the CPU elements come back into service at different times.

For example, consider the situation in which Defer CpuBoard Bringup is scheduled for every day at 8 a.m., and Enable CpuBoard Bringup is scheduled for every day at 9 p.m. In this case, if any CPU element gets removed from service after 8 a.m., it will not be allowed to come back into service until after 9 p.m., when Scheduler executes Enable CpuBoard Bringup. At that time, Enable CpuBoard Bringup will automatically bring up any CPU element that has been deferred between 8 a.m. and 9 p.m.

Connecting Serial Port 1 to the Modem

On systems that have modems and no VTMs, you must change a BIOS setting to enable Serial Port 1 (also known as Serial Port A) to connect to the modem. Without this change in the BIOS settings, the system will not allow the internal modem to use Serial Port 1, and the port will remain available for any other serial port connection.

When performing this procedure from the ftServer Setup utility, use the arrow keys to navigate within the utility.

You can also change the BIOS setting from ftSMC while the system is running by performing the procedure that follows this one.

To change the BIOS setting during a system reboot

1. Shutdown and reboot the system.
2. While the system is rebooting, press the F2 key to enter the ftServer Setup utility.

   The system may take a minute or so to display the ftServer Setup utility Main menu.
3. On the ftServer Setup menu, select the **Advanced** tab.
4. On the Advanced tab, select **I/O Device Configuration**, then press Enter.
5. Select **Serial PortA Connection**, then press Enter.
6. Use the plus key (+) to toggle to **Internal Modem**, then press Enter.
7. Press **Esc**, then select **Exit Saving Changes** and press Enter.
8. At the Setup Confirmation dialog box (with **“Yes”** highlighted**),** press Enter to return to the system boot process.

To change the BIOS setting from ftSMC with the system running

1. In ftSMC, expand **ftServer (Local)**, **ftServer Drivers**, right-click the **BIOS Setup** node, and select **Properties**.
2. In the BIOS Setup Properties page, set the ComAModem property to **True**, and click **OK**.
3. Restart the system to enable the BIOS update to take effect.

Controlling the Modem

⚠ CAUTION

When you replace or install a modem, you must turn power to the modem connector off to prevent damage to the modem and the system.

Use the following procedure to change the power state of the modem while the system remains online. Otherwise, shut down the system and remove the power cords, as described in the *Express5800/320Ma: Operation and Maintenance Guide*.

Powering the modem on or off while the system is online

1. In ftSMC, expand **ftServer (Local)** and **ftServer Call Home Modem**.
2. Refer to the PowerState property in the details pane, or the state of the power (green) LED on the modem, to verify that the power is on or off.
3. If the modem power is on, select **Initiate BringDown** to turn it off. If the modem power is off, select **Initiate BringUp** to turn it on.

Remote Access to Your System Desktop

You can remotely access your system's Windows desktop in different ways, depending on how your system is set up. Remote Desktop and VTM console enable remote access to the Windows desktop from a remote computer.

Remote Desktop

Microsoft Remote Desktop is installed by default on your system. However, it is not enabled by default.

To enable Remote Desktop

1. Right-click **My Computer** and select **Properties**.
2. In System Properties, click the **Remote** tab.
3. Select the check box under **Remote Desktop** to enable users to connect remotely to the computer.
4. The **Remote Sessions** dialog box will appear, stating that some local accounts might not have passwords. Click **OK**.

NOTE

Users must have passwords to access remote desktops with the Remote Desktop application. See Microsoft documentation for details.

Running ftSMC Remotely

See "Running ftSMC on a Remote Computer" on page 3-3 or "Running ftSMC by Remote Access" on page 3-6 for details about running ftSMC on a remote system.

Using VTM Console

If your system has VTMs, you can use VTM console to remotely access the server desktop to turn off system power and boot the host system. See the *Express5800/320Ma Virtual Technician Module User's Guide* for more details.

⚠ CAUTION

Before using the VTM console to turn off system power, always attempt to perform an orderly shutdown of the operating system.

Using the VTM

Using the VTM includes the following major procedures:

- "Setting Up a VTM Administrator Account" on page 2-6
- "Configuring VTM Administrator Email Paging" on page 2-7
- "Configuring the SMTP and SNMP Settings" on page 2-7
- "Setting Paging-Severity Levels" on page 2-8

See "Using VTMs to Troubleshoot Systems" on page 3-5 for related information.

Setting Up a VTM Administrator Account

You set up a VTM administrator account, which enables you to log on to the VTM Console, from the ftSMC. (Note that the VTM administrator account is separate from your Windows administrator account.)

To set up a VTM administrator account

1. In ftSMC, expand **ftServer (Local)**, **ftServer Configuration**, right-click **ActiveService Network**, and select **Properties**.
2. On the dialog box, click the **SMM** tab.
3. Enter values into the following fields:
   - **SMM Admin ID**. Your VTM administrator login name.
   - **SMM Admin Password**. Your VTM administrator password.
   - **SMM Admin Dialback Number**. The phone number you use to dial in to the VTM adapter. After you dial in and are authenticated as the Admin, the VTM hangs up the connection and dials the dialback number to reestablish the connection.
4. Click **OK**.

Configuring VTM Administrator Email Paging

You can configure your VTM to email you VTM alerts. Verify that your SMTP server IP address is correct if you are enabling email paging.

To configure VTM administrator email paging

1. In ftSMC, expand **ftServer (Local)**, **ftServer Configuration**, right-click **ActiveService Network** node, and select **Properties**.
2. In the properties page, click the **SMM** tab.
3. In the **SMM Admin Enable Email** box, set the value to **False** to disable or **True** to enable the sending of VTM email alerts.
4. In the **SMM Admin Email Address** box, enter your email address.
5. Click **OK**.

Configuring the SMTP and SNMP Settings

Configure the Simple Mail Transfer Protocol (SMTP) and Simple Network Management Protocol (SNMP) settings to indicate the IP addresses to use for VTM email notification and for communication between the VTM and the SMTP/SNMP servers. Contact your network administrator for the correct addresses.

To configure SMTP and SNMP settings

1. In ftSMC, expand **ftServer (Local)**, **ftServer Configuration**, right-click **VTM Network Config** node, and select **Properties**.
2. On the **VTM Network Config Properties** page, click the **SMTP/SNMP** tab.
3. Enter values for the following properties:

  - **SMTP Server IP**. A required value: The IP address of your email server.
  - **SNMP Community**. A required value: A filter for incoming SNMP messages and outgoing SNMP traps.
  - **SNMP Server 1–7 IP**. The IP addresses of the SNMP servers that receive VTM SNMP traps.

4. Click **OK**.

Setting Paging-Severity Levels

Set the paging-severity level to notify users when entries are made in the VTM system event log (SEL). Use the settings to indicate how severe an error must be before you receive a notification about it. These are errors that relate to a particular area of the VTM adapter; for example, power, temperature sensors, and so on.

The available security levels are:

- **None**. The user notification for this group is inactive.
- **Warning**. The VTM notifies users when SEL entries in this group exceed warning thresholds.
- **Critical**. The VTM notifies users when SEL entries of the group exceed critical thresholds.
- **All**. The VTM notifies users of every SEL entry of events in the group.

After you set or change the paging-severity levels, the VTM reboots.

To set paging-severity levels

1. In ftSMC, expand **ftServer (Local)**, **ftServer Configuration**, right-click **VTM Network Config**, and select **Properties**.
2. On the **VTM Network Config Properties** page, click one of the **Paging Severity** tabs and set values, as desired, for the displayed properties. Set values on the other **Paging Severity** tab the same way.
3. Click **OK**.

Windows System Event Logs

The system maintains logs of application and system events. These event logs can help you, or the NEC Technical Support, if problems occur on the system.

In the Windows Administrative Tools, you can use **Event Viewer** to view the different logs and to set the size of the application and system event logs. To prevent loss of event log data, maintain a regular schedule for manually archiving event log files or obtain a third-party tool that performs automated event-log archiving.

Setting the Size of Event Log Files

Specify the size of the event log files on your system.

To set the size of the application and system event logs

1. Right-click the log in **Event Viewer** and click **Properties**.
2. In the **Log size** section, set the maximum log size in KB. The system default size for the application and system event logs is 2048 KB.

> ⚠ **CAUTION**
>
> Data will be overwritten if one of these event logs reaches its maximum log size.

Archiving Event Log Files

In the unlikely event that your system experiences problems, take a snapshot of the system event log and the application event log, and save each of these to a file in order to capture important details relevant to the problem.

To save log files

1. Right-click the log file in **Event Viewer**.
2. Select **Save Log File As**.
3. In the **Save “Log File” As** dialog box:
   - In the **Save In:** box, accept the default or enter a new path name.
   - In the **File name:** box, enter the file name.
   - In the **Save as type:** box, accept the default type, Event Log (*.evt). This allows you to view the saved file in Event Viewer.
4. Click **Save** to save the file.
5. After you archive the log file, you can clear it. To clear the log, click **Action**, and then click **Clear all Events**.

Archiving the log file has no effect on the current contents of the active log.

Monitoring Stratus Services

ftServer Manager includes a number of Stratus services that run on your system as Windows services. If any of these services is not running, the system does not function as designed. The *Express5800/320Ma: Technical Reference Guide* describes these services.

To check the status of a service

1. Click **Start**, point to **Programs**, point to **Administrative Tools**, and then click **Computer Management**.
2. Double-click **Services and Applications**, and then click **Services**.
3. In the right-hand pane, in the **Status** column, the Stratus services should all be listed as **Started**. In the **Startup Type** column, they should all be listed as **Automatic**.

If a service's status is **Stopped** or blank, attempt to start the service by right-clicking it, and then clicking **Start**. If the service fails to start, check the event log for any messages related to the service.

> NOTE
>
> The Sysmgt Startup service runs only when the system first starts. This service starts the other system services. After the other services have started, it stops running and its status is blank.

BIOS Settings

To manage BIOS settings, your Express5800/320Ma system uses the ftServer Setup utility.

To start the BIOS setup utilities

1. Turn on or reboot your system. When the logo screen appears, press F2 to enter the BIOS setup utility.
2. After executing some power-on self-test (POST) procedures, the system displays the setup utility's Main menu.

See the *Express5800/320Ma: Technical Reference Guide* for cautions and details about using the BIOS Setup utilities.

Determining the BIOS Version

Use ftSMC to determine the BIOS version. Click a **CPU Enclosure** node and look at the value of the BIOS: Stratus Version property in the details pane.

Enabling IMAPI for Writing to CDs

Your Express5800/320Ma system supports optional DVD±RW drives. Before writing to the DVD±RW drive, enable the Image Mastering Applications Programming Interface (IMAPI), which is turned off by default.

To enable IMAPI

1. Right-click **My Computer**.
2. Click **Manage**, expand **Services and Applications**, and click **Services**.
3. In the Services window, double-click **IMAPI CD-Burning COM Service**.

   The **IMAPI CD-Burning COM Service Properties** dialog box appears.

4. In the dialog box, under **Service Status: Stopped**, click the **Start** button.

   A message stating that Windows is attempting to start the IMAPI service appears. When the service is started, the **Service Status** value changes to **Started**.

5. On the General tab under Startup type, select **Automatic**.
6. Click **OK**.

Floppy Disk Drive Volume Letter

The operating system generally assigns the drive letter A to the optional floppy disk drive when the drive is first connected to a USB port. If you subsequently connect the drive to a different USB port or if the I/O element or element fails over, the operating system may assign the drive letter B to the floppy disk drive.

Serial Ports

On your system:

- Serial Port 1 is generic if:
  - The system uses VTMs. (In this case, the BIOS setting in the Advanced menu, under I/O Device Configuration, Serial PortA Connection is set to **Serial**.)
  - The system does not have VTMs, and you have set the Serial PortA Connection to **Serial** and disabled the ASN. (The ASN is disabled when the ASN Call-home Enable and Call-in Enable properties are both set to **False**. See the ActiveService Network node properties in ftSMC under the ftServer Configuration node.)
- Serial Port 1 is **not** generic if:
  - The Serial PortA Connection setting is **Internal Modem**.
  - There is no VTM in the system and the ASN is enabled.
- Serial Port 2 is always generic.

If you have configured Serial Port 1 or Serial Port 2 on your system to function as a modem or as a communications cable between two computers, use Windows Device Manager (see Figure 3-2) to verify that Serial Port 1 or Serial Port 2 functions as you expect after you install VTMs. You may need to reconfigure the COM port after installing the VTMs.

See "Virtual Modems" and "Using VTMs to Troubleshoot Systems" on page 3-5 for related information.

Uninterruptible Power Supplies

Your Express5800/320Ma system supports the use of uninterruptible power supplies (UPSs) to power the system without interruption during short outages, and to gracefully shut the system down during longer power outages. As part of your fault-tolerant strategy, obtain and use a UPS qualified by NEC Solutions (America), Inc.

- For information about qualified UPS models, see the site planning guide for your system.
- For UPS installation details, see the *Express5800/320Ma: Software Installation and Configuration Guide*.

System Shutdown with UPS Battery Rundown

When you use a UPS qualified by NEC Solutions (America), Inc., you connect that UPS to one half of the system. If a failure occurs in the UPS or in the UPS power source (for example, if the UPS is unplugged) and the backup battery runs low, the system initiates a shutdown, even if the power to the non-UPS half of the system is unaffected by the failure.

If you have independent sources of AC power available for your system, you can minimize the possibility of this kind of shutdown by connecting the UPS to the more reliable power source. However, failure of the more reliable power source can shut down the system even if the less reliable source is still operational.

Changing the IP Address of Systems with a UPS

If you change the IP address on the system, update the configuration on the UPS with the new IP address. If you do not update the UPS, and power to the system is automatically removed after a power failure, the system does not restart when power is restored.

NOTE

Assign a static IP address to the network interface that provides the connection to the UPS.

To change the IP address of systems with a UPS

1. On your system, use **Add or Remove Programs** to remove PowerChute® Network Shutdown (PCNS).
2. Remove the old IP address from the configuration on the UPS.
   a. In a Web browser, enter **http://** and the IP address of the UPS; for example, **http://*xxx.xxx.xxx***.
   b. If prompted for a password, supply a valid password for the UPS.
   c. In the left column of the **Network Management Card** page, click the name of the UPS.
   d. In the left column, click **PowerChute**.
   e. In the right column, next to **Configured Client IP Addresses**, click the old IP address and click **Remove**.
3. Install PCNS on the system again to register the new IP address of the system with the UPS. See the instructions for installing PCNS in the *Express5800/320Ma: Software Installation and Configuration Guide*.

SNMP Traps

Your Express5800/320Ma system supports the Microsoft SNMP Agent, which enables third-party Enterprise Management consoles to remotely monitor the systems. The ftServer SNMP Agent provides a standard mechanism for monitoring the status of systems and for receiving alarms from the systems.

During instances of system malfunction or in response to a system event, such as a firmware update, you may see multiple traps in third-party management consoles for various devices. For instance, if a PCI adapter fails, the SNMP agent may send traps not only for the adapter but also for its slot. You may safely disregard these traps.

See the *Express5800/320Ma: Software Installation and Configuration Guide* for SNMP configuration information.

Installing Hotfixes and Security Updates

Use caution when applying hotfixes from any source. Applying updates indiscriminately may introduce serious problems to your Express5800/320Ma system.

Refer to the following guidelines before updating your system:

- Do not install other types of hotfixes, such as Microsoft patches that fix a particular problem, before obtaining validation from NEC Solutions (America), Inc.
- You can use Windows Automatic Update **to download** hotfixes, but do **not allow** Windows to install them **automatically.**

- You can greatly reduce application downtime when you upgrade software by installing and using the optional Active Upgrade software. If you do plan to install and use Active Upgrade software, be sure to keep system files on a separate disk from data files. See the *Express5800/320Ma: Active Upgrade User's Guide* for more information.

For more information about evaluating hotfixes for Express5800/320Ma systems, see the following web page:

http://support.necsam.com/servers/

Important Things to Avoid

To take full advantage of your system's fault-tolerant features, observe the following when setting up and operating your system:

- **Do not attempt to boot the system from a network drive.** Booting the system from a network drive is not supported**.**
- **Do not use Windows Device Manager to disable devices except in documented special situations.** Using Windows Device Manager to disable devices can interfere with the proper operation of your system. The correct way to take devices out of service and return them to service is through the ftSMC snap-in. However, to handle special situations, the system documentation may instruct you to use the Windows device manager.
- **Do not enable hardware acceleration for your video adapter.** For your system, the **Hardware acceleration** is set to **None**. Do not change this setting. Enabling hardware acceleration makes your video adapter non-fault-tolerant. (To verify the setting, right-click the desktop and click **Properties.** On the Settings tab, click **Advanced** and then click the **Troubleshooting** tab.)
- **Do not install devices unless they have been tested and certified ftServer-compatible.** Installing devices that have not been tested and certified ftServer-system-compatible can reduce the fault tolerance of your system. If you want to install a device that has not been certified, contact your account team.

Chapter 3
ftServer Management Console

For information about using ftServer Management Console (ftSMC), see the following topics:

- "CPU and I/O Enclosures and Elements" on page 3-1
- "ftSMC Overview" on page 3-2
- "Running ftSMC" on page 3-2
- "Performing ftSMC Tasks" on page 3-6

For information about the Virtual Technician Module (VTM), see the *Express5800/320Ma Virtual Technician Module User's Guide* and ftSMC snapin help.

CPU and I/O Enclosures and Elements

Each system houses two CPU-I/O enclosures. Each enclosure contains a CPU element and an I/O element joined to the same board. You can monitor each CPU element and I/O element separately. ftSMC represents these elements in the following nodes:

- CPU Enclosure - 0 and CPU Enclosure - 1
- I/O Enclosure - 10 and I/O Enclosure - 11

Discussions of CPU enclosures and I/O enclosures apply equally to the correspinding parts of CPU-I/O enclosures, unless otherwise specified.

ftSMC Overview

ftSMC, an MMC snap-in, is the system management tool you use to monitor and control the operation of your system. ftSMC works with ftServer Manager (ftSM) to present a list of the system components in the console tree and properties of the component in the details pane.

ftSM gathers information about the system hardware and software components. ftSMC presents the information that ftSM gathers. ftSM runs only on Express5800/320Ma systems. ftSMC runs on Express5800/320Ma systems and on systems running Windows 2000, Windows Server 2003, or Windows XP.

NOTES

1. Use ftSMC to disable devices. Do not use Windows Device Manager to disable devices except in documented special situations.
2. MMC snap-ins, including ftSMC, do not lock edit sessions to prevent simultaneous users from editing the same parameters.

Running ftSMC

You can run ftSMC:

- Directly on Your Express5800/320Ma system
- On a remote computer
- From a remote computer by accessing your Express5800/320Ma system desktop remotely

Running ftSMC Directly on Your Express5800/320Ma System

Click the **ftServer Management Tools** shortcut on your system’s desktop.

Or, do the following:

1. Click the **Start** button, and then click **Run**.
2. Click **Browse**, navigate to C:\Program Files\Stratus\management, and then click **ftServer.msc**.
3. Click **OK**.

Running ftSMC on a Remote Computer

You can manage your system by running ftSMC on a remote system or on any system running Windows 2000, Windows Server 2003, or Windows XP.

1. Install ftSMC on a supported computer: Use the Remote Management Installation (RMI) procedure described in the *Express5800/320Ma: Software Installation and Configuration Guide*.
2. Add the ftSMC snap-in to MMC, specify a system to manage, and save the console that contains the snap-in.

To manage systems you have added to a console, open a previously saved MMC console that contains ftSMC.

Adding the ftServer Management Console Snap-in to MMC

1. From the **Start** menu of the remote computer, click **Run**, type **mmc** in the **Open** box, and click **OK**.
2. In MMC, click the **Console** menu item, and click **Add/Remove Snap-in**.
3. In the **Add/Remove Snap-in** dialog box, click **Add**.

   The **Add Standalone Snap-in** dialog box appears with a list of snap-ins.

4. Click **ftServer Management Console** and click **Add**.

   The **Connect** dialog box appears.

5. Type the *servername.domainname* or the IP address of the server (for example, usbos01.wtcus.com or 192.168.57.10), and select or clear the **Connect as current user** check box. If you clear the check box, type the user name and password that will be used to make the connection. Click **Finish**.

   NOTES

   1. The user name that you enter must be in the Windows Administrators group for the computer that you want to manage.
   2. You can select any remote Express5800/320Ma 3.2 GHz, 3.6 GHz or Dual-Core system to manage, as long as you have appropriate access to it.

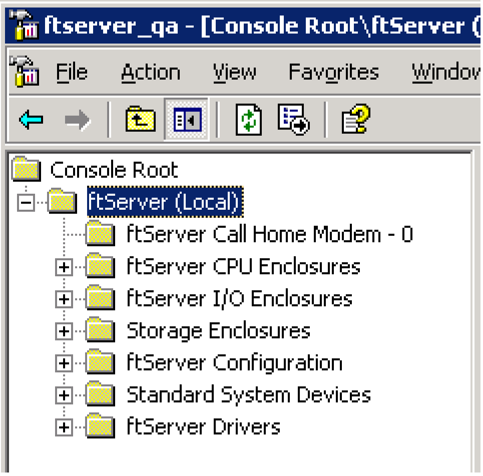
6. Click **Close** in the **Add Standalone Snap-in** dialog box.
7. Click **OK** in the **Add/Remove Snap-in** dialog box.

   The name of the system appears in MMC. The ftSMC snap-in displays information about the system and you can use the ftSMC snap-in to manage the system.

8. Save this console, with ftSMC added, for later use by clicking **Save As** in the **Console** menu. In the **Save As** dialog box, type a file name in the **File Name** box, and click **Save**.

The ftSMC snap-in tree includes an **ftServer Call Home Modem** node (as shown in Figure 3-1), which presents the operational status of the call-home modem.

Figure 3-1. ftSMC Tree



Console Root
ftServer (Local)
ftServer Call Home Modem - 0
ftServer CPU Enclosures
ftServer I/O Enclosures
Storage Enclosures
ftServer Configuration
Standard System Devices
ftServer Drivers

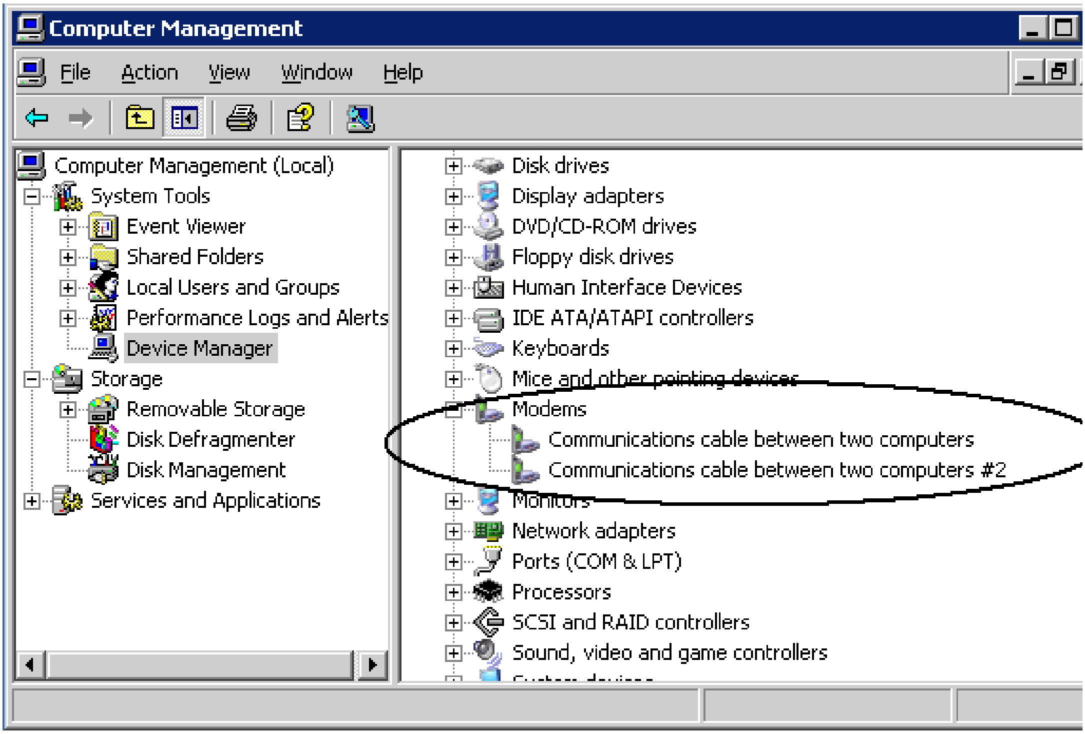
Virtual Modems

The two modems that appear in Windows Device Manager on your Express5800/320Ma system (see Figure 3-2) represent virtual modems that the VTMs use to communicate with the system.

CAUTION

Do not use applications or devices that try to connect to any modem involved in communicating with the ASN, especially on systems that send alarms by phone only.

Figure 3-2. Virtual Modems



Using VTMs to Troubleshoot Systems

Although you may dial in to the VTM to troubleshoot the system, be aware that call-home support and alarm transmission through the ASN modem will be blocked for the duration of the connection.

However, if your system is configured to send alerts by the following options (see “Determining the Value of the Send Alarms By Property” on page 3-6), use of the ASN modem will not block alarms or call-home support, which continue over the Internet:

- **Internet with phone line as backup**
- **Phone line with Internet as backup**
- **Internet only**

See the *Express5800/320Ma ActiveService Network Configuration Guide* for configuration information.

Determining the Value of the Send Alarms By Property

1. In ftSMC, expand **ftServer (Local)** and **ftServer Configuration**.
2. Click **ActiveService Network**.
3. In the details pane, check the value of the Send Alarms By property.

Opening a Previously Saved MMC Console

1. Click **Start**, and then click **Run**.
2. In the **Run** window, type **mmc** in the **Open** box, and then click **OK**.
3. In the **Console** menu, click **Open**, and then click the name of the previously saved MMC console.
4. In the **Connect** dialog box, click **Finish**.

Running ftSMC by Remote Access

You can run ftSMC from a remote computer by accessing a target system's desktop from the remote computer. See "Remote Access to Your System Desktop" on page 2-5 for methods you can use to access the system's desktop remotely. Once you have accessed the system's desktop, perform the procedure described in "Running ftSMC Directly on Your Express5800/320Ma System" on page 3-2 to run ftSMC.

Performing ftSMC Tasks

Detailed instructions for using ftSMC are available in the online Help for ftSMC. Before interacting with ftSMC, observe the following cautions.

⚠ **CAUTION**

Before using ftSMC to interact with the NEC Technical Support, perform the tasks described in the *Express5800/320Ma ActiveService Network Configuration Guide*.

⚠ **CAUTION**

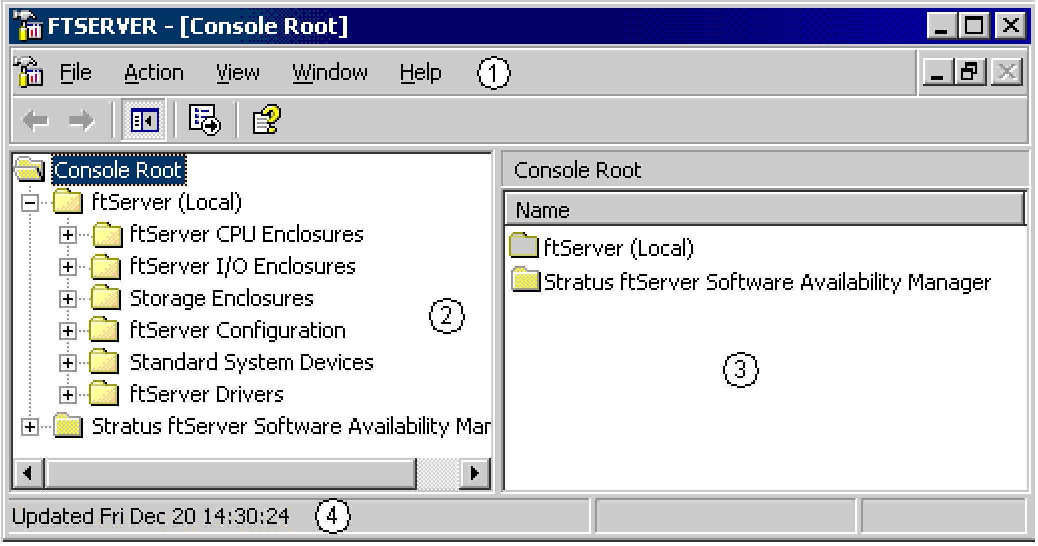
When working in ftSMC, generally do not change the configured values of properties unless directed to do so in documentation or by the NEC Technical Support.

ftSMC Interface

The details pane, the icons used in ftSMC, and the ftSMC display refresh options are features of the ftSMC interface. Figure 3-3 shows the ftSMC user interface.

To expand all nodes, press the asterisk (*) key on the number pad.

Figure 3-3. ftSMC User Interface



Updated Fri Dec 20 14:30:24

Table 3-1 describes the key elements in the ftSMC user interface.

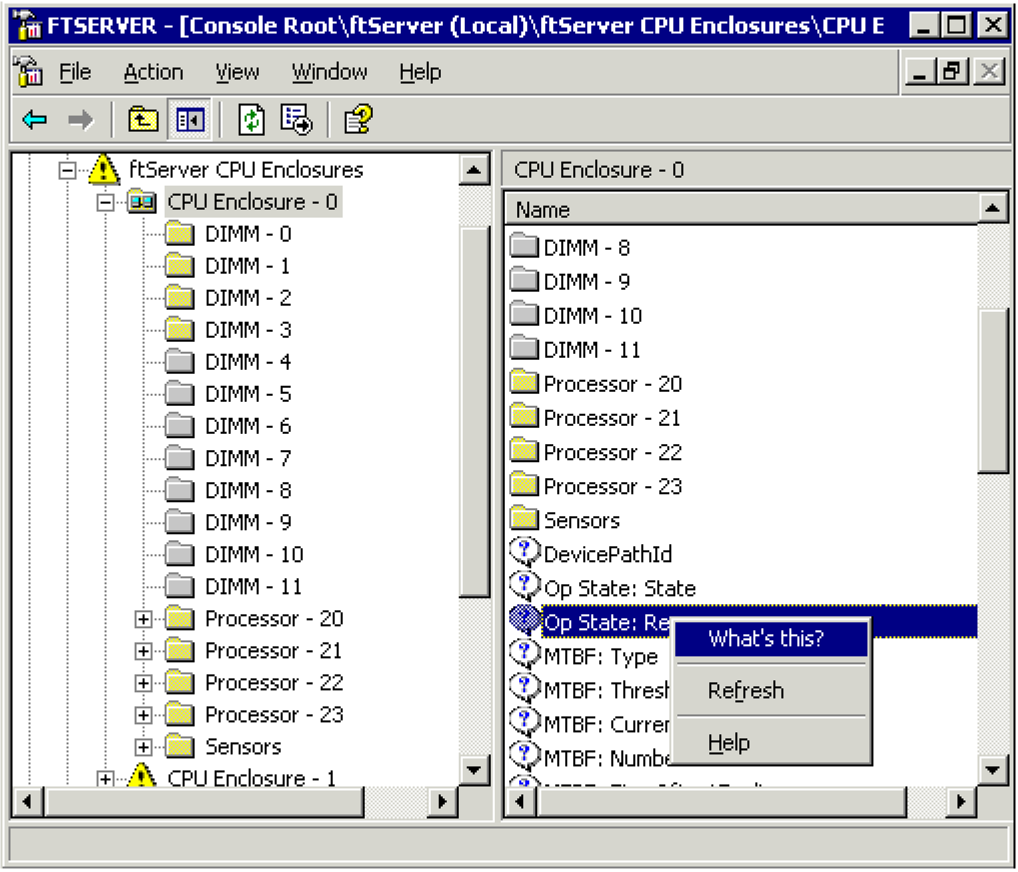
Table 3-1. ftSMC User Interface Key Elements

Item	Description	Function
1	Action band	The Action menu contains MMC snap-in commands. The View menu contains console viewing options.
2	Console tree	Lists all system component nodes. Each node represents a manageable object.
3	Details pane	Displays the properties related to the node selected in the console tree. For an explanation of a property, right-click the property and select **What's this?** from the shortcut menu. (Not all properties have What's this? help.) The *Express5800/320Ma: Technical Reference Guide* includes information about properties.
4	Status bar	Displays ftSMC status messages.

Details Pane

The names and values of the properties of the components in the ftSMC tree are displayed in the details pane. A question mark (**?**) icon in front of a property name indicates that What's this? Help is available. Right-click the property name and click in the shortcut menu that appears. See Figure 3-4.

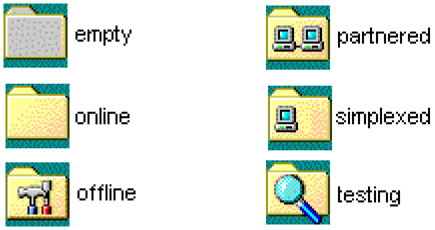
Figure 3-4. Details Pane



Icons Used in ftSMC

Figure 3-5 shows and describes the icons used in the system inventory.

Figure 3-5. System Inventory Icons



- A dimmed folder icon indicates that the node does not contain any information. It is **empty**.
- A plain, yellow folder icon indicates that the node is **online** and contains information or child nodes. This icon indicates online simplex components.
- A tools icon indicates that the node is **offline**, possibly for maintenance.
- A dual-monitor icon indicates that the node is **duplexed** (partnered) with another node (for example, two CPU elements).

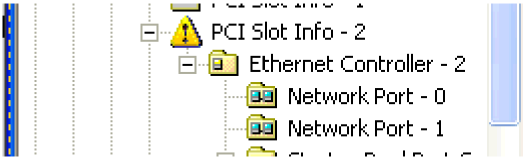
> NOTE
>
> It is safe to remove a duplexed component.

- A magnifying glass icon indicates that the node is offline and undergoing diagnostic **testing**.
- A single-monitor icon indicates that the component is operating **simplexed** (unpartnered).

> NOTE
>
> It is unsafe to remove a simplexed component from the system. Removing a simplexed component causes loss of that component function to the system.

The simplexed icon can also indicate an invalid configuration. For instance, the simplexed icon next to Ethernet Controller - 2, shown in Figure 3-6, indicates that Network Port - 0 and Network Port - 1 beneath the Ethernet Controller - 2 are duplexed, but that Ethernet Controller - 2 is simplexed, which makes it a single point of failure, an illegal configuration.

Figure 3-6. Simplexed Icon for Invalid Configuration



ftSMC displays warning and error icons described in Table 3-2.

Table 3-2. ftSMC Warning and Error Icons

Icon Type	Description	Indication
Warning	Exclamation point inside a yellow triangle	A node whose child node has an error.
Error	White X inside a red circle	The node is offline, in testing, or has failed.
No inventory found	White X inside a gray circle	ftSMC cannot retrieve inventory information for that device. The ftSMC status bar displays a message indicating that the properties cannot be retrieved.
Threshold warning	Exclamation point inside a red triangle	The current reading of a sensor value exceeds the specified threshold. Parent nodes display the yellow warning icon.

Figure 3-7 shows an error icon next to the Ethernet Adapter, indicating an error on that node. Warning icons precede the names of all parent nodes that have nodes with an error.

Figure 3-7. Warning and Error Icons

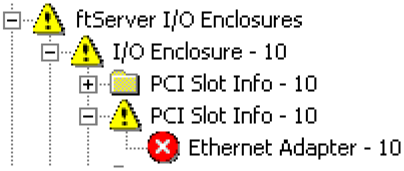
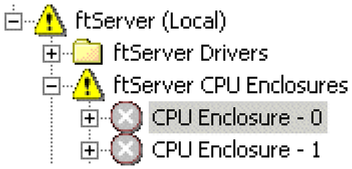


Figure 3-8 shows a “no inventory found” icon next to the CPU Enclosure icons.

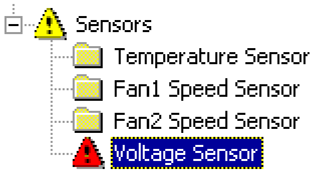
Figure 3-8. Warning and Inventory Error Icons



ftServer (Local)
ftServer Drivers
ftServer CPU Enclosures
CPU Enclosure - 0
CPU Enclosure - 1

Figure 3-9 shows a threshold warning icon at the Voltage Sensor. Its parent nodes display the yellow warning icon.

Figure 3-9. Threshold Warning Icon

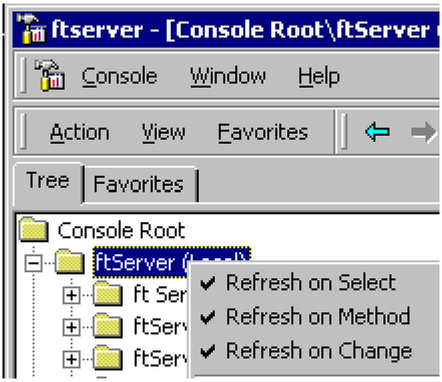


Sensors
Temperature Sensor
Fan1 Speed Sensor
Fan2 Speed Sensor
Voltage Sensor

Refreshing the ftSMC Display

You can right-click the ftServer (Local) root node to enable or disable each of three refresh options. These options cause ftSMC to refresh, or update, the information in the details pane when the specified event occurs. You should enable these options so that the details pane and the node icons update when you complete an action or when a state change occurs. When enabled, a check mark appears in front of the option, as shown in Figure 3-10.

Figure 3-10. ftSMC Details Pane Refresh Options



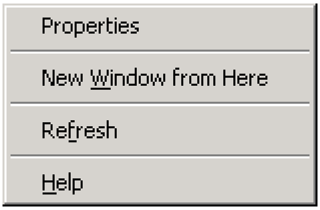
Viewing and Changing Properties

To view the properties of a system inventory component, click the component's node in the console tree. The names and values of that component's properties are displayed in the details pane, as shown in Figure 3-4.

Some components' properties are configurable. Components with configurable properties have a **Properties** command in their shortcut menu. See Figure 3-11.

See the ftSMC online help for details.

Figure 3-11. Properties Command in Shortcut Menu



Required Operational States for Commands

Table 3-3 presents the operational state that a device must be in to carry out the associated command.

Table 3-3. Operational State for Associated Commands

Command	Valid States
CPU Element	
Initiate BringUp	Removed, Broken, Shot, Firmware update complete, Diagnostics passed.
Initiate BringDown	Broken, Firmware update complete, Diagnostics passed, Duplex.
Initiate Diagnostics	Removed, Broken, Firmware update complete, Diagnostics passed.
Set Priority	CPU element must be online and duplexed.
I/O Element	
Initiate BringUp	Removed, Broken, Shot, Diagnostics passed.
Initiate BringDown	Broken, Diagnostics passed, Duplex.
Initiate Diagnostics	Removed, Broken, Diagnostics passed.

Chapter 4
Disk Storage Management

The following disk-management topics apply to your Express5800/320Ma system:

Data Fault Tolerance

Your Express5800/320Ma system offers two methods of ensuring data fault tolerance and continuous availability of its disk media:

- Rapid Disk Resync (RDR), a disk-replicating technology, is supported only on the internal disk drives.

To create striped volumes across the mirrored internal disks, refer to the documentation for your disk-management tool.

You choose to implement RDR, for internal disk drives, or volume-mirroring, for all disks, during the software installation and configuration procedure. However, you can upgrade your disks to RDR after software installation.

NOTE

Create a backup of the system disk with which to restart the system in the unlikely event of a system failure. See the *Express5800/320Ma: Software Installation and Configuration Guide*.

Guidelines for System Disks

Observe the following guidelines when configuring the system disks.

- On the system disk, the IPL procedure creates a boot partition, which contains the operating system and all of its components.
- You can greatly reduce application downtime when you upgrade software by installing and using the optional Active Upgrade software. If you do plan to install and use Active Upgrade software, be sure to keep system files on a separate disk from data files. See the *Express5800/320Ma: Active Upgrade User's Guide* for more information.

Using RDR for Fault Tolerance

Use RDR disk mirroring to configure and create managed disks in the internal storage. With RDR disk mirroring, you can mirror pairs of physical disks to create *RDR virtual disks*. Each pair of mirrored disks constitutes one RDR virtual disk. RDR offers faster resynchronization of mirrored disks than other mirroring methods after transient failures or when a single disk is briefly removed from service.

NOTE

In RDR terminology, an individual physical disk is also called a *plex*, and an RDR virtual disk is also called a *LUN*, for *logical unit*.

The data on one disk of the RDR virtual disk pair is replicated in full—that is, *mirrored* or *duplex*—on its corresponding partner disk, irrespective of volume or partition layout.

However, an RDR virtual disk may also be *simplex*; that is, consisting of only one physical disk. A simplex RDR virtual disk may contain mirrored volumes created using third-party disk management facilities. If all volumes on a simplex RDR disk are mirrored with other disks in the system, then the simplex RDR disk is effectively duplex (mirrored).

If you are upgrading a system's internal disks from a non-RDR to an RDR configuration, the existing internal disks must provide adequate space for metadata. *Metadata* is “data about data” that the RDR software stores on disks to implement disk management. When you configure a disk for RDR, the system displays an error message if the disk does not have adequate space. The disk being upgraded should be a basic disk.

Use RDR to mirror internal disks. To create large striped volumes, use your disk-management tool to create striped volumes across the mirrored internal disks.

Automatic Virtual Disk Expansion

An RDR virtual disk includes an automatic disk-capacity expansion feature. If you replace the physical disks (plexes) of an RDR virtual disk with larger physical disks, RDR automatically recognizes the resulting larger virtual disk, which enables the system to use the added disk capacity.

Note, however, that a virtual disk cannot be larger than the smaller of its two physical disks.

For example, if each physical disk of an RDR virtual disk is 80 gigabytes (GB), the virtual disk is an 80-GB virtual disk. If you replace one 80-GB physical disk with a 160-GB physical disk, the virtual disk remains an 80-GB disk, the smaller of the two physical disks. But if you replace the other 80-GB physical disk with another 160-GB physical disk, the RDR virtual disk automatically updates to 160 GB.

ftSMC reports the capacity of physical disks and virtual disks in the Capacity property in two different locations:

- The physical disk Capacity property appears in the ftSMC details pane under **I/O Enclosure - 10**, **Storage Enclosure - 40**, **Slot - *n***, **Disk - *n***.
- The virtual disk Capacity property appears in the ftSMC details pane under **Logical Disk Information**, **RDR Virtual Disk - *n***. The virtual disk value is slightly lower than the physical disk value because the virtual disk value is reduced by the space reserved for metadata.

NOTE

Automatic virtual disk expansion does not work on dynamic virtual disks; that is, RDR virtual disks that have been converted to dynamic disks by Windows Disk Management

Managing RDR Disks

Managing RDR-configured disks can include any of the following tasks:

- Using RDR to mirror disks in internal storage
- Enabling write caching and read-load balancing
- Setting the active RDR disk (plex)
- Deleting RDR configuration on a physical disk
- Removing a physical disk from and RDR virtual disk
- Deporting a physical disk from an RDR virtual disk
- Creating a Spare Bootable RDR Disk
- Breaking a Physical Disk from an RDR Virtual Disk
- Converting disks from dynamic to basic
- Setting or clearing the mean-time between failure (MTBF) threshold
- Resynchronizing a physical disk from the RDR virtual disk
- Setting the MTBF faultcount limit
- Making a backup of a boot disk
- Booting with a backup disk

- Reusing dynamic disks
- Recovering a disk
- Verifying disk integrity
- Prioritizing resynchronization

To use RDR to mirror dynamic disks, see the *Express5800/320Ma: Software Installation and Configuration Guide*.

You can also set disk parameters from the **SCSI Port Duplex Driver - Sradisk_Driver** node shortcut menu in the ftSMC.

Notes on Using RDR to Mirror Disks in Internal Storage

The procedure used to mirror disks with RDR is the same used to upgrade a disk to RDR. If you are upgrading disks to use RDR, be sure that the disks are basic disks. If the disks have been configured as dynamic disks, convert the disks to basic disks before upgrading them to RDR.

Although you can only create RDR disks from basic disks, you can make RDR disks dynamic if your policies require it.

If you insert a non-RDR-configured disk into a slot whose partner slot is occupied by an RDR virtual disk, the system automatically adds the inserted disk to the RDR virtual disk.

Not all RDR commands and procedures are valid on all physical disks. Error messages appear if you attempt an invalid RDR command. Error messages also suggest possible corrective actions, where applicable.

Some RDR configuration changes, especially those made on simplex RDR virtual disks, may require the operating system to restart, in order to complete. When the Windows restart warning appears, you can restart the system immediately or defer restart until a more convenient time.

An RDR disk is brought online as Unconfigured if you insert it into a slot whose companion slot contains an RDR configured disk that is not the inserted disk’s partner. An RDR disk is brought online normally if you insert it into a slot whose companion slot either is empty or contains an unconfigured disk.

Disk Failures during Resynchronization

In RDR resynchronization, the partnered RDR virtual disks relate as *source* and *target* disks. The source is the disk from which the target disk is being resynchronized.

If a source disk fails or is removed from service during resynchronization, the target disk is removed from the system and treated as a deported disk. If the target disk fails or is removed from service during resynchronization, the source disk continues operating in simplex mode.

If the system starts to shut down while an RDR virtual disk is resynchronizing, RDR records the state of the resynchronization and, upon system reboot, resumes resynchronization from that point.

Write Caching

To optimize system performance, you can enable write caching on RDR virtual disks. By default, write caching is disabled, except during disk resynchronization, when it is automatically enabled.

Write caching does not work on a simplex RDR virtual disk (except when it is resynchronizing), even if it is enabled. However, if you enable write caching on a simplex disk that is later duplexed, write caching will work.

To enable write caching

1. Right-click **My Computer** on the desktop, select **Manage**, select **Device Manager**, and then expand **Disk Drives**.
2. Select the target disk, select **Properties**, and click the **Policies** tab.
3. Check **Enable write caching on the disk**, and click **OK**.

Read-load Balancing

When you enable read-load balancing, read operations on duplex RDR virtual disks alternate between the two physical disks, which improves performance. By default, read-load balancing is enabled on all RDR physical disks.

You can enable or disable read-load balancing either for each physical disk or globally, for all RDR physical disks across the system.

To enable or disable read-load balancing for a single physical disk

1. In ftSMC, expand **ftServer I/O Enclosures** and **Logical Disk Information**.
2. Right-click the target **RDR Virtual Disk**.
3. Select **Set Rdr Lun Load Balancing**.
4. In the dialog box, set the **Rdr Lun Load Balancing** field to **On** or **Off**, and click **Finish**.

NOTE

Global read-load balancing settings do not overwrite read-load balancing settings on individual RDR physical disks.

To enable or disable read-load balancing globally

1. In ftSMC, expand **ftServer Drivers**, right-click **SCSI Port Duplex Driver - Sradisk_Driver**, and select **Properties**.
2. On the dialog box, click the right-most **Properties** tab.
3. In the **GlobalRdrPlexLoadBalancing** field, select **On** or **Off**, and click **OK**.

> NOTE
>
> Global settings do not overwrite settings made on individual RDR physical disks.

To add a physical disk to an RDR virtual disk

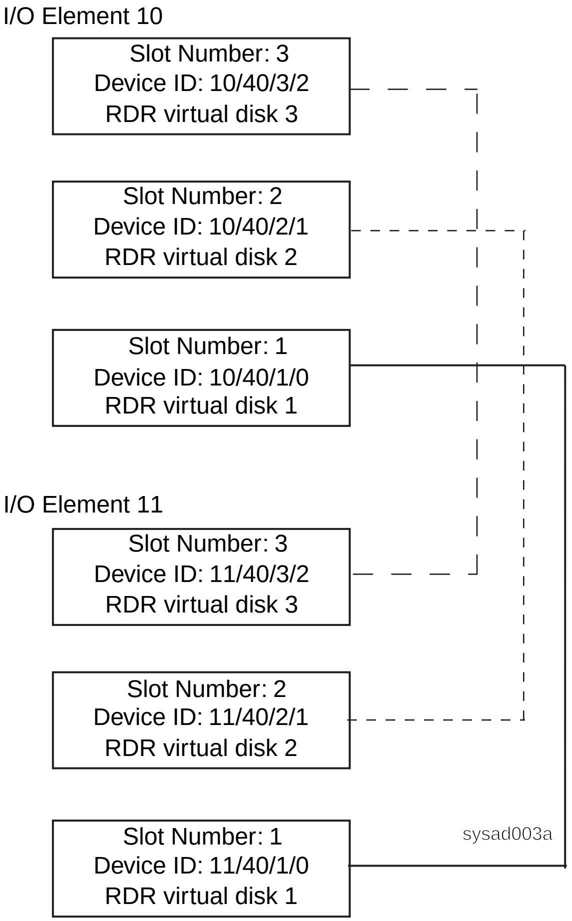
1. Insert and latch disks (see Figure 4-1) into corresponding slots in the enclosures. (See “Finding a Physical Disk” on page 4-25 for an explanation of the numeric values in the figures.)

In your Express5800/320Ma system, the internal storage disks are numbered 3-2-1 from top to bottom in a rack-mounted system. See Table 4-1 and Figure 4-1.

Table 4-1. RDR Disk Numbering

ftSMC Console Pane Node	ftSMC Details Pane ObjectName Property	Location in System
Storage Enclosure - 40		
Slot-1, Disk-0	Harddisk0	Bottom disk drive
Slot-2, Disk-1	Harddisk1	Middle disk drive
Slot-3, Disk-2	Harddisk2	Top disk drive
Logical Disk Information		
RDR Virtual Disk 1	Harddisk0	Bottom disk drive
RDR Virtual Disk 2	Harddisk1	Middle disk drive
RDR Virtual Disk 3	Harddisk2	Top disk drive

Figure 4-1. Mirroring RDR Virtual Disks



2. Double-click **ftServer Management Tools** on the Windows desktop to start ftSMC.
3. In ftSMC, select the target disk in I/O element 10.

   For example, expand **ftServer I/O Enclosures**, **I/O Enclosure - 10**, **Storage Enclosure - 40**, **Slot - 1**, and then click **Disk - 0**.

4. Right-click the target disk, and click **Add Physical Disk To RDR Virtual Disk**.

NOTE

If you receive an error message when using the **Add Physical Disk To RDR Virtual Disk** command, the disk you are trying to add may not have sufficient free space for the metadata. Be sure the disk has a minimum of 10MB free space.

A **System Shutdown** message may appear, stating that the system will reboot in two minutes. If the message appears, let the system restart.

NOTES

1. If you have added a system disk to an RDR virtual disk, a message notifies you that the system will reboot. The message gives you the option of confirming or cancelling the request. The system also restarts if you add a data disk to an RDR virtual disk and the software cannot unmount all data volumes on the disk.
2. You cannot add a physical disk to RDR if the disk is dynamic or a nonblank data disk.

5. In the **Device Configuration Change** dialog box, click **Yes**.
6. Repeat steps 3–5 for the corresponding disk in I/O element 11.

   For example, expand **ftServer I/O Enclosures**, **I/O Enclosure - 11**, **Storage Enclosure - 40**, **Slot - 1**, and then click **Disk - 0**.

7. Allow time for the two disks to synchronize.
   - While the disks are resynchronizing, LEDs blink to indicate read and write operations and ftSMC displays a value of OpState: State Syncing in the details pane for the disk.

     To view the progress of the synchronization in ftSMC, expand **Logical Disk Information** under **ftServer I/O Enclosures**, and select the virtual disk (for example, **RDR Virtual Disk 1)**. In the details pane, the progress is noted as a percentage, as follows:

     ```
     Status: Resync: 20 percent
     ```

     When the disks are synchronized, the LEDs on both disks are lit steady green and ftSMC displays a value of OpState: State: Duplex in the details pane for the disk and for the virtual disk. The value next to Status for the virtual disk is None.

8. For each additional virtual disk to be created, repeat steps 3–7, mirroring:

   - The disk in slot 2 of I/O element 10 with the disk in slot 2 of I/O element 11 to create virtual disk 2
   - The disk in slot 3 of I/O element 10 with the disk in slot 3 of I/O element 11 to create virtual disk 3

Mirroring Dynamic Disks with RDR

This procedure turns dynamic disks into basic disks before mirroring them with RDR. To use RDR to mirror dynamic disks themselves, see Chapter 3 in the *Express5800/320Ma: Software Installation and Configuration Guide*.

Mirroring a dynamic disk with RDR involves two steps:

- Converting the disk to basic
- Upgrading the disk to RDR

Converting a Dynamic Disk to a Basic Disk

⚠ CAUTION

> Converting a dynamic disk to a basic disk removes all data from the disk. So that you can recover the data, back it up to backup media before you convert the disk to a basic disk.

1. Right-click **My Computer**, and click **Manage**.
2. Expand **Computer Management** and **Storage**.
3. Click **Disk Management.**
4. Right-click the icon of the target disk in the lower portion of the Disk Management details pane.
5. Select **Convert to Basic Disk**.
6. If necessary, recover the information from backup media.

To upgrade the basic disks to RDR, see “Notes on Using RDR to Mirror Disks in Internal Storage” on page 4-5.

Setting the Active RDR Disk (Plex)

The **Set As Active RDR Plex** command makes the physical disk on which this command is issued the "active" disk. The active disk is the disk:

- From which data is read
- From which a partner disk is resynchronized

- That survives a failover (the failure of one of two, duplex components)
- To which the data traffic goes when disk utilities, like **chkdsk**, are run

You might use **Set As Active RDR Plex**, for example, when using the **chkdsk** command to check the performance of a particular physical disk in an RDR virtual disk. To do this, issue the **Set As Active RDR Plex** command for the physical disk you want to check; this makes it the active disk. Then disable read-load balancing on the RDR virtual disk, and run **chkdsk** on the active disk.

In the following procedure, ***n*** indicates a component number that appears in ftSMC.

1. In ftSMC, expand **I/O Enclosure - 10** (or **11**) , **Storage Enclosure**, **Slot - *n***, and then right-click on **Disk - *n***.
2. Select **Set As Active RDR Plex**.

A message reports that the operation was successful.

Deleting the RDR Configuration on a Physical Disk

Deleting the RDR configuration removes a physical disk from the RDR virtual disk. You delete one physical disk at a time.

After you delete the RDR configuration on a physical disk:

- The RDR metadata is deleted, but other data remains on the disk.
- The disk is no longer an RDR disk and is not part of an RDR virtual disk.
- You can reconfigure the disk as an RDR disk again, using the **Add Physical Disk To RDR Virtual Disk** command.

You can delete the RDR configuration only from basic data disks, not from dynamic disks, boot disks, or data disks with one or more paging files.

To delete the RDR configuration on a physical disk

1. In ftSMC, right-click the target disk.
2. Select **Delete RDR Configuration on Physical Disk** for disk 0 (or 1 or 2).
3. Optionally, repeat steps 1 and 2 on the disk with which the deleted disk was mirrored.

   When the second of the mirrored disks is removed from the RDR virtual disk, the RDR virtual disk is removed.

4. If desired, repeat steps 1–3 for each physical disk to be removed.

NOTE

Disregard any “Unsafe Removal of Device” messages that appear when you remove an internal physical disk from the enclosure.

Removing a Physical Disk from an RDR Virtual Disk

⚠ **CAUTION**

Removing a physical disk from an RDR virtual disk deletes all of the data from the target disk.

Executing the **Remove a Physical Disk from RDR Virtual Disk** command on a partnered (duplex) RDR virtual disk (comprising two physical disks):

- Erases all of the data on the disk, including all Windows Disk Management , and all RDR metadata.
- Returns the physical disk to a basic, non-RDR-configured, blank disk.

The system does not warn you when you issue this command because the target disk has a surviving partner physical disk that still contains all of the data. For that reason, the system does not need to restart.

If you execute the **Remove a Physical Disk from RDR Virtual Disk** command on an unpartnered (simplex) RDR virtual disk (comprising one physical disk), the system prompts you to remove all partition and volume data on the disk before the command can continue. The prompt alerts you that this operation may result in the loss of all data on this virtual disk since there is only one physical disk.

You cannot remove:

- The only unmirrored boot disk
- The only unmirrored disk containing a paging file
- An unmirrored disk containing data
- A resynchronizing disk

To remove a physical disk from an RDR virtual disk

1. In ftSMC, right-click the target disk.
2. Select **Remove Physical Disk from RDR Virtual Disk**.

Deporting a Physical Disk from an RDR Virtual Disk

Deporting a physical disk from an RDR virtual disk makes the deported disk a clone of its RDR virtual disk partner. You use the **Deport Physical Disk from RDR Virtual Disk** command to create backup disks and spare, bootable, RDR virtual disks.

Once a disk is deported, it is hidden from the system and is inaccessible from ftSMC. It does not become accessible again until it is removed from and reinserted into the system. You can physically remove and then reinsert the disk, or you can issue the **InitiateBringdown** and **InitiateBringup** commands for the disk slot.

If you insert a disk deported from one system into another system, the disk appears in ftSMC as *Active*, *Configured*, *Deported*.

A deported disk inadvertently left in the system or reinserted into its original slot remains an intact backup. It is not automatically resynchronized or overwritten by the primary RDR virtual disk.

You cannot deport:

- The last physical disk of an RDR virtual disk if it is bootable or contains a paging file
- An unmirrored boot disk
- A dynamic disk
- A resynchronizing disk

The Deport a Physical Disk from an RDR Virtual Disk command should be grayed out if the physical disk is not in the valid state (for example, if it is a dynamic disk or a simplex boot disk) for this command to work properly. A valid deport operation should rarely fail.

If the Deport a Physical Disk from an RDR Virtual Disk operation requires that the system reboot, a system-restart dialog box appears, giving you the option to restart the system immediately or later. If the operation succeeds without requiring a reboot, a message box indicating success appears.

If Deport a Physical Disk from an RDR Virtual Disk fails, a dialog box indicating the reason for the failure appears. In this case, the RDR virtual disk is not deported and the system does not reboot.

After a successful Deport a Physical Disk from an RDR Virtual Disk command, no drive letters or mount points associated with volumes on the deported disk are preserved.

To deport a physical disk from an RDR virtual disk

1. In ftSMC, right-click the target disk.
2. Select **Deport Physical Disk from RDR Virtual Disk**.

A message reports that you may have to reboot the system if you continue with this command. You must restart only if the deport command fails. If it succeeds, a message reports the successful operation.

3. Click **OK**.

   A message appears, telling you to remove the deported disk.

4. Remove the deported disk.

The deported disk disappears from ftSMC.

Creating a Spare Bootable RDR Disk

1. Be sure that the system (boot) disk is mirrored.
2. Deport the disk that is the mirror of the system disk.
3. Physically remove the deported disk from the system.

   Label and store this disk, which is now the spare bootable hard disk, in a safe place.

⚠ CAUTION

If the original boot disk is still in a system into which you insert a spare (deported) boot disk, the original boot disk loses its RDR configuration and is no longer an RDR-enabled disk.

For more details, see the discussion of creating a spare bootable disk in the *Express5800/320Ma: Software Installation and Configuration Guide*.

Breaking a Physical Disk from an RDR Virtual Disk

The following procedure isolates an RDR virtual disk plex for backup, backs up the volumes, and then resynchronizes the broken plex with its original partner, adding it back to the RDR virtual disk.

You cannot perform this procedure on:

- dynamic disks
- simplex RDR virtual disks
- RDR virtual disks while they are resynchronizing
- RDR virtual disks if their verify interval is set to 0; that is, if RDR verify is disabled.

1. Verify the RDR virtual disk that you are going to backup to ensure that both plexes of the RDR virtual disk are healthy.
2. In ftSMC, expand **I/O Enclosure**, **Storage Enclosure**, and then select Slot 1, 2, or 3 to access Disk 0, 1, or 2.
3. Right click on the target disk and select **Break Physical Disk from RDR Virtual Disk**.

   This command splits the plex from the RDR virtual disk, creates an exact copy of its volumes, and adds them to Disk Management.

4. Use backup software to make a copy of these volumes created in Disk Management; then remove the volumes from Disk Management.
5. To add the removed plex back to the RDR virtual disk, in ftSMC, right-click the disk you broke in step 2, and select **Add Physical Disk to RDR Virtual Disk**.

   The plex is now synchronized with its active partner and is again a partner in an RDR virtual disk.

Setting or Clearing the MTBF for Disks

Clearing the MTBF resets the MTBF to infinity, the number of faults to 0, and the time of last fault to never.

Setting the MTBF Threshold sets the MTBF threshold and views the current count (seconds), number of faults, and date and time of last fault. NEC Solutions (America), Inc. presets the MTBF threshold; you should not change it unless instructed to do so by your support representative.

See “MTBF Statistics” on page 5-1 for an explanation of MTBF.

To set or clear the MTBF for disks

1. In ftSMC, right-click the target disk.
2. Select either **Set MTBF Threshold** or **Clear MTBF.**

   - If you select **Set MTBF Threshold**, specify the desired threshold value in the **Threshold** field of the dialog box that appears, and then click **Finish.**

     A message appears, indicating a successful operation.

   - If you select **Clear MTBF**, the MTBF is cleared and a message appears, indicating a successful operation.

Setting the MTBF Faultcount Limit for Disks

The MTBF faultcount limit defines the number of times certain errors can occur before the system sends threshold events that generate alarms.

! CAUTION

Do not change the MTBF faultcount limit value, except when advised to by NEC Technical Support.

1. In ftSMC, right-click the target disk.
2. Select **Set MTBF Faultcount Limit**.
3. In the dialog box, enter the desired limit value and click **Finish**.

   A message appears, indicating a successful operation.

Booting a System with a Backup RDR Boot Disk

1. Remove power from the system.
2. Remove all boot disks from the internal storage enclosure, if any are installed.
3. Insert the backup boot disk.
4. Press the system power button.

Reusing Data Disks

If you have stored a copy of a data disk that was created with RDR disk mirroring, use the following procedures to reuse the disk in the system.

Reusing a Stored-Data Disk

After you perform this procedure:

- The data on the stored-data disk is overwritten with the data on the disk in its companion slot.
- The stored-data disk remains an RDR disk.

To reuse a stored-data disk

1. Make sure the original partner of the stored disk is in the companion slot.
2. Insert the stored disk into its original slot. The system automatically resynchronizes the stored disk with the partner disk.

Wait for the disk to be fully resynchronized before removing the stored disk or before removing power from the system.

Removing the RDR Configuration from a Stored-Data Disk

This procedure removes the RDR configuration from a stored-data disk and deletes all of its data.

NOTE

To delete the RDR configuration from a stored-data disk but retains its data, see "Deleting the RDR Configuration on a Physical Disk" on page 4-11.

1. Make sure no disk occupies the slot that is the partner slot to the disk whose RDR configuration you are removing.
2. *If your disk was a dynamic disk*, use your disk-management tool to convert the disk to basic, deleting all data on the disk.

   If your disk was a basic disk, use your disk-management tool to delete all volumes and partitions.

3. In ftSMC, select and right-click the disk, and click **Remove Physical Disk From RDR Virtual Disk**.

⚠ CAUTION

You must complete the final step. Otherwise, if the former RDR virtual disk partner of the newly erased disk is inserted into the partner slot of the erased (but not deleted) disk, the newly inserted disk is mirrored to the empty disk, deleting the data on the newly inserted disk.

Resynchronizing RDR Disks

The system automatically resynchronizes disks that are reinserted into the system and when I/O elements are returned to service. You can also issue a command to resynchronize a disk with its partner from the ftSMC.

When RDR disks are resynchronizing, the Logical to Physical Mapping details pane shows the disk that is resynchronizing as *`SYNCING`*, and shows the partner disk as *`SIMPLEX`*.

NOTE

If you insert a blank disk into the companion slot of an RDR virtual disk, the blank disk is automatically configured and synchronized to the existing RDR disk.

To resynchronize RDR data disks

1. In ftSMC, under the Logical Disk Information icon, right-click the target RDR virtual disk; that is, the disk that might not be synchronized with its mirror disk.

2. Select **Resynchronize This Physical Disk From RDR Virtual Disk**.

   A message appears, indicating a successful start of the command. See step 7 in "Read-load Balancing" on page 4-7 for a description of how to verify completion of the resynchronization process.

See "Disk Failures during Resynchronization" on page 4-5 for instructions on what to do if the source RDR virtual disk fails during resynchronization.

Resynchronizing a Backup Boot RDR Disk

1. Verify that the original partner disk of the backup boot disk is inserted into its original slot in the storage enclosure.
2. Reinsert the backup boot disk into its original slot in the storage enclosure.

   The backup boot disk automatically resynchronizes with the original partner. The command takes some time to run. See step 7 in "Read-load Balancing" on page 4-7 for a description of how to verify completion of the resynchronization process.

Recovering and Replacing RDR Disks

In your disk-management tool, if the status of an RDR disk appears as **Offline**, **Missing**, or **Online (Errors)**, you can try to recover the disk manually. Verify that the disk is securely seated in the enclosure and that it has power. Perform the following procedures to recover the disk.

To recover an RDR disk

1. Delete the RDR configuration on the disk, and then physically remove it from the enclosure.

   > NOTE
   >
   > Disregard any "Unsafe Removal of Device" messages that appear when you remove an internal physical disk from the enclosure.

2. Replace the defective disk and add the disk to an RDR virtual disk.

In the unlikely event of a system failure resulting from disk failures, restore the system by performing one of the following procedures, as appropriate:

- Restore the system by using a backup system disk. See the discussion of creating spare bootable hard disks in the *Express5800/320Ma: Software Installation and Configuration Guide* for information.
- Reload the Express5800/320Ma System software, as described in the *Express5800/320Ma: Software Installation and Configuration Guide*.

To replace a failed physical RDR disk

1. Remove the failed disk.
2. Insert a blank replacement disk.

Verifying RDR Disks

RDR disk verification verifies the integrity of RDR disk mirrors. Specifically, it:

1. Reads all sectors on both disks. If it detects a read error, it recovers the degraded sector from the good partner disk. This safeguards the integrity of both disks.
2. Compares the data from each sector on both disks. If it detects a discrepancy, it logs an error to the event log. In the unlikely event that this happens, contact NEC Technical Support or your authorized service representative, or log an issue under their maintenance contract.

To verify an RDR disk

1. In ftSMC, expand **ftServer I/O Enclosures** and click **Logical Disk Information**.
2. Right-click the appropriate RDR virtual disk.
3. Select **Verify RDR Virtual Disk**.

A message appears, stating that the operation completed successfully, meaning that the command has been executed.

To stop verifying an RDR disk

Use the following procedure to stop RDR verification.

1. In ftSMC, expand **ftServer I/O Enclosures** and click **Logical Disk Information**.
2. Right-click the appropriate RDR virtual disk.
3. Select **Stop Verify RDR Virtual Disk**.

A message appears, stating that the operation completed successfully, meaning that the command has been executed.

To set the interval for automatic RDR disk verification

1. In ftSMC, expand **ftServer Drivers**, right-click **SCSI Port Duplex Driver - Sradisk_Driver**, and select **Properties**.
2. In the dialog box, click the third **Properties** tab from the left.
3. Set the **LunVerifyInterval** property to the desired value and click **OK**.

   The default value is 10080 minutes (7 days), meaning 10080 minutes from the time of the last verification command. The nonzero minimum value cannot be less than 60 minutes. A value of 0 disables automatic RDR disk verification.

Configuring the Priority of RDR Virtual Disk Resynchronization

The resynchronization priority establishes the portion, expressed in megabytes per second (Mbps) in the details pane, of I/O bandwidth that is used for the RDR disk resynchronization operation.

To prioritize resynchronization for all RDR disks in the system

1. In ftSMC, expand **ftServer Drivers**, right-click **SCSI Port Duplex Driver - Sradisk_Driver**, and select **Properties**.
2. In the dialog box, click the third **Properties** tab from the left.
3. Set **GlobalResyncPriority** to **Low**, **Normal**, or **High** and click **OK**.

To prioritize resynchronization for individual RDR disks

1. In ftSMC, expand the appropriate I/O Enclosure node and click **Logical Disk Information**.
2. Right-click the target RDR virtual disk.
3. Select **Set Resync Priority**.
4. Select **Low**, **Medium**, or **Normal** and click **OK**.

Using Volume Mirroring for Fault Tolerance

When using Windows Disk Management to implement data fault tolerance, format volumes as NTFS volumes.

- Configure disks as *dynamic* disks. Dynamic disks organize data within volumes on a disk and support fault-tolerant operation and disk migration between systems.
- Mirror each volume (the boot volume on the system disk and all data volumes) on two or more physical disks. See “Mirroring Disks in Your Express5800/320Ma System” on page 4-24 for details.
- Assign system disks and data disks to the same disk group.

⚠ CAUTION

Failure to set up your disk storage as required results in storage that is not fault tolerant.

System disk usage topics include mirroring disks, mirror resynchronization, and information about inserting more than one disk at time.

A *mirror* is an identical copy of data that you can access if your primary data becomes unavailable. NEC Solutions (America), Inc. requires that you mirror the boot volume on the system disk. The resulting mirrored pair of disks work together to provide a fault-tolerant volume. If one disk fails, the volume automatically uses the data from the other disk.

Mirror all data volumes. Mirroring volumes as documented provides fault tolerance, because volumes are mirrored on separate physical disks on separate FC buses.

When mirroring volumes, pair identical physical disks (same capacity, model, and manufacturer) so that in the event of a disk failure, an entire physical disk can be replaced without any data loss. See “Mirroring Disks in Your Express5800/320Ma System” on page 4-24 for details.

Mirrored Volume Resynchronization

When a volume is mirrored across two physical disks, and one of the disks fails or is brought offline for any reason, the remaining good disk continues to operate. However, the data on the mirrored volumes is no longer synchronized.

After a disk is replaced or brought back online, the mirror between it and the disk that remained in operation must be resynchronized. During resynchronization, the system copies the format and the contents of the good mirrored volume(s) to their mirror(s) on the disk most recently brought back online.

> NOTE
>
> Because mirror resynchronization can severely affect performance, you should resynchronize mirrors when the system is least busy.

Mirror resynchronization can occur automatically, or, in some cases, you must resynchronize the mirror manually:

- If you insert a replacement disk without a disk signature into the same slot as the failed disk, the system automatically attempts to resynchronize the disk.
- If you replace a failed disk with a blank basic or dynamic disk that contains a signature, you must resynchronize the disks manually.
- The system automatically attempts to resynchronize the disks if:
  - An I/O element is removed and inserted.
  - An I/O element goes offline and returns online.

Volume Resynchronization After Rebooting

After rebooting the system, and depending on the circumstances under which the system was shut down, you may need to explicitly reactivate a failed mirrored partner to resynchronize a volume.

For example, if the system was shut down normally, but it was shut down while synchronization was in progress, you need to explicitly reactivate the mirror. On the other hand, if the system shutdown was due to an unexpected event like a power failure, the disks begin the remirroring process automatically after booting.

NOTE

Before mirroring system disks with a disk management tool (such as Windows Disk Management, make sure either that both disks are plexes of an RDR virtual disk or that neither disk is. Do not partner RDR and non-RDR system disks in a mirror. Otherwise, the disks will fully resynchronize after every reboot.

The boot disks do not require resynchronization if the RDR disk is the primary boot volume from which the system is booted.

Inserting or Removing More Than One Disk at a Time

You may remove disks from or insert disks into the internal storage as needed.

ftSMC Interface for Storage Enclosures and Subsystems

The **Storage Enclosure** node represents the internal storage subsystem and the EMC® attached storage systems are not directly represented in ftSMC. The Fibre Channel Controller node represents the adapter associated with an attached EMC storage subsystem.

Storage Enclosure Node

The **Storage Enclosure** node contains some or all of the following nodes:

- Slot
- Disk
- Sensors
- Module

Slot Node

The **Slot** node represents the slots where disks reside. System disks must reside in certain slots (see "Mirroring Disks in Your Express5800/320Ma System" on page 4-24 for details).

> NOTE
>
> In ftSMC, the storage **Slot** nodes display the **Start Slot Identification** and **Stop Slot Identification** commands. Although these commands appear in the context menu for slots in internal storage, the driver for those slots does not support them.

Disk Node

Each **Disk** node represents a hard disk that resides in a slot in a storage enclosure. You use the DevicePathID property to locate a physical disk. See "Finding a Physical Disk" on page 4-25 for details.

Sensor Nodes

The **Sensor Node** include the following subnodes:

- **Temperature** sensors monitor the ambient temperature within the enclosures.
- **Fan Speed** sensors monitor the rotational speed of the fans within the enclosures.
- **Voltage** sensors monitor the voltage level of power within the enclosures.

> ⚠ CAUTION
>
> NEC Solutions (America), Inc. presets the configurable threshold property values of these sensors. Do not change them unless instructed to do so by the NEC Technical Support.

EMC Attached Storage

If an optional EMC CLARiiON®, EMC Symmetrix®, or EMC CLARiiON AX100 Storage System is installed in your system, **Fibre Channel Controller** nodes will appear beneath the **PCI Slot Info** nodes in which the adapters are installed.

NOTE

System disks cannot reside in an EMC attached storage system. See "Mirroring Disks in Your Express5800/320Ma System" on page 4-24 for details.

The values that the Op State: State and Op State: Reason properties can take vary depending on whether EMC PowerPath® software is running. See Table 4-2 for details.

Table 4-2. FC Host Bus Adapter State and Reason Property Values

	Op State: State	**Op State: Reason**
With PowerPath software running	Simplex	None
	Duplex	None
	Broken	Media Disconnect
	Broken	None
Without PowerPath software running	Online	None
	Broken	Media Disconnect

When you reattach a cable between your EMC storage system and the PCI adapters in your system, the connection state may not be immediately reflected in ftSMC. To update ftSMC, issue the command *powermnt restore* in PowerPath, from **Run** on the **Start** menu, or from a command prompt. The information in ftSMC should be updated after about 15 seconds.

Mirroring Disks in Your Express5800/320Ma System

Your Express5800/320Ma system supports the following storage systems:

- Internal SATA disk drives
- EMC storage systems

The various disk-mirroring schemes are outlined in the following sections. See EMC documentation for information about EMC disk-mirroring configurations.

Mirroring Disks in Internal Storage

Your Express5800/320Ma system internal storage supports only SATA disks. Its disks are located in a disk tray that connects to the system backplane.

For non-RDR disk-mirroring configurations, mirror the volumes on disks in two separate disk trays.

For RDR disk mirroring, mirror the internal storage disks as shown in Figure 4-1. Only internal storage enclosures support RDR disks.

NOTES

1. The system disk and its mirrored partner must both reside in the same storage location.
2. The system disk and its mirrored partner are located in slot 1 of each enclosure.

See “Finding a Physical Disk” on page 4-25 for details about physically locating a volume’s hard drive.

Configuring and Creating RDR Disks

You can mirror disks in system internal storage enclosures as RDR disks.

Figure 4-1 shows how disks are mirrored in your Express5800/320Ma system. The arrows in the figures indicate the required mirroring scheme.

Finding a Physical Disk

You find the location of internal physical disks by using the ftSMC. You find disks located in external storage using both Windows Disk Management and ftSMC.

You can use the **Logical to Physical Mapping** node in ftSMC to physically locate the disk members of RDR virtual disks, or the non-RDR disk on which a particular volume resides.

Finding an Internal Physical Disk

System internal disks are identified in the **Logical to Physical Mapping** node details pane. The information differs somewhat for RDR and non-RDR disks.

To use the Logical to Physical Mapping node

1. In ftSMC, expand **ftServer I/O Enclosures** and then **Logical Disk Information**.
2. Click **Logical to Physical Mapping**.

For RDR virtual disks, the detail pane presents information in the following format:The

```
Harddisk0-LUN1-PLEX2 (Basic) 11/40/1 (DUPLEX)
Harddisk0-LUN1-PLEX1 (Basic) 10/40/1 (DUPLEX)
```

information for non-RDR disks is the same, except that it does not include LUN (RDR virtual disk) or PLEX (physical disk) information, which pertains only to RDR disks.

In the details pane:

- `Harddisk0` refers to the Windows disk name.
- `LUN1` refers to RDR virtual disk 1. (Your Express5800/320Ma system can support a maximum of three RDR virtual disks: LUN 1, LUN 2, and LUN 3.)
- `PLEX1` and `PLEX2` refer to the two physical disks that together make up RDR virtual disk 1 (LUN 1).
- `Basic` refers to type of disk. The other possible value is `Dynamic`.
- `10/40/1` indicates the following:
  - `10` indicates I/O element 10.

    NOTE

    In rack-mounted systems, I/O element 10 is in the top enclosure and I/O element 11 is in the bottom enclosure. Pedestal systems (not available in Express5800/320Ma Dual-Core systems) are rotated 90 degrees **clockwise**, so that I/O element 11 is on the left side (from the front) of the system and I/O element 10 is on the right side.

  - `40` indicates the internal storage enclosure within the I/O element.
  - `1` indicates the bottom disk slot in rack-mounted systems.
- For RDR disks, `Duplex` indicates that the two physical disks of the RDR virtual disks are partnered. If the two physical disks were not partnered, the displayed value would be `Simplex`.

  For non-RDR disks, the values in this position indicate the disk’s operating status.

RDR virtual disks list DevicePath[1] and DevicePath[2] properties that indicate the device ID of the disks that make up the virtual disk. However, the DevicePathID for an RDR virtual disk does not indicate a hardware component, but instead identifies the virtual disk to system-management software.

Finding an External Physical Disk

For disks in external storage systems, the operating system assigns letter designations to the logical volumes on the physical disks. Windows Disk Management assigns a disk name to each physical disk in an external storage system and displays which logical volumes reside on each named disk. For a particular volume, you can use the disk name in conjunction with ftSMC to identify the location of the physical disk that contains that volume.

NOTE

The disks of EMC storage systems do not appear in ftSMC.

To find a volume's physical disk

1. In the Windows Disk Management tool (accessed from **My Computer**), find the disk name that contains the volume in question. These disk names may or may not be numeric; however, they do **not** correspond to disk locations. Volume information is displayed along with the disk name.
2. Note the disk name that contains the volume you want to physically locate; for example, **Disk 3**.
3. In ftSMC, expand **Storage Enclosures**, then **Logical Disk Information,** and then click **Logical to Physical Mapping**.
4. In the **Name** column of the ftSMC details pane, find the disk name you noted in step 2. Look up its corresponding device path ID in the **Value** column. This identifies the physical location of the disk within the system. (See "Device IDs and Device Paths" on page 5-6 for details.)

   For example, Disk 3 may have the disk name **Harddisk3** in ftSMC and have a device path ID of **70/12/3**. This disk would appear in ftSMC under the **Storage Enclosures** node as **Disk 3** in **Slot 12** of **Storage Enclosure - 70**.

5. Use the device path ID determined in step 4 with the labels on the system to identify the disk location. You can also use "Diagrams of Component Locations" on page 5-8 to help locate the disk.

NOTE

When external disks are resynchronizing, the Logical to Physical Mapping details pane shows the disk that is resynchronizing as *`SIMPLEX`* and includes the percentage of the disk that has resynchronized: for example, *`SIMPLEX (%20)`*.

Chapter 5
Troubleshooting

The following topics can help you troubleshoot your Express5800/320Ma system:

MTBF Statistics

The fault-tolerant services software automatically maintains mean-time-between-failure (MTBF) statistics for many system components. Administrators can view this information in ftSMC at any time and can reconfigure the MTBF parameters that affect how the fault-tolerant services respond to component problems.

The system stores the current MTBF values associated with each device in Windows registry keys. Whenever any of the MTBF values change, the registry reflects the change. Therefore, when the driver stops and restarts, or the system restarts, the system retains the current MTBF information.

For procedures explaining how to set these settings, see the online ftSMC snap-in help.

Clearing the MTBF

Clearing the MTBF sets the MTBF to 0 (Unknown) and erases the record of all faults.

NOTE

Clearing the MTBF does not bring a device back into service automatically.

If the device that you cleared is in the Broken state, you must correct the state.

Changing the MTBF Threshold

The MTBF threshold is expressed in seconds. If a device's MTBF falls beneath this threshold, the system takes the device out of service and changes the device state to Broken.

⚠ **CAUTION**

NEC Solutions (America), Inc. presets the MTBF thresholds. You should not modify them unless instructed to do so by NEC Technical Support or your authorized service representative.

Taking Components Offline and Bringing Them Online

You can use ftSMC to take a component offline or bring a component online. Before you take a component offline, verify that it is safe to do so.

For a description of the procedures, see the online help for ftSMC.

Hard Disks

If a disk's status is not healthy, you may be able to recover the disk, or you may need to replace the disk.

Recovering a Disk

In your disk-management tool, try to recover the disk manually if:

- A failed volume (non-RDR only) appears as **Failed Redundancy**
- The RDR or non-RDR disks appear as **Offline**, **Missing**, or **Online (Errors)**

Verify that the system does not have a problem that is causing the mirror to break on an internal or external disk. Ensure that the disk is securely seated in the drive and that it has power. Perform the following procedures to recover the disk.

To recover an RDR disk

1. Logically and then physically remove the physical disk from the RDR virtual disk.

   NOTE

   Disregard any "Unsafe Removal of Device" messages that appear when you remove an internal physical disk from the enclosure.

2. Replace the defective disk and make the disk an RDR disk.

In the unlikely event of a system failure resulting from disk failures, restore the system by performing one of the following procedures, as appropriate:

- Restore the system by using a backup system disk. See the discussion of creating spare bootable hard disks in the *Express5800/320Ma: Software Installation and Configuration Guide* for information.
- Reload Express5800/320Ma System software, as described in the *Express5800/320Ma: Software Installation and Configuration Guide*.

To recover a disk in Windows Disk Management

1. Go to **Windows Disk Management** in **Computer Management**.
2. Right-click the disk icon corresponding to the disk that has the **Offline**, **Missing**, or **Online (Errors)** status, and in the option menu, click **Reactivate Disk**.
3. After the mirror regenerates (this may take several minutes), verify that the status of the disk has returned to **Healthy**.

⚠ CAUTION

If a disk continues to have the status of **Online (Errors)**, replace it as soon as possible.

If the recovery procedures fail to reactivate the disk, or if the status does not return to **Healthy**, you must physically replace the failed disk.

Replacing a Failed Disk in Windows Disk Management

You can replace a failed disk with an uninitialized disk (a disk that has no signature written on it). This is the quickest and easiest option. If your only spare disk is initialized (it has a signature written on it), you can replace the failed disk with an initialized disk.

Replacing a Failed Disk with an Uninitialized Disk

Follow this procedure to replace a failed disk with an uninitialized disk. To physically locate a disk, see "Finding a Physical Disk" on page 4-25.

To replace a failed disk with an uninitialized disk

1. Physically remove the failed disk and replace it with an uninitialized disk.
2. Disk-management software automatically resynchronizes the replacement disk with the remaining good disk, creating volumes on the replacement disk and mirroring the disks.

Replacing a Failed Disk with an Initialized Disk

Perform the following procedure to replace a failed disk with an initialized disk using Windows Disk Management.

To physically locate a disk, see "Finding a Physical Disk" on page 4-25.

To use Windows Disk Management to replace a failed disk with an initialized disk

1. Physically remove the failed disk and replace it with an initialized disk. For details, see the operation and maintenance guide for your system.
2. Examine the type of the initialized replacement disk:
   - If the replacement disk's type is **Foreign Dynamic**, go to step 3.
   - If the replacement disk's type is **Basic**, go to step 4.
3. In Disk Management, right-click the foreign dynamic replacement disk, and then click **Convert to Basic**. The replacement disk should now appear as a basic disk.
4. If the basic replacement disk has any volumes, delete them. Right-click the volume on the replacement disk, and then click **Delete Partition**. Repeat for each volume on the replacement disk. Verify that the basic replacement disk now appears as a single unallocated space.
5. Right-click the replacement disk and click **Convert to Dynamic**.
6. Remove the mirrors from the missing disk that was physically removed in step 1. Right-click a volume on the missing disk and then click **Remove Mirror**. In the **Remove Mirror** dialog box, select the missing disk and click the **Remove Mirror** button.

   ⚠ **CAUTION**

   Be sure to select the missing disk, not the remaining good disk. You will lose data if you select the remaining good disk.

   Repeat this step for each volume on the missing disk.

7. Right-click the missing disk, and then click **Remove Disk**.
8. On the remaining good disk, right-click a volume and click **Add Mirror**. In the **Add Mirror** dialog box, select the replacement disk and click the **Add Mirror** button. Repeat this step for all other volumes on the remaining good disk.

Hardware Installation Wizard

Occasionally, after a system reboot or after hot-plugging an I/O element or a disk, a hardware-installation wizard may appear, indicating that a “Express5800/320Ma disk device” has been found. Continue through the wizard steps, but click **Cancel** at the end rather than rebooting.

Determining That a Component Has Failed

Component LEDs and ftSMC provide indicators that a component has failed. See the operation and maintenance guide for your system for general troubleshooting information related to system hardware. ftSMC indicates a failed component by showing a white X inside a red box next to the icon of a failed component.

Using LEDs to Troubleshoot Hardware

LEDs, where present, indicate the status of components. The LEDs can help you locate a failing or failed component. The LED status is also shown by ftSMC in the details pane of components that have LEDs.

The LED State properties indicate the state of an LED in the system. On your Express5800/320Ma system, the LEDs are green, amber, and white.

For detailed information about LEDs and particular components, see the operation and maintenance guide for your system.

Using ftSMC to Troubleshoot Hardware

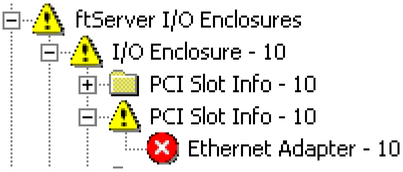
You can view component icons in ftSMC to see if a component has failed.

To use ftSMC to determine that a component has failed

1. In ftSMC, expand the System Inventory by clicking the **ftServer** node in the console tree and pressing the asterisk (*****) key on the numeric keypad.
2. Look for **Warning** (an exclamation point inside a yellow triangle) or **Error** (a white X inside a red circle) icons. If you see a **Warning** icon, click the plus sign (+) in front of nodes that have a **Warning** icon until you see an **Error** icon.

   For example, in Figure 5-1, **Warning** icons appear in three nodes, and the **Error** icon appears beside the slot that has a problem.

Figure 5-1. Warning and Error Icons



3. Click the problem node and check the *MTBF: Current* value in the details pane. If it is less than the *MTBF: Threshold* value, that node has failed and the system removes it from service. For example:

```
MTBF: Time of Last Fault    May 30, 2001 15:07:24
MTBF: Threshold                 300 seconds
MTBF: Number of Faults      2
MTBF: Current                    220 second
```

Locating Components

ftSMC displays device IDs and device paths for system components that it monitors. Components that have a dual-initiated bus have dual device paths. Component location diagrams show the device IDs of major elements, enclosures, and internal disks.

Two commands assist you in locating select system components:

- **Start Slot Identification**. Causes the LEDs on the component to flash so that you can physically locate it.
- **Stop Slot Identification**. Stops the LEDs on the component from flashing after you have physically located it.

Disk slots on CPU- I/O enclosure slots, PCI adapter slots, and modems support these slot identification commands.

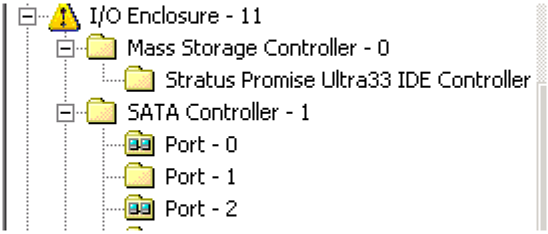
Device IDs and Device Paths

Hardware components in the system inventory are organized hierarchically. Level 1 components (for example, CPU elements and I/O elements, represented by the CPU Enclosure nodes and I/O Enclosure nodes, respectively) have Level 2 child components, such as DIMMs and processors, which may have Level 3 and Level 4 components. For example, I/O enclosures (elements), which are Level 1, have storage enclosures (Level 2), which have slots (Level 3), which have disks (Level 4).

Hardware devices in the system inventory have *device ID* numbers. For example, the device ID of the I/O element in Figure 5-2 is 11. Figure 5-2 illustrates the following hierarchically presented components and their device IDs:

- Level 1: I/O Enclosure - 11
- Level 2: Mass Storage Controller - 0 and SATA Controller - 1
- Level 3: Ports 0 through 2

Figure 5-2. Component Levels



I/O Enclosure - 11
Mass Storage Controller - 0
Stratus Promise Ultra33 IDE Controller
SATA Controller - 1
Port - 0
Port - 1
Port - 2

A *device path* is a slash-separated sequence of device IDs that identifies the location of a component in the system. Device paths appear in the details pane of ftSMC. They use the following syntax:

> Level-1 device ID/Level-2 device ID/Level-3 device ID/Level-4 device ID

For example, referring to Figure 5-2, the device path 11/1/2 indicates:

> I/O Enclosure - 11/SATA Controller - 1/Port - 2

Table 5-1 presents the system device IDs.

Table 5-1. System Devices and Device IDs

Component Level	Device	Device ID
1	Call-Home Modem CPU Enclosure (element) I/O Enclosure (element)	0 0, 1 10, 11

Table 5-1. System Devices and Device IDs

Component Level	Device	Device ID
2	DIMM	0–7
	Processor	20–23
	Storage Enclosure (internal)	40
	BMC	120
	Mass Storage Controller	0
	SATA Controller	1
	USB Controller	2
	VGA Controller	3
	VTM Adapter	4
	Ethernet Controller	5
	PCI to PCI Bridge	6, 7
	First PCI-X slot on riser card	8
	PCI Slot Info	9–11
3	Port	0–2
	Network Port	0,1
	Slot	1–3
4	Disk (internal)	0–2

Device IDs and device paths apply only to hardware components. Logical devices (for example, two physical Ethernet ports partnered to provide a single fault-tolerant path to the network) and software components do not have device IDs even if they appear in the ftSMC interface.

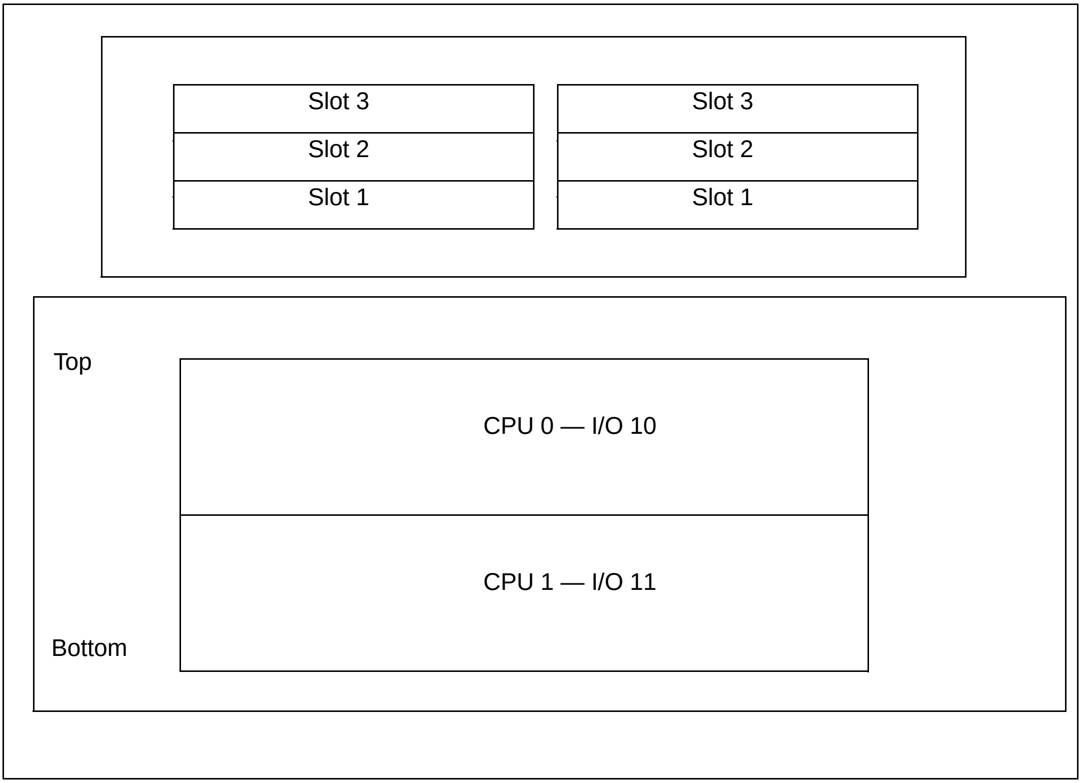
Diagrams of Component Locations

See Figure 5-3 to locate I/O and CPU elements for your Express5800/320Ma system. If a component is shown as failed or failing in ftSMC, note its device ID and then use the following information to locate that component within the system. All top-level components have a physical label that includes their device ID.

System Elements and Internal Storage Disk Locations

Figure 5-3 shows the locations of the CPU and I/O elements and disk slots. The internal storage is housed in an enclosure located above the CPU-I/O enclosure.

Figure 5-3. CPU-I/O Enclosure, and Disk Slot Labeling



When Windows Does Not Respond

If Windows does not respond (that is, if the system appears hung), use the VTM console or the power button (for systems without VTM console) to restart the system. Related information can be found in the *Express5800/320Ma Virtual Technician Module User’s Guide*.

Delayed System Restart

When you restart a system that contains certain models of adapters, the system appears to hang for approximately 10 seconds while the drivers for the adapter are installed. Allow several seconds for restart to proceed.

Unresponsive Mouse and Keyboard

If your system contains VTMs, the mouse and keyboard may appear unresponsive at some point after the system has restarted. This is normal behavior while the operating system finds the virtual mouse and keyboard as new hardware. Responsiveness returns after a short period of time.

Remote Event Notification and Service

The ASN provides the following features:

- Event reporting to your NEC Technical Support or your authorized service representative (dial-out)
- Remote service to your system by service support personnel (dial-in)

You use the ASM Web site to configure all remote event reporting and remote service features of the ASN. See the *Express5800/320Ma ActiveService Network Configuration Guide* for details.

Remote Reporting of Events

When the system's fault-tolerant software detects a hardware or software problem, the system generates alarm messages that can be:

- Sent to NEC Technical Support or other authorized service representative
- Sent to a customer contact by way of email or pager
- Written to the Windows system event log

Autonomous Call Home

For systems with VTMs, the VTM can send an alarm when a fault-resilient boot fails to bring up the Windows operating system.

System Inventory Reports

An alarm message can include a full system inventory, a partial system inventory, or no inventory at all, depending on the message type. A *system inventory* consists of an enumeration of all of the properties of the manageable hardware devices tracked by the Inventory Service.

SNMP Traps

Most alarms can also generate SNMP traps. Device state alarms generate an SNMP trap whenever a device state transitions to or from an online, broken, or offline state. Sensor threshold alarms generate an SNMP trap whenever a sensor status improves or worsens to normal, warning, and critical states.

Event-Log Entries

ftServer Manager may generate an alarm in response to a sequence of several events. To indicate what these events are, an alarm message may include event-log entries. These event-log entries contain items that represent an event from both the System and Application event logs. The number of event-log entries included with an alarm message is determined by specifying how many seconds of the event log to include. ftServer Manager may configure this time differently for each type of alarm, or it may exclude some event-log entries.

Remote Service

If you have a service contract with NEC Technical Support or your authorized service representative, to connect to your system, your service representative first dials the system. For systems with VTMs, the adapter validates that the call is from a permitted source, disconnects the incoming call, and calls back to make a connection to the validated NEC Technical Support. For systems without VTMs, the Windows RAS service authenticates the call and allows NEC Technical Support user to log on.

> NOTE
>
> Do not change the SMM ASN Hub ID, SMM ASN Hub Password, Dial-in User Name, Dial-in Password, or PPP Password properties without first contacting NEC Technical Support or your authorized service representative.

You can configure the system to allow the NEC Technical Support to connect to your system, either through a dialup modem or over the Internet, to diagnose problems and perform data-transfer functions. These accesses are subject to validation by NEC Technical Support database, by the VTMs on your system, and by you as the system administrator.

NEC Technical Support or your authorized service representative may contact you to determine the seriousness of the condition. If a CRU has failed, the NEC Technical Support will ship a new part to your site.

On systems equipped with VTMs, ftServer Manager continuously copies a limited number of Windows system event-log messages to a log on VTMs so that support personnel can retrieve the log if your system fails.

Making Dump Files

Dump files are snapshots of either a system’s memory or a particular component’s firmware memory. Dump files enable NEC Technical Support to diagnose system or component problems. You can create dump files in the following ways.

To create system memory dumps, you can:

- Press a button.
- Configure your system to create memory dumps.
- In ftSMC, right-click a CPU Enclosure, and select the Dump and Go command.
- In ftSMC, right-click a certain component, and select either the Dump and Go command or the Dump command. (These commands are not available for all components.)

The Dump command dumps a snapshot of the corresponding component. While dumping, the component is not available. When the dump is complete, the component returns to service.

You can also use Windows commands to configure the creation of memory dumps. See Windows documentation.

Using the Dump Button

CAUTION

Making a dump file of an entire system automatically takes the operating system offline and then restarts it.

With a firm, fine-tipped object, like a pushpin, press the Dump button, which is actually a small circular opening.

Press the Dump button on the primary enclosure. The *primary enclosure* is the enclosure on which the power switch LED is lit. The Dump button is located at the center rear panel of each enclosure. It is labeled DUMP.

System Memory Dumps

Memory dumps are enabled through the Board Instance driver’s DumpQuickEnabled and DumpNumberOfFilesToSave properties.

To enable system memory dumps

1. In ftSMC, expand **ftServer (Local)**, **ftServer Drivers**, and then **Board Instance Driver - srabid**.
2. Right click **Board Instance Driver - srabid**, **Properties**, and set **DumpQuickEnabled** to **True**.
3. Set **DumpNumberOfFilesToSave** to the number of dump files you want to save to disk.

Dump files beyond this number overwrite the existing saved dump files. For instance, if the value is 3, then the fourth saved dump file overwrites the first, existing dump file.

If, at the time of a system crash, the DumpQuickEnabled property of the **Board Instance Driver** node is **True** and the CPU element is duplex, the system creates a memory dump and stores the dump in the memory of one CPU element. The system restarts with the remaining CPU element. After the system restarts, the dump is automatically copied to a disk file.

After a system reboot where a dump has been generated, do not attempt to read or copy the Memory.dmp file created. After the system has completed writing the Memory.dmp file, it renames the file Memory*n*.dmp, where *n* is a numeral. You can read or copy the Memory*n*.dmp file. It may take up to five minutes after the reboot to complete writing the Memory.dmp file before it is renamed and can be read.

⚠ **CAUTION**

If you attempt to read or copy the Memory.dmp file while the system is writing it, you may corrupt the file.

The normal Windows dump mechanism is used if the **DumpQuickEnabled** parameter is **False** (disabled) or if the CPU element is in simplex mode.

Dump and Go

The Dump and Go command captures a snapshot dump of a running system or a particular component without significantly interfering with the system’s or component’s operation. The system must be running duplex in order to use this method. To capture a snapshot dump, right-click the **CPU Enclosure** node of interest in the ftSMC console tree and select **Dump and Go** from the Action menu. The system:

- Takes the selected CPU element offline with its memory intact
- Dumps a snapshot of the memory to C:\sradumps\Memory*n*.dmp
- Displays the status of the operation
- Returns the CPU element back to online status

A Dump and Go command on a BMC controller dumps a snapshot of the BMC firmware’s memory, and then restores the BMC to service.

Online Diagnostic Codes

The Virtual BMC LCD displays online diagnostic codes (described in Appendix B) only when a diagnostic test is running on an operative system.

Disaster Recovery

To help you to log on and access system resources after a computer disaster has occurred, you can restart the system in safe mode, boot from a spare disk, or use the Windows WinPE command shell.

Safe Mode

You use the Safe Mode startup options to start the system with only the minimal necessary services. Safe Mode options include Last Known Good Configuration, Safe Mode, Safe Mode with Networking, and Safe Mode with Command Prompt. For more information, see Safe Mode startup options in Windows Help.

⚠ **CAUTION**

> You must disable the Watchdog Timer by disabling boot monitoring in the BIOS before attempting to boot in Safe Mode. See the *Express5800/320Ma: Software Installation and Configuration Guide* for a description of how to disable boot monitoring.

Booting From a Spare System Disk

To boot from a spare system hard disk, you need a spare hard disk that was prepared during your initial system configuration process. Refer to the *Express5800/320Ma: Software Installation and Configuration Guide* for information about how to prepare this hard disk. Typically, you boot from a backup hard disk only to recover from an unlikely disaster situation where all redundant system disks suffered simultaneous failure.

To boot a system from an RDR boot disk, see “Booting a System with a Backup RDR Boot Disk” on page 4-16.

The following procedure explains how to boot a system from a non-RDR system disk.

To boot from a previously prepared non-RDR spare system disk

1. Shut down the operating system.
2. Physically remove one of the original system disks.
3. Insert the spare system disk into the empty slot created in step 2.
4. Unlatch the other original system disk.
5. Power up the system.
6. After the system has booted, insert (latch) the original disk that you unlatched in step 4.

7. Use your disk-management tool’s **Delete Volume** command to delete the volume on the original disk you inserted in step 6. When this step is complete, the disk is set to **Unallocated space**.
8. Create a mirror of the spare system disk’s C: volume on the original disk you inserted in step 6.

   Using Windows Disk Management, right-click the spare system disk’s C: volume. In the shortcut menu, click **Add Mirror**. A wizard prompts you through the rest of the mirroring process.
9. When the disk is 100% resynchronized, verify that the original system disk and the upgraded system disk are healthy, resynching, dynamic, mirrored volumes. Note that the drives are not duplexed until the resynchronization activity is complete.
10. After all resynchronization activity has finished, verify that all dynamic disks are healthy, dynamic, mirrored volumes.
11. Start all applications to verify that your system and applications are working properly.

WinPE

WinPE (Windows Pre-Installation Environment) provides a command shell from which you can perform system recovery using operating system commands.

To access the WinPE command shell, you must boot from the ExpressBuilder CD (1 of 2). Select the **Use WinPE to repair a corrupted hard drive** command when the Express5800/320Ma System software presents that option.

WinPE is recommended for advanced users or administrators only. See Microsoft documentation for information about WinPE.

Windows Hotfixes Distributed by NEC Solutions (America), Inc.

To create a file that lists the Windows hotfixes distributed with your Express5800/320Ma System software release and installed on your system by an IPL or upgrade to the release, use the following procedure.

To obtain a list of Windows hotfixes

1. Insert your ExpressBuilder CD (1 of 2) in the CD-ROM drive.
2. If the Express5800/320Ma System software installation wizard runs automatically and asks if you want to install Express5800/320Ma System Software, click **Cancel**.
3. In a command-prompt window, change to a directory in which to save the file.
4. Enter a command in the following format:

```
dir cddrive:\Bin\Hotfix\*LG* > outputfile
```

In the command format:

- *cddrive* is the drive letter for your CD-ROM drive
- *LG* is the language code for your Windows version
- *outputfile* is the name of the file to hold the results. You can specify any name for the file.

5. Eject the CD-ROM.

For example, the following command produces a file named hotfixlist.txt in the current directory of your command prompt window. The file contains a list of all hotfixes for the English versions of Windows Server 2003:

```
dir D:\Bin\Hotfix\*EN* > hotfixlist.txt
```

Appendix A
Advanced Topics

This appendix presents the following advanced topics:

- "Disabling Hyperthreading"
- "Using Windows Headless Mode and Console Redirection"
- "Security Configuration Wizard"

These procedures require that you change settings in the BIOS. For further information about BIOS settings, see the *Express5800/320Ma: Technical Reference Guide*.

Disabling Hyperthreading

Some system installations may disable hyperthreading to facilitate application execution.

⚠ CAUTION

Disable hyperthreading only if your system satisfies the minimum BIOS version requirements. Contact NEC Technical Support or your authorized service representative to confirm that you have the correct BIOS version.

To disable hyperthreading, you enter the ftServer Setup utility.

To disable hyperthreading

1. Turn on or restart your system. When the logo screen appears, press F2 to enter your system's BIOS setup utility.

   The BIOS setup utility's **Main** menu appears after the system completes more of the POST (power-on self-test) process.

2. On the Main menu, use the right-arrow key to select the **Advanced** tab.
3. Use the down-arrow key to select **Advanced Processor Options** and press Enter.
4. Select **Hyper Threading Technology** and press Enter.
5. Change the value from Enabled to **Disabled** and press Enter.

6. Press **Esc**, then select **Exit Saving Changes** and press Enter.

   The system resumes booting.

Using Windows Headless Mode and Console Redirection

In *headless* mode, Windows Server 2003 can run without a keyboard, mouse, and monitor. You can remotely manage and restart the system through a serial connection.

If your system is operating in headless mode, and if the port for both console redirection and Windows headless are set to use the same Serial port, configure the BIOS to stop console redirection when the power-on self-test (POST) has finished processing.

To configure the BIOS to stop console redirection after POST

1. When the system is booting and the progress bar has started to fill, press F2 to enter the BIOS setup program and wait for the BIOS setup program to run.
2. Use the RIGHT ARROW key to select the **Advanced** tab.
3. On the **Advanced** menu, use the DOWN ARROW key to select **Console Redirection**. Press ENTER.
4. On the **Console Redirection** menu, use the DOWN ARROW key to select **Continue C.R. after POST**. Use the PLUS SIGN key (+) to change the value to **OFF**.
5. Press F10.
6. In the **Setup Confirmation** dialog box, select **Yes** and press ENTER to save the new settings and exit from the BIOS Setup program.

Security Configuration Wizard

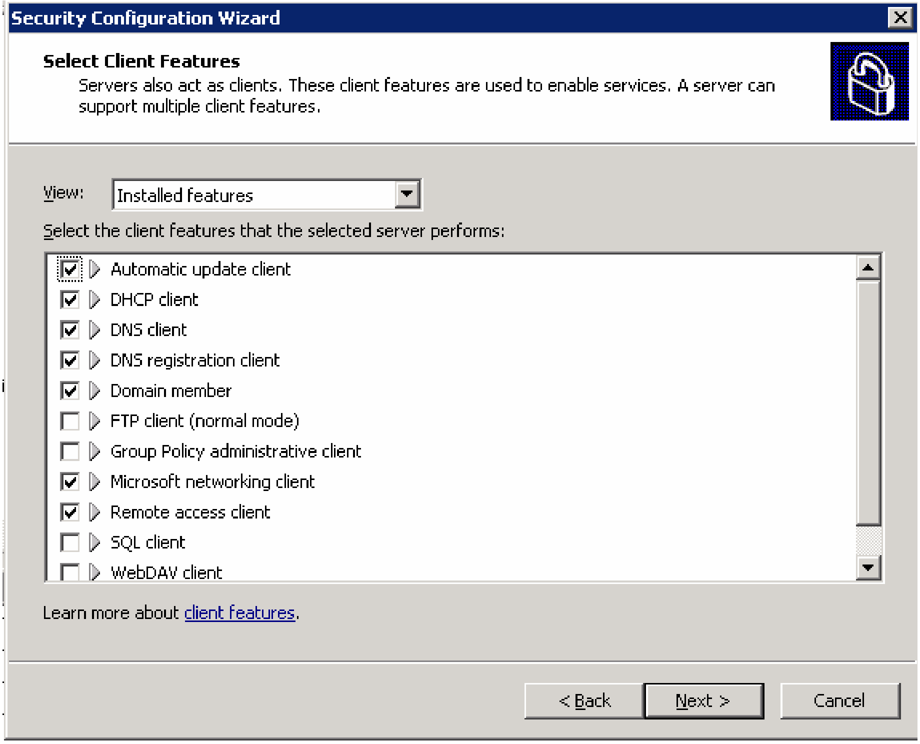
If you use the Security Configuration Wizard (new in Windows Server 2003 Service Pack 1) to create a security-configuration template on an Express5800/320Ma system, perform the following steps to ensure that the template does not interfere with ftServer services running on the system.

The following steps assume that you have selected all the defaults associated with the ftServer services.

> NOTE
>
> The dialog boxes shown in the following steps do not appear in the exact sequence shown. However, they should all appear in the course of running the Security

Configuration Wizard. See Windows documentation for more information.

1. Check the **Remote access client** box in the **Select Client Feature**s dialog box, as shown below.



Select Client Features

Servers also act as clients. These client features are used to enable services. A server can support multiple client features.

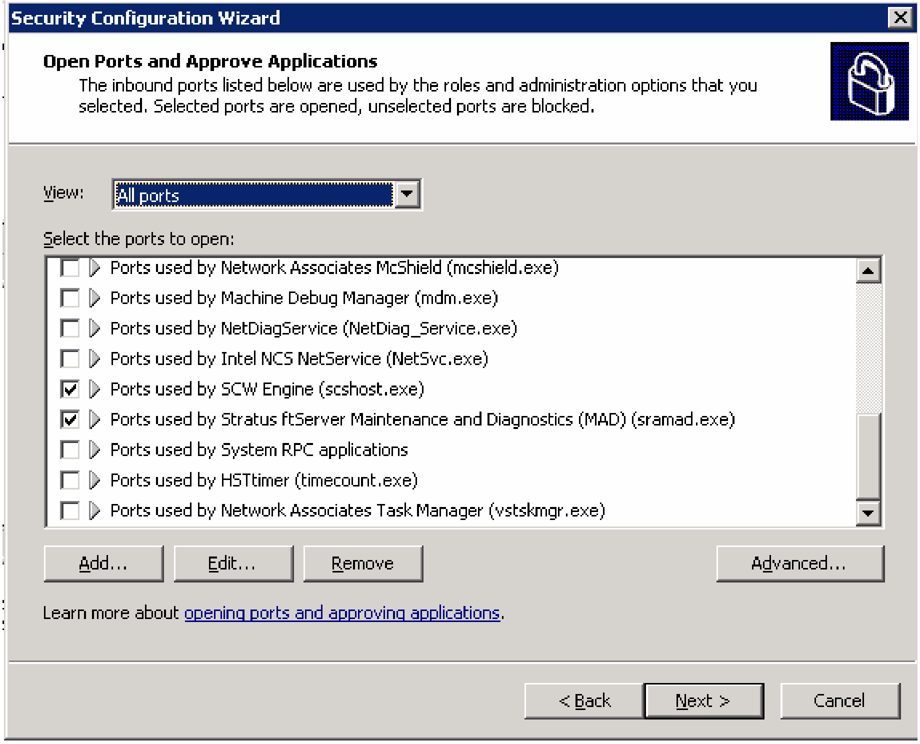
View: Installed features

Select the client features that the selected server performs:

- ☑ Automatic update client
- ☑ DHCP client
- ☑ DNS client
- ☑ DNS registration client
- ☑ Domain member
- □ FTP client (normal mode)
- □ Group Policy administrative client
- ☑ Microsoft networking client
- ☑ Remote access client
- □ SQL client
- □ WebDAV client

Learn more about client features.

2. In the **Open Ports and Approve Application** dialog (shown below), if the ftServer SSN service (SRA_SSN.EXE) does not appear in the list, click **Add**.



Security Configuration Wizard

Open Ports and Approve Applications

The inbound ports listed below are used by the roles and administration options that you selected. Selected ports are opened, unselected ports are blocked.

View: All ports

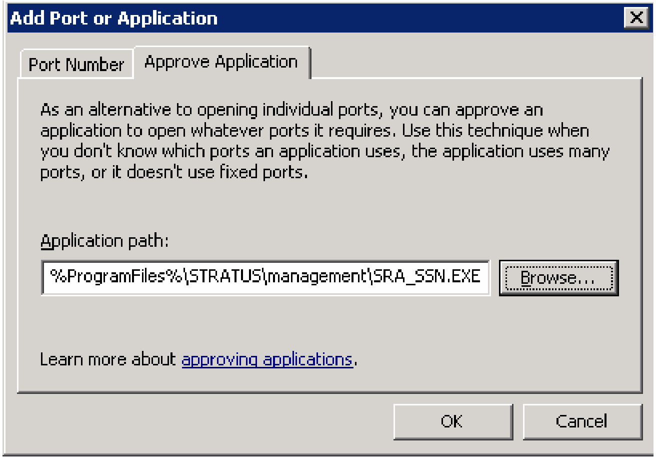
Select the ports to open:

- □ Ports used by Network Associates McShield (mcshield.exe)
- □ Ports used by Machine Debug Manager (mdm.exe)
- □ Ports used by NetDiagService (NetDiag_Service.exe)
- □ Ports used by Intel NCS NetService (NetSvc.exe)
- ☑ Ports used by SCW Engine (scshost.exe)
- ☑ Ports used by Stratus ftServer Maintenance and Diagnostics (MAD) (sramad.exe)
- □ Ports used by System RPC applications
- □ Ports used by HSTtimer (timecount.exe)
- □ Ports used by Network Associates Task Manager (vstskmgr.exe)

Learn more about opening ports and approving applications.

3. Browse to the location of the SRA_SSN.EXE service, as shown in the dialog box below, and click **OK**.

   The service name then appears checked in the list shown in the step 2.



As an alternative to opening individual ports, you can approve an application to open whatever ports it requires. Use this technique when you don't know which ports an application uses, the application uses many ports, or it doesn't use fixed ports.

Application path: %ProgramFiles%\STRATUS\management\SRA_SSN.EXE

4. In the **Open Ports and Approve Application** dialog box (shown in step 2), click **Add**, select **SRA_RAS.EXE**, and press **OK**.

   The service name then appears checked in the list shown in the step 2.

Appendix B
Online Diagnostic Codes

The following describes the online diagnostic codes for your Express5800/320Ma systems. Online diagnostic codes are hexadecimal values that indicate a test or initialization routine. The codes appear on the Server Info page of the Virtual Technician Module (VTM) Console.

Online Diagnostic Test Codes

The following describe the codes for online diagnostic tests, which are performed when the system boots, when a CPU or I/O element is brought back into service, and when initiated by an administrator of the system.

- "CPU Diagnostic Test Codes"
- "I2C Bus Diagnostic Test Codes"
- "Primary I/O Element Diagnostic Test Codes"
- "Secondary I/O Element Diagnostic Test Codes"

CPU Diagnostic Test Codes

The following tests are performed on the CPU element.

D000

Verify successful completion of BIST (built-in self test).

D010

Test whether CPU 1 can arbitrate for control of the system bus.

D020

Test the processor stepping.

D030

Enable processor machine check architecture (MCA).

D031

Disable MCA.

D032

Verify that no processor MCA errors were reported.

D040

Compare the QDF numbers (an Intel processor identifier) between the processors in each CPU element.

D050

Verify that the processors are installed in a supported configuration.

D110

Test the registers in the configuration space on the PCI-to-PCI bus chipset.

D111

Test the ability of the PCI-to-PCI bus chipset to generate error-correction codes.

D130

Test write protection for Flash drives.

D170

Test for errors recorded by the chipset.

D221

Verify that there are no mixed size DIMMs per bank.

D223

Set and verify the Data Queue Strobing (DQS) timing settings.

D224

Verify that the timing settings are correct for the installed DIMM modules.

D230

Perform pattern tests on the memory.

D310

Test the registers of the PCI ASICs.

D330

Test for parity errors on the PCI-to-PCI bus.

D340

Test the fault tolerant switch interface.

D341

Test the PCI Express channel status.

D342

Test the CPU side of the fault tolerant switch ASIC for errors.

D343

Enable the error registers on the CPU side of the fault tolerant switch ASIC.

I2C Bus Diagnostic Test Codes

The following tests are performed on the I2C bus.

D400

Verify the validity of the CPU’s IDPROM checksum.

D410

Test the I2C interface.

D430

Verify the validity of the IDPROM checksum.

D480

Test the validity of the contents of the IDPROM on an I/O element.

D481

Test whether the BMC can read the IDPROM, obtain the IDPROM from the BMC, and checksum the contents.

D482

Verify the backplane IDPROM checksum.

D483

Invalid SROM format.

D484

Failed to read the backplane SROM.

D485

MAC address check.

D497

Test the BMC interface.

D4E1

BMC retry failure.

D502

Test whether the CPU side of the fault tolerant switch ASIC to the primary I/O element responds to all interrupts.

D503

Test whether the CPU side of the fault tolerant switch ASIC to the primary I/O element responds to an interrupt.

DE01

On the primary I/O element, retry communication between the BIOS and the baseboard-management controllers.

Primary I/O Element Diagnostic Test Codes

The following tests are performed on the booting I/O element.

D580

Test the system error-handling interrupt.

D581

Test the SMI interrupt.

D590

Test the NMI interrupt.

D591

Test the INTR interrupt.

D592

Test the A20 interrupt.

D593

Test the NMI.

D595

Test whether the BMC can initiate an NMI interrupt.

D597

Test the BMC KCS interrupt.

D5A0

Test the IRQ0 interrupt (timer).

D5A1

Test the IRQ1 interrupt (keyboard).

D5A2

Test the IRQ4 interrupt (UART).

D5A3

Test the IRQ8 interrupt (RTC).

D5A4

Test the IRQ12 interrupt (mouse).

D5A5

Test the IRQ14 interrupt (IDE).

D5A6

Test the SCI interrupt.

D5A7

Test the IRQ3 interrupt (COM2).

D5B0

Test the PIRQ0 IRQ1 interrupt (USB).

D600

Test the interface between the PCI ASICs on the CPU element and the primary I/O element.

D601

Verify that PCI-card ASIC has not generated break errors.

D612

Test the PCI-card PCI bus.

D613

Test the PCI-card ASIC interrupt.

D614

Verify that PCI-card ASIC has not generated break errors.

D620

Test the ability to move data between PCI-card ASICs.

D630

Examine PCI-card ASIC error registers, to verify the ASIC is working correctly.

D632

Test the PCI ASIC for errors.

D650

Verify that the path to the I/O side of the fault tolerant switch ASIC is available.

D651

Test the I/O side of the fault tolerant switch ASIC on the primary I/O element for errors.

D652

Test the fault tolerant switch data mover on the booting primary I/O element for errors.

D653

Test the fault tolerant switch crosslink.

D660

Perform a sanity test on the fault tolerant switch HPC.

D700

Test the PIIX ISA registers.

D701

Test the PIIX IDE register.

D702

Test the PIIX USB register.

D703

Test the PIIX PM register.

D704

Test the PCI bus.

D720

Test the timers.

D721

Test the real-time clock.

D722

Test the real-time clock crystal.

D730

Test direct memory access to the serial I/O port.

D740

Test the loopback interface to the serial I/O port.

D741

Test the SIO (super input-output) loopback from COM2.

D745

Test the SIO (super input-output) interface to the LPC (low-pin count) bus.

D750

Test the ISA bus.

D801

Test the PCI interface to the Ethernet port.

D802

On the primary I/O element, initiate the Ethernet port self-test.

D803

On the primary I/O element, initiate the Ethernet parity error test.

D804

On the primary I/O element, initiate the Ethernet loopback test.

D805

On the primary I/O element, initiate the Ethernet interrupt test.

D806

On the primary I/O element, initiate the Ethernet BAR decoding test.

D807

On the primary I/O element, initiate the Ethernet CSMA/CD test.

D808

On the primary I/O element, initiate the Ethernet PHY OUI verification test.

D809

On the primary I/O element, initiate the Ethernet PROM checksum test.

D820

Test the Gigabit Ethernet interface to the PCI bus.

D821

On the primary I/O element, initiate the Gigabit Ethernet PHY OUI verification test.

D822

Test the Gigabit Ethernet loopback.

D823

Test the Gigabit Ethernet interrupt.

D824

Test the Gigabit Ethernet BAR decoding.

D825

On the primary I/O element, initiate the Gigabit Ethernet PROM checksum test.

D826

Test the interface to the Ethernet PHY identifier (function 1).

D827

Test the Ethernet interrupt (function 1).

D828

Test the Ethernet loopback (function 1).

D830

Verify that reads and writes can be made to the PCI configuration space for the video controller. Verify that reads and writes can be made to the memory-mapped registers for the video controller.

D831

On the primary I/O element, fill the embedded video memory with a data pattern. Verify the data pattern and perform binary inversion. Verify memory inversion.

D840

Test that reads and writes can be made to the PCI configuration space for the SATA controller.

D841

On the primary I/O element, generate a SATA PHY interrupt.

D842

Verify that data can be sent between the SATA controller and a SATA disk.

D850

Perform error checking on the IDE controller

D851

Perform an internal diagnostics test on the IDE controller

D852

Perform an interrupt test on the IDE controller

D860

Perform error checking on the USB controller

D861

Perform an internal diagnostics test on the USB controller

D862

Perform an interrupt test on the USB controller

D863

Perform a test of the USB DMA.

D900

Test the fault tolerant switch-to-PXH interface.

D901

Test the PXH PCI-X interface

D902

Perform error checking on the PXH HPC controller.

D910

Test the PCI-X-to-PCI bridge interface.

D920

Perform a sanity test on the PXH hot-plug controller.

D921

Test the PXH hot-plug controller interrupt.

D922

Test PXH hot-plug controller slot power.

DC00

Test PCI-card ASIC interface in the BIOS boot block.

DC04

Test the PCI bus interface.

DC06

On the primary I/O element, log early boot block errors.

DC50

Test the ISA bus.

Secondary I/O Element Diagnostic Test Codes

The following tests are performed on the secondary I/O element.

E481

Initiate the IDPROM checksum test on the secondary I/O element.

E580

Initiate a diagnostic test of an interrupt that is specific to your Express5800/320Ma system.

E581

Initiate the SMI interrupt diagnostic test.

E591

Initiate the INTR interrupt diagnostic test.

E597

Test the BMC interface.

E5A0

Initiate the IRQ0 interrupt (Timer) diagnostic test.

E5A1

Initiate the IRQ1 interrupt (KB) diagnostic test.

E5A2

Initiate the IRQ4 interrupt (COM1) diagnostic test.

E5A3

Initiate the IRQ8 interrupt (RTC) diagnostic test.

E5A6

Initiate the SCI interrupt diagnostic test.

E5A7

Initiate the IRQ3 interrupt (COM2) diagnostic test.

E5A8

Test the system error-handling interrupt.

E600

Initiate the PCI-card ASIC interface diagnostic test.

E620

Initiate the PCI-card ASIC Gsync diagnostic test.

E650

Verify that the path to the fault tolerant switch ASIC is available.

E651

Test the I/O side of the fault tolerant switch ASIC element for errors.

E652

Test the fault tolerant switch data mover for errors.

E653

Test the fault tolerant switch crosslink.

E660

Perform a sanity test on the fault tolerant switch HPC.

E720

Initiate the timer diagnostic test.

E721

Initiate the RTC diagnostic test.

E740

Initiate the serial loopback (Port 1) diagnostic test.

E741

Initiate the Serial loopback (Port 2) diagnostic test.

E745

Test the SIO (super input-output) interface to the LPC (low-pin count) bus.

E801

Initiate the Ethernet controller PCI interface diagnostic test.

E805

Initiate the Ethernet controller interrupt diagnostic test.

E806

Initiate the Ethernet BAR decoding check diagnostic test.

E808

Initiate the Ethernet PHY OUI verification diagnostic test.

E809

Initiate the Ethernet EEPROM diagnostic test.

E820

Initiate the Ethernet (Gigabit) PCI interface diagnostic test.

E821

Initiate the Ethernet (Gigabit) PHY OUI verification diagnostic test.

E823

Initiate the Ethernet (Gigabit) interrupt diagnostic test.

E824

Initiate the Ethernet (Gigabit) BAR decoding check diagnostic test.

E825

Initiate the Ethernet (Gigabit) EEPROM diagnostic test.

E826

Test the interface to the Ethernet PHY identifier (function 1).

E827

Test the Ethernet interrupt (function 1).

E828

Test the Ethernet loopback (function 1).

E830

Verify read/write to VGA PCI configuration space. Verify read/write to VGA memory-mapped registers.

E831

Fill 4MB embedded video memory with data pattern. Verify data pattern and perform binary inversion. Verify memory inversion.

E840

Test read/write to SATA PCI configuration space.

E841

Generate SATA PHY interrupt.

E842

Verify that data can be sent between the SATA controller and the SATA disk.

E860

Perform error checking on the USB controller

E861

Perform an internal diagnostics test on the USB controller

E862

Perform an interrupt test on the USB controller

E900

Test the fault tolerant switch- to-PXH interface.

E901

Test the PXH PCI-X interface

E902

Perform error checking on the PXH HPC controller.

E910

Test the PCI-X-to-PCI bridge interface.

E920

Test the PXH hot-plug controller.

E921

Test the PXH hot-plug controller interrupt.

E922

Test the PXH hot-plug controller slot power.

EB02

Initiate the secondary I/O diagnostic test.

EB03

Finish secondary I/O diagnostic test.

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