

Premium Series Digital Video Storage Array

RAID Controller Module Failure Recovery on the 3U Chassis



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Preface

All Bosch Premium 3U subsystems are equipped with single controllers. Please note that if you are using a single controller subsystem, controller failure means the whole subsystem comes to a stop.

This document provides detailed procedures dealing with a failed or malfunctioning RAID controller module and covers the following topics:

- How Do I Know a RAID Controller Module Has Failed?
- What Does the Error Message Mean?
- Is It Possible a RAID Controller Has Not Actually Failed?
- How to Locate a Failed Controller Module?
- How to Replace a Failed Controller Module?
- How to Install a Memory Module?
- Procedures to recover from RAID controller failure.
- Notices and working theories behind the recovery operation.

Document Conventions

Convention	Meaning
Bold	Denotes a part, item, or assembly.
<i>Italic</i>	Denotes a reference to another paragraph, figure or table.
<u>Underline</u>	Used to emphasize a point.
<code>courier</code>	Denotes the actual name of an object, the exact code that should be typed or a message returned from a system.

Symbols

You may encounter these symbols within the document. Explanatory text accompanies each symbol, which provides additional information detailing the operation or highlighting safety information.



NOTICE! Notices inform you of essential but non-critical information. Read these messages carefully as any directions or instructions contained therein can help you avoid making mistakes.



CAUTION! Cautionary messages provide critical information that help you reduce the chance of losing data or damaging the system. Please heed these messages.



WARNING! Warnings highlight information, that if overlooked may cause damage to the system or result in personal injury. Take warnings seriously.



DANGER! Danger messages denote the presence of electrical equipment that may cause electric shock or electrocution. Take care when you see this symbol to avoid serious injury or death.

Related Publications

Refer to the latest Bosch Security Systems, Inc. Databook for the most up-to-date datasheets. To obtain a copy of the Databook, please contact your local Bosch representative.

You can also visit the Bosch Security Systems World Wide Web site at: <http://www.boschsecurity.com> to view a current listings of our publications.

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1 Identifying a Raid Controller Module Failure

1.1 How Do I Know a RAID Controller Module Has Failed?

This document focuses on the procedures for restoring operation after a controller failure. Make sure all other interruptions to system operation, e.g., cable failure, power outage, etc., have been excluded or corrected before assuming the fault was caused by a RAID controller. Because all of the monitoring and event notification algorithms are managed by the RAID controller module, if your subsystem is equipped with single controller, an administrator may or may not receive event messages if the RAID controller fails or is about to fail. Some critical conditions, such as channel processor failure, may also render the system useless. Before replacing a RAID controller module, perform the following steps to ensure that you can identify the exact failed module for removal.

Critical Working Conditions:

Another possibility is that a RAID controller has become non-responsive if controller detects temperature error or the preset temperature threshold is exceeded due to the enclosure component failure. Before a controller becomes unstable, you should receive one or more of the messages listed below. If you receive any of the messages, verify the working condition of every enclosure module.

```
Device ALERT: CPU Cold Temperature Detected (_(C))
Device ALERT: Temperature Sensor # Failure Detected
Device ALERT: Temperature Sensor # Not Present
Device ALERT: Cold Temperature # Detected (_(C))
Device ALERT: CPU Temperature <high/low threshold>Temperature Detected
Device ALERT: Board_ Temperature <high/low threshold>Temperature Detected
Force Controller Write-Through on Trigger Cause
Peripheral Device ALERT: Elevated Temperature Alert
Controller ALERT: Power Supply Unstable or NVRAM Failed
ALERT: +_V Low Voltage Detected (.__V)
```

If the shutdown was caused by elevated temperature or unstable voltage input, restore the normal working condition by replacing the failed cooling module, failed power supply unit, etc. The first event occurs when the preset safety mechanisms are activated. Event Triggered Operation is determined by a user's preference settings and may not apply to all subsystems. The subsystem might disable the Write-Back caching or stop charging batteries when it detects critical events.



NOTICE! Before attempting to replace a controller module, make sure the rest of the subsystem components are operating normally. All external factors affecting normal subsystem operation should be corrected before assuming a module failure has occurred.

1.1.1 LCD Display and LCD Screen Messages

When a controller module is failed or malfunctions, the LCD panel on the front of the subsystem will:

1. The third LED (ATTEN) counting from the top of the left LCD panel will light red.
2. A warning message will show on the LCD panel.
3. The LCD panel shows different warning messages when controller fails during its active service or initialization process. Please see the following for detail.

Controller Failure During Active Service

The following conditions may happen if a RAID controller fails or malfunctions during active service.

1. There may or may not be symptoms showing the operation is already unstable. Three major failure conditions are demonstrated below:
 - a. Before controller failure, problems with the voltage readings and I/O timeout might generate event messages. However, if you are using a single controller subsystem and the controller hangs, you may no longer access the hyper terminal or LCD event log.
 - b. Although the chance is rare, channel chip processor failure can render the subsystem useless. Upon receiving the channel failure (the last two messages listed below) messages, check cabling connection and channel configurations. If a chip processor fails, contact your vendor and return the controller for repair.
 - c. With extreme configurations such as using hundreds of LUN numbers as host LUN mapping entries, your original memory size may be insufficient. Your subsystem will halt until you upgrade your memory module.

The error messages may look like these:

```
Memory Not Sufficient to Fully Support Current Config.
Redundant Path for Chl:X ID:X Failure Detected
Redundant Loop for Chl:X Failure Detected
Redundant Path for Chl:X ID:X Expected but Not Found
Redundant Controller Failure Detected
CHL:_ FATAL ERROR(_)
```

For a complete event list, please refer to Section 1.2.

2. If the RAID controller fails or hangs, you may see the following conditions:
 - a. If the RAID controller has failed electronically, the LCD backlight may completely go out. The LEDs on subsystem modules may have also gone out.
 - b. If the controller hangs, the LCD may only show the backlight with or without text being displayed. There will be no response when pushing the LCD keypad buttons.
3. If there is only one controller in the subsystem, it is not possible to see the controller failure event on the LCD screen. If the single controller fails, you will be prompted by the message, "Controller connection failed, this application will close now!" The current management session will be ended.
4. Unless your connection to a managed subsystem is made through the "In-Band" method (management link using the existing host bus connection), the event log previously shown on the RAIDWatch Server screen will be lost. If using the In-band method, a copy of the event list will be stored on the management computer. Open the event log to discover what might have caused the failure. For the instructions of how to use the RAID-Watch Server program, please refer to RAIDWatch User's Manual.

An example of the RAIDWatch Server program screen is shown in Figure 1.1.

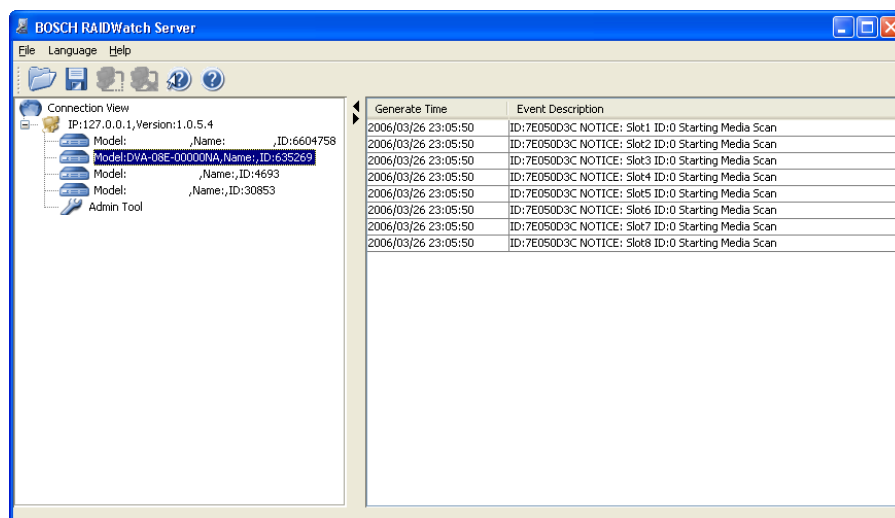


Fig. 1.1 RAIDWatch Server Event Screen

Controller Failure During the Initialization Process

1. The followings are the error messages that might occur when you reset or power cycle the subsystem for a specific reason:

Error! Check DDR RAM Install?

NVRAM CRC Error! <ENT> to Confirm

Memory Not Sufficient to Fully Support Current Config

What to Do?

1. If any of the above messages appears, note the message. Identify the failed controller if shows. Refer to Section 1.3 for the controller module locations.
2. Press [ESC] button to clear the message and return to the LCD main screen. Press the [ENT] button if the message shows "NVRAM CRC Error." If there is no response, it means the controller hangs and hardware errors might have occurred. If the audible alarm was triggered, the alarm will not stop until it is manually turned off.
3. To stop the alarm beeping, press the [MUTE] button.
4. Refer to Section 1.2 for more details about the related event messages. Refer to Section 1.3 for the controller module failure rectification procedures.

1.1.2

Controller Module LEDs

Check the LEDs on the rear-side faceplate of the controller module. If a controller has ceased to function, the LEDs should all go off. Nevertheless, it is possible for the LEDs to remain on even though the controller has stopped responding to host and user commands (e.g., board temperature threshold was exceeded). An example of the LEDs on the controller rear panel is showing in Figure 1.2.

If you are using a single controller subsystem, the system might not be able to indicate controller faults by LED, if fatal errors have occurred.

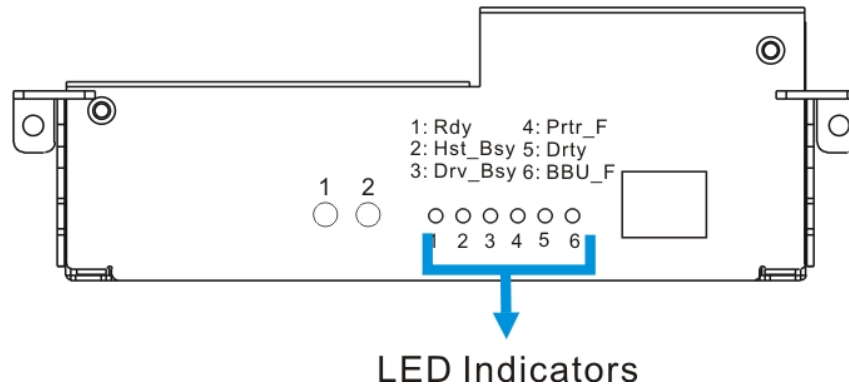


Fig. 1.2 Controller Module LEDs

1. If the audible alarm is beeping, press the [MUTE] button on the LCD panel (see Figure 1.1) or use hyper terminal to stop the alarm. (Refer to Method 1.1.4.)
2. Refer to Section 1.3 to rectify the controller failure problem.

1.1.3

Audible Alarm

Every Bosch RAID subsystem equips an audible alarm. If a subsystem component has failed, the audible alarm will automatically be triggered. If the system manager is onsite and hears an alarm, the manager should immediately check for error messages that are simultaneously displayed on the LCD screen, hyper terminal, or the Bosch RAIDWatch user interface to determine what has triggered the alarm.

For the single controller subsystem, when the controller fails, the audible alarm might not be triggered.

What to Do?

1. To stop the alarm beeping, press the [MUTE] button on the LCD panel (see Figure 1.1) or use hyper terminal to stop the alarm. (Refer to Method 1.1.4.)
2. Refer to Section 1.3 for the controller module failure rectification procedures.

1.1.4

Hyper Terminal

Please note that if you are using a single controller subsystem, you might or might not be prompted with an event message before the controller fails. If the only controller ceases to function, the hyper terminal connection will be terminated, and the access to firmware-embedded utility will be ended.

What to Do?

1. To stop the beeping alarm, first select from the main menu, "System Functions," and then press [ENTER] on "Mute beeper." Choose "Yes" and press [ENTER] in the next dialog box to turn the beeper off temporarily for the current event. The beeper will still be activated on the next event. The same function can also be accessed through the LCD panel and Bosch RAIDWatch.

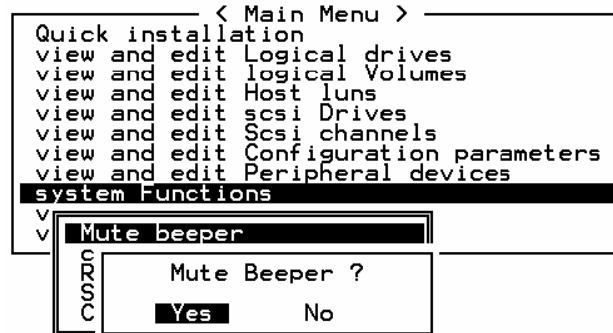


Fig. 1.3 Mute Beeper by Hyper Terminal Screen

2. Press [ESC] several times until return to the hyper terminal main screen.
3. Refer to Section 1.3 to rectify controller module failure.

1.1.5

RAIDWatch Server

The RAIDWatch Server is a sub-module of the RAIDWatch program for centralized management. If you have setup and turn on the RAIDWatch Server function, no matter where you are, a controller failure alert message can be sent to you wirelessly by Email, SNMP traps, fax, LAN broadcast, MSN, ICQ, and SMS messages. The message may look like below:

Name: ID XXXXXXX, Controller ALERT: Redundant Controller Failure Detected (Primary in slot A)

If you have received a controller failure alert message, refer to Section 1.3 for the rectification procedures. Refer to Section 1.2 for the description of event messages.

What to Do?

1. If the audible alarm is beeping, press the [MUTE] button on the LCD panel (see Figure 1.1) or use hyper terminal to stop the alarm. (Refer to Method 1.1.4.)
2. Refer to Section 1.3 for the controller module failure rectification procedures.

1.1.6

Bosch RAIDWatch

The Bosch RAIDWatch software has the visualized representation of enclosure components that corresponds to the real situation. RAIDWatch recognizes each subsystem by its board serial number, and displays an exact replica of it in its panel view. Although module failure problems can only be solved onsite, an administrator can use the Bosch RAIDWatch to remotely identify a problem and then contact the engineer in the place at the array site.

To view the controller module information in the RAIDWatch Enclosure View window, select either the Enclosure icon from the configuration tree or select the Enclosure View from the Action menu, as shown in Figure 1.6. The command allows you to access the graphical display of the enclosure's front and rear view window.

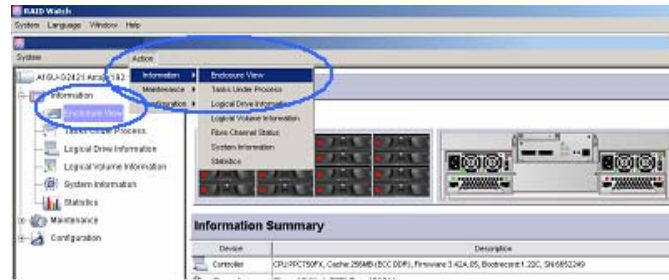


Fig. 1.4 Opening RAIDWatch Enclosure View Window

If multiple enclosures have been cascaded, you can select a different enclosure by clicking its tabbed icons as displayed above.

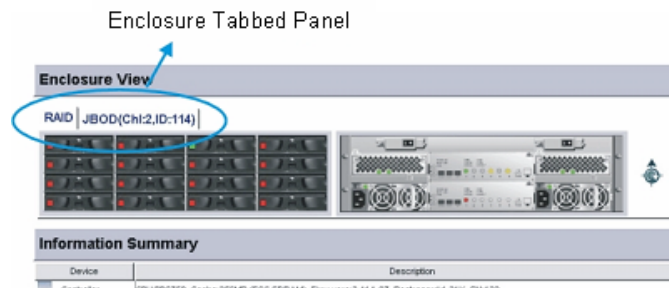


Fig. 1.5 Enclosure Tabbed Panel

Select an enclosure and start viewing devices in the Enclosure View window.

LEDs shown on the enclosure view is real time represents the LEDs on the subsystem's rear panel. (See Figure 1.7.)

Please note that if you are using a single controller system, the Bosch RAIDWatch may or may not be able to prompt error messages before the controller fails. If the only controller ceases to function, the Bosch RAIDWatch will be terminated, and the access to management computer will be ended.

Controller Connection Fail

If you see a connection failure, it may either be a connection failure or controller failure. However, in a software session with a single-controller subsystem, a controller failure will be reported as a connection failure. So, when you see the connection failure message as shown below, it may either be a connection failure or controller failure.

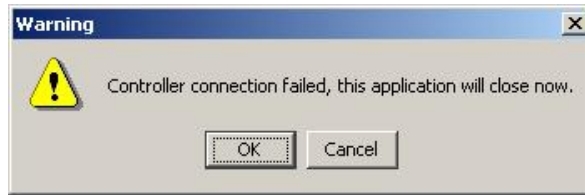


Fig. 1.6 Connection Failed Message

Upon seeing this message, you should first check the cabling and network connection. If you receive the message on a remote computer, contact the administrator at the installation site.

What to Do?

1. Verify the subsystem enclosure that the faulty controller module is installed by checking the enclosure tabbed panel located above the enclosure view window.
2. If the audible alarm is beeping, press the [MUTE] button on the LCD panel (see Figure 1.1) or use hyper terminal to stop the alarm. (Refer to Method 1.1.4.)
3. Refer to Section 1.3 for the controller module failure rectification procedures.

1.2

What Does the Error Message Mean?

When the controllers fails, you should receive controller module failure messages through hyper terminal screen, LCD screen, Bosch RAIDWatch or event notification. However, on a single controller subsystem, you may or may not receive the messages before the controller fails. The message may look like one of the followings:

Memory Not Sufficient to Fully Support Current Config.

Error! Check DDR RAM Install?

CHL:_ Host Channel ALERT: Channel Failure

CHL:_ FATAL ERROR(_)

NVRAM CRC Error! <ENT> to conform

Device ALERT: Temperature Sensor # Failure Detected

Device ALERT: Temperature Sensor # Not Present

Device ALERT: Cold Temperature # Detected (_(C))

Device ALERT: CPU Temperature <high/low threshold>Temperature Detected

Device ALERT: Board_ Temperature <high/low threshold>Temperature Detected

Force Controller Write-Through on Trigger Cause

Peripheral Device ALERT: Elevated Temperature Alert

Controller ALERT: Power Supply Unstable or NVRAM Failed

ALERT: +_V Low Voltage Detected (_._V)

Event Description

Event Message	Description	Action
Memory Not Sufficient to Fully Support Current Config	The original memory size may be insufficient for your subsystem.	Replace a memory module that has correct memory size.
Error! Check DDR RAM Install?	An unsupported memory module is installed or that a module is not correctly installed. Try to re-install the memory module.	Reinstall or replace a memory module that has correct memory size.
CHL:_ Host Channel ALERT: Channel Failure	One of the channels is disconnected and not functional.	Replace a new controller module.
CHL:_ FATAL ERROR(_)	Data is unable to transferred through a channel.	Host channel failed. Replace a new controller.
NVRAM CRC Error! <ENT> to conform	Unable to load and run firmware from NVRAM! The controller has failed to initialize by loading firmware. In addition to controller failure, this event also appears when an incompatible version of firmware is loaded into the controller. Press the ENT key to proceed. If there is no response after pressing the button, the controller may have encountered hardware problems. You may need to return the controller for repair.	Replace a new memory module or a new controller.
Device ALERT: Cold Temperature # Detected (_(C))	The subsystem is running under cold temperature and the controller might be failed.	Raise the environmental temperature.
Device ALERT: CPU Temperature <high/low threshold>Temperature Detected	The CPU on the controller module is detected running under the temperature exceed preset threshold.	Check the cooling modules in the subsystem. Adjust the environmental temperature.
Device ALERT: Board Temperature <high/low threshold>Temperature Detected	The temperature sensor on the controller board detects the temperature exceed preset threshold.	Check the cooling modules in the subsystem. Adjust the environmental temperature.
Peripheral Device ALERT: Elevated Temperature Alert	One of more of the peripheral devices is failed. The temperature breaches the preset threshold.	Check all peripheral devices in the subsystem.
ALERT: +_V Low Voltage Detected (__V)	The subsystem does not consume enough power voltage.	Check all PSUs and power source.

1.3

Is It Possible a Controller Module Has Not Actually Failed?

When you have received any of the above alert messages or a subsystem has failed to respond to host I/O requests or user commands, follow the below steps to rectify the problem.

1. Exclude all external factors that might impact the subsystem's normal operation. For example, power outage, multi-point cabling failure, system overheat, etc.
2. If the subsystem has failed to respond to host I/Os, you may close the application programs.
3. If the following conditions exist, you may try to restart the subsystem:
 - a. The LCD or rear-end LEDs are still lit.
 - b. The subsystem stopped responding to I/O requests and user commands.
 - c. You made configuration changes or upgraded firmware before the subsystem malfunctioned.
 - d. You released the extraction levers or removed screws on the controller module.
 - e. You upgraded the memory module mounted on the controller module.
 - f. Unreasonable I/Os were distributed to the subsystem, e.g., computer viruses.
 - g. Exceeded temperature thresholds or malfunctioning PSUs may cause the subsystem to stop receiving I/Os. Correct the operating conditions before attempting to reset the subsystem.
4. If all LEDs on the controller and LCD went off, and no other factors could have caused the shutdown, you may reinstall the controller and then power on. First stop the application programs running on the hosts. If your subsystem has a battery backup module, the cached data will be safe. If not, the unfinished writes cached in memory will be lost.
5. If the controller is still not functioning properly, it should be replaced. Please refer to Chapter 2 for the controller module replacement procedure.

1.4 How to Locate a Failed Controller Module?

Refer to the figure below to locate the failed controller module. All controllers in the single controller models are located in the upper middle module slot.

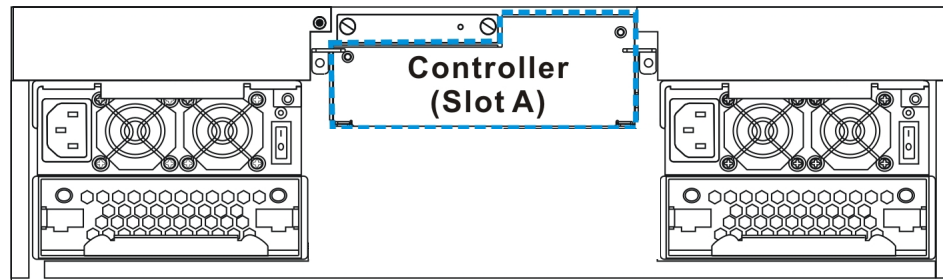


Fig. 1.7 Controller Module Location

2 Controller Module Replacement Procedures

2.1 How to Replace a Failed Controller Module?

Once you have located the failed controller, it should be replaced to restore system operation.



WARNING! When replacing the controller module, you must remember that the controller board is one of the most sensitive components in the subsystem. All safety precautions must be strictly adhered to. Failure to adhere to precautions can result in permanent damage to the controller board, resulting in timely delays.

For your own safety when replacing a controller in a single controller subsystem, make sure that no power is being supplied to the system prior to replacing the controller module.

The controller modules are secured to the chassis with the two (2) retention screws located on two levers. To replace the controller module, please follow these steps:

2.1.1 Removing the Controller Module

To remove the controller module:

1. If you are using a single controller subsystem, turn off the subsystem. If possible power off the subsystem after you power off host computers and/or networking devices. If that is not possible, turn off both PSU modules and disconnect the power cords.
2. Disconnect all cables that are connected to the controller module you wish to replace. These include the Ethernet cables connected to the network, and any cable connected to the RS-232C audio jack connector.
3. Remove the screws on the levers at the back of the controller module. (See Figure 2.1).

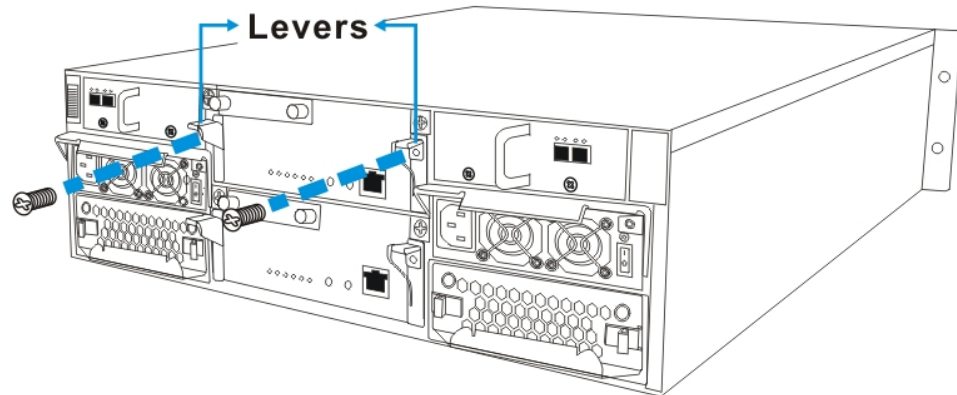


Fig. 2.1 Removing the Controller Module Screws

4. Remove the controller module by pressing down the two (2) levers at the back of the controller module. The controller module will automatically be eased out of the controller module bay. (See Figure 2.2.)

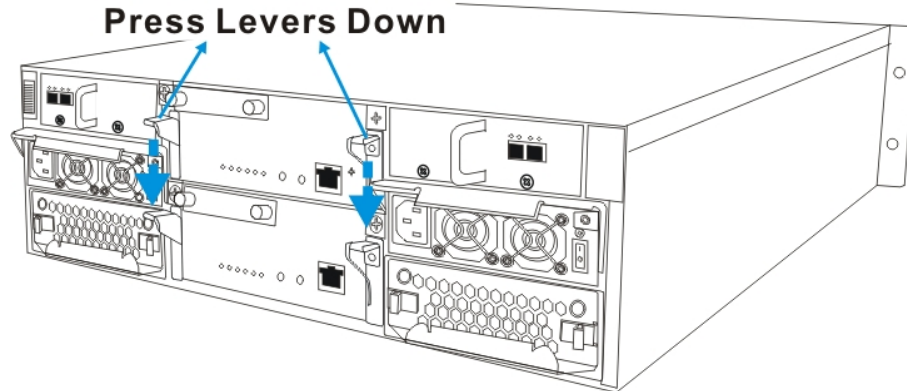


Fig. 2.2 Press Down the Controller Levers

5. Gently pull the controller module out of the subsystem. (See Figure 2.3) Place the controller module on a clean surface.

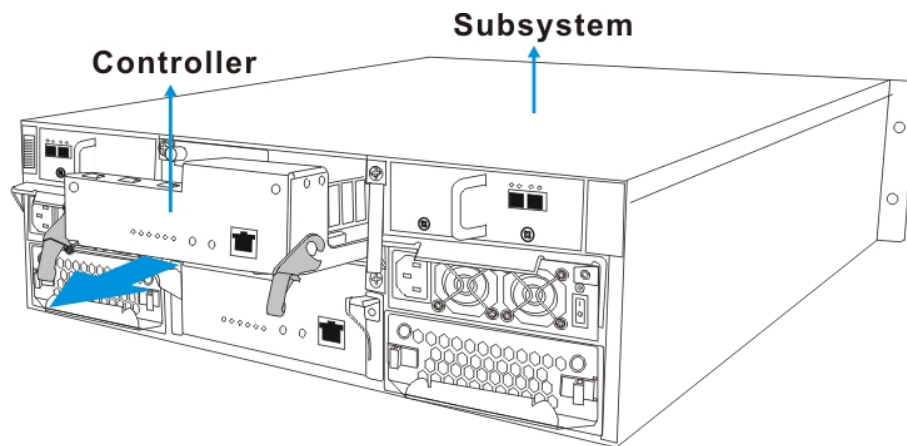


Fig. 2.3 Removing the Controller Module

2.1.2

Replacing the Controller Module

1. Install the DIMM module onto the new controller module; making sure that the memory module is securely in place. (See Section 2.2.)
2. Install the controller module. Make sure the levers at the back of the controller module are down. Align the controller module with the controller module bay at the rear of the subsystem. Gently slide the controller module in. (See Figure 2.4.)

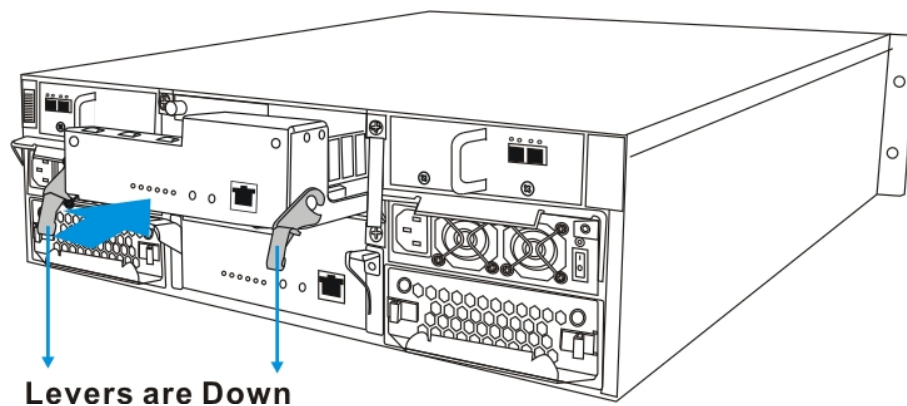


Fig. 2.4 Installing the Controller Module

3. Reposition the controller module. Once fully inserted, lift up the levers at the back of the controller module. This will set the controller module in the correct position. (See Figure 2.5)

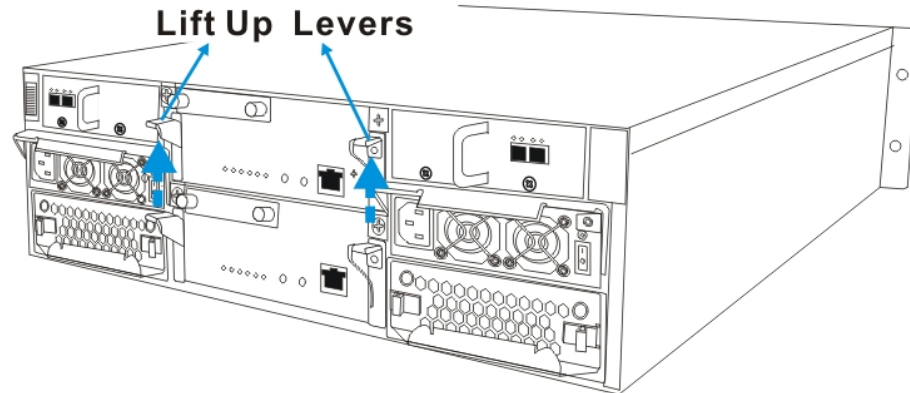


Fig. 2.5 Lifting the Controller Module Latches Upward

4. Secure the controller module to the subsystem by installing the two (2) screws on the levers. (See Figure 2.6.)

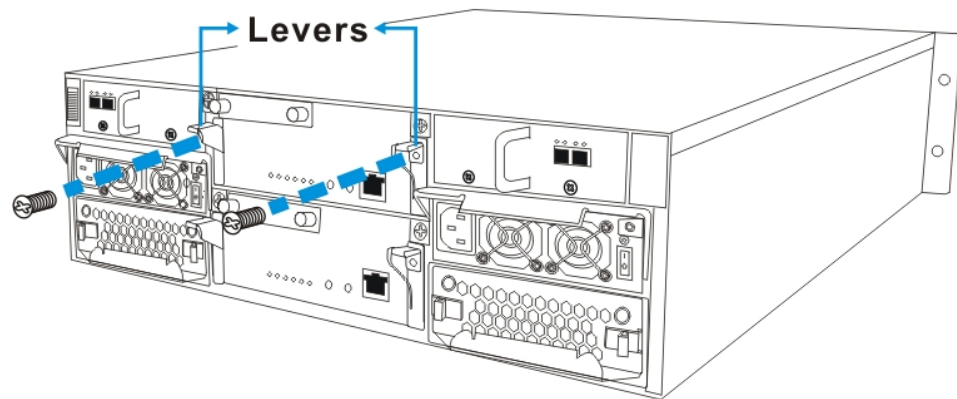


Fig. 2.6 Installing the Controller Module Screws

5. Re-attach all the cables that were removed. These include the cables that connect to the host and the expansion chassis, any Ethernet cable that was previously attached to the LAN port, and any cables that were attached to the COM ports.
6. Power on the subsystem.

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