



ThinkSystem DG7000 Hardware Installation and Maintenance Guide



Machine Types: 7DE5

Note

Before using this information and the product it supports, be sure to read and understand the safety information and the safety instructions, which are available at:

http://thinksystem.lenovofiles.com/help/topic/safety_documentation/pdf_files.html

In addition, be sure that you are familiar with the terms and conditions of the Lenovo warranty for your system, which can be found at:

<http://datacentersupport.lenovo.com/warrantylookup>

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Safety

Before installing this product, read the Safety Information.

قبل تركيب هذا المنتج، يجب قراءة الملاحظات الأمنية

Antes de instalar este produto, leia as Informações de Segurança.

在安装本产品之前，请仔细阅读 Safety Information（安全信息）。

安裝本產品之前，請先閱讀「安全資訊」。

Prije instalacije ovog produkta obavezno pročitajte Sigurnosne Upute.

Před instalací tohoto produktu si přečtěte příručku bezpečnostních instrukcí.

Læs sikkerhedsforskrifterne, før du installerer dette produkt.

Lees voordat u dit product installeert eerst de veiligheidsvoorschriften.

Ennen kuin asennat tämän tuotteen, lue turvaohjeet kohdasta Safety Information.

Avant d'installer ce produit, lisez les consignes de sécurité.

Vor der Installation dieses Produkts die Sicherheitshinweise lesen.

Πριν εγκαταστήσετε το προϊόν αυτό, διαβάστε τις πληροφορίες ασφάλειας (safety information).

לפני שתתקינו מוצר זה, קראו את הוראות הבטיחות.

A termék telepítése előtt olvassa el a Biztonsági előírásokat!

Prima di installare questo prodotto, leggere le Informazioni sulla Sicurezza.

製品の設置の前に、安全情報をお読みください。

본 제품을 설치하기 전에 안전 정보를 읽으십시오.

Пред да се инсталира овој продукт, прочитајте информацијата за безбедност.



Les sikkerhetsinformasjonen (Safety Information) før du installerer dette produktet.

Przed zainstalowaniem tego produktu, należy zapoznać się z książką "Informacje dotyczące bezpieczeństwa" (Safety Information).

Antes de instalar este produto, leia as Informações sobre Segurança.

Перед установкой продукта прочтите инструкции по технике безопасности.

Pred inštaláciou tohto zariadenia si pečítajte Bezpečnostné predpisy.

Pred namestitvijo tega proizvoda preberite Varnostne informacije.

Antes de instalar este producto, lea la información de seguridad.

Läs säkerhetsinformationen innan du installerar den här produkten.

ཐོན་རྫས་འདི་བདེ་སྤྱོད་མ་བྱས་གོང་། རྫོང་གི་ཡིད་གཟབ་
བྱ་འདྲ་མིན་ཡོད་པའི་འོད་ཟེར་བལྟ་དགོས།

Bu ürünü kurmadan önce güvenlik bilgilerini okuyun.

مەزكۇر مەھسۇلاتنى ئورنىتىشتىن بۇرۇن بىخەتەرلىك ئۇچۇرلىرىنى ئوقۇپ چىقىڭ.

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canjbinj soengq cungj vahgangj ancien siusik.

Chapter 1. Introduction

This chapter provides a brief introduction to your system. This chapter contains information about product specifications, management software, tech tips, and security advisories.

System package contents

When you receive your system, verify that the shipment contains everything that you expected to receive.

The system package includes the following items:

Note: Items marked with asterisk (*) are available on some models only.

- **1** DG7000 unit
 - **2** Rail kit*. Detailed instructions for installing the rail kit are provided in the package with the rail kit.
 - **3** Cable management arm (Quantity: 2)
 - **4** Material box, including items such as cable management arm*, accessory kit, power cords* and documentation
-

Specifications

The following information is a summary of the features and specifications of the DG7000 storage unit. Depending on the model, some features might not be available, or some specifications might not apply.

Table 1. Storage specifications

Specification	Description
Dimension	<ul style="list-style-type: none">• 4U• Height: 175 mm (6.9 inches)• Width:<ul style="list-style-type: none">– With mounting flanges: 483 mm (19.0 inches)– Without mounting flanges: 447 mm (17.6 inches)• Depth:<ul style="list-style-type: none">– With cable management arm: 929 mm (36.6 inches)– Without cable management arm: 876 mm (34.5 inches)
Weight	49.2 kg (108.5 lb)
Processor	<ul style="list-style-type: none">• Intel 2.2 GHz 10-core processor• Two 10-core processors per node• 40 total processor core per system
Power supplies	Four hot-swap power supplies for redundancy support
Memory	<ul style="list-style-type: none">• Memory: 128 GB per node, 256 GB in total• NVRAM: 16 GB per node, 32 GB in total• Type:<ul style="list-style-type: none">– DDR4-2666, dual-rank, 32 GB ECC RDIMM– DDR4-2666, single-rank, 16 GB ECC NVDIMM

Table 1. Storage specifications (continued)

Specification	Description													
Expansion slots	<ul style="list-style-type: none"> • Five PCIe slots per node • Ten PCIe slots per system For detailed information, see “Rear view” on page 6 .													
Input/Output (I/O) features	Rear panel (per node): <ul style="list-style-type: none"> • Four x4 12 Gb MiniSAS HD (SFF-8644) connectors • Two 25 GbE SFP28 connectors(for HA interconnect) • Two 100 GbE QSFP28 connectors (for cluster interconnect) • One RJ-45 1 GbE management ports • One RJ-45 console port • One Micro-USB console port • One USB Type-A connector (Netboot & OS update) Depending on configuration, the following host ports will be included: <ul style="list-style-type: none"> • Four 16 Gb Fiber Channel SFP+ connectors or; • Four 25 GbE SFP28 connectors 													
Storage controller adapters	<ul style="list-style-type: none"> • 2-port 10GBase-T Ethernet, RJ45 port • 4-port 10Gb Ethernet, SFP+ port • 2-port 25Gb Ethernet, SFP28 port • 2-port 100Gb Ethernet, QSFP28 port • 4-port 32GB Fiber Channel, SFP+ port 													
System fans	<ul style="list-style-type: none"> • Eight hot-swap system fans • System can operate with a single fan failure 													
Electrical input	The storage system supports up to two hot-swap power supplies for node for redundancy. <table border="1" data-bbox="521 1278 1422 1514"> <tbody> <tr> <td>Power supply</td> <td>100–120 V ac</td> <td>200–240 V ac</td> </tr> <tr> <td rowspan="2">1600-watt 80 PLUS Platinum</td> <td>(50–60 Hz)</td> <td>(50–60 Hz)</td> </tr> <tr> <td>Yes</td> <td>Yes</td> </tr> <tr> <td rowspan="2">1600-watt 80 PLUS Titanium</td> <td>(50–60 Hz)</td> <td>(50–60 Hz)</td> </tr> <tr> <td>Yes</td> <td>Yes</td> </tr> </tbody> </table> <p>Note: Each node can operate with a single failed power supply. The storage system can continue to operate with up to two failed power supplies.</p> <p>A power supply fan failure will cause power supply to shut down.</p>	Power supply	100–120 V ac	200–240 V ac	1600-watt 80 PLUS Platinum	(50–60 Hz)	(50–60 Hz)	Yes	Yes	1600-watt 80 PLUS Titanium	(50–60 Hz)	(50–60 Hz)	Yes	Yes
Power supply	100–120 V ac	200–240 V ac												
1600-watt 80 PLUS Platinum	(50–60 Hz)	(50–60 Hz)												
	Yes	Yes												
1600-watt 80 PLUS Titanium	(50–60 Hz)	(50–60 Hz)												
	Yes	Yes												

Table 1. Storage specifications (continued)

Specification	Description
Acoustical noise emissions	<ul style="list-style-type: none"> • Sound power: 8.5 bels • Sound pressure: 67.2 dBA
Environment	<p>The system is supported in the following environment:</p> <ul style="list-style-type: none"> • Air temperature: <ul style="list-style-type: none"> – Operating: ASHRAE class A2: 10–35°C (50–95°F) – Shipping or storage: -40–70°C (-40–158°F) • Maximum altitude: <ul style="list-style-type: none"> – Operating: 3048 m (10000 ft) – Shipping or storage: 12 192 m (40000 ft) • Relative humidity (non-condensing): <ul style="list-style-type: none"> – Operating: ASHRAE class A2: 8%–80%; maximum dew point: 21°C (70°F) – Shipping or storage: 10%–95% <p>Your storage complies with ASHARE class A2 specifications. For detailed information, see “ASHRAE class compliance information” on page 88.</p>

Management software

ONTAP is available for managing your system. For detailed information about how to use ONTAP, go to: https://thinksystem.lenovofiles.com/storage/help/topic/ontap_software/overview.html

Tech Tips

Lenovo continually updates the support website with the latest tips and techniques that you can use to solve issues that you might have with your system. These Tech Tips (also called retain tips or service bulletins) provide procedures to work around issues related to the operation of your system.

To find the Tech Tips available for your system:

1. Go to <http://datacentersupport.lenovo.com> and navigate to the support page for your system.
2. Click **How-tos & Solutions**.

Expand **Symptom** to choose a category for the type is problem that you are having.

Security advisories

Lenovo is committed to developing products and services that adhere to the highest security standards in order to protect our customers and their data. When potential vulnerabilities are reported, it is the responsibility of the Lenovo Product Security Incident Response Team (PSIRT) to investigate and provide information to our customers so they may put mitigation plans in place as we work toward providing solutions.

The list of current advisories is available at the following site:

https://datacentersupport.lenovo.com/product_security/home

Chapter 2. System components

This section provides information to help you locate your DG7000 components.

Front view

The following illustration shows the front view of the DG7000 with the front bezel removed.

Front view without bezel

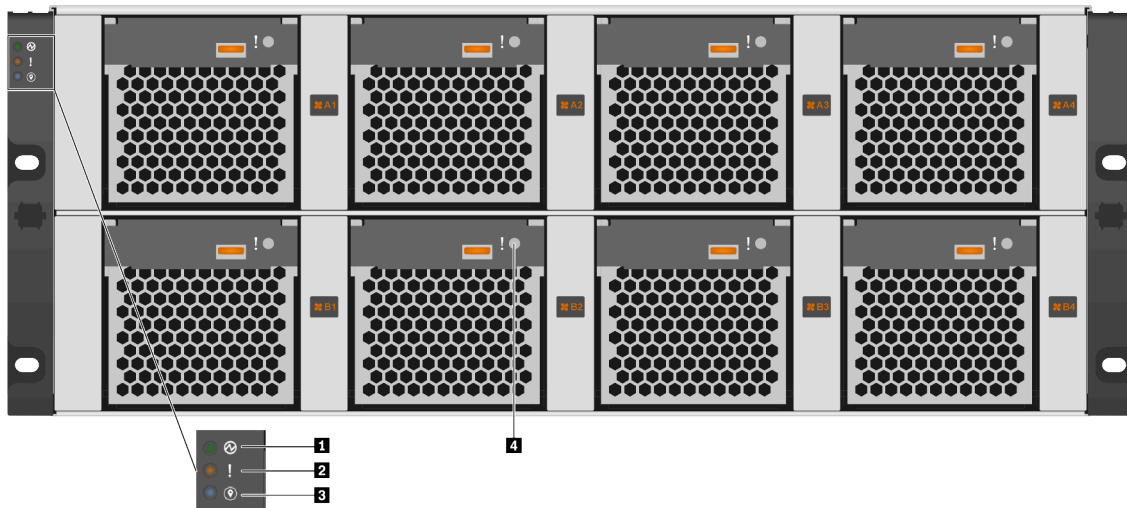


Figure 1. Front view without bezel

1 Chassis power LED	2 System attention LED
3 Location LED	4 Fan fault LED

1 Chassis power LED

The power status LED helps you to determine the current power status.

Status	Color	Description
Solid on	Green	The system is on and running.
Off	None	No power supply is delivering power to the system.

2 System attention LED

The system attention LED provides basic diagnostic functions for your storage system. If the system attention LED is lit, one or more LEDs elsewhere in the system might also be lit to direct you to the source of the error.

Status	Color	Description	Action
On	Yellow	An error has been detected on the system. Causes might include but not limited to the following errors: <ul style="list-style-type: none"> • A fan failure • A memory error • A storage failure • A PCIe device failure • A power supply failure • A port failure • A system board error 	Check the event log to determine the exact cause of the error.
Off	None	The system is off, or the system is on and working correctly.	None.

3 Location LED

The blue system location LED is used to visually locate a system.

4 Fan fault LED

The fan fault LED is used to determine the status of the system fan.

Status	Color	Description	Action
On	Yellow	An error has occurred with the system fan.	Replace the system fan.
Off	None	The system fan is working normally.	None.

Rear view

The rear view of the storage provides access to the system connectors and components.

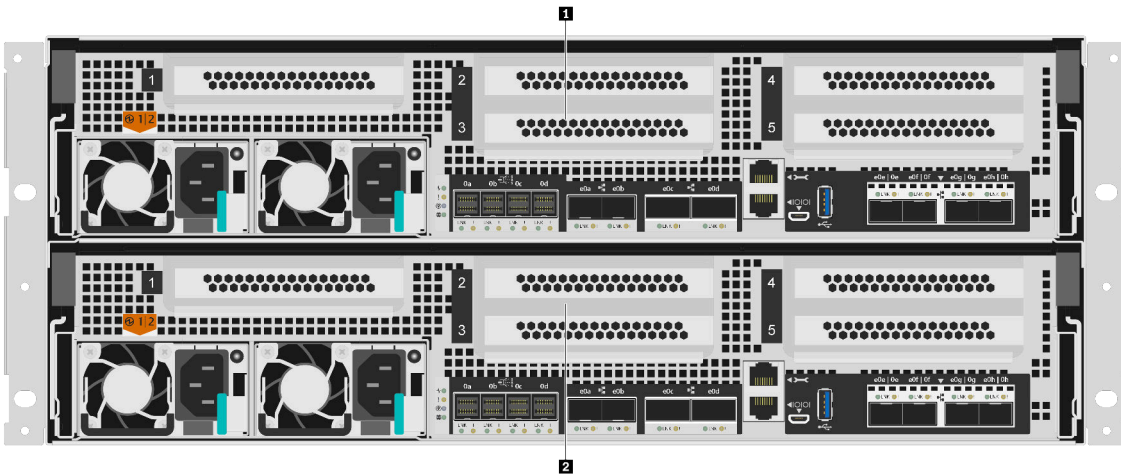


Figure 2. Rear view with dual, high availability, nodes

1 Top controller, node A	2 Bottom controller, node B
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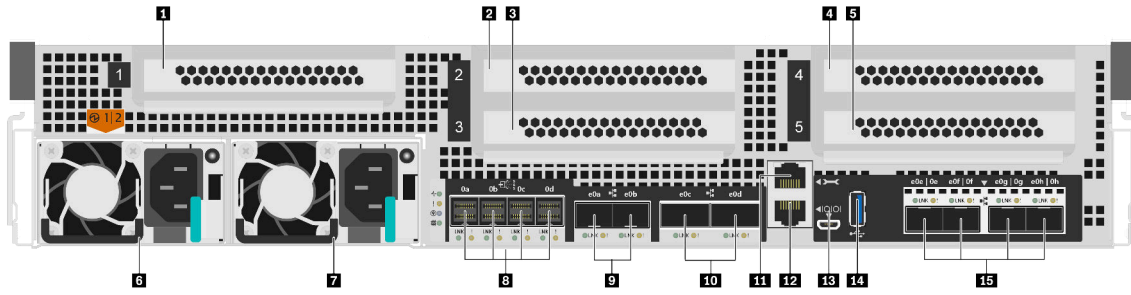


Figure 3. Rear view of controller nodes

1 PCIe slot 1 (on riser 1)	2 PCIe slot 2 (on riser 2)
3 PCIe slot 3 (on riser 2)	4 PCIe slot 4 (on riser 3)
5 PCIe slot 5 (on riser 3)	6 Power supply 1
7 Power supply 2	8 x4 12 Gb mini-SAS HD (SFF-8644) connectors (4)
9 25 GbE SFP28 connectors (2)	10 100 GbE QSFP28 connectors (2)
11 RJ-45 console port	12 1 GbE RJ-45 management port
13 Micro-USB console port	14 USB Type-A port
15 16 GB Fibre channel SFP+ ports or 25 GbE SFP28 ports (4)	

Note: 16 GB Fibre channel or 25 GbE is dependent on configuration.

1 2 3 4 5 PCIe slots

You can find the PCIe slot numbers on the rear of each controller.

6 7 Power supplies

The hot-swap redundant power supplies help you avoid significant interruption to the operation of the system when a power supply fails. Each controller can continue to operate with a single power supply failure.

On each power supply, there are multi-color status LEDs near the power cord connector. For information about the status LEDs, see [“Rear view LEDs”](#) on page 8.

8 x4 12 Gb mini-SAS HD (SFF-8644) connectors (4)

SAS ports are not supported.

9 25 GbE SFP28 connectors (2)

Each controller includes two 25 Gb ethernet ports that are used to provide node-to-node high availability.

10 100 GbE QSFP28 connectors (2)

Each controller includes two 100 Gb ethernet ports that are used to provide node-to-node clustering or switch node clustering on a DG7000.

11 RJ-45 console port

The RJ-45 console port connection provides serial access to the nodes BMC management network device.

12 1 GbE RJ-45 management port

The RJ-45 console port connection provides 1 Gb Ethernet connectivity to the node for systems management using the Storage Manager.

13 Micro-USB console port

The Micro-USB console port connection provides serial access to the nodes BMC management network device.

14 USB Type-A port

The USB Type-A port is a Read-Only connection that can be used for ONTAP netboot and system updates.

15 16 GB Fibre channel SFP+ ports or 25 GbE SFP28 ports (4)

Depending upon the configuration, the node can be equipped with four 16 Gb fiber channel host IO ports or four 25 Gb Ethernet host IO ports.

- 16 GB Fibre channel SFP+ ports: The ports require the use of a 16 Gb SFP+ fiber channel transceiver.
- 25 GbE SFP28 ports: The ports require the use of either a 25 Gb SFP28 transceiver or 25 Gb Direct Attach Copper (DAC) cable.

Rear view LEDs

The illustration in this section shows the LEDs on the rear of the storage unit.

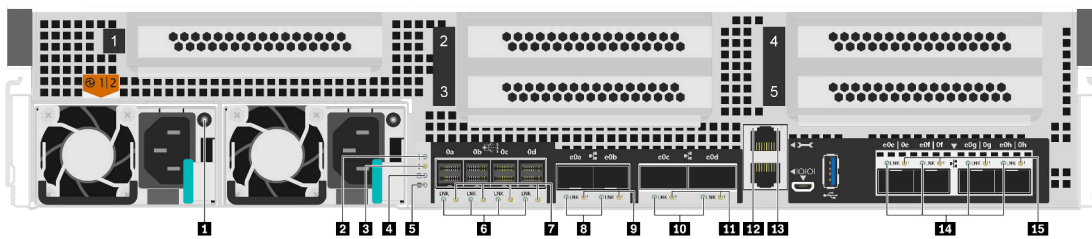


Figure 4. Rear view LEDs

Table 2. LEDs on the rear of the system

1 Power supply	2 Controller activity LED
3 Controller attention LED	4 Controller location LED
5 NVMEM discharge LED	6 SAS port link LEDs (4)
7 SAS port attention LEDs (4)	8 25 GbE port link LEDs (2)
9 25 GbE port attention LEDs (2)	10 100 GbE port link LEDs (2)
11 100 GbE port attention LEDs (2)	12 RJ45 management port link LED
13 RJ45 management port activity LED	14 Fibre channel or Ethernet port link LEDs (4)
15 Fibre channel or Ethernet port attention LEDs (4)	

1 Power supply LED

The power supply has a multi-color status LED.

Status	Color	Description
On	Green	The power supply is connected to the AC power source.
	Red	The power supply is failed or the AC power source is removed.
Off	None	The system is off.

2 Controller activity LED

The controller activity LED provides the status of ONTAP running on the controller.

Status	Color	Description
Blinking	Green	The controller is running ONTAP. The length of time the light remains on is proportional to the controller activity.
Off	None	ONTAP is not running on the controller.

3 Controller attention LED

The controller attention LED indicates that there is an issue with a controller. Check other LEDs and event logs to determine the cause of the issue.

Status	Color	Description
On	Amber	The controller has a fault.
Off	None	The controller is operating normally.

4 Controller location LED

The controller location LED is a blue LED that helps to show the location of a specific controller in a system.

5 NVMEM discharge LED

The NVMEM discharge LED provides the status of ONTAP running on the controller.

Status	Color	Description
Blinking	Green	NVMEM destage events are occurring.
Solid	Green	NVMEM destage events completed successfully.
Off	None	The system is running normally and the NVMEM is ready if ONTAP is running.

6 7 SAS port status LEDs

The SAS port has two status LEDs.

Status LED	Status	Color	Description
6 SAS port link LEDs (4)	On	Green	A connection is established on the port.
	Off	None	No connection is established on the port.
7 SAS port attention LEDs (4)	On	Amber	The port requires attention.
	Off	None	The port operates normally.

8 9 25 Gb Ethernet port status LEDs

The Ethernet port has two status LEDs.

Status LED	Status	Color	Description
8 25 GbE port link LEDs (2)	On	Green	A connection is established on the port.
	Off	None	No connection is established on the port.
9 25 GbE port attention LEDs (2)	On	Amber	The port requires attention.
	Off	None	The port operates normally.

10 11 100 Gb Ethernet port status LEDs

The Ethernet port has two status LEDs.

Status LED	Status	Color	Description
10 100 GbE port link LEDs (2)	On	Green	A connection is established on the port.
	Off	None	No connection is established on the port.
11 100 GbE port attention LEDs (2)	On	Amber	The port requires attention.
	Off	None	The port operates normally.

12 13 RJ45 management port status LEDs

The RJ45 management port is a 1Gb Ethernet port that has two status LEDs.

Status LED	Status	Color	Description
12 RJ45 management port link LED	On	Green	A link is established between the port and some upstream device.
	Off	None	No link is established.
13 RJ45 management port activity LED	Blinking	Green	Traffic is flowing over the connection.
	Off	None	No traffic is flowing over the connection.

14 15 Fiber channel or Ethernet port status LEDs

This can be configured with either Fiber channel or Ethernet ports. The port has two status LEDs.

Status LED	Status	Color	Description
14 Fibre channel or Ethernet port link LEDs (4)	On	Green	A connection is established on the port.
	Off	None	No connection is established on the port.
15 Fibre channel or Ethernet port attention LEDs (4)	On	Amber	The port requires attention.
	Off	None	The port operates normally.

PCIe slots

The DG7000 supports five (5) x16 PCIe slots per controller. These slots are used to add extra adapters for host, storage, or cluster connectivity. The tables below show the supported adapters, the max number supported per controller and the adapter slot priority.

Adapter support

Name	Option PN	Feature Code	Plug Type	Supported Protocol(s)	Per Controller	Slot Priority
Host Interface						
10Gb BaseT 2 port Ethernet Card	4XC7A60794	B94F	RJ45	Ethernet 1/10 Gb	4	1,2,3,4,5
10Gb 4 port Ethernet Card	4XC7A38329	B730	SFP+	Ethernet 10Gb	4	1,2,3,4,5
25Gb 2 port Ethernet Card	4XC7A38328	B72Z	SFP28	Ethernet 10/25Gb	4	1,2,3,4,5
100Gb 2 port Ethernet Card	4XC7A38327	B72Y	QSFP28	Ethernet 40/100 Gb	5	1,2,3,4,5
32Gb 4 port Fibre Channel Card	4XC7A38326	B72X	SFP+	Fibre Channel 8/16/32 Gb NVMe/FC 16/32 Gb	5	1,2,3,4,5
Expansion						
100Gb 2 port Ethernet Card ¹	4XC7A38327	B72Y	QSFP28	Ethernet 40/100 Gb	2	4,5
MetroCluster						
100Gb iWARP 2 Port Ethernet Card	4XC7A60795	B94G	QSFP28	Ethernet 100Gb	1	1

Adapter Support with IP MetroCluster

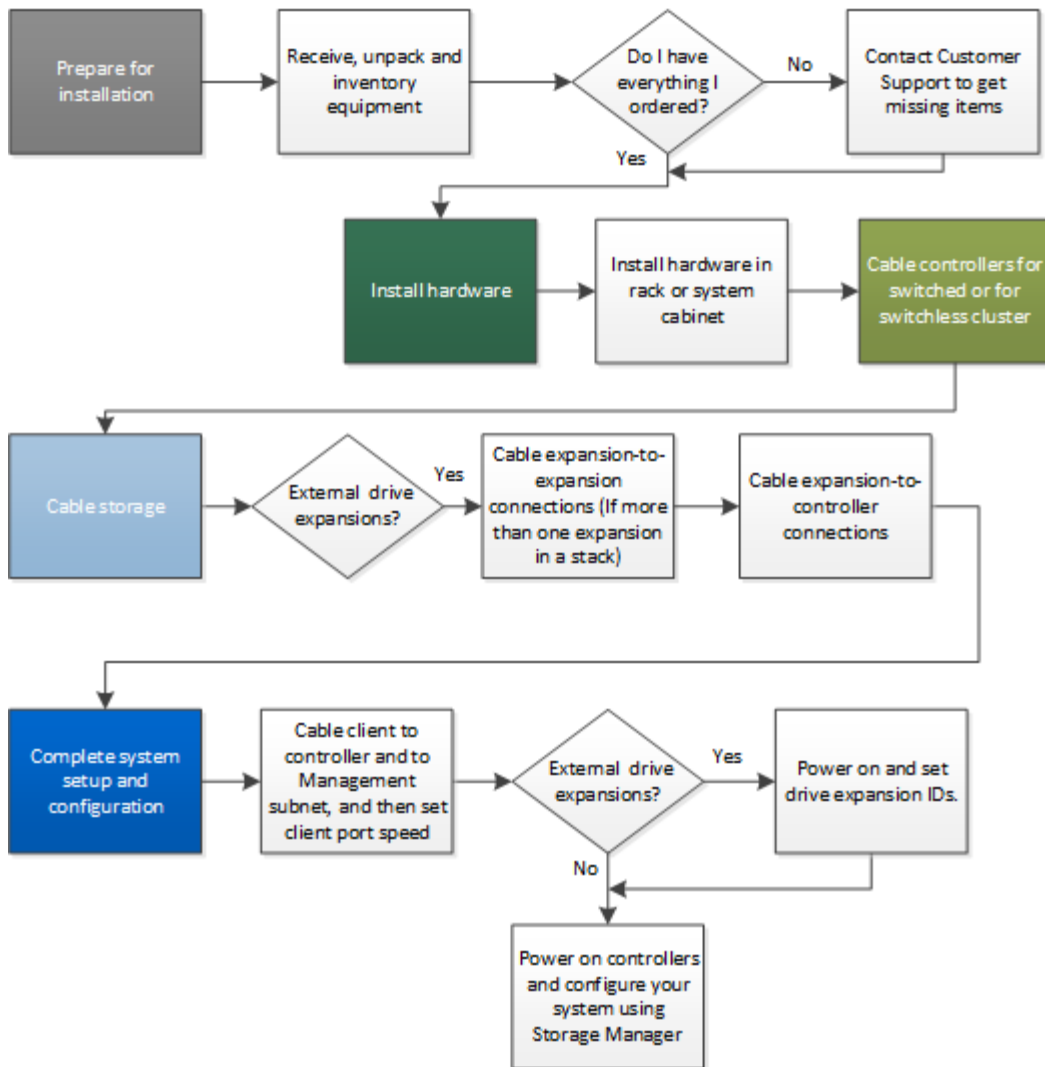
Name	Option PN	Feature Code	Plug Type	Supported Protocol(s)	Per Controller	Slot Priority
Host Interface						
10Gb BaseT 2 port Ethernet Card	4XC7A60794	B94F	RJ45	Ethernet 1/10 Gb	4	2,3,4,5
10Gb 4 port Ethernet Card	4XC7A38329	B730	SFP+	Ethernet 10Gb	4	2,3,4,5
25Gb 2 port Ethernet Card	4XC7A38328	B72Z	SFP28	Ethernet 10/25Gb	4	2,3,4,5
100Gb 2 port Ethernet Card	4XC7A38327	B72Y	QSFP28	Ethernet 40/100 Gb	4	2,3,4,5
32Gb 4 port Fibre Channel Card	4XC7A38326	B72X	SFP+	Fibre Channel 8/16/32 Gb NVMe/FC 16/32 Gb	4	2,3,4,5
Expansion						
100Gb 2 port Ethernet Card ¹	4XC7A38327	B72Y	QSFP28	Ethernet 40/100 Gb	2	4,5
MetroCluster						
100Gb iWARP 2 Port Ethernet Card	4XC7A60795	B94G	QSFP28	Ethernet 100Gb	1	1

¹: Used with DM240N expansion, restricted to 100 GbE only.

Chapter 3. System installation and setup

Installation and setup high-level workflow

Before you begin the installation and setup of your new system, you can familiarize yourself with the installation process.



Installation and setup PDF poster

You can use the PDF poster to install and set up your new system. The PDF poster provides step-by-step instructions with live links to additional content.

Access the *Installation and Setup Instructions* PDF poster:

[DG7000 Systems Installation and Setup Instructions](#)

Installation and setup guide

You can use this guide to install and setup your new system. The procedures in this guide provide step-by-step instructions with live links to additional content.

Preparing for installation

To install your system, you need to create an account and register the system. You also need to inventory the appropriate number and type of cables for your system and collect specific network information.

Before you begin

You need to have access to the Lenovo Press for information about site requirements as well as additional information on your configured system. You might also want to access the Release Notes on the Lenovo Data Center Support Site for your version of ONTAP for more information about this system.

[Lenovo press](#)

You need to provide the following at your site:

- Rack space for the storage system
- Phillips #2 screwdriver
- Additional networking cables to connect your system to your network switch and laptop or console with a Web browser



Step 1. Unpack the contents of all boxes.





Step 2. Record the system serial number for your system.



Step 3. Inventory and make a note of the number and types of cables you received. The following table identifies the types of cables you might receive. If you receive a cable not listed in the table, see the Lenovo Press to locate the cable and identify its use.

[Lenovo press](#)

Type of cable...	Part number and length	Connector type	For...
100 GbE cable (QSFP28)	7Z57A03561, 1m 7Z57A03562, 3m 7Z57A03563, 5m		Storage, cluster interconnect/HA, and Ethernet data (order-dependent)
25 GbE cable (SFP28s)	7Z57A03557, 1m 7Z57A03558, 3m 7Z57A03559, 5m		GbE network connection (order-dependent)

Type of cable...	Part number and length	Connector type	For...
Optical cables	4Z57A10845, .5M LC-LC OM4 4Z57A10846, 1M LC-LC OM4 4Z57A10847, 3M LC-LC OM4 4Z57A10848, 5M LC-LC OM4 4Z57A10849, 10M LC-LC OM4 4Z57A10850, 15M LC-LC OM4 4Z57A10851, 25M LC-LC OM4 4Z57A10852, 30M LC-LC OM4		16 Gb FC or 25GbE cables for mezzanine cards (order-dependent)
RJ-45 (order dependant)	Various		Management network
Micro-USB console cable	Not applicable		Console connection used during software setup if laptop or console does not support network discovery.
Power cables	Not applicable		Powering up the system

Step 4. Collect the following information to be used in the setup of your DG series system:

This worksheet prepares you to gather information needed to setup the storage system.

Table 3. Storage system information

Storage system name	
Password for admin account <e.g Eight characters long, must contain at least one letter and one number, special characters are allowed>	
License	License will be present on system on new factory orders. If license information is needed after initial setup, go to Lenovo Key Management System and click Retrieve history .
TCP/IP addresses for cluster and node management (3 total for e0M)	
TCP/IP addresses for BMC/SP remote management interfaces (2 total for BMC/SP)	

Table 3. Storage system information (continued)

DNS domain names and DNS server IP address	
NTP network time services host name or IP address	
SMTP mail host and email address for notifications	
SNMP trap host	
System logs (syslog) server	
SVM names(s)	
Setup information for data protocol(s)	SAN — host side initiators NAS — TCP/IP addresses

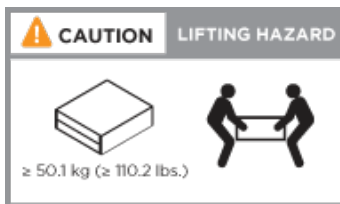
Installing the hardware

You need to install your system in a 4-post rack or Lenovo system cabinet, as applicable.

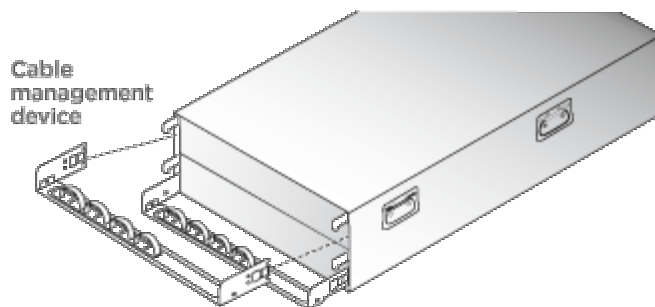
Step 1. Install the rail kits, as needed.

Step 2. Install and secure your system using the instructions included with the rail kit.

Note: You need to be aware of the safety concerns associated with the weight of the system.



Step 3. Attach cable management devices (as shown).



Step 4. Place the bezel on the front of the system.

Cabling controllers to your network

You can cable the controllers to your network by using the two-node switchless cluster method or by using the cluster interconnect network.

For more detailed information, refer to [DG7000 Systems Installation and Setup Instructions](#).

Cabling a two-node switchless cluster

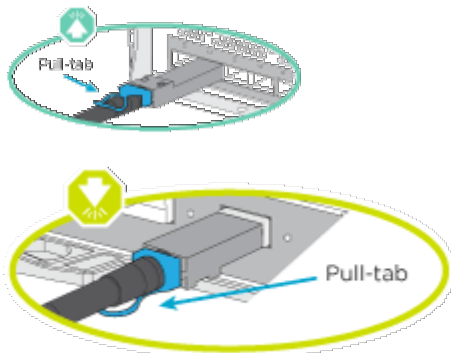
The optional data ports, optional NIC cards, and management ports on the controller modules are connected to switches. The cluster interconnect and HA ports are cabled between both controller modules.

Before you begin

You must have contacted your network administrator for information about connecting the system to the switches.

About this task

Be sure to check the direction of the cable pull-tabs when inserting the cables in the ports. Cable pull-tabs are up for all onboard ports and down for expansion (NIC) cards.



Note: As you insert the connector, you should feel it click into place; if you do not feel it click, remove it, turn it around and try again.

- Step 1. Complete the cabling between the controllers and to the switches:
- Cable ports e0a to e0a between controller A and controller B.
 - Cable ports e0b to e0b between controller A and controller B.
 - Cable ports e3a to e3a and e3b to e3b between controllers A and B.
 - Cable the e0M management ports for each controller to your management network.
 - If needed you can also cable your Ethernet and FibreChannel ports to the host provided switches using the available ports.

Step 2. Cable your storage: [“Cabling controllers to drive shelves” on page 18](#)

Cabling a switched cluster

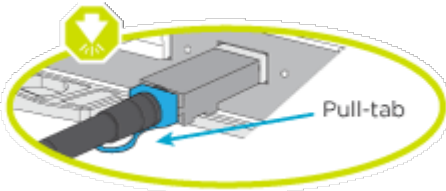
The optional data ports, optional NIC cards, mezzanine cards, and management ports on the controller modules are connected to switches. The cluster interconnect and HA ports are cabled on to the cluster/HA switch.

Before you begin

You must have contacted your network administrator for information about connecting the system to the switches.

About this task

Be sure to check the direction of the cable pull-tabs when inserting the cables in the ports. Cable pull-tabs are up for all onboard ports and down for expansion (NIC) cards.



Note: As you insert the connector, you should feel it click into place; if you do not feel it click, remove it, turn it around and try again.

Step 1. Complete the cabling between the controllers and to the switches:

- a. Cable ports e0a to e0a between controller A and controller B.
- b. Cable ports e0b to e0b between controller A and controller B.
- c. Cable ports e3a from each controller to switch 1.
- d. Cable ports e3b from each controller to switch 2.
- e. Cable the e0M management ports for each controller to your management network.
- f. If needed you can also cable your Ethernet and FibreChannel ports to the host provided switches using the available ports.

Step 2. Cable your storage: [“Cabling controllers to drive shelves” on page 18](#)

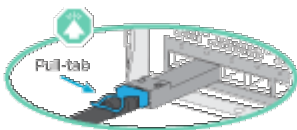
Cabling controllers to drive shelves

Cabling the controllers to a single drive shelf

You must cable each controller to the NSM modules on the DM240N drive shelf.

About this task

Be sure to check the illustration arrow for the proper cable connector pull-tab orientation. The cable pull-tab for the DM240N are up.



Note: As you insert the connector, you should feel it click into place; if you do not feel it click, remove it, turn it around and try again.

Step 1. Cable your controllers to a single drive shelf.

[Hot-adding a DM240N drive shelf](#)

Step 2. To complete setting up your system, see [“Completing system setup and configuration” on page 19](#).

Completing system setup and configuration

You can complete the system setup and configuration by connecting directly to a controller in the system and then connecting to the management switch.

Completing system setup and configuration using serial port connection

You must complete the configuration and setup using this task with the serial port cable provided.

Step 1. Cable and configure your laptop or console:

- a. Set the console port on the laptop or console to 115,200 baud with N-8-1.

Note: See your laptop or console's online help for how to configure the console port.

- b. Connect the console cable to the laptop or console using the console cable that came with your system, and then connect the laptop to the management switch on the management subnet .
- c. Assign a TCP/IP address to the laptop or console, using one that is on the management subnet.

Step 2. If your system has two DM240N drive shelves, the shelves are pre-set to shelf ID 01 and 02. If you want to change the shelf IDs, you must use a tool to insert into the hole where button is located.

[Changing a shelf ID for an DM240N drive shelf](#)

Step 3. Plug the power cords into the controller power supplies, and then connect them to power sources on different circuits.

Note: Initial booting may take up to eight minutes.

Step 4. Assign an initial node management IP address to one of the nodes.

If the management network has DHCP...	Then...
Configured	Record the IP address assigned to the new controllers.
Not configured	<ol style="list-style-type: none">1. Open a console session using PuTTY, a terminal server, or the equivalent for your environment. <p>Note: Check your laptop or console's online help if you do not know how to configure PuTTY.</p> <ol style="list-style-type: none">2. Enter the management IP address when prompted by the console.

Step 5. Use Storage Manager on your laptop or console, configure your cluster:

- a. Point your browser to the node management IP address (from [Step 4 on page 19](#)).

Note: The format for the address is `https://x.x.x.x`.

- b. Collect the following information to be used in the setup of your DG series system:

This worksheet prepares you to gather information needed to setup the storage system.

Table 4. Storage system information

Storage system name	
Password for admin account <e.g Eight characters long, must contain at least one letter and one number, special characters are allowed>	
License	License will be present on system on new factory orders. If license information is needed after initial setup, go to Lenovo Key Management System and click Retrieve history .
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TCP/IP addresses for BMC/SP remote management interfaces (2 total for BMC/SP)	
DNS domain names and DNS server IP address	
NTP network time services host name or IP address	
SMTP mail host and email address for notifications	
SNMP trap host	
System logs (syslog) server	
SVM names(s)	
Setup information for data protocol(s)	SAN – host side initiators NAS – TCP/IP addresses

- Step 6. Set up your account on the Lenovo commercial account portal for ThinkSystem Intelligent Monitoring.
- a. Log in to your existing account or create an account. [Lenovo Support Registration](#)
 - b. Register your system. [Lenovo Product Registration](#)
- Step 7. After you have completed the initial configuration, go to the [Lenovo ONTAP Resources](#) page for information about configuring additional features in ONTAP.

Chapter 4. Hardware replacement procedures

Replacing a power supply

Replacing a power supply (PSU) involves disconnecting the target PSU from the power source, unplugging the power cable, removing the old PSU, installing the replacement PSU, and then reconnecting the replacement PSU to the power source.

About this task

- The power supplies are redundant and hot-swappable.
- This procedure is written for replacing one power supply at a time.

Note: It is a best practice to replace the power supply within two minutes of removing it from the chassis. The system continues to function, but ONTAP sends messages to the console about the degraded power supply until the power supply is replaced.

A video for this task is available at:

- YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-C8THdP1nmPF25RWwGRta3v>

You can use the following steps to replace the power supply.

- Step 1. If you are not already grounded, properly ground yourself.
- Step 2. Identify the power supply you want to replace, based on console error messages or through the LEDs on the power supplies.
- Step 3. Disconnect the power supply:
 - a. Open the power cable retainer, and then unplug the power cable from the power supply.
 - b. Unplug the power cable from the power source.
- Step 4. Remove the power supply:
 - a. Rotate the cam handle on the left of the power supply so that it can be used to pull the power supply out of the chassis.
 - b. Press the blue locking tab to release the power supply from the chassis.
 - c. Using both hands, pull the power supply out of the chassis, and then set it aside.
- Step 5. Using both hands, support and align the edges of the power supply with the opening in the controller module, and then gently push the replacement power supply into the controller module until the locking tab clicks into place. The power supplies will only properly engage with the internal connector and lock in place one way.

Attention: To avoid damaging the internal connector, do not use excessive force when sliding the power supply into the system.
- Step 6. Rotate the cam handle so that it is flush against the power supply.
- Step 7. Reconnect the power supply cabling:
 - a. Reconnect the power cable to the power supply and the power source.
 - b. Secure the power cable to the power supply using the power cable retainer.Once power is restored to the power supply, the status LED should be green.

Completing the replacement process

After you replace the part, you can return the failed part to Lenovo, as described in the RMA instructions shipped with the kit. Contact technical support at [Lenovo Data Center Support](#) if you need the RMA number or additional help with the replacement procedure.

Hot-swapping a fan module

To swap out a fan module without interrupting service, you must perform a specific sequence of tasks.

About this task

Attention: You must replace the fan module within two minutes of removing it from the chassis. System airflow is disrupted and the controller module or modules shut down after two minutes to avoid overheating.

A video for this task is available at:

- YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-C8THdP1nmPF25RWwGRta3v>

You can use the following steps to hot-swap a fan module.

- Step 1. If you are not already grounded, properly ground yourself.
- Step 2. Remove the bezel (if necessary) with two hands, by grasping the openings on each side of the bezel, and then pulling it toward you until the bezel releases from the ball studs on the chassis frame.
- Step 3. Identify the fan module that you must replace by checking the console error messages and looking at the Attention LED on each fan module.
- Step 4. Press down the orange release latch in the fan module cam handle. The fan module moves a little bit away from the chassis.
- Step 5. Pull the fan module straight out from the chassis, making sure that you support it with your free hand.

CAUTION:

The fan modules are short. Always support the bottom of the fan module with your free hand so that it does not suddenly drop free from the chassis and injure you.

- Step 6. Set the fan module aside.
- Step 7. Insert the replacement fan module into the chassis by aligning it with the opening, and then sliding it into the chassis.
- Step 8. Push firmly on the fan module cam handle so that it is seated all the way into the chassis. The cam handle raises slightly when the fan module is completely seated.
- Step 9. Swing the cam handle up to its closed position, making sure that the cam handle release latch clicks into the locked position. The Attention LED should not be lit after the fan is seated and has spun up to operational speed.
- Step 10. Align the bezel with the ball studs, and then gently push the bezel onto the ball studs.

Completing the replacement process

After you replace the part, you can return the failed part to Lenovo, as described in the RMA instructions shipped with the kit. Contact technical support at [Lenovo Data Center Support](#) if you need the RMA number or additional help with the replacement procedure.

Replacing the controller module

You must review the prerequisites for the replacement procedure and select the correct one for your version of the ONTAP operating system.

Before you begin

- All drive shelves must be working properly.
- If your system is in a MetroCluster configuration, you must review the section "Choosing the correct recovery procedure" in the *MetroCluster Management and Disaster Recovery Guide* to determine whether you should use this procedure. [MetroCluster management and disaster recovery](#)

Shutting down the node

To shut down the impaired node, you must determine the status of the node and, if necessary, take over the node so that the healthy node continues to serve data from the impaired node storage.

If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy node shows false for eligibility and health, you must correct the issue before shutting down the impaired node.

1. If AutoSupport is enabled, suppress automatic log creation by invoking an AutoSupport message:
`system node autosupport invoke -node * -type all -message MAINT=number_of_hours_downh`

Example

The following AutoSupport message suppresses automatic log creation for two hours: cluster1:

```
* > system node autosupport invoke -node * -type all -message MAINT=2h
```

2. Disable automatic giveback from the console of the healthy node: `storage failover modify -node local -auto-giveback false`
3. Take the impaired node to the LOADER prompt:

If the impaired node is displaying...	Then...
The LOADER prompt	Go to the next step.
Waiting for giveback...	Press Ctrl-C, and then respond y when prompted.
System prompt or password prompt (enter system password)	Take over or halt the impaired node: <ul style="list-style-type: none">• For an HA pair, take over the impaired node from the healthy node: <code>storage failover takeover -ofnode <i>impaired_node_name</i></code> When the impaired node shows "Waiting for giveback...", press Ctrl-C, and then respond y.

About this task

- You must replace the failed component with a replacement FRU component you received from your provider.
- You must be replacing a controller module with a controller module of the same model type. You cannot upgrade your system by just replacing the controller module.
- You cannot change any drives or drive shelves as part of this procedure.
- In this procedure, the boot device is moved from the impaired node to the replacement node so that the replacement node will boot up in the same version of ONTAP as the old controller module.
- It is important that you apply the commands in these steps on the correct systems:

- The *impaired* node is the node that is being replaced.
- The *replacement* node is the new node that is replacing the impaired node.
- The *healthy* node is the surviving node.
- You must always capture the node's console output to a text file. This provides you a record of the procedure so that you can troubleshoot any issues that you might encounter during the replacement process.

Replacing the controller module hardware

To replace the controller module hardware, you must remove the impaired node, move FRU components to the replacement controller module, install the replacement controller module in the chassis, and then boot the system to Diagnostic menu.

Removing the controller module

To access components inside the controller module, you must remove the controller module from the chassis.

About this task

A video for this task is available at:

- YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-C8THdP1nmPF25RWwGRta3v>

You can use the following steps to remove the controller module from the chassis.

- Step 1. Assemble the replacement controller module: On the replacement controller module, open the air duct and remove the empty risers from the controller module using the steps:
 - a. Press the locking tabs on the sides of the air duct in toward the middle of the controller module.
 - b. Slide the air duct toward the back of the controller module, and then rotate it upward to its completely open position.
 - c. Rotate the riser locking latch on the left side of riser 1 up and toward air duct, lift the riser up, and then set it aside.
 - d. Repeat the previous step for the remaining risers.
- Step 2. If you are not already grounded, properly ground yourself.
- Step 3. Release the power cable retainers, and then unplug the cables from the power supplies on the controller being serviced.
- Step 4. Loosen the hook and loop strap binding the cables to the cable management device, and then unplug the system cables and SFPs (if needed) from the controller module, keeping track of where the cables were connected.
- Step 5. Remove the cable management device from the controller module and set it aside.
- Step 6. Press down on both of the locking latches on each side of the controller, and then rotate both latches downward at the same time. The controller module moves slightly out of the chassis.
- Step 7. Slide the controller module out of the chassis. Make sure that you support the bottom of the controller module as you slide it out of the chassis.
- Step 8. Place the controller module on a stable, flat surface.

Moving the power supplies

You must move the power supply from the impaired controller module to the replacement controller module when you replace a controller module.

About this task

A video for this task is available at:

- YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-C8THdP1nmPF25RWwGRta3v>

You can use the following steps to move the power supplies to the replacement controller module.

Step 1. Remove the power supply:

- a. Rotate the cam handle on the left of the power supply so that it can be used to pull the power supply out of the chassis.
- b. Press the blue locking tab to release the power supply from the chassis.
- c. Using both hands, pull the power supply out of the chassis, and then set it aside.

Step 2. Assemble the replacement controller module: On the replacement controller module, open the air duct and remove the empty risers from the controller module using the steps:

- a. Press the locking tabs on the sides of the air duct in toward the middle of the controller module.
- b. Slide the air duct toward the back of the controller module, and then rotate it upward to its completely open position.
- c. Rotate the riser locking latch on the left side of riser 1 up and toward air duct, lift the riser up, and then set it aside.
- d. Repeat the previous step for the remaining risers.

Step 3. Move the power supply to the new controller module, and then install it.

Step 4. Using both hands, support and align the edges of the power supply with the opening in the controller module, and then gently push the replacement power supply into the controller module until the locking tab clicks into place. The power supplies will only properly engage with the internal connector and lock in place one way.

Attention: To avoid damaging the internal connector, do not use excessive force when sliding the power supply into the system.

Step 5. Repeat the preceding steps for any remaining power supplies.

Moving the boot media

You must locate the boot media, and then follow the directions to remove it from the impaired controller module and insert it into the replacement controller module.

About this task

A video for this task is available at:

- YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-C8THdP1nmPF25RWwGRta3v>

You can use the following steps to move the boot media from the impaired controller module to the replacement controller module.

Step 1. Locate and remove the boot media from the controller module. It is along the left side of the controller directly in front of the NVDIMM battery. When viewing the controller from the rear.

- a. Press the blue button at the end of the boot media until the lip on the boot media clears the blue button.
- b. Lift the boot media up and gently pull the boot media out of the socket.

- Step 2. Move the boot media to the new controller module, align the edges of the boot media with the socket housing, and then gently push it into the socket.
- Step 3. Lock the boot media in place:
- Press the boot media down toward the motherboard.
 - Ensure the blue locking button is in the open position
 - Placing your fingers at the end of the boot media by the blue button, firmly push down on the boot media end to engage the blue locking button.

Moving the PCIe risers and mezzanine card

As part of the controller replacement process, you must move the PCIe risers and mezzanine card from the impaired controller module to the replacement controller module.

About this task

A video for this task is available at:

- YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-C8THdP1nmPF25RWwGRta3v>

You can use the following steps to move the PCIe risers and mezzanine card from the impaired controller module to the replacement controller module.

- Step 1. Move PCIe risers one and two (when counting from left and going right) from the impaired controller module to the replacement controller module.
- Remove any SFP or QSFP modules that might be in the PCIe cards.
 - Rotate the riser locking latch on the left side of the riser up and toward air duct. The riser raises up slightly from the controller module.
 - Lift the riser up, and then move it to the replacement controller module.
 - Align the riser with the pins to the side of the riser socket, lower the riser down on the pins, push the riser squarely into the socket on the motherboard, and then rotate the latch down flush with the sheet metal on the riser.
 - Repeat this step for riser number 2.
- Step 2. Remove riser card number 3 (far right), remove the mezzanine card, and install both into the replacement controller module:
- Remove any SFP or QSFP modules that might be in the PCIe and mezzanine cards.
 - Rotate the riser locking latch on the left side of the riser up and toward air duct. The riser raises up slightly from the controller module.
 - Lift the riser up, and then set it aside on a stable, flat surface.
 - Loosen the thumbscrews on the mezzanine card, and gently lift the card back and out of the socket, and then move it to the replacement controller module.
 - Install the mezzanine in the replacement controller and secure it with the thumbscrews.
 - Install the third riser in the replacement controller module directly over the mezzanine card.

Moving the NVDIMM battery

To move the NVDIMM battery from the impaired controller module to the replacement controller module, you must perform a specific sequence of steps.

About this task

A video for this task is available at:

- YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-C8THdP1nmPF25RWwGRta3v>

You can use the following steps to move the NVDIMM battery from the impaired controller module to the replacement controller module.

Step 1. Open the air duct:

- a. Press the locking tabs on the sides of the air duct in toward the middle of the controller module.
- b. Slide the air duct toward the back of the controller module, and then rotate it upward to its completely open position.

Step 2. Locate the NVDIMM battery in the controller module. It is along the left edge of the controller when viewing the controller from the rear.

Step 3. Locate the battery plug and squeeze the clip on the face of the battery plug to release the plug from the socket, and then unplug the battery cable from the socket.

Step 4. Grasp the battery and press the blue locking tab marked PUSH, and then lift the battery out of the holder and controller module.

Step 5. Move the battery to the replacement controller module.

Step 6. Align the battery module with the opening for the battery, and then gently push the battery into slot until it locks into place.

Moving the DIMMs

You need to locate the DIMMs, and then move them from the impaired controller module to the replacement controller module.

Before you begin

You must have the new controller module ready so that you can move the DIMMs directly from the impaired controller module to the corresponding slots in the replacement controller module.

About this task

A video for this task is available at:

- YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-C8THdP1nmPF25RWwGRta3v>

You can use the following steps to move the DIMMs from the impaired controller module to the replacement controller module.

Step 1. Locate the DIMMs on your controller module.

Step 2. Note the orientation of the DIMM in the socket so that you can insert the DIMM in the replacement controller module in the proper orientation.

Step 3. Verify that the NVDIMM battery is not plugged into the new controller module.

Step 4. Move the DIMMs from the impaired controller module to the replacement controller module:

Important: Make sure that you install the each DIMM into the same slot it occupied in the impaired controller module.

- a. Eject the DIMM from its slot by slowly pushing apart the DIMM ejector tabs on either side of the DIMM, and then slide the DIMM out of the slot.

Attention: Carefully hold the DIMM by the edges to avoid pressure on the components on the DIMM circuit board.

- b. Locate the corresponding DIMM slot on the replacement controller module.
 - c. Make sure that the DIMM ejector tabs on the DIMM socket are in the open position, and then insert the DIMM squarely into the socket. The DIMMs fit tightly in the socket, but should go in easily. If not, realign the DIMM with the socket and reinsert it.
 - d. Visually inspect the DIMM to verify that it is evenly aligned and fully inserted into the socket.
 - e. Repeat these substeps for the remaining DIMMs.
- Step 5. Plug the NVDIMM battery into the motherboard. Make sure that the plug locks down onto the controller module.

Finalizing the replacement controller

About this task

A video for this task is available at:

- YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-C8THdP1nmPF25RWwGRta3v>

You can use the following steps to finalize the replacement controller.

- Step 1. You will now need to connect the cable for the NVDIMM battery on the replacement controller.
- Step 2. To do this, find the cable from the NVDIMM battery that is installed along the left-hand side of the controller and plug the cable into the motherboard.

Installing the controller module

After all of the components have been moved from the impaired controller module to the replacement controller module, you must install the replacement controller module into the chassis, and then boot it to Diagnostics menu.

About this task

A video for this task is available at:

- YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-C8THdP1nmPF25RWwGRta3v>

You can use the following steps to install the replacement controller module in the chassis.

- Step 1. If you have not already done so, close the air duct.
- Step 2. Align the end of the controller module with the opening in the chassis, and then gently push the controller module fully into the system until the locking latches begin to rise.
- Step 3. Cable the management and console ports only, so that you can access the system to perform the tasks in the following sections.
- Step 4. Complete the installation of the controller module:
- a. Fully seat the controller module in the chassis by rotating the locking latches upward, tilting them so that they clear the locking pins, gently push the controller all the way in, and then lower the locking latches into the locked position.
 - b. Plug the power cord into the power supply, reinstall the power cable locking collar, and then connect the power supply to the power source for each power supply.
 - c. If you have not already done so, reinstall the cable management device.
 - d. Interrupt the normal boot process and boot to LOADER by pressing `ctrl-c`.

Setting and verifying system time after replacing the controller

You should check the time and date on the replacement controller module against the healthy controller module in an HA pair, or against a reliable time server in a stand-alone configuration. If the time and date do not match, you must reset them on the replacement controller module to prevent possible outages on clients due to time differences.

About this task

It is important that you apply the commands in the steps on the correct systems:

- The *replacement node* is the new node that replaced the impaired node as part of this procedure.
- The *healthy node* is the HA partner of the replacement node

A video for this task is available at:

- YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-C8THdP1nmPF25RWwGRta3v>

Step 1. If the replacement node is not at the LOADER prompt, halt the system to the LOADER prompt.

Step 2. On the healthy node, check the system time by using the `system date show` command.

The date and time are given in GMT.

Step 3. At the LOADER prompt, check the date and time on the replacement node by using the `show date` command.

The date and time are given in GMT.

Step 4. If necessary, set the date in GMT on the replacement node by using the `set date mm/dd/yyyy` command.

Step 5. If necessary, set the time in GMT on the replacement node by using the `set time hh:mm:ss` command.

Step 6. At the LOADER prompt, confirm the date and time on the replacement node by using the `show date` command.

The date and time are given in GMT.

Running diagnostics

After you have replaced a component in your system, you should run diagnostic tests on that component.

Before you begin

Your system must be at the LOADER prompt to start diagnostics.

About this task

All commands in the diagnostic procedures are issued from the node where the component is being replaced.

Step 1. If the node to be serviced is not at the LOADER prompt, stop service to the node: `system node halt -node node_name` After you issue the command, you should wait until the system stops at the LOADER prompt.

Step 2. At the LOADER prompt, access the special drivers specifically designed for system-level diagnostics to function properly: `boot_diags`

Step 3. Select **Scan System** from the displayed menu to enable running the diagnostics tests.

- Step 4. Select **Test system** from the displayed menu to run diagnostics tests.
- Step 5. Select the test or series of tests from the various sub-menus.
- Step 6. Proceed based on the result of the preceding step:
 - If the test failed, correct the failure, and then rerun the test.
 - If the test reported no failures, select `Reboot` from the menu to reboot the system.

Completing system restoration

You must complete a series of tasks before restoring your system to full operation.

Recabling the system

After running diagnostics, you must recable the controller module's storage and network connections.

- Step 1. Recable the system.
- Step 2. Verify that the cabling is correct.

Reassigning disks

If the storage system is in an HA pair, the system ID of the new controller module is automatically assigned to the disks when the giveback occurs at the end of the procedure.

About this task

You must use the correct procedure for your configuration:

Controller redundancy	Then use this procedure...
HA pair	"Verifying the system ID change on an HA system" on page 30

Verifying the system ID change on an HA system

You must confirm the system ID change when you boot the replacement node and then verify that the change was implemented.

About this task

This procedure applies only to systems running ONTAP in an HA pair.

- Step 1. If the replacement node is in Maintenance mode (showing the `*>` prompt, exit Maintenance mode and go to the LOADER prompt: `halt`
- Step 2. From the LOADER prompt on the replacement node, boot the node, entering `y` if you are prompted to override the system ID due to a system ID mismatch:
- Step 3. Wait until the `Waiting for giveback...` message is displayed on the replacement node console and then, from the healthy node, verify that the new partner system ID has been automatically assigned: `storage failover show`

Example

In the command output, you should see a message that the system ID has changed on the impaired node, showing the correct old and new IDs. In the following example, node2 has undergone replacement and has a new system ID of 151759706.

```
node1> storage failover show
```

Node	Partner	Takeover Possible	State	Description

```

-----
node1          node2          false      System ID changed on partner (Old:
151759755, New: 151759706), In takeover
node2          node1          -          Waiting for giveback (HA mailboxes)

```

Step 4. From the healthy node, verify that any coredumps are saved:

- a. Change to the advanced privilege level: `set -privilege advanced` You can respond `Y` when prompted to continue into advanced mode. The advanced mode prompt appears (`*>`).
- b. Save any coredumps: `system node run -node local-node-name partner savecore`
- c. Wait for savecore command to complete before issuing the giveback. You can enter the following command to monitor the progress of the savecore command: `system node run -node local-node-name partner savecore -s`
- d. Return to the admin privilege level: `set -privilege admin`

Step 5. Give back the node:

- a. From the healthy node, give back the replaced node's storage: `storage failover giveback -ofnode replacement_node_name`
The replacement node takes back its storage and completes booting.

If you are prompted to override the system ID due to a system ID mismatch, you should enter `y`.

Note: If the giveback is vetoed, you can consider overriding the vetoes. [Find the High-Availability Configuration Guide for your version of ONTAP 9](#)

- b. After the giveback has been completed, confirm that the HA pair is healthy and that takeover is possible: `storage failover show` The output from the `storage failover show` command should not include the System ID changed on partner message.

Step 6. Verify that the disks were assigned correctly: `storage disk show -ownership`

Example

The disks belonging to the replacement node should show the new system ID. In the following example, the disks owned by node1 now show the new system ID, 1873775277:

```
node1> storage disk show -ownership
```

Disk	Aggregate	Home	Owner	DR Home	Home ID	Owner ID	DR Home ID	Reserver	Pool
1.0.0	aggr0_1	node1	node1	-	1873775277	1873775277	-	1873775277	Pool0
1.0.1	aggr0_1	node1	node1		1873775277	1873775277	-	1873775277	Pool0
.									
.									

Step 7. If the system is in a MetroCluster configuration, monitor the status of the node: `metrocluster node show`

The MetroCluster configuration takes a few minutes after the replacement to return to a normal state, at which time each node will show a configured state, with DR Mirroring enabled and a mode of normal. The `metrocluster node show -fields node-systemid` command output displays the old system ID until the MetroCluster configuration returns to a normal state.

Step 8. If the node is in a MetroCluster configuration, depending on the MetroCluster state, verify that the DR home ID field shows the original owner of the disk if the original owner is a node on the disaster site. This is required if both of the following are true:

- The MetroCluster configuration is in a switchover state.
- The replacement node is the current owner of the disks on the disaster site. [MetroCluster management and disaster recovery](#)

Step 9. If your system is in a MetroCluster configuration, verify that each node is configured: `metrocluster node show -fields configuration-state`

MetroCluster management and disaster recovery

Example

```
node1_siteA:> metrocluster node show -fields configuration-state
```

dr-group-id	cluster node	configuration-state
1 node1_siteA	node1mcc-001	configured
1 node1_siteA	node1mcc-002	configured
1 node1_siteB	node1mcc-003	configured
1 node1_siteB	node1mcc-004	configured

4 entries were displayed.

Step 10. Verify that the expected volumes are present for each node: `vol show -node node-name`

Step 11. If you disabled automatic takeover on reboot, enable it from the healthy node: `storage failover modify -node replacement-node-name -onreboot true`

Installing licenses for the replacement node in ONTAP

You must install new licenses for the replacement node if the impaired node was using ONTAP features that require a standard (node-locked) license. For features with standard licenses, each node in the cluster should have its own key for the feature.

About this task

Until you install license keys, features requiring standard licenses continue to be available to the replacement node. However, if the impaired node was the only node in the cluster with a license for the feature, no configuration changes to the feature are allowed. Also, using unlicensed features on the node might put you out of compliance with your license agreement, so you should install the replacement license key or keys on the replacement node as soon as possible.

The licenses keys must be in the 28-character format.

You have a 90-day grace period in which to install the license keys. After the grace period, all old licenses are invalidated. After a valid license key is installed, you have 24 hours to install all of the keys before the grace period ends.

Note: The new license keys that you require are automatically generated and sent to the email address on file. If you did not receive the email with the license keys within 30 days, contact technical support.

Step 1. If you need to retrieve the license keys, obtain the replacement license keys on [Lenovo Features on Demand](#). For details, refer to [DM Series Premium Feature Key Procedure](#).

Step 2. Install each license key: `system license add -license-code license-key, license-key...`

Step 3. Remove the old licenses, if desired:

- Check for unused licenses: `license clean-up -unused -simulate`
- If the list looks correct, remove the unused licenses: `license clean-up -unused`

Restoring Storage and Volume Encryption functionality

After replacing the controller module or NVRAM module for a storage system that you previously configured to use Storage or Volume Encryption, you must perform additional steps to provide uninterrupted Encryption functionality. You can skip this task on storage systems that do not have Storage or Volume Encryption enabled.

Step 1. Restore Storage or Volume Encryption functionality by using the appropriate procedure in the *Lenovo Encryption Power Guide*.

Encryption of data at rest

Use one of the following procedures, depending on whether you are using onboard or external key management:

- “Restoring onboard key management encryption keys”
- “Restoring external key management encryption keys”

Verifying LIFs

Before returning the replacement controller to service, you should verify that the LIFs are on their home ports and reset automatic giveback.

Step 1. Verify that the logical interfaces are reporting to their home controller and ports: `network interface show -is-home false` If any LIFs are listed as false, revert them to their home ports: `network interface revert *`

Step 2. If automatic giveback was disabled, reenable it: `storage failover modify -node local -auto-giveback true`

Completing the replacement process

After you replace the part, you can return the failed part to Lenovo, as described in the RMA instructions shipped with the kit. Contact technical support at [Lenovo Data Center Support](#) if you need the RMA number or additional help with the replacement procedure.

Replacing a DIMM

You must replace a DIMM in the controller module when your system registers an increasing number of correctable error correction codes (ECC); failure to do so causes a system panic.

Before you begin

All other components in the system must be functioning properly; if not, you must contact technical support.

You must replace the failed component with a replacement FRU component you received from your provider.

Shutting down the impaired controller

You can shut down or take over the impaired controller using different procedures, depending on the storage system hardware configuration.

Shutting down the node

To shut down the impaired node, you must determine the status of the node and, if necessary, take over the node so that the healthy node continues to serve data from the impaired node.

Before you begin

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy node shows false for eligibility and health, you must correct the issue before shutting down the impaired node.

Step 1. If AutoSupport is enabled, suppress automatic log creation by invoking an AutoSupport message: `system node autosupport invoke -node * -type all -message MAINT=number_of_hours_downh`

Example

The following AutoSupport message suppresses automatic log creation for two hours: `cluster1:*> system node autosupport invoke -node * -type all -message MAINT=2h`

- Step 2. Disable automatic giveback from the console of the healthy node: `storage failover modify -node local -auto-giveback false`
- Step 3. Take the impaired node to the LOADER prompt:

If the impaired node is displaying...	Then...
The LOADER prompt	Go to the next step.
Waiting for giveback...	Press Ctrl-C, and then respond <code>y</code> when prompted.
Lenovo Data ONTAP system prompt or password prompt (enter system password)	Take over or halt the impaired node: <ul style="list-style-type: none">For an HA pair, take over the impaired node from the healthy node: <code>storage failover takeover -ofnode <i>impaired_node_name</i></code> When the impaired node shows <code>Waiting for giveback...</code>, press Ctrl-C, and then respond <code>y</code>.

Removing the controller module

To access components inside the controller module, you must remove the controller module from the chassis.

About this task

A video for this task is available at:

- YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-C8THdP1nmPF25RWwGRta3v>

You can use the following steps to remove the controller module from the chassis.

- Step 1. If you are not already grounded, properly ground yourself.
- Step 2. Release the power cable retainers, and then unplug the cables from the power supplies on the controller being serviced.
- Step 3. Loosen the hook and loop strap binding the cables to the cable management device, and then unplug the system cables and SFPs (if needed) from the controller module, keeping track of where the cables were connected.
- Step 4. Remove the cable management device from the controller module and set it aside.
- Step 5. Press down on both of the locking latches on each side of the controller, and then rotate both latches downward at the same time. The controller module moves slightly out of the chassis.
- Step 6. Slide the controller module out of the chassis. Make sure that you support the bottom of the controller module as you slide it out of the chassis.
- Step 7. Place the controller module on a stable, flat surface.

Replacing system DIMMs

Replacing a system DIMM involves identifying the target DIMM through the associated error message, locating the target DIMM using the FRU map on the air duct or the lit LED on the motherboard, and then replacing the DIMM.

About this task

The DIMMs are located in sockets 2, 4, 13, and 15. The NVDIMM is located in slot 11.

A video for this task is available at:

- YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-C8THdP1nmPF25RWwGRta3v>

You can use the following steps to replace a system DIMM.

Step 1. Open the air duct:

- a. Press the locking tabs on the sides of the air duct in toward the middle of the controller module.
- b. Slide the air duct toward the back of the controller module, and then rotate it upward to its completely open position.

Step 2. Locate the DIMMs on your controller module.

Step 3. Note the orientation of the DIMM in the socket so that you can insert the replacement DIMM in the proper orientation.

Step 4. Eject the DIMM from its socket by slowly pushing apart the two DIMM ejector tabs on either side of the DIMM, and then slide the DIMM out of the socket.

Attention: Carefully hold the DIMM by the edges to avoid pressure on the components on the DIMM circuit board.

Step 5. Remove the replacement DIMM from the antistatic shipping bag, hold the DIMM by the corners, and align it to the slot. The notch among the pins on the DIMM should line up with the tab in the socket.

Step 6. Make sure that the DIMM ejector tabs on the connector are in the open position, and then insert the DIMM squarely into the slot. The DIMM fits tightly in the slot, but should go in easily. If not, realign the DIMM with the slot and reinsert it.

Attention: Visually inspect the DIMM to verify that it is evenly aligned and fully inserted into the slot.

Step 7. Push carefully, but firmly, on the top edge of the DIMM until the ejector tabs snap into place over the notches at the ends of the DIMM.

Step 8. Close the air duct.

Installing the controller module

After you have replaced the component in the controller module, you must re-install the controller module into the chassis, and then boot it to Maintenance mode.

About this task

A video for this task is available at:

- YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-C8THdP1nmPF25RWwGRta3v>

You can use the following steps to install the controller module in the chassis.

- Step 1. If you have not already done so, close the air duct.
- Step 2. Align the end of the controller module with the opening in the chassis, and then gently push the controller module fully into the system until the locking latches begin to rise.
- Step 3. Cable the management and console ports only, so that you can access the system to perform the tasks in the following sections.
- Step 4. Complete the installation of the controller module:
 - a. Fully seat the controller module in the chassis by rotating the locking latches upward, tilting them so that they clear the locking pins, gently push the controller all the way in, and then lower the locking latches into the locked position.
 - b. Plug the power cord into the power supply, reinstall the power cable locking collar, and then connect the power supply to the power source for each power supply.
 - c. If you have not already done so, reinstall the cable management device.
 - d. Interrupt the normal boot process and boot to LOADER by pressing `Ctrl-C`.

Running diagnostics

After you have replaced a system DIMM in your system, you should run diagnostic tests on that component.

Before you begin

Your system must be at the LOADER prompt to start diagnostics.

About this task

All commands in the diagnostic procedures are issued from the node where the component is being replaced.

- Step 1. If the node to be serviced is not at the LOADER prompt, stop service to the node: `system node halt -node node_name` After you issue the command, you should wait until the system stops at the LOADER prompt.
- Step 2. At the LOADER prompt, access the special drivers specifically designed for system-level diagnostics to function properly: `boot_diags`
- Step 3. Select **Scan System** from the displayed menu to enable running the diagnostics tests.
- Step 4. Select **Stress-Test system** from the displayed menu.
- Step 5. Select an option from the displayed sub-menu and run the test.
- Step 6. Proceed based on the result of the preceding step:
 - If the test failed, correct the failure, and then rerun the test.
 - If the test reported no failures, select `Reboot` from the menu to reboot the system.

Completing the replacement process

After you replace the part, you can return the failed part to Lenovo, as described in the RMA instructions shipped with the kit. Contact technical support at [Lenovo Data Center Support](#) if you need the RMA number or additional help with the replacement procedure.

Replacing an NVDIMM

You must replace the NVDIMM in the controller module when your system registers that the flash lifetime is almost at an end or that the identified NVDIMM is not healthy in general; failure to do so causes a system panic.

Before you begin

All other components in the system must be functioning properly; if not, you must contact technical support.

You must replace the failed component with a replacement FRU component you received from your provider.

Shutting down the impaired controller

You can shut down or take over the impaired controller using different procedures, depending on the storage system hardware configuration.

Shutting down the node

To shut down the impaired node, you must determine the status of the node and, if necessary, take over the node so that the healthy node continues to serve data from the impaired node.

Before you begin

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy node shows false for eligibility and health, you must correct the issue before shutting down the impaired node.

Step 1. If AutoSupport is enabled, suppress automatic log creation by invoking an AutoSupport message:
`system node autosupport invoke -node * -type all -message MAINT=number_of_hours_downh`

Example

The following AutoSupport message suppresses automatic log creation for two hours: `cluster1:*> system node autosupport invoke -node * -type all -message MAINT=2h`

Step 2. Disable automatic giveback from the console of the healthy node: `storage failover modify -node local -auto-giveback false`

Step 3. Take the impaired node to the LOADER prompt:

If the impaired node is displaying...	Then...
The LOADER prompt	Go to the next step.
Waiting for giveback...	Press Ctrl-C, and then respond <code>y</code> when prompted.
Lenovo Data ONTAP system prompt or password prompt (enter system password)	Take over or halt the impaired node: <ul style="list-style-type: none">• For an HA pair, take over the impaired node from the healthy node: <code>storage failover takeover -ofnode <i>impaired_node_name</i></code> When the impaired node shows Waiting for giveback..., press Ctrl-C, and then respond <code>y</code>.

Removing the controller module

To access components inside the controller module, you must remove the controller module from the chassis.

About this task

A video for this task is available at:

- YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-C8THdP1nmPF25RWwGRta3v>

You can use the following steps to remove the controller module from the chassis.

- Step 1. If you are not already grounded, properly ground yourself.
- Step 2. Release the power cable retainers, and then unplug the cables from the power supplies on the controller being serviced.
- Step 3. Loosen the hook and loop strap binding the cables to the cable management device, and then unplug the system cables and SFPs (if needed) from the controller module, keeping track of where the cables were connected.
- Step 4. Remove the cable management device from the controller module and set it aside.
- Step 5. Press down on both of the locking latches on each side of the controller, and then rotate both latches downward at the same time. The controller module moves slightly out of the chassis.
- Step 6. Slide the controller module out of the chassis. Make sure that you support the bottom of the controller module as you slide it out of the chassis.
- Step 7. Place the controller module on a stable, flat surface.

Replacing the NVDIMM

To replace the NVDIMM, you must locate it in the controller module using the FRU map on top of the air duct or locate the Attention LED using the FRU Map on top of the controller.

Before you begin

- The NVDIMM LED blinks while destaging contents when you halt the system. After the destage is complete, the LED turns off.
- Although the contents of the NVDIMM is encrypted, it is a best practice to erase the contents of the NVDIMM before replacing it.
- To do this halt the node using the halt command on the controller that is being serviced.
- From the LOADER prompt type armclean to wipe the DIMM.

About this task

A video for this task is available at:

- YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-C8THdP1nmPF25RWwGRta3v>

You can use the following steps to replace the NVDIMM.

- Step 1. Open the air duct and then locate the NVDIMM in slot 11 on your controller module.

Note: The NVDIMM looks significantly different than system DIMMs.

- Step 2. Eject the NVDIMM from its slot by slowly pushing apart the two NVDIMM ejector tabs on either side of the NVDIMM, and then slide the NVDIMM out of the socket and set it aside.

Attention: Carefully hold the NVDIMM by the edges to avoid pressure on the components on the NVDIMM circuit board.

- Step 3. Remove the replacement NVDIMM from the antistatic shipping bag, hold the NVDIMM by the corners, and then align it to the slot. The notch among the pins on the NVDIMM should line up with the tab in the socket.
- Step 4. Locate the slot where you are installing the NVDIMM.

Step 5. Insert the NVDIMM squarely into the slot. The NVDIMM fits tightly in the slot, but should go in easily. If not, realign the NVDIMM with the slot and reinsert it.

Attention: Visually inspect the NVDIMM to verify that it is evenly aligned and fully inserted into the slot.

Step 6. Push carefully, but firmly, on the top edge of the NVDIMM until the ejector tabs snap into place over the notches at the ends of the NVDIMM.

Step 7. Close the air duct.

Installing the controller module

After you have replaced the component in the controller module, you must re-install the controller module into the chassis, and then boot it to Maintenance mode.

About this task

A video for this task is available at:

- YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-C8THdP1nmPF25RWwGRta3v>

You can use the following steps to install the controller module in the chassis.

Step 1. If you have not already done so, close the air duct.

Step 2. Align the end of the controller module with the opening in the chassis, and then gently push the controller module fully into the system until the locking latches begin to rise.

Step 3. Cable the management and console ports only, so that you can access the system to perform the tasks in the following sections.

Step 4. Complete the installation of the controller module:

- a. Fully seat the controller module in the chassis by rotating the locking latches upward, tilting them so that they clear the locking pins, gently push the controller all the way in, and then lower the locking latches into the locked position.
- b. Plug the power cord into the power supply, reinstall the power cable locking collar, and then connect the power supply to the power source for each power supply.
- c. If you have not already done so, reinstall the cable management device.
- d. Interrupt the normal boot process and boot to LOADER by pressing `ctrl-c`.

Running diagnostics

After you have replaced the NVDIMM in your system, you should run diagnostic tests on that component.

Before you begin

Your system must be at the LOADER prompt to start diagnostics.

About this task

All commands in the diagnostic procedures are issued from the node where the component is being replaced.

Step 1. If the node to be serviced is not at the LOADER prompt, stop service to the node: `system node halt -node node_name` After you issue the command, you should wait until the system stops at the LOADER prompt.

- Step 2. At the LOADER prompt, access the special drivers specifically designed for system-level diagnostics to function properly: `boot_diags`
- Step 3. Select **Scan System** from the displayed menu to enable running the diagnostics tests.
- Step 4. Select **Test Memory** from the displayed menu.
- Step 5. Select **NVDIMM Test** from the displayed menu.
- Step 6. Proceed based on the result of the preceding step:
 - If the test failed, correct the failure, and then rerun the test.
 - If the test reported no failures, select `Reboot` from the menu to reboot the system.

Restoring the controller module to operation after running diagnostics

After completing diagnostics, you must recable the system, give back storage owned by the controller module, and then reenable automatic giveback.

- Step 1. Recable the system, as needed. If you removed the media converters (QSFPs or SFPs), remember to reinstall them if you are using fiber optic cables.
- Step 2. Return the node to normal operation by giving back its storage. From the running node type:
`storage failover giveback -ofnode impaired_node_name`
- Step 3. If automatic giveback was disabled, reenable it from the running node: `storage failover modify -node local -auto-giveback true`

Completing the replacement process

After you replace the part, you can return the failed part to Lenovo, as described in the RMA instructions shipped with the kit. Contact technical support at [Lenovo Data Center Support](#) if you need the RMA number or additional help with the replacement procedure.

Replacing the boot media

The boot media stores a primary and secondary set of system (*boot image*) files that the system uses when it boots.

Before you begin

You must have a USB flash drive, formatted to MBR/FAT32, with the appropriate amount of storage to hold the `image_XXX.tgz`

About this task

- You must replace the failed component with a replacement FRU component you received from your provider.
- It is important that you apply the commands in these steps on the correct node:
 - The *impaired node* is the node on which you are performing maintenance.
 - The *healthy node* is the HA partner of the impaired node.

Shutting down the impaired controller

You can shut down or take over the impaired controller using different procedures, depending on the storage system hardware configuration.

Shutting down the node

To shut down the impaired node, you must determine the status of the node and, if necessary, take over the node so that the healthy node continues to serve data from the impaired node.

Before you begin

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy node shows false for eligibility and health, you must correct the issue before shutting down the impaired node.

Step 1. If AutoSupport is enabled, suppress automatic log creation by invoking an AutoSupport message:
`system node autosupport invoke -node * -type all -message MAINT=number_of_hours_downh`

Example

The following AutoSupport message suppresses automatic log creation for two hours: `cluster1:* > system node autosupport invoke -node * -type all -message MAINT=2h`

Step 2. Disable automatic giveback from the console of the healthy node: `storage failover modify -node local -auto-giveback false`

Step 3. Take the impaired node to the LOADER prompt:

If the impaired node is displaying...	Then...
The LOADER prompt	Go to the next step.
Waiting for giveback...	Press Ctrl-C, and then respond <code>y</code> when prompted.
Lenovo Data ONTAP system prompt or password prompt (enter system password)	Take over or halt the impaired node: <ul style="list-style-type: none">• For an HA pair, take over the impaired node from the healthy node: <code>storage failover takeover -ofnode <i>impaired_node_name</i></code> When the impaired node shows Waiting for giveback..., press Ctrl-C, and then respond <code>y</code>.

Removing the controller module

To access components inside the controller module, you must remove the controller module from the chassis.

About this task

A video for this task is available at:

- YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-C8THdP1nmPF25RWwGRta3v>

You can use the following steps to remove the controller module from the chassis.

Step 1. If you are not already grounded, properly ground yourself.

Step 2. Release the power cable retainers, and then unplug the cables from the power supplies on the controller being serviced.

- Step 3. Loosen the hook and loop strap binding the cables to the cable management device, and then unplug the system cables and SFPs (if needed) from the controller module, keeping track of where the cables were connected.
- Step 4. Remove the cable management device from the controller module and set it aside.
- Step 5. Press down on both of the locking latches on each side of the controller, and then rotate both latches downward at the same time. The controller module moves slightly out of the chassis.
- Step 6. Slide the controller module out of the chassis. Make sure that you support the bottom of the controller module as you slide it out of the chassis.
- Step 7. Place the controller module on a stable, flat surface.

Replacing the boot media

You must locate the boot media in the controller module (see the FRU map on the controller module), and then follow the directions to replace it.

Before you begin

Although the contents of the boot media is encrypted, it is a best practice to erase the contents of the boot media.

To erase this drive first halt the node that is being serviced.

Next type `boot_ontap menu` to bring up the menu selections for the system.

Then choose option 4 to wipe the configuration for the node.

About this task

You can use the following steps to replace the boot media.

- Step 1. Open the air duct:
 - a. Press the locking tabs on the sides of the air duct in toward the middle of the controller module.
 - b. Slide the air duct toward the back of the controller module, and then rotate it upward to its completely open position.
- Step 2. Locate and remove the boot media from the controller module. It is along the left side of the controller directly in front of the NVDIMM battery. When viewing the controller from the rear.
 - a. Press the blue button at the end of the boot media until the lip on the boot media clears the blue button.
 - b. Lift the boot media up and gently pull the boot media out of the socket.
- Step 3. Align the edges of the replacement boot media with the boot media socket, and then gently push it into the socket.
- Step 4. Check the boot media to make sure that it is seated squarely and completely in the socket. If necessary, remove the boot media and reseal it into the socket.
- Step 5. Lock the boot media in place:
 - a. Rotate the boot media down toward the motherboard.
 - b. Placing a finger at the end of the boot media by the blue button, push down on the boot media end to engage the blue locking button.
 - c. While pushing down on the boot media, lift the blue locking button to lock the boot media in place.

Step 6. Close the air duct.

Transferring the boot image to the boot media

The replacement boot media that you installed does not have a boot image, so you need to transfer a boot image using a USB flash drive.

Before you begin

- A copy of the same image version of ONTAP as what the impaired controller was running.

You can download the appropriate image from the Downloads section on the Lenovo Data Center Support Site.

Step 1. Download and copy the appropriate service image from the Lenovo Data Center Support Site to the USB flash drive.

- a. Download the service image to your work space on your laptop.
- b. Unzip the service image.

Note: If you are extracting the contents using Windows, do not use winzip to extract the netboot image. Use another extraction tool, such as 7-Zip or WinRAR.

There are two folders in the unzipped service image file:

- `boot`
 - `efi`
- c. Copy the `efi` folder to the top directory on the USB flash drive.
The USB flash drive should have the `efi` folder and the same image version of ONTAP as what the impaired controller was running.
 - d. Remove the USB flash drive from your laptop.

Step 2. If you have not already done so, close the air duct.

Step 3. Align the end of the controller module with the opening in the chassis, and then gently push the controller module fully into the system. Complete the installation of the controller module:

- a. Rotate the locking latches upward, tilting them so that they clear the locking pins, and then lower them into the locked position.
- b. If you have not already done so, reinstall the cable management device.

Step 4. Reinstall the cable management device and recable the system, as needed. When recabling, remember to reinstall the media converters (SFPs or QSFPs) if they were removed.

Step 5. Plug the power cord into the power supply, reinstall the power cable locking collar, and then connect the power supply to the power source.

Step 6. Insert the USB flash drive into the USB slot on the controller module. Make sure that you install the USB flash drive in the slot labeled for USB devices, and not in the USB console port.

Step 7. Interrupt the boot process by pressing Ctrl-C to stop at the LOADER prompt. If you miss this message, press Ctrl-C, select the option to boot to Maintenance mode, and then `halt` the node to boot to LOADER.

Step 8. From the LOADER prompt, boot the recovery image from the USB flash drive: `boot_recovery`
The image is downloaded from the USB flash drive.

Step 9. When prompted, either enter the name of the image or accept the default image displayed inside the brackets on your screen.

Step 10. After the image is installed, start the restoration process:

- a. Record the IP address of the impaired node that is displayed on the screen.
- b. Press `y` when prompted to restore the backup configuration.
- c. Press `y` when prompted to overwrite `/etc/ssh/ssh_host_dsa_key`.

Step 11. From the partner node in advanced privilege level, start the configuration synchronization using the IP address recorded in the previous step: `system node restore-backup -node local -target-address impaired_node_IP_address`

Step 12. If the restore is successful, press `y` on the impaired node when prompted to use the restored copy?.

Step 13. Press `y` when you see confirm backup procedure was successful, and then press `y` when prompted to reboot the node.

Step 14. Verify that the environmental variables are set as expected.

- a. Take the node to the LOADER prompt. From the ONTAP prompt, you can issue the command `system node halt -skip-lif-migration-before-shutdown true -ignore-quorum-warnings true -inhibit-takeover true`.

- b. Check the environment variable settings with the `printenv` command.

Note: Please take special note the variable labeled `bootarg.init.vendor_data1`

This is the system serial number and needs to match for both nodes

- c. If an environment variable is not set as expected, modify it with the `setenv environment_variable_name changed_value` command.
- d. Save your changes using the `saveenv` command.
- e. Reboot the node.

Step 15. With the rebooted impaired node displaying the Waiting for Giveback... message, perform a giveback from the healthy node:

If your system is in...	Then...
An HA pair	<p>After the impaired node is displaying the Waiting for Giveback... message, perform a giveback from the healthy node:</p> <ol style="list-style-type: none"> 1. From the healthy node: <code>storage failover giveback -ofnode <i>partner_node_name</i></code> The impaired node takes back its storage, finishes booting, and then reboots and is again taken over by the healthy node. <p>Note: If the giveback is vetoed, you can consider overriding the vetoes. High-availability Configuration Guide</p> <ol style="list-style-type: none"> 2. Monitor the progress of the giveback operation by using the <code>storage failover show-giveback</code> command. 3. After the giveback operation is complete, confirm that the HA pair is healthy and that takeover is possible by using the <code>storage failover show</code> command. 4. Restore automatic giveback if you disabled it using the <code>storage failover modify</code> command.

Step 16. Exit advanced privilege level on the healthy node.

Completing the replacement process

After you replace the part, you can return the failed part to Lenovo, as described in the RMA instructions shipped with the kit. Contact technical support at [Lenovo Data Center Support](#) if you need the RMA number or additional help with the replacement procedure.

Replacing the real-time clock battery

You replace the real-time clock (RTC) battery in the controller module so that your system's services and applications that depend on accurate time synchronization continue to function.

About this task

- You can use this procedure with all versions of ONTAP supported by your system
- All other components in the system must be functioning properly; if not, you must contact technical support.

Shutting down the impaired controller

You can shut down or take over the impaired controller using different procedures, depending on the storage system hardware configuration.

Shutting down the node

To shut down the impaired node, you must determine the status of the node and, if necessary, take over the node so that the healthy node continues to serve data from the impaired node.

Before you begin

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy node shows false for eligibility and health, you must correct the issue before shutting down the impaired node.

Step 1. If AutoSupport is enabled, suppress automatic log creation by invoking an AutoSupport message:
`system node autosupport invoke -node * -type all -message MAINT=number_of_hours_downh`

Example

The following AutoSupport message suppresses automatic log creation for two hours: `cluster1:*>`
`system node autosupport invoke -node * -type all -message MAINT=2h`

Step 2. Disable automatic giveback from the console of the healthy node: `storage failover modify -node local -auto-giveback false`

Step 3. Take the impaired node to the LOADER prompt:

If the impaired node is displaying...	Then...
The LOADER prompt	Go to the next step.
Waiting for giveback...	Press Ctrl-C, and then respond <code>y</code> when prompted.
Lenovo Data ONTAP system prompt or password prompt (enter system password)	Take over or halt the impaired node: <ul style="list-style-type: none"> For an HA pair, take over the impaired node from the healthy node: <code>storage failover takeover -ofnode <i>impaired_node_name</i></code> When the impaired node shows <code>Waiting for giveback...</code>, press Ctrl-C, and then respond <code>y</code>.

Removing the controller module

To access components inside the controller module, you must remove the controller module from the chassis.

About this task

A video for this task is available at:

- YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-C8THdP1nmPF25RWwGRta3v>

You can use the following steps to remove the controller module from the chassis.

- Step 1. If you are not already grounded, properly ground yourself.
- Step 2. Release the power cable retainers, and then unplug the cables from the power supplies on the controller being serviced.
- Step 3. Loosen the hook and loop strap binding the cables to the cable management device, and then unplug the system cables and SFPs (if needed) from the controller module, keeping track of where the cables were connected.
- Step 4. Remove the cable management device from the controller module and set it aside.
- Step 5. Press down on both of the locking latches on each side of the controller, and then rotate both latches downward at the same time. The controller module moves slightly out of the chassis.
- Step 6. Slide the controller module out of the chassis. Make sure that you support the bottom of the controller module as you slide it out of the chassis.
- Step 7. Place the controller module on a stable, flat surface.

Replacing the RTC battery

You need to locate the RTC battery inside the controller module, and then follow the specific sequence of steps. See the FRU map inside the controller module for the location of the RTC battery.

About this task

You can use the following steps to replace the RTC battery.

- Step 1. If you are not already grounded, properly ground yourself.
- Step 2. Open the air duct:

- a. Press the locking tabs on the sides of the air duct in toward the middle of the controller module.
- b. Slide the air duct toward the back of the controller module, and then rotate it upward to its completely open position.

Step 3. Locate, remove, and then replace the RTC battery:

- a. Using the FRU map, locate the RTC battery on the controller module.
- b. Gently push the battery away from the holder, rotate it away from the holder, and then lift it out of the holder.

Note: Note the polarity of the battery as you remove it from the holder. The battery is marked with a plus sign and must be positioned in the holder correctly. A plus sign near the holder tells you how the battery should be positioned.

- c. Remove the replacement battery from the antistatic shipping bag.
- d. Note the polarity of the RTC battery, and then insert it into the holder by tilting the battery at an angle and pushing down.

Step 4. Visually inspect the battery to make sure that it is completely installed into the holder and that the polarity is correct.

Step 5. Close the air duct.

Installing the controller module

After you have replaced the component in the controller module, you must re-install the controller module into the chassis, and then boot it to Diagnostics menu.

About this task

A video for this task is available at:

- YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-C8THdP1nmPF25RWwGRta3v>

You can use the following steps to install the controller module in the chassis.

Step 1. If you have not already done so, close the air duct.

Step 2. Align the end of the controller module with the opening in the chassis, and then gently push the controller module fully into the system until the locking latches begin to rise.

Step 3. Cable the management and console ports only, so that you can access the system to perform the tasks in the following sections.

Step 4. Complete the installation of the controller module:

- a. Plug the power cord into the power supply, reinstall the power cable locking collar, and then connect the power supply to the power source.
- b. Using the locking latches, firmly push the controller module into the chassis until it meets the midplane and is fully seated.
The locking latches rise when the controller module is fully seated.

Note: Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.

The controller module begins to boot as soon as it is fully seated in the chassis. Be prepared to interrupt the boot process.

- c. Fully seat the controller module in the chassis by rotating the locking latches upward, tilting them so that they clear the locking pins, gently push the controller all the way in, and then lower the locking latches into the locked position.
- d. If you have not already done so, reinstall the cable management device.
- e. Interrupt the normal boot process and boot to LOADER by pressing `Ctrl-C`.
- f. At the LOADER prompt, enter `bye` to reinitialize the PCIe cards and other components and let the node reboot.

Step 5. Return the node to normal operation by giving back its storage. From the running node type:
`storage failover giveback -ofnode impaired_node_name`

Step 6. If automatic giveback was disabled, reenable it from the running node: `storage failover modify -node local -auto-giveback true`

Completing the replacement process

After you replace the part, you can return the failed part to Lenovo, as described in the RMA instructions shipped with the kit. Contact technical support at [Lenovo Data Center Support](#) if you need the RMA number or additional help with the replacement procedure.

Replacing a PCIe or mezzanine card

To replace a PCIe or mezzanine card, you must disconnect the cables and any SFP and QSFP modules from the cards, replace the failed PCIe or mezzanine card, and then recable the cards.

About this task

- You can use this procedure with all versions of ONTAP supported by your system.
- All other components in the system must be functioning properly; if not, you must contact technical support.

Shutting down the impaired controller

You can shut down or take over the impaired controller using different procedures, depending on the storage system hardware configuration.

Shutting down the node

To shut down the impaired node, you must determine the status of the node and, if necessary, take over the node so that the healthy node continues to serve data from the impaired node.

Before you begin

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy node shows false for eligibility and health, you must correct the issue before shutting down the impaired node.

Step 1. If AutoSupport is enabled, suppress automatic log creation by invoking an AutoSupport message:
`system node autosupport invoke -node * -type all -message MAINT=number_of_hours_downh`

Example

The following AutoSupport message suppresses automatic log creation for two hours: `cluster1:*>`
`system node autosupport invoke -node * -type all -message MAINT=2h`

Step 2. Disable automatic giveback from the console of the healthy node: `storage failover modify -node local -auto-giveback false`

Step 3. Take the impaired node to the LOADER prompt:

If the impaired node is displaying...	Then...
The LOADER prompt	Go to the next step.
Waiting for giveback...	Press Ctrl-C, and then respond <code>y</code> when prompted.
Lenovo Data ONTAP system prompt or password prompt (enter system password)	Take over or halt the impaired node: <ul style="list-style-type: none"> For an HA pair, take over the impaired node from the healthy node: <code>storage failover takeover -ofnode <i>impaired_node_name</i></code> When the impaired node shows <code>Waiting for giveback...</code>, press Ctrl-C, and then respond <code>y</code>.

Removing the controller module

To access components inside the controller module, you must remove the controller module from the chassis.

About this task

A video for this task is available at:

- YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-C8THdP1nmPF25RWwGRta3v>

You can use the following steps to remove the controller module from the chassis.

- Step 1. If you are not already grounded, properly ground yourself.
- Step 2. Release the power cable retainers, and then unplug the cables from the power supplies on the controller being serviced.
- Step 3. Loosen the hook and loop strap binding the cables to the cable management device, and then unplug the system cables and SFPs (if needed) from the controller module, keeping track of where the cables were connected.
- Step 4. Remove the cable management device from the controller module and set it aside.
- Step 5. Press down on both of the locking latches on each side of the controller, and then rotate both latches downward at the same time. The controller module moves slightly out of the chassis.
- Step 6. Slide the controller module out of the chassis. Make sure that you support the bottom of the controller module as you slide it out of the chassis.
- Step 7. Place the controller module on a stable, flat surface.

Replacing a PCIe card

To replace a PCIe card, you must locate the failed PCIe card, remove the riser that contains the card from the controller module, replace the card, and then reinstall the PCIe riser in the controller module.

About this task

A video for this task is available at:

- YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-C8THdP1nmPF25RWwGRta3v>

You can use the following steps to replace a PCIe card.

- Step 1. Remove the riser containing the card to be replaced:
- Open the air duct by pressing the locking tabs on the sides of the air duct, slide it toward the back of the controller module, and then rotate it to its completely open position.
 - Remove any SFP or QSFP modules that might be in the PCIe cards.
 - Rotate the riser locking latch on the left side of the riser up and toward air duct. The riser raises up slightly from the controller module.
 - Lift the riser up straight up and set it aside on a stable flat surface,
- Step 2. Remove the PCIe card from the riser:
- Turn the riser so that you can access the PCIe card.
 - Press the locking bracket on the side of the PCIe riser, and then rotate it to the open position.
 - For risers 2 and 3 only, swing the side panel up.
 - Remove the PCIe card from the riser by gently pushing up on the bracket and lift the card straight out of the socket.
- Step 3. Install the replacement PCIe card in the riser by aligning the card with the socket, press the card into the socket and then close the side panel on the riser, if present. Be sure that you properly align the card in the slot and exert even pressure on the card when seating it in the socket. The PCIe card must be fully and evenly seated in the slot.
- Note:** If you are installing a card in the bottom slot and cannot see the card socket well, remove the top card so that you can see the card socket, install the card, and then reinstall the card you removed from the top slot.
- Step 4. Reinstall the riser:
- Align the riser with the pins to the side of the riser socket, lower the riser down on the pins.
 - Push the riser squarely into the socket on the motherboard.
 - Rotate the latch down flush with the sheet metal on the riser.

Replacing the mezzanine card

The mezzanine card is located under riser number 3 (slots 4 and 5). You must remove that riser to access the mezzanine card, replace the mezzanine card, and then reinstall riser number 3. See the FRU map on the controller module for more information.

About this task

A video for this task is available at:

- YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-C8THdP1nmPF25RWwGRta3v>

You can use the following steps to replace the mezzanine card.

- Step 1. Remove riser number 3 (slots 4 and 5):
- Open the air duct by pressing the locking tabs on the sides of the air duct, slide it toward the back of the controller module, and then rotate it to its completely open position.
 - Remove any SFP or QSFP modules that might be in the PCIe cards.
 - Rotate the riser locking latch on the left side of the riser up and toward air duct. The riser raises up slightly from the controller module.
 - Lift the riser up, and then set it aside on a stable, flat surface.
- Step 2. Replace the mezzanine card:

- a. Remove any QSFP or SFP modules from the card.
- b. Loosen the thumbscrews on the mezzanine card, and gently lift the card directly out of the socket and set it aside.
- c. Align the replacement mezzanine card over the socket and the guide pins and gently push the card into the socket.
- d. Tighten the thumbscrews on the mezzanine card.

Step 3. Reinstall the riser:

- a. Align the riser with the pins to the side of the riser socket, lower the riser down on the pins.
- b. Push the riser squarely into the socket on the motherboard.
- c. Rotate the latch down flush with the sheet metal on the riser.

Installing the controller module

After you have replaced the component in the controller module, you must re-install the controller module into the chassis, and then boot it to Diagnostics menu.

About this task

A video for this task is available at:

- YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-C8THdP1nmPF25RWwGRta3v>

You can use the following steps to install the controller module in the chassis.

Step 1. If you have not already done so, close the air duct.

Step 2. Align the end of the controller module with the opening in the chassis, and then gently push the controller module fully into the system until the locking latches begin to rise.

Step 3. Cable the management and console ports only, so that you can access the system to perform the tasks in the following sections.

Step 4. Complete the installation of the controller module:

- a. Plug the power cord into the power supply, reinstall the power cable locking collar, and then connect the power supply to the power source.
- b. Using the locking latches, firmly push the controller module into the chassis until it meets the midplane and is fully seated.
The locking latches rise when the controller module is fully seated.

Note: Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.

The controller module begins to boot as soon as it is fully seated in the chassis. Be prepared to interrupt the boot process.

- c. Fully seat the controller module in the chassis by rotating the locking latches upward, tilting them so that they clear the locking pins, gently push the controller all the way in, and then lower the locking latches into the locked position.
- d. If you have not already done so, reinstall the cable management device.
- e. Interrupt the normal boot process and boot to LOADER by pressing `Ctrl-C`.
- f. At the LOADER prompt, enter `bye` to reinitialize the PCIe cards and other components and let the node reboot.

Step 5. Return the node to normal operation by giving back its storage. From the running node type:
`storage failover giveback -ofnode impaired_node_name`

Step 6. If automatic giveback was disabled, reenable it from the running node: `storage failover modify -node local -auto-giveback true`

Restoring the controller module to operation after running diagnostics

After completing diagnostics, you must recable the system, give back storage owned by the controller module, and then reenable automatic giveback.

Step 1. Recable the system, as needed. If you removed the media converters (QSFPs or SFPs), remember to reinstall them if you are using fiber optic cables.

Step 2. Return the node to normal operation by giving back its storage. From the running node type: `storage failover giveback -ofnode impaired_node_name`

Step 3. If automatic giveback was disabled, reenable it from the running node: `storage failover modify -node local -auto-giveback true`

Completing the replacement process

After you replace the part, you can return the failed part to Lenovo, as described in the RMA instructions shipped with the kit. Contact technical support at [Lenovo Data Center Support](#) if you need the RMA number or additional help with the replacement procedure.

Replacing the NVDIMM battery

To replace the NVDIMM battery, you must remove the controller module, remove the battery, replace the battery, and then reinstall the controller module.

About this task

All other components in the system must be functioning properly; if not, you must contact technical support.

Shutting down the impaired controller

You can shut down or take over the impaired controller using different procedures, depending on the storage system hardware configuration.

Shutting down the node

To shut down the impaired node, you must determine the status of the node and, if necessary, take over the node so that the healthy node continues to serve data from the impaired node.

Before you begin

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy node shows false for eligibility and health, you must correct the issue before shutting down the impaired node.

Step 1. If AutoSupport is enabled, suppress automatic log creation by invoking an AutoSupport message: `system node autosupport invoke -node * -type all -message MAINT=number_of_hours_downh`

Example

The following AutoSupport message suppresses automatic log creation for two hours: `cluster1:*> system node autosupport invoke -node * -type all -message MAINT=2h`

Step 2. Disable automatic giveback from the console of the healthy node: `storage failover modify -node local -auto-giveback false`

Step 3. Take the impaired node to the LOADER prompt:

If the impaired node is displaying...	Then...
The LOADER prompt	Go to the next step.
Waiting for giveback...	Press Ctrl-C, and then respond <code>y</code> when prompted.
Lenovo Data ONTAP system prompt or password prompt (enter system password)	Take over or halt the impaired node: <ul style="list-style-type: none"> For an HA pair, take over the impaired node from the healthy node: <code>storage failover takeover -ofnode <i>impaired_node_name</i></code> When the impaired node shows <code>Waiting for giveback...</code>, press Ctrl-C, and then respond <code>y</code>.

Removing the controller module

To access components inside the controller module, you must remove the controller module from the chassis.

About this task

A video for this task is available at:

- YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-C8THdP1nmPF25RWwGRta3v>

You can use the following steps to remove the controller module from the chassis.

- Step 1. If you are not already grounded, properly ground yourself.
- Step 2. Release the power cable retainers, and then unplug the cables from the power supplies on the controller being serviced.
- Step 3. Loosen the hook and loop strap binding the cables to the cable management device, and then unplug the system cables and SFPs (if needed) from the controller module, keeping track of where the cables were connected.
- Step 4. Remove the cable management device from the controller module and set it aside.
- Step 5. Press down on both of the locking latches on each side of the controller, and then rotate both latches downward at the same time. The controller module moves slightly out of the chassis.
- Step 6. Slide the controller module out of the chassis. Make sure that you support the bottom of the controller module as you slide it out of the chassis.
- Step 7. Place the controller module on a stable, flat surface.

Replacing the NVDIMM battery

To replace the NVDIMM battery, you must remove the failed battery from the controller module and install the replacement battery into the controller module. See the FRU map inside the controller module to locate the NVDIMM battery.

Before you begin

The NVDIMM LED on the rear of the controller near the bottom labeled NV blinks while destaging contents when you halt the system. After the destage is complete, the LED turns off.

Shutting down the impaired controller

You can shut down or take over the impaired controller using different procedures, depending on the storage system hardware configuration.

Shutting down the node

To shut down the impaired node, you must determine the status of the node and, if necessary, take over the node so that the healthy node continues to serve data from the impaired node storage.

If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy node shows false for eligibility and health, you must correct the issue before shutting down the impaired node.

1. If AutoSupport is enabled, suppress automatic log creation by invoking an AutoSupport message:
`system node autosupport invoke -node * -type all -message MAINT=number_of_hours_downh`

Example

The following AutoSupport message suppresses automatic log creation for two hours: cluster1:

```
* > system node autosupport invoke -node * -type all -message MAINT=2h
```

2. Disable automatic giveback from the console of the healthy node: `storage failover modify -node local -auto-giveback false`
3. Take the impaired node to the LOADER prompt:

If the impaired node is displaying...	Then...
The LOADER prompt	Go to the next step.
Waiting for giveback...	Press Ctrl-C, and then respond y when prompted.
System prompt or password prompt (enter system password)	Take over or halt the impaired node: <ul style="list-style-type: none"> • For an HA pair, take over the impaired node from the healthy node: <code>storage failover takeover -ofnode <i>impaired_node_name</i></code> <p>When the impaired node shows "Waiting for giveback...", press Ctrl-C, and then respond y.</p>

About this task

A video for this task is available at:

- YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-C8THdP1nmPF25RWwGRta3v>

You can use the following steps to replace the NVDIMM battery.

- Step 1. Open the air duct:
 - a. Press the locking tabs on the sides of the air duct in toward the middle of the controller module.
 - b. Slide the air duct toward the back of the controller module, and then rotate it upward to its completely open position.
- Step 2. Locate the NVDIMM battery in the controller module. It is along the left edge of the controller when viewing the controller from the rear.
- Step 3. Locate the battery plug and squeeze the clip on the face of the battery plug to release the plug from the socket, and then unplug the battery cable from the socket.
- Step 4. Grasp the battery and press the blue locking tab marked PUSH, and then lift the battery out of the holder and controller module.

- Step 5. Remove the replacement battery from its package.
- Step 6. Align the battery module with the opening for the battery, and then gently push the battery into slot until it locks into place.
- Step 7. Plug the battery plug back into the controller module, and then close the air duct.

Installing the controller module

After you have replaced the component in the controller module, you must re-install the controller module into the chassis, and then boot it to Maintenance mode.

About this task

A video for this task is available at:

- YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-C8THdP1nmPF25RWwGRta3v>

You can use the following steps to install the controller module in the chassis.

- Step 1. If you have not already done so, close the air duct.
- Step 2. Align the end of the controller module with the opening in the chassis, and then gently push the controller module fully into the system until the locking latches begin to rise.
- Step 3. Cable the management and console ports only, so that you can access the system to perform the tasks in the following sections.
- Step 4. Complete the installation of the controller module:
 - a. Fully seat the controller module in the chassis by rotating the locking latches upward, tilting them so that they clear the locking pins, gently push the controller all the way in, and then lower the locking latches into the locked position.
 - b. Plug the power cord into the power supply, reinstall the power cable locking collar, and then connect the power supply to the power source for each power supply.
 - c. If you have not already done so, reinstall the cable management device.
 - d. Interrupt the normal boot process and boot to LOADER by pressing `ctrl-c`.

Running diagnostics

After you have replaced a component in your system, you should run diagnostic tests on that component.

Before you begin

Your system must be at the LOADER prompt to start diagnostics.

About this task

All commands in the diagnostic procedures are issued from the node where the component is being replaced.

- Step 1. If the node to be serviced is not at the LOADER prompt, stop service to the node: `system node halt -node node_name` After you issue the command, you should wait until the system stops at the LOADER prompt.
- Step 2. At the LOADER prompt, access the special drivers specifically designed for system-level diagnostics to function properly: `boot_diags`
- Step 3. Select **Scan System** from the displayed menu to enable running the diagnostics tests.
- Step 4. Select **Test system** from the displayed menu to run diagnostics tests.

Step 5. Proceed based on the result of the preceding step:

- If the scan show problems, correct the issue, and then rerun the scan.
- If the scan reported no failures, select `Reboot` from the menu to reboot the system.

Restoring the controller module to operation after running diagnostics

After completing diagnostics, you must recable the system, give back storage owned by the controller module, and then reenable automatic giveback.

Step 1. Recable the system, as needed. If you removed the media converters (QSFPs or SFPs), remember to reinstall them if you are using fiber optic cables.

Step 2. Return the node to normal operation by giving back its storage. From the running node type:
`storage failover giveback -ofnode impaired_node_name`

Step 3. If automatic giveback was disabled, reenable it from the running node: `storage failover modify -node local -auto-giveback true`

Completing the replacement process

After you replace the part, you can return the failed part to Lenovo, as described in the RMA instructions shipped with the kit. Contact technical support at [Lenovo Data Center Support](#) if you need the RMA number or additional help with the replacement procedure.

Replacing the chassis

Before you begin

All other components in the system must be functioning properly; if not, you must contact technical support.

About this task

- You can use this procedure with all versions of ONTAP supported by your system.
- This procedure is disruptive. For a two-node cluster, you will have a complete service outage and a partial outage in a multi-node cluster.

Shutting down the controllers when replacing a chassis

You must shut down the controllers before replacing the chassis.

Shutting down the nodes

You must shut down the nodes in the chassis prior to moving them to the new chassis.

Before you begin

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy node shows false for eligibility and health, you must correct the issue before shutting down the impaired node.

Step 1. If AutoSupport is enabled, suppress automatic log creation by invoking an AutoSupport message:
`system node autosupport invoke -node * -type all -message MAINT=number_of_hours_downh`

Example

The following AutoSupport message suppresses automatic log creation for two hours: `cluster1:*> system node autosupport invoke -node * -type all -message MAINT=2h`

Step 2. Disable the HA pair.

If your system is running clustered ONTAP with...	Then...
Two nodes in the cluster	<code>cluster ha modify -configured false storage failover modify -node node0 -enabled false</code>
More than two nodes in the cluster	<code>storage failover modify -node node0 -enabled false</code>

Step 3. Halt the node, pressing `y` when you are prompted to confirm the halt: `system node halt -node node_name` The confirmation message looks like the following:

```
Warning: Rebooting or halting node
"node_name" in an HA-enabled cluster may result in client disruption or data access
failure. To ensure continuity of service, use the "storage
failover takeover" command. Are you sure you want to halt node
"node_name"? {y|n}:
```

Attention: You must perform a clean system shutdown before replacing chassis to avoid losing unwritten data in the nonvolatile memory (NVME).

Step 4. Halt the second node to avoid a possible quorum error message in an HA pair configuration: `system node halt -node second_node_name -ignore-quorum-warnings true`

Removing the controller modules

To replace the chassis, you must remove the controller modules from the old chassis.

About this task

A video for this task is available at:

- YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-C8THdP1nmPF25RWwGRta3v>

You can use the following steps to remove the controller module in the chassis.

- Step 1. If you are not already grounded, properly ground yourself.
- Step 2. Release the power cable retainers, and then unplug the cables from the power supplies on the controller being serviced.
- Step 3. Loosen the hook and loop strap binding the cables to the cable management device, and then unplug the system cables and SFPs (if needed) from the controller module, keeping track of where the cables were connected.
- Step 4. Remove and set aside the cable management devices from the left and right sides of the controller module.
- Step 5. Press down on both of the locking latches on each side of the controller, and then rotate both latches downward at the same time. The controller module moves slightly out of the chassis.
- Step 6. Slide the controller module out of the chassis. Make sure that you support the bottom of the controller module as you slide it out of the chassis.
- Step 7. Set the controller module aside in a safe place, and repeat these steps for the other controller module in the chassis.

Moving the fans

To move the fan modules to the replacement chassis when replacing the chassis, you must perform a specific sequence of tasks.

About this task

A video for this task is available at:

- YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-C8THdP1nmPF25RWwGRta3v>

You can use the following steps to remove the fans in the chassis.

- Step 1. If you are not already grounded, properly ground yourself.
- Step 2. Remove the bezel (if necessary) with two hands, by grasping the openings on each side of the bezel, and then pulling it toward you until the bezel releases from the ball studs on the chassis frame.
- Step 3. Press down the orange release latch in the fan module cam handle. The fan module moves a little bit away from the chassis.
- Step 4. Pull the fan module straight out from the chassis, making sure that you support it with your free hand.

CAUTION:

The fan modules are short. Always support the bottom of the fan module with your free hand so that it does not suddenly drop free from the chassis and injure you.

- Step 5. Set the fan module aside.
- Step 6. Repeat the preceding steps for any remaining fan modules.
- Step 7. Insert the fan module into the replacement chassis by aligning it with the opening, and then sliding it into the chassis.
- Step 8. Push firmly on the fan module cam handle so that it is seated all the way into the chassis. The cam handle raises slightly when the fan module is completely seated.
- Step 9. Swing the cam handle up to its closed position, making sure that the cam handle release latch clicks into the locked position. The fan LED should be green after the fan is seated and has spun up to operational speed.
- Step 10. Repeat these steps for the remaining fan modules.

Replacing a chassis from within the equipment rack or system cabinet

You must remove the existing chassis from the equipment rack or system cabinet before you can install the replacement chassis.

About this task

A video for this task is available at:

- YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-C8THdP1nmPF25RWwGRta3v>

You can use the following steps to replace a chassis within the equipment rack or system cabinet.

- Step 1. Remove the screws from the chassis mount points.
- Step 2. With two people, slide the old chassis off the rack rails in a system cabinet or equipment rack, and then set it aside.
- Step 3. If you are not already grounded, properly ground yourself.
- Step 4. Using two people, install the replacement chassis into the equipment rack or system cabinet by guiding the chassis onto the rack rails in a system cabinet or equipment rack.
- Step 5. Slide the chassis all the way into the equipment rack or system cabinet.
- Step 6. Secure the front of the chassis to the equipment rack or system cabinet, using the screws you removed from the old chassis.

Installing the controller modules

After you install the controller modules into the new chassis, you need to boot it to a state where you can run the diagnostic test.

About this task

For HA pairs with two controller modules in the same chassis, the sequence in which you install the controller module is especially important because it attempts to reboot as soon as you completely seat it in the chassis.

A video for this task is available at:

- YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-C8THdP1nmPF25RWwGRta3v>

- Step 1. Align the end of the controller module with the opening in the chassis, and then gently push the controller module fully into the system until the locking latches begin to rise.
- Step 2. Recable the console to the controller module, and then reconnect the management port.
- Step 3. Complete the installation of the controller module:
 - a. Fully seat the controller module in the chassis by rotating the locking latches upward, tilting them so that they clear the locking pins, gently push the controller all the way in, and then lower the locking latches into the locked position.
 - b. Plug the power cord into the power supply, reinstall the power cable locking collar, and then connect the power supply to the power source for each power supply.
 - c. If you have not already done so, reinstall the cable management device.
 - d. Interrupt the normal boot process and boot to LOADER by pressing `Ctrl-C`.
- Step 4. Repeat the preceding steps to install the second controller into the new chassis.

Verifying and setting the HA state of the chassis

You must verify the HA state of the chassis, and, if necessary, update the state to match your system configuration.

- Step 1. From the LOADER prompt, enter Maintenance mode by typing `boot_maint`.

In Maintenance mode, from either controller module, display the HA state of the local controller module and chassis: `ha-config show`

The HA state should be the same for all components.

- Step 2. If the displayed system state for the chassis does not match your system configuration:
 - a. Set the HA state for the chassis: `ha-config modify chassis HA-state`

The value for *HA-state* can be one of the following:

- `ha`
- `mcc`
- `mcc-2n`
- `non-ha`

- b. Confirm that the setting has changed: `ha-config show`

- Step 3. If you have not already done so, recable the rest of your system.

Running diagnostics

After you have replaced a component in your system, you should run diagnostic tests on that component.

Before you begin

Your system must be at the LOADER prompt to start diagnostics.

About this task

All commands in the diagnostic procedures are issued from the node where the component is being replaced.

- Step 1. If the node to be serviced is not at the LOADER prompt, stop service to the node: `system node halt -node node_name` After you issue the command, you should wait until the system stops at the LOADER prompt.
- Step 2. At the LOADER prompt, access the special drivers specifically designed for system-level diagnostics to function properly: `boot_diags`
- Step 3. Select **Scan System** from the displayed menu to enable running the diagnostics tests.
- Step 4. Select **Test system** from the displayed menu to run diagnostics tests.
- Step 5. Select the test or series of tests from the various sub-menus.
- Step 6. Proceed based on the result of the preceding step:
 - If the test failed, correct the failure, and then rerun the test.
 - If the test reported no failures, select `Reboot` from the menu to reboot the system.

Completing the replacement process

After you replace the part, you can return the failed part to Lenovo, as described in the RMA instructions shipped with the kit. Contact technical support at [Lenovo Data Center Support](#) if you need the RMA number or additional help with the replacement procedure.

Chapter 5. System level diagnostics

Introduction to system-level diagnostics

DG7000 System-level diagnostics provides a menu-driven interface for tests that search for and determine hardware problems on supported storage systems. You use system-level diagnostics to confirm that a specific component is operating properly or to help identify faulty components. DG7000 system-level diagnostics is specifically designed for DG7000 storage systems only.

You run system-level diagnostics after one of the following common troubleshooting situations:

- Initial system installation
- Addition or replacement of hardware components
- System panic caused by an unidentified hardware failure
- Access to a specific device becomes intermittent or the device becomes unavailable

To access system-level diagnostics for the storage system, you must directly connect to the serial console port of the storage system or access the serial console remotely via the Baseband Management Controller (BMC) of the storage system. Then, take over or halt the storage system to reach the LOADER prompt. Once at the LOADER prompt, enter the `boot_diags` command to start system-level diagnostics.

From the main menu of system-level diagnostics, the following choices are available:

- **Scan system** — Scan the system to obtain an accurate H/W inventory of the system for subsequent testing
- **Test system** — Test specific components or the entire system for proper operation.
- **Show VPD information** — Display vital product data (VPD) for components in the system.
- **Show FW revision** — Display the firmware revision information for components in the system.
- **Show MAC address** — Display the unique MAC addresses allocated to components in the system.
- **Show logs** — Display a recorded log of previous scan and test results.
- **Reboot (BMC power cycle) controller to LOADER** — Exit system-level diagnostics and return to the LOADER prompt.
- **Scan system** — Scan the system to obtain an accurate H/W inventory of the system for subsequent testing

Once a menu command is chosen, all output is displayed on the console session. Terminal session logging can be used to conveniently capture test results and other displayed information. In addition, system scans, system tests and memory tests are persistently logged on the boot media. The last ten results for each scan or test command are available for review.

If test results complete successfully, you can exit system-level diagnostics and reboot the system for normal operation. In the event of test failures, the test results will help technical support make appropriate recommendations. The failure could be resolved by reinstalling the FRU. If the failure cannot be resolved, then there is a likely hardware failure and the affected hardware must be replaced.

Scan system

When you scan the system, system-level diagnostics obtains an accurate hardware inventory of the system. You must scan the system first, before you run any tests. To execute the "Scan system" operation, type "1" and then press "Enter" to start the system scan.

```
Copyright (c) 2019 NetApp Inc. All rights reserved.
FAS8300 System-Level HW Diagnostics 04.03.03
#### System          PN: 111-04200      ####
#### System          SN: 041939003424  ####
#### Controller-B   PN: 111-04198      ####
#### Controller-B   SN: 041938001831  ####
1) Scan System
2) Test System (must scan system, first)
3) Test Memory (must scan system, first)
4) Stress-Test System (must scan system, first)
5) Show UPD Information
6) Show FW Revision
7) Show MAC Address
8) Show Logs
9) Reboot (BMC Power Cycle) Controller to LOADER
Select a number 1-9 to execute the respective command: 
```

The scan system summary provides general information about the hardware inventory present in the system. Press "Enter" to return to the main menu after the scan is complete.

Scan System Summary:

Controller-B PN:TEMP-S000092338 SN:2BJJ0267S00N
CPU :Expect: 2 Present: 2 Result: PASSED
TPM :Expect: 1 Present: 1 Result: PASSED
SAS :Expect: 2 Present: 2 Result: PASSED
Expander :Expect: 2 Present: 2 Result: PASSED
SFPGA :Expect: 1 Present: 1 Result: PASSED
Ethernet - I210 :Expect: 2 Present: 2 Result: PASSED
BMC :Expect: 1 Present: 1 Result: PASSED

Memory: PASSED

Expect:16 Present:16

slot	PN	SN
dimm1	SHB724G4LML23P2-SB	3213D720
dimm2	SHB724G4LML23P2-SB	3213C819
dimm3	SHB724G4LML23P2-SB	3213D19E
dimm4	SHB724G4LML23P2-SB	3213D47D
dimm5	SHB724G4LML23P2-SB	3213D13C
dimm6	SHB724G4LML23P2-SB	3213CAC5
dimm7	SHB724G4LML23P2-SB	3213D19F
dimm8	SHB724G4LML23P2-SB	3213CB3F
dimm9	SHB724G4LML23P2-SB	3213CB1A
dimm10	SHB724G4LML23P2-SB	3213CD73
dimm11	SHB724G4LML23P2-SB	3213C84B
dimm12	SHB724G4LML23P2-SB	32149EEA
dimm13	SHB724G4LML23P2-SB	3213D250
dimm14	SHB724G4LML23P2-SB	3213D806
dimm15	SHB724G4LML23P2-SB	3213D44B
dimm16	SHB724G4LML23P2-SB	3213D52D

NVMe: PASSED

Expect: 2 Present: 2

slot	PN	SN
NVME0	SAMSUNG MZVLV128HCGR	S2J4NX0H510081
NVME1	SAMSUNG MZVLV128HCGR	S2J4NX0H510038

HBA: PASSED

Expect: 7 Present: 7

slot	description	PN	SN
1	NVRAM10P Module	031611001295	031615000072
2	32Gb FC HBA-1	111-03249	FC60778265
3	32Gb FC HBA-2	111-03249	FC61004370
4	12Gb SAS HBA	N/A	N/A
5	40GbE NIC HBA	H76496-002	3CFDFE9DCBB8H76496-002
6	40GbE OCP-1	H52289-004	90E2BABBD90H52289-004
7	40GbE OCP-2	H52289-004	90E2BAC7EC30H52289-004

Fan: PASSED

Expect: 8 Present: 8

Fan_1	13536RPM
Fan_2	13728RPM
Fan_3	13632RPM
Fan_4	13632RPM
Fan_5	13632RPM
Fan_6	13536RPM
Fan_7	13632RPM
Fan_8	13632RPM

PSU: PASSED

Expect: 1 Present: 1

slot	PN	SN
PSU1		HZBD1625000552

Press [Enter] key to go back to Main Menu

Test system

The "Test system" command allows you to specify component-level or system-level testing of the system. One or more iterations or "loops" can be specified, as well. To execute the "Test System" operation, type "2" and then press "Enter" to go to the Test System option page.

```
Copyright (c) 2019 NetApp Inc. All rights reserved.
FAS8300 System-Level HW Diagnostics 04.03.03
#### System          PN: 111-04200          ####
#### System          SN: 041939003424   ####
#### Controller-B    PN: 111-04198          ####
#### Controller-B    SN: 041938001831   ####
1) Scan System
2) Test System (must scan system, first)
3) Test Memory (must scan system, first)
4) Stress-Test System (must scan system, first)
5) Show UPD Information
6) Show FW Revision
7) Show MAC Address
8) Show Logs
9) Reboot (BMC Power Cycle) Controller to LOADER
Select a number 1-9 to execute the respective command: [ ]
```

The Test System page is shown, below:

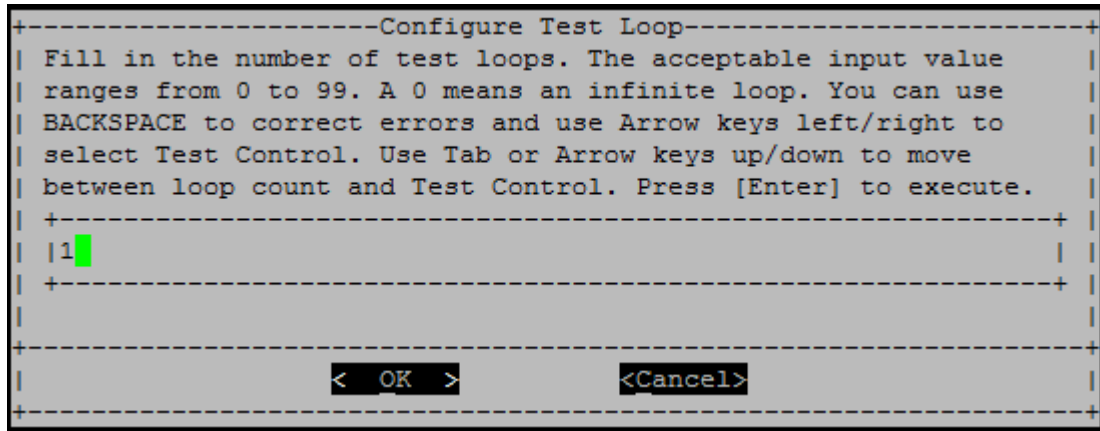
```
-----Test System-----
+-----+
| Select one or more items to test using the SPACE bar to toggle the option. |
| Use Arrow keys to move up/down to select individual test. Use Arrow keys |
| left/right to select Test Control. Press [Enter] to execut.                |
+-----+
| [ ] a. CPU Test <Register read test> |
| [ ] b. TPM Test <Self-test> |
| [ ] c. Ethernet I210 Test <Internal loopback test> |
| [ ] d. BMC Test <Self-test/Sensor status check> |
| [ ] e. PSU Test <Sensor status check> |
| [ ] f. PCH-I2C Test <Device read test> |
| [ ] g. Fan Test <Fan speed control test> |
| [ ] h. Onboard: Quad Port 12G SAS Test <External loopback test> |
| [ ] i. Onboard: Dual Port 25GbE RoCE NIC Test <BIST/External loopback test> |
| [ ] j. Onboard: Dual Port 100GbE RoCE NIC Test <BIST/External loopback test> |
| [ ] k. Mezz: Quad Port 16G FC Test <Internal/External loopback test> |
| [ ] l. HBA: Quad Port 10GbE NIC Test <BIST/External loopback test> |
+-----+
| (+) |
+-----+
| <OK> | <Test all> | <Cancel> |
+-----+
```

- Use the "up" and "down" arrow keys to select test options (from option "a" to option "m").

Note: Scroll down to see all available tests

- Use the left and right arrow keys to select "Run", "Test All" or "Cancel":
- Use the "space" bar to toggle an option on or off.
 - Run– Run the selected tests from the Test System page
 - Test All– Run all available system tests
 - Cancel– Cancel system test and return to the main menu.
- Press "Enter" to execute your choice.

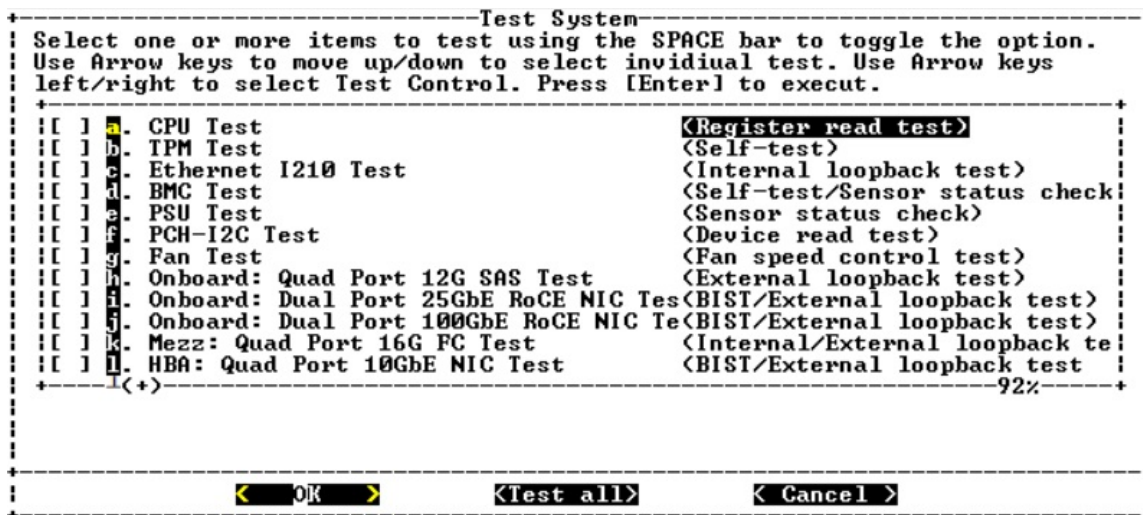
If "Run" or "Test All" is chosen, the "Configure Test Loop" page is displayed.



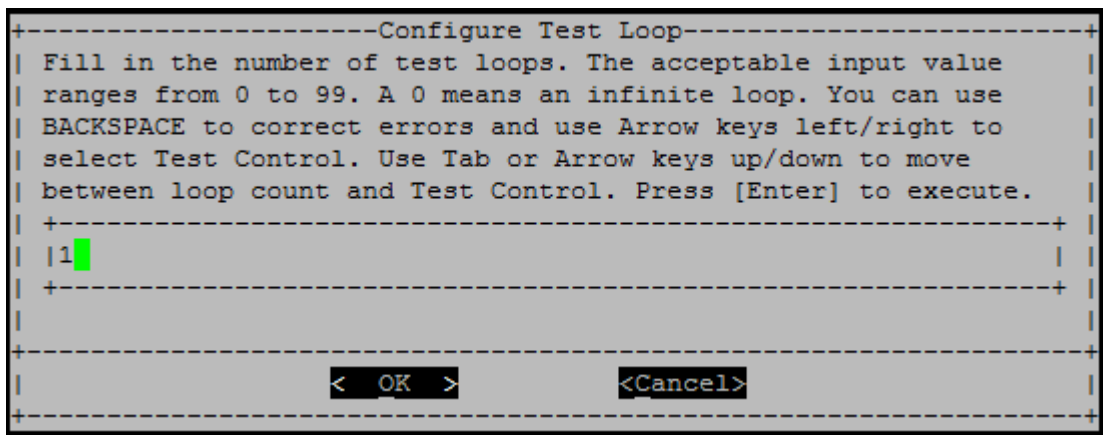
- Enter the number of test loops for the selected tests.
- Use the "Tab" key to switch the cursor between the loop input panel and the page control panel.
- Use the left and right arrow keys to select "OK" or "Cancel".
- Press "Enter" to start the tests.

Test example: Run CPU Test

To only run the CPU test, toggle on option "a. CPU test (Execute stability Test)", select "Run", and then press "Enter".

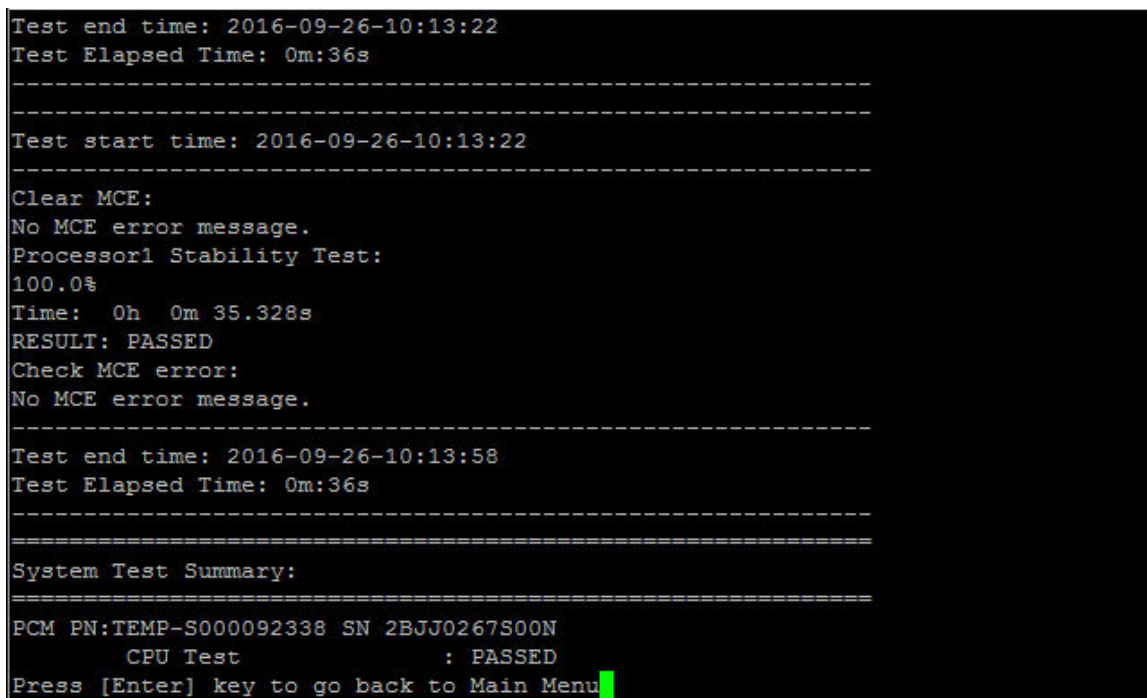


The "Configure Test Loop" page is displayed.



To run one test loop only, retain the default "1" value, press "Tab" to switch contexts to the control panel, select "OK", and then press "Enter" to start the test.

The test results are displayed on the console, as shown below. Press "Enter" to return to the main menu.



Test memory

The "Test memory" command allows you to run tests on part or all of system memory. To execute the "Test Memory" operation, type "3" and then press "Enter".


```

Copyright (c) 2019 NetApp Inc. All rights reserved.
FAS8300 System-Level HW Diagnostics 04.03.03
#### System          PN: 111-04200          ####
#### System          SN: 041939003424      ####
#### Controller-B   PN: 111-04198         ####
#### Controller-B   SN: 041938001831      ####
1) Scan System
2) Test System (must scan system, first)
3) Test Memory (must scan system, first)
4) Stress-Test System (must scan system, first)
5) Show UPD Information
6) Show FW Revision
7) Show MAC Address
8) Show Logs
9) Reboot (BMC Power Cycle) Controller to LOADER
Select a number 1-9 to execute the respective command: 

```

Configure Memory Test Range

Use the Configure Memory Test Range to specify the start and the end addresses for the memory tests.

- Fill in the "Start Address" and "End Address" fields with the desired memory address range (in hexadecimal).
- Use the "Tab" key to switch the cursor between memory address input and the page control panel ("OK" or "Cancel").
- Select "OK" in the control panel, and then press "Enter".

```

+-----Configure Memory Test Range-----+
| Fill in the start address and the end address for the |
| memory test range. The default range is the maximum  |
| testable memory range. You can use BACKSPACE to correct |
| errors and use Arrow keys left/right to select Test  |
| Control. Press [Enter] to execute.                    |
+-----+
| Start Address:  0x180000000                          |
| End Address:    0x807fffffff                          |
+-----+
|
| < OK >          <Cancel>

```

Memory Test Selection and Loop Count

The "Test Memory" page displays the available memory tests:

- Memory Pattern Test – Verifies system memory with a pre-determined pattern
- Memory Random Test – Verifies system memory with randomly generated patterns

```

=====
Total Memory Size: 512 GB
slot      Size      PN              SN
dimmm1   32 GB     SHB724G4IML23P2-SB  3213D720
dimmm2   32 GB     SHB724G4IML23P2-SB  3213C819
dimmm3   32 GB     SHB724G4IML23P2-SB  3213D19E
dimmm4   32 GB     SHB724G4IML23P2-SB  3213D47D
dimmm5   32 GB     SHB724G4IML23P2-SB  3213D13C
dimmm6   32 GB     SHB724G4IML23P2-SB  3213CAC5
dimmm7   32 GB     SHB724G4IML23P2-SB  3213D19F
dimmm8   32 GB     SHB724G4IML23P2-SB  3213CB3F
dimmm9   32 GB     SHB724G4IML23P2-SB  3213CB1A
dimmm10  32 GB     SHB724G4IML23P2-SB  3213CD73
dimmm11  32 GB     SHB724G4IML23P2-SB  3213C84B
dimmm12  32 GB     SHB724G4IML23P2-SB  32149EEA
dimmm13  32 GB     SHB724G4IML23P2-SB  3213D250
dimmm14  32 GB     SHB724G4IML23P2-SB  3213D806
dimmm15  32 GB     SHB724G4IML23P2-SB  3213D44B
dimmm16  32 GB     SHB724G4IML23P2-SB  3213D52D
===== LOOP 1 =====

```

```

=====
Memory Pattern Test:
=====

```

```

Clear ECC:

```

```

ECC error counts:0
-----

```

```

Run Pattern Test for 0x180000000 - 0x807fffffff:
-----

```

```

Test start time: 2016-09-26-10:25:44
-----

```

```

Progressing:100%

```

```

RESULT: PASSED
-----

```

```

Test end time: 2016-09-26-10:33:39

```

```

Test Elapsed Time: 7m:55s
-----

```

```

Check ECC:

```

```

ECC error counts:0

```

```

Press [Enter] key to go back to Main Menu

```

- Use the "up" and "down" arrow keys to select test options "a" or "b"
- Use the "space" bar to toggle an option on or off.
- Use the left and right arrow keys to select "Run" or "Cancel".
- Press "Enter" to execute your choice.

If "Run" is chosen, the "Configure Test Loop" page is displayed.

```
+-----Configure Test Loop-----+
| Fill in the number of test loops. The acceptable input value |
| ranges from 0 to 99. A 0 means an infinite loop. You can use |
| BACKSPACE to correct errors and use Arrow keys left/right to |
| select Test Control. Use Tab or Arrow keys up/down to move  |
| between loop count and Test Control. Press [Enter] to execute. |
+-----+
| 1 █                                                              |
+-----+
|                                                                 |
|                                                                 |
|                                                                 |
|                                                                 |
+-----+
|               < OK >          <Cancel>                          |
+-----+
|                                                                 |
+-----+
|                                                                 |
+-----+
```

- Enter the number of test loops for the selected tests.
Note: For the "Memory Random Test", this value specifies the number of seconds spent running the test.
- Use the "Tab" key to switch the cursor between the loop input panel and the page control panel.
- Use the left and right arrow keys to select "OK" or "Cancel".
- Press "Enter" to start the tests.

The test results are displayed on the console, as shown below. Press "Enter" to return to the main menu.

```

=====
Total Memory Size: 512 GB
slot      Size      PN                      SN
dimmm1   32 GB     SHB724G4IML23P2-SB    3213D720
dimmm2   32 GB     SHB724G4IML23P2-SB    3213C819
dimmm3   32 GB     SHB724G4IML23P2-SB    3213D19E
dimmm4   32 GB     SHB724G4IML23P2-SB    3213D47D
dimmm5   32 GB     SHB724G4IML23P2-SB    3213D13C
dimmm6   32 GB     SHB724G4IML23P2-SB    3213CAC5
dimmm7   32 GB     SHB724G4IML23P2-SB    3213D19F
dimmm8   32 GB     SHB724G4IML23P2-SB    3213CB3F
dimmm9   32 GB     SHB724G4IML23P2-SB    3213CB1A
dimmm10  32 GB     SHB724G4IML23P2-SB    3213CD73
dimmm11  32 GB     SHB724G4IML23P2-SB    3213C84B
dimmm12  32 GB     SHB724G4IML23P2-SB    32149EEA
dimmm13  32 GB     SHB724G4IML23P2-SB    3213D250
dimmm14  32 GB     SHB724G4IML23P2-SB    3213D806
dimmm15  32 GB     SHB724G4IML23P2-SB    3213D44B
dimmm16  32 GB     SHB724G4IML23P2-SB    3213D52D
===== LOOP 1 =====

```

```

=====
Memory Pattern Test:
=====

```

```

Clear ECC:

```

```

ECC error counts:0
-----

```

```

Run Pattern Test for 0x180000000 - 0x807fffffff:
-----

```

```

Test start time: 2016-09-26-10:25:44
-----

```

```

Progressing:100%

```

```

RESULT: PASSED
-----

```

```

Test end time: 2016-09-26-10:33:39

```

```

Test Elapsed Time: 7m:55s
-----

```

```

Check ECC:

```

```

ECC error counts:0

```

```

Press [Enter] key to go back to Main Menu █

```

Show VPD information

The "Show VPD information" command displays vital product data (VPD) information for components of the system. To execute the "Show VPD information" operation, type "5" and then press "Enter".

```
Copyright (c) 2019 NetApp Inc. All rights reserved.
FAS8300 System-Level HW Diagnostics 04.03.03
#### System          PN: 111-04200          ####
#### System          SN: 041939003424    ####
#### Controller-B    PN: 111-04198          ####
#### Controller-B    SN: 041938001831    ####
1) Scan System
2) Test System (must scan system, first)
3) Test Memory (must scan system, first)
4) Stress-Test System (must scan system, first)
5) Show UPD Information
6) Show FW Revision
7) Show MAC Address
8) Show Logs
9) Reboot (BMC Power Cycle) Controller to LOADER

Select a number 1-9 to execute the respective command: 
```

VPD information is displayed. Press "Enter" to return to the main menu.

```
32Gb FC HBA-1:
Product Name      : Emulex LightPulse LPe32002-M2-NA 2-Port 32Gb Fibre Chan
nel Adapter, FC PF
PN (Part Number)  : 111-03249
SN (Serial Number): FC62671258
V0                : FC62671258
V1                : 111-03249 Emulex LightPulse LPe32002-M2-NA 2-Port 32Gb
Fibre Channel Adapter
V2                : 111-03249
V5                : LPe32002-M2-NA
V7                : ID:0294,V:00.00.03.09
32Gb FC HBA-2:
Product Name      : Emulex LightPulse LPe32002-M2-NA 2-Port 32Gb Fibre Chan
nel Adapter, FC PF
PN (Part Number)  : 111-03249
SN (Serial Number): FC62787200
V0                : FC62787200
V1                : 111-03249 Emulex LightPulse LPe32002-M2-NA 2-Port 32Gb
Fibre Channel Adapter
V2                : 111-03249
V5                : LPe32002-M2-NA
V7                : ID:0294,V:00.00.03.09

12Gb SAS HBA:
Serial number     : 031627002195
NetApp P/N       : 111-02026
NetApp Rev.      : B0
Date             : 20160703
Manufacturer     : NetApp, Inc.
Manufacturer P/N : 110-00401
Manufacturer Rev. : B0
Driver name      : pm80xx
major rev        : 1
minor rev        : 3
build rev        : 0
maxdevices       : 3984
maxoutstandingIO : 8192
Press [Enter] key to go back to Main Menu
```

Show FW revision

The "Show FW revision" command displays the firmware revision information for components in the system. To execute the "Show FW revision" operation, type "6" and then press "Enter".


```
Copyright (c) 2019 NetApp Inc. All rights reserved.
FAS8300 System-Level HW Diagnostics 04.03.03
#### System          PN: 111-04200          ####
#### System          SN: 041939003424   ####
#### Controller-B   PN: 111-04198          ####
#### Controller-B   SN: 041938001831   ####
1) Scan System
2) Test System (must scan system, first)
3) Test Memory (must scan system, first)
4) Stress-Test System (must scan system, first)
5) Show UPD Information
6) Show FW Revision
7) Show MAC Address
8) Show Logs
9) Reboot (BMC Power Cycle) Controller to LOADER

Select a number 1-9 to execute the respective command: 
```

The FW revision is displayed. Press "Enter" to return to the main menu.

```
Select a number 1-9 to execute the respective command: 6
BIOS : 16.0
BMC : 13.01.00
SFPGA : 0.14
Controller Board : 2
PSU Board 1 : 4.21.0
PSU Board 2 : 4.21.0
Ethernet Switch : 3.3
SATA DEV1 : D0MU051
NUMe DEV1 : NA01
TPM Version 1 : 5.62
Battery Board : A3
I210(e0M) : 3.25-5.5
I210(e0S) : 3.25-5.5
Onboard: Quad Port 12G SAS : 10.00.00.00-10.02.81.10
Onboard: Dual Port 25GbE RoCE NIC : 16.25.1020
Onboard: Dual Port 100GbE RoCE NIC : 16.25.1020
Mezz: Quad Port 16G FC-1 : 12.2.390.0
Mezz: Quad Port 16G FC-2 : 12.2.390.0
HBA: Quad Port 10GbE NIC : 5.05 0x8000289d 0.0.0
HBA: Quad Port 10GbE NIC : 5.05 0x8000289d 0.0.0
Press [Enter] key to go back to Main Menu

```

Show MAC address

The "Show MAC address" command displays the unique MAC addresses allocated to components in the system. To execute the "Show MAC address" operation, type "7" and then press "Enter".

```

Copyright (c) 2019 NetApp Inc. All rights reserved.
FAS8300 System-Level HW Diagnostics 04.03.03
#### System          PN: 111-04200          ####
#### System          SN: 041939003424      ####
#### Controller-B    PN: 111-04198          ####
#### Controller-B    SN: 041938001831      ####
1) Scan System
2) Test System (must scan system, first)
3) Test Memory (must scan system, first)
4) Stress-Test System (must scan system, first)
5) Show UPD Information
6) Show FW Revision
7) Show MAC Address
8) Show Logs
9) Reboot (BMC Power Cycle) Controller to LOADER

Select a number 1-9 to execute the respective command: 

```

MAC address information is displayed. Press "Enter" to return to the main menu.

```

Select a number 1-9 to execute the respective command: 7
BMC MAC0          : D0:39:EA:10:C6:CD
BMC MAC1          : D0:39:EA:10:C6:CE
Intel I210 Gigabit Network Connection (e0M) : D0:39:EA:10:C6:CB
Intel I210 Gigabit Backplane Connection (e0S) : D0:39:EA:10:C6:CC
Onboard: Quad Port 12G SAS                   : 5000000080000000
Onboard: Dual Port 25GbE RoCE NIC (e0a)      : D0:39:EA:10:C6:C7
Onboard: Dual Port 25GbE RoCE NIC (e0b)      : D0:39:EA:10:C6:C8
Onboard: Dual Port 100GbE RoCE NIC (e0c)     : D0:39:EA:10:C6:C9
Onboard: Dual Port 100GbE RoCE NIC (e0d)     : D0:39:EA:10:C6:CA
Mezz: Quad Port 16G FC-1 (0e)                : 500A09800E0321EF
Mezz: Quad Port 16G FC-1 (0f)                : 500A09810E0321EF
Mezz: Quad Port 16G FC-2 (0g)                : 500A09820E0321EF
Mezz: Quad Port 16G FC-2 (0h)                : 500A09830E0321EF
HBA: Quad Port 10GbE NIC (e1a)               : 3C:FD:FE:E5:DE:08
HBA: Quad Port 10GbE NIC (e1b)               : 3C:FD:FE:E5:DE:09
HBA: Quad Port 10GbE NIC (e1c)               : 3C:FD:FE:E5:DE:0A
HBA: Quad Port 10GbE NIC (e1d)               : 3C:FD:FE:E5:DE:0B
HBA: Quad Port 10GbE NIC (e2a)               : 3C:FD:FE:E5:CE:30
HBA: Quad Port 10GbE NIC (e2b)               : 3C:FD:FE:E5:CE:31
HBA: Quad Port 10GbE NIC (e2c)               : 3C:FD:FE:E5:CE:32
HBA: Quad Port 10GbE NIC (e2d)               : 3C:FD:FE:E5:CE:33
Press [Enter] key to go back to Main Menu

```

Show logs

The "Show logs" command displays a recorded log of previous scan and test results. System scans, system tests and memory tests are persistently logged on the boot media. The last ten results for each scan or test command are available for review.

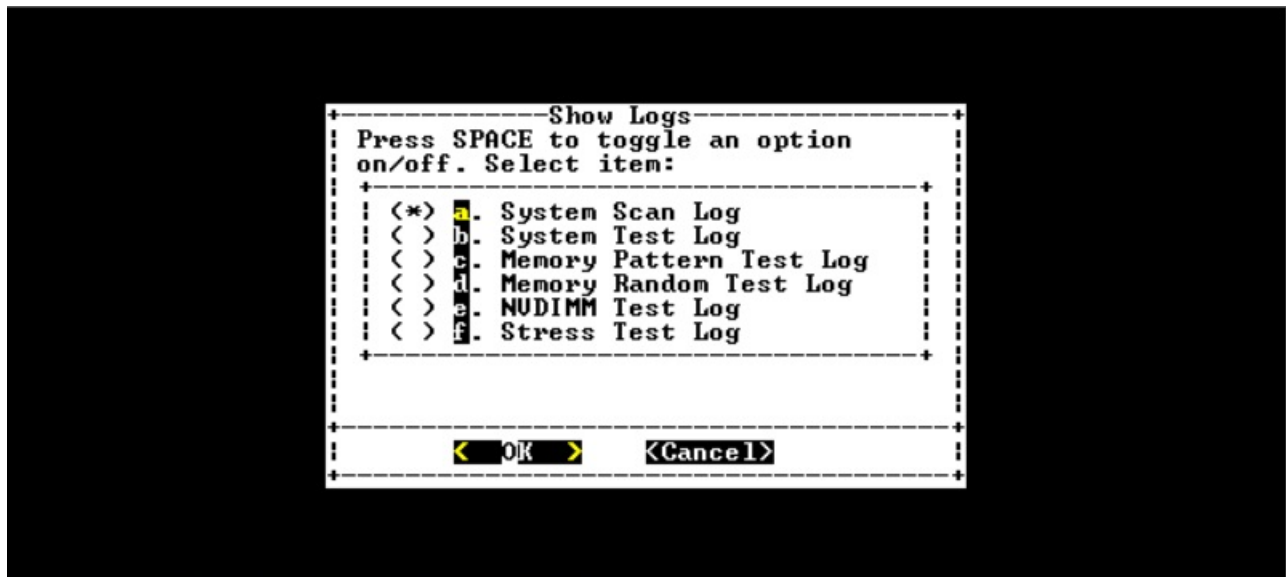
To execute the "Show logs" operation, type "8" and then press "Enter" to go to the "Show Logs" page.


```

Copyright (c) 2019 NetApp Inc. All rights reserved.
FAS8300 System-Level HW Diagnostics 04.03.03
#### System      PN: 111-04200      ####
#### System      SN: 041939003424  ####
#### Controller-B PN: 111-04198    ####
#### Controller-B SN: 041938001831  ####
1) Scan System
2) Test System (must scan system, first)
3) Test Memory (must scan system, first)
4) Stress-Test System (must scan system, first)
5) Show UPD Information
6) Show FW Revision
7) Show MAC Address
8) Show Logs
9) Reboot (BMC Power Cycle) Controller to LOADER
Select a number 1-9 to execute the respective command: 

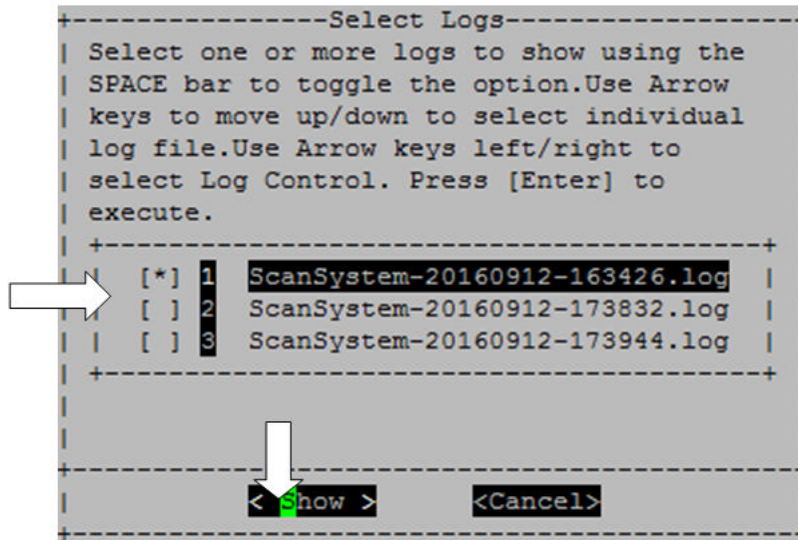
```

Show Logs Selection



- Use the "up" and "down" arrow keys to select the log types to display.
- Use the "space" bar to toggle an option on or off.
- Use the left and right arrow keys to select "Show" or "Cancel".
- Press "Enter" to execute your choice.

The "Select Logs" page is displayed:



The system saves the latest ten logs and conveniently includes the timestamp in the log name.

- Use the "up" and "down" arrow keys to select the logs to display.
- Use the "space" bar to toggle an option on or off.
- Use the left and right arrow keys to select "Show" or "Cancel".
- Press "Enter" to execute your choice.

The logs are displayed, shown as below.

```

=====
CPU:
Processor  T/C  Vendor      Model  Family Core  Frequency  Stepping  Cache
Temperature
Processor0  1    GenuineIntel  79     6     18    2.30GHz   1         46080 K
B 39
Processor1  1    GenuineIntel  79     6     18    2.30GHz   1         46080 K
B 39
=====
Memory:
DIMM      Size   Speed   Rank  Manufacturer  PN                               SN
dimm1    32 GB  2133 MHz  2     Samsung       SHB724G4LML23P2-SB            3213D720
dimm2    32 GB  2133 MHz  2     Samsung       SHB724G4LML23P2-SB            3213C819
dimm3    32 GB  2133 MHz  2     Samsung       SHB724G4LML23P2-SB            3213D19E
dimm4    32 GB  2133 MHz  2     Samsung       SHB724G4LML23P2-SB            3213D47D
dimm5    32 GB  2133 MHz  2     Samsung       SHB724G4LML23P2-SB            3213D13C
dimm6    32 GB  2133 MHz  2     Samsung       SHB724G4LML23P2-SB            3213CAC5
dimm7    32 GB  2133 MHz  2     Samsung       SHB724G4LML23P2-SB            3213D19F
dimm8    32 GB  2133 MHz  2     Samsung       SHB724G4LML23P2-SB            3213CB3F
dimm9    32 GB  2133 MHz  2     Samsung       SHB724G4LML23P2-SB            3213CB1A
dimm10   32 GB  2133 MHz  2     Samsung       SHB724G4LML23P2-SB            3213CD73
dimm11   32 GB  2133 MHz  2     Samsung       SHB724G4LML23P2-SB            3213C84B
dimm12   32 GB  2133 MHz  2     Samsung       SHB724G4LML23P2-SB            32149EEA
/boot/EFI/lemur/ScanSystem-20160923-094234.log

```

Use the following keys to control the displayed log output:

- PgUp/PgDn – Scroll up or down page by page
- Up/Down Arrow keys – Scroll up or down line by line

- Home – Return to the beginning of the page
- End – Go to the end of the page
- / (slash) – Keyword search (enter text and press "Enter")
- Q – Return to the main menu

Reboot (BMC power cycle) controller to LOADER

To exit system-level diagnostics and return to the LOADER prompt, type "8" and then press "Enter".

```
Copyright (c) 2019 NetApp Inc. All rights reserved.
FAS8300 System-Level HW Diagnostics 04.03.03
#### System          PN: 111-04200          ####
#### System          SN: 041939003424     ####
#### Controller-B    PN: 111-04198          ####
#### Controller-B    SN: 041938001831     ####
1) Scan System
2) Test System <must scan system, first>
3) Test Memory <must scan system, first>
4) Stress-Test System <must scan system, first>
5) Show UPD Information
6) Show FW Revision
7) Show MAC Address
8) Show Logs
9) Reboot <BMC Power Cycle> Controller to LOADER
Select a number 1-9 to execute the respective command: 
```

Appendix A. Getting help and technical assistance

If you need help, service, or technical assistance or just want more information about Lenovo products, you will find a wide variety of sources available from Lenovo to assist you.

On the World Wide Web, up-to-date information about Lenovo systems, optional devices, services, and support are available at:

<http://datacentersupport.lenovo.com>

Note: This section includes references to IBM Web sites and information about obtaining service. IBM is Lenovo's preferred service provider for ThinkSystem.

Before you call

Before you call, there are several steps that you can take to try and solve the problem yourself. If you decide that you do need to call for assistance, gather the information that will be needed by the service technician to more quickly resolve your problem.

Attempt to resolve the problem yourself

You can solve many problems without outside assistance by following the troubleshooting procedures that Lenovo provides in the online help or in the Lenovo product documentation. The Lenovo product documentation also describes the diagnostic tests that you can perform. The documentation for most systems, operating systems, and programs contains troubleshooting procedures and explanations of error messages and error codes. If you suspect a software problem, see the documentation for the operating system or program.

You can find the product documentation for your ThinkSystem products at the following location:

<http://thinksystem.lenovofiles.com/help/index.jsp>

You can take these steps to try to solve the problem yourself:

- Check all cables to make sure that they are connected.
- Check the power switches to make sure that the system and any optional devices are turned on.
- Check for updated software, firmware, and operating-system device drivers for your Lenovo product. The Lenovo Warranty terms and conditions state that you, the owner of the Lenovo product, are responsible for maintaining and updating all software and firmware for the product (unless it is covered by an additional maintenance contract). Your service technician will request that you upgrade your software and firmware if the problem has a documented solution within a software upgrade.
- If you have installed new hardware or software in your environment, check <https://serverproven.lenovo.com/> and <https://datacentersupport.lenovo.com/us/en/lsc> to make sure that the hardware and software are supported by your product.
- Go to <http://datacentersupport.lenovo.com> and check for information to help you solve the problem.
 - Check the Lenovo forums at https://forums.lenovo.com/t5/Datacenter-Systems/ct-p/sv_eg to see if someone else has encountered a similar problem.

You can solve many problems without outside assistance by following the troubleshooting procedures that Lenovo provides in the online help or in the Lenovo product documentation. The Lenovo product documentation also describes the diagnostic tests that you can perform. The documentation for most systems, operating systems, and programs contains troubleshooting procedures and explanations of error

messages and error codes. If you suspect a software problem, see the documentation for the operating system or program.

Gathering information needed to call Support

If you believe that you require warranty service for your Lenovo product, the service technicians will be able to assist you more efficiently if you prepare before you call. You can also see <http://datacentersupport.lenovo.com/warrantylookup> for more information about your product warranty.


Gather the following information to provide to the service technician. This data will help the service technician quickly provide a solution to your problem and ensure that you receive the level of service for which you might have contracted.

- Hardware and Software Maintenance agreement contract numbers, if applicable
- Machine type number (Lenovo 4-digit machine identifier)
- Model number
- Serial number
- Current system UEFI and firmware levels
- Other pertinent information such as error messages and logs

As an alternative to calling Lenovo Support, you can go to [the Service requests and PMRs website](#) to submit an Electronic Service Request. Submitting an Electronic Service Request will start the process of determining a solution to your problem by making the pertinent information available to the service technicians. The Lenovo service technicians can start working on your solution as soon as you have completed and submitted an Electronic Service Request.

Collecting service data

To clearly identify the root cause of a system issue or at the request of Lenovo Support, you might need collect service data that can be used for further analysis. Service data includes information such as event logs and hardware inventory. Service data is collected automatically in the background. If the AutoSupport function is enabled on ONTAP, service data is automatically transmitted. To enable the AutoSupport function, do the following:

- Step 1. Input the user name and password to enter the ONTAP main interface.
- Step 2. Click **Cluster** → **Settings** from the left navigation pane.
- Step 3. In the **AutoSupport** card, click the more icon  .
- Step 4. Select **Enable**.
- Step 5. To configure how the AutoSupport data is sent, select **More options**.
Note: The available transport protocols are HTTP, HTTPS, and SMTP.
- Step 6. If necessary, configure the proxy.
- Step 7. Configure the mail-host and e-mail recipient that will receive the data.

Contacting Support

You can contact Support to obtain help for your issue.

You can receive hardware service through a Lenovo Authorized Service Provider. To locate a service provider authorized by Lenovo to provide warranty service, go to <https://datacentersupport.lenovo.com/>

[serviceprovider](#) and use filter searching for different countries. For Lenovo support telephone numbers, see <https://datacentersupport.lenovo.com/supportphonenumberlist> for your region support details.

Appendix B. Notice of Privacy Practices

Lenovo recognizes that privacy is of great importance to individuals everywhere – our customers, website visitors, product users...everyone. This is why the responsible use and protection of personal and other information under our care is a core Lenovo value.

Our full privacy statement is available at the link below. If you have any further questions or concerns, please feel free to reach us at privacy@lenovo.com.

<https://www.lenovo.com/us/en/privacy/>

To view this privacy statement in other languages, visit the sites below:

- Chinese: <https://www.lenovo.com.cn/public/privacy.html>
- English (UK): <https://www3.lenovo.com/gb/en/privacy/>
- English (Canada): <https://www3.lenovo.com/ca/en/privacy/>
- French (Canada): <https://canada.lenovo.com/fr/ca/en/privacy/>
- German: <https://www.lenovo.com/de/de/privacy/>
- French: <https://www.lenovo.com/fr/fr/privacy/>
- Swedish: <https://www.lenovo.com/se/sv/privacy/>
- Danish: <https://www.lenovo.com/dk/da/privacy/>
- Spanish: <https://www.lenovo.com/es/es/privacy/>
- Japanese: <http://www.lenovo.com/privacy/jp/ja/>
- Brazilian Portuguese: <https://www.lenovo.com/br/pt/privacy/>
- Italian: <https://www.lenovo.com/it/it/privacy/>
- Hungarian: <https://www.lenovo.com/hu/hu/privacy/>
- Russian: <https://www.lenovo.com/ru/ru/privacy/>
- Korean: <https://www.lenovo.com/kr/ko/privacy/>
- Polish: <https://www.lenovo.com/pl/pl/privacy/>

Our service provider NetApp will also collect certain information when you use this device. More information about NetApp's privacy practices is available at the link below:

<https://www.netapp.com/us/legal/privacypolicy/index.aspx>.

To view NetApp's privacy policy in other languages, visit the sites below:

- German: <https://www.netapp.com/de/legal/privacypolicy/index.aspx>
- Japanese: <https://www.netapp.com/jp/legal/privacypolicy/index.aspx>
- French: <https://www.netapp.com/fr/legal/privacypolicy/index.aspx>
- Spanish: <https://www.netapp.com/es/legal/privacypolicy/index.aspx>

Appendix C. Notices

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Morrisville, NC 27560
U.S.A.
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Any references in this publication to non-Lenovo Web sites are provided for convenience only and do not in any manner serve as an endorsement of those Web sites. The materials at those Web sites are not part of the materials for this Lenovo product, and use of those Web sites is at your own risk.

Any performance data contained herein was determined in a controlled environment. Therefore, the result obtained in other operating environments may vary significantly. Some measurements may have been made on development-level systems and there is no guarantee that these measurements will be the same on generally available systems. Furthermore, some measurements may have been estimated through extrapolation. Actual results may vary. Users of this document should verify the applicable data for their specific environment.

Trademarks

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Important notes

Processor speed indicates the internal clock speed of the microprocessor; other factors also affect application performance.

CD or DVD drive speed is the variable read rate. Actual speeds vary and are often less than the possible maximum.

When referring to processor storage, real and virtual storage, or channel volume, KB stands for 1 024 bytes, MB stands for 1 048 576 bytes, and GB stands for 1 073 741 824 bytes.

When referring to hard disk drive capacity or communications volume, MB stands for 1 000 000 bytes, and GB stands for 1 000 000 000 bytes. Total user-accessible capacity can vary depending on operating environments.

Maximum internal hard disk drive capacities assume the replacement of any standard hard disk drives and population of all hard-disk-drive bays with the largest currently supported drives that are available from Lenovo.

Maximum memory might require replacement of the standard memory with an optional memory module.

Each solid-state memory cell has an intrinsic, finite number of write cycles that the cell can incur. Therefore, a solid-state device has a maximum number of write cycles that it can be subjected to, expressed as total bytes written (TBW). A device that has exceeded this limit might fail to respond to system-generated commands or might be incapable of being written to. Lenovo is not responsible for replacement of a device that has exceeded its maximum guaranteed number of program/erase cycles, as documented in the Official Published Specifications for the device.

Lenovo makes no representations or warranties with respect to non-Lenovo products. Support (if any) for the non-Lenovo products is provided by the third party, not Lenovo.

Some software might differ from its retail version (if available) and might not include user manuals or all program functionality.

Particulate contamination

Attention: Airborne particulates (including metal flakes or particles) and reactive gases acting alone or in combination with other environmental factors such as humidity or temperature might pose a risk to the device that is described in this document.

Risks that are posed by the presence of excessive particulate levels or concentrations of harmful gases include damage that might cause the device to malfunction or cease functioning altogether. This specification sets forth limits for particulates and gases that are intended to avoid such damage. The limits must not be viewed or used as definitive limits, because numerous other factors, such as temperature or moisture content of the air, can influence the impact of particulates or environmental corrosives and gaseous contaminant transfer. In the absence of specific limits that are set forth in this document, you must implement practices that maintain particulate and gas levels that are consistent with the protection of human health and safety. If Lenovo determines that the levels of particulates or gases in your environment have caused damage to the device, Lenovo may condition provision of repair or replacement of devices or parts

on implementation of appropriate remedial measures to mitigate such environmental contamination. Implementation of such remedial measures is a customer responsibility.

Table 5. Limits for particulates and gases

Limits for particulates and gases

Contaminant	Limits
Particulate	<ul style="list-style-type: none"> • The room air must be continuously filtered with 40% atmospheric dust spot efficiency (MERV 9) according to ASHRAE Standard 52.2¹. • Air that enters a data center must be filtered to 99.97% efficiency or greater, using high-efficiency particulate air (HEPA) filters that meet MIL-STD-282. • The deliquescent relative humidity of the particulate contamination must be more than 60%². • The room must be free of conductive contamination such as zinc whiskers.
Gaseous	<ul style="list-style-type: none"> • Copper: Class G1 as per ANSI/ISA 71.04-1985³ • Silver: Corrosion rate of less than 300 Å in 30 days
<p>¹ ASHRAE 52.2-2008 - <i>Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size</i>. Atlanta: American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.</p> <p>² The deliquescent relative humidity of particulate contamination is the relative humidity at which the dust absorbs enough water to become wet and promote ionic conduction.</p> <p>³ ANSI/ISA-71.04-1985. <i>Environmental conditions for process measurement and control systems: Airborne contaminants</i>. Instrument Society of America, Research Triangle Park, North Carolina, U.S.A.</p>	

ASHRAE class compliance information

Your system complies with ASHRAE class A2 specifications. System performance may be impacted when operating temperature is outside ASHRAE A2 specification.

- Air temperature:
 - Operating:
 - ASHRAE class A2: 10–35°C (50–95°F); when the altitude exceeds 900 m (2953 ft), the maximum ambient temperature value decreases by 1°C (1.8°F) with every 300 m (984 ft) of altitude increase.
 - ASHRAE class A3: 5–40°C (41–104°F); when the altitude exceeds 900 m (2953 ft), the maximum ambient temperature value decreases by 1°C (1.8°F) with every 175 m (574 ft) of altitude increase.
 - ASHRAE class A4: 5–45°C (41–113°F); when the altitude exceeds 900 m (2953 ft), the maximum ambient temperature value decreases by 1°C (1.8°F) with every 125 m (410 ft) of altitude increase.
 - System off: 5–45°C (41–113°F)
 - Shipping or storage: -40–60°C (-40–140°F)
- Maximum altitude: 3050 m (10 000 ft)
- Relative humidity (non-condensing):
 - Operating:
 - ASHRAE class A2: 8%–80%; maximum dew point: 21°C (70°F)
 - ASHRAE class A3: 8%–85%; maximum dew point: 24°C (75°F)
 - ASHRAE class A4: 8%–90%; maximum dew point: 24°C (75°F)
 - Shipping or storage: 8%–90%

Depending on the hardware configuration, some system models comply with ASHRAE class A3 and class A4 specifications.

Telecommunication regulatory statement

This product may not be certified in your country for connection by any means whatsoever to interfaces of public telecommunications networks. Further certification may be required by law prior to making any such connection. Contact a Lenovo representative or reseller for any questions.

Electronic emission notices

When you attach a monitor to the equipment, you must use the designated monitor cable and any interference suppression devices that are supplied with the monitor.

Additional electronic emissions notices are available at:

<http://thinksystem.lenovofiles.com/help/index.jsp>

Taiwan region BSMI RoHS declaration

單元 Unit	限用物質及其化學符號 Restricted substances and its chemical symbols					
	鉛Lead (Pb)	汞Mercury (Hg)	鎘Cadmium (Cd)	六價鉻 Hexavalent chromium (Cr ⁺⁶)	多溴聯苯 Polybrominated biphenyls (PBB)	多溴二苯醚 Polybrominated diphenyl ethers (PBDE)
機架	○	○	○	○	○	○
外部蓋板	○	○	○	○	○	○
機械組件	-	○	○	○	○	○
空氣傳動設備	-	○	○	○	○	○
冷卻組件	-	○	○	○	○	○
內存模組	-	○	○	○	○	○
處理器模組	-	○	○	○	○	○
電纜組件	-	○	○	○	○	○
電源供應器	-	○	○	○	○	○
儲備設備	-	○	○	○	○	○
電路卡	-	○	○	○	○	○
光碟機	-	○	○	○	○	○
雷射器	-	○	○	○	○	○

備考1. “超出0.1 wt %”及“超出0.01 wt %”係指限用物質之百分比含量超出百分比含量基準值。
 Note1: “exceeding 0.1wt%” and “exceeding 0.01 wt%” indicate that the percentage content of the restricted substance exceeds the reference percentage value of presence condition.

備考2. “○”係指該項限用物質之百分比含量未超出百分比含量基準值。
 Note2: “○” indicates that the percentage content of the restricted substance does not exceed the percentage of reference value of presence.

備考3. “-”係指該項限用物質為排除項目。
 Note3: The “-” indicates that the restricted substance corresponds to the exemption.

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Taiwan Region import and export contact information

Contacts are available for Taiwan Region import and export information.

委製商/進口商名稱: 台灣聯想環球科技股份有限公司
 進口商地址: 台北市南港區三重路 66 號 8 樓
 進口商電話: 0800-000-702

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