ES1686dc

User Guide

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1. Preface

About This Guide

This guide provides information on the QNAP ES1686dc NAS and step-by-step instructions on installing the hardware. It also provides instructions on basic operations and troubleshooting information.

Audience

This document is intended for storage administrators. This guide assumes that the user is knowledgeable and qualified to install, maintain, and troubleshoot issues involving servers, server components, and storage systems. This guide also assumes that the user is trained to recognize hazards, including the appropriate actions the user needs to take to prevent personal injury and damage to data and property.

Document Conventions

Symbol	Description
	Notes provide default configuration settings and other supplementary information.
	Important notes provide information on required configuration settings and other critical information.
	Tips provide recommendations or alternative methods of performing tasks or configuring settings.
	Warnings provide information that, when ignored, may result in potential loss, injury, or even death.

2. Product Overview

This chapter provides basic information about the QNAP ES1686dc NAS.

About the ES1686dc

The ES1686dc is designed to deliver a scalable platform for enterprise-level solutions. It is equipped with a powerful multi-core processor, AES-NI hardware encryption engine, and both USB 3.0 and 10GbE ports, allowing it to deliver optimal performance for enterprise users. The ES1686dc supports up to 16 storage drives. This number can be increased by attaching multiple expansion units. It has M.2 drive support and redundant storage controllers and power supplies to provide the necessary reliability, serviceability, and read/write speeds.

Hardware Specifications

> ⚠ **Warning**
> If your QNAP product has hardware defects, return the product to QNAP or a QNAP-authorized service center for maintenance or replacement. Any attempt to repair or perform maintenance procedures on the product by you or an unauthorized third-party invalidates the warranty.
> QNAP is not responsible for any damage or data loss caused by unauthorized modifications and installation of unsupported third-party applications.
> For details, see the QNAP Warranty Terms and Conditions.

Ordering P/N	CPU	Memory	Power supply
ES1686dc-2123IT-64G	Intel® Xeon™ D-2123IT	64 GB (32 GB per controller)	Redundant
ES1686dc-2145NT-96G	Intel® Xeon™ D-2145NT	96 GB (48 GB per controller)	Redundant
ES1686dc-2145NT-128G	Intel® Xeon™ D-2145NT	128 GB (64 GB per controller)	Redundant

Component	ES1686dc-2123IT-64G	ES1686dc-2145NT-96G ES1686dc-2145NT-128G
Processor		
CPU	Intel® Xeon™ D-2123IT	Intel® Xeon™ D-2145NT
Frequency	4-core/8-thread 2.2 GHz base/3.0 GHz turbo	8-core/16-thread 1.9 GHz base/3.0 GHz turbo
Architecture	x86 64-bit	
Encryption engine	AES-256	
Memory		

Component	ES1686dc-2123IT-64G	ES1686dc-2145NT-96G ES1686dc-2145NT-128G
Memory slots	8 x DDR4 RDIMM or LRDIMM slots per controller	
	⊙ Important Use only QNAP memory modules to maintain system performance and stability. For NAS devices with more than one memory slot, use QNAP modules with identical specifications. Using unsupported modules may degrade performance, cause errors, or prevent the operating system from starting. You can only use one type of dual in-line memory module (DIMM) at a time. Do not use registered DIMM (RDIMM) with load-reduction DIMM (LRDIMM) memory.	
Maximum memory	512 GB RAM: 8 x 64 GB	
Flash memory	4 GB (dual boot OS protection)	
Cache for Copy-to-Flash	64 GB per controller	
Storage		
Drive bays	16 x 3.5-inch SAS 12 Gbps **📄 Note** The interface is backward compatible to SAS 6 Gbps.	
Drive compatibility	• 3.5-inch SATA hard disk drives • 3.5-inch SAS hard disk drives • 2.5-inch SATA hard disk drives • 2.5-inch SATA solid-state drives • 2.5-inch SAS hard disk drives • 2.5-inch SAS solid-state drives **💡 Tip** For the list of compatible drive models, go to https://www.qnap.com/compatibility.	
M.2 SSD slots	2 x M.2 SSD slots per controller **📄 Note** These slots support SATA 6 Gbps and PCIe Gen 3 x4 NVMe SSDs.	
M.2 SSD form factor	2280	
SSD cache acceleration support	• 3.5-inch drive bays 1 to 16 • M.2 SSD slots 1 to 2 • Optional: M.2 SSD slots on an M.2 SSD expansion card	
Network		
10 Gigabit Ethernet ports	4 x 10GbE SFP+ ports per controller	

Component	ES1686dc-2123IT-64G	ES1686dc-2145NT-96G ES1686dc-2145NT-128G
Gigabit Ethernet ports	3 x GbE RJ45 ports per controller	
External I/O Ports & Expansion Slots		
PCIe slots	2 x PCIe 3.0 x8 slots per controller **Tip** For the list of compatible expansion cards, go to https://www.qnap.com/compatibility.	
USB ports	2 x USB 3.0 Type-A ports per controller	
Interface		
Buttons	NAS • Power Storage Controllers • Power • Reset	
Dimensions		
Form factor	3U Rackmount	
Dimensions (H x W x D)	132 x 483.05 x 630.62 mm (5.20 x 19.02 x 24.83 in)	
Net weight	25.83 kg (56.95 lbs)	
Others		
Rail compatibility	RAIL-E02 **Note** Information on rail kit installation can be found in the installation guide included in the rail kit package.	
Power supply unit	2 x 770W, 90-264V AC, 50/60 Hz	
System battery	CR2032 lithium battery (3V, 225 mAh) **Warning** To avoid potential battery explosion, causing injury or damage to components, ensure that you replace the existing battery with a battery of the same type. **Important** Dispose of used batteries according to local regulations or the instructions of the battery manufacturer.	
Hot-swappable battery backup unit	2 x 10.8V, 2200 mAh	
Sound level	55.8 db(A) **Note** The sound level was tested at a bystander position, which is within one meter of the NAS. The test NAS operated at low speed with the maximum number of drives installed.	

Component	ES1686dc-2123IT-64G	ES1686dc-2145NT-96G ES1686dc-2145NT-128G
Hot-swappable fan module	System: 60 x 60 x 38 mm, 12V DC ⚠ **Warning** To avoid potential injury or damage to components, do not touch the fans while the NAS is connected to a power source. To ensure proper cooling, replacement of the fan should be completed within 10 seconds.	
Operating temperature	0˚C to 40˚C (32˚F to 104˚F)	
Relative humidity	• Non-condensing relative humidity: 5% to 95% • Wet-bulb temperature: 27˚C (80.6˚F)	

💡 **Tip**
Model specifications are subject to change without prior notice. To see the latest specifications, go to https://www.qnap.com.

Package Contents

Item	Quantity
ES1686dc NAS	1
Power cord	2
Ethernet cable	6
Screws for 2.5-inch drives	64
Screws for 3.5-inch drives	64
Screws for M.2 SSDs	4
RAIL-E02 rail kit	1
Quick Installation Guide (QIG)	1

Components

Front Panel
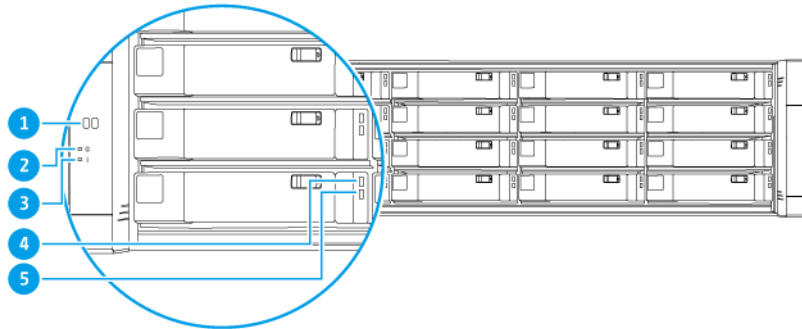
No.	Component	No.	Component
1	OLED display	4	Drive status LED
2	System power LED	5	Drive activity LED
3	Status LED	-	-

Front Panel Buttons
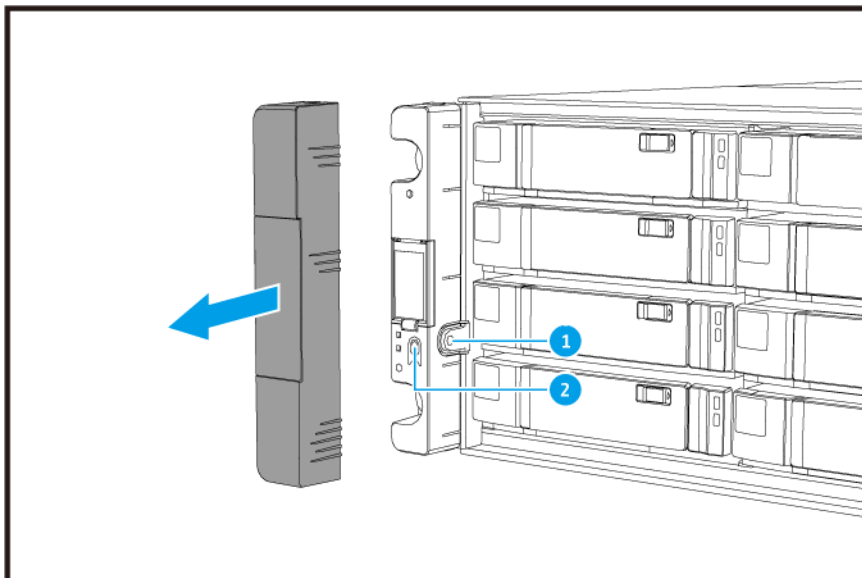
> **Note**
> Pull the panel cover to access the front panel buttons.

No.	Component	No.	Component
1	OLED button	2	Power button

Operation	User Action	Result
Power on NAS	Press the power button.	• Both storage controllers power on. • All storage and management services are disabled. **Tip** • System startup takes 10 to 15 minutes, depending on the number of installed drives and connected devices. Check the rear panel LEDs to determine the startup status. For details, see Rear Panel LEDs. • This button can only be used to power on the two storage controllers. Use the respective rear panel storage controller power button to power off the storage controllers. For details, see Storage Controller Power Button.
Power on OLED display	Press the OLED button.	The OLED display powers on.
Power off OLED display	Press the OLED button.	The OLED display powers off.

Front Panel LEDs

The front panel LEDs indicate system status and related information when the NAS is powered on. The following LED information applies only when the drive is correctly installed and when the NAS is connected to the network.

For details on the location of the LEDs, see Front Panel.

LED	Status	Description
System power	Blue	System powered on

LED	Status	Description
System status	Green	System operating normally
	Red	• System errors or warnings (e.g. degraded RAID mode, memory failure, fan/power supply failure, system/disk temperature too high, storage pool reaching threshold value) were detected. Refer to the QES User Guide for details. • The system is performing takeover. The dual active-active controller system enables a single controller to take over the pool disk resources owned by the other controller in the event of a controller failure. Takeovers can be initiated manually or be set up with the automatic system failover protection. For more information, refer to the QES user guide. • Power supply unit unplugged
Drive status	Green	Drive can be accessed
	Flashing green slowly	The QES Storage Manager Locate command is enabled and is identifying the drive
	Red	Drive read/write error
	Off	Drive not installed
Drive activity	Flashing green continuously or slowly	No drive activity
	Flashing green	High activity on drive or drive being configured as part of an array

Front Panel OLED Display

The OLED display displays the status of the storage controllers and main components.

For details on the location of the OLED display, see Front Panel.

Icon name	Icon	Description
Controller power status		• On: Both controllers are powered on • Flashing: Both controllers are booting
		• On: Only controller A is powered on • Flashing: Controller A is booting
		• On: Only controller B is powered on • Flashing: Controller B is booting

Icon name	Icon	Description
Controller fan status		• On: The fan modules of both controllers are operating normally • Flashing: The fan modules of both controllers are operating incorrectly or are not installed
		If both controllers are installed: • Flashing: The fan module in controller A is operating incorrectly or is not installed If only controller A is installed: • On: The fan module in controller A is operating normally • Flashing: The fan module in controller A is operating incorrectly or is not installed
		If both controllers are installed: • Flashing: The fan module in controller B is operating incorrectly or is not installed If only controller B is installed: • On: The fan module in controller B is operating normally • Flashing: The fan module in controller B is operating incorrectly or is not installed

Icon name	Icon	Description
Controller battery backup unit		• On: The BBUs of both controllers are operating normally • Flashing: The BBUs of both controllers are operating incorrectly • Highlighted: The BBUs of both controllers are charging • Off: The BBUs of both controllers are not detected
		If both controllers are powered on: • Flashing: The BBU in controller A is operating incorrectly or is not detected • Highlighted: The BBU in controller A is charging If only controller A is powered on: • On: The BBU in controller A is operating normally • Flashing: The BBU in controller A is operating incorrectly or is not detected • Highlighted: The BBU in controller A is charging
		If both controllers are powered on: • Flashing: The BBU in controller B is operating incorrectly or is not detected • Highlighted: The BBU in controller B is charging If only controller B powered on: • On: The BBU in controller B is operating normally • Flashing: The BBU in controller B is operating incorrectly or is not detected • Highlighted: The BBU in controller B is charging
High availability status		• On: In active state • Flashing: Performing takeover or undergoing giveback
		Highlighted: Controller A is in takeover state
		Highlighted: Controller B is in takeover state

Icon name	Icon	Description
Two-digit display	05	The two-digit display shows the booting status of each storage controller. The left digit is controller A, and right is controller B. • `No Display`: BIOS booting • `1`: Detecting device • `2`: Applying network settings • `3`: Applying system settings • `4`: Service starting • `5`: System self-testing • `8`: System initializing • `0`: System ready

Tip
To view the full list of system components and their status, open **High Availability** in QES.

Rear Panel
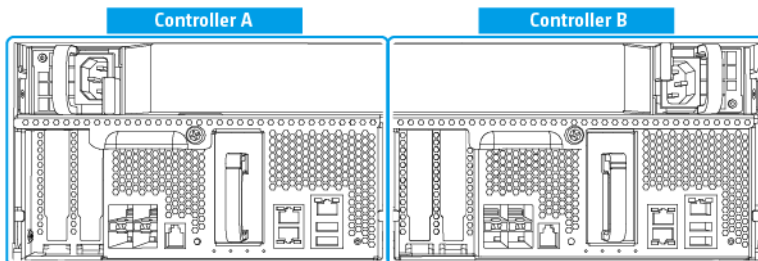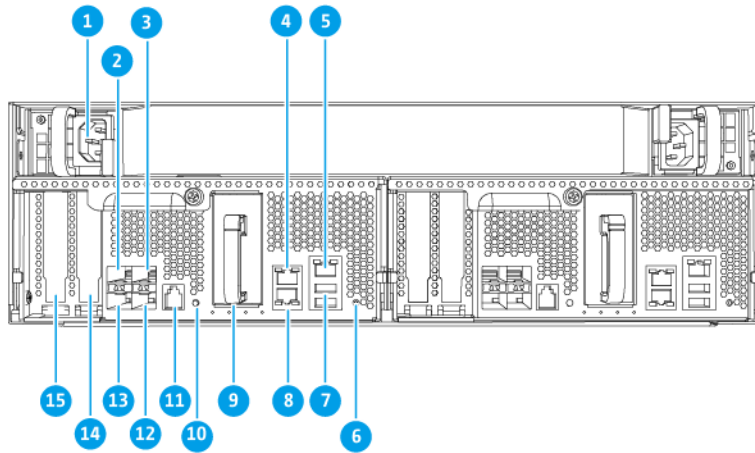
No.	Component	No.	Component
1	Power supply unit	9	Battery backup unit
2	Ethernet port 6 (10GbE SFP+)	10	Power button
3	Ethernet port 4 (10GbE SFP+)	11	Service port
4	Ethernet port 2 (GbE RJ45)	12	Ethernet port 5 (10GbE SFP+)
5	Ethernet port 1 (GbE RJ45, management port)	13	Ethernet port 7 (10GbE SFP+)
6	Reset button	14	PCIe 3.0 x8 slot 1
7	USB 3.0 Type-A ports	15	PCIe 3.0 x8 slot 2
8	Ethernet port 3 (GbE RJ45)	-	-

Rear Panel LEDs
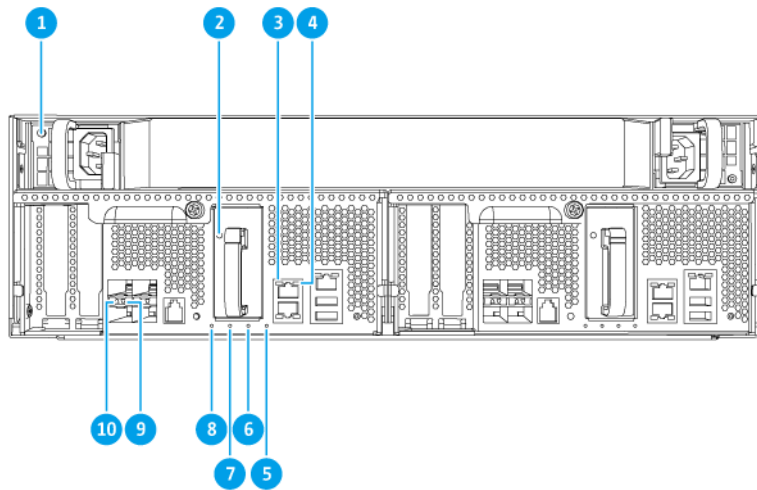
No.	Component	No.	Component
1	Power supply LED	6	Battery backup unit status LED
2	Battery backup unit LED	7	Fan status LED
3	Gigabit Ethernet LED (port speed)	8	Status LED
4	Gigabit Ethernet LED (port activity)	9	10 Gigabit Ethernet LED (port activity)
5	High availability LED	10	10 Gigabit Ethernet LED (port speed)

The following LED information applies only when the drive is correctly installed and when the NAS is connected to the network.

LED	Status	Description
Power supply unit	Green	• Powered on • Power supply functioning normally
	Flashing green	System powering off
	Orange	AC power cord unplugged or malfunctioning
	Off	One or more of the following conditions exist: • AC power unavailable • Power supply failed
Battery backup unit	Green	Functioning normally
	Red	Malfunctioning
	Orange	Charging or learning
	Off	Not correctly attached to the ES1686dc
Status	Green	System operating normally
	Flashing green	System booting
	Off	System powered off

LED	Status	Description
Fan	Green	Functioning normally
	Orange	Malfunctioning
	Off	Fans not detected
Battery backup unit status	Green	Functioning normally
	Orange	Writing buffer for Copy-to-Flash For details, see Battery Backup Unit.
	Off	One or more of the following conditions exist: • Storage controller is powered off • System cannot detect battery backup unit
High availability	Green	Active State
	Flashing orange	One of the following: • Performing takeover: The dual active-active controller system enables a controller to take over the pool disk resources and access the data upon the failure of the other controller. Takeovers can be initiated manually or be set up with the automatic system failover protection. For more details, refer to the QES user guide. • Undergoing giveback: One of the storage controllers has taken over the system. The other storage controller has resumed operations and is ready to resume data service. Giveback can be initiated manually or be set up with automatic failback after system recovers. For more details, refer to the QES user guide.
	Orange	Storage controller has taken over from the other storage controller
	Off	One or more of the following conditions exist: • Storage controller failed • Storage controller is powered off
10 Gigabit Ethernet port speed	Green	10GbE connection
	Orange	1GbE connection
	Off	100 Mbps connection
10 Gigabit Ethernet port activity	Green	Network link active
	Flashing green	Network link active
	Off	No network link
1 Gigabit Ethernet port activity	Green	Network link established
	Flashing green	Network link active
	Off	No network link
1 Gigabit Ethernet port speed	Green	1GbE connection
	Orange	100 Mbps connection

Storage Controller Power Button

Operation	User Action	Result
Power on	Press the button once.	The storage controller powers on.
Power off	Press and hold the button for 5 seconds.	The storage controller powers off.
Force power off	Press and hold the button for 10 seconds.	The storage controller shuts down. ⚠️ **Warning** Use this method only when the storage controller is unresponsive. This action may result in data loss.

Reset Button

Operation	User Action	Result

Basic system reset	Press and hold the button for 3 seconds.	The following settings are set to default values.
		
		• System administrator password: admin
		
		• TCP/IP configuration:
		
		  • IP address settings: Automatically obtained via DHCP
		
		  • Jumbo frames: Disabled
		
		  • Port trunking mode: Failover (multi-LAN models only)
		
		• Security level: Low (Allow all connections)
		
		• LCD panel password: (blank)
		
		• VLAN: Disabled
		
		• Service binding: NAS services can run on any available network interface

Advanced system reset	Press and hold the button for 10 seconds.	The device performs a basic system reset. All default system settings are also restored, deleting all previously created users, user groups, and shared folders. The user data stored on the disks is retained. To retrieve data after an advanced system reset, recreate the previous folder structure on the NAS.

Battery Backup Unit

The battery backup unit (BBU) protects the data integrity of each storage controller. If both power supply units fail during a power outage, the system uses the BBUs for power and activates the asynchronous DRAM refresh (ADR) feature of the processors. While the BBUs supply power, cached data stored in the DRAM are written to the M.2 SSDs. This process is called Copy-to-Flash. Once power is restored and the system restarts, any logs, archives, or other important data are reconstructed from the data stored on the M. 2 SSDs.

> **⚠ Warning**
> During a power outage, do not remove storage controllers while their BBU status LEDs are orange. Removing a storage controller during this period interrupts the Copy-to-Flash process and may result in data loss.

System Board
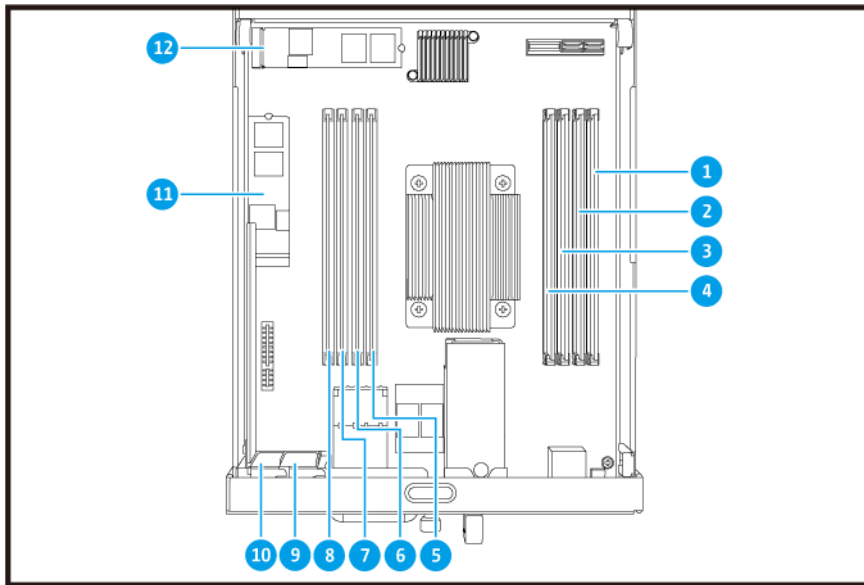
No.	Component	No.	Component
1	Memory slot 1	7	Memory slot 7
2	Memory slot 2	8	Memory slot 8
3	Memory slot 3	9	PCIe 3.0 slot 1 (x8)
4	Memory slot 4	10	PCIe 3.0 slot 2 (x8)
5	Memory slot 5	11	M.2 SSD slot 2
6	Memory slot 6	12	M.2 SSD slot 1

Drive Numbering
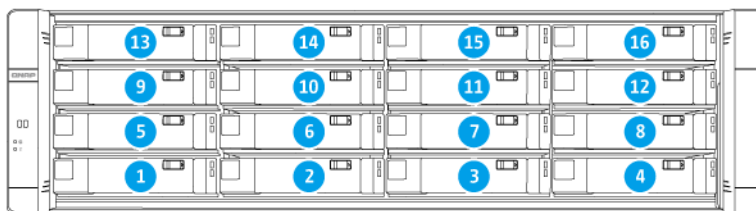
M.2 Drive Numbering
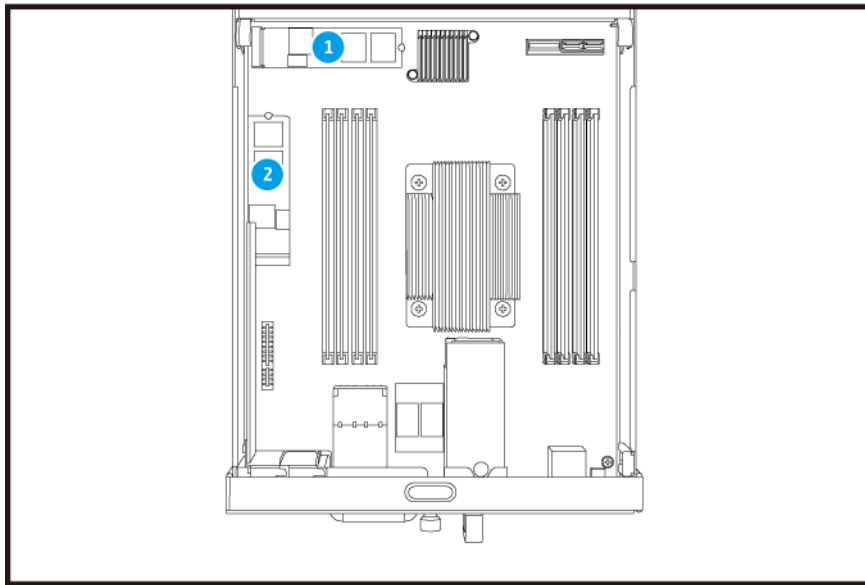
Installation Requirements

Category	Item

Environment	• Room temperature: 0˚C to 40˚C (32˚F to 104˚F)
	
	• Non-condensing relative humidity: 5% to 95%
	
	• Wet-bulb temperature: 27˚C (80.6˚F)
	
	• Flat, anti-static surface without exposure to direct sunlight, liquids, or chemicals
	
	• Free from objects that may obstruct NAS ventilation or apply pressure to the NAS or power cord
	
	• Restricted access
	
	    • The NAS should be stored in a secure location with restricted access, controlled through the use of a tool, lock and key, or any means of security.
	
	    • Only qualified, trained, and authorized NAS administrators with knowledge of all restrictions, safety precautions, and installation and maintenance procedures should have physical access to the NAS.

Hardware and peripherals	• Storage drives For the list of compatible drive models, go to https://www.qnap.com/compatibility. • Network cable
Tools	• Phillips #1 or #2 screwdriver • Anti-static wrist strap

Setting Up the NAS

1. Place your NAS device in an environment that meets the requirements.
   For details, see Installation Requirements.

2. Install the drives.
   For details, see the following topics:

   - Drive Configuration

   - Installing 3.5-inch Hard Drives on 3.5-inch Trays

   - Installing 2.5-inch Hard Drives or Solid State Drives on 3.5-inch Trays

   - Installing M.2 Solid State Drives on the System Board

   For a list of compatible drives and expansion cards, go to http://www.qnap.com/compatibility.

3. Optional: Install expansion cards.
   For details, see Installing Expansion Cards.

4. Connect the NAS to the network.
   For details, see the following topics:

   - Management Port Configuration

   - Multipath I/O Network Configuration

5. Optional: Connect the SAS Expansion Units.
   For details, see Connecting SAS Expansion Units.

6. Connect the power cord and all applicable cables.

7. Power on the NAS.
   For details, see Front Panel Buttons.

8. Install QES.
   For details, see QES Installation.

9. Log on to QES.
   If QES finds unused disks in your NAS, it will ask you to initialize these disks. Click **Initialize** to start the process.

10. Open **High Availability** and check the system status.
    If any of the components are experiencing issues, check if they are properly installed.

3. Installation and Configuration

This chapter provides specific hardware and firmware installation and configuration steps.

Hardware Installation

This section provides information on removing or installing the storage controller, drives, expansion cards, power supply units, fan modules, memory modules, and battery backup units.

Removing a Storage Controller

1. Power off the NAS.

2. Disconnect the power cord from the electrical outlet.

3. Disconnect all cables and external attachments.

4. Remove the storage controller.

   a. Loosen the screw.
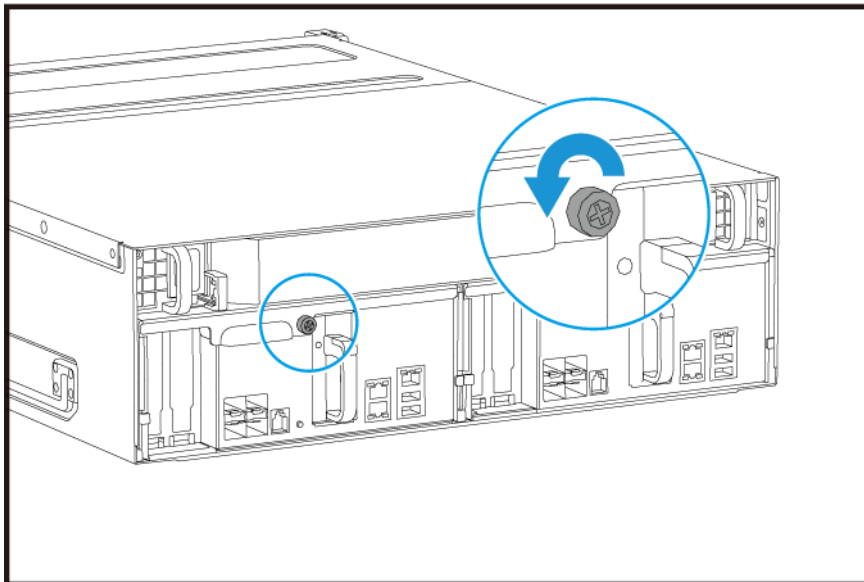
   b. Pull the handle to pull out the storage controller.
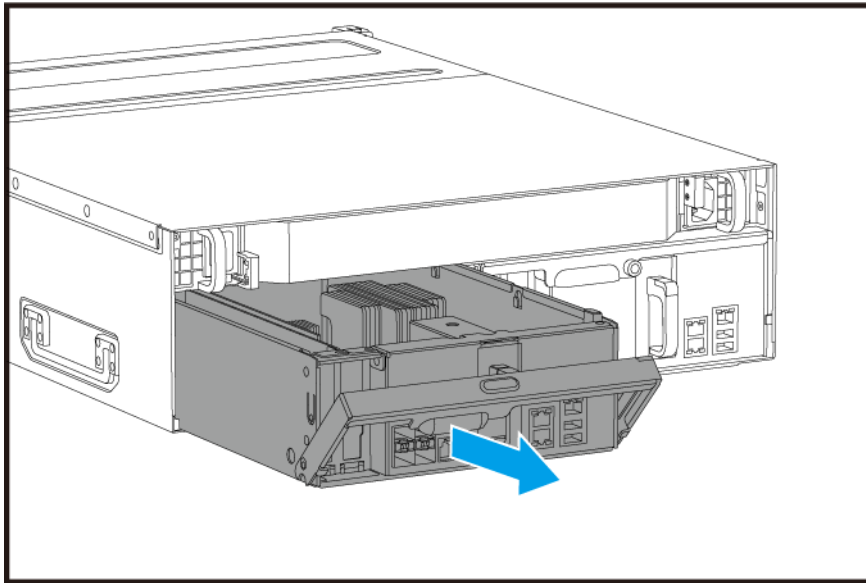
Installing a Storage Controller

1. Load the controller into the NAS.

    a. Insert the controller into the chassis.

    b. Push the handle up.
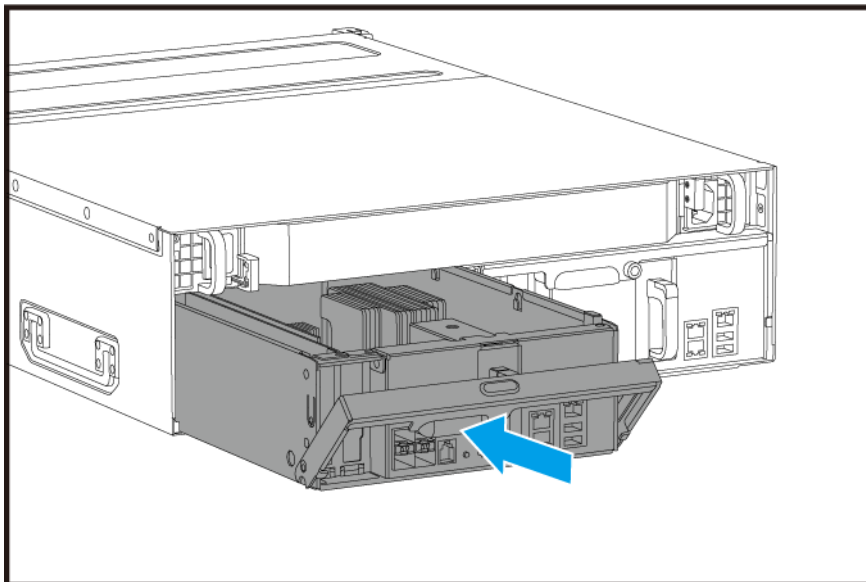
2. Tighten the screw.
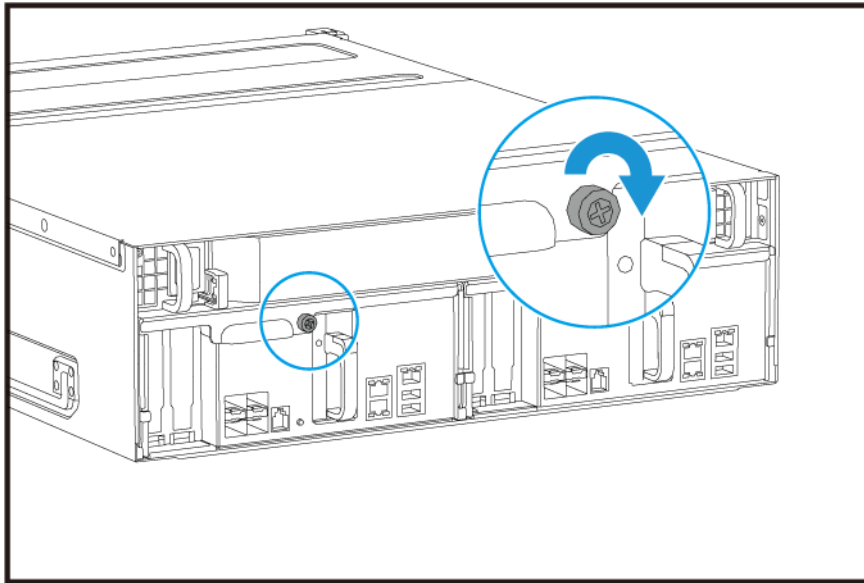
3. Connect all cables and external attachments.

4. Connect the power cord to the electrical outlet.

5. Power on the NAS.

Drive Installation

The ES1686dc is compatible with 3.5-inch and 2.5-inch hard drives, and 2.5-inch and M.2 solid state drives.

Drive Configuration

The ES1686dc supports the following drive configurations.

Configuration	Description
All SSDs	Use all solid-state drives (SSDs) for I/O intensive workloads and business-critical storage.
All HDDs	Use all hard disk drives (HDDs) for the best value for capacity. This configuration is suitable for storing cold data and running applications that require sequential data access, such as video editing and surveillance software.
Hybrid	Use a combination of SSDs and HDDs to balance cost and performance. In addition to high input/output operations per second (IOPS), the ES1686dc also supports creating an SSD read cache to further increase storage performance. This configuration is especially suitable for virtual desktop infrastructure (VDI) and web servers. When using a hybrid configuration, QNAP recommends installing SSDs in drive bays 1 to 4.

Drive bays 1 to 4 are reserved for system configurations. QNAP recommends using drive bays 5 to 16 for data storage. This setup prevents data storage operations from interfering with the basic operation of the NAS system. This also allows easier migration of drives used for data storage.

For details on drive numbering, see Drive Numbering.

Installing 3.5-inch Hard Drives on 3.5-inch Trays

For the list of compatible drive models, go to https://www.qnap.com/compatibility.

> ⚠️ **Warning**
>
> - Installing a drive deletes all data on the drive.
>
> - Observe electrostatic discharge (ESD) procedures to avoid damage to components.
>
> - Do not replace a drive without first bringing the storage pool offline in QES. You may replace a drive online only when it is part of an array that has been configured for fault tolerance and a predictive failure alert is received from QES. For more information, refer to the QES user guide.

1. Power off the NAS.

2. Remove the drive tray.

   a. Slide the lock to the left.

   b. Push the button to release the handle.

   c. Pull the tray out.

3. Install a drive on the tray.

   a. Place the drive on the tray so that the holes on the sides of the drive are aligned with the holes on the sides of the tray.

   b. Attach the screws.

4. Load the tray into the bay.

   a. Insert the tray into the bay.

   b. Push the handle.

    c. Slide the lock to the right.

5. Power on the NAS.

Installing 2.5-inch Hard Drives or Solid State Drives on 3.5-inch Trays

For the list of compatible drive models, go to https://www.qnap.com/compatibility.

> ⚠️ **Warning**
>
> - Installing a drive deletes all data on the drive.
>
> - Observe electrostatic discharge (ESD) procedures to avoid damage to components.
>
> - Do not replace a drive without first bringing the storage pool offline in QES. You may replace a drive online only when it is part of an array that has been configured for fault tolerance and a predictive failure alert is received from QES. For more information, refer to the QES user guide.

1. Power off the NAS.

2. Remove the drive tray.

    a. Slide the lock to the left.

b. Push the button to release the handle.

c. Pull the tray out.

3. Install a drive on the tray.

    a. Place the drive on the tray so that the holes on the bottom of the drive are aligned with the holes on the bottom of the tray.

    b. Attach the screws.
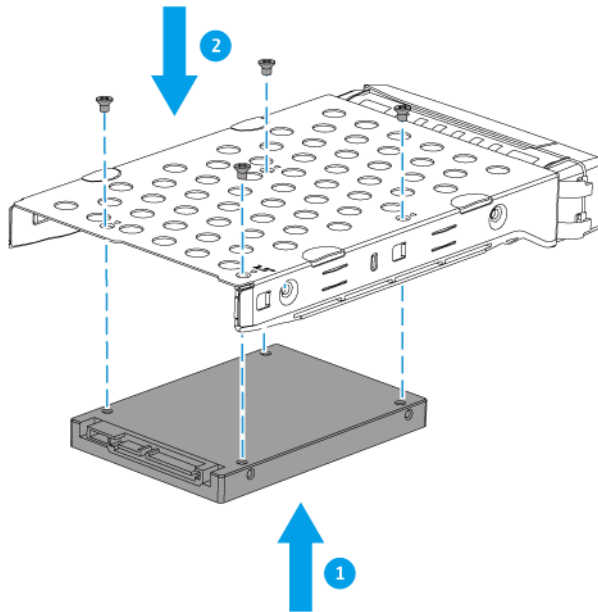
4. Load the tray into the bay.

    a. Insert the tray into the bay.

    b. Push the handle.
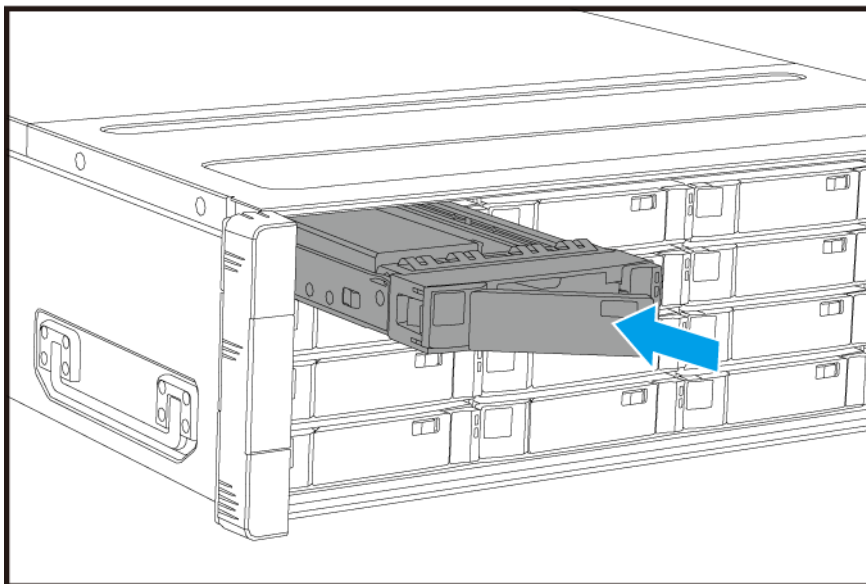
    c. Slide the lock to the right.

5. Power on the NAS.

Installing M.2 Solid State Drives on the System Board

The ES1686dc has two M.2 SSD slots on the system board. For a list of compatible M.2 SSDs, go to http://www.qnap.com/compatibility

> ⚠️ **Warning**
>
> - Only qualified personnel should perform the following steps. Failure to follow instructions can result in serious injury or death.
>
> - Observe electrostatic discharge (ESD) procedures to avoid damage to components.

1. Remove the storage controller.
   For details, see Removing a Storage Controller.

2. Install the M.2 SSD.

   a. Insert the M.2 SSD into the slot.
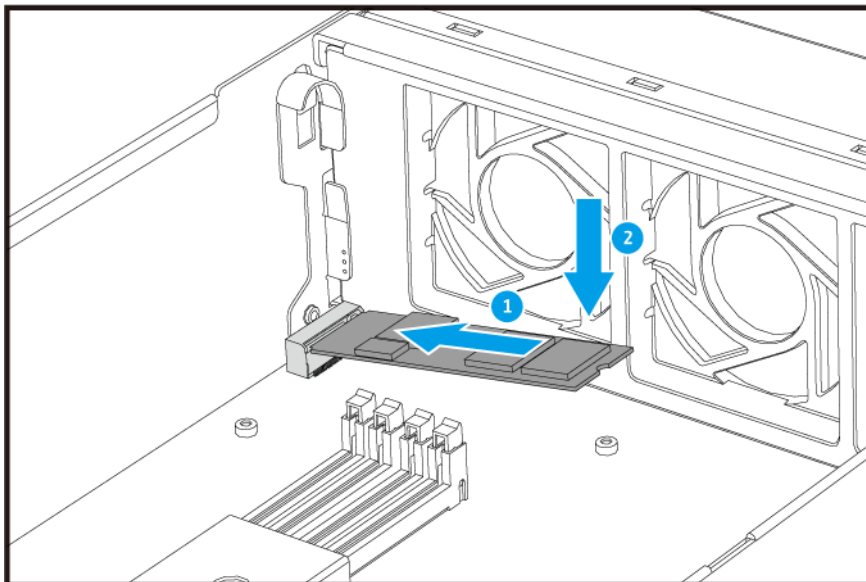
   b. Attach the screw.
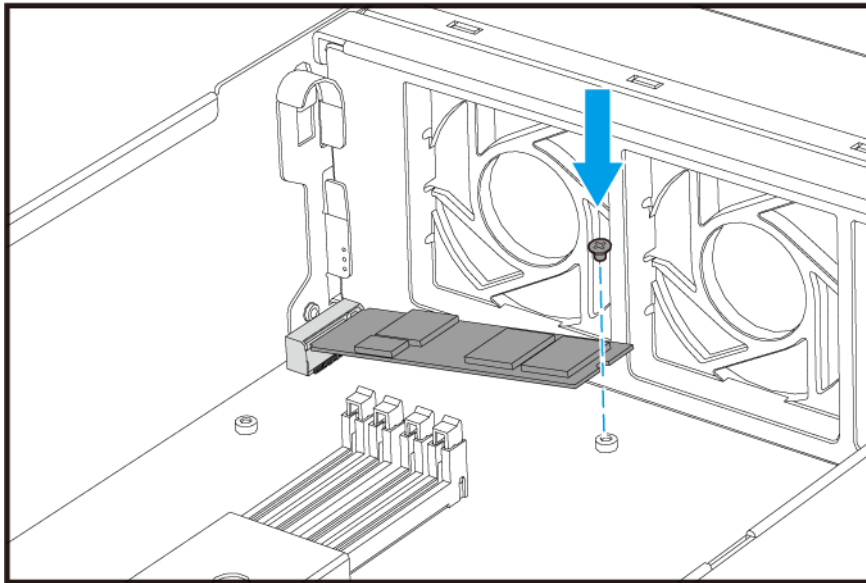
3. Install the storage controller.
   For details, see Installing a Storage Controller.

Installing Expansion Cards

The ES1686dc supports selected expansion cards, some of which require QNAP PCIe brackets. QNAP-branded expansion cards purchased from the company website are shipped with the brackets necessary to fit the ES1686dc.

> ⚠️ **Warning**
>
> • Only qualified personnel should perform the following steps. Failure to follow instructions can result in serious injury or death.
>
> • Observe electrostatic discharge (ESD) procedures to avoid damage to components.

1. Check the expansion cards and brackets supported by your model on the QNAP website.

   a. Go to www.qnap.com/compatibility.

   b. Click **Search by NAS**.

   c. Specify the number of bays and the specific model of your NAS.

   d. Under **Category**, select the component or device type.

   e. Locate a specific component or device model in the list.

   f. Optional: Click the corresponding **Note** icon to view more information.

2. Remove the storage controller.
   For details, see Removing a Storage Controller.

3. Remove the PCIe cover.

   a. Remove the screw that secures the cover to the bracket.

b. Pull the cover away from the slot.

4. Optional: Attach the QNAP bracket to the expansion card.

    a. Remove all screws of the existing bracket.

    b. Carefully pull the bracket away from the card.

    c. Attach the QNAP bracket to the card using the same screws.
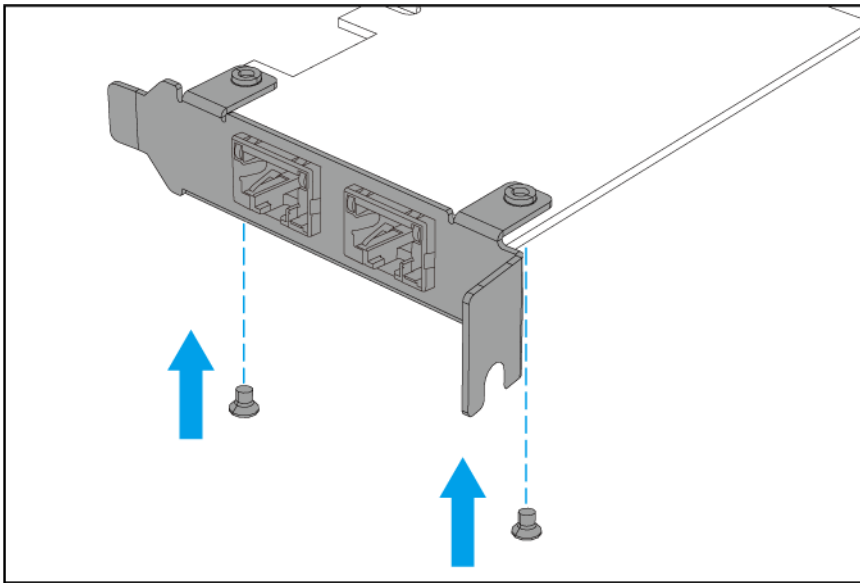
    d. Verify that the bracket does not move.

5. Install the expansion card.

    a. Hold the card by the edges.

    b. Insert the card into the slot.

    c. Attach the screw.
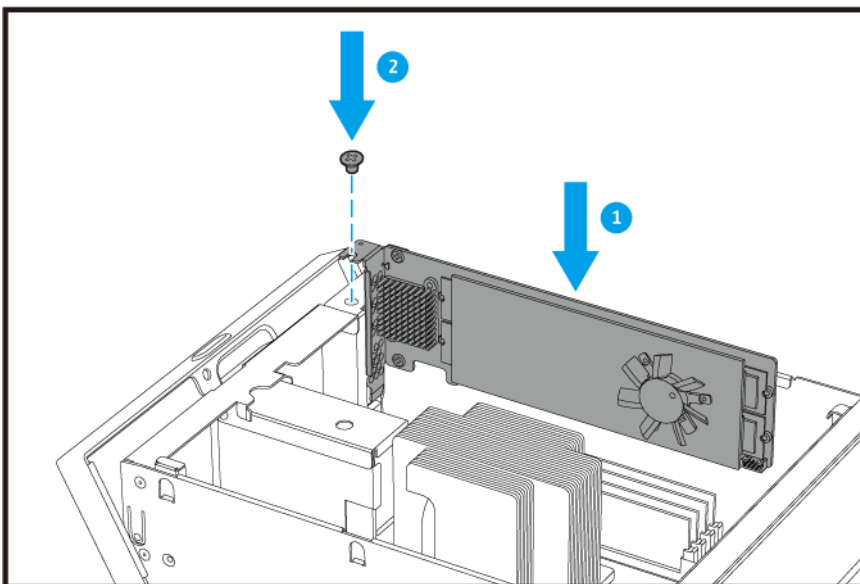
6. Install the storage controller.
For details, see Installing a Storage Controller.

Replacing Memory Modules

Each storage controller has eight memory slots. You can increase the memory capacity of the NAS by upgrading the memory module.

Use only QNAP modules of the same type and capacity to maintain system performance and stability. You can purchase QNAP memory modules from authorized resellers.

> **Important**
> For best results, QNAP recommends installing modules in pairs.
>
> • Ensure that each pair uses identical modules.
>
> • Install the pairs in sequence and follow the assigned slots for each pair.
>
> • The ES1686dc has eight memory slots. For optimal quad-channel performance, install memory modules on either four or eight of the slots. When installing four memory modules, install the memory in slots 1, 3, 6, and 8.
>
> For details on slot numbering, see System Board.

| Module Pair	Slot Number
First pair	Slots 1 and 8
Second pair	Slots 3 and 6
Third pair	Slots 2 and 7
Fourth pair	Slots 4 and 5

> **Warning**
>
> • Only qualified personnel should perform the following steps. Failure to follow instructions can result in serious injury or death.
>
> • Observe electrostatic discharge (ESD) procedures to avoid damage to components.

1. Remove the storage controller.
   For details, see Removing a Storage Controller.

2. Remove an existing module.

   a. Push the retention clips outward simultaneously to release the module.

> **Warning**
> Attempting to remove a module that is not completely released may damage the module and the motherboard.

b. Hold the module by the edges and then carefully slide it out of the slot.
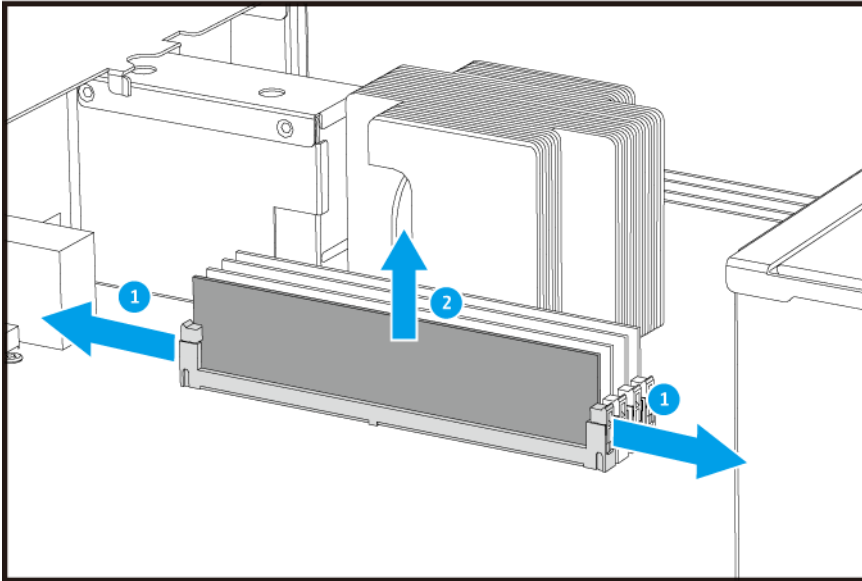
3. Install a new module.

   a. Align the notch with the ridge in the slot.

   b. Insert the module into the slot.

   c. Verify that the metal connectors are completely inserted into the slot.

   d. Carefully press down on the module until the retention clips lock the module into place.
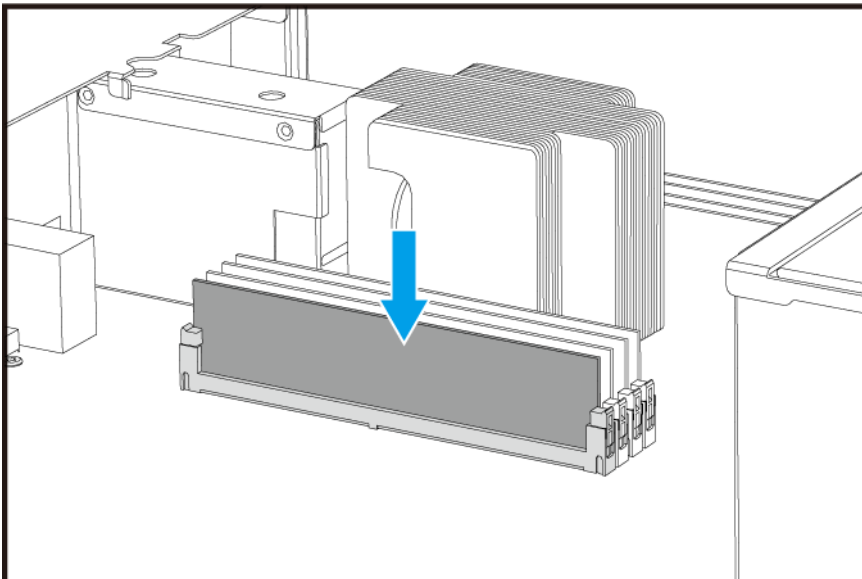
4. Install the storage controller.
   For details, see Installing a Storage Controller.

5. Verify that the module is recognized by the NAS.

   a. Log on to QES as administrator.

   b. Go to **Control Panel** > **System** > **System Status** > **Hardware Information** .

c. Check the values for each memory slot.

Replacing the Fan Module

The fan module of the ES1686dc contains three fans to ensure adequate cooling.

> ⚠️ **Warning**
>
> - To avoid potential injury or damage to components, do not touch the fans while the NAS is connected to a power source.
>
> - Only qualified personnel should perform the following steps. Failure to follow instructions can result in serious injury or death.
>
> - Observe electrostatic discharge (ESD) procedures to avoid damage to components.

1. Remove the storage controller.
   For details, see Removing a Storage Controller.

2. Remove the fan module.

   a. Pull the handle to release the fan module.

   b. Pull the module out.
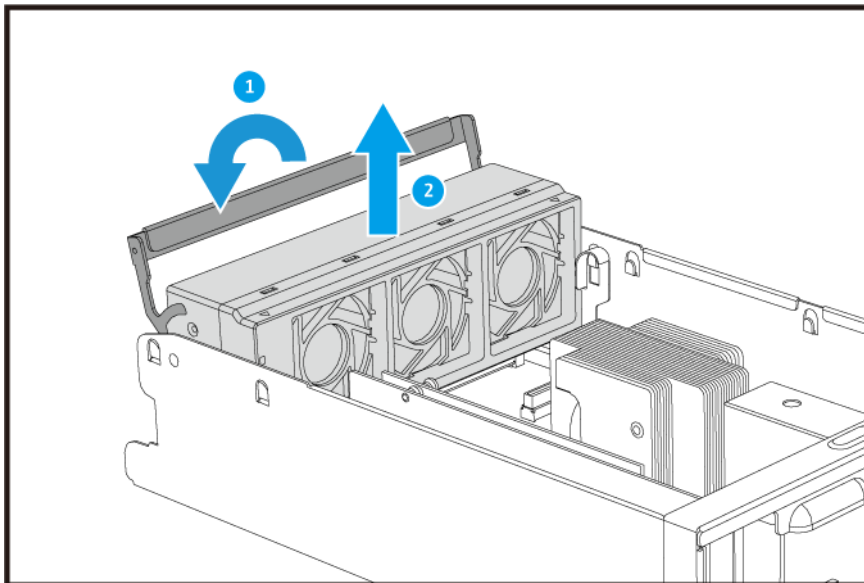
3. Install a new fan module.

   a. Insert the module into the chassis.

   b. Push the handle down to lock the module in place.
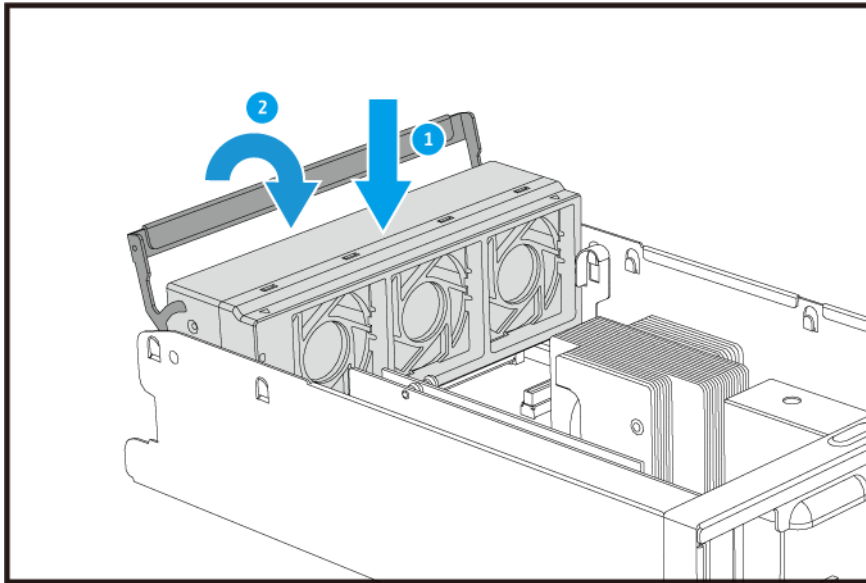
4. Install the storage controller.
   For details, see Installing a Storage Controller.

Hot-swapping Redundant Power Supply Units

1. Power off the storage controller.

2. Disconnect the power cord from the electrical outlet and the PSU that you are replacing.
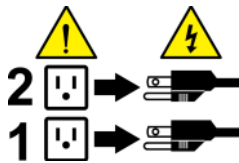
> ⚠️ **Warning**
>
>
>
> The NAS may have one or more power supply unit (PSU) cords. To avoid serious injuries, a trained service technician must disconnect all PSU cords before installing or replacing system components.

3. Firmly press the latch toward the handle and then pull the PSU out.
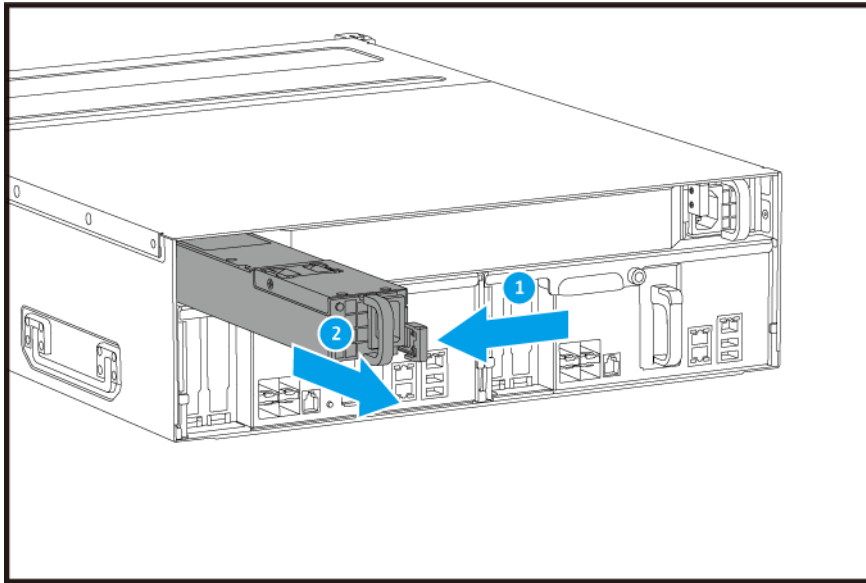
4. Insert the new PSU.
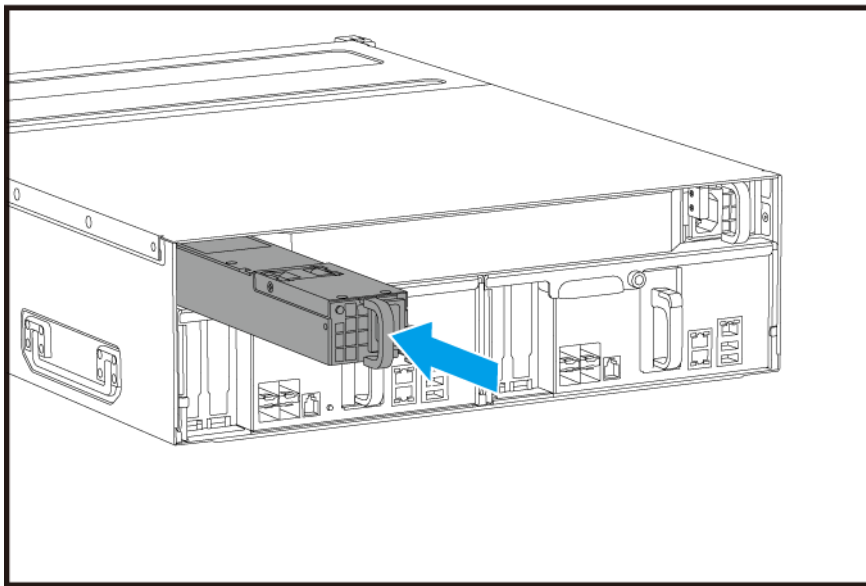
5. Connect the power cord to the PSU and the electrical outlet.

6. Power on the storage controller.

Replacing the Battery Backup Unit

If the power supply unit of the storage controller fails, the system will switch to the battery backup unit (BBU) for power.

1. Press the button and pull the BBU out.
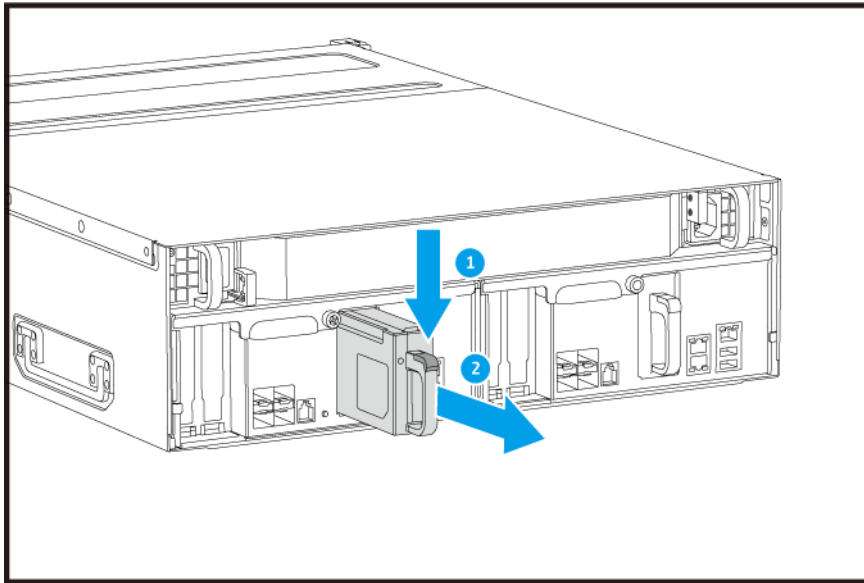
2. Insert the new BBU into the slot until it locks in place.
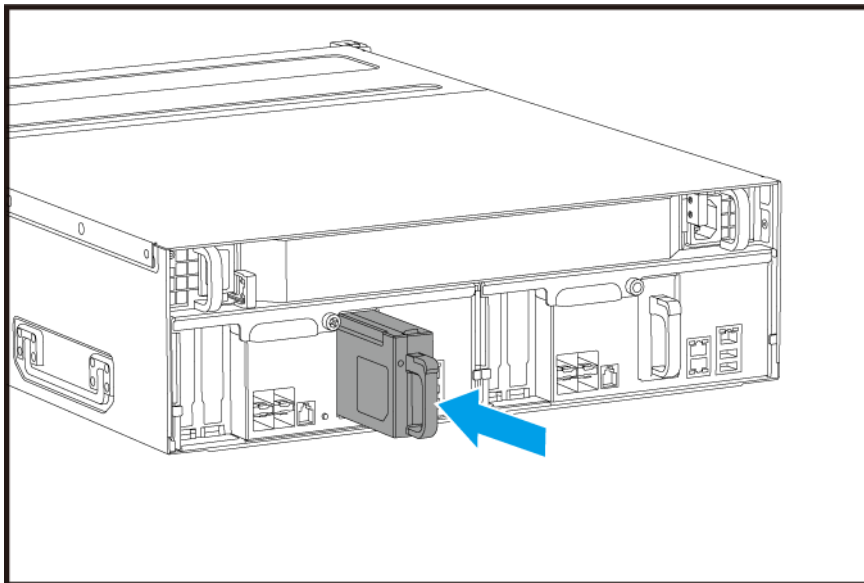
Expansion Unit Installation

The ES1686dc supports SAS expansion units and is compatible with the EJ1600 v2. When connecting to the EJ1600 v2, some storage expansion accessories are required. Refer to the following table for details.

Expansion Unit Type	Description	Required Accessories	Maximum Expansion Units Supported
EJ1600 v2	• Uses a SAS 12 Gbps interface • Supports SAS HDD/SSD	• SAS-12G2E storage expansion card • Mini-SAS SFF-8644 cable • RAIL-E02 rail kit	7

You can purchase storage expansion accessories from QNAP or an authorized reseller.

For details, go to https://shop.qnap.com/.

Connecting SAS Expansion Units

1. Install a storage expansion card on the PCIe slot.
   For details, see Installing Expansion Cards.

2. Connect the expansion units to the NAS using one of the following topologies.

> **Important**
> QNAP recommend always using dual-path configuration, to prevent storage downtime due to expansion unit failure or cable disconnection. Single-path configuration should be used only in a situation where it is not possible to use dual-path configuration.
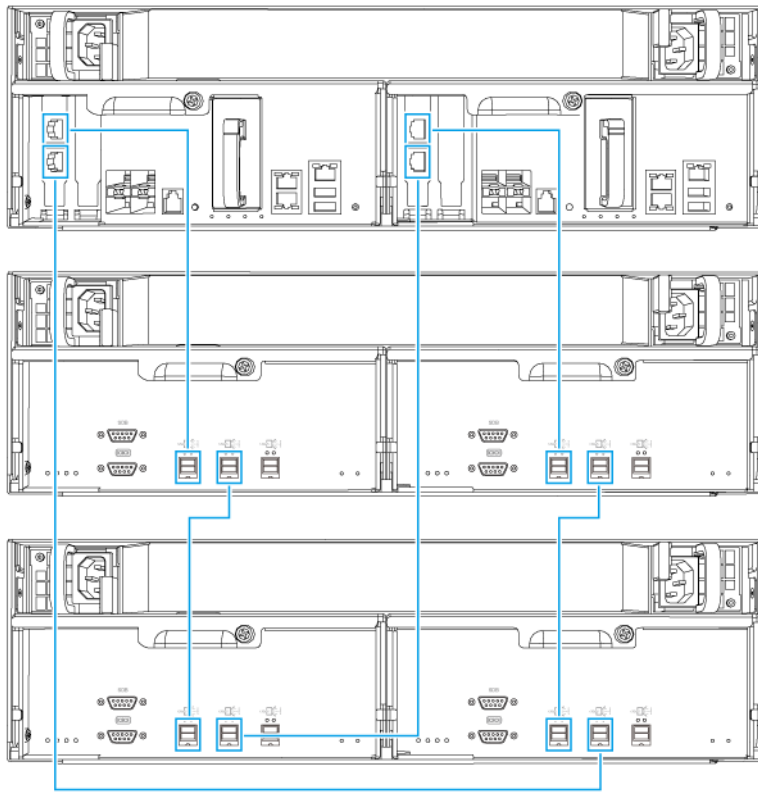
Dual-path configuration
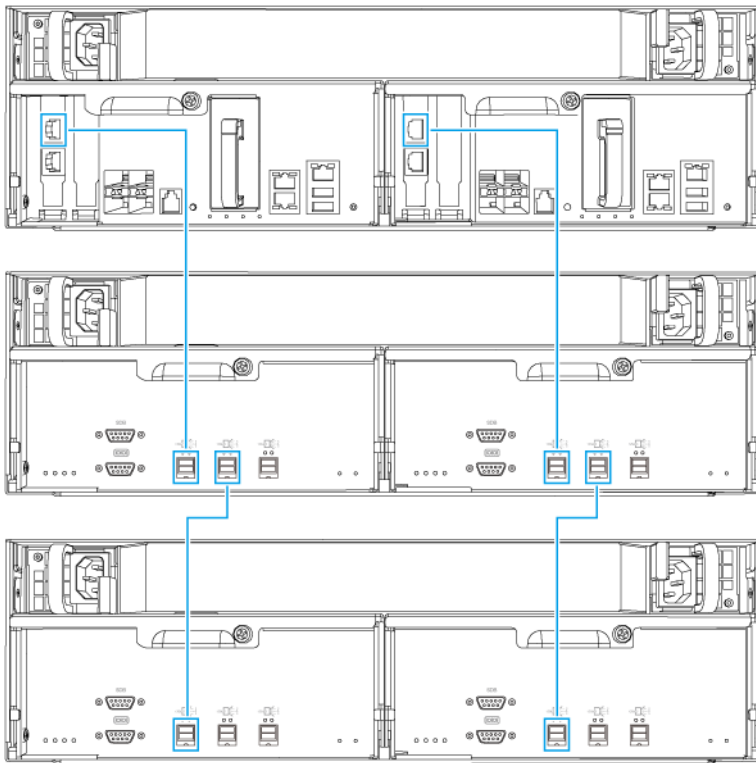
Single-path configuration

3. Power on the expansion units.

4. Verify that the expansion units are recognized by the NAS.

    a. Log on to QES as administrator.

    b. Go to **Main Menu** > **Storage Manager** > **Overview** > **System** .

    c. Verify that the expansion units are listed.

Adding an SAS Expansion Unit

> **Important**
>
> • When adding an expansion unit to an existing NAS topology, the new expansion must be added last. For example, if there are 2 existing expansion units, then you must add the new unit in sequence as expansion unit 3.
>
> • If you are using a dual-path configuration, you must prepare 2 new SAS cables.
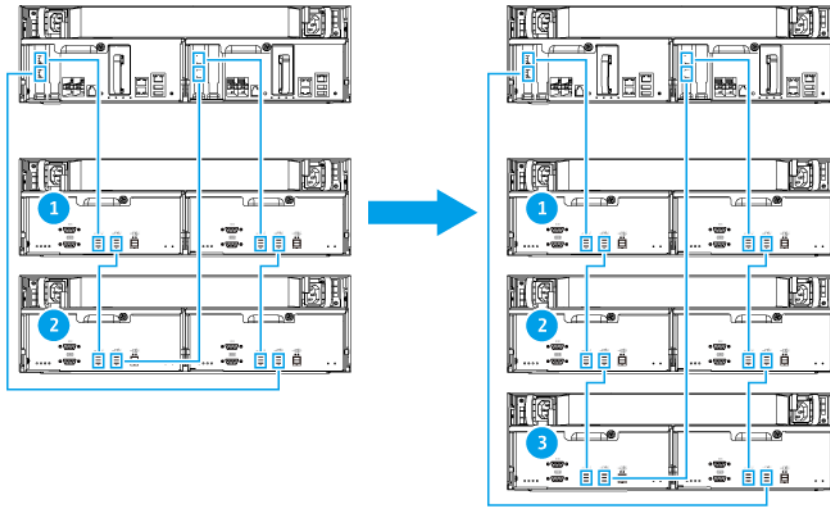
Dual-path configuration
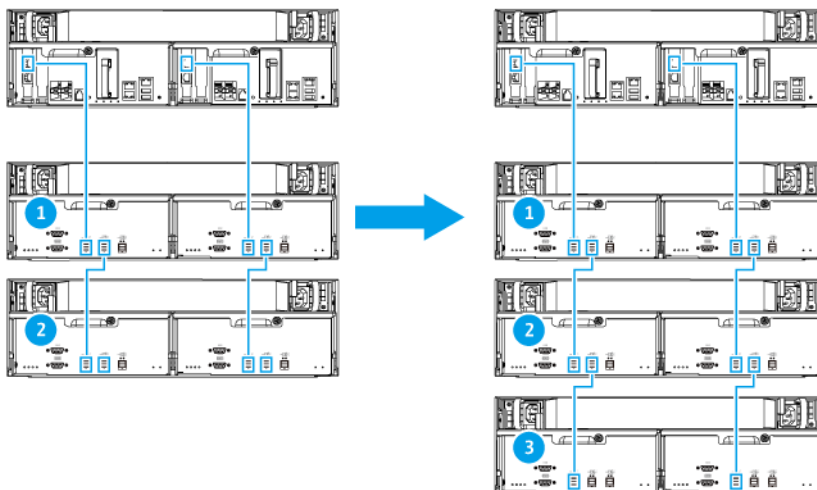
Single-path configuration

1. Mount the new expansion unit on the rack.

2. Install the drives in the new expansion unit.

3. If you are using a dual-path configuration, disconnect the loop cables from the SAS ports on the last expansion unit.
    Loop cables are the SAS cables that you use to connect the last expansion unit back to the NAS.

4. Using the two new SAS cables, connect the last expansion unit to the new expansion unit.

5. If you are using a dual-path configuration, connect the loop cables to the new expansion unit.

6. Connect the power cables to the new expansion unit.

7. Power on the new expansion unit.

8. Log on to QES as administrator.

9. Go to **Main Menu** > **Storage Manager** > **Storage** > **Disks** .

10. Click **Recover**, and then select **Reinitialize enclosure ID**.

QES scans for and detects the new expansion unit and installed disks.

Replacing an SAS Expansion Unit

1. Take all storage pools on the old expansion unit offline.

> ⚠️ **Warning**
> Disconnecting an expansion unit containing online storage pools may result in data loss.

Configuration	Description
Single-path configuration	If you disconnect a SAS expansion unit, all succeeding units in the connection will also be disconnected. For example, if you are replacing expansion unit 2, then you must take the storage pools on expansion units 3 and 4 offline.
Dual-path configuration	If you disconnect an old expansion unit, only its storage pools will be taken offline.

For more information, refer to the QES User Guide.

2. Press and hold the power button on the old expansion unit for 5 seconds.
The old expansion unit powers off.

3. Disconnect all SAS cables from the old expansion unit.

4. Disconnect all power cables from the old expansion unit.

5. Unmount and remove the old expansion unit from the rack.

6. Remove the drives from the old expansion unit.

7. Mount the new expansion unit on the rack.

8. Install the drives in the new expansion unit.

9. Connect the SAS cables to the new expansion unit.
Use one of the following cabling topologies, depending on your current cabling layout. For more information, see Connecting SAS Expansion Units.
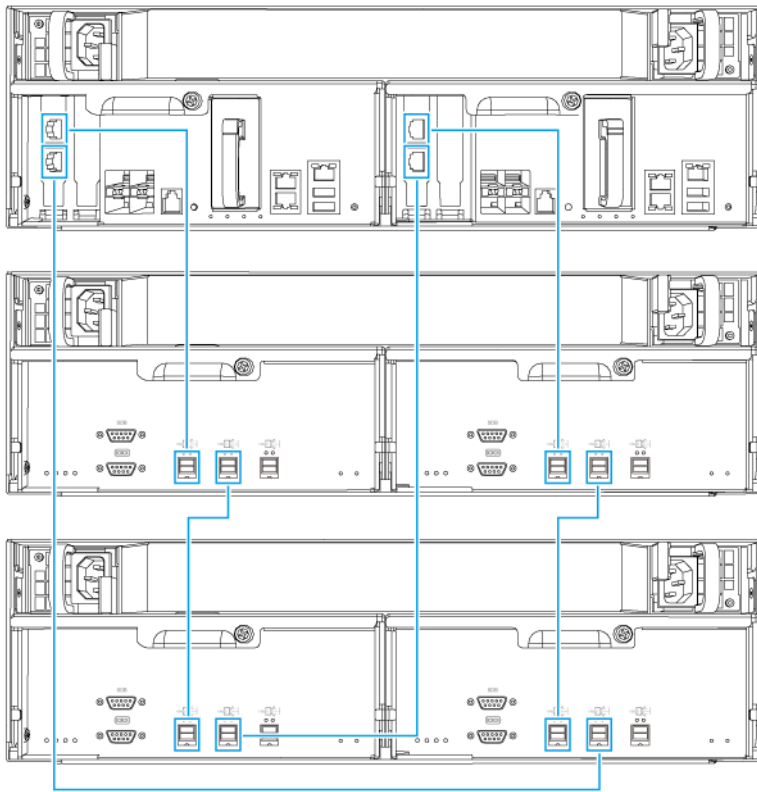
Dual-path configuration
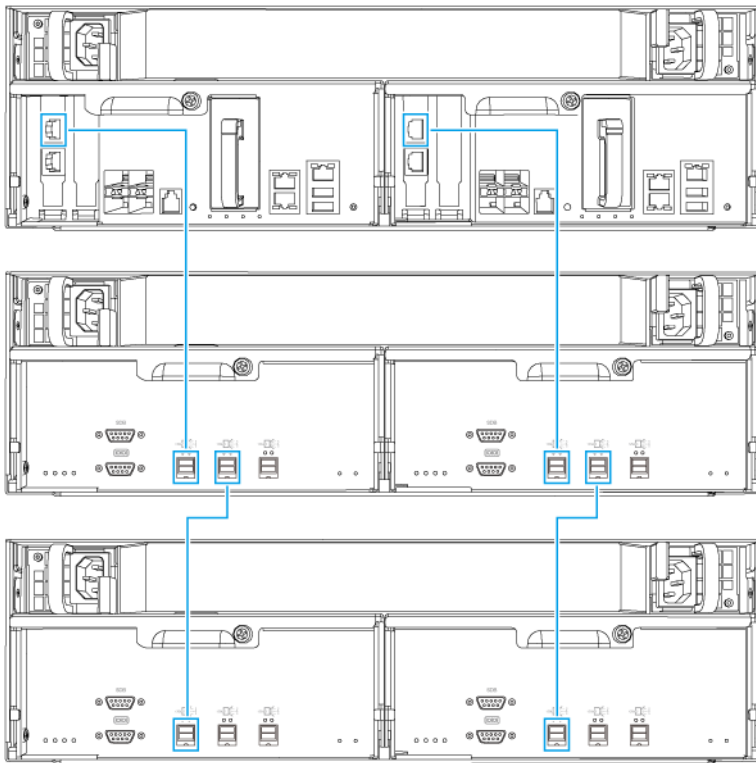
Single-path configuration

10. Connect the power cables to the new expansion unit.

11. Power on the new expansion unit.

12. Log on to QES as administrator.

13. Go to **Main Menu** > **Storage Manager** > **Storage** > **Disks** .

14. Click **Recover**, and then select **Reinitialize enclosure ID**.
    QES scans for and detects the new expansion unit and installed disks.

15. Bring all offline storage pools back online.

QES Installation

The ES1686dc uses the QNAP QES operating system. If the NAS is connected to your local area network, you can install QES using Qfinder Pro.

Mode	Description
Quick setup	Install QES and configure basic settings. For details, see the following topics: • Installing QES Using a Static IP Address • Installing QES Using a Dynamic IP Address

Mode	Description
Manual setup	Install QES and configure advanced settings such as device type access and the QES system file storage pool. For details, see Installing QES Using Manual Setup.

Installing QES Using a Static IP Address

⚠️ **Warning**
Installing QES deletes all data on the drives. Back up your data before proceeding.

1. Power on the NAS.

2. Connect the NAS to your local area network.

3. Run Qfinder Pro on a computer that is connected to the same local area network.

💡 **Tip**
To download Qfinder Pro, go to https://www.qnap.com/utilities.

4. Locate the IP address of the storage controller from the device list.
If the computer is connected to the NAS through the management port, Qfinder Pro will also display the the IP address of the second controller.

Controller Number	IP Address
1	169.254.100.100
2	169.254.100.101

5. Configure the network settings.

   a. On your Windows device, go to **Contol Panel** > **Network and Internet** > **Network and Sharing Center** .

   b. Identify and click the network interface connected to the management port.
   The connection status window opens.

   c. Click **Properties**.
   The connection properties window opens.

   d. From the list of connections, select **Internet Protocol Version 4 (TCP/IPv4)**.

   e. Click **Properties**.
   The **Internet Protocol Version 4 (TCP/IPv4) Properties** window opens.

   f. Select **Use the following IP address**.

   g. Specify an IP address and subnet mask.
   Example:

   - IP address: 169.254.1.10

   - Subnet mask: 255.255.0.0

   h. Click **OK**.

💡 **Tip**
You can change the settings back to their original configuration after installing QES.

6. In Qfinder Pro, double-click an uninitialized controller.
The setup wizard opens.

7. Click **Quick Setup**.
The **Quick Setup** window opens.

8. Specify a NAS name and password.

Field	Requirements
NAS name	• Length: 1-14 characters • Valid characters: A-Z, a-z, 0-9 • Valid special characters: Hypen (-) • Not allowed: The last character is a hyphen (-)
Password	• Length: 5-64 characters • Valid characters: All ASCII characters

9. Specify the static IP address of the management port of each controller.
Example:

- LAN IP block: `10.8.13.xx`

- Controller 1 IP address: `10.8.13.62`

- Controller 2 IP address: `10.8.13.78`

10. Click **Proceed**.
A confirmation message appears.

⚠ **Warning**
Clicking **Confirm** deletes all data on the drive before installing QES.

11. Click **Confirm**.
The wizard installs QES and restarts the NAS.
You must initialize any unused disks upon your next login.

Installing QES Using a Dynamic IP Address

⚠ **Warning**
Installing QES deletes all data on the drives. Back up your data before proceeding.

1. Power on the NAS.

2. Connect the NAS to your local area network.

3. Run Qfinder Pro on a computer that is connected to the same local area network.

💡 **Tip**
To download Qfinder Pro, go to https://www.qnap.com/utilities.

4. Locate the NAS in the device list.

💡 **Tip**
Refer to the device type and MAC address to identify the NAS. Its status is a question mark (?).

If the computer is connected to the NAS through the management port, Qfinder Pro will also display the the details of the second controller.

5. Double-click an uninitialized controller.
The setup wizard opens.

6. Click **Quick Setup**.
The **Quick Setup** window opens.

7. Specify a NAS name and password.

Field	Requirements
NAS name	• Length: 1-14 characters • Valid characters: A-Z, a-z, 0-9 • Valid special characters: Hypen (-) • Not allowed: The last character is a hyphen (-)
Password	• Length: 5-64 characters • Valid characters: All ASCII characters

8. Specify DHCP as the IP address.

9. Click **Proceed**.
A confirmation message appears.

> ⚠ **Warning**
> Clicking **Confirm** deletes all data on the drive before installing QES.

10. Click **Confirm**.
The wizard installs QES and restarts the NAS.
You must initialize any unused disks upon your next login.

Installing QES Using Manual Setup

> ⚠ **Warning**
> Installing QES deletes all data on the drives. Back up your data before proceeding.

1. Power on the NAS.

2. Connect the NAS to your local area network.

3. Run Qfinder Pro on a computer that is connected to the same local area network.

> 💡 **Tip**
> To download Qfinder Pro, go to https://www.qnap.com/utilities.

4. Locate the NAS in the device list, and then double-click the name or IP address.
The setup wizard opens.

5. Click **Manual Setup**.
The **Enter the NAS name and administrator's password** screen appears.

6. Specify a NAS name and password.

Field	Requirements
NAS name	• Length: 1-14 characters • Valid characters: A-Z, a-z, 0-9 • Valid special characters: Hypen (-) • Not allowed: The last character is a hyphen (-)
Password	• Length: 5-64 characters • Valid characters: All ASCII characters

7. Click **Next**.
   The **Set the date and time** screen appears.

8. Specify the time zone, date, and time.

> 💡 **Tip**
> QNAP recommends connecting to an NTP server to ensure that the NAS follows the Coordinated Universal Time (UTC) standard.

9. Click **Next**.
   The **Configure the network settings** screen appears.

10. Select **Obtain an IP address automatically (DHCP)**.

11. Click **Next**.
    The **Cross-platform file transfer service** screen appears.

12. Select the types of devices that you will use to access shared folders on the NAS.

13. Click **Next**.
    The **Check system disk status** screen appears.

14. Select a storage pool to install QES on.

> ⛔ **Important**
> Once the installation process starts, the selected storage pool cannot be modified. Reinitialize the NAS before selecting a different disk group.

15. Click **Next**.
    The **Summary** screen appears.

16. Review the settings.

17. Click **Apply**.
    A confirmation message appears.

> ⚠️ **Warning**
> Clicking **Confirm** deletes all data on the drive before installing QES.

18. Click **Confirm**.
    The wizard installs QES and restarts the NAS.
    You must initialize any unused disks upon your next login.

Service Port Configuration

The service port is the main point for hardware installation, configuration, and maintenance activities.

> **Important**
> Only use the service port when directed by QNAP technical support personnel.

Storage Controller Service Port

The storage controller service port is a RS-232 port with an RJ-11 connector. Use the appropriate cable/adapter (i.e.RJ-11 to DB9/DB9 to USB or RJ-11 to USB) to connect this port with your computer. The pin-outs are defined as follows:
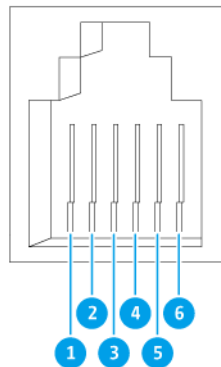
Pin Number	Signal	Description
1	Rx1	Receive Data of UART1
2	Tx1	Transmit Data of UART1
3	GND	Ground
4	Rx2	Receive Data of UART2
5	Tx2	Transmit Data of UART2
6	GND	Ground

Configure the baud rate and character format of the PC or terminal to match these console port default characteristics:

- 115200 baud rate

- 8 data bits

- 1 stop bit

- No parity

- Flow control: XON/XOFF

- **Default username/password:** `admin/admin`

Expansion Unit Service Port

The expansion unit service port is a RS-232 port with an DB-9 (or DE-9) connector. The pin-outs are defined as the following:
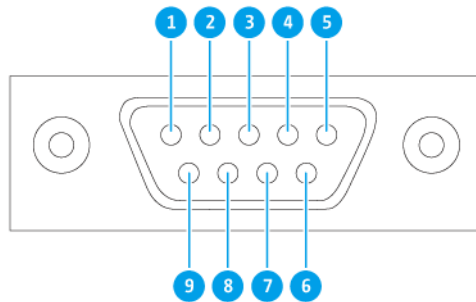
Pin Number	Signal	Description
1	NC	No Connection
2	Rx	Receive Data
3	Tx	Transmit Data
4	NC	No Connection
5	GND	Ground
6	NC	No Connection
7	NC	No Connection
8	NC	No Connection
9	NC	No Connection

Configure the baud rate and character format of the PC or terminal to match these console port default characteristics:

- 115200 baud rate

- 8 data bits

- 1 stop bit

- No parity

- Flow control: XON/XOFF

- Default username/password: `admin/admin`

Management Port Configuration

Management is provided by the Intel® i210 Gigabit Ethernet controller. The management port allows you to connect to the QES desktop of the ES1686dc. The default ES1686dc management website is 169.254.100.100:8080. If the NAS has been configured to use DHCP, you can use the QNAP Qfinder Pro to check the IP address of the NAS. Make sure the NAS and the computer that runs the QNAP Qfinder Pro are connected to the same subnet.

The system requires that the management IP addresses are configured on both controllers and that the controllers' management ports are connected to the management network. This should be a separate LAN or a VLAN because you should not use the production LAN or VLAN for management network traffic. To configure the management port IP address, refer to the QES User Guide. If one storage controller fails, you can enable takeover function from the High Availability app in QES to manage the system through the management port of the other storage controller with the same IP address. For more information, see the QES User Guide.

The following diagrams illustrate management port connections.
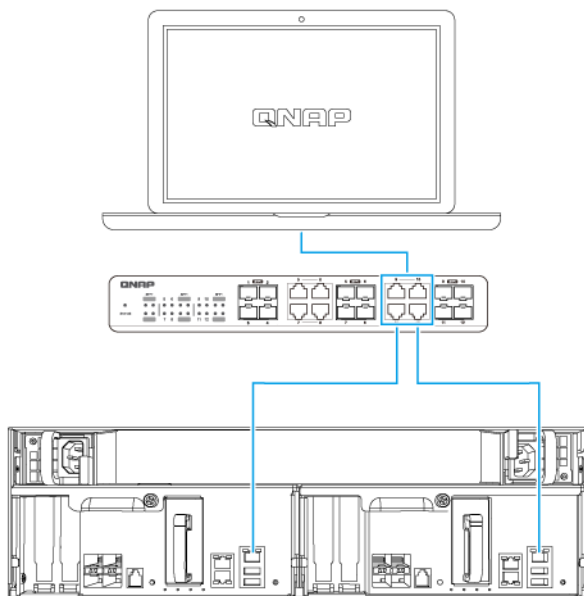
Connected to a QES endpoint using DHCP
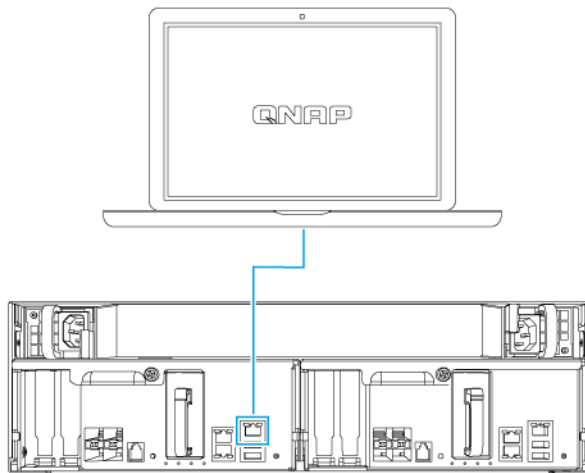
Directly connected to a QES endpoint

Multipath I/O Network Configuration

Multipath I/O (MPIO) is a fault-tolerance technique where more than one physical network path is created between a server and a storage device such as a NAS. If any one network path goes down due to the failure of a switch, cable, or network card, the server can route I/O through the remaining network paths with no storage downtime. The ES1686dc supports MPIO on iSCSI connections using standard Ethernet infrastructure.

The following diagram is an example of how the multipath I/O should be implemented:
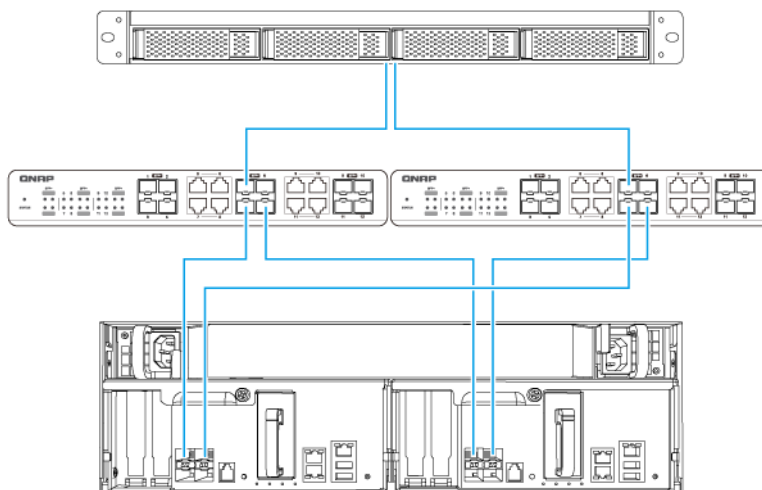
> **Important**
> Requirements:
>
> • Each QES data port must use a static IP address.

> • Each server and storage controller must be connected to at least two different physical switches on different subnets.

Recommendations:

> • Use dedicated network switches or VLANs to separate iSCSI traffic from other network traffic.

Platform	QNAP Application Note Name
Windows	Configuring Microsoft iSCSI Storage with QNAP Enterprise-Class ES NAS
Linux	Configuring Linux iSCSI Storage with QNAP ES NAS

For further information, see the following user guide: https://download.qnap.com/Storage/TechnicalDocument/ES1640dc-v2/ESNAS-UG1102-20180103-en.pdf

4. Troubleshooting

This chapter describes basic troubleshooting information.

Forcing Qfinder Pro to Locate the NAS

If Qfinder Pro is unable to locate the NAS during QES installation, the drives or data may be faulty.

1. Power off the NAS.

2. Remove all drives.

3. Power on the NAS.

4. Locate the NAS using Qfinder Pro.

5. Reinsert the drives.

6. Continue with the QES installation.

Hot-swapping Failed Drives

The NAS supports hot-swapping of drives in the following situations.

RAID Type	Situation
RAID 1	One member drive fails
RAID 5	One member drive fails
RAID 6	One or two member drives fail
RAID 10	One or two member drives in two different pairs fail.
RAID 50	One disk per subgroup fails.
RAID 60	Two disks per subgroup fail.
Triple Mirror	One or two member drives fail.
RAID-TP	One, two, or three member drives fail.

1. Log on to QES as administrator.

2. Go to **Main Menu** > **Storage Manager** > **Storage** > **Disks** .

3. Locate the failed drive.

4. Prepare a new hard drive with a capacity that is the same as or larger than the failed hard drive.

5. Remove the failed drive from the NAS.

6. Wait for 20 seconds or until the NAS beeps twice.

7. Remove the failed drive from the drive tray.

8. Insert the new drive into the drive tray.

9. Install the new drive.
   The NAS beeps twice.

10. Go to **Main Menu** > **Storage Manager** > **Storage Space** .

11. Locate the volume that contains the new drive and then verify that the status is `Rebuilding`.

Support and Other Resources

QNAP provides the following resources:

Resource	URL
Documentation	https://docs.qnap.com
Helpdesk	https://helpdesk.qnap.com
Downloads	https://download.qnap.com
Community Forum	https://forum.qnap.com

5. Glossary

QES

QNAP NAS operating system

Qfinder Pro

QNAP utility that lets you locate and access QNAP NAS devices in your local area network

6. Notices

This chapter provides information about warranty, disclaimers, licensing, and federal regulations.

Limited Warranty

QNAP offers limited warranty service on our products. Your QNAP-branded hardware product is warranted against defects in materials and workmanship for a period of one (1) year or more from the date printed on the invoice. ("Warranty Period"). Please review your statutory rights at www.qnap.com/warranty, which may be amended from time to time by QNAP in its discretion.

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Back up the system periodically to avoid any potential data loss is recommended. QNAP disclaims any responsibility of all sorts of data loss or recovery.

Should you return any components of the package of QNAP products such as NAS (Network Attached Storage) for refund or maintenance, make sure they are carefully packed for shipping. Any form of damages due to improper packaging will not be compensated.

All the features, functionality, and other product specifications are subject to change without prior notice or obligation. Information contained herein is subject to change without notice.

Further, the ® or ™ symbols are not used in the text.

BSMI Notice

警告使用者：這是甲類的資訊產品，在居住的環境中使用時，可能會造成射頻干擾，在這種情況下，使用者會被要求採取某些適當的對策。

CE Notice

This QNAP NAS complies with CE Compliance Class A.

FCC Notice

FCC Class A Notice

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.

2. This device must accept any interference received, including interference that may cause undesired operation.

> **Note**
> This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

> **Important**
> Any modifications made to this device that are not approved by QNAP Systems, Inc. may void the authority granted to the user by the FCC to operate this equipment.

SJ/T 11364-2006

本产品符合中国 RoHS 标准。以下表格标示此产品中某有毒物质的含量符合中国 RoHS 标准规定的限量要求。

本产品上会附有"环境友好使用期限"的标签，此期限是估算这些物质"不会有泄漏或突变"的年限。本产品可能包含有较短的环境友好使用期限的可替换元件，像是电池或灯管，这些元件将会单独标示出来。

部件名称	有毒有害物质或元素					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (CR(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
壳体	O	O	O	O	O	O
显示	O	O	O	O	O	O
印刷电路板	O	O	O	O	O	O
金属螺帽	O	O	O	O	O	O
电缆组装	O	O	O	O	O	O
风扇组装	O	O	O	O	O	O
电力供应组装	O	O	O	O	O	O
电池	O	O	O	O	O	O
O: 表示该有毒有害物质在该部件所有物质材料中的含量均在 SJ/T11363-2006 标准规定的限量要求以下。						
X: 表示该有毒有害物质至少在该部件的某一均质材料中的含量超出 SJ/T11363-2006 标准规定的限量要求。						

VCCI Notice

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VCCI–A