USER GUIDE



ZINC CUBE C232

Doc. Rev. 1.0

Doc. ID: 1062-4104

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ZINC CUBE C232 - USER GUIDE

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Revision History

Revision	Brief Description of Changes	Date of Issue	Author/ Editor
1.0	Initial Issue	2018-June-14	HJS

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Symbols

The following symbols may be used in this user guide

⚠DANGER	DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.
⚠WARNING	WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.
NOTICE	NOTICE indicates a property damage message.
⚠CAUTION	CAUTION indicates a hazardous situation which, if not avoided, may result in minor or moderate injury.
	Electric Shock! This symbol and title warn of hazards due to electrical shocks (> 60 V) when touching products or parts of products. Failure to observe the precautions indicated and/or prescribed by the law may endanger your life/health and/or result in damage to your material.
	ESD Sensitive Device! This symbol and title inform that the electronic boards and their components are sensitive to static electricity. Care must therefore be taken during all handling operations and inspections of this product in order to ensure product integrity at all times.
	HOT Surface! Do NOT touch! Allow to cool before servicing.
	Laser! This symbol inform of the risk of exposure to laser beam and light emitting devices (LEDs) from an electrical device. Eye protection per manufacturer notice shall review before servicing.
	This symbol indicates general information about the product and the user guide. This symbol also indicates detail information about the specific product configuration.
	This symbol precedes helpful hints and tips for daily use.

For Your Safety

Your new Kontron product was developed and tested carefully to provide all features necessary to ensure its compliance with electrical safety requirements. It was also designed for a long fault-free life. However, the life expectancy of your product can be drastically reduced by improper treatment during unpacking and installation. Therefore, in the interest of your own safety and of the correct operation of your new Kontron product, you are requested to conform with the following guidelines.

High Voltage Safety Instructions

As a precaution and in case of danger, the power connector must be easily accessible. The power connector is the product's main disconnect device.

⚠CAUTION

Warning

All operations on this product must be carried out by sufficiently skilled personnel only.

⚠CAUTION



Electric Shock!

Before installing a non hot-swappable Kontron product into a system always ensure that your mains power is switched off. This also applies to the installation of piggybacks. Serious electrical shock hazards can exist during all installation, repair, and maintenance operations on this product. Therefore, always unplug the power cable and any other cables which provide external voltages before performing any work on this product.

Earth ground connection to vehicle's chassis or a central grounding point shall remain connected. The earth ground cable shall be the last cable to be disconnected or the first cable to be connected when performing installation or removal procedures on this product.

Special Handling and Unpacking Instruction

NOTICE



ESD Sensitive Device!

Electronic boards and their components are sensitive to static electricity. Therefore, care must be taken during all handling operations and inspections of this product, in order to ensure product integrity at all times.

Do not handle this product out of its protective enclosure while it is not used for operational purposes unless it is otherwise protected.

Whenever possible, unpack or pack this product only at EOS/ESD safe work stations. Where a safe work station is not guaranteed, it is important for the user to be electrically discharged before touching the product with his/her hands or tools. This is most easily done by touching a metal part of your system housing.

It is particularly important to observe standard anti-static precautions when changing piggybacks, ROM devices, jumper settings etc. If the product contains batteries for RTC or memory backup, ensure that the product is not placed on conductive surfaces, including anti-static plastics or sponges. They can cause short circuits and damage the batteries or conductive circuits on the product.

Lithium Battery Precautions

If your product is equipped with a lithium battery, take the following precautions when replacing the battery.

⚠CAUTION

Danger of explosion if the battery is replaced incorrectly.

- Replace only with same or equivalent battery type recommended by the manufacturer.
- Dispose of used batteries according to the manufacturer's instructions.

General Instructions on Usage

In order to maintain Kontron's product warranty, this product must not be altered or modified in any way. Changes or modifications to the product, that are not explicitly approved by Kontron and described in this user guide or received from Kontron Support as a special handling instruction, will void your warranty.

This product should only be installed in or connected to systems that fulfill all necessary technical and specific environmental requirements. This also applies to the operational temperature range of the specific board version that must not be exceeded. If batteries are present, their temperature restrictions must be taken into account.

In performing all necessary installation and application operations, only follow the instructions supplied by the present user guide.

Keep all the original packaging material for future storage or warranty shipments. If it is necessary to store or ship the product then re-pack it in the same manner as it was delivered.

Special care is necessary when handling or unpacking the product. See Special Handling and Unpacking Instruction.

The length of power or I/O cables must not exceed 3 meters and no line leaves the building.

Quality and Environmental Management

Kontron aims to deliver reliable high-end products designed and built for quality, and aims to complying with environmental laws, regulations, and other environmentally oriented requirements. For more information regarding Kontron's quality and environmental responsibilities, visit http://www.kontron.com/about-kontron/corporate-responsibility/quality-management.

Disposal and Recycling

Kontron's products are manufactured to satisfy environmental protection requirements where possible. Many of the components used are capable of being recycled. Final disposal of this product after its service life must be accomplished in accordance with applicable country, state, or local laws or regulations.

WEEE Compliance

The Waste Electrical and Electronic Equipment (WEEE) Directive aims to:

- Reduce waste arising from electrical and electronic equipment (EEE)
- Make producers of EEE responsible for the environmental impact of their products, especially when the product become waste
- Encourage separate collection and subsequent treatment, reuse, recovery, recycling and sound environmental disposal of EEE
- Improve the environmental performance of all those involved during the lifecycle of EEE



Environmental protection is a high priority with Kontron.
Kontron follows the WEEE directive
You are encouraged to return our products for proper disposal.

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1/ Specifications and Regulatory information

Table 1: Environmental Specifications Temperature range[1]

Specification	Value
Operating	0 - ~35°C
Non-operating	-20 - ~70°C
Relative humidity (noncondensing) Non-operating	0% - ~93%

[1] **All temperature ratings shown are for sea level. An altitude derating of 1°C per 304.8 m (1.8°F per 1,000 ft) to 3048 m (10,000 ft) is applicable. No direct sunlight allowed.**

Table 2: Mechanical Specifications

Specification	Value
Height	217 mm/225 with feet
Depth	245 mm/263 mm with screws for PCIe
Width	225 mm

1.1. European Union Regulatory Notice

Products bearing the CE marking comply with one or more of the following EU Directives as may be applicable:

- Low Voltage Directive 2014/35/EU
- EMC Directive 2014/30/EU
- Product Safety Directive 2001/95/EC
- RoHS Directive 2011/65/EU

Compliance with these directives is assessed using applicable European Harmonized Standards.

2/ Component Identification

Figure 1: System Components

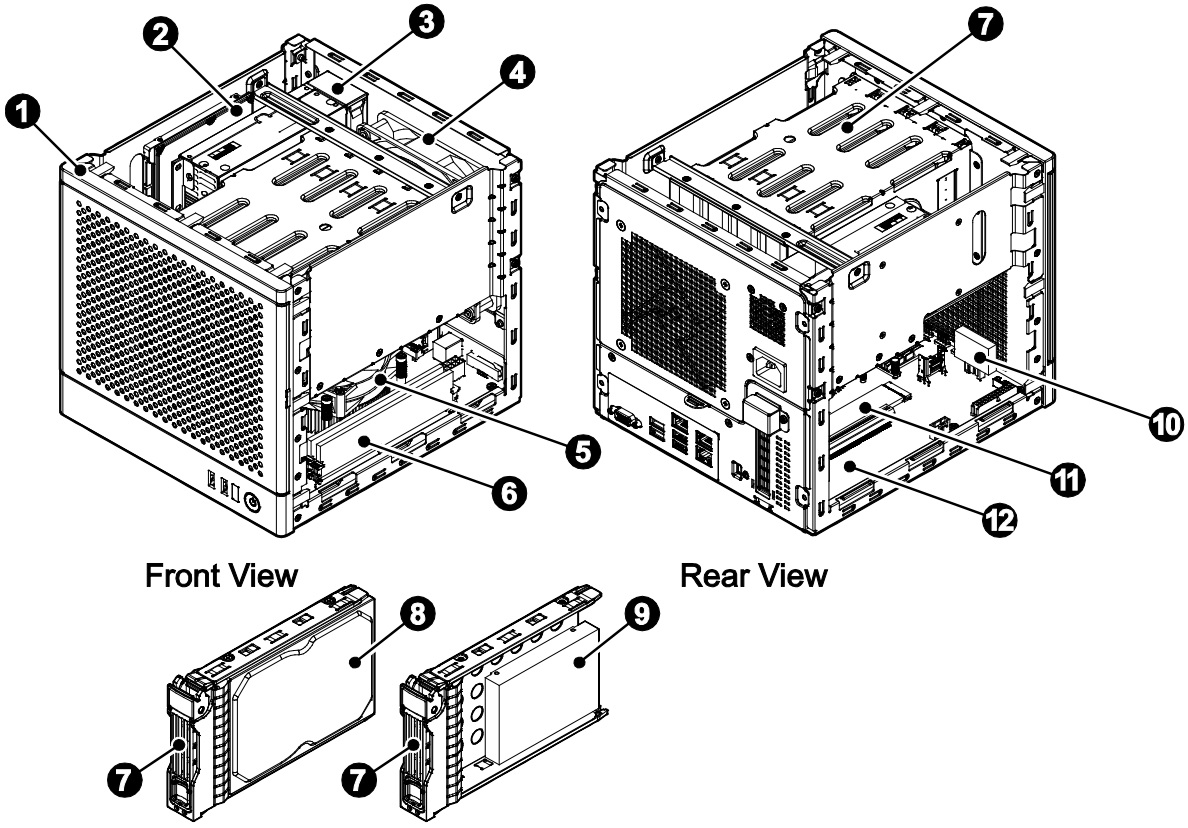


Table 3: Main View

Item	Description
1	System chassis
2	2.5" SSD (1)
3	Power supply unit
4	System fan module
5	CPU fan module
6	DIMM slot (2)
7	3.5"/ 2.5" HDD carrier (4)
8	3.5"HDD (4)
9	2.5"HDD (4) (optional)
10	SATADOM (1) (optional)
11	M.2 card
12	System board

2.1. Front Panel Components

Figure 2: Front Panel

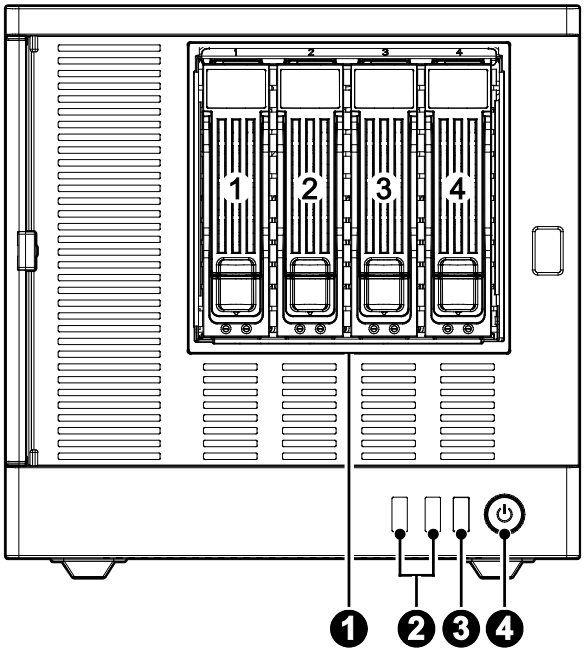


Table 4: Front View

Item	Description
1	3.5"/ 2.5" HDD bays
2	USB 3.0 (2)
3	HDD activity LED and system health LED
4	Power button

2.2. Rear Panel Components

Figure 3: Rear Panel

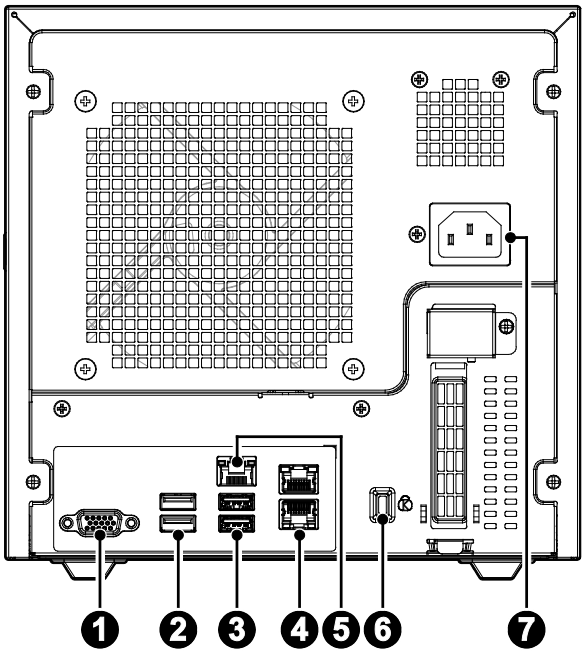


Table 5: Rear View

Item	Description
1	VGA port
2	USB 2.0 ports (2)
3	USB 3.0 (2)
4	1G RJ45 ports (2)
5	10/100 M RJ45 (BMC) port
6	Kensington security slot
7	power socket

2.3. Storage Drive LEDs

Table 6: Drive LEDs

LED Appearance	Description
Off	HDD not present or not active
Green blinking	HDD read/write activity

2.4. Board LEDs

See the following illustrations to locate the LED indicator for IPMI and RJ45 (management network).

2.4.1. RJ45

Figure 4: RJ45 Connector

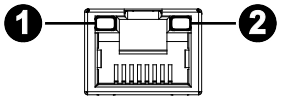


Table 7: RJ45

Item	Description
1	NIC Link Speed LED
2	NIC Link/Activity LED

Figure 5: System Board LED Indicator

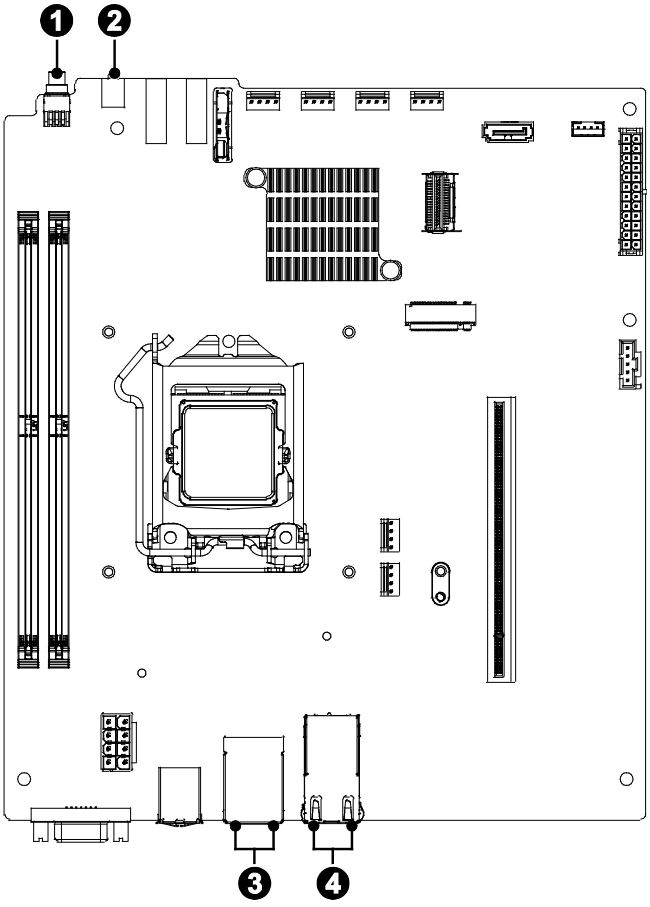


Table 8: LED Indicator

Item	Description
1	Power button

Item	Description
2	HDD activity LED and system health LED
3	10/100 M RJ45 (BMC) port – MGNT LAN
4	1G RJ45 ports – GLAN 2

Table 9: LED Function

LED Name	Voltage Sources	LED Color State		Description
S3_LED (LED 3)	P3V3_AUX	Green	On	S5 status
		—	Off	Not S5 status
GLAN 2 Active (Right)	P3V3_AUX	Green	Blink	Activity
		—	Off	Not activity
GLAN 2 Link (Left)	P3V3_AUX	Green	On	Link at 1000 Mbps
		Amber	On	Link at 10/100 Mbps
		—	Off	No link
MGNT LAN Active	P3V3_AUX	Green	Blink	LAN access
		—	Off	No traffic
MGNT LAN Link	P3V3_AUX	Amber	On	Link is OK
		—	Off	Disconnection
System power OK (LED 9)	P3V3_AUX	Amber	On	All of power OK
		—	Off	One of power is fail
Power button (SW 2)	P3V3_AUX	Green	On	DC status
		Amber	On	AC status
BMC heartbeat (LED 1)	P3V3_AUX	Green	On	BMC is ready
		—	Off	BMC is not ready
HDD activity LED (LED 12 Upper)	P3V3	Green	Blink	The drive is active
		—	Off	The drive is not active
Health LED (LED 12 Lower)	P3V3_AUX	Red	Solid	Error occur when fan, voltage, temp and other sensor abnormal event log be recorded
		Green	Solid	System is OK

2.5. System Board Components

Figure 6: Board Components

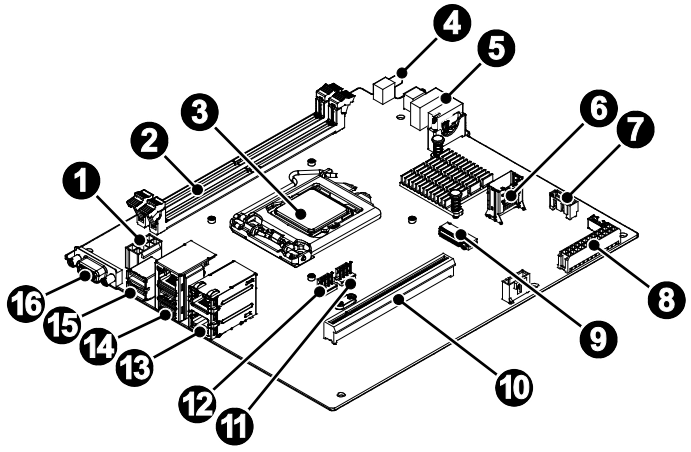


Table 10: Board Components

Item	Description
1	CPU and memory power connector
2	DIMM slot (2)
3	CPU socket
4	Power button
5	USB 3.0 (2)
6	MiniSAS connector
7	SATA connector
8	MB power connector
9	M.2 connector
10	PCIe x16 slot
11	CPU fan connector
12	System fan connector
13	1G RJ45 ports (2)
14	10/100 M RJ45 (BMC) port (1) and USB 3.0 ports (2)
15	USB 2.0 ports (2)
16	VGA port

2.6. System Components

The following figure shows specific components of the server system. See the following figure and table to become familiar with the server components.

Figure 7: System Components

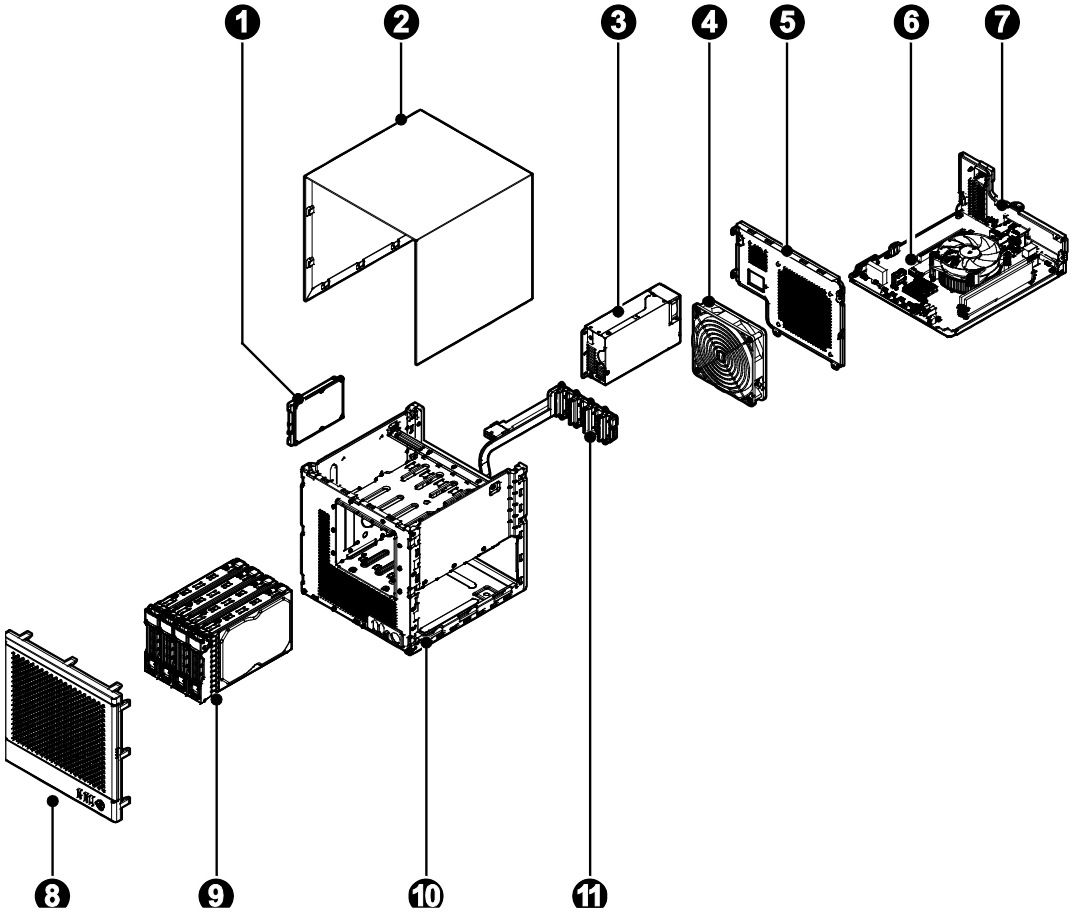


Table 11: System Components

Item	Description
1	2.5" SSD (1)
2	Top cover
3	Power supply unit
4	Fan module
5	Rear plate
6	System board
7	System board tray
8	Front panel
9	3.5"/ 2.5" HDD carrier (4)
10	Chassis

Item	Description
11	MiniSAS to 4SATA cable

3/ Operations

3.1. Powering up the Server

The following procedure assumes that at least one power cord is connected to the server to supply power to the server and that the server has been previously powered on.

1. Verify the power cord.
2. Power up the server
   - Local server power-on: Press and release the power button on the front control panel of the server to power on the server.
   - BMC web interface power-on: Log in to the BMC web interface and select power on from the power control action list box.
   - Log in to the BMC CLI and execute the IPMI command to power on system.

3.2. Powering down the Server

The following procedures display how to shut down the server and verify the power status.

3.2.1. Shutting down the Server

3.2.1.1. Graceful Shutdown

- To perform a graceful shutdown: Save all open files, network service, and close all applications prior to shut down.
- Stop or terminate all necessary system processes to bring down the operating system and power off the compute node.
- Press and release the power button on the front panel of ACPI-enabled (Advanced Configuration and Power Interface) operating systems to perform the operating system instructions (hibernation or orderly shutdown).

3.2.1.2. Emergency Shutdown

⚠CAUTION **All applications and files will be closed without saving changes, file system corruption might occur.**

To perform an emergency shutdown, press and hold down the power button on the front panel for at least five seconds to shut down and enter show down mode.

3.2.1.3. BMC CLI Shutdown

Log in to the BMC and execute the IPMI command to shut down the server.

4/ Installation

4.1. Safety Measures

Static electricity discharges can damage computer components and electronic circuit boards. Working on computers that are still connected to a power supply can be extremely dangerous. Follow these guidelines to avoid self-injury and damage to the computer:

- Always disconnect the server from the power outlet when working inside of the computer case.
- If possible, wear a grounded wrist strap when working inside the computer case. Alternatively, discharge any static electricity by touching the bare metal chassis of the computer case, or the bare metal body of any other grounded appliance.
- Hold electronic circuit boards only by the edges. Do not touch the components on the board unless it is necessary to do so. Do not flex or stress the circuit board.
- Leave all components inside the static-proof packaging until ready to use the component for the installation.

4.2. Identifying the Contents of the Server Shipping Carton

Unpack the server shipping carton and locate the materials for installing the server.

The contents of the server shipping carton include:

- Server
- Power cord (optional)

In addition to the supplied items, you might need:

- Operating system or application software
- Hardware options

4.3. Front Panels

Figure 8: Opening a Front Panel

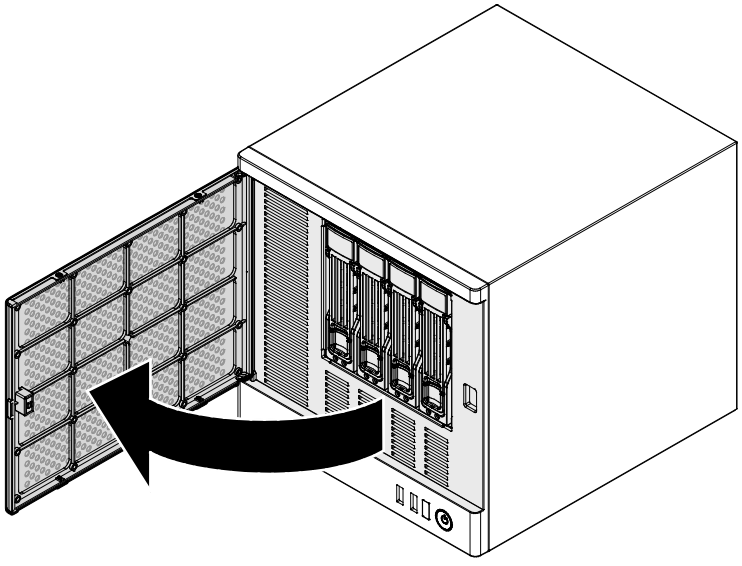
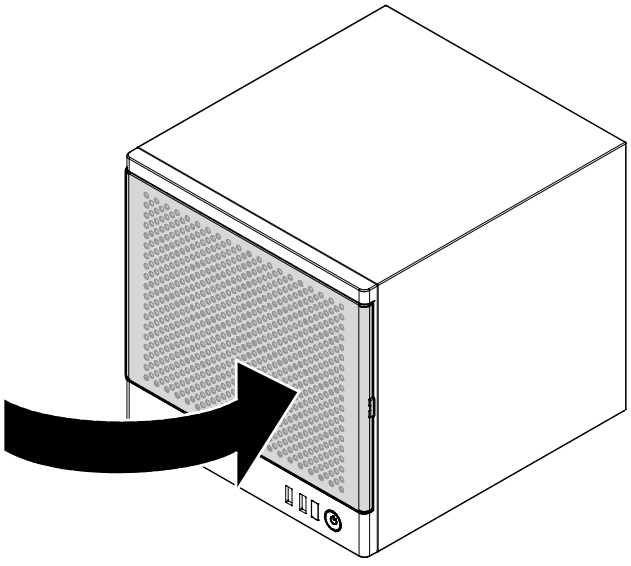


Figure 9: Closing a Front Panel



4.4. Hard Disk Drives

Figure 10: Removing an HDD Assembly

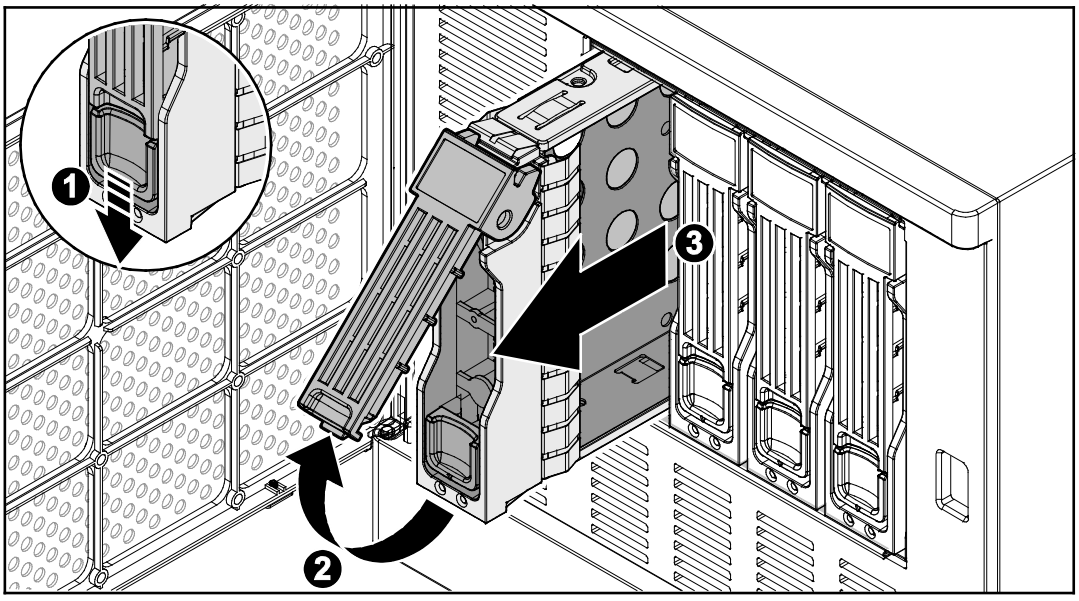
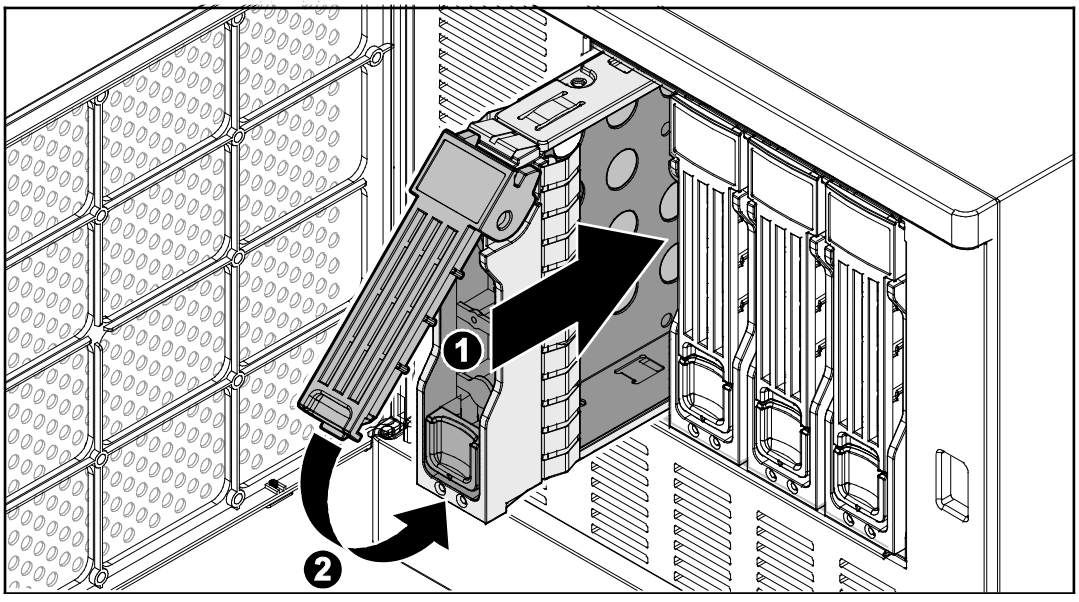


Figure 11: Installing an HDD Assembly



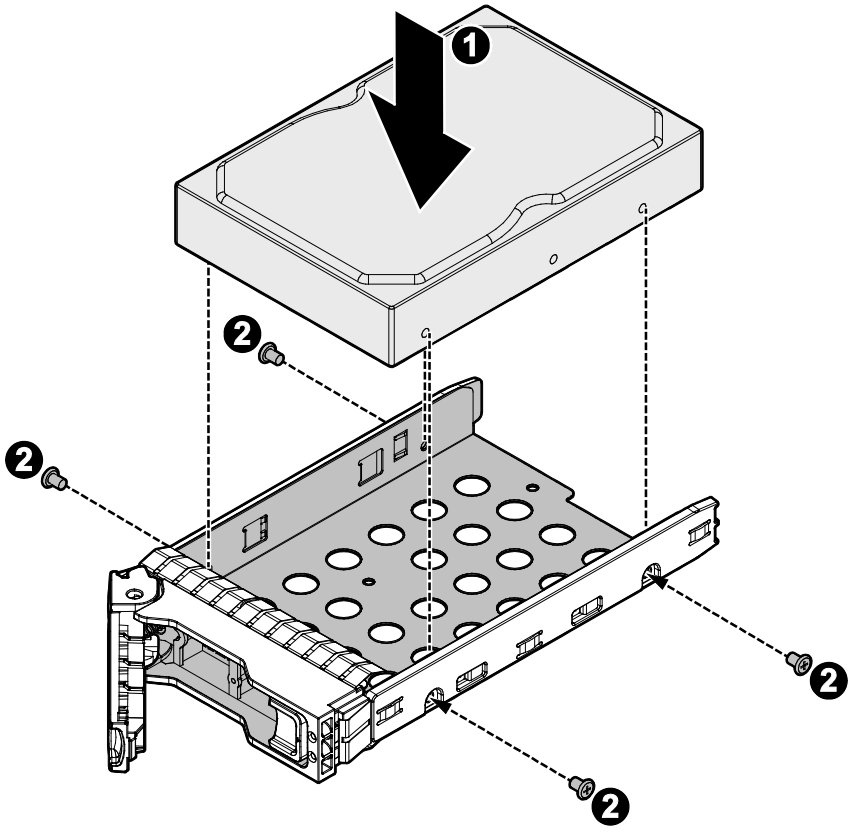
Verify that the drive is fully seated.

4.5. Installing a 3.5" HDD Module

To install a 3.5" HDD module:

1. Open the front panel.
2. Remove the HDD assembly from the chassis.
3. Align the HDD in the HDD carrier with the connectors facing the opening of the carrier.
4. Secure the HDD and the HDD carrier with screws.

Figure 12: Installing 3.5" HDD



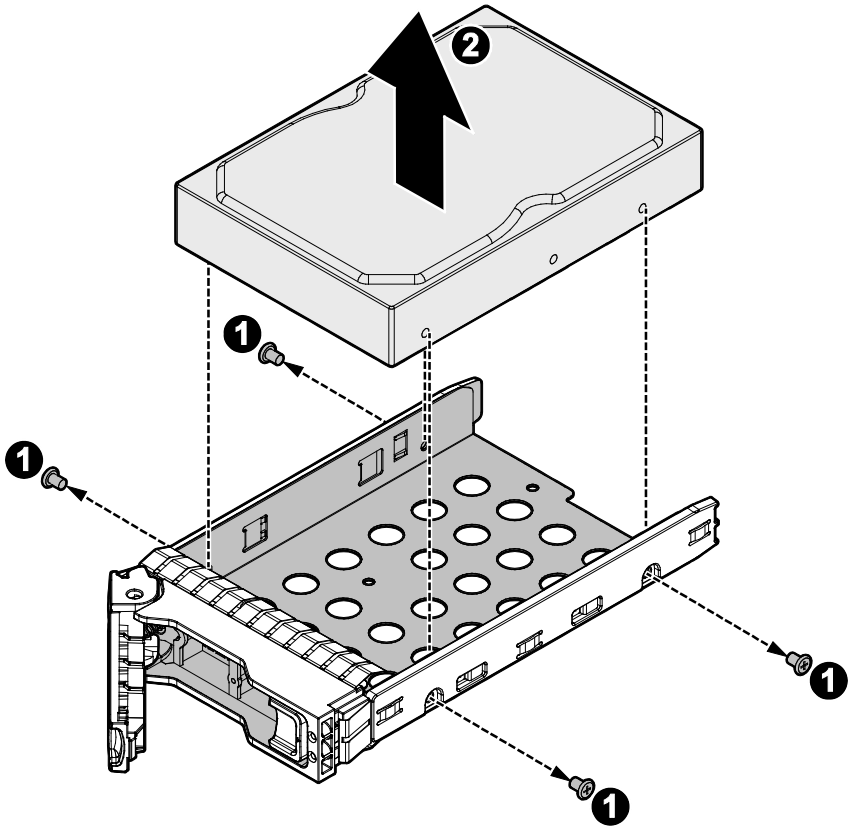
5. Install the HDD assembly in the chassis.
6. Close the front panel.

4.6. Removing a 3.5" HDD Module

To remove a 3.5" HDD module:

1. Open the front panel.
2. Remove the HDD assembly from the chassis.
3. Remove the screws securing the HDD from the HDD carrier.
4. Remove the HDD from the HDD carrier.

Figure 13: Removing a 3.5" Module

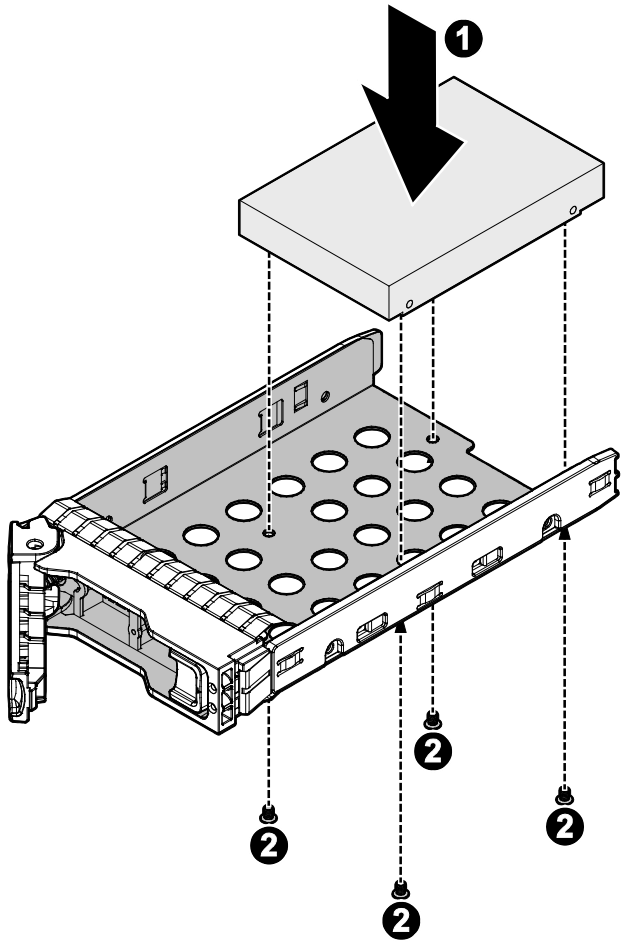


4.7. Installing a 2.5" HDD module

To install a 2.5" HDD module:

1. Open a front panel.
2. Remove the HDD assembly from the chassis.
3. Align the HDD in the HDD carrier with the connectors facing the opening of the carrier.
4. Secure the HDD and the HDD carrier with screws.

Figure 14: Installing a 2.5" HDD



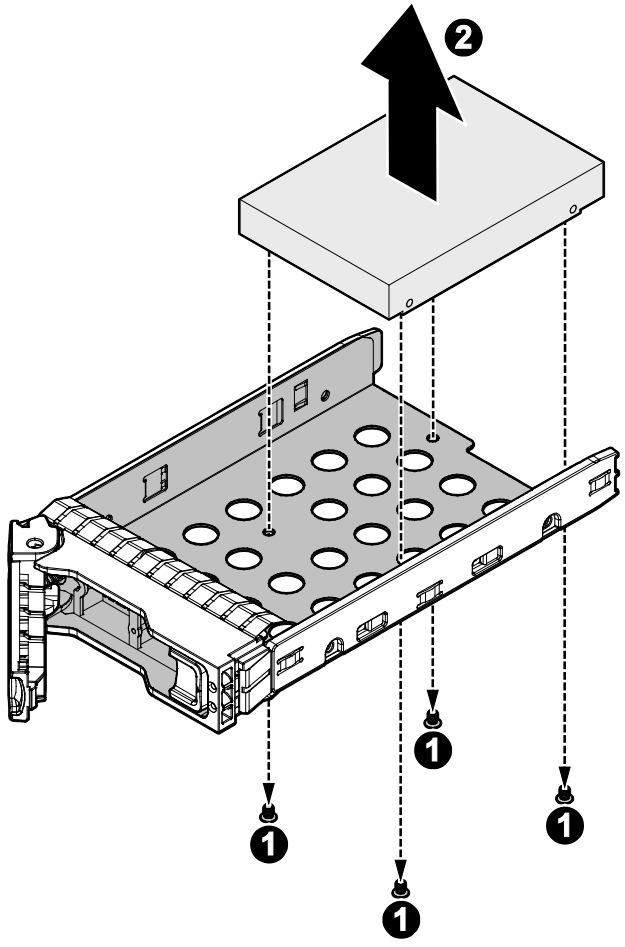
5. Install the HDD assembly in the chassis.
6. Close the front panel.

4.8. Removing a 2.5" HDD module

To remove a 2.5" HDD module:

1. Open the front panel.
2. Remove the HDD assembly from the chassis.
3. Remove the screws securing the HDD from the HDD carrier.
4. Remove the HDD from the HDD carrier.

Figure 15: Removing a 2.5" HDD



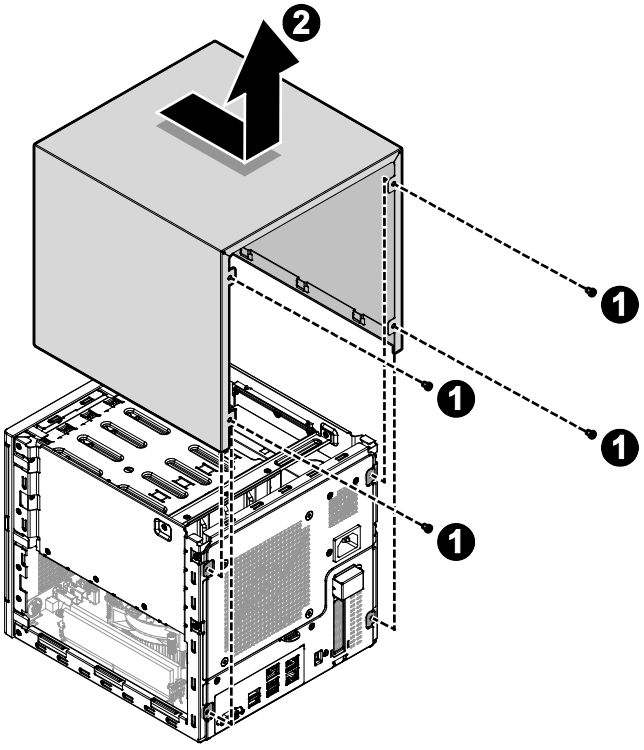
4.9. Top Cover

4.9.1. Removing a top Cover

To remove a top cover:

1. Power off the server, and then detach the power cord from the power supply.
2. Remove the screws securing the top cover and the chassis.
3. Pull and remove the top cover.

Figure 16: Removing a top Cover

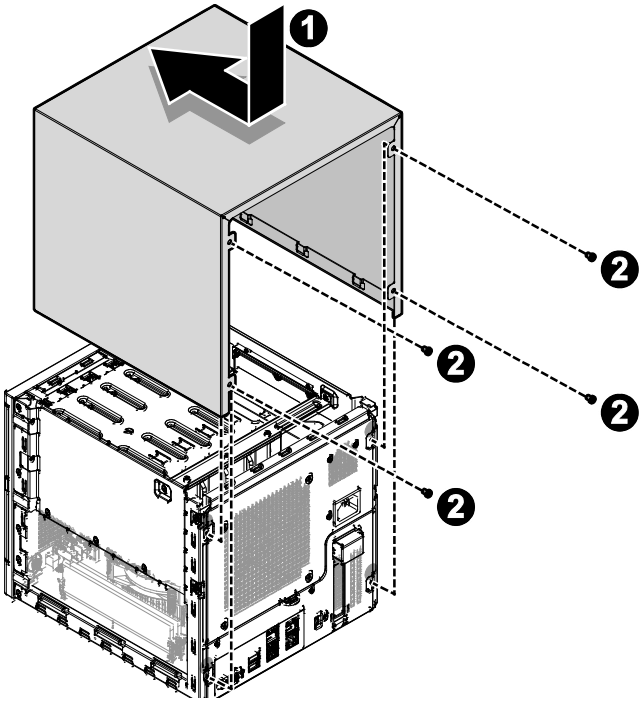


4.9.2. Installing a top Cover

To install a top cover:

1. Align the top cover over the chassis.
2. Slide the top cover as shown in the following illustration. Make sure the top cover is flush with the front of chassis.
3. Secure the top cover and the chassis with screws.

Figure 17: Installing a top Cover



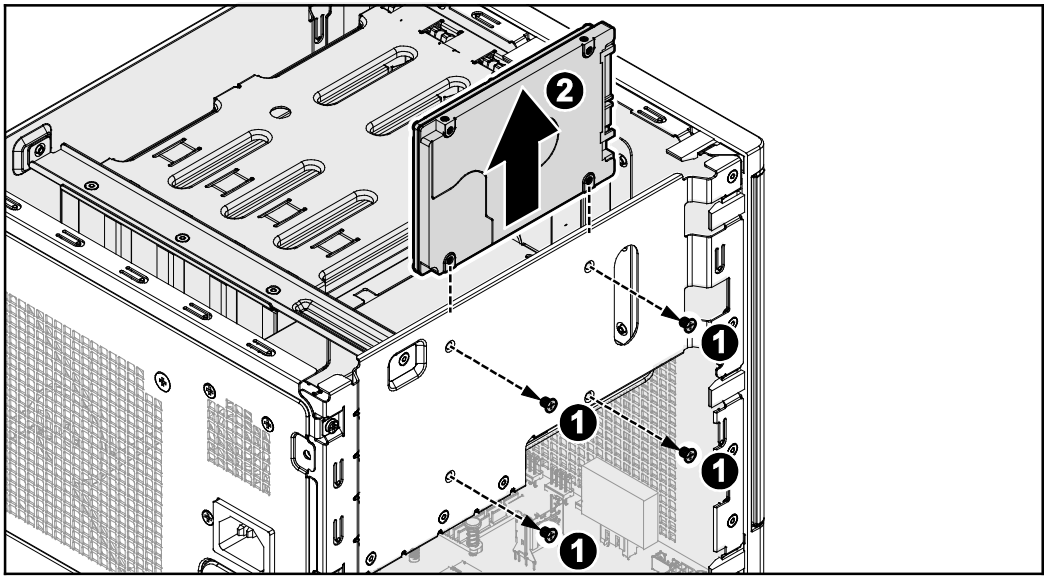
4.10. Solid State Drives

4.10.1. Removing an SSD Module

To remove an SSD module:

1. Power off the server, and then detach the power cord from the power supply.
2. Remove the top cover.
3. Remove the screws securing the SSD and the chassis.
4. Remove the SSD.

Figure 18: Removing an SSD

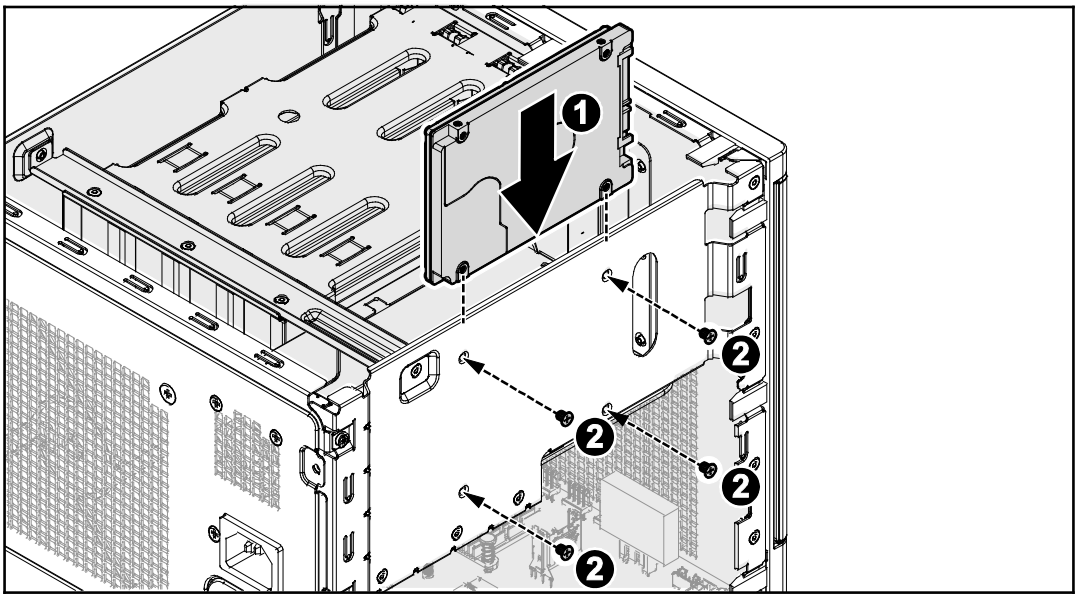


4.10.2. Installing an SSD Module

To install an SSD module:

1. Insert the SSD and align the screw holes on SSD with the holes on chassis.
2. Secure the SSD and the chassis with screws.

Figure 19: Installing an SSD



3. Install the top cover.

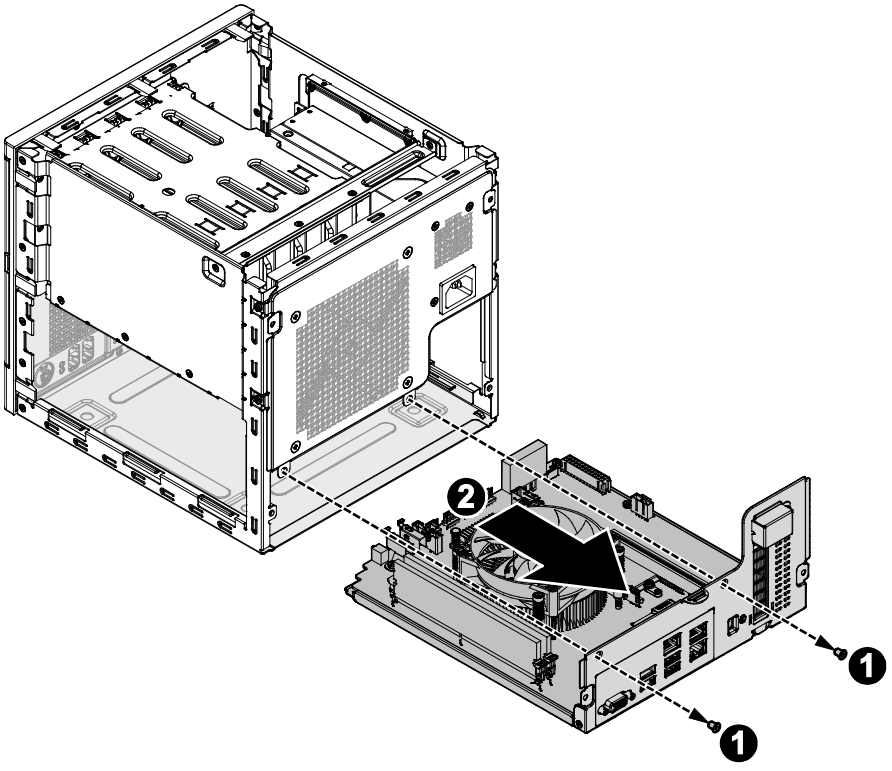
4.11. System Board Trays

4.11.1. Removing a System Board Tray

To remove a system board tray:

1. Power off the server, and then detach the power cord from the power supply.
2. Remove the top cover.
3. Remove the screws securing the system board tray and the chassis.
4. Pull the system board out a little and then disconnect all the cables from the system board.
5. Remove the system board tray.

Figure 20: Removing a Board Tray



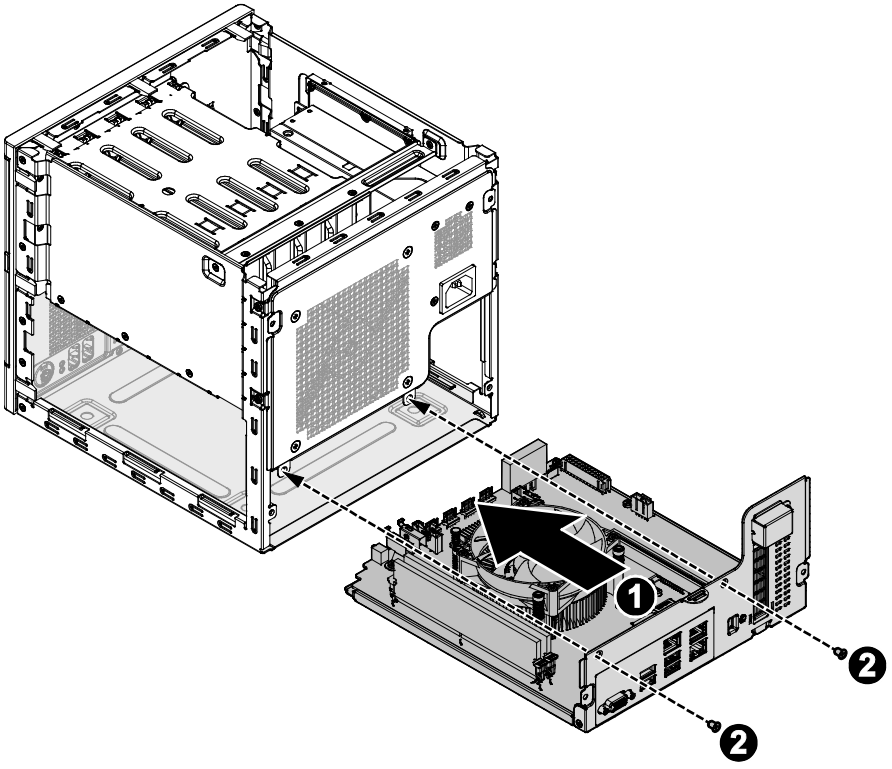
4.11.2. Installing a System Board Tray

⚠CAUTION **To prevent damage to the system board, do not force the system board assembly into the chassis.**

To install a system board tray:

1. Align the system board assembly with the chassis bay. Make certain the system board components are clear of the chassis when installing the system board.
2. Slide the system board into the chassis a little. Connect all the cables to the system board, and then slide the system board assembly into the chassis. Make sure the system board assembly is flush with the chassis.
3. Secure the system board tray and the chassis with screws.

Figure 21: Installing a System Board Tray



1. Install the top cover.

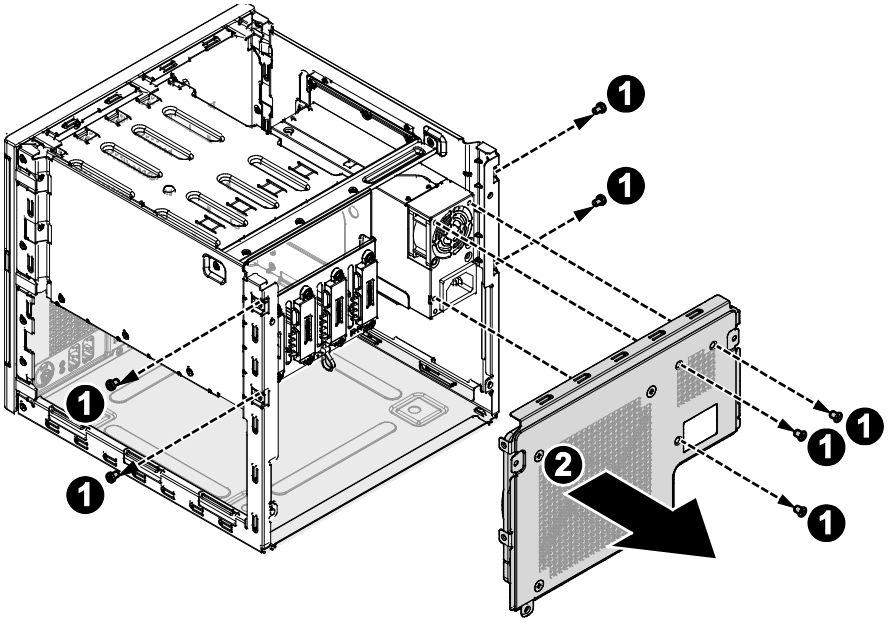
4.12. Rear Plates

4.12.1. Removing a Rear Plate

To remove a rear plate:

1. Power off the server, and then detach the power cord from the power supply.
2. Remove the top cover.
3. Remove the system board tray.
4. Remove the screws securing the rear plate and the chassis.
5. Remove the rear plate.

Figure 22: Removing a Rear Plate

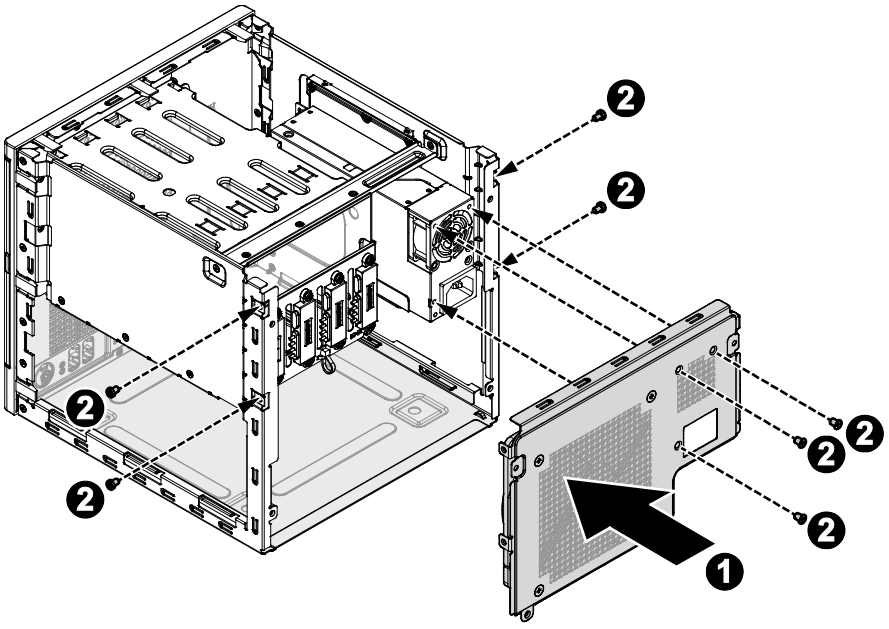


4.12.2. Installing a Rear Plate

To install a rear plate:

1. Align the screw holes on rear plate with the holes on chassis.
2. Secure the rear plate and the chassis with screws.

Figure 23: Installing a Rear Plate



1. Install the system board tray.
2. Install the top cover.

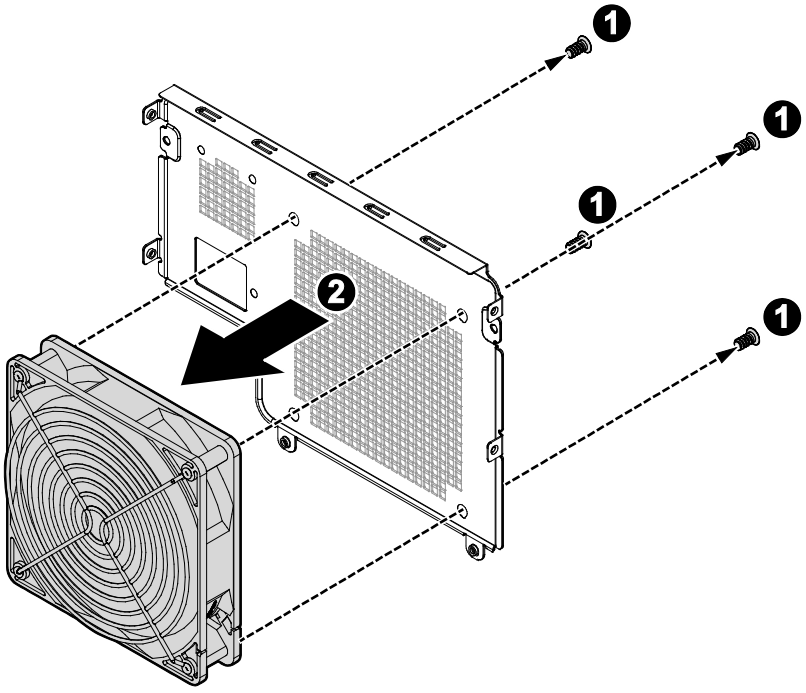
4.13. System Fan Modules

4.13.1. Removing a System Fan Module

To remove a system fan module:

1. Power off the server, and then detach the power cord from the power supply.
2. Remove the top cover.
3. Remove the system board tray.
4. Remove the rear plate.
5. Remove the screws securing the system fan module and the rear plate.
6. Remove the system fan module.

Figure 24: Removing a Fan Module

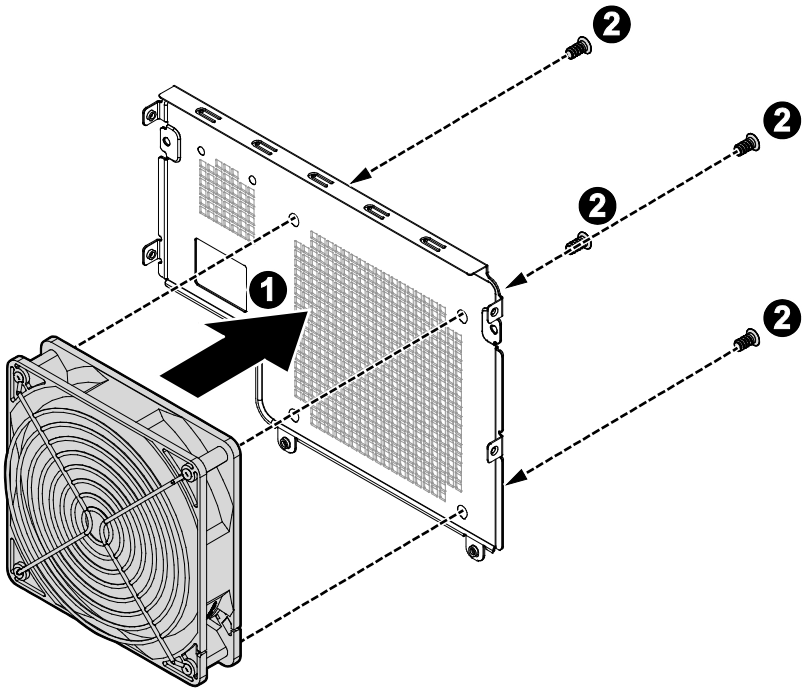


4.13.2. Installing a System Fan Module

To install a system fan module:

1. Align the screw holes on the system fan module with the holes on rear plate.
2. Secure the system fan module and the rear plate with screws.

Figure 25: Installing a Fan Module



3. Install the rear plate.
4. Install the system board tray.
5. Install the top cover.

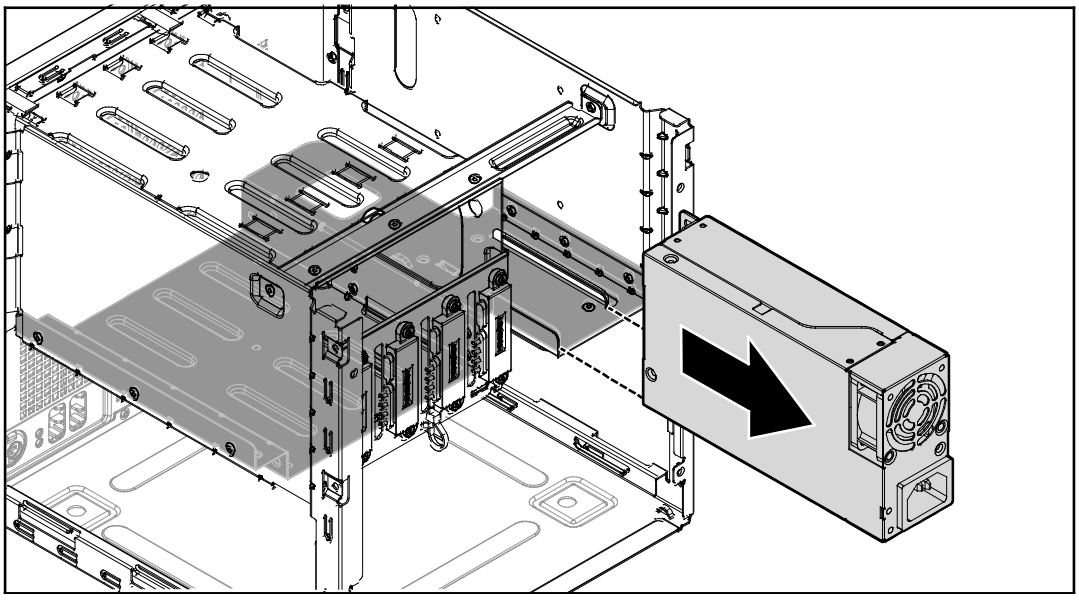
4.14. Power Supply Units

4.14.1. Removing a Power Supply Unit

To remove a power supply unit:

1. Power off the server, and then detach the power cord from the power supply.
2. Remove the top cover.
3. Remove the system board tray.
4. Remove the rear plate.
5. Slide and remove the power supply unit.

Figure 26: Removing a Power Supply

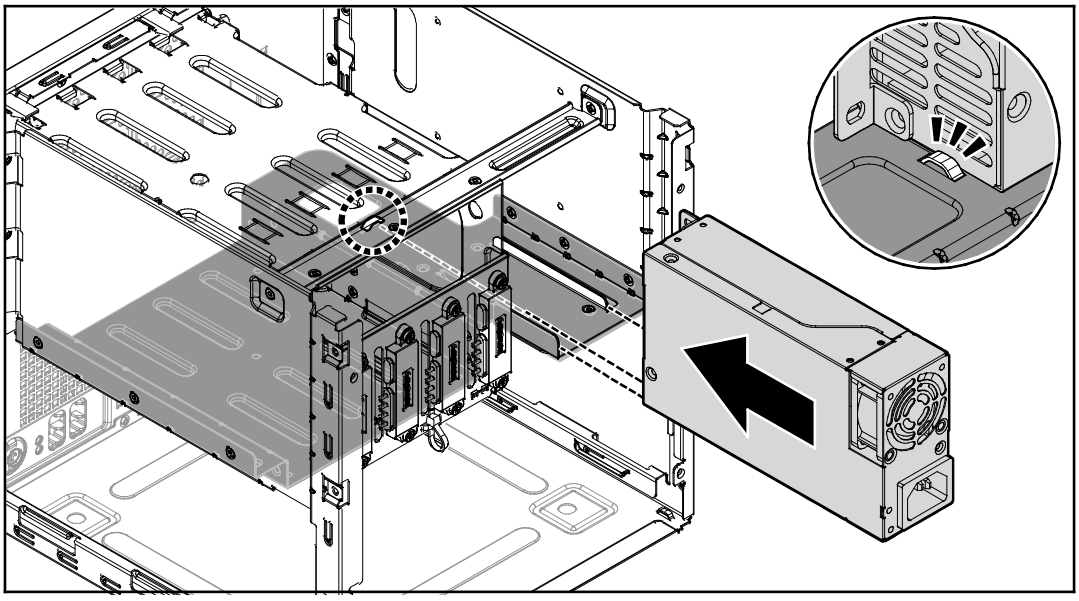


4.14.2. Installing a Power Supply Unit

To install a power supply unit:

1. Slide in the power supply until it is fully seated in the PSU bay.

Figure 27: Installing a Power Supply



2. Install the rear plate.
3. Install the system board tray.
4. Install the top cover.

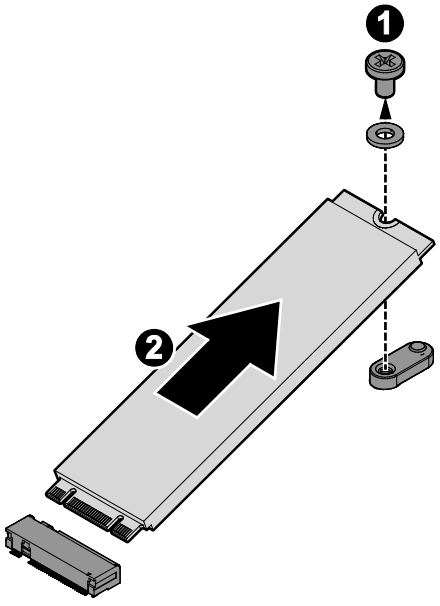
4.15. M.2 Cards

4.15.1. Removing a M.2 Card

To remove a M.2 card:

1. Power off the server, and then detach the power cord from the power supply.
2. Remove the top cover.
3. Remove the system board tray.
4. Remove the screw and washer securing the M.2 card and M.2 holder.
5. The M.2 card pops up. Grasp it by the edges and slide it out.

Figure 28: Removing a M.2 Card

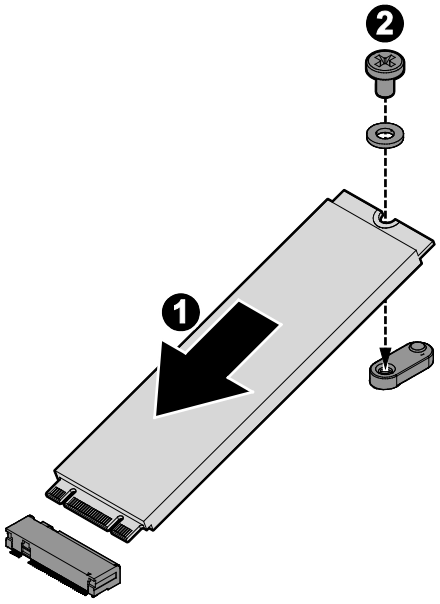


4.15.2. Installing a M.2 Card

To install a M.2 card:

1. Align the connector on the M.2 with the connector on the server board. Make sure the slits are aligned with the protrusions on the connector.
2. Insert the M.2 card into the connector on the server board.
3. Install the washer.
4. Secure the M.2 card M.2 holder with the screw.

Figure 29: Installing a M.2 Card



5. Install the system board tray.
6. Install the top cover.

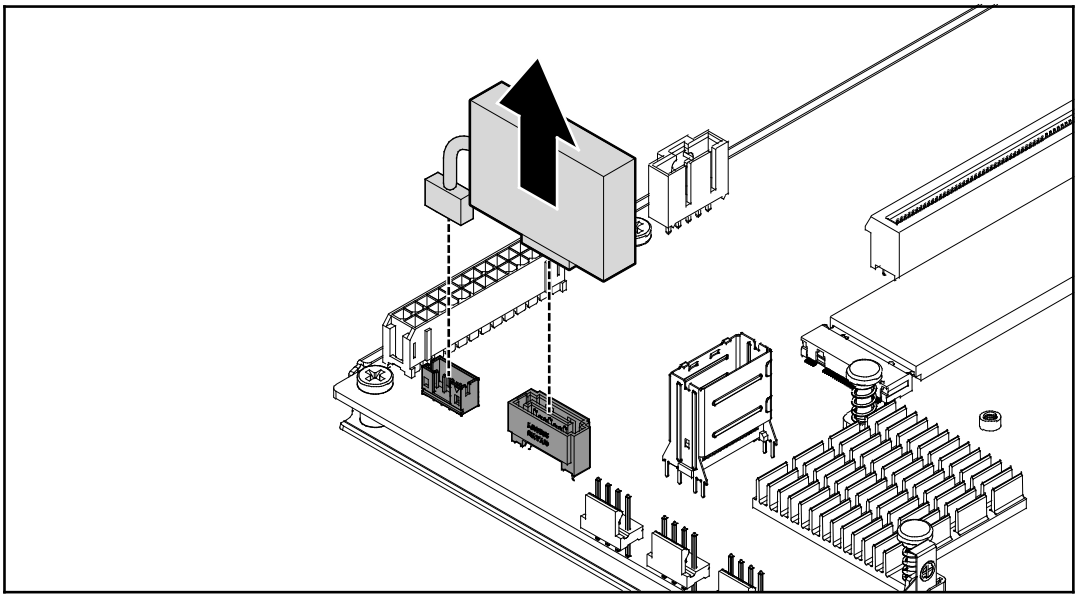
4.16. SATADOMs

4.16.1. Removing a SATADOM

To remove a SATADOM:

1. Power off the server, and then detach the power cord from the power supply.
2. Remove the top cover.
3. Remove the system board tray.
4. Disconnect the SATADOM power cable connecting to the system board.
5. Remove the SATADOM.

Figure 30: SATADOMs

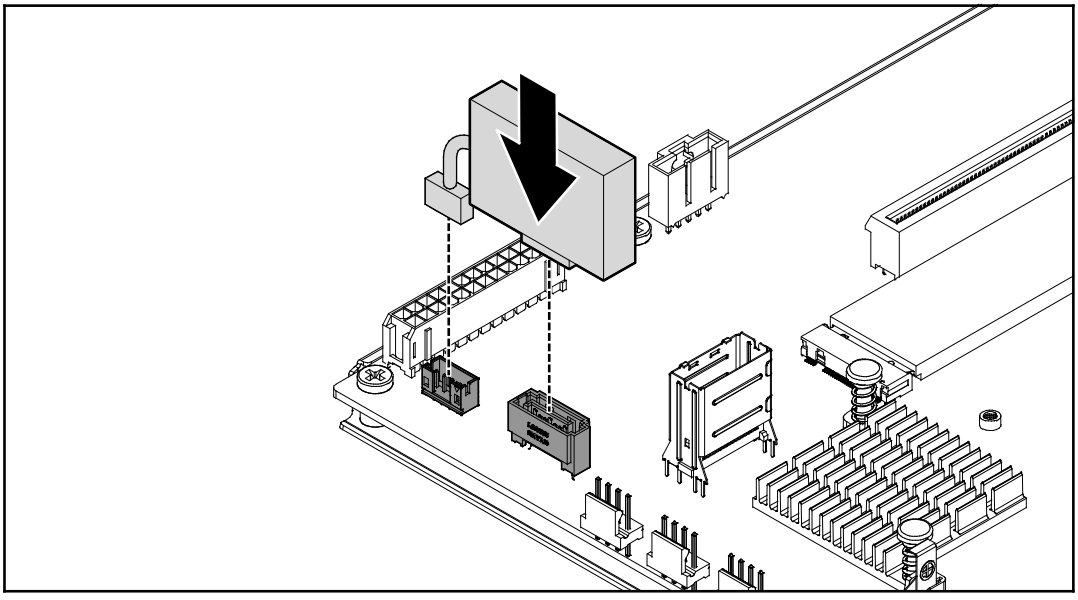


4.16.2. Installing a SATADOM

To install a SATADOM:

1. Align the connectors on SATADOM with the connectors on the system board.
2. Install the SATADOM gently.
3. Connect the SATADOM power cable to the system board.

Figure 31: Installing a SATADOM



4. Install the system board tray.
5. Install the top cover.

4.17. Memory Modules

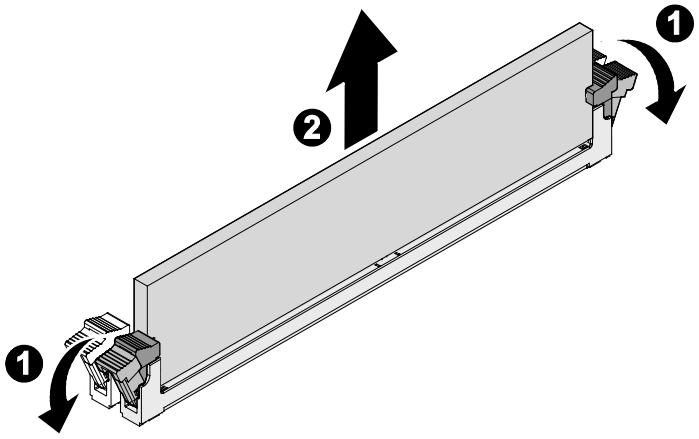
4.17.1. Removing a Memory Module

The system board includes two DIMM slots for the installation of DDR4 2133/2400 MHz memory.

To remove a memory module:

1. Power off the server, and then detach the power cord from the power supply.
2. Remove top cover.
3. Remove the system board tray.
4. Push the locking latches of the DIMM slot downward and outward to eject the memory module.
5. Remove the memory module.

Figure 32: Removing a Memory Module



6. Repeat the process for the additional memory modules.

4.17.2. Installing a Memory Module

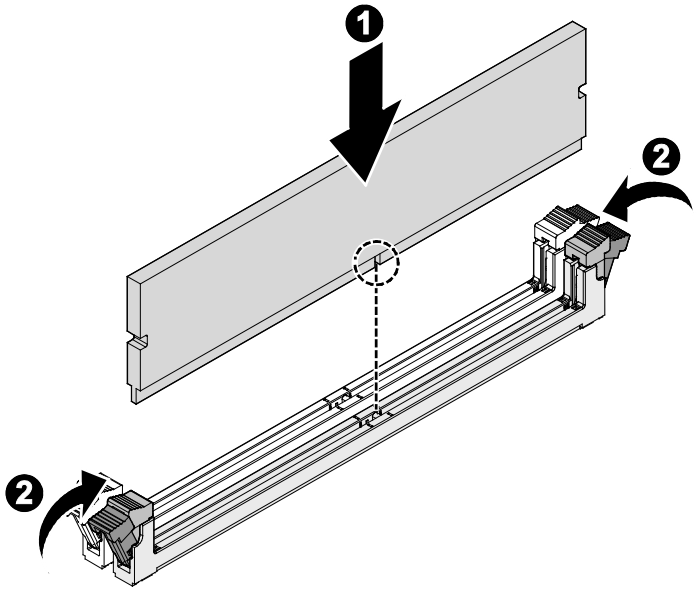
The system board includes 2 DIMM slots for the installation of DDR4 2133/2400 MHz memory.

To install a memory module:

1. Pull the locking latches of the DIMM slot outward.
2. Place the memory module into the socket so the notch and obstruction are aligned.
3. Press the edge connector of the memory module into the slot.

Press down firmly so that the locking latches of the DIMM slot are levered upward to secure the memory module.

Figure 33: Installing a Memory Module



4. Repeat for the additional memory modules.
5. Install the system board tray.
6. Install the top cover.

4.18. Heat Sinks

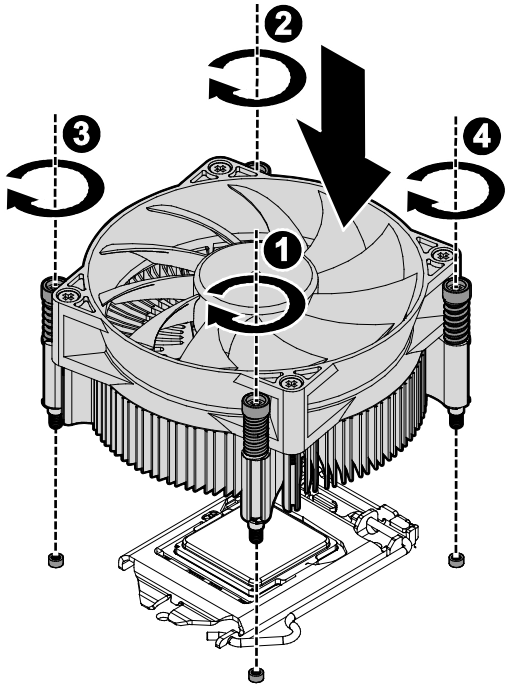
Active heat sinks cool processors. To achieve optimal cooling performance, the underside of the heat sink must be properly attached to the processor with TIM. The mechanical performance of the heat sink is designed to meet the requirements of Intel processors. The heat sink is necessary to maintain CPU temperature at or below temperature limits.

4.18.1. Installing a Heat Sink

To install a heat sink:

1. Place the heat sink on top of the CPU, until it is seated firmly in place.
2. Tighten the four retaining screws clockwise, in the order shown, to secure the heat sink.

Figure 34: Installing a Heat Sink



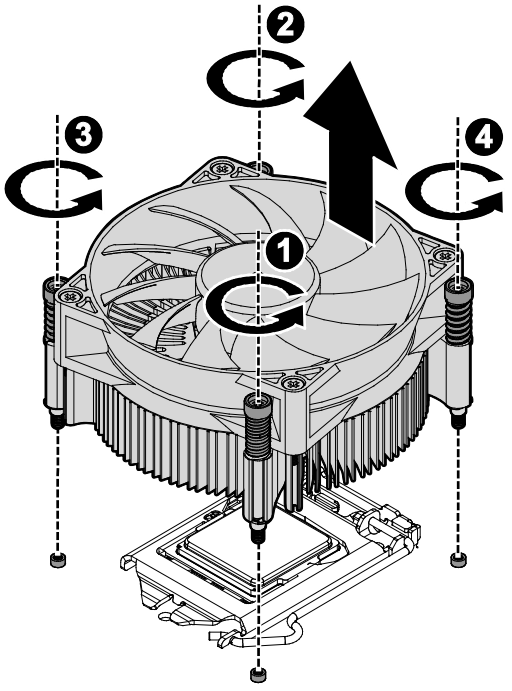
3. Connect the CPU fan cable to the system board.
4. Install the system board tray.
5. Install the top cover.

4.18.2. Removing a Heat Sink

To remove a heat sink:

1. Power off the server, and then detach the power cord from the power supply.
2. Remove the top cover.
3. Remove the system board tray.
4. Disconnect the CPU fan cable from the system board.
5. Loosen the four screws in the order shown.
6. Remove the heat sink.

Figure 35: Removing a Heat Sink



4.19. Processor

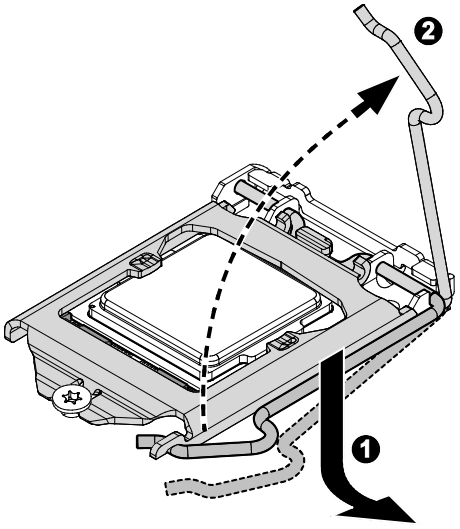
4.19.1. Removing a Processor

⚠CAUTION **ESD protection must be worn during the procedure to avoid damaging the components.**

To remove a processor:

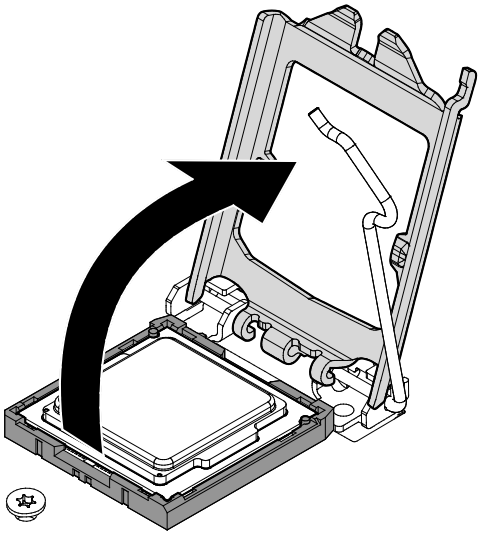
1. Power off the server, and then detach the power cord from the power supply.
2. Remove the top cover.
3. Remove the system board tray.
4. Remove the heat sink.
5. Press downward and outward on the right processor locking lever, pulling it fully open.

Figure 36: Removing a Processor



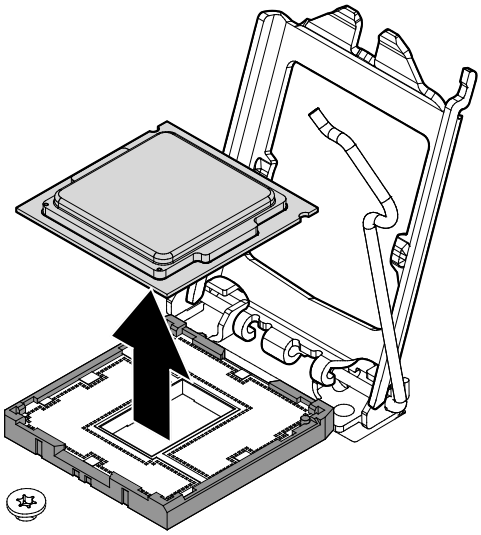
6. Lift the processor load plate to the fully open position.

Figure 37: Push first the right Processor Locking up and then then lift the processor Load plate



7. Lift the processor out of the socket.

Figure 38: Lifting the Processor



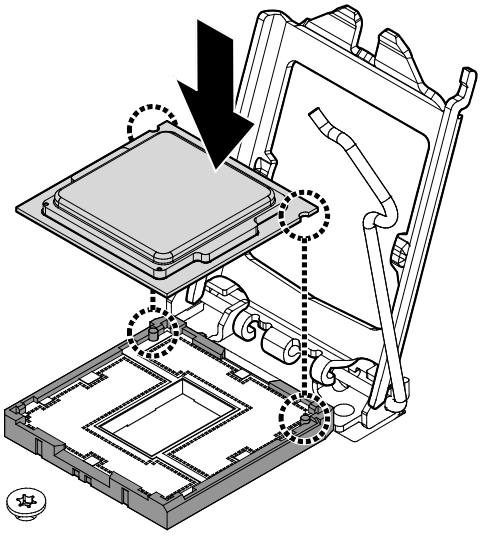
4.19.2. Installing a Processor

⚠CAUTION ESD protection must be worn during the procedure to avoid damaging the components.

To install a processor:

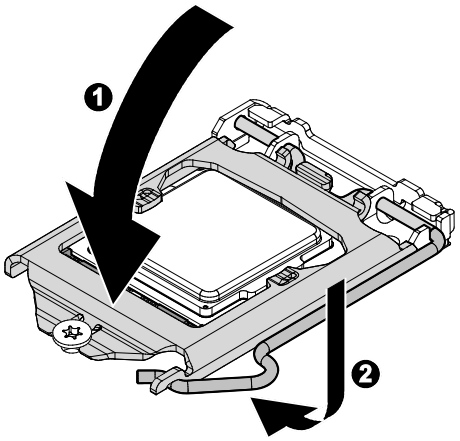
1. Align the indents on processor with the corresponding tabs on socket.
2. Insert the processor into the socket, being sure that the four keys on the socket fit into the corresponding keys on the processor.

Figure 39: Installing a Processor



3. Lower the processor load plate over the processor.
4. Push the right processor locking lever down and latch it into the locked position.

Figure 40: Push the right Processor Locking down



5. Install the heat sink.
6. Install the system board tray.
7. Install the top cover.

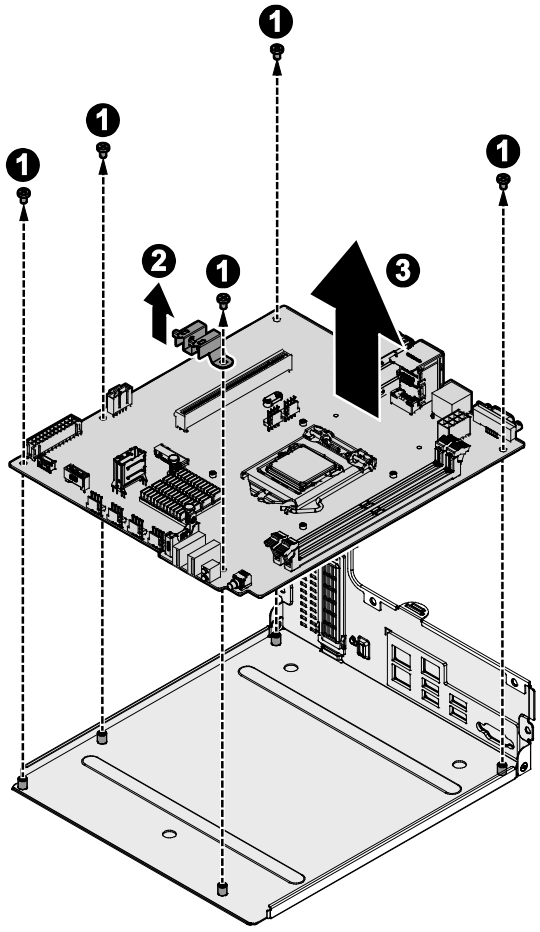
4.20. System Board Module

4.20.1. Removing a System Board Module

To remove a system board module:

1. Power off the server, and then detach the power cord from the power supply.
2. Remove the top cover.
3. Pull the system board tray out a little and then disconnect all the cables from the system board.
4. Remove the system board tray from the chassis.
5. Remove the M.2 card.
6. Remove the memory modules.
7. Remove the heat sink.
8. Remove the processor.
9. Remove the screws securing the system board and the system board tray.
10. Remove the USB cover from the system board.
11. Lift the front of the system board and pull it away from the rear of the system board tray. Make sure the I/O ports clear of the system board tray before lifting the system board.
12. Remove the system board.

Figure 41: Removing a Board Module

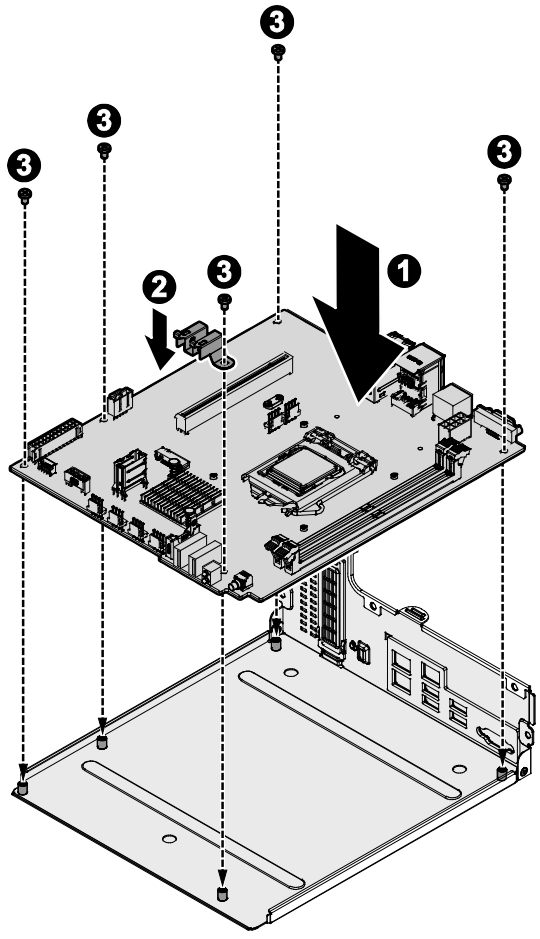


4.20.2. Installing a System Board Module

To install a system board module:

1. Align the I/O ports on the system board with the slots on the system board tray.
2. Slide the system board into position. Make sure the I/O ports are seated correctly.
3. Lower the system board onto the system board tray. Make sure the screw holes on the system board and system board tray are aligned.
4. Install the USB cover onto the system board.
5. Secure the system board to the system board tray with screws.

Figure 42: Installing a System Board Module



6. Install the processor.
7. Install the heat sink.
8. Install the memory modules.
9. Install the M.2 card.
10. Install the SATADOM.
11. Install the system board tray.
12. Connect the cables to the system board.
13. Install the top cover.

4.21. Powering on and selecting Boot Options

1. Connect the Ethernet cable.
2. Press Power On/Standby.
3. During the initial boot:
   - To modify the BIOS default settings, press DEL or ESC when prompted from the start-up sequence to enter the BIOS setup utility. By default, the BIOS setup utility runs in the English language.
   - It is not necessary to modify the server configuration, press F11 during system boot to select the boot device for system software installation.
4. To enter PXE boot:
   - Press the DEL or ESC when prompted from the start sequence.
   - After pressing DEL or ESC, the BIOS setup menu displays. Choose Advanced → CSM Configuration and configure Network Option ROM execution order (choose Legacy or UEFI based on the current BIOS mode).

   NOTE: To check the current BIOS mode, select Boot → Boot mode in the BIOS setup menu.
   NOTE: If the current BIOS mode is UEFI,it is necessary to enable the Network Stack via the BIOS setup menu Advanced → Network Stack Configuration → Network Stack → Enabled (default setting is Disabled)

   - Press F4 to save configuration and exit.
   - After reboot, press F11 when prompted from the start sequence.
   - If the current BIOS mode is UEFI, select UEFI:IPv4/6 Onboard Network Port 1/2 to boot from PXE.
   - If the current BIOS mode is Legacy, select BRCM MBA Slot to boot from PXE.

4.22. Installing the Operating System

To operate properly, the server must have a supported OS.

To install an OS on the server, use one of the following methods. Once the installation is complete, you may need to reboot the system.

- Local installation (USB key or USB optical disc)
- Remote deployment installation (PXE, virtual KVM)

5/ Cabling

5.1. Internal System Cable Routing

The server internal cable routing is listed in the following figure and table:

Figure 43: PSU Cable Routing

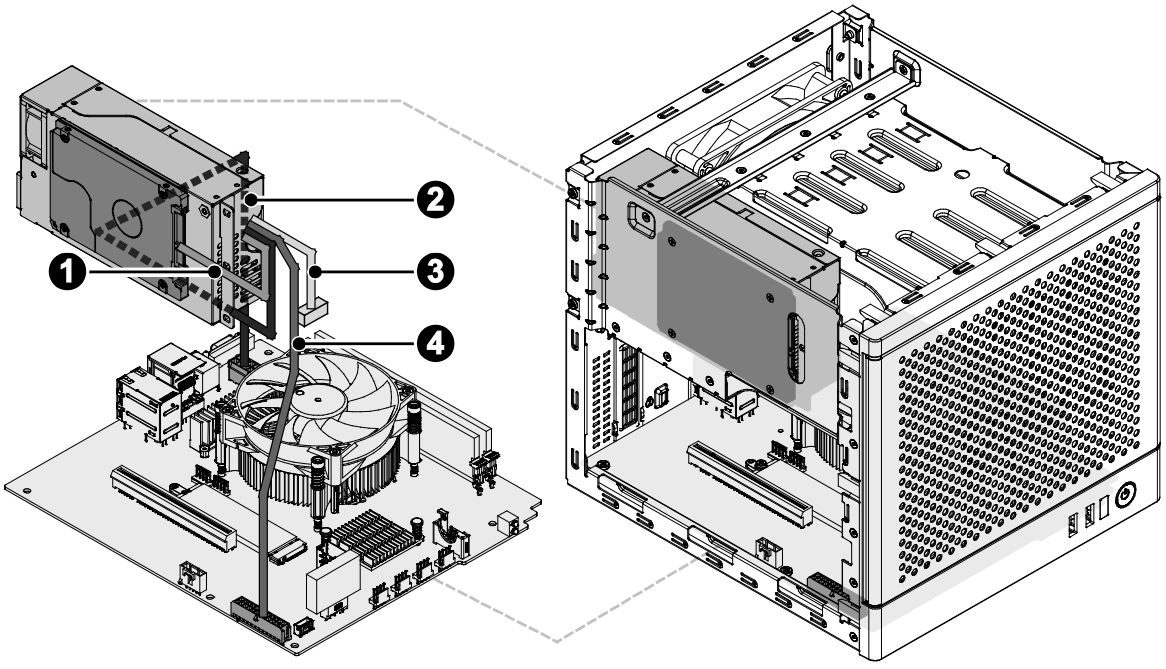


Table 12: Cable Routing

Item	Description	Quantity
1	PSU 1x5-pin cable	1, from PSU to SSD
2	PSU 2x4-pin cable	1, from PSU to system board
3	PSU 2x5-pin cable	1, from PSU to miniSAS power cable
4	PSU 2x12-pin cable	1, from PSU to system board

Figure 44: System Fan and CPU Fan Cable Routing

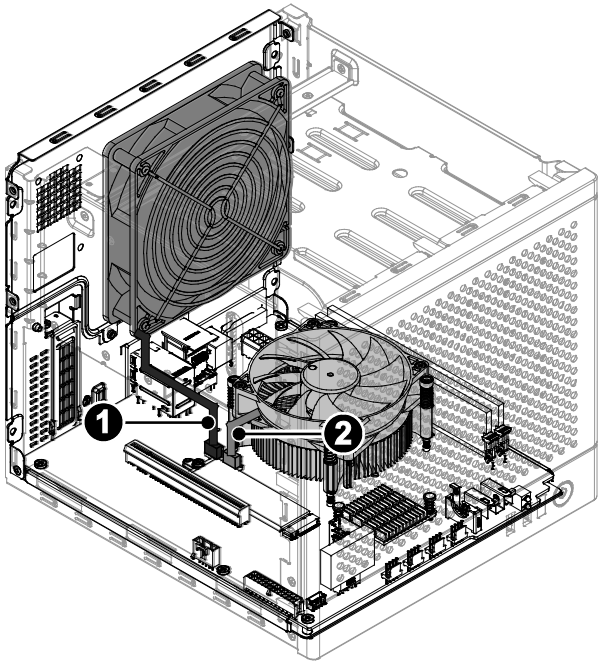


Table 13: Fan Cables

Item	Description	Quantity
1	System fan cable	1, from fan module to system board
2	CPU fan cable	1, from heat sink to system board

Figure 45: MiniSAS Cable Routing

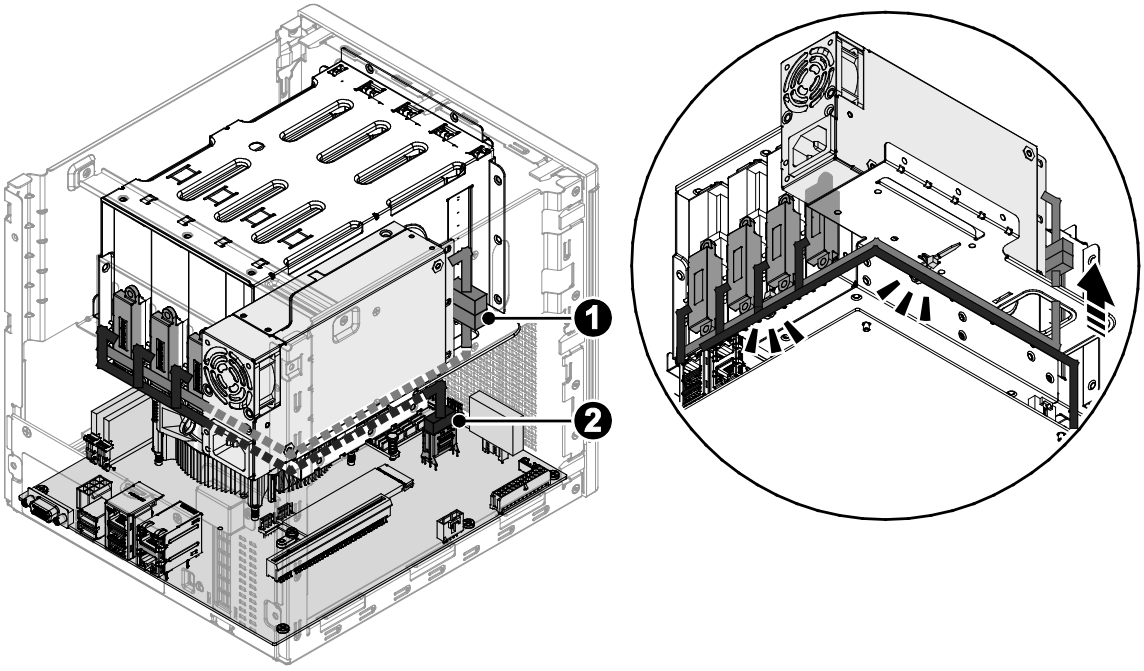


Table 14: SAS Power Cables

Item	Description	Quantity
1	MiniSAS power cable	1, from HDD to PSU cable
2	MiniSAS signal cable	1, from HDD to system board

Figure 46: SSD SATA Cable routing

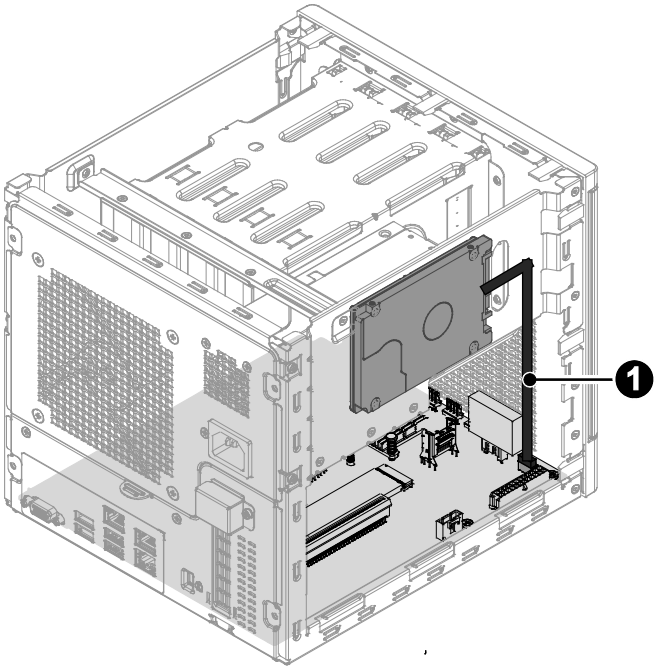


Table 15: SATA Cable

Item	Description	Quantity
1	SSD SATA cable	1, from SSD to system board J48

6/ Configuration

6.1. BMC

6.1.1. WebGUI Introduction

The WebGUI is a friendly interface for the end users. A user can access the iBMC via a web browser, and then go through the server status and do many configurations to the IBMC.

The default user privilege is set to administrator. The web function access rights are determined by different privileges. For example, the administrator privilege can access all functions, but the user privilege cannot.

The WebGUI provides many useful functions, such as:

- firmware update
- system power control
- system event log (SEL)
- current sensor reading
- configuration for: BMC network, user accounts, PEF, alerts, SOL, information about BMC, and the system

6.1.2. IP Address

Static and DHCP are the two common IP sources of iBMC. The default setting is DHCP. The detailed IP address information is available from the BIOS setup menu.

6.1.3. User Name and Password

A user name and password are required to establish a WebGUI session. The user should also have accessibility to the LAN channel. Use the system management software to set the user name, password, and grant access. The default setting is shown below:

- ID 2: User Name = admin Password = admin

6.1.4. Web Browser

iBMC supports either Microsoft Internet Explorer or Firefox.

The embedded web server provides full access. The WebGUI is accessible via the HTTP protocol or via the encrypted HTTPS protocol.

6.1.5. Logging in

To log in to the WebGUI, enter the iBMC IP address into a web browser. An example of using the HTTP protocol is http://192.168.1.1. An example of using the encrypted HTTPS protocol is https://192.168.1.1

6.1.6. Updating the Firmware

Many common problems can be resolved by updating the firmware. The BMC FW can be updated through a host-based utility or through the WebGUI.

6.1.6.1. Restoring the Default Configuration

The BMC FW supports an OEM command to restore all of the configuration values to their defaults. Using the OEM command restores all IPMI configuration parameters and all Linux user configuration files (password, group, and so on). The OEM command is not available to the end user, but the WebGUI provides a friendly interface to do this. This command does not restore the SEL records.

End-users may choose to restore the default configuration when updating firmware through the utilities or the WebGUI.

The default configuration should be selected when SDR is changed.

6.1.6.2. BMC FW Version

The "`Get Device ID`" command (`NetFn Application, Command 1`) reports the firmware revision. The "`Get Device ID`" command also reports the auxiliary firmware revision.

6.1.6.3. Updating BMC using Linux

To update BMC using Linux:

1. Log into Linux.
2. Open the terminal.
3. Create new directory "/work", command:

```
mkdir /work
```

4. Copy the BMC FW package to the /work directory using the command:

```
cp file_name.zip /work
```

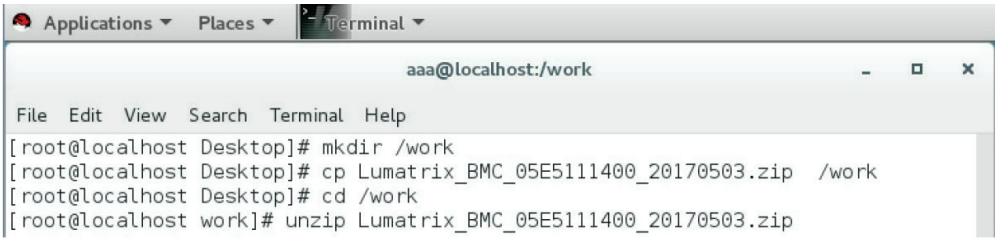
5. Enter directory using the /work, command:

```
cd /work
```

6. Uncompress the BMC FW package using the command:

```
upzip file_name.zip
```

Figure 47: Linux Terminal



7. Enter directory of uncompressed before, command:

```
cd file_name/Linux/Linux_x86_64
```

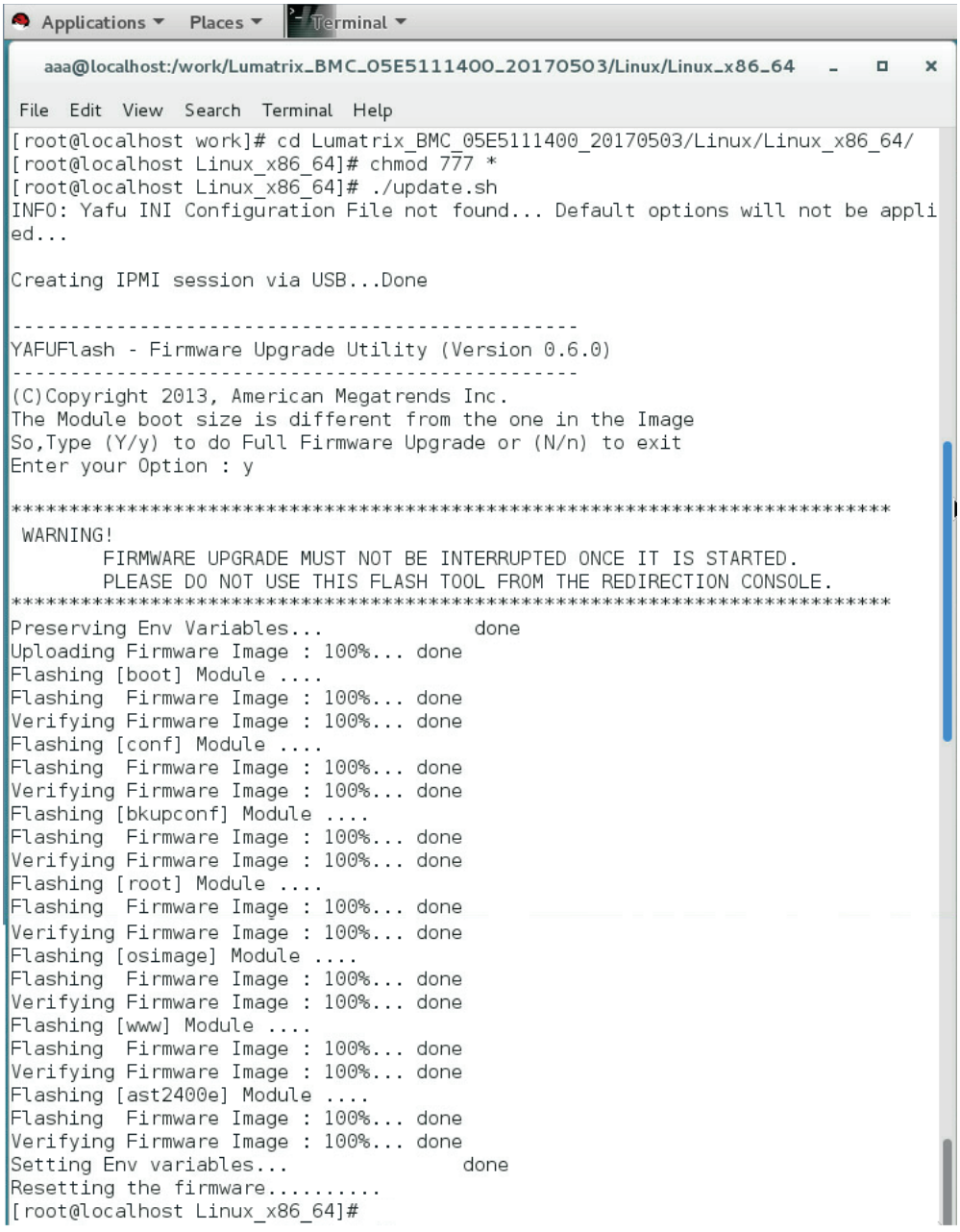
8. Add execute permission for file_name, command:

```
chmod 777 *
```

9. Execute `./update.sh` to update BMC.

10. The following screen shot shows that BMC successfully updated.

Figure 48: BMC updated

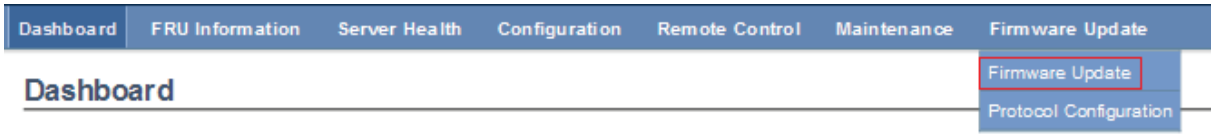


6.1.6.4. Updating BMC via a WebGUI

To update BMC using the WebGUI:

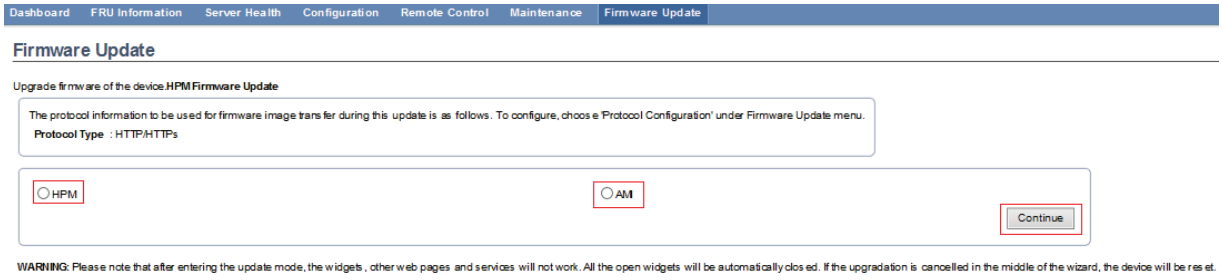
1. Log into the WebGUI using a web browser.
2. Select the **Firmware Update** menu and click the **Firmware Update** button.

Figure 49: Firmware Update



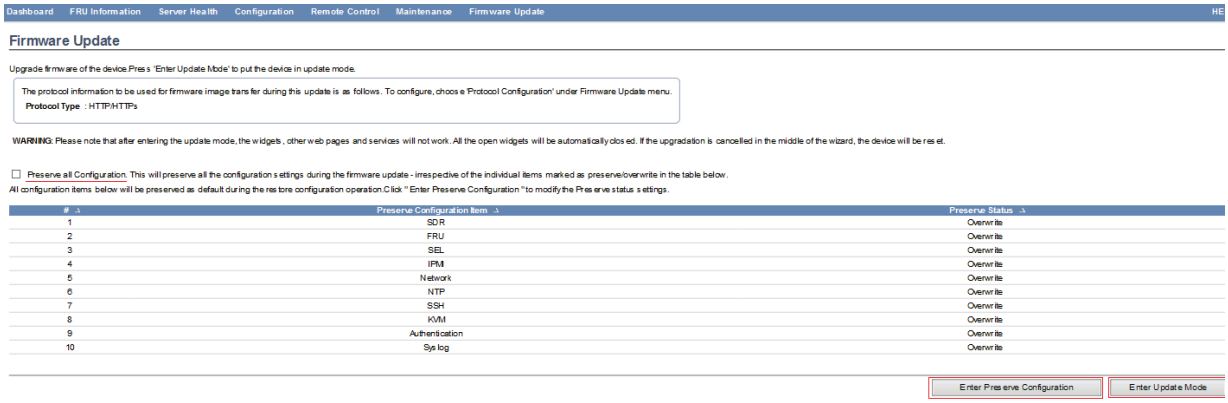
3. Select **HPM** or **AMI**. Then click **Continue**.

Figure 50: Select HPM or AMI



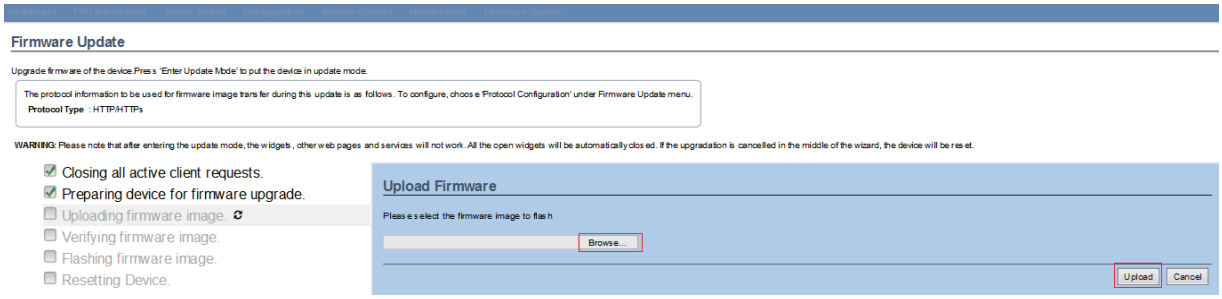
By default, all configuration items will be overwritten while firmware Update. If you want to change the specific configuration that needs to be preserved, please click **Enter Preserve Configuration** button to configure. If not, please click **Enter Update Mode** button.

Figure 51: Enter Update Mode



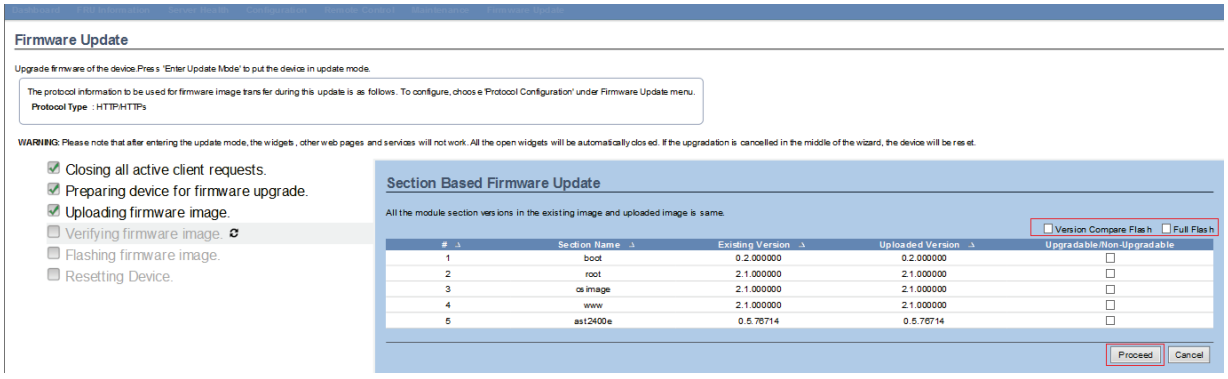
4. After you click the **Enter Update Mode** button, please click **Browse…** button to select the firmware image to flash. If the file is invalid, a message from webpage window will notify you. If the file is valid, click **Upload** button.

Figure 52: Click Update



5. Select checkbox Version Compare Flash or Full Flash, click **Proceed** button to start the actual upgrade operation, or click **Cancel** button, the process will be terminated. After upgrade successfully, the device will be reset.

Figure 53: Click Proceed



6. When the upgrade is completed, the device will reset automatically.

Figure 54: Device has been reset



6.2. BIOS Settings

There are eight menus in the BIOS setup utility, which appear in the following order: Main, Advanced, Chipset, Server Mgmt, GPNV Logs, Security, Boot, and Save & Exit. Use the arrow keys to navigate the menus or options that are listed on the menu. Configurable menu options or fields appear in color. For further instructions about how to navigate and change settings in the BIOS setup utility, see the on-screen instructions that are provided on the menu.

6.2.1. BIOS Setup Menus

The following table provides descriptions for the top-level BIOS setup menus.

Table 16: BIOS Menus

BIOS Menu	Description
Main	General product information including BIOS/memory information, and time/date.
Advanced	Configuration information for the serial port console redirection, CPU, SATA, SIO, network stack, CSM, NVMe, USB, WHEA, PXE retry configuration, Power restore on Loss.
Chipset	Configuration information for server platform service, system agent and PCH-IO.
Server Mgmt	BMC self-test status, BMC firmware version, timer settings and timeout behavior, system event log setting, view FRU information, BMC network settings, view system event Log and BMC warm reset.
GPNV Logs	SMBIOS Event log Setting and View SMBIOS event logs.
Security	Set or change the user, administrator passwords, HDD security configuration and safe mode configuration.
Boot	Configure setup Prompt Timeout, bootup numlock state, quiet boot, new boot option policy, boot mode select and the boot device priority.
Save & Exit	Save changes and exit, discard changes and exit, save changes and reset, discard changes and reset; save changes, discard changes, restore defaults and boot options.

6.2.2. POST Error Message

There are three methods to treat the event/errors detected during POST:

- Log to SMBIOS
- Log to SEL
- Shown on-screen during POST

Table 17: SMBIOS Event Log

SMBIOS Event Log	Description
0x07	POST memory resize
0x08	POST errors
0x10	System limit exceeded
0x16	Log area reset
0x17	System boot
0xFF	End of log
0x80	IDE device failed
0x81	Flash device update operation failed
0x82	No more PCI resources available
0x83	No space for any more legacy OPROM

SMBIOS Event Log	Description
0x84	Invalid password entered three times
0x85	Clear CMOS

Table 18: System Event Log (POST)

Sensor Name	Sensor Type	Sensor Number	E/R Type	Event Data1	Event Data2	Event Data3	Description
BIOS POST Sensor	0x0F	0x09	0x6F	0xC0	0x01	0xFF	System firmware error. No system memory is physically installed in the system.
	0x0F		0x6F	0xC0	0x02	0xFF	System firmware error. No usable system memory, all installed memory has experienced an unrecoverable failure.
	0x0F		0x6F	0xC0	0x0A	0xFF	System firmware error. No video device detected.
	0x07		0x6F	0x02	0xFF	0xFF	FRBI/BIST failure.
	0x10		0x6F	0x04	0xFF	0xFF	SEL full.

6.2.3. Entering the Pop-up Boot Menu

To enter the pop-up boot menu, press **F11** during system boot when the Press **F11** `to enter Popup Boot Menu` message displays.

The pop-up boot menu screen displays as shown in the following figure.

Table 19: Select Boot Device

Please select boot device:
<device list> Enter Setup
↑ And ↓ to move selection ENTER to select boot device ESC to boot using defaults

6.2.4. Entering PXE Boot

To access PXE boot:

1. Set **Network Option ROM** execution order in the BIOS setup menu.
2. Set Network as the first boot device in the BIOS setup menu.
3. Select Network device from the pop-up boot menu.

6.2.5. Entering the BIOS Setup Menu

The BIOS setup menu is accessible using the following method:

- Connect a USB keyboard, mouse, and VGA monitor directly to the server.

NOTICE

The BIOS setup menu can be accessed through the BMC virtual KVM.

To access the BIOS setup utility menus:

1. Press the power button on the front control panel to power up the server.
2. Press DEL or ESC during system boot when the Press <DEL> or <ESC> to enter setup displays.
3. Use the left and right arrow keys to navigate the different menu options. When a menu option is selected, the top-level screen for that option appears.
4. Use the up and down arrow keys to scroll up and down to select an item on a top-level screen. When the up and down arrow keys are pressed, the only options that are highlighted are the options that can be modified.
   - If an item can be modified, user instructions for modifying the option appear in the right column of the screen.
   - If an item is a link to a sub-screen, a prompt to press Enter to access the sub-screen appears in the right column.
5. Modify the setup item and press F4 to save the changes and exit the screen.
6. Follow the instructions on the Save & Exit menu screen to save or discard your changes and exit the BIOS setup utility.

6.2.6. BIOS Maintenance

This section provides information about upgrading the BIOS, clearing the BIOS password, clearing CMOS, and a BIOS jumper description.

6.2.6.1. Upgrading the BIOS using DOS

The flash memory update utility loads a fresh copy of the BIOS into flash ROM. This utility only updates the BIOS region.

BIOS update utility: AFUDOS.EXE

Boot the system to DOS environment and execute the following command to update BIOS:

AFUDOS <BIOS ROM File Name>[Option 1][Option 2]
or
AFUDOS<Output BIOS ROM File Name><Commands>

- Commands

Use the mandatory field to select an operation mode.

- /O Save current ROM image to file
- /U Get and display ROM ID from BIOS ROM file
- /S Refer to Option: /S
- /D Verification test of given ROM File without flashing BIOS.
- Options

Use the optional field to supply more information for flashing the BIOS ROM. The following lists the supported optional parameters and format:

- /P Program main bios image
- /B Program Boot Block
- /N Program NVRAM
- /E Program Embedded Controller block if present
- /K Program all non-critical blocks
- /Kn Program n'th non-critical block only (0>= n <=7)
- /Q Quiet mode enable
- /REBOOT Reboot after update BIOS done
- /X Do not check ROM ID

- /S Display current system's BIOS ROM ID
- /R Preserve all SMBIOS structures during NVRAM programming.
- /Rn Preserve SMBIOS type N during Boot Block programming.
- /ECUF Update EC BIOS when newer version is detected.
- /Shutdown Shutdown after programming.
- Rules
- Any parameter enclosed by <> is a mandatory field.
- Any parameter enclosed by [ ] is an optional field.
- <Commands> cannot co-exist with any [Options].
- The main BIOS image is the default flashing area if no options are present.
- [/REBOOT], [/X], and [/S] automatically enables the [/P] function automatically.
- If [/B] is present alone, only the boot block area needs to be updated.
- If [/N] is present alone, only the NVRAM area needs to be updated.
- If [/E] is present alone, only the embedded controller block needs to be updated.

Table 20: Flash Commands

Flash Command	Description
afudos XXXX.ROM /P	Program main BIOS image
afudos XXXX.ROM /P /B	Program main BIOS and BB (Boot Block)
afudos XXXX.ROM /P /B /N	Program main BIOS, BB and NVRAM
afudos XXXX.ROM /P /B /R	Program BB and main BIOS without SMBIOS

6.2.6.2. Clearing the BIOS Password

If the user and/or administrator password is lost or forgotten, clear both passwords by moving the password clear jumper into the clear position.

The BIOS determines if the password clear jumper is in the clear position during BIOS POST and clears any passwords if necessary. The password clear jumper must be restored to its original position for the new password to remain set.

6.2.6.3. Clearing the CMOS

The CMOS clear jumper uses RTCRST# to:

- Clear CMOS values.
- Set the RTC power well configuration bits to default.

To compatible legacy BIOS for user who is used to use legacy BIOS, BIOS provide the function to restore the default settings of BIOS Setup when CMOS is cleared, even though UEFI BIOS store BIOS settings to NVRAM.

There are two methods to clear the CMOS:

- Clear the CMOS jumper.
- Remove the CMOS battery when the system is in AC OFF status.

NOTICE

Important: After clearing the CMOS, the BIOS setup default is restored, but the password that was set by the user is still reserved.

6.2.6.4. BIOS Jumpers

This section provides information about the BIOS. See the following table to locate the BIOS maintenance jumpers.

Table 21: BIOS Jumpers

Jumper	Description	Jumper Adjustment
J6	ME FLASH OVERRIDE	1-2: Security measures defined are set. (Default) 2-3: Security measures defined by BIOS are over-written.
J59	ME FORCE UPDATE	1-2: Normal operation (Default) 2-3: ME is in force update mode.
J60	PASSWORD CLEAR	1-2: Password protected. (Default) 2-3: Clear both the user and administrator passwords on system.
J61	CMOS CLEAR	1-2: Normal RTC reset. (Default) 2-3: Clear RTC register.

6.3. Checking the FW Version

6.3.1. Checking the BIOS Version using Linux

1. Log into Linux.
2. Open the terminal. Execute the dmidecode –t 0 command to display the BIOS version, as shown in the following figure.

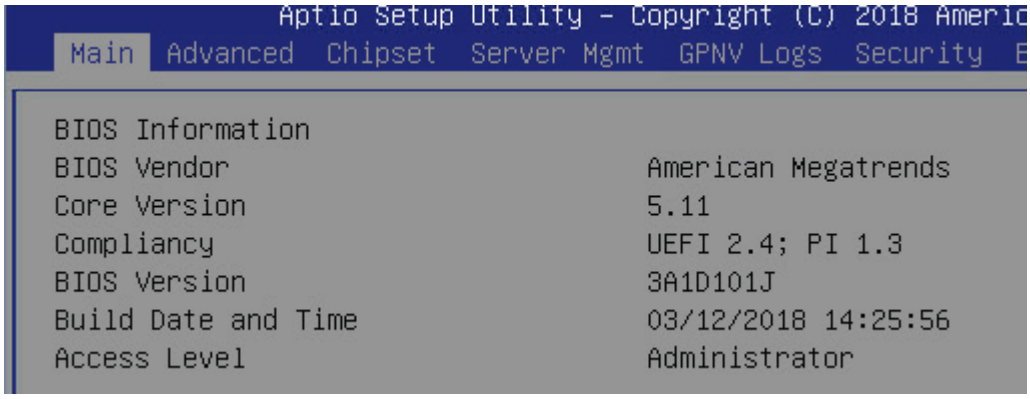
Figure 55: Linux Terminal



6.3.2. Checking the BIOS Version using the BIOS Setup Utility

1. Log into the BIOS setup utility.
2. Use the arrow keys to select the **Main**, menu to display the BIOS version as shown in the following figure.

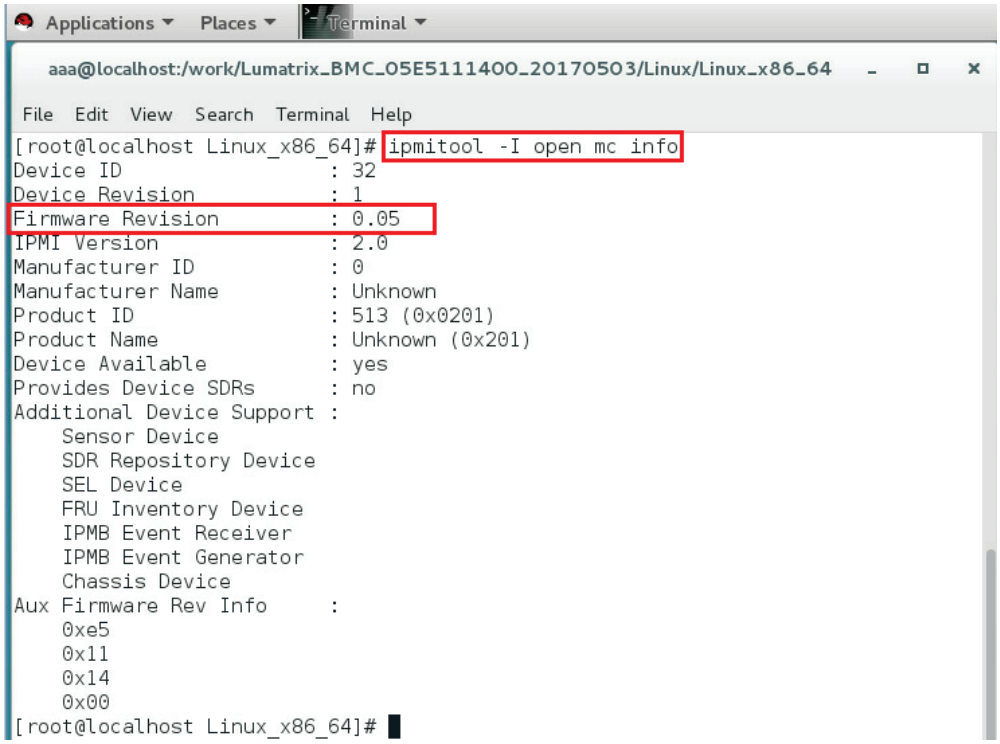
Figure 56: BIOS Main



6.3.3. Checking the BMC Version using Linux

1. Log into Linux.
2. Open the terminal. Execute the `ipmitool -I open mc info` command to display the BMC version as shown in the following figure.

Figure 57: Ipmitool with Linux



6.3.4. Checking the BMC Version using the WebGUI

1. Log into the WebGUI.
2. Check the BMC version in the **Dashboard** main menu, as shown in the following figure.

Figure 58: WebGUI Dashboard

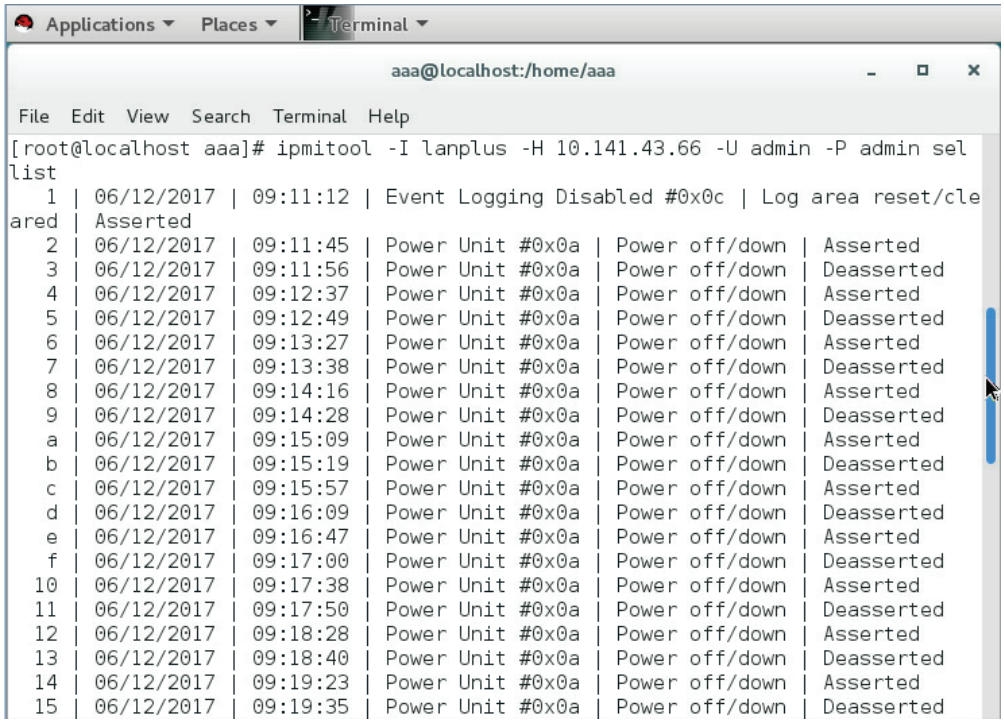


6.4. Checking the Event Log

6.4.1. Checking the system event log using Linux remote desktop

1. To check the system event log using Linux Log into Linux.
2. Open the terminal.
3. Execute the `ipmitool -I lanplus -H BMCIP -U admin -P password sel list` command to check the system event log.

Figure 59: System Event Log

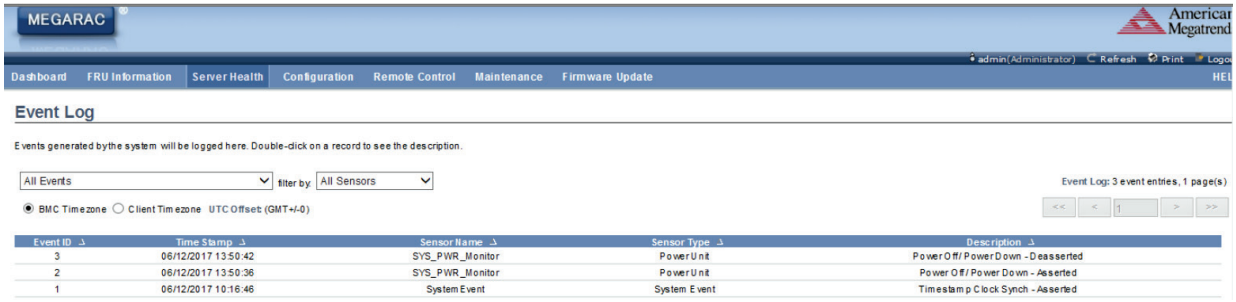


6.4.2. Checking the System Event Log using the WebGUI

To check the system event log using the web user interface:

1. Log into the WebGUI.
2. Click Server Health → Event Log to display the system event log, as shown in the following figure.

Figure 60: WebGUI Event Log



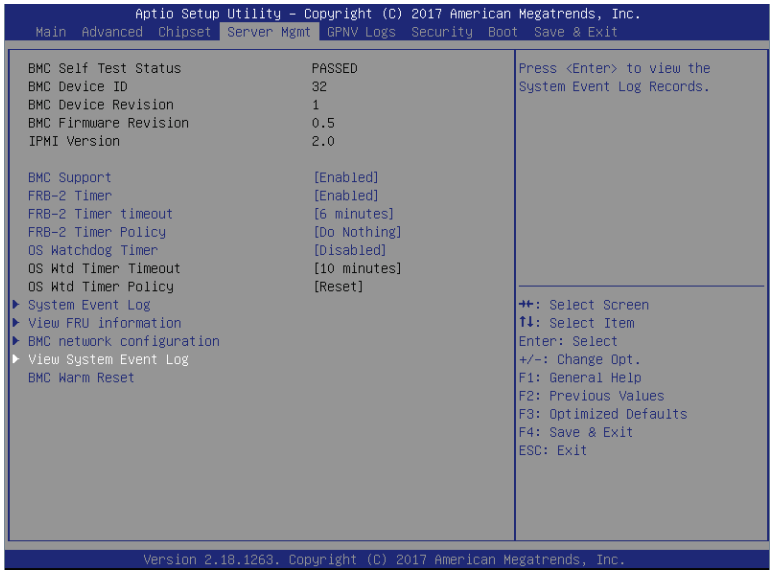
6.4.3. Checking the Event Log using the BIOS Setup Utility

6.4.3.1. System Event Logs

To check the event log using the BIOS setup utility:

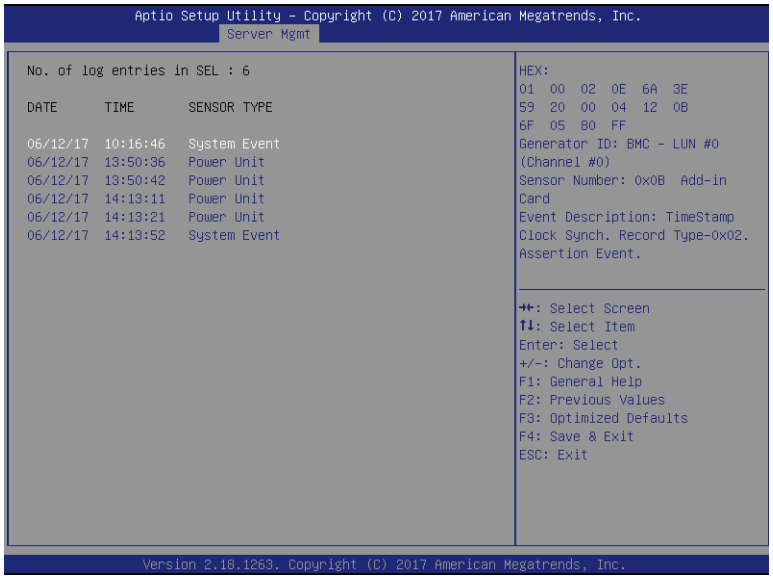
1. Enter the BIOS setup utility, and then select the Server Mgmt menu.

Figure 61: BIOS Setup Event Log



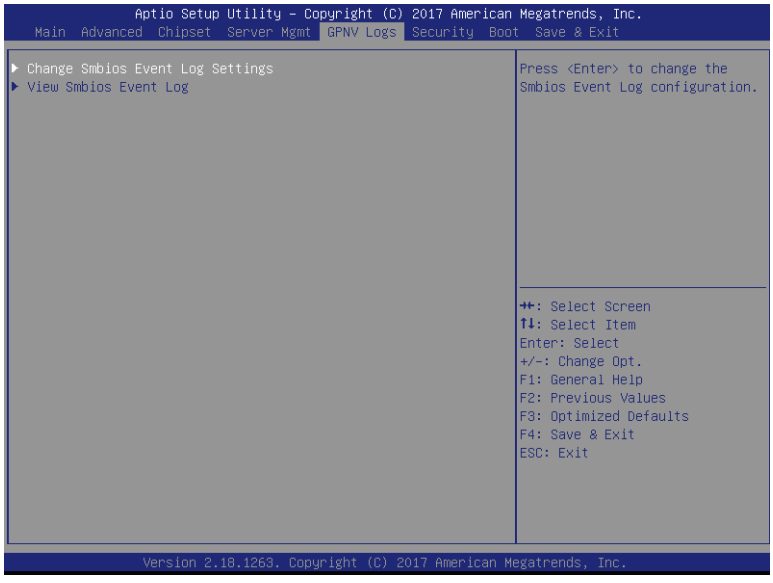
1. Use the arrow keys to select **View System Event Log**, and then press **Enter**. The "View System Event Log" displays.

Figure 62: BIOS System Event



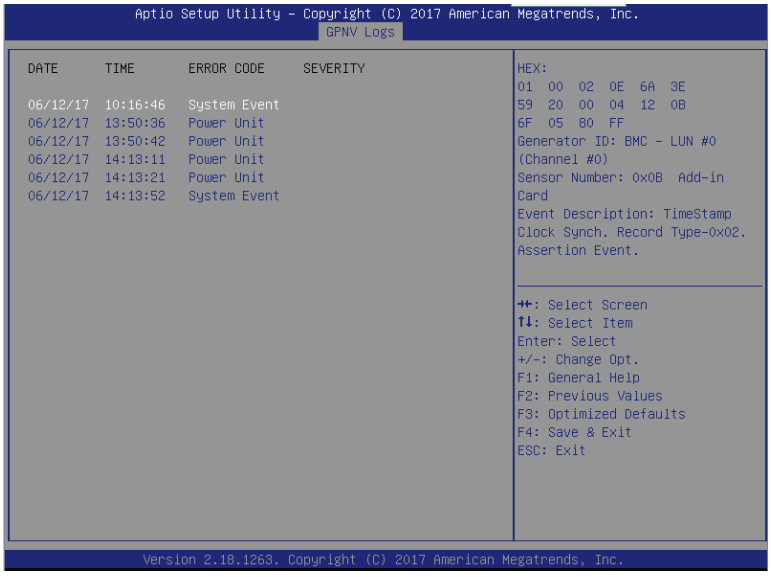
2. Enter the BIOS setup, and then select the **GPNV Logs** menu.

Figure 63: SMBIOS



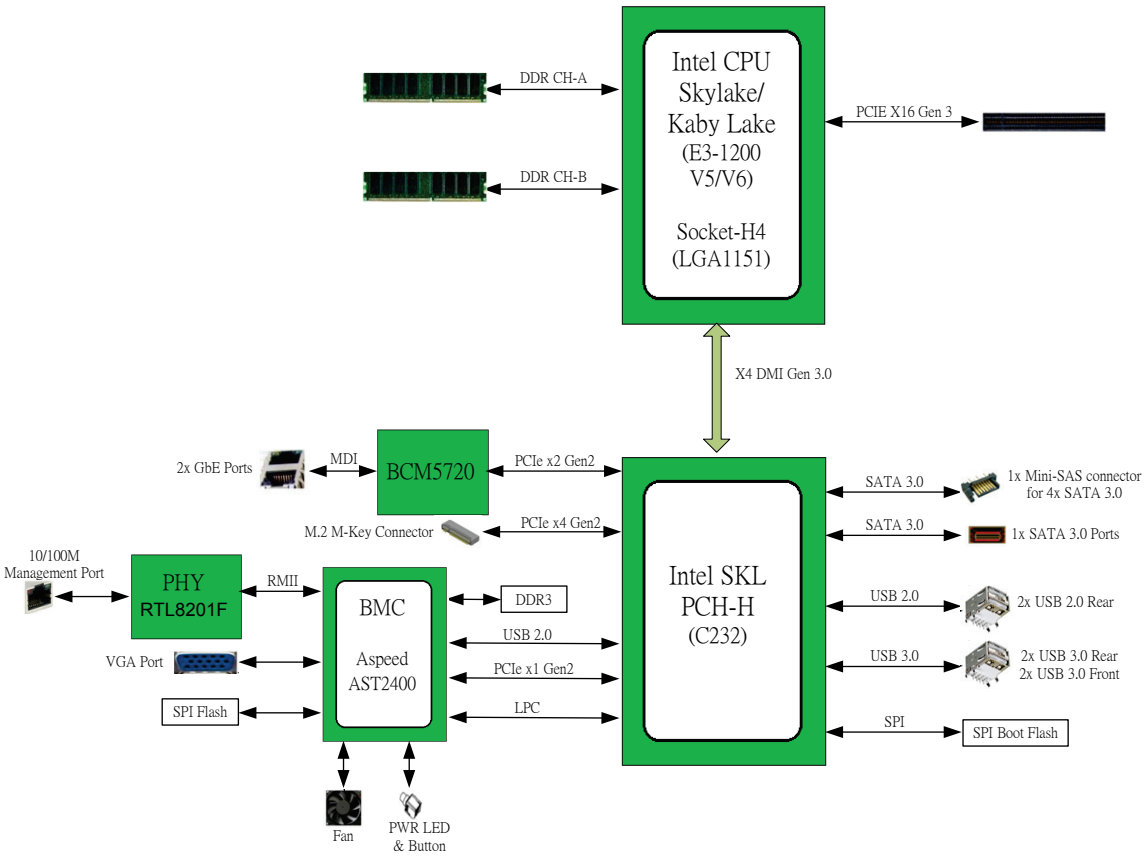
3. Use the arrow keys to select **View SMBIOS Event Log**, and then press **Enter**. The "SMBIOS Event Log" displays.

Figure 64: View SMBIOS Event



7/ Block Diagram

Figure 65: System Board Diagram



8/ Troubleshooting

8.1.1. Pre-diagnostic

⚠WARNING To avoid potential problems, Always read the warnings and cautionary information in the server documentation before removing, replacing, reseating or modifying system components..

NOTICE Important: Refer to the server documentation for information on procedures, hardware options, software tools and operating systems supported by the server.

Follow the following pre-diagnostic steps before system troubleshooting process:

1. Review the important safety information.
2. Collect symptom information.
3. Prepare the server for troubleshooting.
4. Use the troubleshooting flowchart to begin the troubleshooting process.

8.1.2. Symptom Collection

Before troubleshooting a server problem, collect the following information:

- Does the server power on?
- Does the server complete POST?
- If not, then what do the health LEDs indicate? Is video display available? If the server completes POST and video is available, are there any POST error messages?
- Record the text of the POST error message as displayed.
- Does the server successfully boot an operating system or hypervisor? If not, does the server display any of the following symptoms?
- An uncorrectable machine check exception
- Stop error or blue screen (Windows)
- Purple diagnostic screen (Linux)
- Linux kernel panic
- A system "hang"
- A system "freeze"
- If the problem occurs after an OS is installed:
- Does the problem occur when a new application is loading or a patch is applying?
- What symptoms did the server display when the server malfunctioned? (for example, did it reboot, were there LED codes, health logs, messages on the screen, and so forth)
- Are any indications present that show that the malfunction was reported as a memory error, PCI error, or so forth? The processor now contains the memory controller and PCI Express controller, so faults in other areas may be attributed to a processor malfunction.
- When did the problem occur?

Record exactly when the problem happens (include the date and time). If it happens more than once, keep a list of all symptoms for each occurrence.

- What events preceded the failure?
- After which steps does the problem occur?
- What has been changed since the time the server was working?
- Did you recently add or remove hardware or software?
- How long has the server exhibited problem symptoms?
- If the problem occurs randomly, what is the duration or frequency?

Observe the server LEDs and their statuses. See the LED Indicators for more information.

8.1.3. Prepare the Server for Diagnosis

1. Be sure that the server is in the proper operating environment with adequate power, air conditioning, and humidity control. For required environmental conditions, see the server documentation.
2. Record any error messages displayed by the system.
3. Remove all external peripherals such as the network cables, monitor, keyboard, and mouse.
4. Collect all tools and utilities necessary to troubleshoot the problem, such as a Cross screwdriver, loopback adapters, ESD wrist strap, and software utilities.
5. Determine if the server will troubleshoot offline or online.
6. To diagnose the server offline, power down the server and peripheral devices. If possible, always perform an orderly shutdown:
7. Exit any applications.
8. Exit the operating system.
9. Power down the server.
10. Disconnect any peripheral devices not required for testing (any devices not necessary to power up the server).

8.1.4. Performing Processor Procedures in the Troubleshooting Process

Before performing any troubleshooting steps that involve processors, review the following guidelines:

- Be sure that only authorized personnel perform the troubleshooting steps that involve installation, removal, or replacement of a processor.
- Never touch the contacts in the processor socket. THE PINS ON THE SYSTEM BOARD ARE VERY FRAGILE AND EASILY DAMAGED. If the contacts inside the processor socket are damaged, you must replace the system board.
- Some processor models require the use of a processor installation tool, and specific steps are documented to ensure that they do not damage the processor or processor socket on the system board. For server models that have pins inside the processor socket, remember that THE PINS ON THE SYSTEM BOARD ARE VERY FRAGILE AND EASILY DAMAGED. If the socket is damaged, you must replace the system board.

Always complete all other troubleshooting procedures before removing or replacing a processor.

8.1.5. Breaking the Server down to the Minimum Hardware Configuration

During the troubleshooting process, it might be necessary to break down the server to the minimum hardware configuration. A minimum configuration consists of only the components needed to boot the server and successfully pass POST.

When requested to break the server down to the minimum configuration, uninstall the following components, if installed:

- All additional DIMMs
- Leave only the minimum required to boot the server—one DIMM.
- All additional cooling fans, if applicable
- All hard drives

Before removing the components, be sure to determine the minimum configuration for each component and follow all guidelines in the server user and maintenance guide.

Always use the recommended minimum configuration above before removing any processors. If you are unable to isolate the issue with the configuration above, you will then remove all but one of the processors.

⚠CAUTION

Before removing or replacing any processors, be sure to follow the guidelines provided in removing and installing processors steps.

Failure to follow the recommended guidelines can cause damage to the system board, requiring replacement of the system board.

8.1.6. Battery Replacement

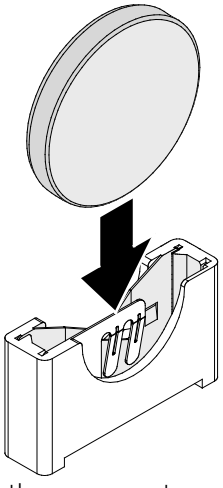
If the server no longer automatically displays the correct date and time, you might need to replace the battery that provides power to the real-time clock.

⚠WARNING **The computer contains an internal lithium manganese dioxide, a vanadium pentoxide, or an alkaline battery pack. A risk of fire and burns exists if the battery pack is not properly handled. To reduce the risk of personal injury:**

- **Do not attempt to recharge the battery.**
- **Do not expose the battery to temperatures higher than 60°C (140°F).**
- **Do not disassemble, crush, puncture, short external contacts, or dispose of in fire or water.**
- **Replace only with the spare designated for this product.**

To remove the component:

1. Power down the server.
2. Remove all power:
3. Disconnect each power cord from the power source.
4. Disconnect each power cord from the server.
5. If installed, remove the secondary PCIe riser cage.
6. Locate the battery.
7. Remove the battery.



To replace the component, reverse the removal procedure.

For more information about battery replacement or proper disposal, contact an authorized reseller or an authorized service provider.

8.1.7. Firmware Update Tools

This chapter describes the firmware the system firmware types, support OS, utility for firmware update and supported server mode.

Table 22: Update Tools

Firmware Type	Supported OS	Server Mode	Firmware Tool
BIOS	Windows 8.1 (64bit) Windows 10 (64bit) Windows Server 2012(64bit) Windows Server 2012 R2 (64bit) Microsoft Windows Server 2016 Red Hat Enterprise Linux 6.9 (64 bit) Red Hat Enterprise Linux 7.2, 7.3 (64 bit) SLES11 SP4 (64 bit) (includes XEN) SLES12 SP2(64bit) (includes XEN) CentOS 7.2 Ubuntu 16.04.1 Ubuntu 16.10	Legacy/UEFI	DOS - AFUDOS.exe Linux - afulnx_32/afulnx_64 Shell - AfuEfix64.efi Windows - afuwin.exe
BMC			Yafuflash

Appendix A: List of Acronyms

API	Application Programming Interface
BMC	Base Management Controller
CLI	Command-Line Interface
COM	Computer-on-Module
ECC	Error Checking and Correction
FRU	Field Replaceable Unit
GPU	Graphics Processing Unit
HD/HDD	Hard Disk /Drive
HPM	PICMG Hardware Platform Management specification family
IOL	IPMI-Over-LAN
IOT	Internet of Things
IPMI	Intelligent Platform Management Interface
KCS	Keyboard Controller Style
KVM	Keyboard Video Mouse
MEI	Management Engine Interface
NCSI	Network Communications Services Interface
PCIe	PCI-Express
PECI	Platform Environment Control Interface
PICMG®	PCI Industrial Computer Manufacturers Group
RTC	Real Time Clock
SEL	System Event Log
ShMC	Shelf Management Controller
SMBus	System Management Bus
SMWI	System Monitor Web Interface
SOL	Serial Over LAN
SSH	Secure Shell
TPM	Trusted Platform Module
UEFI	Unified Extensible Firmware Interface
VLP	Very Low Profile

About Kontron

Kontron is a global leader in embedded computing technology (ECT). As a part of technology group S&T, Kontron offers a combined portfolio of secure hardware, middleware and services for Internet of Things (IoT) and Industry 4.0 applications. With its standard products and tailor-made solutions based on highly reliable state-of-the-art embedded technologies, Kontron provides secure and innovative applications for a variety of industries. As a result, customers benefit from accelerated time-to-market, reduced total cost of ownership, product longevity and the best fully integrated applications overall. For more information, please visit: **www.kontron.com**

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