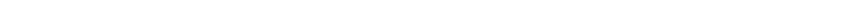


RAID Configuration

Workstation Creator! Extreme Rev3

RAID Support

4.1	RAID configurations	1
4.1.1	RAID definitions	1
4.1.2	Installing storage devices.....	2
4.1.3	Intel® Rapid Storage Technology in UEFI BIOS.....	2
4.1.4	Intel® Virtual Raid on CPU in UEFI BIOS.....	6
4.1.5	Intel® Rapid Storage Technology Option ROM utility.....	12
4.2	Creating a RAID driver disk	16
4.2.1	Creating a RAID driver disk in Windows®	16



RAID Support

4.1 RAID configurations

The motherboard supports Intel® Rapid Storage Technology with RAID 0, RAID 1, RAID 5, and RAID 10 solution.



If you want to install a Windows® operating system to a hard disk drive included in a RAID set, you have to create a RAID driver disk and load the RAID driver during OS installation. Refer to section **4.2 Creating a RAID driver disk** for details.

4.1.1 RAID definitions

RAID 0 (Data striping) optimizes two identical hard disk drives to read and write data in parallel, interleaved stacks. Two hard disks perform the same work as a single drive but at a sustained data transfer rate, double that of a single disk alone, thus improving data access and storage. Use of two new identical hard disk drives is required for this setup.

RAID 1 (Data mirroring) copies and maintains an identical image of data from one drive to a second drive. If one drive fails, the disk array management software directs all applications to the surviving drive as it contains a complete copy of the data in the other drive. This RAID configuration provides data protection and increases fault tolerance to the entire system. Use two new drives or use an existing drive and a new drive for this setup. The new drive must be of the same size or larger than the existing drive.

RAID 5 strips both data and parity information across three or more hard disk drives. Among the advantages of RAID 5 configuration include better HDD performance, fault tolerance, and higher storage capacity. The RAID 5 configuration is best suited for transaction processing, relational database applications, enterprise resource planning, and other business systems. Use a minimum of three identical hard disk drives for this setup.

RAID 10 is data striping and data mirroring combined without parity (redundancy data) having to be calculated and written. With the RAID 10 configuration you get all the benefits of both RAID 0 and RAID 1 configurations. Use four new hard disk drives or use an existing drive and three new drives for this setup.

4.1.2 Installing storage devices

The motherboard supports Serial ATA hard disk drives and PCIe SSD storage devices. For optimal performance, install identical drives of the same model and capacity when creating a disk array.



Refer to Chapter 2 for details on installing storage devices to your motherboard.

4.1.3 Intel® Rapid Storage Technology in UEFI BIOS

To enter the Intel® Rapid Storage Technology in UEFI BIOS:

1. Enter the BIOS Setup during POST.
2. Go to the **Advanced** menu > **PCH Storage Configuration**, then press <Enter>.
3. Set the SATA Mode Selection item to **[Intel RST Premium With Intel Optane System Acceleration (RAID)]**.



If you are using PCIe storage devices, ensure to enable all the **PCIe Storage RAID Support** items.

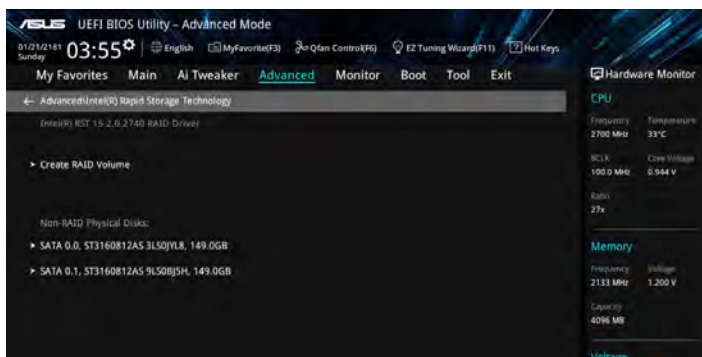
4. Go to the **Boot** menu > **CSM (Compatibility Support Module)** > **Launch CSM**, then set the item to **[Disabled]**.
5. Save your changes and exit the BIOS Setup, then enter the BIOS Setup again.
6. Go to the **Advanced** menu > **Intel(R) Rapid Storage Technology**, then press <Enter> to display the Intel® Rapid Storage Technology menu.



Refer to Chapter 3 for details on entering and navigating through the BIOS Setup.



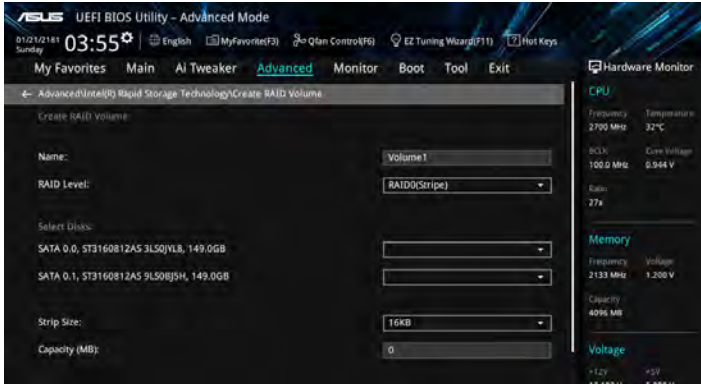
Due to chipset limitation, when SATA ports are set to RAID mode, all SATA ports run at RAID mode together.



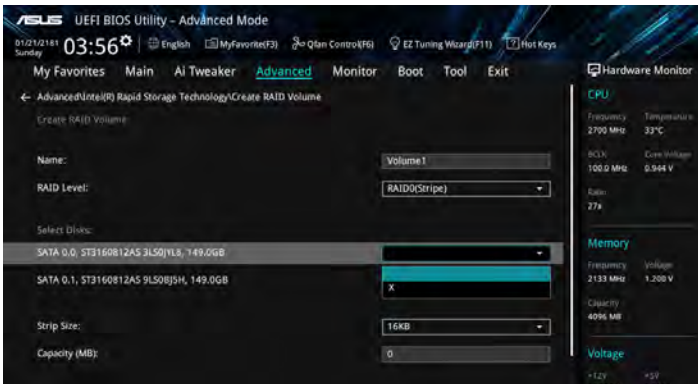
Creating a RAID set

To create a RAID set:

1. From the Intel® Rapid Storage Technology menu, select **Create RAID Volume** and press <Enter>. The following screen appears:



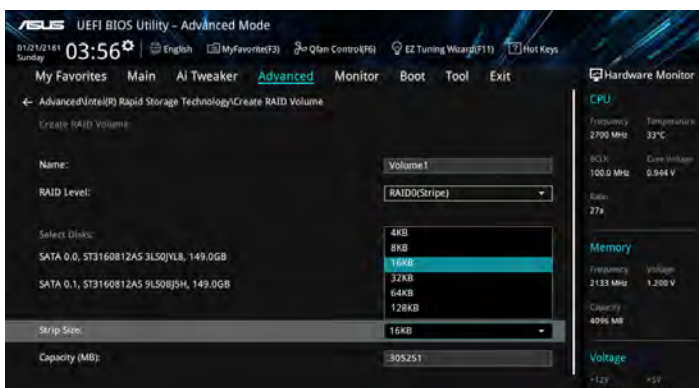
2. When the **Name** item is selected, enter a name for the RAID set and press <Enter>.
3. When the **RAID Level** item is selected, press <Enter> to select the RAID level to create, and then press <Enter>.
4. Under **Select Disks**, press <Enter> and select **X** for the disks you want to include in the RAID set.



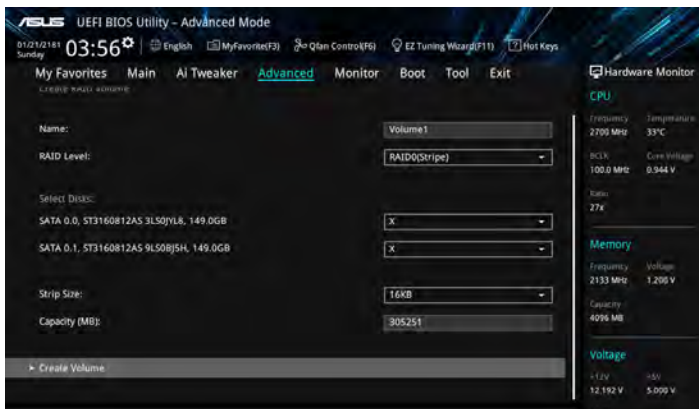
5. When the **Strip Size** item is selected, press <Enter> to select strip size for the RAID array (for RAID 0, 10 and 5 only), and then press <Enter>. The available strip size values range from 4 KB to 128 KB. The following are typical values:
- RAID 0: 128 KB
 - RAID 10: 64 KB
 - RAID 5: 64 KB



We recommend a lower strip size for server systems, and a higher strip size for multimedia computer systems used mainly for audio and video editing.



6. When the **Capacity (MB)** item is selected, enter the RAID volume capacity that you want and press <Enter>. The default value indicates the maximum allowed capacity.
7. When the **Create Volume** item is selected, press <Enter> to create the RAID volume and return to the Intel® Rapid Storage Technology menu.



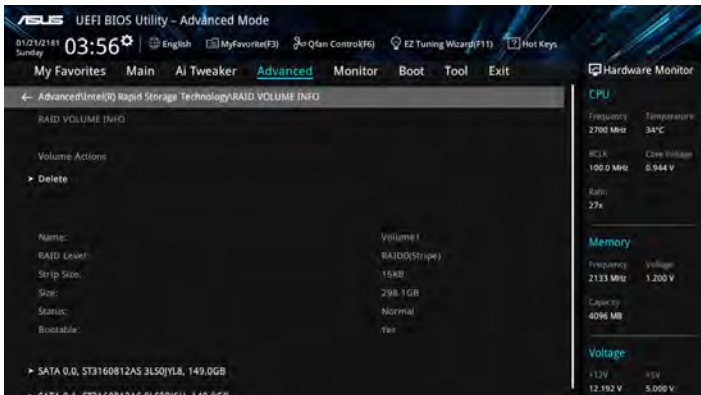
Deleting a RAID set



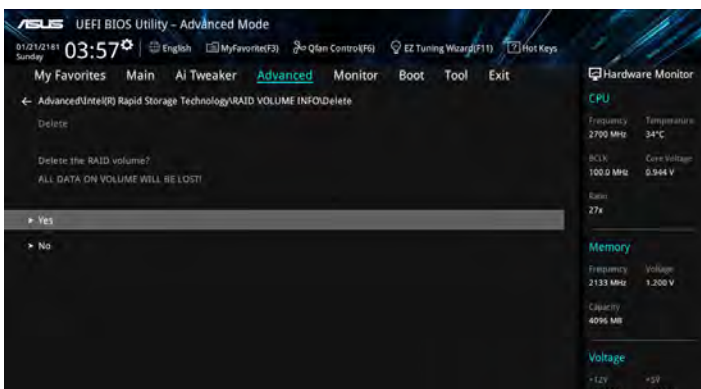
Be cautious when deleting a RAID set. You will lose all data on the hard disk drives when you delete a RAID set.

To delete a RAID set:

1. From the Intel® Rapid Storage Technology menu, select the RAID volume you want to delete and press <Enter>. The following screen appears:



2. When the **Delete** item is selected, press <Enter>, then select **Yes** to delete the RAID volume and return to the Intel® Rapid Storage Technology menu, or select **No** to cancel.



4.1.4 Intel® Virtual Raid on CPU in UEFI BIOS

This feature requires a KEY module to enable CPU RAID functions with Intel® CPU RSTe.



- The KEY module is purchased separately.
- The HYPER M.2 X16 Card is purchased separately.
- Due to CPU behavior, CPU RAID functions with Intel® CPU RSTe only supports Intel® Core™ X-series Processors (6-core or above) and Intel® SSD modules.
- Refer to section 1.1.9 **Internal connectors** for the location of the VROC_HW_KEY connector.



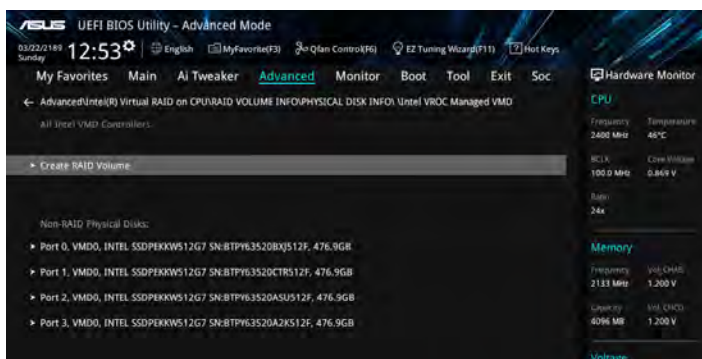
Due to hardware design, your motherboard does not support CPU RAID configurations as OS drives.

To enter the Intel® Virtual Raid on CPU in UEFI BIOS:

1. Enter the BIOS Setup during POST.
2. Go to the **Boot** menu > **CSM (Compatibility Support Module)** > **Launch CSM**, then set the item to **[Disabled]**.
3. Go to the **Advanced** menu > **CPU Storage Configuration**, then set the PCIE slot(s) that you have installed the Hyper M.2 X16 Card(s) or PCIE X4 SSD Card(s) to **Hyper M.2 X16** or **PCIE X4 SSD Card** correspondingly.
4. Save your changes and exit the BIOS Setup, then enter the BIOS Setup again.
5. Go to the **Advanced** menu > **Intel(R) Virtual Raid on CPU** > **All Intel VMD Controllers**, then press <Enter> to display the Intel® Virtual Raid on CPU menu.



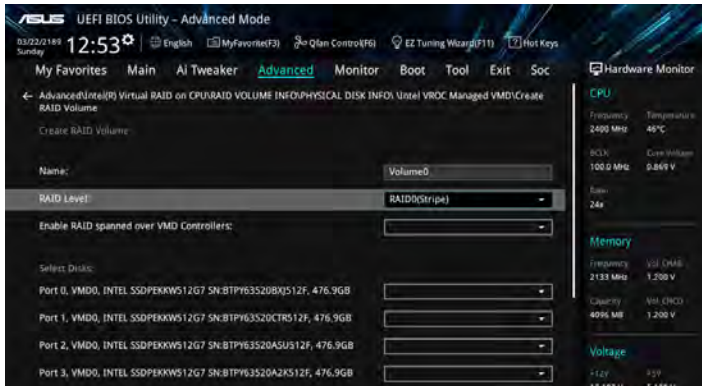
Refer to Chapter 3 for details on entering and navigating through the BIOS Setup.



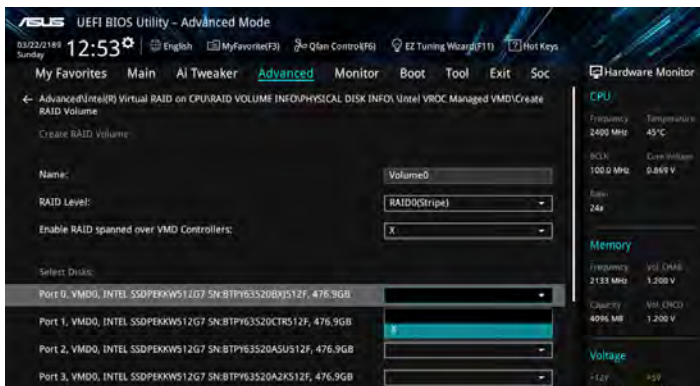
Creating a RAID set

To create a RAID set:

1. From the Intel® Virtual RAID on CPU menu, select **Create RAID Volume** and press <Enter>. The following screen appears:



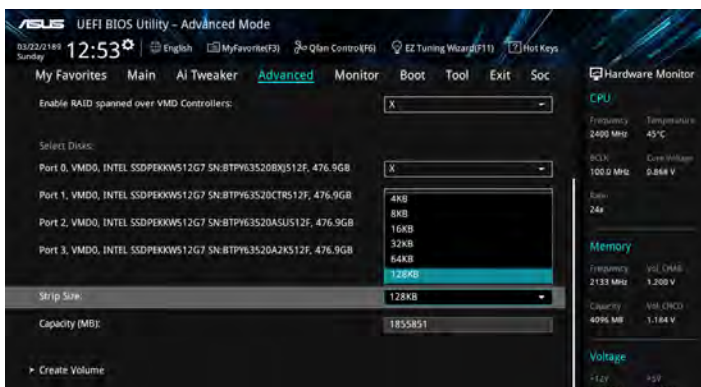
2. When the **Name** item is selected, enter a name for the RAID set and press <Enter>.
3. When the **RAID Level** item is selected, press <Enter> to select the RAID level to create, and then press <Enter>.
4. When the **Enable RAID spanned over VMD Controllers** item is selected, press <Enter> and select **X** to enable this function.
5. Under **Select Disks**, press <Enter> and select **X** for the disks you want to include in the RAID set.



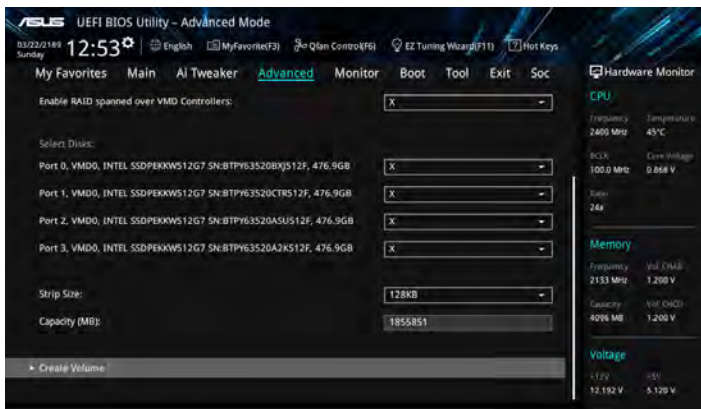
6. When the **Strip Size** item is selected, press <Enter> to select strip size for the RAID array (for RAID 0, 10 and 5 only), and then press <Enter>. The available strip size values range from 4 KB to 128 KB. The following are typical values:
- RAID 0: 128 KB
 - RAID 10: 64 KB
 - RAID 5: 64 KB



We recommend a lower strip size for server systems, and a higher strip size for multimedia computer systems used mainly for audio and video editing.



7. When the **Capacity (MB)** item is selected, enter the RAID volume capacity that you want and press <Enter>. The default value indicates the maximum allowed capacity.
8. When the **Create Volume** item is selected, press <Enter> to create the RAID volume and return to the Intel® Rapid Storage Technology menu.



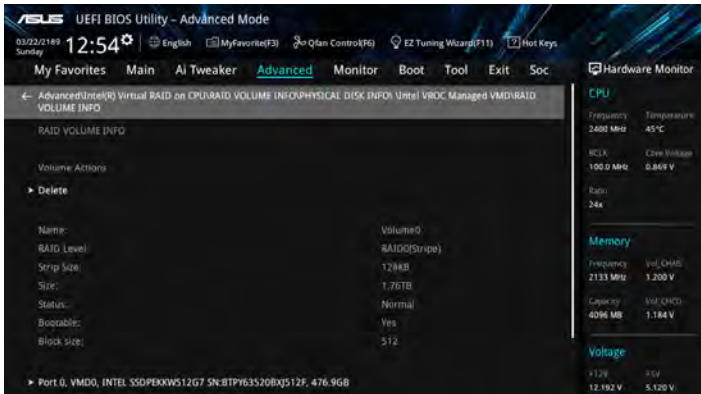
Deleting a RAID set



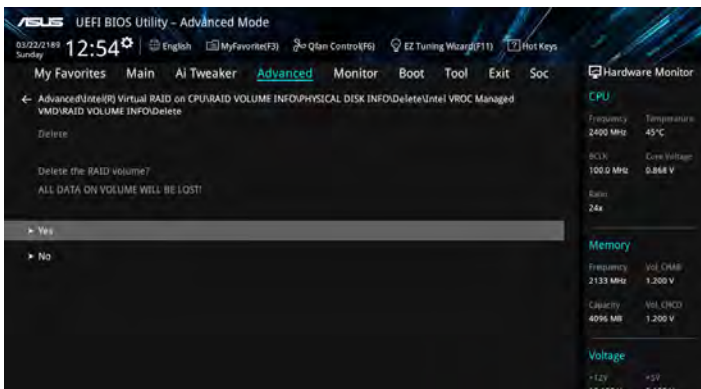
Be cautious when deleting a RAID set. You will lose all data on the hard disk drives when you delete a RAID set.

To delete a RAID set:

1. From the Intel® Virtual Raid on CPU menu, select the RAID volume you want to delete and press <Enter>. The following screen appears:



2. When the **Delete** item is selected, press <Enter>, then select **Yes** to delete the RAID volume and return to the Intel® Virtual Raid on CPU menu, or select **No** to cancel.



Installing the RAID controller driver during Windows® 10 OS installation

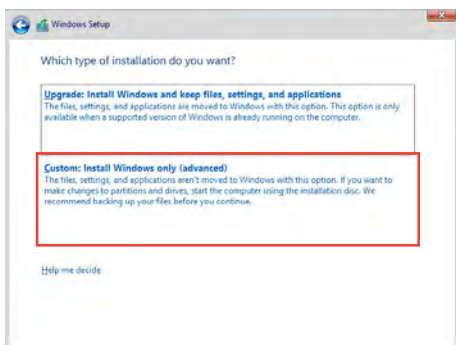
After creating the RAID sets, you are now ready to install an operating system to the independent drives or bootable array. This part provides the instructions on how to install the RAID controller drivers during OS installation.



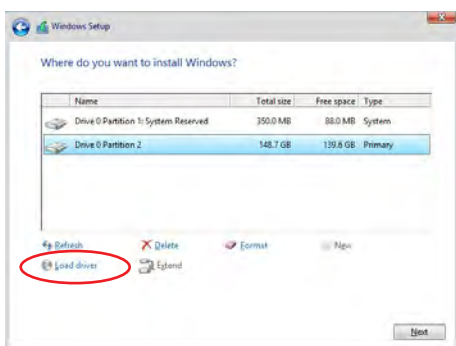
If you plan on using the CPU RAID configuration spanned across different PCIe slots as OS drives, please install the Hyper M.2 X16 Cards to PCIEX16_2 (x4 mode) and PCIEX16_4 (x8 mode) slots.

To install the RAID controller driver when installing Windows® 10 OS:

1. Boot the computer using the Windows® 10 OS installation disc. Follow the screen instructions to start installing Windows® 10.
2. When prompted to choose a type of installation, click **Custom: Install Windows only (advanced)**.



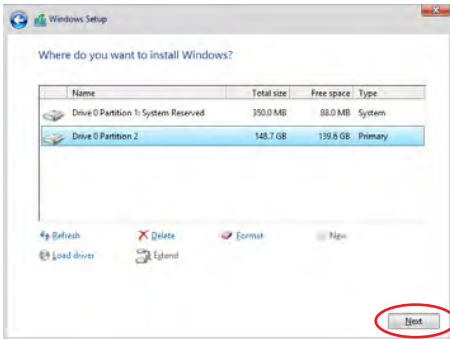
3. Click **Load Driver**.



4. A message appears, reminding you to insert the installation media containing the driver of the RAID controller driver. If you have only one optical drive installed in your system, eject the Windows OS installation disc and replace with the motherboard Support DVD into the optical drive. Click **Browse** to continue.



5. Locate the driver in the corresponding folder of the Support DVD then click **OK** to continue.
6. Select the RAID controller driver you need from the list and click **Next**.
7. When the system finishes loading the RAID driver, replace the motherboard Support DVD with the Windows Server installation disc. Select the drive to install Windows and click **Next**.



8. Setup then proceeds with the OS installation. Follow screen instructions to continue.

4.1.5 Intel® Rapid Storage Technology Option ROM utility

To enter the Intel® Rapid Storage Technology Option ROM utility:

1. Turn on the system.
2. During POST, press <Ctrl> + <I> to display the utility main menu.

```
Intel(R) Rapid Storage Technology - Option - v10.5.1.1070
Copyright(C) 2003-14 Intel Corporation. All Rights Reserved.

[ MAIN MENU ]

1. Create RAID Volume          4. Recovery Volume Options
2. Delete RAID Volume        5. Acceleration Options
3. Reset Disks to Non-RAID   6. Exit

[ DISK/VOLUME INFORMATION ]

RAID Volumes:
None defined.

Physical Devices:
Port  Device Model  Serial #      Size   Type/Status(Vol ID)
0     ST3160812AS     9LS0HJA4    149.0GB Non-RAID Disk
1     ST3160812AS     9LS0F4HL    149.0GB Non-RAID Disk
2     ST3160812AS     3LS0JYL8    149.0GB Non-RAID Disk
3     ST3160812AS     9LS0BJ5H    149.0GB Non-RAID Disk

[↑,↓]-Select      [ESC]-Exit      [ENTER]-Select Menu
```

The navigation keys at the bottom of the screen allow you to move through the menus and select the menu options.



The RAID BIOS setup screens shown in this section are for reference only and may not exactly match the items on your screen.

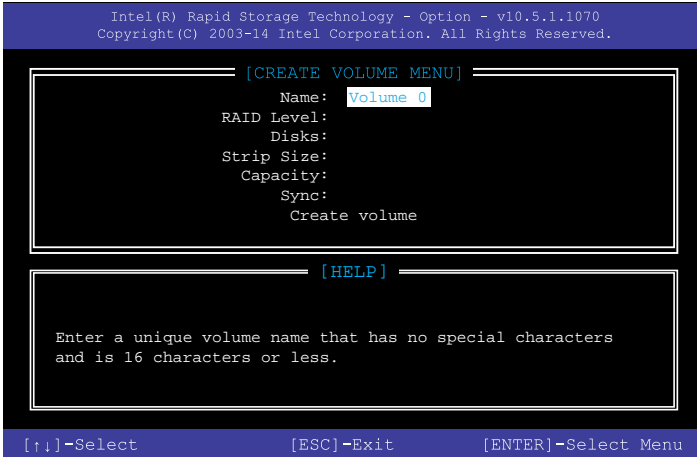


The utility supports maximum four hard disk drives for RAID configuration.

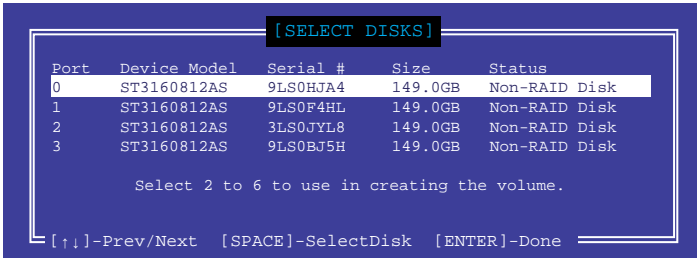
Creating a RAID set

To create a RAID set:

1. From the utility main menu, select **1. Create RAID Volume** and press <Enter>. The following screen appears:



2. Enter a name for the RAID set and press <Enter>.
3. When the RAID Level item is selected, press the up/down arrow key to select a RAID level to create, and then press <Enter>.
4. When the Disks item is selected, press <Enter> to select the hard disk drives you want to include in the RAID set. The SELECT DISKS screen appears:



5. Use the up/down arrow key to select a drive, and then press <Space> to select. A small triangle marks the selected drive. Press <Enter> after completing your selection.
6. Use the up/down arrow key to select the strip size for the RAID array (for RAID 0, 10 and 5 only), and then press <Enter>. The available strip size values range from 4 KB to 128 KB. The following are typical values:
 - RAID 0: 128 KB
 - RAID 10: 64 KB
 - RAID 5: 64 KB



We recommend a lower strip size for server systems, and a higher strip size for multimedia computer systems used mainly for audio and video editing.

7. When the **Capacity** item is selected, enter the RAID volume capacity that you want and press <Enter>. The default value indicates the maximum allowed capacity.
8. When the **Create Volume** item is selected, press <Enter>. The following warning message appears:

```
WARNING: ALL DATA ON SELECTED DISKS WILL BE LOST.  
Are you sure you want to create this volume? (Y/N)
```

9. Press <Y> to create the RAID volume and return to the main menu, or <N> to go back to the CREATE VOLUME menu.

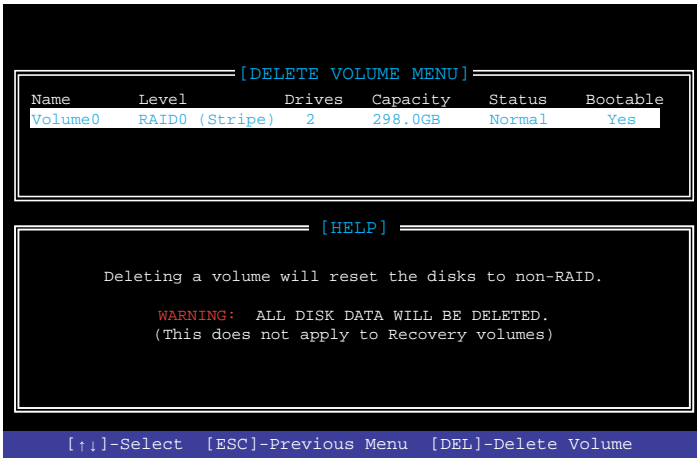
Deleting a RAID set



Be cautious when deleting a RAID set. You will lose all data on the hard disk drives when you delete a RAID set.

To delete a RAID set:

1. From the utility main menu, select **2. Delete RAID Volume** and press <Enter>. The following screen appears:



2. Use the up/down arrow key to select the RAID set you want to delete, and then press <Delete>. The following warning message appears:

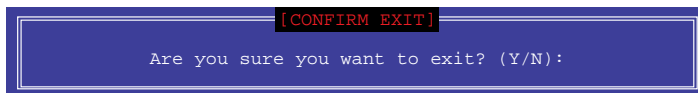


3. Press <Y> to delete the RAID set and return to the utility main menu, or press <N> to return to the DELETE VOLUME menu.

Exiting the Intel® Rapid Storage Technology Option ROM utility

To exit the utility:

1. From the utility main menu, select **6. Exit**, then press <Enter>. The following warning message appears:



2. Press <Y> to exit or press <N> to return to the utility main menu.

4.2 Creating a RAID driver disk

4.2.1 Creating a RAID driver disk in Windows®

To install the RAID driver for Windows® OS:

1. During the OS installation, click **Load Driver** to allow you to select the installation media containing the RAID driver.
2. Insert the USB flash drive with RAID driver into the USB port or the support DVD into the optical drive, and then click **Browse**.
3. Click the name of the device you've inserted, go to **Drivers > RAID**, and then select the RAID driver for the corresponding OS version. Click **OK**.
4. Follow the succeeding screen instructions to complete the installation.



Before loading the RAID driver from a USB flash drive, you have to use another computer to copy the RAID driver from the support DVD to the USB flash drive.



To set up a Windows® UEFI operating system under RAID mode, ensure to load the UEFI driver for your optical drive.
