

RAID Configuration

Workstation Creator! Extreme Rev3

RAID Support

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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.

- 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.
- 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:

My Favorites Main Ai Tweaker Ad	anced Monitor Boot Tool Exit	Hardware Monitor
Advanced Untel(R) Rapid Storage Technology/Create R/	ID Volume	CPU
Create RAID Volume		Frequency Temperature 2700 MHz 32*C
Name:	Volume1	9CIN Core William 100.0 MHz 0.944 V
RAID Level:	RAID0(Stripe) +] kata 27a
Solert Dises-		and the second
SATA 0.0, ST3160812A5 3LS0JVL8, 149.0GB	-	Memory Frequency Volume
SATA 0.1, ST3160812A5 9L50BJ5H, 149.0GB		2133 MHz 1.200 V Capacity
Strip Size:	16KB •	4096 MB
Capacity (MB);	0	Voltage
		- 129 + 59 13 103 W 1 000 W

- 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.

01/21/2181 03:56 [¢] ⊕ English ⊡MyFavorite(F3) & Qfan Contro Sunday My Favorites Main Ai Tweaker <u>Advanced</u> Mon		Hardware Monitor
Advanced/Untek[#) Rapid Storage Technology/Create RAID Volume Create RAID Volume		CPU Frequency Temperarties 2700 MHz 33*C
Name:	Volume 1	903X Core William 100.0 MHz 0.944 V
RAID Level:	RAID0(Stripe)	Ratie: 275
Select Disks:		Memory
SATA 0.0, ST3160812AS 3L50JVL8, 149.0GB	-	Frequency Velices
SATA 0.1, ST3160812AS 9LS08J5H, 149.0GB	x	2133 MHz 1.200 V Capacity
Strip Size:	16KB -	4096 MB
Capacity (MB):	0	Voltage
		•12V +5V

- 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

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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.

My Favorites Main Ai Tweaker Advanced Moni	itor Boot Tool Exit	Hardware Monitor
 Advanced\intel(R) Rapid Storage Technology\Create RAID Volume 		CPU
Create RAID Volume		Pressunts Temperature 2700 MHz 33°C
Náme:	Volume 1	9CLN Core William 100.0 MHz 0.944 V
RAID Level:	RAID0(Stripe) +	Ratin: 273
Solect Disks	4KB	-
SATA 0.0, ST3160812AS 3LS0JVL8, 149.0GB	8K8 16K8	Memory
	3788	Frequency Vollage
SATA 0.1, ST3160812A5 9LS08JSH, 149.0GB	64KB 128KB	2133 MHz 1.200 V
Strip Size:	16KB -	4095 MB
Capacity (MB):	305251	Voltage

- 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.
- When the Create Volume item is selected, press <Enter> to create the RAID volume and return to the Intel[®] Rapid Storage Technology menu.

My Favorites Main Ai Tweaker	Advanced Me	onitor Boot Tool Exit	🕼 Hardware Monit
			CPU
Name:		Volume1	2700 MHz 33°C
RAID Level:		RAID0(Stripe)	BCLK Core Velta 100.0 MHz 0.944 V
Select Disks:			Katin 278
SATA 0.0, ST3160812AS 3LS0JYL8, 149.0GB		x	•
SATA 0.1, ST3160812AS 9L50BJ5H, 149.0GB		x	Memory Frequency Volume 2133 MHz 1200 V
Strip Size:		16KB	Causeny
Capacity (MB):		305251	4076 MB

Deleting a RAID set



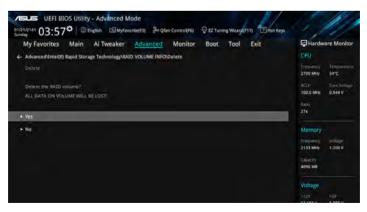
Be cautious when deleting a RAID set. You will lose all data on the hard disk drives when you delete a RAID set.

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:



 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.



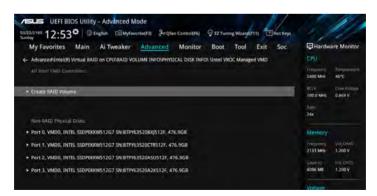
Due to hardware design, your motherboard does not support CPU RAID configurations as OS drives.

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

- 1. Enter the BIOS Setup during POST.
- Go to the Boot menu > CSM (Compatibility Support Module) > Launch CSM, then set the item to [Disabled].
- 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.
- 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:

UEFI BLOS Utility - Advanced Mode B3/22/1491 12:53* 🖶 English 🖾 MyFavorite(13) So Qlan Control(F6)	Q EZ Tuning Weard(F11)	110
My Favorites Main Ai Tweaker Advanced Monitor	Boot Tool Exit Soc	Hardware Monitor
Advanced\intel(R) Virtual RAID on CPU\RAID VOLUME INFO\PHYSICAL DISK IN RAID Volume	FOI Unitel VROC Managed VMD\Greate	CPU
Create RAID Volume		Frequency Temperature 2400 MHz 46°C
Name:	Volume0	BCDX Done William 100.0 MHz D.869 V
RAID Level	RAIDD(Stripe) -	24s
Enable RAID spanned over VMD Controllers:	. <u> </u>	Memory
Select Disks:		Frequency Vol OWE
Port U, VMDD, INTEL SSDPEKKW512G7 SN:BTPy63520BXj512F, 476.9GB	· · · · ·	Chartery And CHCD
Port 1, VMD0, INTEL SSDPEKKWS12G7 SN:BTPY63S20CTR512F, 476.9GB	· ·	4096 MB 1 200 V
Port 2, VMD0, INTEL SSDPEKKWS12G7 SN:BTP963520A5U512F, 476.9GB	-	Voltage
Port 3, VMD0, INTEL SSDPEKKWS12G7 SN:BTPV63520A2K512F, 476.9GB		1129 - 150 111010 - 111010

- 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.

My Favorites Main Ai Tweaker Advanced Monite	or Boot Tool Exit	Soc	Hardw	are Monito
- Advanced/Untel(R) Virtual RAID on CPU/RAID VOLUME INFO/PHYSICAL DISK I	INFO\ Untel VROC Managed VMD\C	reate	CPU	
RAID Volume Creare RAID Velume			Frequency 2400 MHz	Temperani 45°C
Name	Valume0		900X 100.0 MH2	Done William DiBNY V
RAID Level:	RAIDO(Stripe)	•	24a	
Enable RAID spanned over VMD Controllers:	x	•	Memory	
Select Disks:			110,000 CY	Vel 0448
Port D. VMDD, INTEL SSDPEKKW51207 SN-8TPY635208XJ512F, 476.9G8		•	Challery	NH CHO
Port 1, VMD0, INTEL SSDPEKKWS12G7 SN:BTPY63S20CTR512F, 476.9GB			4096 MB	1.200 V
Port 2, VMD0, INTEL SSDPEKKW512G7 SN:BTPY63520ASU312F, 476.9GB		-	Voltage	
Port 3, VMD0, INTEL SSDPEKKWS12G7 SN:BTPY63520A2K512F, 476.9GB	1	•		

- 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

1g

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.

dy Favorites Main Ai Tweaker Advanced Monit	or Boot Tool Exit Soc	Hardware Moni
Enable RAID spanned over VMD Controllers:	[X]	
		Frequency Temperar 2405 MHz 45°C
Select Disks		
Port 0. VMD0, INTEL SSDPEKKW512G7 5N:BTPY63520BXj512F, 476.9G8	× •	90.01 Done Wills 100.0 MHz 9.864 V
Port 1, VMD0, INTEL SSDPEKKWS12G7 SN:BTPY63520CTR512F, 476.9GB	488	Extern.
Port 2, VMD0, INTEL SSDPERKWS12G7 SN-8TPY63S20ASUS12F, 476.9GB	8KB 16KB	24#
Port 3, VMD0, INTEL SSDPEKKW512G7 SN:BTPY63520A2K512F, 476.9GB	32KB 54KB	Memory
	128KB	Frequency Vol CHAR
Strip Size:	128KB -	2133 MH2 1 200 V
Capacity (MB):	1855851	4096 MB 1.164 V

- 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.
- When the Create Volume item is selected, press <Enter> to create the RAID volume and return to the Intel[®] Rapid Storage Technology menu.

My Favorites Main Ai Tweaker Advanced Monit	or Boot Tool Exit	Soc	Hardwa	are Moni
Enable RAID spanned over VMD Controllers:	x	-	CPU frequency	tempma
Select Disks:			2400 MHz	45°C
Port 0, VMD0, INTEL SSDPEKKWS12G7 SN:BTPY63520BXJ512F, 476.9GB	x	•	00.0 100.0 MHz	Date Will Date V
Port 1, VMD0, INTEL SSDPEKKW512G7 SN:BTPY63520CTR512F, 476.9GB	x	•	Report	
Port Z, VMD0, INTEL SSDPEXKWS12G7 SN:BTPy63S20ASUS12F, 476.9GB	x	•	24#	
Port 3, VMD0, INTEL SSDPEKKW512G7 SN:BTPY63520A2K512F, 476.9GB	x	•	Memory Frequency	winui
Strip Size:	128KB	•	2133 MHz	1.200 V
Capacity (MB):	1855851		4076 MB	1200V

Deleting a RAID set



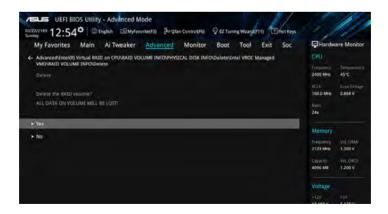
Be cautious when deleting a RAID set. You will lose all data on the hard disk drives when you delete a RAID set.

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:

My Favorites Main Ai Tweaker Advanced	Monitor Boot Tool Exit Soc	Hardw	are Monito
Advanced/Intel(R) Virtual RAID on CPU/RAID VOLUME INFORPH VOLUME INFO	HYSICAL DISK INFON Untel VROC Managed VMD/RAID	CPU	
VOLUME INFO RAID VOLUME INFO		Frequency 2400 MHP	Timperation 45%
IGGD VOLUME DIPO			
Volume Actions		SCLA 100.0 MHz	Date William Distory V
Delete		Ratin 24x	
Name:	Volume0	-	
RAID Level	6A1DQ(Stripe)	Memory	
Strip Size	12068	Truguiney	VOLCHAE
		2133 MPI2	1.200 V
Status:	Normal	Capacity	
Boorable:		4096 MB	1.184 V
Block size:		-	

 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

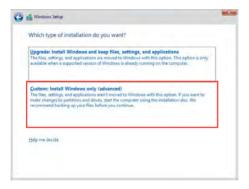
After creating the RAID sets, you are now ready to install an operating system to the independent drives or bootable array. This part provides the instructions on how to install the RAID controller drivers during OS installation.



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.

tem Reserved 350.0 M	1E 98.0 MR	
	a sources	System
148.7 G	IB 139.6 GB	Primary
talata - Ecomat	Ner	
	148.7 0 Delete I Format	telete 🥥 Ecomat New

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.
- 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.

	Name		Total size	Free space	Tune
a		on 1: System Reserved	350.0 MB	88.0 MB	
1	Drive 0 Partiti	on 2	148.7 GB	139.6 GB	Primary
		× Delete	@ Ecrmut	New	
4+ Beli	resth	U Besece			

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> + <l> 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 2. Delete RAID Volume 3. Reset Disks to Non-RAID 4. Recovery Volume Options 5. Acceleration Options 6. Exit							
[DISK/VOLUME INFORMATION] RAID Volumes: None defined. Physical Devices: Port Device Model Serial # Size Type/Status(Vol ID) 0 ST3160812AS 9LSOHJA4 149.0GB Non-RAID Disk 1 ST3160812AS 9LSOF4HL 149.0GB Non-RAID Disk 2 ST3160812AS 3LSOJYL8 149.0GB Non-RAID Disk 3 ST3160812AS 9LSOHJ5H 149.0GB Non-RAID Disk							
[↑↓]-Select	[ESC] - E>	kit	[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.

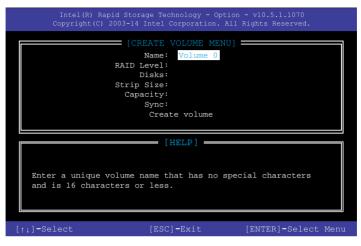


The utility supports maximum four hard disk drives for RAID configuration.

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:

Port	Device Model	Serial #	Size	Status				
0	ST3160812AS	9LSOHJA4	149.0GB	Non-RAID Disk				
1	ST3160812AS	9LSOF4HL	149.0GB	Non-RAID Disk				
	ST3160812AS	3LS0JYL8	149.0GB	Non-RAID Disk				
	ST3160812AS	9LSOBJ5H	149.0GB	Non-RAID Disk				
Select 2 to 6 to use in creating the volume.								

- 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.
- When the Create Volume item is selected, press <Enter>. The following warning message appears:



 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:

Name Level Drives Capacity Status Bootable Volume0 RAID0 (Stripe) 2 298.0GB Normal Yes [HELP]			OLUME MENU		
[HELP]		Drives	Capacity	Status	
Deleting a volume will reset the disks to non-RAID. WARNING: ALL DISK DATA WILL BE DELETED.					

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:



 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.
- Insert the USB flash drive with RAID driver into the USB port or the support DVD into the optical drive, and then click **Browse**.
- 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 $^{\otimes}$ UEFI operating system under RAID mode, ensure to load the UEFI driver for your optical drive.