

# Intel® VROC RAID Configuration for The X12 Series Motherboards

**USER'S GUIDE** 

Revision 1.0a

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## Preface

## **About This Manual**

This user's guide is written for system integrators, IT technicians, and knowledgeable end users. It provides information and instructions on how to configure Intel VROC RAID settings on Supermicro's X12 Series motherboards.

## About Intel® VROC RAID

Intel® Virtual RAID on CPU (Intel® VROC) is a hybrid RAID (Redundant Array of Independent Disks) solution designed for Intel® Volume Management Device (Intel® VMD) that supports NVMe-based solid-state drives (SSDs). Intel VROC, which directly connects NVMe SSD devices to the PCIe lanes of the Intel® Xeon® Scalable processor without needing a RAID host bus adaptor (HBA), can greatly enhance device performance and networking transmission efficiency.

**Note 1**: For processor/BIOS updates, please refer to our website at http://www.su-permicro.com/products/.

**Note 2:** To configure RAID 0, RAID 1, or RAID 10, an Intel® VROC standard hardware key is required. For RAID 0, RAID 1, RAID 5, or RAID10 support, an Intel VROC Premium hardware key is needed. Without a VROC key installed in the system, only RAID 0 is supported. Refer to the links below for Intel VROC support, including a trial version of Intel VROC key used for a Windows system.

https://www.intel.com/content/dam/support/us/en/documents/memory-andstorage/ssd-software/Windows VROC User Guide.pdf

https://www.intel.com/content/www/us/en/support/articles/000030445/memory-andstorage/ssd-management-tools.html

## **User Guide Organization**

This user's guide contains the following sections:

Section 1.1 provides instructions on how to access the All Intel VMD Controller menu.

Section 1.2 provides instructions on how to configure RAID settings.

Section 1.3 describes the use of journaling drive for a RAID5 volume (parity-based RAID).

## **Conventions Used in the Manual**

Special attention should be given to the following symbols for proper installation and system setup.

**Note:** Important information is given to ensure proper system installation or to relay safety precautions.

#### **Contacting Supermicro**

Headquarters	
Address:	Super Micro Computer, Inc.
	980 Rock Ave.
	San Jose, CA 95131 U.S.A.
Tel:	+1 (408) 503-8000
Fax:	+1 (408) 503-8008
Email:	marketing@supermicro.com (General Information)
	support@supermicro.com (Technical Support)
Website:	www.supermicro.com
_	
Europe	
Address:	Super Micro Computer B.V.
	Het Sterrenbeeld 28, 5215 ML
	's-Hertogenbosch, The Netherlands
Tel:	+31 (0) 73-6400390
Fax:	+31 (0) 73-6416525
Email:	sales@supermicro.nl (General Information)
	support@supermicro.nl (Technical Support)
	rma@supermicro.nl (Customer Support)
Website:	www.supermicro.nl
Asia-Pacific	
Address:	Super Micro Computer, Inc.
	3F, No. 150, Jian 1st Rd.
	Zhonghe Dist., New Taipei City 235
	Taiwan (R.O.C)
Tel:	+886-(2) 8226-3990
Fax:	+886-(2) 8226-3992
Email:	support@supermicro.com.tw
Website:	www.supermicro.com.tw

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## Chapter 1

## **Configuring Intel VROC RAID Settings**

## 1.1 All Intel VMD Controllers Menu

The following section provides you with the instructions on how to access the All Intel VMD Controllers menu to enable a selected PCI slot for VMD support when configuring Intel VROC RAID settings for a Supermicro X12 motherboard.

**Note 1:** Only use NVMe devices that have been validated by Supermicro. For the latest updates, please refer to our website at <u>https://www.supermicro.com.</u>

**Note 2:** Depending on the version of driver/utility/package, you may or may not have exactly the same as the BIOS settings/features as shown in the user's guide.

### Enabling a PCI Slot for VMD Support in the BIOS Setup Utility

- 1. Press <Del> during system boot to enter the BIOS Setup utility.
- 2. Use the arrow key to select "Advanced" on top of the BIOS menu bar.
- 3. Use the down arrow key to select "Chipset Configuration" and press <Enter>.
- 4. Select "North Bridge" and press <Enter>.
- When the North Bridge submenu displays, use the down arrow key to select "IIO Configuration" and press <Enter> to enter the IIO Configuration submenu as shown below.

Aptio Setup – A	MI
IIO Configuration 	Press <enter> to bring up the Intel® VMD for Volume Management Device Configuration menu.</enter>
	++: Select Screen 11: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit

6. When the screen above displays, use the down arrow key to select **Intel® VMD Technology** and press <Enter> to invoke its submenu as shown below.

Aptio Setup - AMI Advanced	
Intel® VMD Technology NVMe Mode Switch [Auto] Intel® VMD for Volume Management Device on CPU1	Select NVMe Mode, default Auto mode – enable VMD when VROC key presence +*: Select Screen 14: Select Item Enter: Select
	+/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit
Version 2.21.1279 Copyright (C)	2020 AMI

Note: The "Intel VMD for Volume Management Device on CPU1" feature is grayed out (unavailable) by default. To enable this feature support, please click "NVMe Mode Switch", select "Manual" from its options pull-down box as shown below, and press <Enter>. After changing the default setting of the "NVMe Mode Switch" to Manual, the feature-"Intel VMD for Volume Management Device on CPU1 (or another selected CPU)" will become available for VMD configuration.



- 7. Once you've enabled the feature: "Intel VMD for Volume Management Device on CPU1 (or another selected CPU)," you are ready to configure a desired device for VMD support. From the available VMD devices displayed on the screen, select a desired device and highlight it (to select it for VMD support).
- 8. After selecting the VMD device, select <Enable> from the options pull-down box and press <Enable> to enable VMD support for the selected device as shown below.



- 9. Repeat Step 7 ~ Step 8 to select and enable all devices of your choice for VMD support.
- 10. After all devices chosen by you are enabled for VMD support on the BIOS Setup utility, install the physical VMD devices (such as add-on cards) on the slots that you've configured for VMD support on the motherboard.
- 11.Press <F4> to save the settings and exit the BIOS Setup utility. Press <Del> during system boot to enter the BIOS Setup utility.

**Note:** After you've enabled VMD support in the BIOS on a PCIe slot specified by you, this PCIe slot will be dedicated for VMD use only, and it will no longer support any PCIe device. To re-activate this slot for PCIe use, please disable VMD in the BIOS.

12. From the BIOS Setup utility, select the **Advanced** tab and press <Enter>. The following screen will display.



13. From the **Advanced** menu, use the down arrow key to select **Intel® Virtual RAID on CPU** by highlighting it as shown above and press <Enter>. The following screen will display.

Aptio Setup – American Megatrends Internati Intel(R) Virtual RAID on CPU	onal, LLC.
Intel(R) VROC with VMD Technology 7.5.0.1126 Upgrade key: Premium	Select to see more information about the Intel VMD Controllers
No RAID volumes on the system	
Intel VROC Managed Controllers: ▶ All Intel VMD Controllers	
	<pre>+: Select Screen 14: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save &amp; Exit ESC: Exit</pre>
Ver. 2.21.1277 Copyright (C) 2020 American Megatrends	International, LLC.

**Note 1:** The license and a (connection) header on the motherboard for Intel® VROC hardware key are required.

**Note 2:** Intel<sup>®</sup> VROC Premium hardware key is used in the user's guide to demonstrate RAID settings.

From the screen as shown above, press <Enter> to invoke to All Intel VMD
 Controllers submenu as shown below. This submenu will allow you to create RAID volumes and configure settings of NVMe devices as detected by the system.

All Intel VMD Controllers ▶ Create RAID Volume	This page allows you to create a RAID volume
Non-RAID Physical Disks: SAMSUNG MZQLB119HAJR-00007 SN:S439NX0M501218, 1788.506B Port 5:0, Slot 1, CPU0, VM04, BDF 81:00.0 SAMSUNG MZQLB179HAJR-00007 SN:S439NX0M50024, 1788.506B Port 5:1, Slot 2, CPU0, VM04, BDF 82:00.0	
	<pre>+*: Select Screen 11: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save &amp; Exit ESC: Exit</pre>

## **1.2 Configuring RAID Settings**

Follow the instructions provided in Section 1.1 to access the **All Intel VMD Controllers** submenu as show in the screen below. Please carefully follow the instructions listed in this section to configure RAID settings for your devices as desired.

Aptio Setup – American Megatrends Interr Intel VROC Managed VMD	hational, LLC.
All Intel VMD Controllers	This page allows you to create a RAID volume
Non-RAID Physical Disks: > SAMSUNG M2QLBIT9HAJR-00007 SN:S439NX0M501218, 1788.50GB Port 5:0, Slot 1, CPU0, VMD4, BDF 81:00.0 > SAMSUNG M2QLBIT9HAJR-00007 SN:S439NX0M500024, 1788.50GB Port 5:1, Slot 2, CPU0, VMD4, BDF 82:00.0	
	++: Select Screen 11: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit
Ver. 2.21.1277 Dopuright (D) 2020 American Megatre	ands International, LLC.

#### To Create a RAID Volume

From the screen above, use the arrow keys to select **Create RAID Volume** and press <Enter> to enter the **Create RAID Volume** submenu as shown below. This submenu will allow you to create and configure the settings of the RAID volume as you desire.

Aptio Setup – Create RAID Volume	American Megatrends Inter	national, LLC.
Create RAID Volume		Enter a unique volume name
Name:		the beginning or backslash and
RAID Level:	[RAIDO(Stripe)]	is 16 characters or less.
Enable RAID Spanned over VMD	[]	
Controllers:		
Select Disks:		
SAMSUNG MZQLB1T9HAJR-00007	[]	
SN:S439NX0M501218, 1788.50GB		
Port 5:0 CPU0 VMD4		
SAMSUNG MZQLB1T9HAJR-00007	[]	
SN:S439NX0M500024, 1788.50GB		
Port 5:1 CPU0 VMD4		++: Select Screen
		T↓: Select Item
Strip Size:	[128KB]	Enter: Select
Capacity (GB):	0.0	+/-: Change Opt.
		F1: General Help
▶ Create volume		F2: Previous values
Select at least two dicks		F3: Uptimizeu Derduits
Select at least two disks		ECP. EVit
		LOU. LAIT

#### To Enter a Name for the RAID Volume

From the **Create RAID Volume** submenu as shown on the previous screen, use the arrow keys to select **Name** and press <Enter>, and the following screen will display.



When the screen above displays, enter a unique name for the RAID volume.

#### To Set the RAID Level for the RAID Volume

From the **Create RAID Volume** submenu, select **RAID Level** and press <Enter>. The following screen will display.

Create RAID Volume		Select RAID Level
Name: RAID Level: Enable RAID Spanned over VMD Controllers:	Volume0 [RAIDO(Stripe)] []]	
Select Disks: SAMSUNG M20LB179H03R-00007 SN:S439NX0H501218, 1788.506B Port 5:0 CPU0 VM04 SAMSUNG M20LB179H03R-00007 SN:S439NX0H500024, 1788.506B Port 5:1 CPU0 VM04 SAMSUNG M20LB179H03R-00007 SN:S439NX0K501219, 1788.506B Port 5:2 CPU0 VM04 SAMSUNG M20LB179H03R-00007 SN:S439NX0K501215, 1788.506B Port 5:3 CPU0 VM04	[] RAID Level: RAID0(Stripe) RAID1(Mirror) RAID5(Parity) []	++: Select Screen 14: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F3: Soure & F4:
Strip Size: Capacity (GB):	[128KB] 0.0	ESC: Exit
Create Volume		

Use the arrow keys to select the desired RAID level for the RAID volume that you've created. The options are **RAID0(Stripe)**, RAID1(Mirror), RAID5(Parity), and RAID10(RAID0+1).

**Note 1:** The RAID level(s) displayed is(are) based on the number of NVMe devices connected to the system.

**Note 2:** For RAID0/RAID1/RAID5/RAID10, the minimum number of NVMe devices required is two/two/three/four respectively.

RAID Setting	Minimum Number of NVMe Devices Required
RAID 0	Two
RAID 1	Two
RAID 5	Three
RAID 10	Four

**Note 3:** Use Intel® VROC Standard hardware key to support RAID 0/1/10. Use Intel® VROC Premium hardware key (or Intel SSD Only hardware key) to support RAID 0/1/5/10.

#### Enabling RAID Spanned over VMD Controllers

From the **Create RAID Volume** submenu, use the arrow keys to select **Enter RAID spanned over VMD Controllers** and press <Enter>. The following screen will display.

Create RAID Volume		Enable RAID Spanned over VMD
		Controllers: For Data RAID
Name:	VolumeO	only, boot not supported.
RAID LEVEL:	[RAIDU(Stripe)]	
Controllers:		
Select Disks:		
SAMSUNG MZQLB1T9HAJR-00007	[]	
SN:S439NX0M501218, 1788.50GB		
Port 5:0 CPU0 VMD4 Enable	RAID Spanned over VMD Con	trollers:
SAMSUNG MZQLB1T9HAJR-		
SN:S439NX0M500024, 17 X		
Port 5:1 CPU0 VMD4		Screen
SAMSUNG MZQLB1T9HAJR-00		Item
SN:S439NX0M501219, 1788.50GB		Enter: Select
Port 5:2 CPU0 VMD4	12 N	+/-: Change Opt.
SAMSUNG MZQLB1T9HAJR-00007	LJ	F1: General Help
SN:S439NXUM5U1215, 1788.50GB		F2: Previous values
MORT 5:3 CPUU VMD4		F3: Uptimized Defaults
Otain Cina.	[100/0]	F4: Save & Exit
SULTA SIZE:	[120KB]	COL. EXIL
capacity (ap).	0.0	
Preste Volume		

Enter a desired setting for your RAID volume in the pop-up menu. The options are **(not selected)** and **X** (selected). To select **X** and make it the default, press the down arrow key when **X** is highlighted and press <Enter>. This feature will allow the RAID level you've selected earlier to cross the VMD domains.

**Note:** The feature above is for Data RAID only. For a bootable RAID volume, do not cross VMD domains.

#### To Select Disks for the RAID Volumes

From the **Create RAID Volume** submenu, use the arrow keys to highlight **Select Disk:** and press <Enter>. The following screen will display.

Create RAID Volume		X - to Select Disk
Name: RAID Level: Enable RAID Spanned over VMD Controllers:	VolumeO [RAIDO(Stripe)] []]	
Select Disks:		
SAMSUNG MZQLB1T9HAJR-00007 SN:S439NX0M501218. 1788.50GB		
Port —— SAMSUNG MZQLB1T9HAJR-00	007 SN:S439NX0M501218, 178	38.50GB Port 5:0 CPU0 VMD4 ————
Port SAMSUNG M2QLB1T9HAJR-00 SAMS SN:S Port SAMSUN SAMSUN SN:S439NX0M501219, 1788,5068	007 SN:S439NX0M501218, 178	8.506B Port 5:0 CPU0 VMD4
Port 5:2 CPU0 VMD4	007 SN:S439NX0M501218, 170	8.506B Port 5:0 CPU0 VMD4
Port SAMSUNG M20LB1T9HAJR-00 SANS X Port SN:5439NX0M501219, 1788.506B Port 5:2 CPU0 WD4 SAMSUNG M20LB179HAJR-0007 SN:5439NX0M501215, 1788.506B Port 5:3 CPU0 WD4	007 SN:S439NXOM501218, 178	B.50GB Port 5:0 CPU0 VMD4 Enter: Select +/-: Change Oot. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Fxit
Port SAMSUNG M20LB1T9HAJR-00 SAMS SAMSUN SAMSUN SAMSUN SAMSUN SAMSUN SAMSUN SAMSUNG SAMSUNG SAMSUNG M20LB1T9HAJR-0007 SN:S439NX0MS01215, 1788.50GB Port 5:3 CPU0 VMD4 Strip Size:	007 SN:S439NXOM501218, 178 [ ] [128K8]	8.5068 Port 5:0 CPU0 VMD4 Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit
Port SAMSUNG M20LB1T9HAJR-00 SAMS SAMSUN SAMSUN SAMSUN SAMSUN SAMSUN SAMSUN SAMSUNG SAMSUNG SAMSUNG M20LB1T9HAJR-00007 SN:5439MX0MS01215, 1788.506B Port 5:3 CPU0 VMD4 Strip Size: Capacity (GB):	007 SN:S439NXOM501218, 178 [] [] [128KB] 0.0	8.50GB Port 5:0 CPU0 VMD4 Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit

The options are **(not selected)** and X (selected). To select **X** as your desired RAID disk for your RAID volume configuration, highlight **X**, press the down arrow key and then press <Enter>\*. (\*See the note below.) Repeat the same step to select all your desired disks for your desired RAID volumes.

**Note:** A faster way to select a disk is to press the <Space Bar> instead of pressing <Enter>.

#### To Set Strip Size for the RAID Volume

From the **Create RAID Volume** submenu, use the arrow keys to select **Strip Size:** and press <Enter>. The following screen will display.

reate RAID Volume		▲ Strip size help
Name:	Volume0	
RAID Level:	[RAIDO(Stripe)]	
Enable RAID Spanned over VMD Controllers:	[]	
Select Disks:		
SAMSUNG MZULBI19HAJK-00007 SN:S439NY0M501218 1788 5068	AKB	
Port 5:0 CPU0 VMD4	BKB	
SAMSUNG MZQLB1T9HAJR-00007	16KB	
SN:S439NX0M500024, 1788.50GB	32KB	
Port 5:1 CPU0 VMD4	64KB	++: Select Screen
SAMSUNG MZQLB1T9HAJR-00007	128KB	t↓: Select Item
SN:S439NX0M501219, 1788.5068		Enter: Select
SAMSLING MZ01 B1T9HATR-00007	r 1	E1: Ceneral Help
SN:S439NX0M501215, 1788, 50GB		F2: Previous Values
Port 5:3 CPU0 VMD4		F3: Optimized Defaults
Strip Size:		ESC: Exit
Capacity (GB):	0.0	
Create Volume		₩ •

From the pop-up window as shown above, select the desired RAID strip size for your RAID volume and press <Enter>. The options are 4KB, 8KB, 16KB, 32KB, 64KB, and **128KB**.

#### To Set the Capacity (GB) for the RAID Volume

From the **Create RAID Volume** submenu, use the arrow keys to select **Capacity (GB):** and press <Enter>. The following screen will display.

Create RAID Volume		Capacity is an approximation
Name:	VolumeO	size. 0 will be treated as
RAID Level:	[RAIDO(Stripe)]	Maximum Size, Default Capaci
Enable RAID Spanned over VMD Controllers:	[]	is approximately 95% of Maximum size.
Select Disks:	r 1	
SN:S439NX0M501218, 1788.50GB	1 1	
Port 5:0 CPUO VMD4		
SAMSUNG MZQLB1T9HAJR-00007	—Capacity (GB):—	_
SN:S439NX0M500024, 1/88.5068	0.0_	the Solact Senson
SAMSUNG MZOLB1T9HATR-00007		tl: Select Item
SN:S439NX0M501219, 1788.50GB		Enter: Select
Port 5:2 CPUO VMD4		+/-: Change Opt.
SAMSUNG MZQLB1T9HAJR-00007	[]	F1: General Help
SN:S439NX0M501215, 1788.50GB		F2: Previous Values
Port 5:3 CPUO VMD4		F3: Optimized Defaults
Strip Size:	[128KB]	ESC: Exit
Capacity (GB):	0.0	
Sreate Volume		

Enter the desired RAID capacity (in GB) in the pop-up window to set the capacity for your RAID volume.

#### To Set the RWH Policy for RAID 5

When the following screen displays, use the arrow keys to select **RWH Policy**, and press the <Tab> key. The available options will display: Distributed PPL and **Disable** (\*Default). Select your desired option and press <Enter>.

Huvanceu		
Select Disks: INTEL SSDF2cX00078 SN:BTLJ746603308P0HGN, 7452.04GB 4:2 CPU1 VM03 INTEL SSDF2cX00078 SN:BTLJ746603508P0HGN, 7452.04GB 4:3 CPU1 VM03 INTEL SSDF2cX00078 SN:BTLJ746603508P0HGN, 7452.04GB 5:0 CPU1 VM04 INTEL SSDF2cX00078 SN:BTLJ746603408P0HGN, 7452.04GB S:1 CPU1 VM04 INTEL SSDF2cX00078 SN:BTLJ746603408P0HGN, 7452.04GB	(X) Port (X) Port (X) Port RWH Polloy Distributed PPL Disable Port	Raid Write Hole Policy mode. Select Distributed PPL, Journaling Drive or Disable. Note: Journaling Drive needs to be created first in order to enable option.
S:2 CPU1 MH04 INTEL SSDF2KX040T8 SN:BTLJ74550A874P0DGN, 3726.02GB S:3 CPU1 VM04 Strip Size: Capacity (GB): RAH Policy	[ ] Port [64KB] 14158.86 [Disable]	+: Select Screen 14: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit

#### **To Create Volumes**

To finalize your RAID volume configuration, select **Create Volume** from the **Create RAID Volume** submenu as shown on the screen below.

Aptio Setup – Create RAID Volume	American Megatrends Inte	ernational, LLC.
Create RAID Volume Name: RAID Level:	VolumeO [RAIDO(Stripe)]	Create a volume with the settings specified above
Enable RAID Spanned over VMD Controllers: Select Disks:	[X]	
SAMSUNG MZQLB1T9HAJR-00007 SN:S439NXOM501218, 1788.50GB Port 5:0 CPU0 VMD4	[X]	
SAMSUNG MZQLB1T9HAJR-00007 SN:S439NX0M500024, 1788.50GB Port 5:1 CPU0 VMD4	[X]	++: Select Screen 14: Select Item
Strip Size:	[128KB]	Enter: Select
Capacity (GB):	3398.13	+/-: Change Opt. E1: General Help
▶ Create Volume		F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit
	rt (t) 2020 Allel Itali Negal	renus international, LLC.

After selecting **Create Volume**, press <Enter>. The following screen will appear and will display RAID volumes as shown below.

Aptio Setup – American Megatrends International, LLC. Intel VROC Managed VMD		
All Intel VMD Controllers ▶ Create RAID Volume RAID Volumes: ▶ Volume0, RAID0(Stripe), 3398.136B, Normal	Select to see more information about the RAID Volume	
	<pre>++: Select Screen 14: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save &amp; Exit ESC: Exit</pre>	
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#### To Display RAID Volumes

For detailed RAID volume information, use the arrow keys to select the desired RAID volume to display as shown in the screen below.

Aptio Set RAID VOLUME INFO	up – American Megatrends Inter	national, LLC.
RAID VOLUME INFO Volume Actions ▶ Delete Name: RAID Level: Strip Size: Size: Status: Bootable: Disk direct	VolumeO RAIDO(Stripe) 128KB 3398.136B Normal Yes	
Block size: RAID Member Disks: SANSUNG M2GLBITSHAR-00007 SN Port 5:0, Slot 1, CPU0, VM SAMSUNG M2GLBITSHAJR-00007 SN Port 5:1, Slot 2, CPU0, VM	512 :S439NXOM501218, 1788.506B D4, BDF 81:00.0 :S439NXOM500024, 1788.506B D4, BDF 82:00.0	<pre>++: Select Screen I4: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save &amp; Exit ESC: Exit</pre>
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#### To Delete a RAID Volume

From the **Intel® Virtual RAID on CPU** submenu, use the arrow keys to select the Volume you want to delete as shown below.

Aptio Setup – American Megatrends Interna Intel(R) Virtual RAID on CPU	ational, LLC.
Intel(R) VROC with VMD Technology 7.5.0.1126 Upgrade key: Premium	Select to see more information about the RAID Volume
Intel VROC Managed Volumes: ▶ Volume0, RAID5(Parity), 3398.13G8, Normal	
Intel VROC Managed Controllers: ▶ All Intel VMD Controllers	
	<pre>++: Select Screen fl: Select Item Enter: Select +/-: Change Opt. Fl: General Help F2: Previous Values F3: Optimized Defaults F4: Save &amp; Exit ESC: Exit</pre>
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When the screen as shown above appears, press <Enter>. The following screen will display.

RAID VOLUME INFO		
Volume Actions Delete Name: RAID Level: Strip Size: Size: Size: Status: Bontable:	Volume0 RAID5(Parity) 64KB 3390.136B Normal Vee	
Block size: RWH Policy:	512 [Disable]	++: Select Screen
SAMSUNG MZQLBIT9HAJR-00007 Port 5:0, Slot 1, CPU0, SAMSUNG MZQLBIT9HAJR-00007 Port 5:1, Slot 2, CPU0,	SN:S439NX0M501218, 1788.50GB VMD4, BDF 81:00.0 SN:S439NX0M500024, 1788.50GB VMD4, BDF 82:00.0	Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values
▶ SAMSUNG MZQLB1T9HAJR-00007 Port 5:2, Slot 3, CPU0,	SN:S439NXOM501219, 1788.506B VMD4, BDF 83:00.0	F3: Optimized Defaults F4: Save & Exit ESC: Exit

When the screen as shown above appears, press <Enter>, and the **delete confirmation** submenu screen will display as shown below.

Aptio Setup – American Megatrends Internat Delete	ional, LLC.
Delete Delete the RAID volume? ALL DATA ON VOLUME WILL BE LOST!	Deleting a volume will reset the disks to non-RAID.
▶ Yes ▶ No	
	++: Select Screen 14: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit
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When the submenu as shown above appears, asking you if you want to delete the RAID volume. Press **Yes** to delete the RAID volume on the selected disk.

**Note**: when you choose to delete the RAID volume from a disk, all data on that disk will be deleted as well.

#### To Reset the RAID Volume to non-RAID

On the **RAID VOLUME INFO** submenu below, select the desired NVMe device from the list to reset to non-RAID, and press <Enter>. The following screen will display.

Aptio S RAID VOLUME INFO	Setup – American Megatrends Interna	ational, LLC.
RAID VOLUME INFO		
Volume Actions ▶ Delete		
Name: RAID Level: Strip Size: Size: Status: Bootable: Block size: RWH Policy: RAID Member Disks: > SAMSUNG M20LBIT9HAJR-00007 Port 5:0, Slot 1, CPU0, > SAMSUNG M20LBIT9HAJR-00007 Port 5:1, Slot 2, CPU0, > SAMSUNG M20LBIT9HAJR-00007 Port 5:2, Slot 3, CPU0,	Volume0 RAID5(Parity) 64KB 3398.136B Norma1 Yes 512 [Disable] SN:S439NXOM501218, 1788.506B YMD4, BDF 81:00.0 SN:S439NXOM50024, 1788.506B YMD4, BDF 82:00.0 SN:S439NXOM501219, 1788.506B YMD4, BDF 83:00.0	<pre>++: Select Screen 14: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save &amp; Exit ESC: Exit</pre>
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Select **Reset to Non-RAID** from the screen below and press <Enter> to reset the selected NVMe device to a Non-RAID device.

Aptio Setup PHYSICAL DISK INFO	– American Megatrends Inter	national, LLC.
SAMSUNG MZQLB1T9HAJR-00007 SN:S4	39NXOM501218, 1788.50GB	Removes RAID data from the disk
Disk Actions: ▶ Reset to non-RAID		
Locate LED	[Off]	
Controller:	Volume Management Device Controller	
Model Number:	SAMSUNG MZQLB1T9HAJR-00007	
Serial Number:	\$439NX0M501218	
Size:	1788.50GB	
Status:	RAID Member	
Block Size:	512	++: Select Screen
Root Port Number:	5	t↓: Select Item
Root Port Offset:	0	Enter: Select
Slot Number:	1	+/-: Change Opt.
Socket Number:	0	F1: General Help
VMD Controller Number:	4	F2: Previous Values
PCI Bus:Device.Function:	81:00.0	F3: Optimized Defaults
VMD Bus:Device.Function:	64:00.5	F4: Save & Exit ESC: Exit
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When the following screen appears, select **Yes** to confirm that you want to set the selected RAID device to non-RAID. The options are **Yes** and No.

Aptio Setup – American Megatrends Internati Reset to non-RAID	onal, LLC.
Reset to non-RAID	Removes RAID data from the disk
Remove RAID structure on disk?	
▶ Yes ▶ No	
	++: Select Screen
	Enter: Select
	F1: General Help F2: Previous Values
	F3: Optimized Defaults F4: Save & Exit
	ESC: Exit
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#### To Turn on the Disk Locator LED

Follow the instructions stated in Section 1.1 to access the **Advanced** Menu. Scroll down the **Advanced** menu to select the **Intel® Virtual RAID on CPU** submenu by highlighting it as shown below.



When the Intel® Virtual RAID on CPU submenu is selected, press <Enter> to access the All Intel VMD Controllers submenu as displayed below.

Aptio Setup – American Megatrends Int Intel(R) Virtual RAID on CPU	ernational, LLC.
Intel(R) VROC with VMD Technology 7.5.0.1126 Upgrade key: Premium	Select to see more information about the Intel VMD Controllers
Intel VROC Managed Volumes: ▶ VolumeO, RAID5(Parity), 3398.13GB, Normal	
Intel VROC Managed Controllers: ▶ All Intel VMD Controllers	
	++: Select Screen ↑↓: Select Item
	Frier: Select +/-: Change Opt. F1: General Help E2: Preview Values
	F3: Optimized Defaults F4: Save & Exit F55: Exit
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When the **All Intel VMD Controllers** submenu appears as shown above, select **All Intel VMD Controllers** and press <Enter>. The following screen will display.



From the submenu displayed above, select the VMD drive you want to turn on **the Locate LED** by highlighting it and press <Enter>. The following screen will display.

Aptio Se PHYSICAL DISK INFO	tup – American Megatrends Interr	national, LLC.
SAMSUNG MZQLB1T9HAJR-00007 S	N:S439NXOM501215, 1788.50GB	Sends locate led command to a
Disk Actions:		0,140
Reset to non-RAID		
Locate LED		
Controller:	Volume Management Device Controller	
Model Number:	SAMSUNG MZQLB1T9HAJR-00007	
Serial Number:	\$439NX0M501215	
Size:	1788.50GB	
Status:	Journaling Drive	
Block Size:	512	++: Select Screen
Root Port Number:	5	↑↓: Select Item
Root Port Offset:	3	Enter: Select
Slot Number:	4	+/-: Change Opt.
Socket Number:	0	F1: General Help
VMD Controller Number:	4	F2: Previous Values
PCI Bus:Device.Function:	84:00.0	F3: Optimized Defaults
VMD Bus:Device.Function:	64:00.5	F4: Save & Exit ESC: Exit
Journaling Disk PPL areas:		
JD PPL MPB 0	(Unused)	
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When the **PHYSICAL DISK INFO** submenu screen displays as shown above, use the down arrow key to select **Locate LED** and press <enter>.

A pop-up window will display to confirm if you want to enable **Locate LED**. Select **On** to enable the **Locate LED** feature. The options are On and **Off**.



#### To Mark a Non-RAID Drive as Spare

Follow the instructions stated in Section 1.1 to access the **Advanced** Menu. Scroll down to select the **Intel® Virtual RAID on CPU** and press <Enter> to access the **All Intel VMD Controllers** submenu. Select the item **All Intel VMD Controllers** and press <Enter> to invoke the following submenu screen.

Aptio Setup – American Megatrends Intern Intel VROC Managed VMD	national, LLC.
All Intel VMD Controllers ▶ Create RAID Volume	Select to see more information about the disk
<ul> <li>Non-RAID Physical Disks:</li> <li>SAMSUNG M2QLBIT9HAJR-00007 SN:S439NX0M501218, 1788.5068</li> <li>Port 5:0, Slot 1, CPU0, VMD4, BDF 81:00.0</li> <li>SAMSUNG M2QLBIT9HAJR-00007 SN:S439NX0M50024, 1788.5068</li> <li>Port 5:1, Slot 2, CPU0, VMD4, BDF 82:00.0</li> <li>SAMSUNG M2QLBIT9HAJR-00007 SN:S439NX0M501215, 1788.5068</li> <li>Port 5:2, Slot 3, CPU0, VM04, BDF 83:00.0</li> <li>SAMSUNG M2QLBIT9HAJR-00007 SN:S439NX0M501215, 1788.5068</li> <li>Port 5:3, Slot 4, CPU0, VM04, BDF 84:00.0</li> </ul>	++: Select Screen 14: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Gottimized Defaults
	F4: Save & Exit ESC: Exit

From the submenuas shown above, select a Non-RAID drive to mark as Spare and press < Enter>. When the following screen displays, select **Mark as Spare** and press < Enter> to mark the selected device as a spare device.

Aptio S PHYSICAL DISK INFO	Setup – American Megatrends Intern	ational, LLC.
SAMSUNG MZQLB1T9HAJR-00007	SN:S439NX0M501218, 1788.50GB	Mark disk as Spare
Disk Actions: ▶ Mark as Spare ▶ Mark as Journaling Drive Locate LED	[0ff]	
Controller:	Volume Management Device Controller	
Model Number:	SAMSUNG MZQLB1T9HAJR-00007	
Serial Number:	S439NX0M501218	
Size:	1788.50GB	
Status:	Non-RAID	++: Select Screen
BIOCK Size:	512	14: Select item
Root Port Affset:	0	Liter - Select
Slot Number:	1	E1: General Help
Socket Number:	0	F2: Previous Values
VMD Controller Number:	4	F3: Optimized Defaults
PCI Bus:Device.Function:	81:00.0	F4: Save & Exit
VMD Bus:Device.Function:	64:00.5	ESC: Exit
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After marking the selected drive as Spare, a pop-up window will display to confirm if you want to mark the selected device as spare. Select **Yes** and press <Enter> to make the selected drive as a spare drive. If you do not want to make the selected drive as a spare drive, select **No** and press <Enter>.

Aptio Setup – American Megatrends Internatio Mark as Spare	onal, LLC.
Mark as Spare	Mark disk as Spare
Are you sure you want to mark the disk as Spare? Marking disk as Spare will remove all data on the disk.	
≻ Yes ▶ No	
	<pre>++: Select Screen 11: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save &amp; Exit ESC: Exit</pre>
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**Note:** A spare disk is used for automatic RAID volume rebuilds when the status of "failed", "missing", or "at risk" is detected on the array disk. For a RAID0 volume, only the status of "at risk" will trigger automatic RAID volume rebuilds.

#### To Mark a Non-RAID Drive as a Journaling Drive

Refer to the instructions stated in Section 1.1 to access the **All Intel VMD Controllers** menu. When the following screen appears, select a desired NVMe device from the list of Non-RAID Physical Disks to be used as a journaling drive. A journaling drive is used as an error event log to record an event when an error occurs to a RAID5 volume.

Aptio Setup – American Megatrends International, LLC. Intel VROC Managed VMD	
All Intel VMD Controllers ▶ Create RAID Volume	Select to see more information about the disk
Non-RAID Physical Disks:           > SAMSUNG MZQLBIT9HAJR-00007 SN:S439NX0M501218, 1788.50GB           Port 5:0, Slot 1, CPU0, VMD4, BDF 81:00.0           > SAMSUNG MZQLBIT9HAJR-00007 SN:S439NX0M500024, 1788.50GB           Port 5:1, Slot 2, CPU0, VMD4, BDF 82:00.0           > SAMSUNG MZQLBIT9HAJR-00007 SN:S439NX0M501219, 1788.50GB           Port 5:2, Slot 3, CPU0, VMD4, BDF 82:00.0	
<ul> <li>SHMSUNG MCQUBBIJHHAR-00007 SH:S439NA0H501215, 1788.5048</li> <li>Port 5:3, Slot 4, CPU0, VHD4, BDF 84:00.0</li> </ul>	<ul> <li>++: Select Screen</li> <li>↑↓: Select Item</li> <li>Enter: Select</li> <li>+/-: Change Opt.</li> <li>F1: General Help</li> <li>F2: Previous Values</li> <li>F3: Optimized Defaults</li> <li>F4: Save &amp; Exit</li> <li>ESC: Exit</li> </ul>
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After selecting a NVMe device, press <Enter> and the following screen will appear. Select **Mark as Journaling Drive** and press <Enter>.

Aptio S PHYSICAL DISK INFO	etup – American Megatrends Interna	tional, LLC.
SAMSUNG MZQLB1T9HAJR-00007	SN:S439NX0M501218, 1788.50GB	Mark disk as Journaling Drive
Disk Actions: ▶ Mark as Spare ▶ Mark as Journaling Drive Locate LED	[Off]	
Controller:	Volume Management Device Controller	
Model Number:	SAMSUNG MZQLB1T9HAJR-00007	
Serial Number:	S439NX0M501218	
Size:	1788.50GB	
Status:	Non-RAID	↔: Select Screen
Block Size:	512	↑↓: Select Item
Root Port Number:	5	Enter: Select
Root Port Offset:	0	+/-: Change Opt.
Slot Number:	1	F1: General Help
Socket Number:	0	F2: Previous Values
VMD Controller Number:	4	F3: Uptimized Defaults
PUI Bus:Device.Function:	81:00.0	F4: Save & Exit
vnb bus.bevice.Function:	64.00.5	COU. EXIL
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When the following screen appears, select **Yes** to confirm that the selected device will be used as a journaling drive. The options are **Yes** and No.

Aptio Setup – A Mark as Journaling Drive	merican Megatrends I	nternational, LLC.
Mark as Journaling Drive		Mark disk as Journaling Drive
Are you sure you want to mark the disk as Journaling Drive? Marking disk as Journaling Drive will remove all data on the disk.		
► Yes		
NU.		
		<pre>++: Select Screen 14: Select Item Enter: Select +/-: Change Opt. F1: General Heip F2: Previous Values F3: Optimized Defaults F4: Save &amp; Exit ESC: Exit</pre>
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**Note:** RAID Write Hole (RWH) is a condition associated with a power/drive-failure or crash when writing to a RAID5 volume. The use of journaling drive that contains partial parity logging (PPL) can reduce the potential data loss. Refer to the following illustration for the use of journaling drive.



## 1.3 Use of Journaling Drive

The following section describes the use of a journaling drive for the RAID5 volume, which is a parity-based RAID. A journaling drive, used as an error event log, records an event when an error occurs to a RAID5 volume. To create RAID5 drives, follow the instructions below.

Step 1. Refer to the instructions stated in Section 1.1 to access **All Intel VMD Controllers** submenu and press <Enter>. When the following screen appears, select **Create RAID Volume** and press <Enter>. The following screen will display.

Aptio Setup – American Megatrends International, LLC. Create RAID Volume		
Create RAID Volume		Enter a unique volume name that does not contain space at
Name:		the beginning or backslash and
RAID Level:	[RAIDO(Stripe)]	is 16 characters or less.
Enable RAID Spanned over VMD Controllers:	[]	
Select Disks:		
SAMSUNG MZQLB1T9HAJR-00007 SN:S439NX0M501218, 1788.50GB	[]	
Port 5:0 CPU0 VMD4		
SAMSUNG MZQLB1T9HAJR-00007	[]	
SN:S439NX0M500024, 1788.50GB		
Port 5:1 CPU0 VMD4		++: Select Screen
SAMSUNG MZULBI THAJR-00007	L J	14: Select Item
SN:S439NXUM501219, 1788.5068		Enter: Select
PUPIL 5:2 GEOU VH04 SOMSLING MZOL P1 TPHO TP. 00007	r 1	F1: Concept Woln
SN+S439NX0M501215 1788 5008		F2: Previous Values
Port 5:3 CPU0 VMD4		E3: Ontimized Defaults
		F4: Save & Exit
Strip Size:	[128KB]	ESC: Exit
Capacity (GB):	0.0	
▶ Create Volume		▼
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When the screen above appears, use the down arrow key to select **RAID Level** and press <Enter>. The following screen will display.

Aptio Setup - Create RAID Volume	- American Megatrends Int	ernational, LLC.
Create RAID Volume		Select RAID Level
Name: RAID Level: Enable RAID Spanned over VMD Controllers:	VolumeO [RAIDO(Stripe)] []	
Select Disks: SANSUNG MZQLB179HAJR-00007 SN:S439NX0M501218, 1788.50GB Port 5:0 CPU0 VM04 SANSUNG MZQLB179HAJR-00007 SN:S439NX0M500204, 1788.50GB Port 5:1 CPU0 VM04 SANSUNG MZQLB179HAJR-00007 SN:S439NX0M501218, 1788.50GB Port 5:2 CPU0 VM04 SANSUNG MZQLB179HAJR-00007 SN:S439NX0M501215, 1788.50GB Port 5:3 CPU0 VM04	[] RAID Level: RAID0(Stripe) RAID5(Parity) RAID5(Parity)	++: Select Screen 11: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F3: Optimized Defaults
Strip Size: Capacity (GB):	[128KB] 0.0	ESC: Exit
▶ Create Volume		
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Create RAID Volume		Select RAID Level
Name: ARID Level: Enable RAID Spanned over VMD Controllers:	Volume0 [RAIDO(Stripe)] []]	
Select Disks: SAMSUNG MZQLB15HAJR-00007 SN:5439NX0M501218, 1788.50GB Port 5:0 CPU0 VMD4 SAMSUNG MZQLB15HAJR-00007 SN:5439NX0M50024, 1788.50GB Port 5:1 CPU0 VMD4 SAMSUNG MZQLB15HAJR-00007 SN:5439NX0M501219, 1788.50GB Port 5:2 CPU0 VMD4 Port 5:3 CPU0 VMD4	[] RAID Level: RAIDO(Stripe) RAID1(Mirror) RAID5(Parity) []	++: Select Screen 11: Select Item Enter: Select +/-: Change Opt, F1: General Help F2: Previous Values F3: Optimized Defaults
Strip Size: Capacity (GB):	[128KB] 0.0	ESC: Exit

From the pop-up window above, select **RAID5 (Parity)** and press <Enter>.

After selecting RAID5 (Parity), press <Enter>, and the following screen will display.

Create RAID Volume		Select RAID Level
Name:	Volume0	
Enable RAID Spanned over VMD Controllers:	[]	
Select Disks:		
SAMSUNG MZQLB1T9HAJR-00007 SN:S439NX0M501218, 1788.50GB	[]]	
Port 5:0 CPU0 VMD4		
SAMSUNG MZQLB1T9HAJR-00007	[]	
SN:S439NX0M500024, 1788.50GB		
POPT 5:1 UPU0 VMU4		**: Select Screen
SHMSUNG MZQLBITSHHJR-00007	LJ	T+: Select Item
SN:5439NXUM501219, 1788.5068		Enter: Select
SAMSLING M201 B1T9HATE-00007	r 1	F1: Ceneral Heln
SN+S439NY0M501215 1788 5008	ι	F2: Provinue Values
Port 5:3 CPUO VMD4		F3: Ontimized Defaults
		E4: Save & Exit
Strip Size:	[64KB]	ESC: Exit
Capacity (GB):	0.0	
RWH Policy	[Disable]	

When the following screen displays, use the arrow keys to select a disk that you want to mark it as RAID5 and press <Enter>. An "X" will appear on the pop-up window of the selected drive. Press the down arrow key at the "X" and press <Enter> to mark the drive as a RAID5 volume.

Repeat this step to mark at least three drives as RAID5 volume as shown below.

Create RAID Volume		X - to Select Disk
Name:	Volume0	
RAID Level:	[RAID5(Parity)]	
Enable RAID Spanned over VMD Controllers:	[]	
Select Disks:		
SAMSLING MZOL B1 T9HA TR-00007	[X]	
SN:S439NX0M501218, 1768.50GB Port SAMSUNG MZQLB1T9HAJR-00	0007 SN:S439NX0M501219, 17	88.50GB Port 5:2 CPU0 VMD4
SANSUM (1280-1219) 1780-5068 Pont SAMSUNG M2QLB1T9HAJR-00 SAMS SKIS X Pont SKIS X SAMSUM	0007 SN:S439NX0M501219, 17	88.506B Port 5:2 CPU0 VMD4
UNISON HEADEILINING COULD SAMSUNG MEQLBIT9HAJR-OU SAMSUNG MEQLBIT9HAJR-OU SAMSUNG MEDILINI SAMSUN SAMSUNG MEDILINI SAMSUNG MEDIL	0007 SN:S439NXOM501219, 17	88.50GB Port 5:2 CPU0 VMD4
SANSUM 1218, 1788,505B           Pont           SAMSUNG M2QLB1T9HAJR-00           SAMS           SAMSUNG M2QLB1T9HAJR-00           SAMSUNG M2QLB1T9HAJR-00           SAMSUNG M2QLB1T9HAJR-00           SAMSUNG M2QLB1T9HAJR-00           SAMSUNG M2QLB1T9HAJR-0007           SAMSUNG M2QLB1T9HAJR-00007           SN:5439NX0M501215, 1788.50GB           Pont 5:3 CPU0 VMD4	0007 SN:5439NXOM501219, 17	88.506B Port 5:2 CPU0 VMD4 Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Fx1
SMASDA HEREIJANG-GOOD SAMS SAMSUNG MZQLBIT9HAJR-OC SAMS SAMSUN SAMSUN SAMSUN SAMSUN SAMSUN SAMSUNG SAMSUNG MZQLBIT9HAJR-OCOO7 SMS1439NXOM501215, 1788.50GB Port 5:3 CPU0 VMD4 Strip Size:	0007 SN: 5439NX0M501219, 17 [ ] [ 64KB]	88.5068 Port 5:2 CPU0 VMD4 Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit
SHABANG HEREFITANGK-GOOR SAMSUNG HEREFITANGK-GOOR SAMSUNG M2QLBIT9HAJR-OU SAMSUNG M2QLBIT9HAJR-OU SAMSUNG M2QLBIT9HAJR-OO SAMSUNG M2QLBIT9HAJR-OO007 SN:5439NXOM501219, 1788.50GB Port 5:3 CPU0 VMD4 Strip Size: Capacity (GB):	[ ] [ 64KB] 0.0	88.5068 Port 5:2 CPU0 VMD4 Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit

Mark sure that you have at least three drives marked as RAID5 disks as shown below.

Create RAID Volume		🔺 X - to Select Disk
Name: RAID Level: Enable RAID Spanned over VMD Controllers:	Volume0 [RAID5(Parity)] []	
Select Dísks:		
SAMSUNG MZQLB1T9HAJR-00007 SN:S439NX0M501218, 1788.50GB	[X]	
SAMSUNG MZQLB1T9HAJR-00007	[X]	
Port 5:1 CPU0 VMD4		++: Select Screen
		†↓: Select Item
SN:S439NX0M501219, 1788.50GB		Enter: Select
SAMSUNG MZOLB1T9HAJR-00007	r 1	F1: General Help
SN:S439NX0M501215, 1788.50GB	. <b>.</b> .	F2: Previous Values
Port 5:3 CPUO VMD4		F3: Optimized Defaults
Strin Size:	[64KB]	F4: Save & Exit
Capacity (GB):	3398.13	
RWH Policy	[Disable]	

After you've selected three RAID5 drives, using the down arrow key to select **Create Volume** as shown below.

	()= 1	Create a volume with the
Name:	VOIUMEU	settings specified above
RHID LEVEL:	(RHID2(Paril(g))	
Controllers:		
Select Disks:		
SAMSUNG MZQLB1T9HAJR-00007	[X]	
SN:S439NX0M501218, 1788.50GB		
SAMSLING M201 B1T9HAT8-00007	[V]	
SN:S439NX0M500024 1788 5068	[/]	
Port 5:1 CPU0 VMD4		
SAMSUNG MZQLB1T9HAJR-00007	[X]	↔+: Select Screen
SN:S439NX0M501219, 1788.50GB		↑↓: Select Item
Port 5:2 CPUO VMD4		Enter: Select
SAMSUNG MZQLB1T9HAJR-00007	[]	+/-: Change Opt.
SN:S439NX0M501215, 1788.50GB		F1: General Help
Port 5:3 CPUO VMD4		F2: Previous Values
Stain Size:	[64KB]	F4: Save & Evit
Canacity (GB):	3398 13	ESC: Evit
RWH Policy	[Disable]	a second se
▶ Create Volume		· · · · · · · · · · · · · · · · · · ·

When "**Create Volume**" is selected as shown above, press <Enter> and the following screen will display.

Aptio Setup – American Megatrends International, LLC. Intel VROC Managed VMD		
All Intel VMD Controllers	This page allows you to create	
▶ Create RAID Volume	a KHID VUIUME	
RAID Volumes: ▶ Volume0, RAID5(Parity), 3398.13GB, Normal		
Non-RAID Physical Disks: ▶ SAMSUNG MZQLBIT9HAJR-00007 SN:S439NXOM501215, 1788.506B Port 5:3, Slot 4, CPU0, VMD4, BDF 84:00.0		
	++: Select Screen 11: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit	
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Using the arrow keys, select a drive that has been marked as "RAID5 (Parity) and press <Enter>, The following screen will display.

Aptio Setup – American Megatrends Intern RAID VOLUME INFO	national, LLC.
RAID VOLUME INFO	Raid Write Hole policy
Volume Actions ▶ Delete	
Name:         Volume0           RAID Level:         RAIDS(Parity)           Strip Size:         64KB           Size:         3398.13GB           Status:         Normal           Bootable:         Yes           Block size:         512           Cold Size:         512	
NAME FOILQS.         DISSUE;           RAID Member Disks:         SANSUNG MZQLBITHAJR-00007 SN:S439NX0M501218, 1788.506B           Port 5:0, Slot 1, CPU0, VM04, BDF 81:00.0           SAMSUNG MZQLBITHAJR-00007 SN:S439NX0M500024, 1788.506B           Port 5:1, Slot 2, CPU0, VM04, BDF 82:00.0           SAMSUNG MZQLBITHAJR-00007 SN:S439NX0H501219, 1788.506B           Port 5:2, Slot 3, CPU0, VM04, BDF 83:00.0	++: Select Screen 11: Select Item Enter: Select +/-: Change Oot. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit
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Using the arrow keys, highlight a drive marked as "RAID5 (Parity) and press <Enter>, the following screen will display.

	Aptio RAID VOLUME INFO	Setup – American Megatrends Internati	onal, LLC.
Γ	RAID VOLUME INFO		Raid Write Hole policy
•	Volume Actions Delete		
	Name: RAID Level: Strip Size: Size: Status: Botable: Block Size: RWH Policy:	Volume0 RAID5(Parity) 64KB 3398.136B Normal Normal Distributed PPL Journaling Drive Disable	++: Select Screen
•	RAID Member Disks: SAMSUNG MZQLB1T9HAJR-00007	SN: S439NXOM	T∔: Select Item Enter: Select
•	Port 5:0, Slot 1, CPU0, SAMSUNG MZQLB1T9HAJR-00007 Port 5:1, Slot 2, CPU0,	VMD4, BDF 81:00.0 SN:S439NX0M500024, 1788.50GB VMD4, BDF 82:00.0	+/-: Change Opt. F1: General Help F2: Previous Values
	SAMSUNG M2QLB1T9HAJA-00007 Port 5:2, Slot 3, CPU0,	SN:S439NXOM501219, 1788.506B VMD4, BDF 83:00.0	F3: Optimized Defaults F4: Save & Exit ESC: Exit
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Step 2. Use the arrow keys to select **RWH Policy**. RWH is a scenario related to a power/ drive-failure or crash.

#### **RWH Policy**

The options for RWH Policy are Distributed PPL, Journaling Drive, and **Disable**. (Please note that If no device has been set as a journaling drive, the options are Distributed PPL and **Disable**.) Select **Journaling Drive** from the screen above and press <Enter>, the following screen will display.

Aptio Setup RAID VOLUME INFO	– American Megatrends Interr	hational, LLC.
RAID VOLUME INFO Volume Actions		▲ Raid Write Hole policy
<pre>&gt; Delete Name: RAID Level: Strip Size: Size: Status: Bootable: Block size: RHH Polley: RHH Polley: RHH DD:</pre>	VolumeO RAID5(Parity) 64KB 3398.13GB Normal Yes 512 [Journaling Drive] [SAKBUNG	++: Select Screen
	M2QLB1T9HAJR-00007 SN:S439NX0M501215, 1788.50GB Port 5:3 CPU0 VMD4]	tl: Select Item Enter: Select +/-: Change Opt. F1: General Help
Change RWH Settings RAID Member Disks:		F2: Previous Values F3: Optimized Defaults F4: Save & Exit
SAMSUNG MZQLB1T9HAJR-00007 SN:S Port 5:0, Slot 1, CPU0, VMD4	439NX0M501218, 1788.50GB , BDF 81:00.0	ESC: Exit
▶ SAMSUNG MZQLB1T9HAJR-00007 SN:S Port 5:1, Slot 2, CPU0, VMD4	439NXOM500024, 1788.50GB , BDF 82:00.0	
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**Note 1:** Partial parity logging (PPL) can be defined as the result of XOR calculation of old data and old parity. PPL is a feature available for RAID5 volumes. When a power/ drive-failure or crash occurs, PPL information helps rebuild the RAID volume and reduce the potential data loss.

**Note 2:** For the RWH condition, the Intel® RSTe 5.X or above RWH closure algorithm provides the option of use of an additional NVMe device for RAID volume rebuilds (Journaling Drive RWH closure mode). Without the use of an additional NVMe device, PPL distributed RWH closure mode can be utilized to close the RWH by using the parity drive for example.



Step 3. Set the feature: RWH Policy to Journaling Drive.

#### **RWH JD**

When the screen as shown above appears, use the arrow keys to select **RWH JD** by highlighting it and press <Enter>, the following screen will appear. The feature displays the information of journaling drive(s).

Aptio Set RAID VOLUME INFO	up – American Megatrends Inter	national, LLC.
RAID VOLUME INFO Volume Actions		A RWH Journaling Drive chosen
Name: RAID Level: Strip Size: Size: Status: Bootable: Block s RHH Pol SAMSUNG M2QLB1T9HAJR RHH JO:	V01ume0 RAID5(Parity) 64KB 3398.136B Norma1 Yes - RWH JD: -00007 SN:S439NX0M501215, 1788	.5068 Port 5:3 CPU0 VMD4
	SN:S439NXOM501215, 1788.50GB Port 5:3 CPUO VMD4]	Enter: Select +/-: Change Opt. F1: General Help
Change RWH settings RAID Member Disks:		F2: Previous Values F3: Optimized Defaults F4: Save & Exit
<ul> <li>SAMSUNG MZQLB1T9HAJR-00007 SN Port 5:0, Slot 1, CPU0, VM</li> <li>SAMSUNG MZQLB1T9HAJR-00007 SN Port 5:1, Slot 2, CPU0, VM</li> </ul>	:S439NX0M501218, 1788.50GB D4, BDF 81:00.0 :S439NX0M500024, 1788.50GB D4, BDF 82:00.0	ESC: Exit
Ver. 2.21.1277 Copy	right (C) 2020 American Megatr	ends International, LLC.

Step 4. Use the arrow keys and press <Enter> to select the desired journaling drive from the option list of **RWH JD**.

Step 5. For the changes to take effect, use the arrow keys to select **Change RWH** settings and press <Enter>.

Aptio Se RAID VOLUME INFO	etup – American Megatrends Interna	ational, LLC.
RAID VOLUME INFO		
Volume Actions ▶ Delete		
Name: RATD Level: Strip Size: Size: Status: Bootable: Block size: RWH Policy: RWH JD:	Volume0 RAIDS(Parity) 64KB 3398.136B Normal Yes 512 [Journaling Drive] [SAMSUNG M2QLB1T9HAJR-00007 SN:8439NXOM501215, 1786.506B Port 5:3 CPU0 VM04]	<pre>**: Select Screen 14: Select Item Enter: Select +/-1 Change Opt. F1: General Helo</pre>
Change RWH settings RAID Member Disks:		F2: Previous Values F3: Optimized Defaults F4: Save & Exit
<ul> <li>SAMSUNG MZQLB1T9HAJR-00007 S</li> <li>Port 5:0, Slot 1, CPU0, V</li> <li>SAMSUNG MZQLB1T9HAJR-00007 S</li> <li>Port 5:1, Slot 2, CPU0, V</li> </ul>	N:S439NXOM501218, 1788.50GB /MD4, BDF 81:00.0 N:S439NXOM500024, 1788.50GB /MD4, BDF 82:00.0	ESC: Exit
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Your computer will return to the main screen of All Intel VMD Controllers as shown below.

