



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.supermicro.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-and-storage/ssd-software/Windows\\_VROC\\_User\\_Guide.pdf](https://www.intel.com/content/dam/support/us/en/documents/memory-and-storage/ssd-software/Windows_VROC_User_Guide.pdf)

<https://www.intel.com/content/www/us/en/support/articles/000030445/memory-and-storage/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.

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# Table of Contents

## *Preface*

### *Chapter 1 Configuring Intel VROC RAID Settings*

1.1 All Intel VMD Controllers Menu .....	6
Enabling a PCI Slot for VMD Support in the BIOS Setup Utility .....	6
1.2 Configuring RAID Settings .....	11
1.3 Use of Journaling Drive .....	31

# 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 <https://www.supermicro.com>.

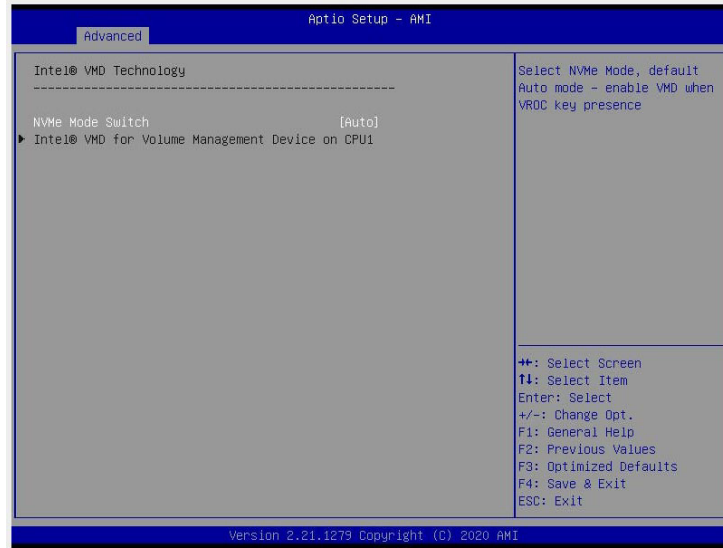
**Note 2:** Depending on the version of driver/utility/package, you may or may not have exactly the same as the BIOS settings/features as shown in the user's guide.

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

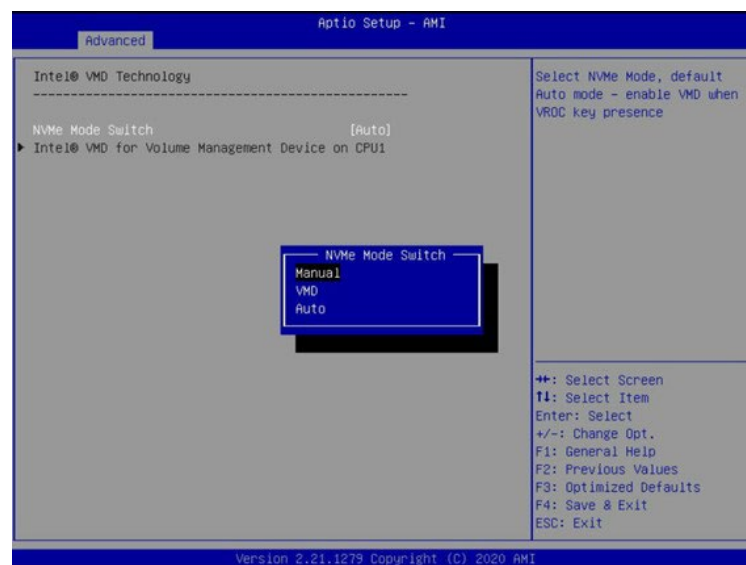
1. Press <Del> during system boot to enter the BIOS Setup utility.
2. Use the arrow key to select "**Advanced**" on top of the BIOS menu bar.
3. Use the down arrow key to select "**Chipset Configuration**" and press <Enter>.
4. Select "**North Bridge**" and press <Enter>.
5. When the North Bridge submenu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



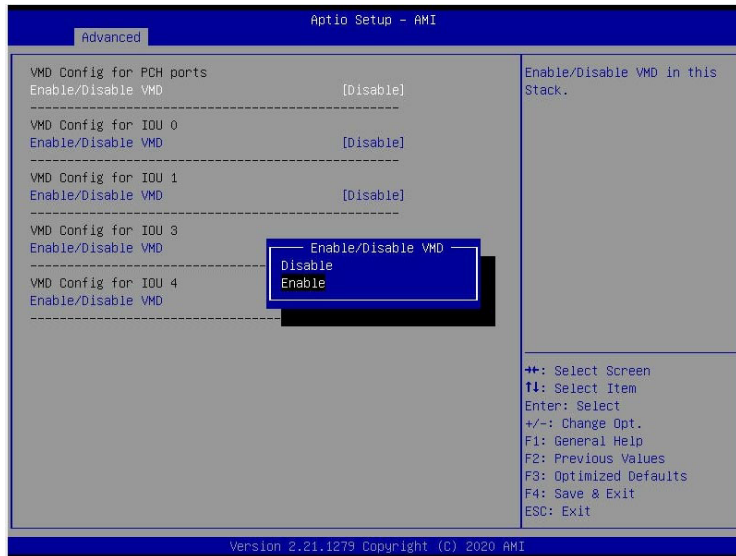
6. When the screen above displays, use the down arrow key to select **Intel® VMD Technology** and press <Enter> to invoke its submenu as shown below.




**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.

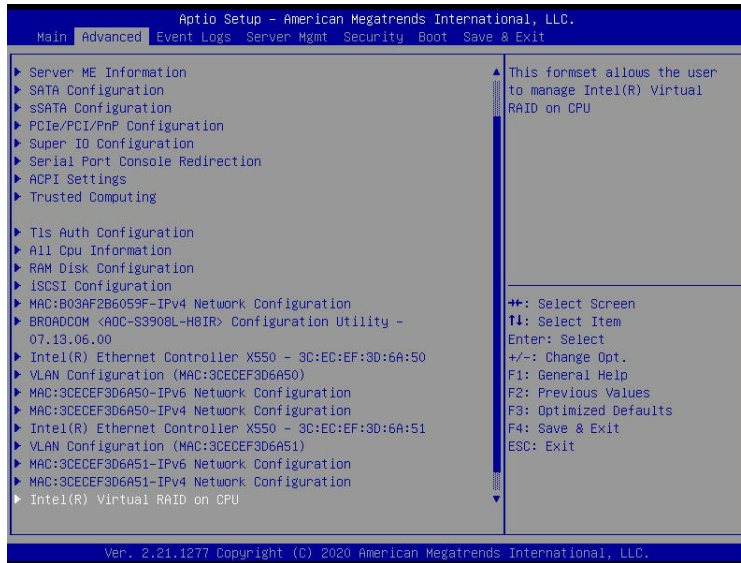


9. Repeat Step 7 ~ Step 8 to select and enable all devices of your choice for VMD support.
10. After all devices chosen by you are enabled for VMD support on the BIOS Setup utility, install the physical VMD devices (such as add-on cards) on the slots that you've configured for VMD support on the motherboard.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

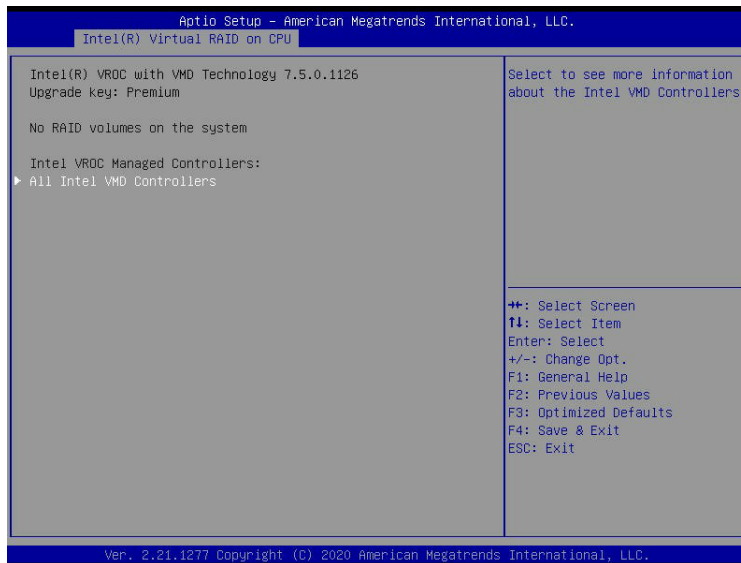
 **Note:** After you've enabled VMD support in the BIOS on a PCIe slot specified by you, this PCIe slot will be dedicated for VMD use only, and it will no longer support any PCIe device. To re-activate this slot for PCIe use, please disable VMD in the BIOS.




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



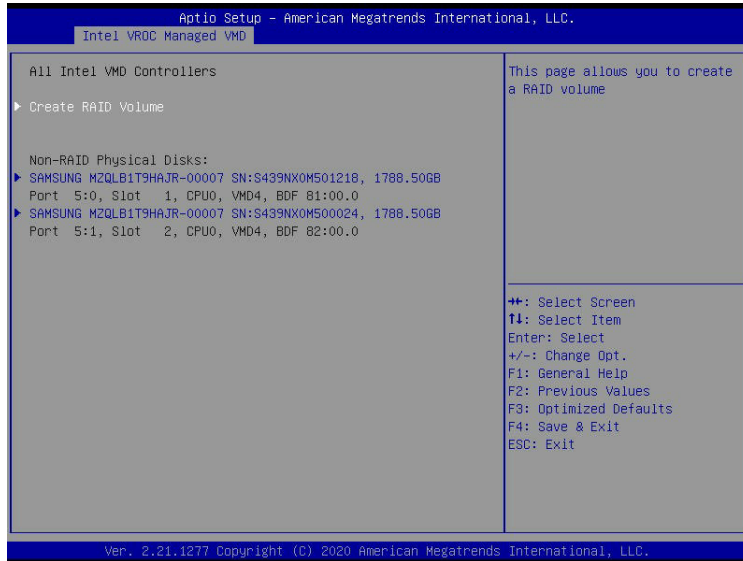
13. From the **Advanced** menu, use the down arrow key to select **Intel® Virtual RAID on CPU** by highlighting it as shown above and press <Enter>. The following screen will display.



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

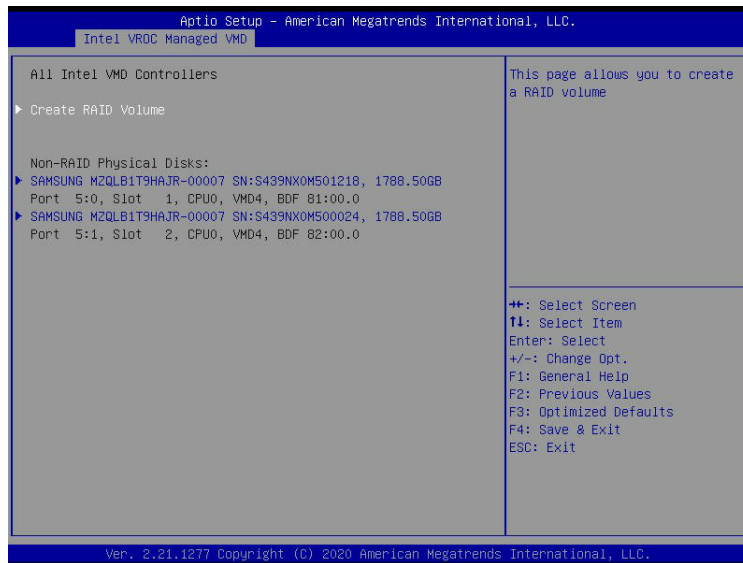
**Note 2:** Intel® VROC Premium hardware key is used in the user's guide to demonstrate RAID settings.

14. 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.



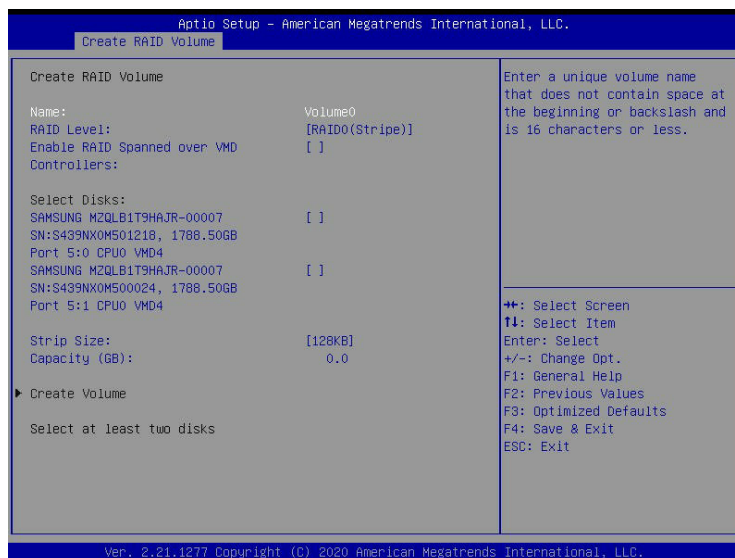
## 1.2 Configuring RAID Settings

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.



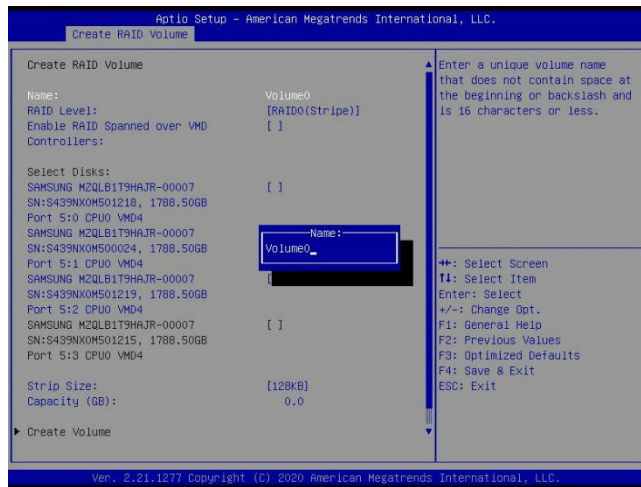
### To Create a RAID Volume

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.



### To Enter a Name for the RAID Volume

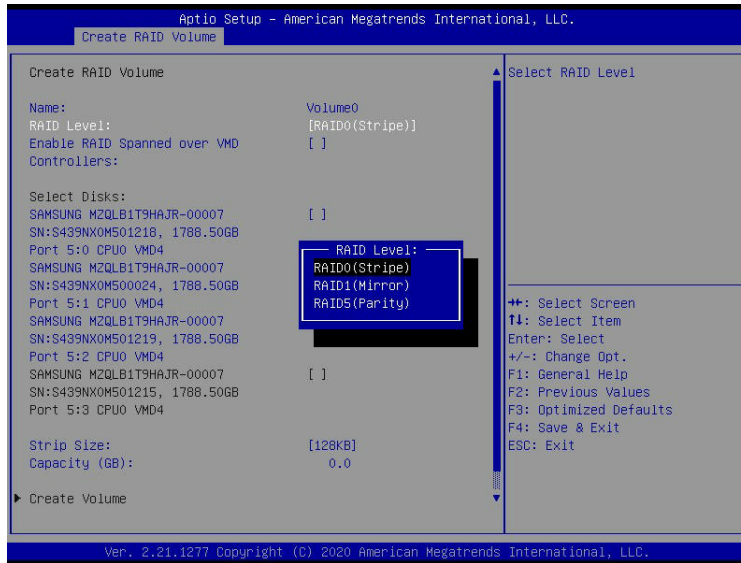
From the **Create RAID Volume** submenu as shown on the previous screen, use the arrow keys to select **Name** and press <Enter>, and the following screen will display.



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.



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.

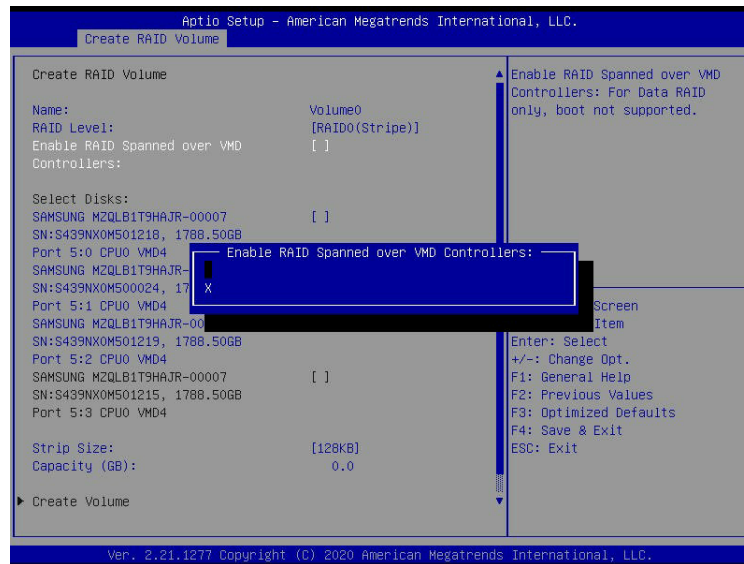
**Note 2:** For RAID0/RAID1/RAID5/RAID10, the minimum number of NVMe devices required is two/two/three/four respectively.

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.

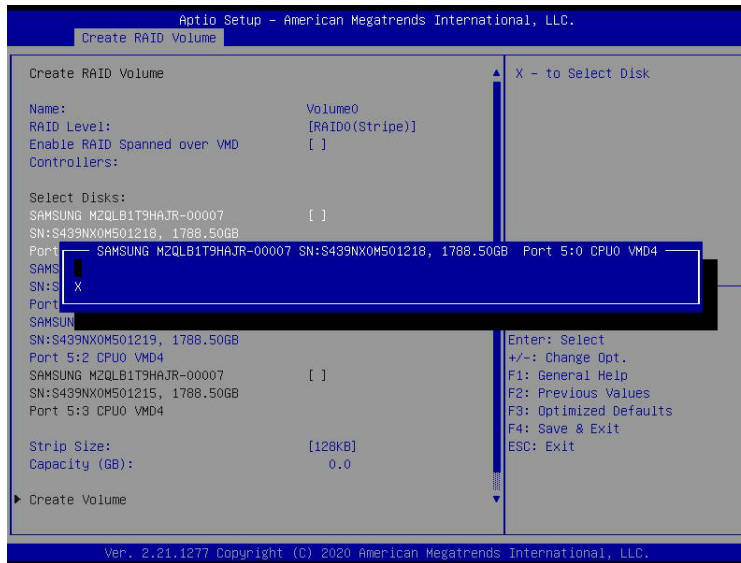


Enter a desired setting for your RAID volume in the pop-up menu. The options are **(not selected)** and **X** (selected). To select **X** and make it the default, press the down arrow key when **X** is highlighted and press <Enter>. This feature will allow the RAID level you've selected earlier to cross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

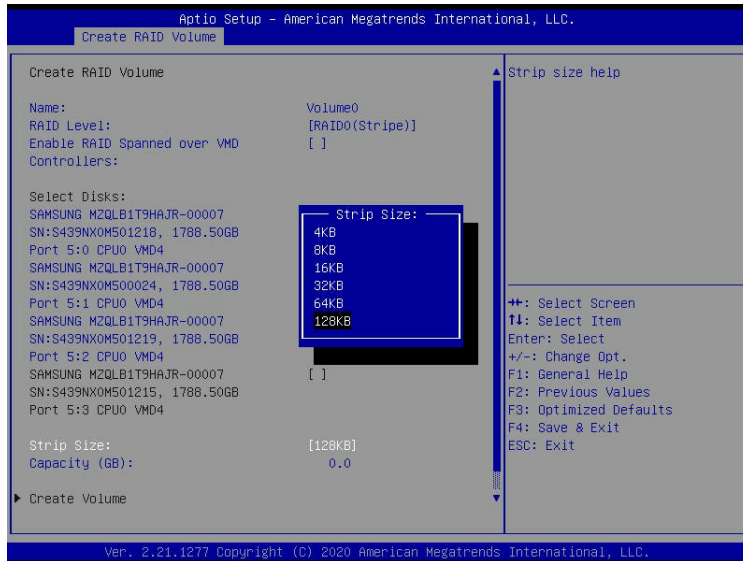


The options are **(not selected)** and **X (selected)**. To select **X** as your desired RAID disk for your RAID volume configuration, highlight **X**, press the down arrow key and then press <Enter>\*. (\*See the note below.) Repeat the same step to select all your desired disks for your desired RAID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

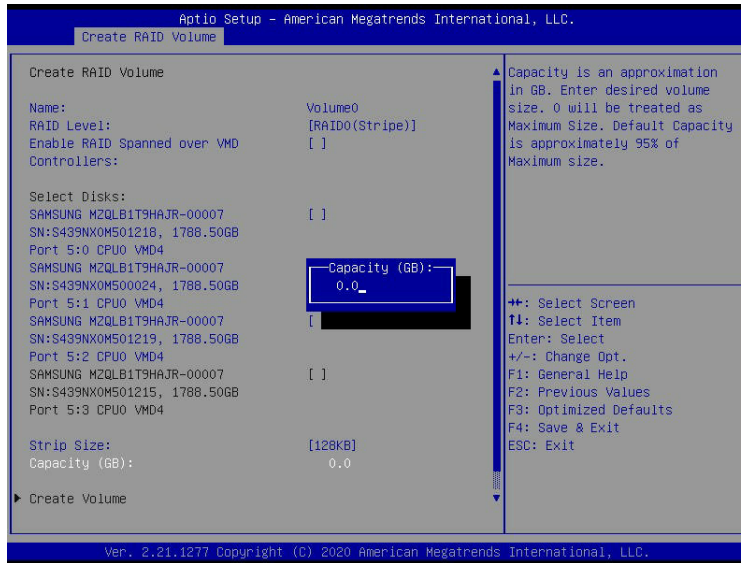


From the pop-up window as shown above, select the desired RAID strip size for your RAID volume and press <Enter>. The options are 4KB, 8KB, 16KB, 32KB, 64KB, and **128KB**.



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

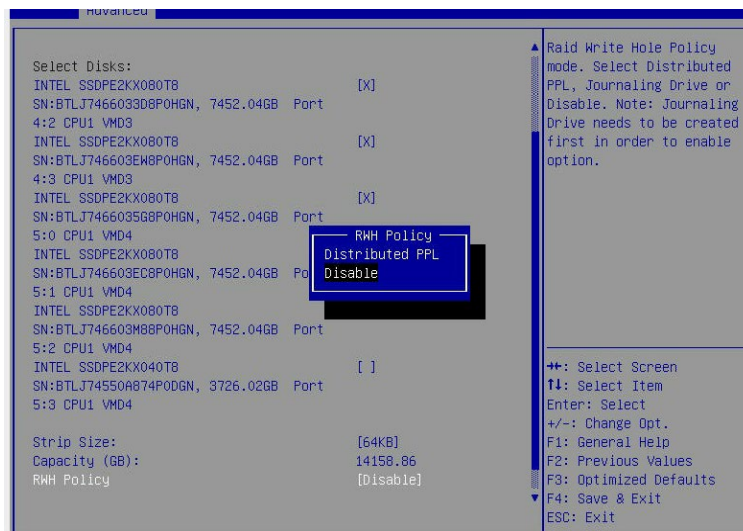
From the **Create RAID Volume** submenu, use the arrow keys to select **Capacity (GB)**: and press <Enter>. The following screen will display.



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

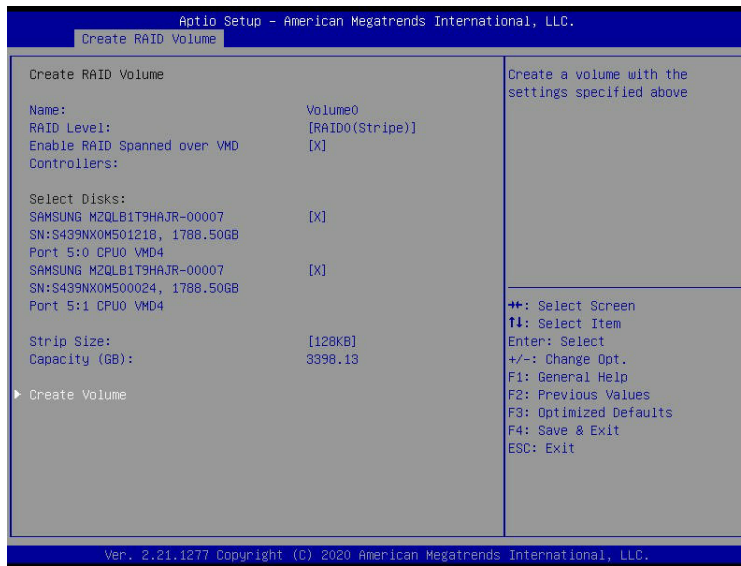
## To Set the RWH Policy for RAID 5

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>.



## To Create Volumes

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

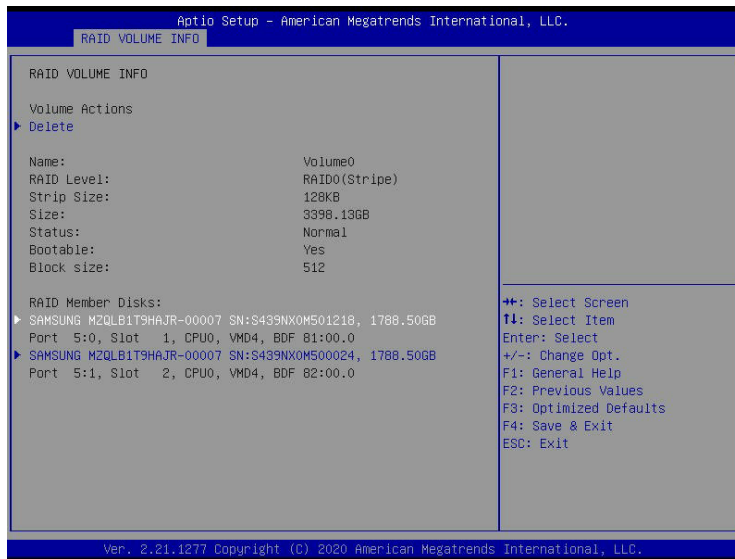


After selecting **Create Volume**, press <Enter>. The following screen will appear and will display RAID volumes as shown below.



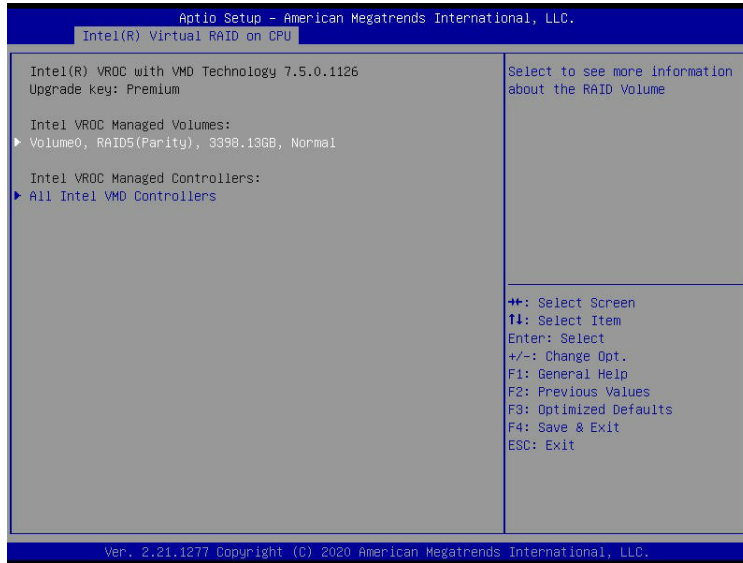
## To Display RAID Volumes

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

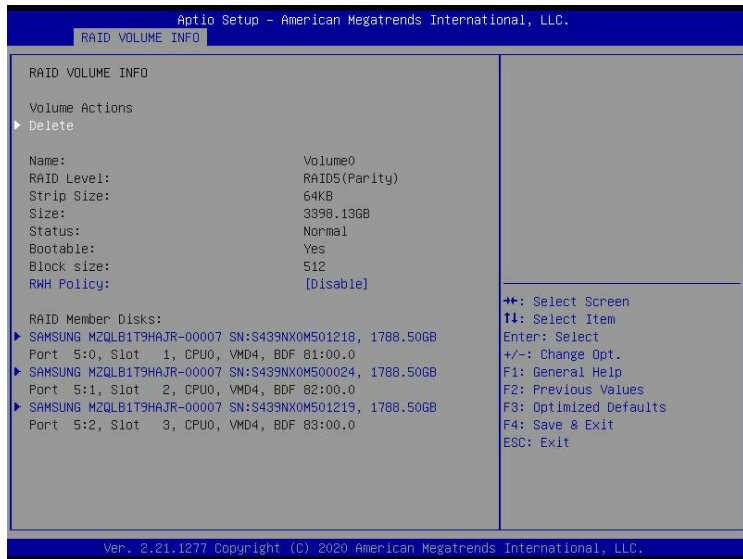


### To Delete a RAID Volume

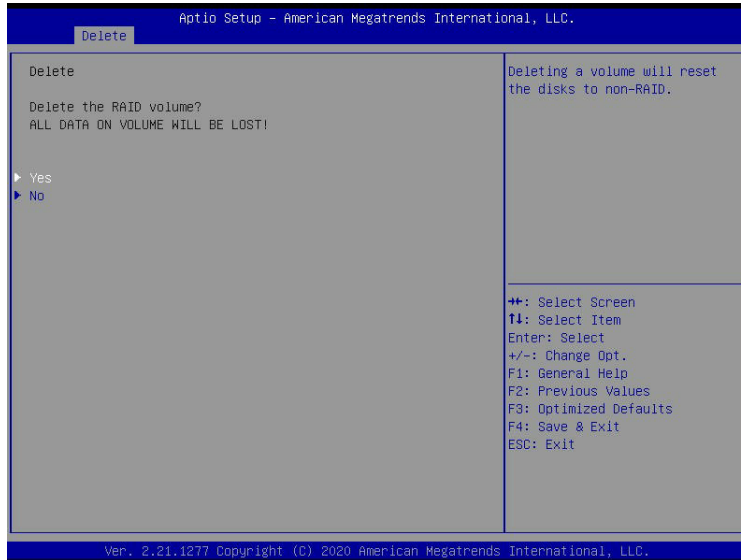
From the **Intel® Virtual RAID on CPU** submenu, use the arrow keys to select the Volume you want to delete as shown below.



When the screen as shown above appears, press <Enter>. The following screen will display.



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

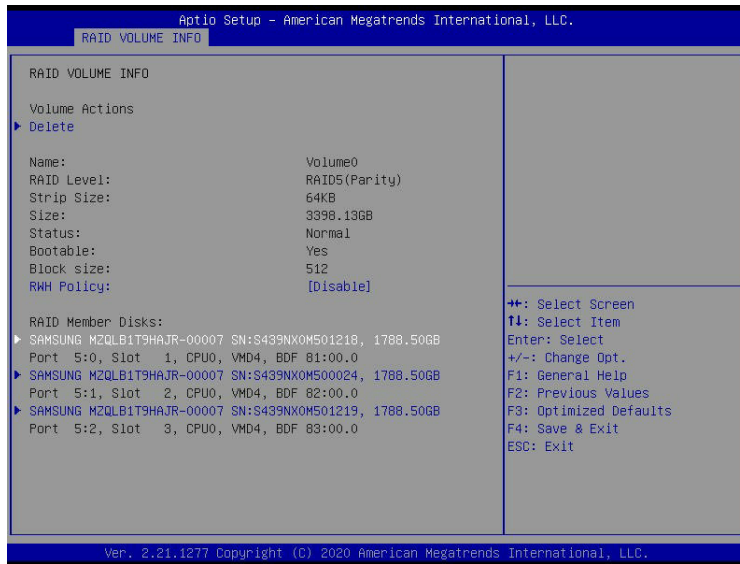


When the submenu as shown above appears, asking you if you want to delete the RAID volume. Press **Yes** to delete the RAID volume on the selected disk.

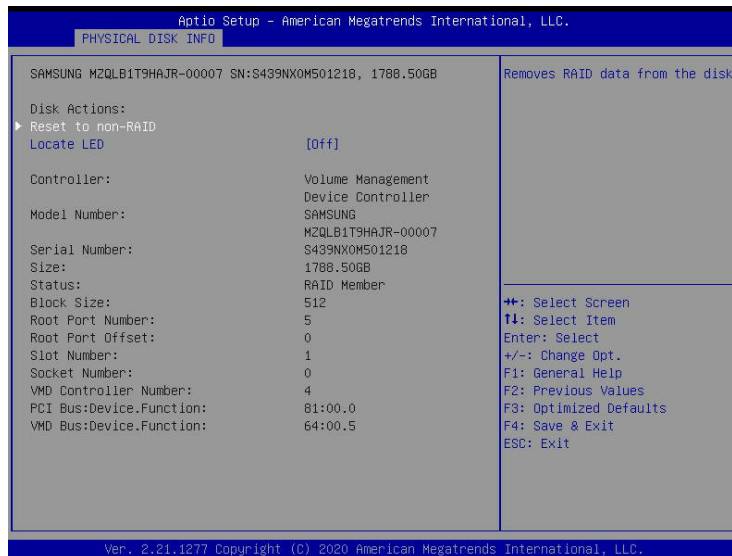
 **Note:** when you choose to delete the RAID volume from a disk, all data on that disk will be deleted as well.

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

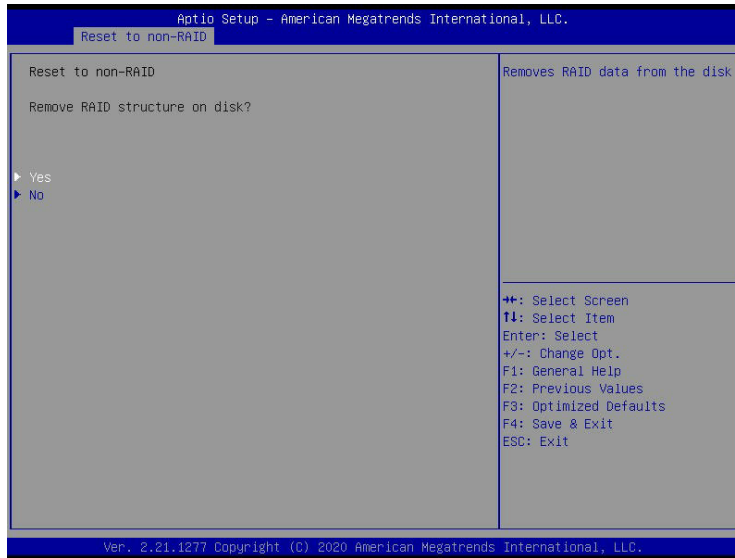
On the **RAID VOLUME INFO** submenu below, select the desired NVMe device from the list to reset to non-RAID, and press <Enter>. The following screen will display.



Select **Reset to Non-RAID** from the screen below and press <Enter> to reset the selected NVMe device to a Non-RAID device.

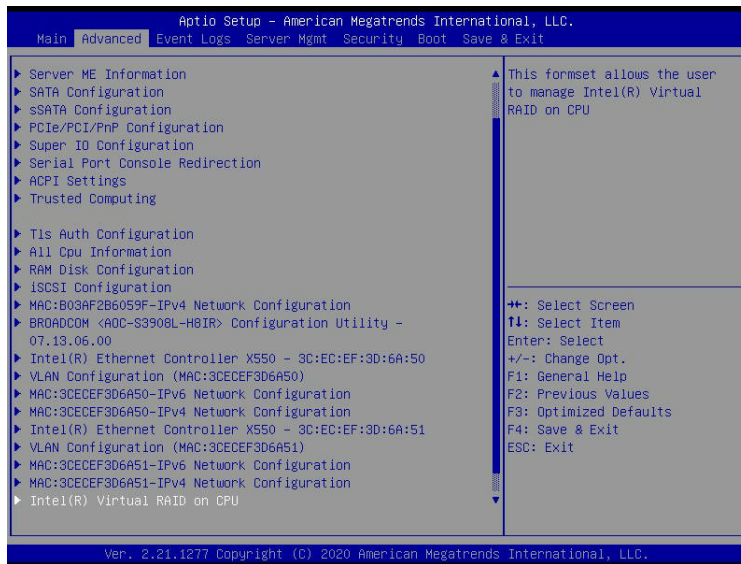


When the following screen appears, select **Yes** to confirm that you want to set the selected RAID device to non-RAID. The options are **Yes** and **No**.

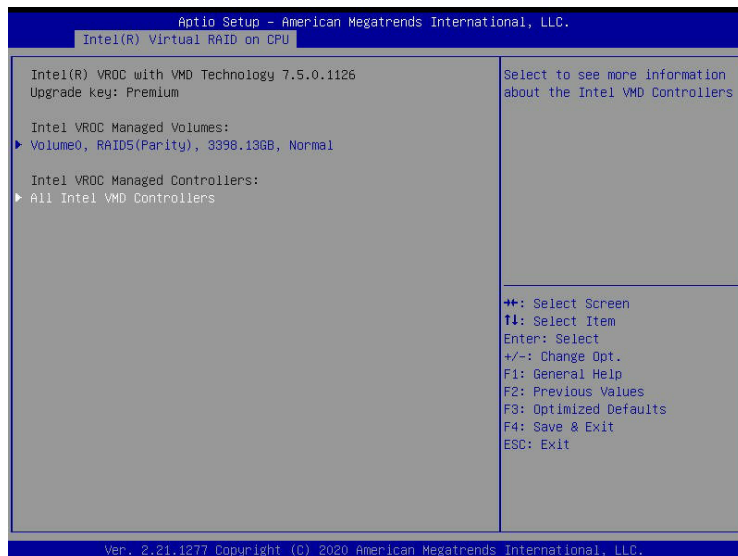


### To Turn on the Disk Locator LED

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.

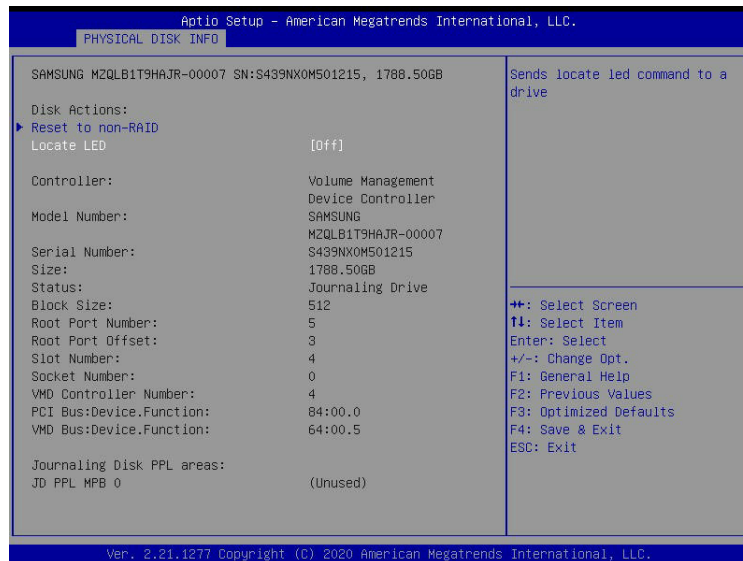




When the **All Intel VMD Controllers** submenu appears as shown above, select **All Intel VMD Controllers** and press <Enter>. The following screen will display.

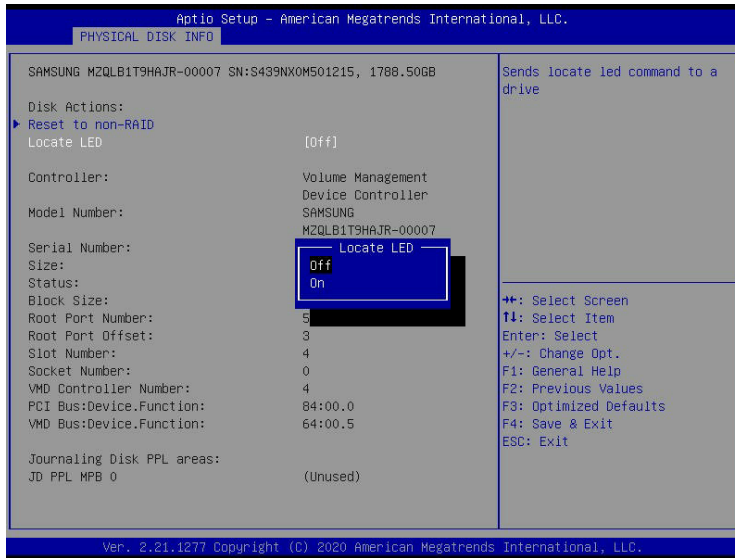


From the submenu displayed above, select the VMD drive you want to turn on the **Locate LED** by highlighting it and press <Enter>. The following screen will display.



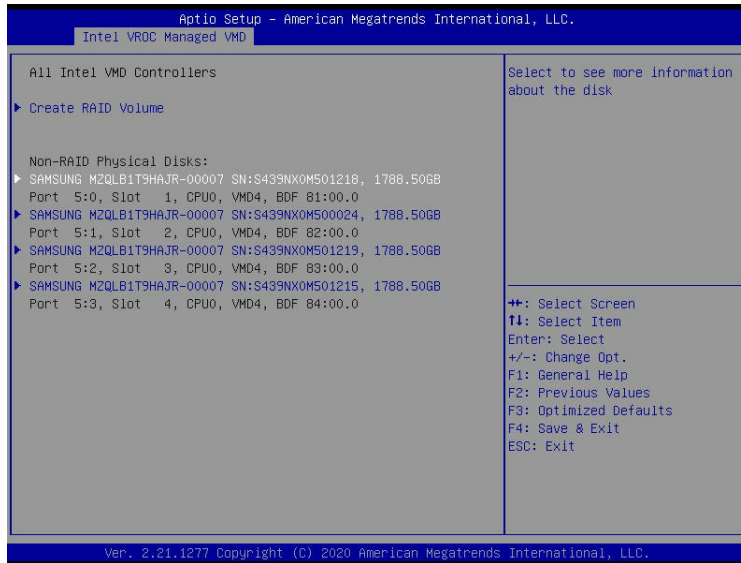
When the **PHYSICAL DISK INFO** submenu screen displays as shown above, use the down arrow key to select **Locate LED** and press <enter>.

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**.

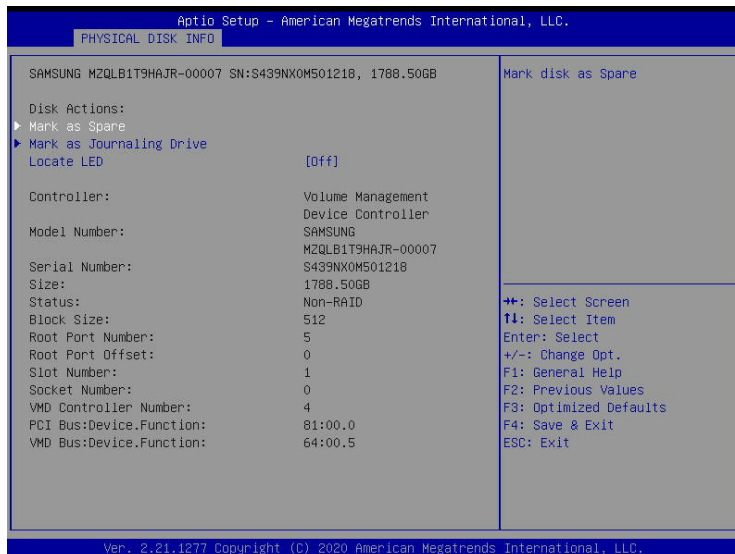


## To Mark a Non-RAID Drive as Spare

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.




From the submenu as 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.



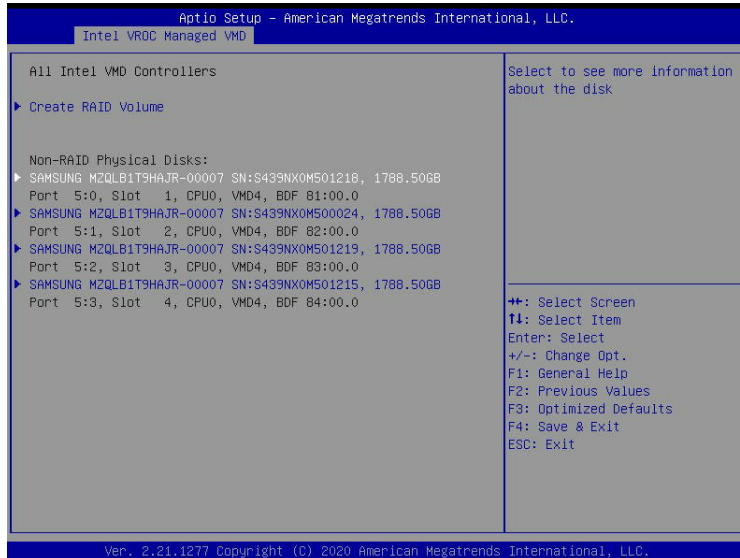
After marking the selected drive as Spare, a pop-up window will display to confirm if you want to mark the selected device as spare. Select **Yes** and press <Enter> to make the selected drive as a spare drive. If you do not want to make the selected drive as a spare drive, select **No** and press <Enter>.



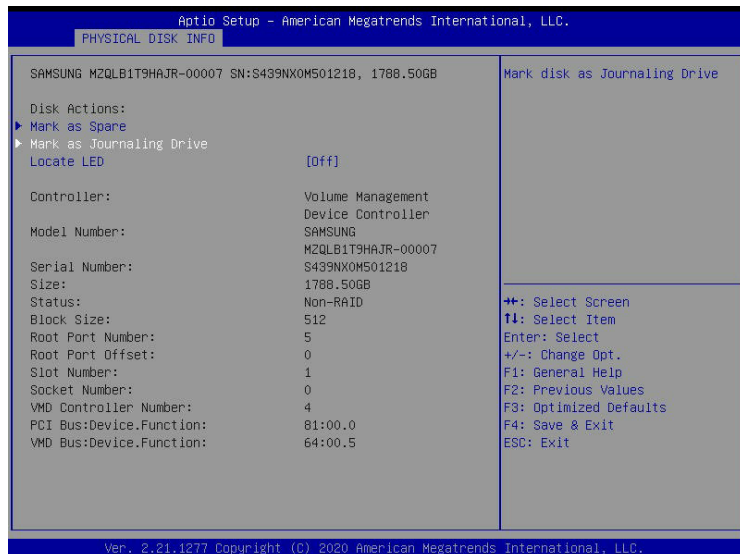
 **Note:** A spare disk is used for automatic RAID volume rebuilds when the status of “failed”, “missing”, or “at risk” is detected on the array disk. For a RAID0 volume, only the status of “at risk” will trigger automatic RAID volume rebuilds.

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

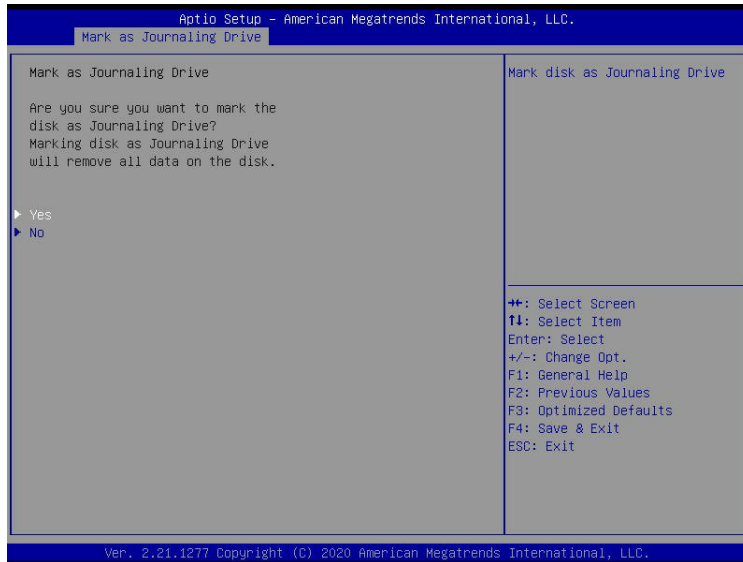
Refer to the instructions stated in Section 1.1 to access the **All Intel VMD Controllers** menu. When the following screen appears, select a desired NVMe device from the list of Non-RAID Physical Disks to be used as a journaling drive. A journaling drive is used as an error event log to record an event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



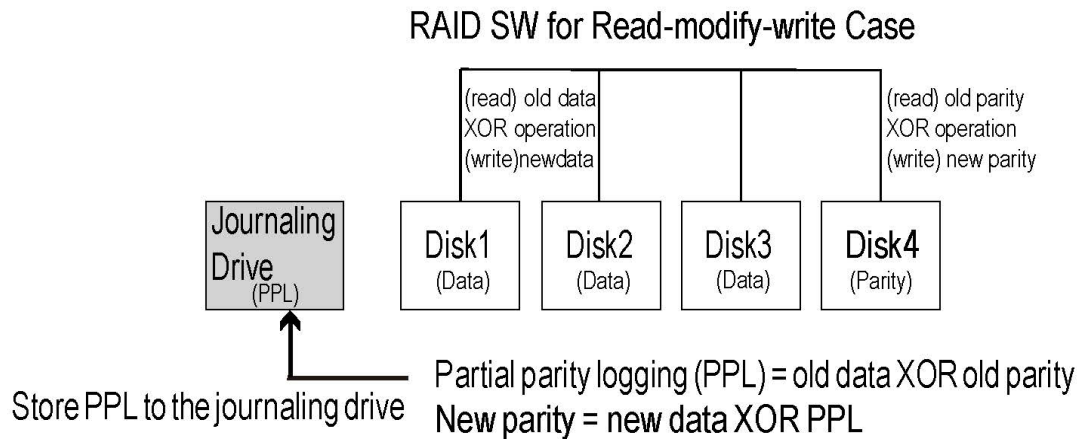
After selecting a NVMe device, press <Enter> and the following screen will appear. Select **Mark as Journaling Drive** and press <Enter>.



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.



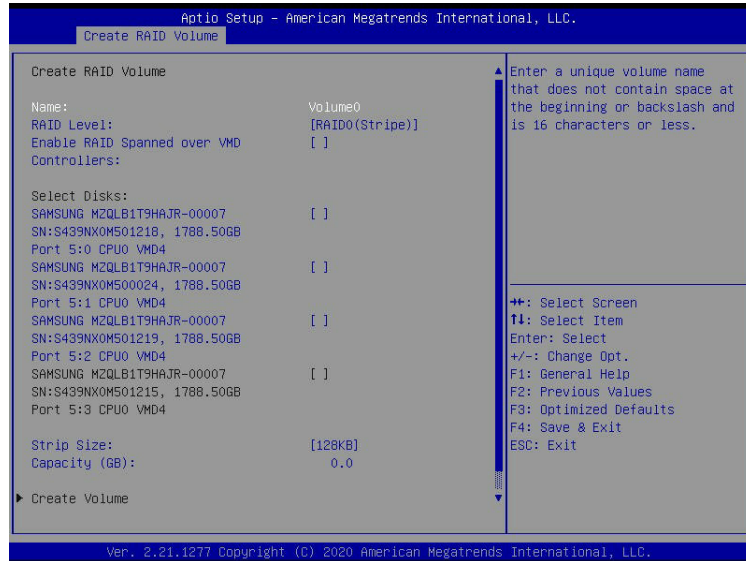
**Note:** RAID Write Hole (RWH) is a condition associated with a power/drive-failure or crash when writing to a RAID5 volume. The use of journaling drive that contains partial parity logging (PPL) can reduce the potential data loss. Refer to the following illustration for the use of journaling drive.



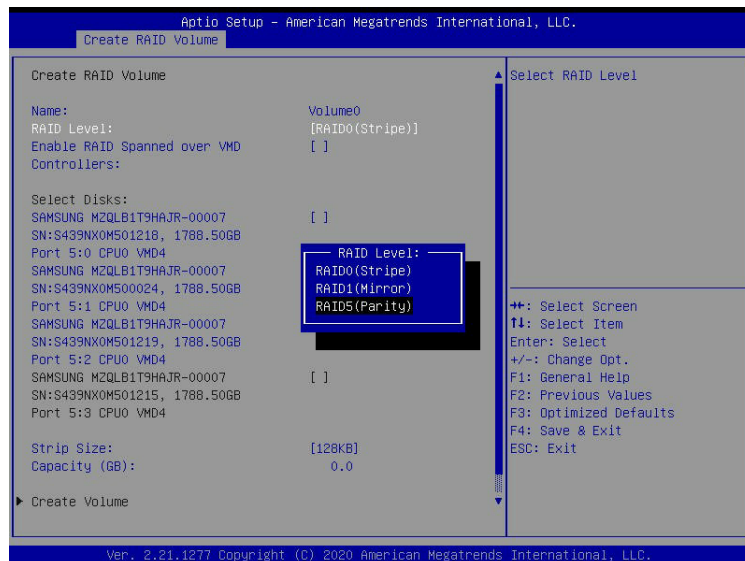
## 1.3 Use of Journaling Drive

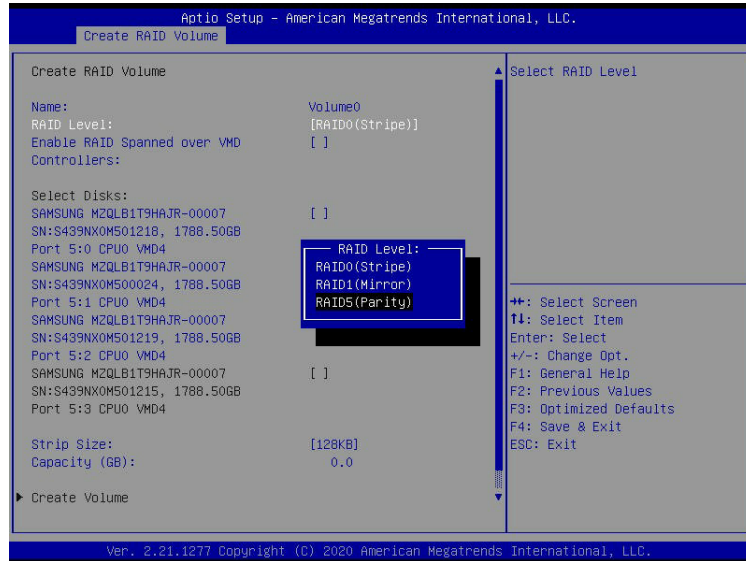
The following section describes the use of a journaling drive for the RAID5 volume, which is a parity-based RAID. A journaling drive, used as an error event log, records an event when an error occurs to a RAID5 volume. To create RAID5 drives, follow the instructions below.

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.



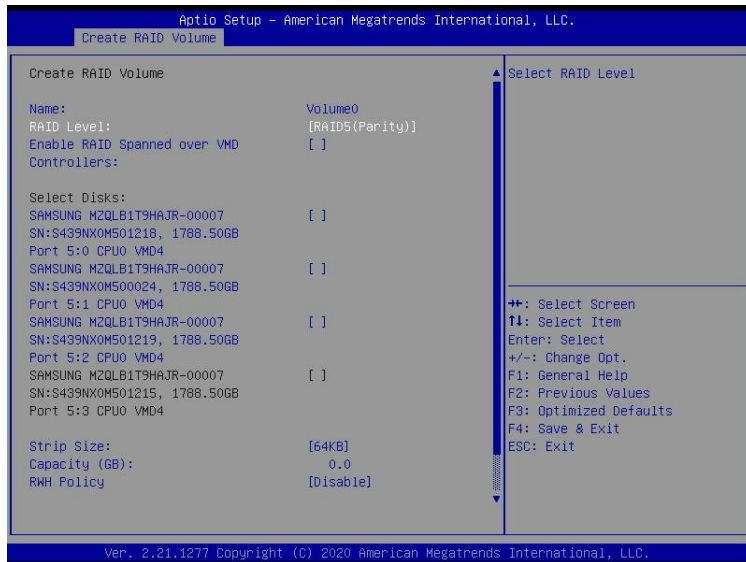
When the screen above appears, use the down arrow key to select **RAID Level** and press <Enter>. The following screen will display.





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

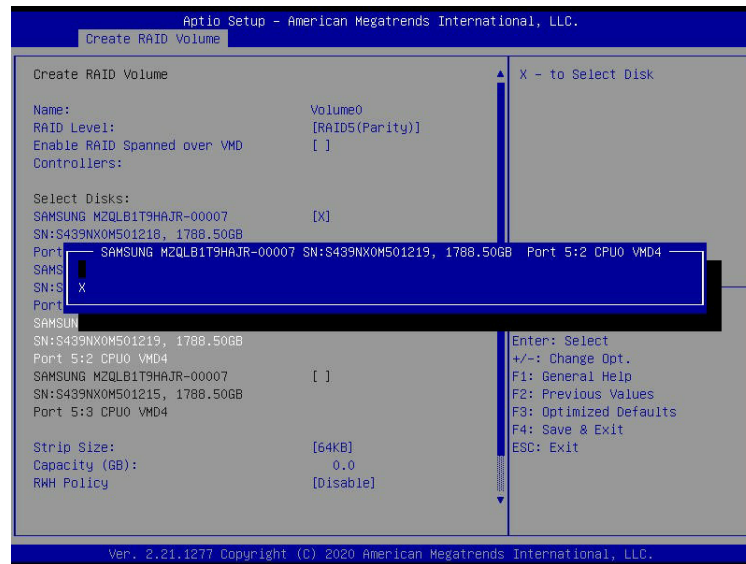
After selecting RAID5 (Parity), press <Enter>, and the following screen will display.



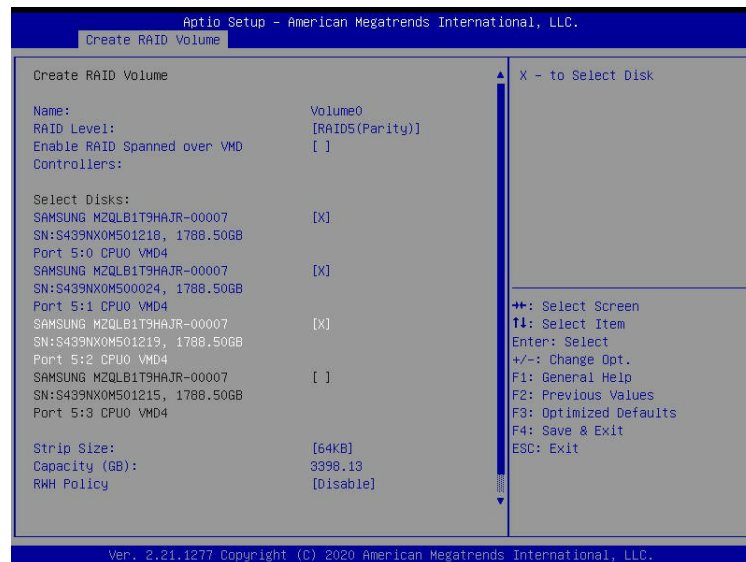


When the following screen displays, use the arrow keys to select a disk that you want to mark it as RAID5 and press <Enter>. An “X” will appear on the pop-up window of the selected drive. Press the down arrow key at the “X” and press <Enter> to mark the drive as a RAID5 volume.

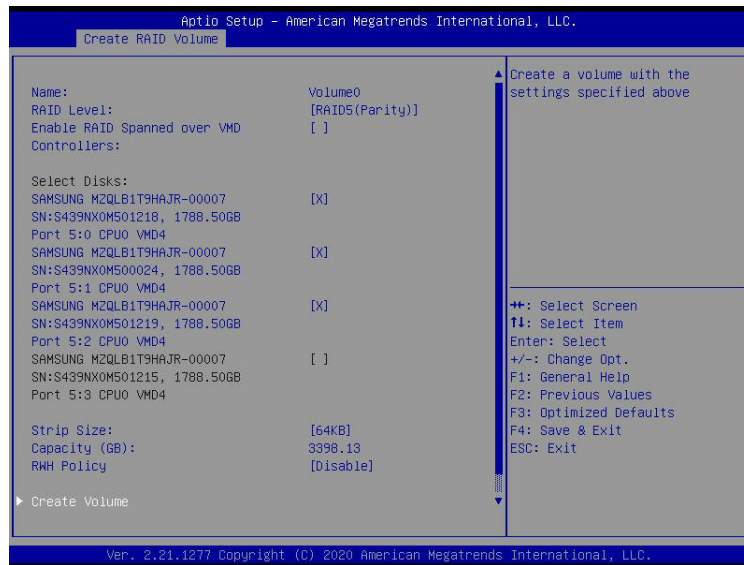
Repeat this step to mark at least three drives as RAID5 volume as shown below.



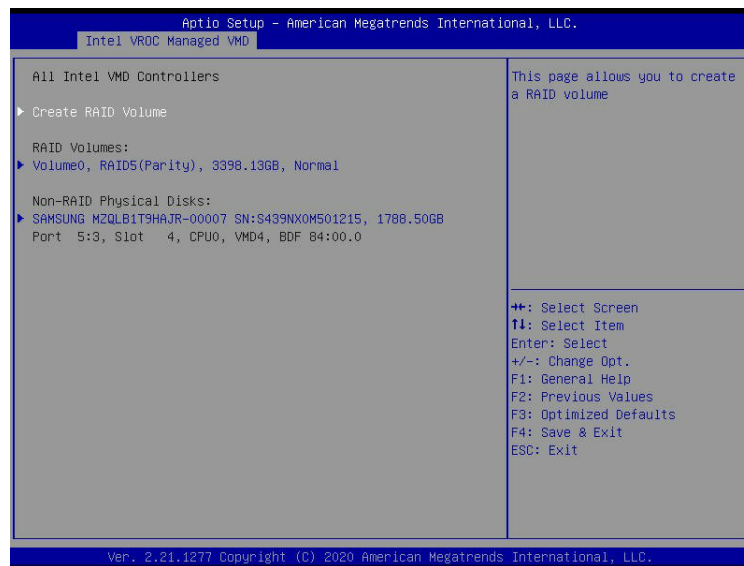
Mark sure that you have at least three drives marked as RAID5 disks as shown below.



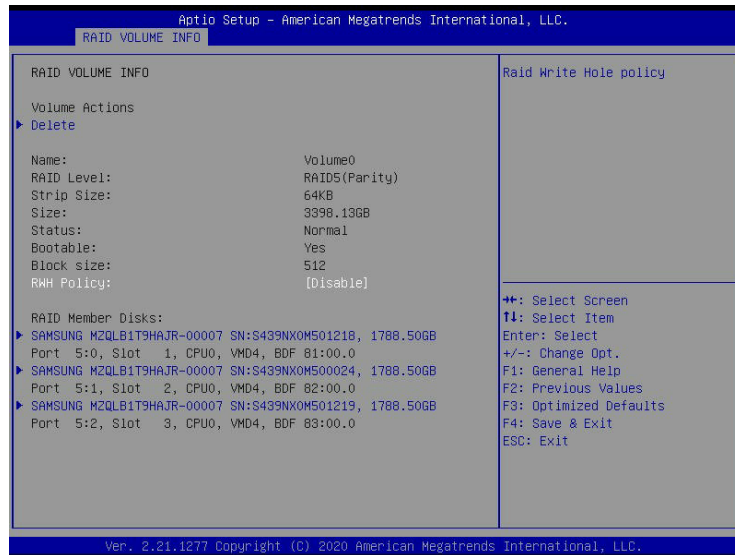
After you've selected three RAID5 drives, using the down arrow key to select **Create Volume** as shown below.



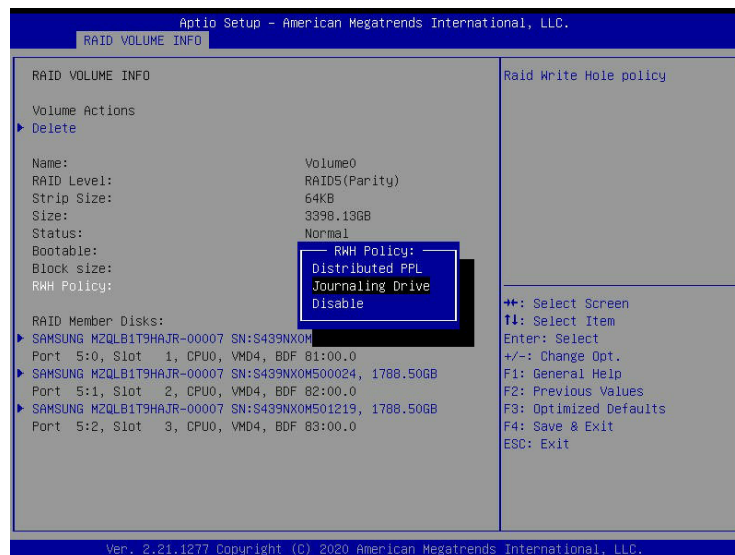
When **“Create Volume”** is selected as shown above, press <Enter> and the following screen will display.



Using the arrow keys, select a drive that has been marked as “RAID5 (Parity)” and press <Enter>, The following screen will display.



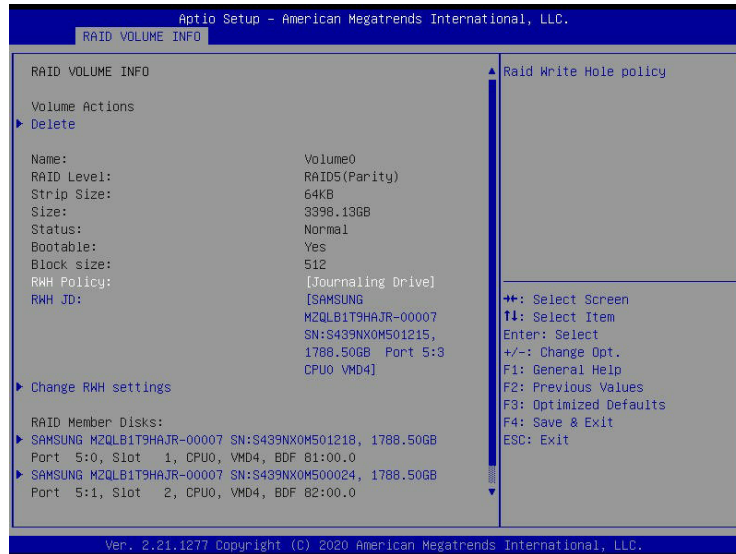
Using the arrow keys, highlight a drive marked as “RAID5 (Parity)” and press <Enter>, the following screen will display.



Step 2. Use the arrow keys to select **RWH Policy**. RWH is a scenario related to a power/drive-failure or crash.

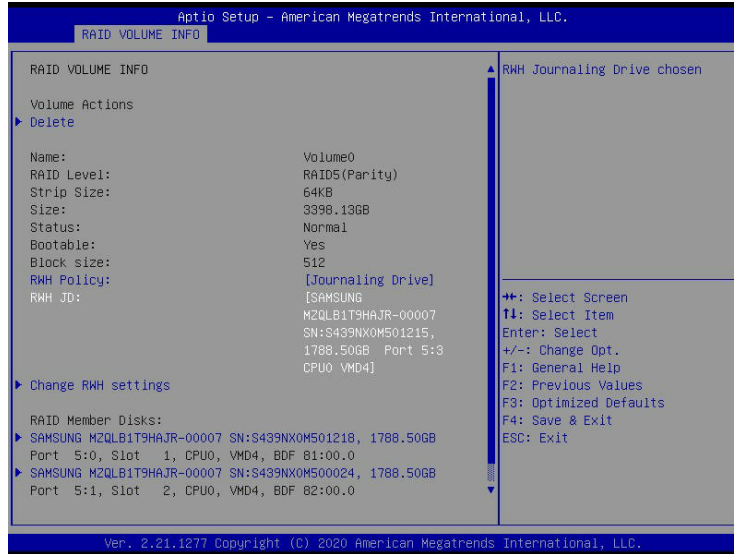
## RWH Policy

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.



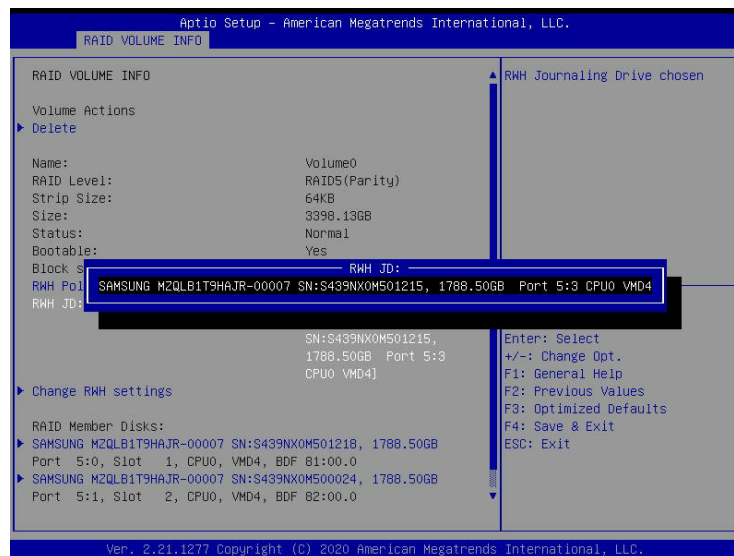
**Note 1:** Partial parity logging (PPL) can be defined as the result of XOR calculation of old data and old parity. PPL is a feature available for RAID5 volumes. When a power/drive-failure or crash occurs, PPL information helps rebuild the RAID volume and reduce the potential data loss.

**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**.

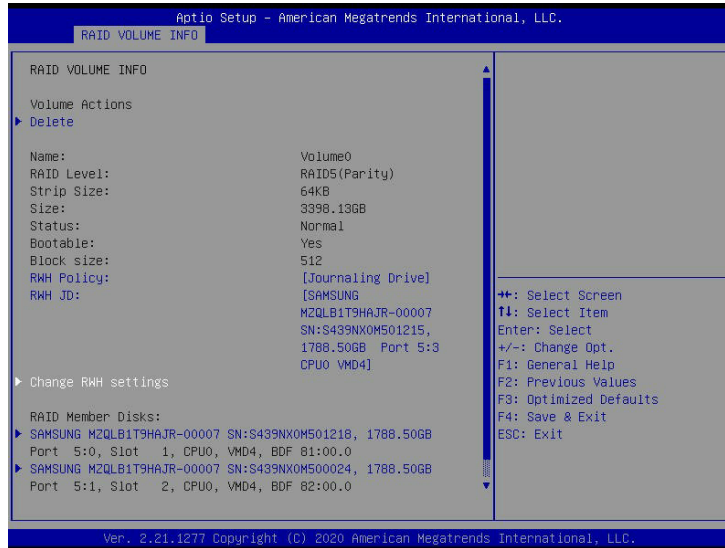
## RWH JD

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).



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>.



Your computer will return to the main screen of All Intel VMD Controllers as shown below.

