Intel® VROC SATA/sSATA/tSATA RAID Configurations for The X13 Series Motherboards

USER'S GUIDE

Revision 1.0

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Manual Revision 1.0

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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 SATA/sSATA/tSATA RAID settings on Supermicro X13 Series motherboards.

About Intel® VROC SATA RAID

Intel® VROC (Virtual RAID on CPU), a hybrid RAID (Redundant Array of Independent Disks) solution, is used to configure RAID settings for both NVMe-based storage devices via Intel® VMD (Volume Management Device) Technology and Serial-based SATA devices via UEFI BIOS to enhance system performance and networking connectivity with optimal efficiency without using a RAID host bus adaptor (HBA). This user guide provides detailed instructions on how to configure RAID settings on SATA devices utilizing UEFI BIOS support.

Note: For processor/BIOS updates, please refer to our website at http://www.supermicro.com/products/.
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

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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Chapter 1

Introduction to Intel® VROC SATA RAID/sSATA RAID/tSATA RAID Settings

1.1. Overview

This section provides an overview on Intel® VROC SATA RAID support on the SATA storage devices installed on a Supermicro X13 motherboard using the AMI UEFi BIOS Setup utility. For detailed, step-by-step instructions on SATA RAID configuration, refer to **Chapter 2: Configuring VROC SATA RAID/sSATA RAID/tSATA RAID Settings**.

Note 1: Only use SATA/SSD 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 BIOS settings and features as shown in the user's guide.

Note 3: The images included in this user guide may look different from those displayed on your monitor. The screens displayed on your monitor reflect the physical devices installed in the system. Since each system configuration differs, the BIOS screen displays will differ as well.

1.1a. Invoking the Intel® VROC SATA Controller Submenu in the BIOS

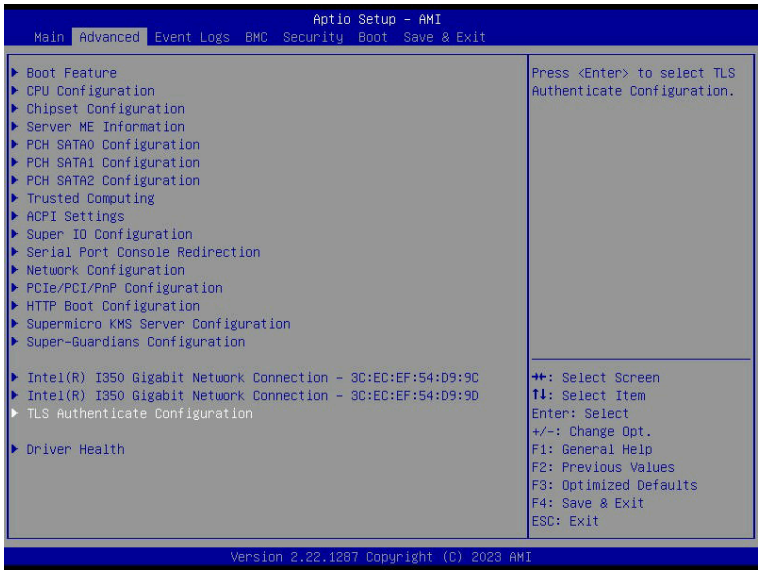
To enable **Intel® VROC SATA RAID** support in the UEFI BIOS, follow the instructions below.

1. Press the <Del> key during system boot to enter the BIOS Setup utility.
2. Using the arrow key, select *Advanced* from the BIOS menu bar on the top of the screen. The following screen will display.

Note: If the **Intel® VROC SATA RAID Controller** submenu is not displayed in the **Advanced** menu, it indicates that RAID volumes have not been created for your system. However, if the submenu is displayed as shown in the following screen, you can skip the next section and go directly to **Sections 1.2: Enabling SATA Devices for VROC SATA RAID Support** to enable SATA RAID support for your system.

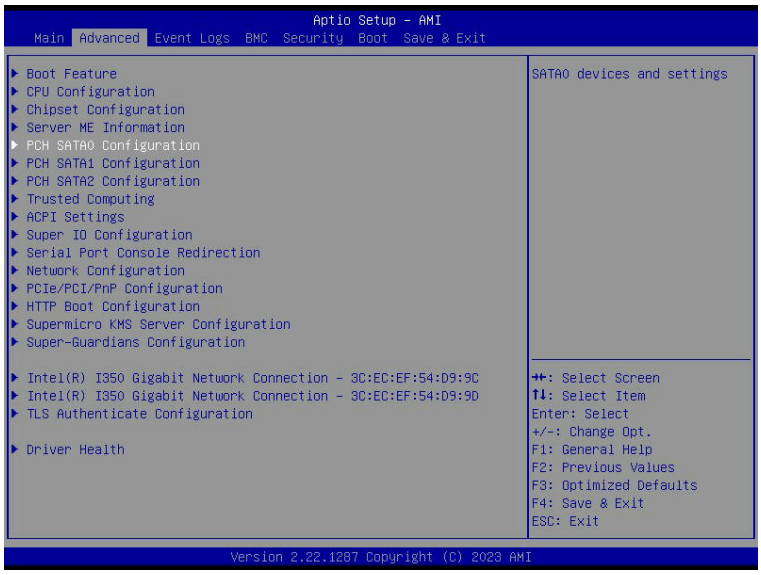
To Invoke the Intel® VROC SATA RAID Controller Submenu

After entering the BIOS Setup utility, and if you do not see the Intel® VROC SATA RAID submenu displayed as shown below, you will need to enable PCH SATA RAID controller support first.

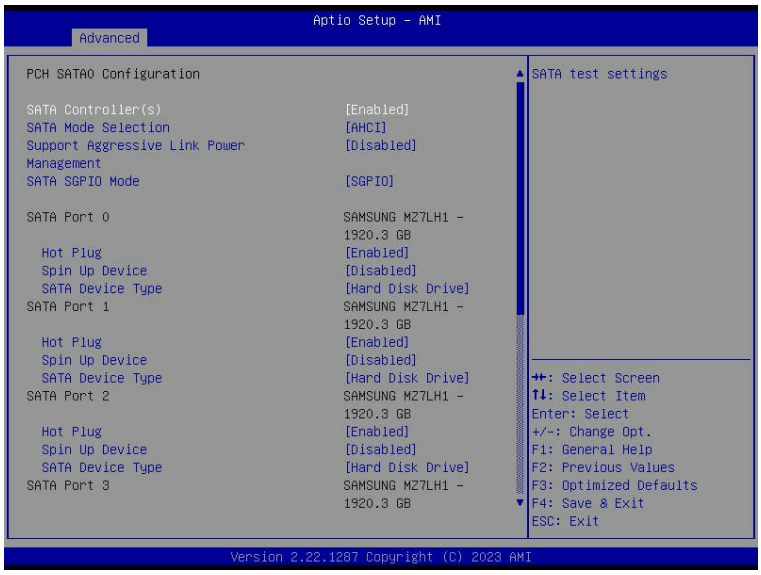


To enable PCH SATA RAID controller support, follow the instructions below.

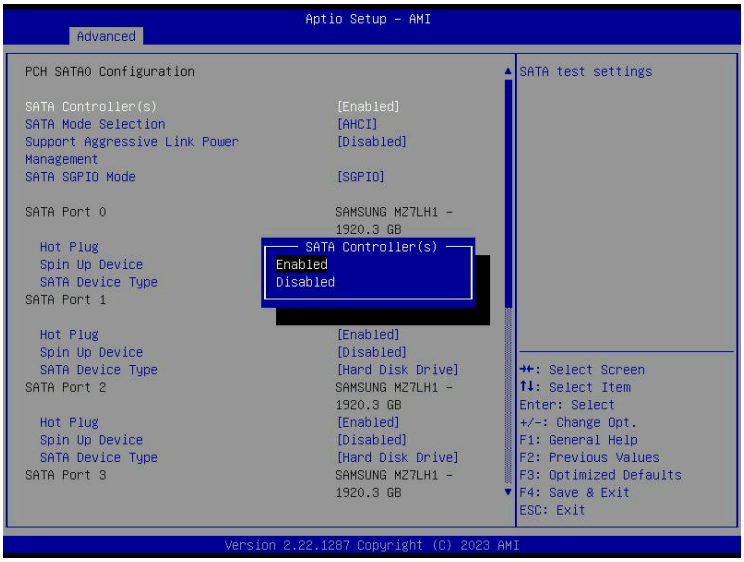
Step 1: Select the PCH SATA controller you want to use for SATA RAID Configuration as shown below.



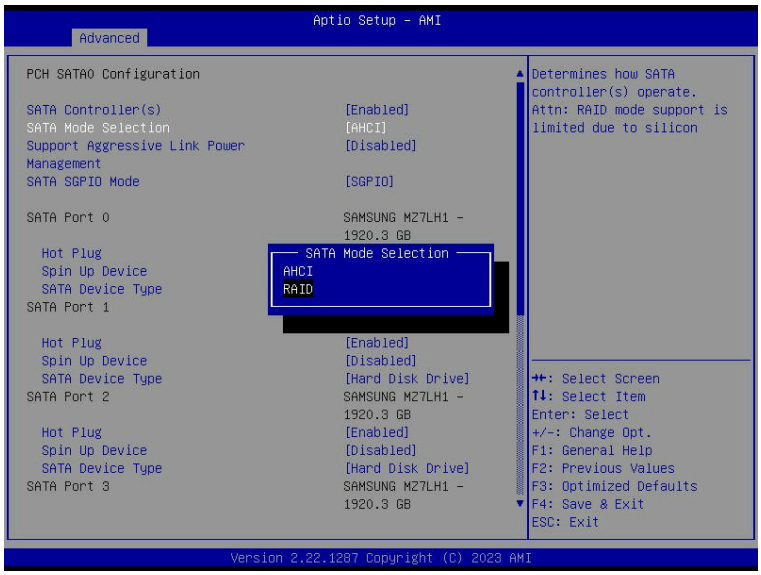
Step 2: Once you've selected the SATA controller you want to enable RAID support, press <Enter>. The following screen will display.



Step 3: When the screen below displays, select *Enable* to enable SATA Controller for the drives to be listed as "available" for RAID configuration.

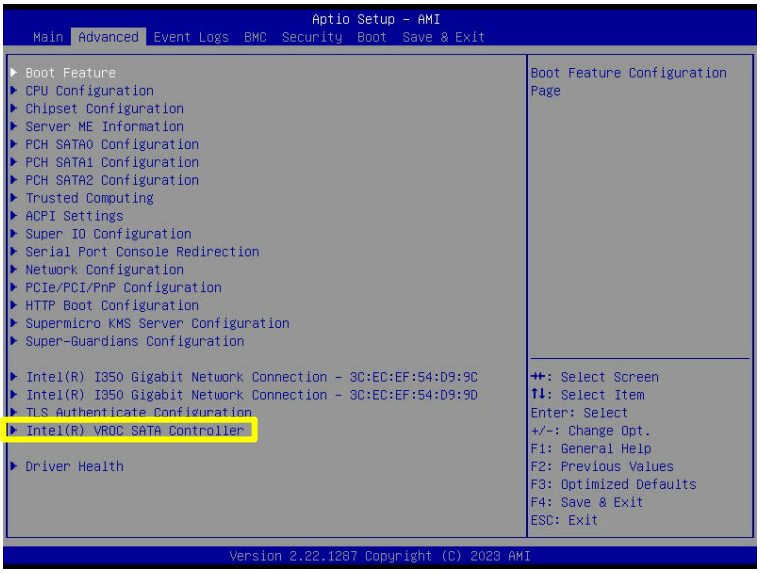


Step 4: Scroll down to **SATA Mode Section**, and press <Enter>. From the pop-up window, select *RAID* and press <Enter> as shown below.



Step 5: After setting your selected devices for SATA RAID support, select *Save and Reset* from the **Save and Exit** menu and press <Enter> to save the changes and reboot the system.

During system reboot, press <Del> to enter the BIOS Setup utility. From the BIOS menu bar on top of the screen, select **Advanced** to invoke the Advanced menu as shown below.



Step 6: The Intel® VROC SATA Controller submenu will be displayed and available for configuration as shown above. Follow the instructions given on Section 1.2 to proceed with SATA RAID setting configuration.

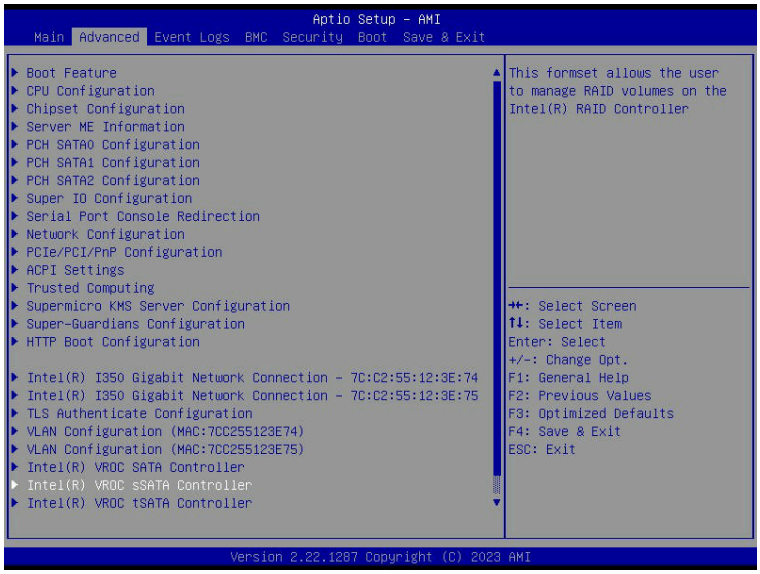
1.1b. To Invoke the Intel® VROC sSATA Controller Submenu in the BIOS

To enable **Intel® VROC sSATA RAID** support in the UEFI BIOS, follow the instructions below.

1. Press the <Del> key during system boot to enter the BIOS Setup utility.

2. Using the arrow key, select *Advanced* from the BIOS menu bar on top of the screen. The following screen will display.

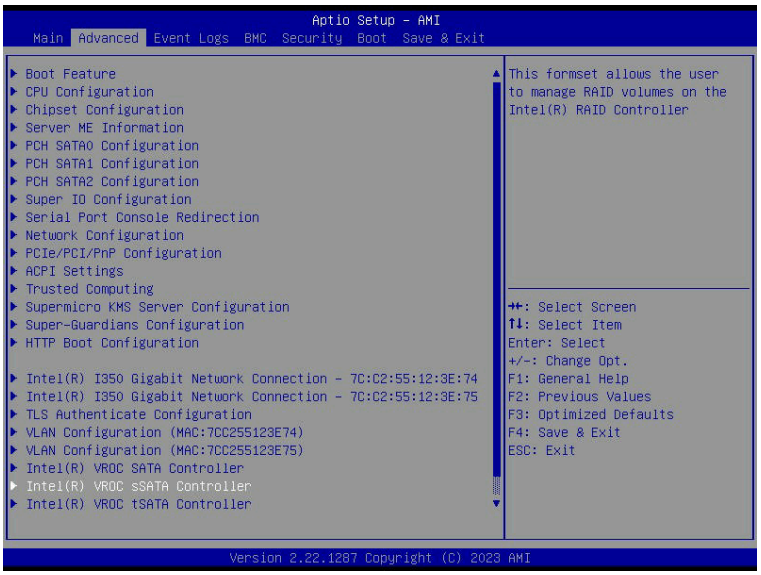
Note: If the **Intel® VROC sSATA RAID Controller** submenu is not displayed as shown below, it indicates that sSATA RAID volumes have not been created for your system.



However, if the **Intel® VROC sSATA RAID Controller** submenu is displayed as shown above, please skip the next section and go directly to **Section 1.2** to proceed with sSATA RAID configuration for your system.

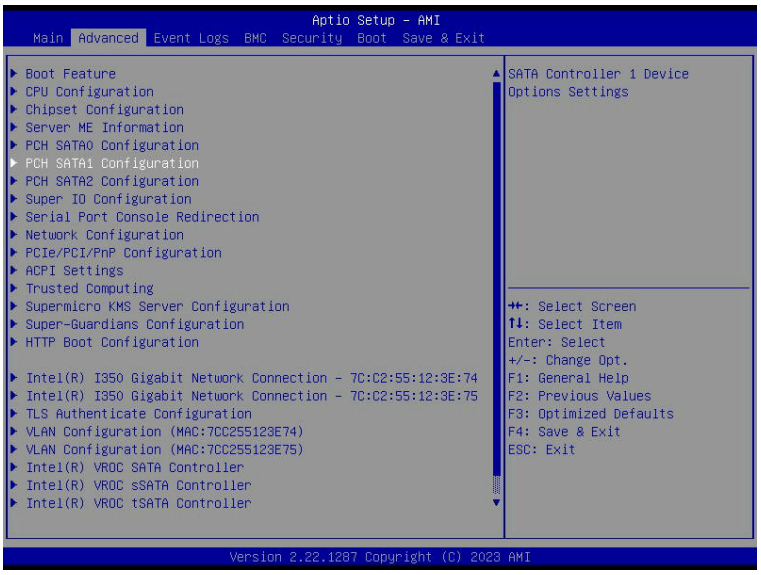
To Invoke the Intel® VROC sSATA RAID Controller Submenu

After entering the BIOS Setup utility, and if you do not see the Intel® VROC sSATA RAID submenu displayed as shown below, you will need to enable PCH sSATA RAID controller support first.

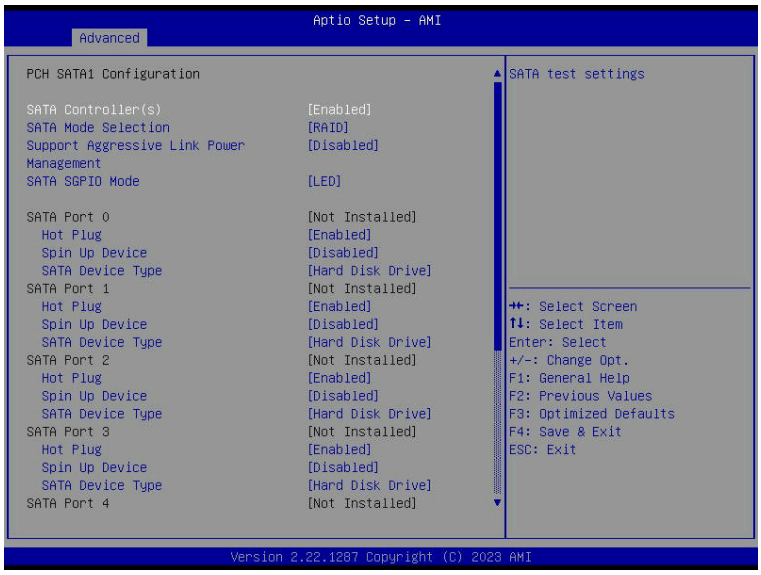


To enable PCH sSATA RAID Controller for the drives you want to use for RAID configuration, follow the instructions below.

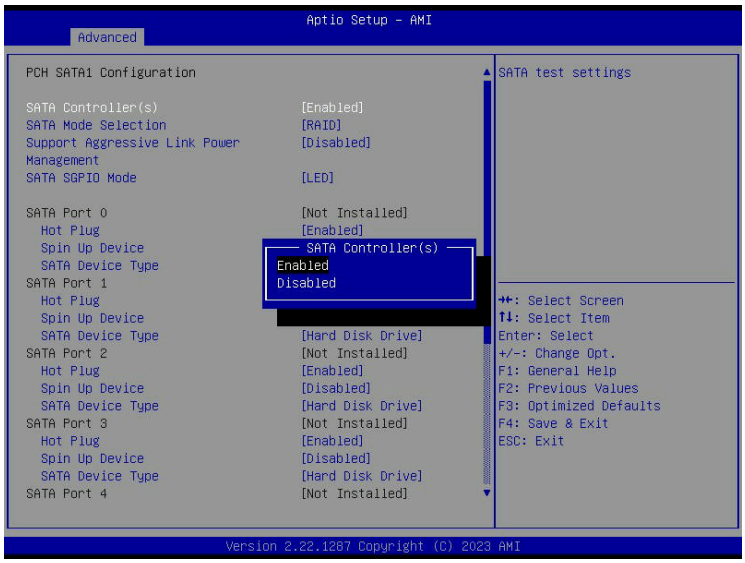
Step 1: Select the PCH sSATA controller that you want to use for RAID configuration as shown below.



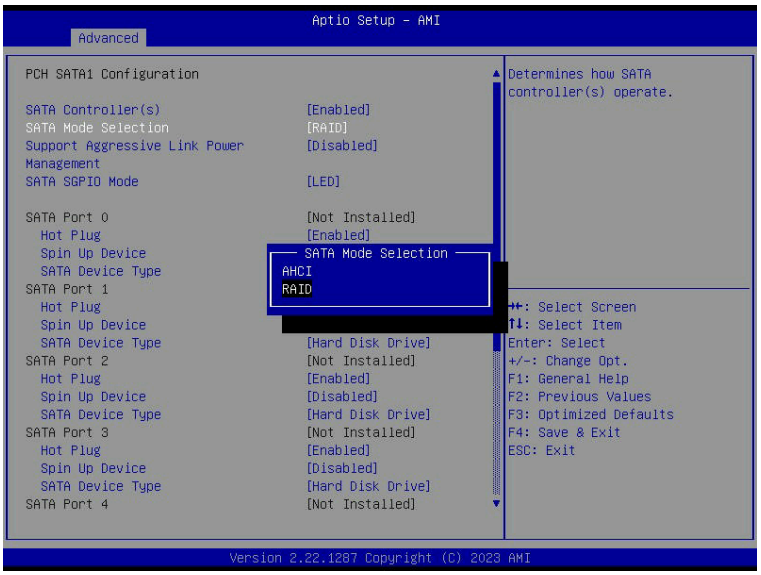
Step 2: Once you've selected the sSATA controller to enable RAID support, press <Enter>. The following screen will display.



Step 3: When the screen below displays, select *Enable* to enable the sSATA Controller for the drives to be listed as "available" for RAID configuration and press <Enter>.

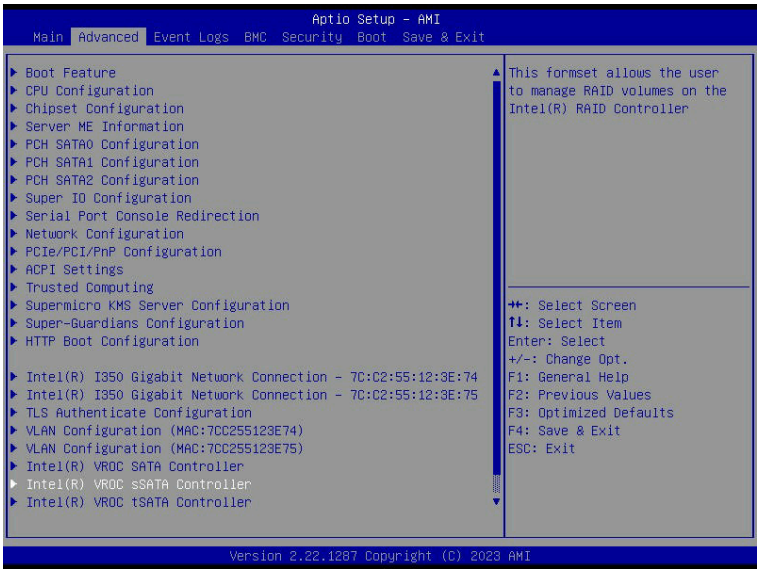


Step 4: Scroll down to **SATA Mode Section**, and press <Enter>. From the pop-up window, select *RAID* and press <Enter> as shown below.



Step 5: Once you've configured all selected drive for sSATA RAID support, select *Save and Reset* from the **Save and Exit** menu and press <Enter> to save the changes and reboot the system. A confirmation window will display. Select *Yes* and press <Enter> to proceed with sSATA RAID configuration. (Select No and press <Enter> to abort the procedure.)

After confirming sSATA RAID configuration, the system will reboot. During system reboot, press <Del> to enter the BIOS Setup utility. From the BIOS menu bar on the top of the screen, select **Advanced** to invoke the Advanced menu as shown below.



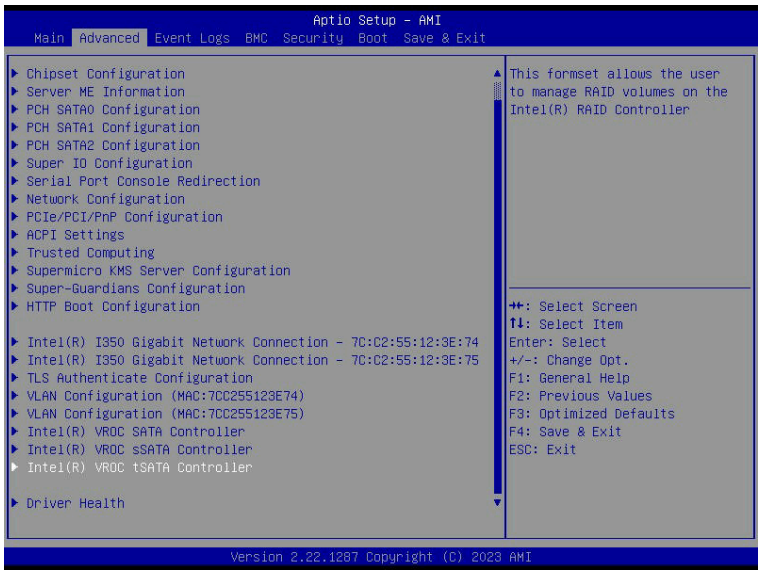
Step 6: The Intel® VROC sSATA Controller submenu is displayed for configuration. Follow the instructions given on Section 1.2 to configure RAID settings.

1.1c Invoking the Intel® VROC tSATA Controller Submenu in the BIOS

To enable **Intel® VROC tSATA RAID** support in the UEFI BIOS, follow the instructions below.

1. Press the <Del> key during system boot to enter the BIOS Setup utility.

2. Using the arrow key, select *Advanced* on top of the BIOS menu bar. The following screen will display.

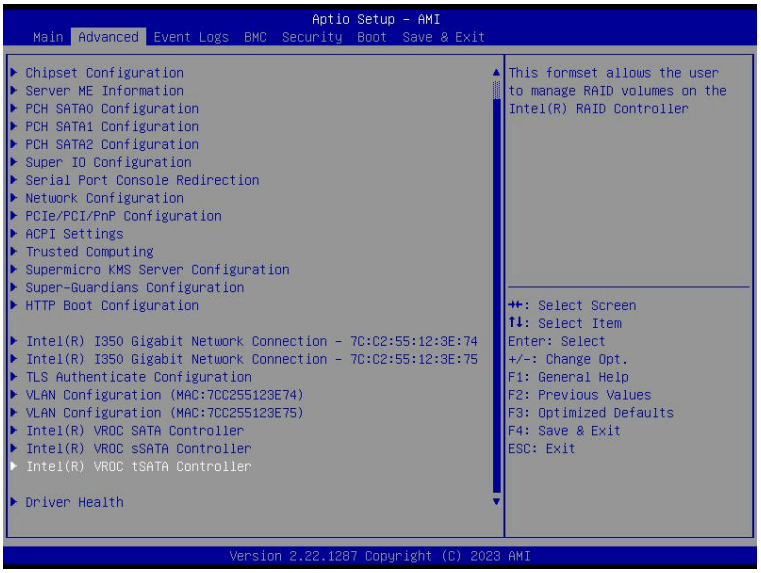


Note: If the **Intel® VROC tSATA RAID Controller** submenu as highlighted above is not displayed in the **Advanced** menu, it indicates that RAID volumes have not been created for your system.

However, if the submenu as shown above is displayed, please skip the next section and go directly to **Section 2** to proceed with tSATA RAID configuration for your system

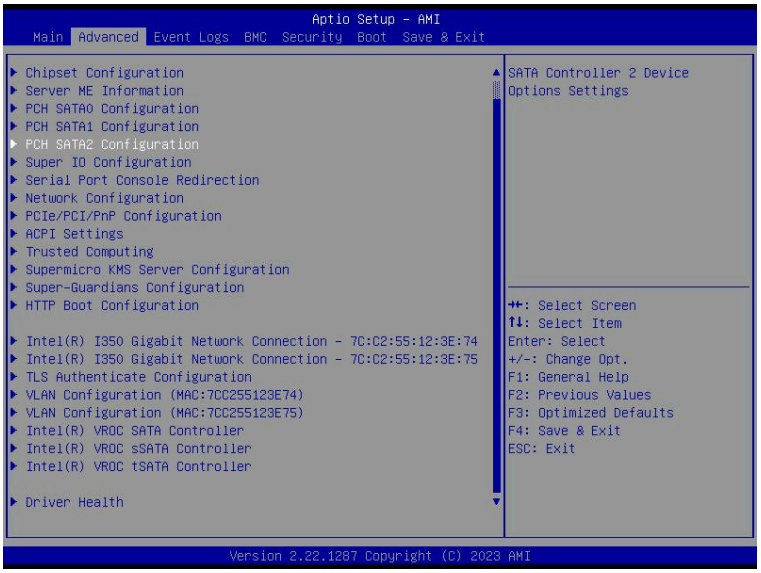
To Invoke the Intel® VROC tSATA RAID Controller Submenu

After entering the BIOS Setup utility, and if you do not see the Intel® VROC tSATA RAID submenu displayed as shown below, you will need to enable PCH tSATA RAID Controller support first.

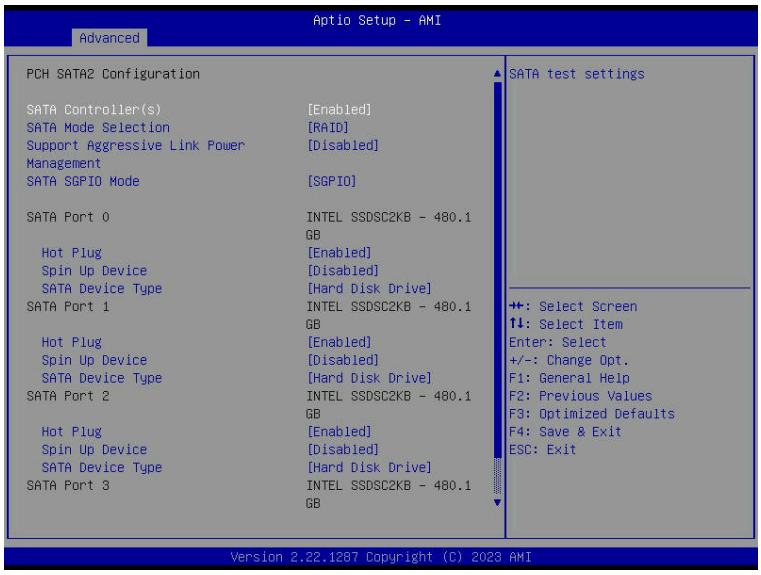


To enable PCH tSATA Controller for the devices you want to use, follow the instructions below.

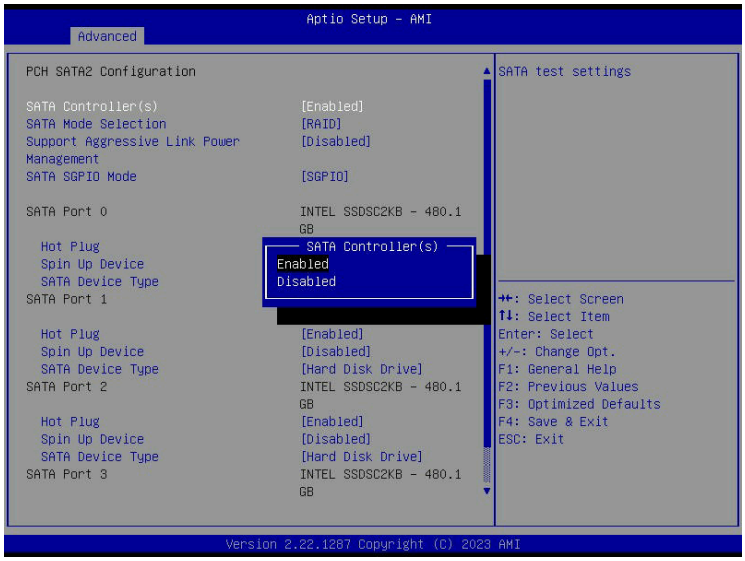
Step 1: Select the PCH tSATA controller for tSATA RAID Configuration as shown below.



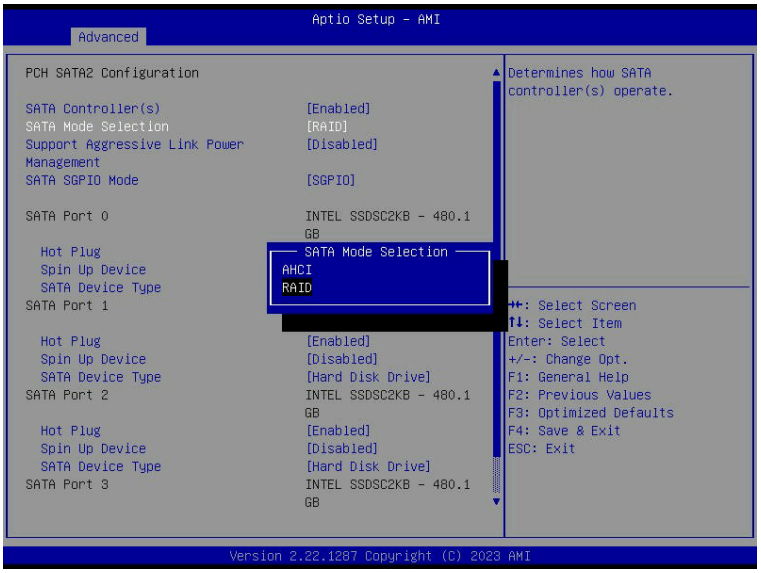
Step 2: Once you've selected the tSATA controller for RAID support, press <Enter>. The following screen will display.



Step 3: When the screen below displays, select *Enable* and press <Enter> to enable tSATA Controller for the drives to be listed as "available" for RAID on configuration.

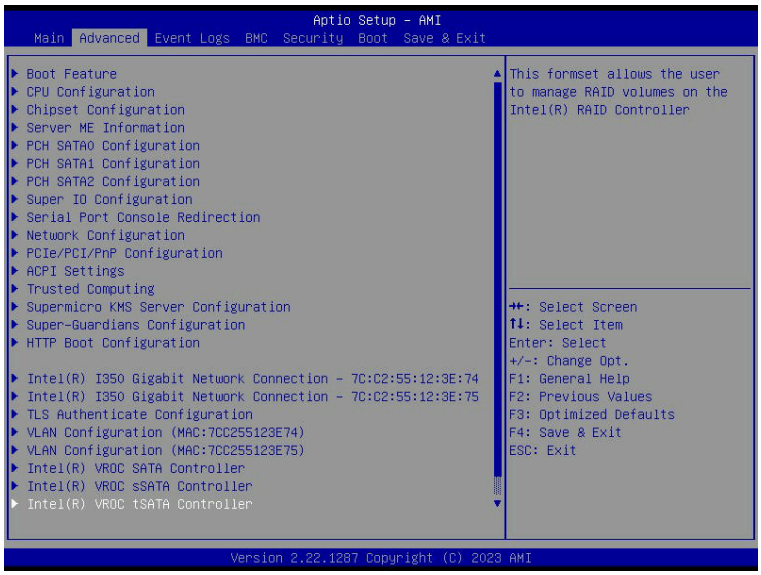


Step 4: Scroll down to **SATA Mode Section**, and press <Enter>. From the pop-up window, select *RAID* and press <Enter> to enable all devices of your choice for RAID support as shown below.



Step 5: Once you've configured SATA RAID support on your selected devices, select *Save and Reset* from the **Save and Exit** menu and press <Enter>. A confirmation window will display. Select *Yes* and press <Enter> to proceed with tSATA RAID configuration. Select *No* to abort the process.

After confirming tSATA RAID configuration and pressing <Enter>, the system will reboot. During system reboot, press <Del> to enter the BIOS Setup utility. From the BIOS menu bar on the top of the screen, select **Advanced** to invoke the Advanced menu as shown below.

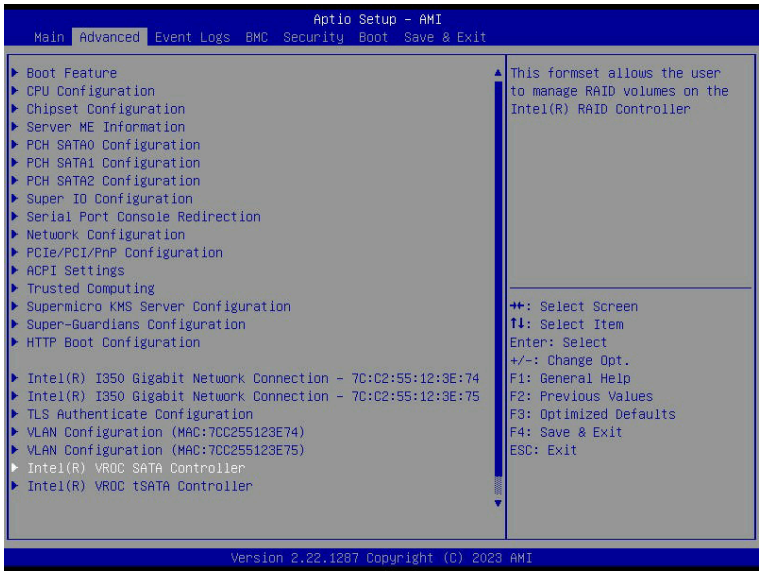


Step 6: The Intel® VROC tSATA Controller submenu will be displayed and available for configuration as shown above. Follow the instructions given on Section 1.2 to configure RAID settings.

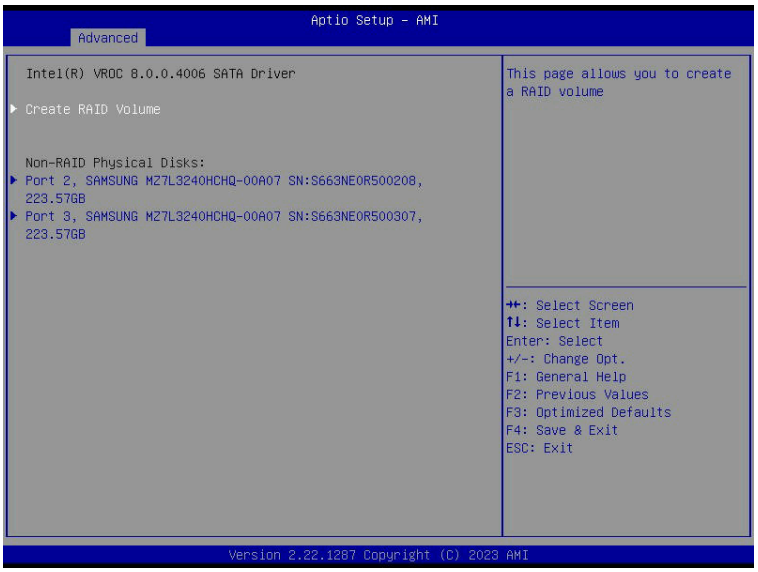
1.2 Enabling VROC SATA RAID/sSATA RAID/tSATA RAID Support

Note: The procedures to enable Intel VROC SATA RAID, VROC sSATA RAID, and VROC tSATA RAID support are identical. Please follow the instructions below to enable all three types of Intel VROC SATA RAID configurations for your system.

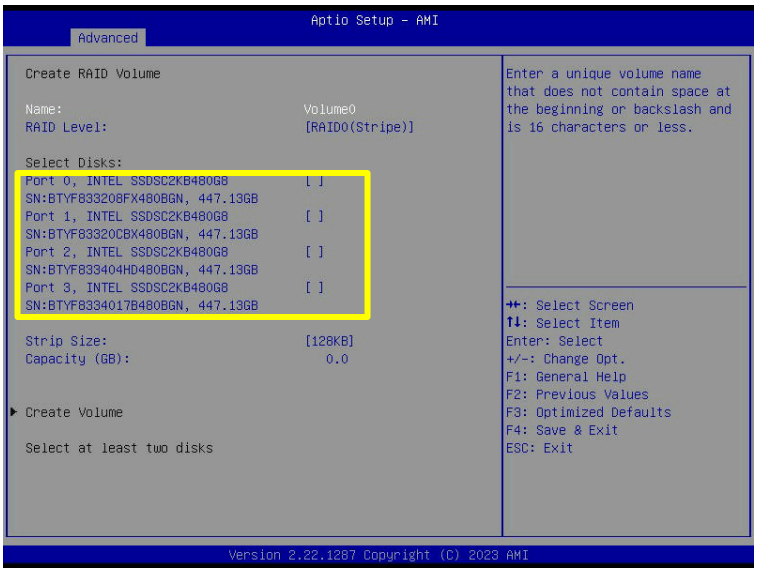
1. Press the <Del> key during system boot to enter the BIOS Setup utility.
2. Use the arrow key to select **Advanced** from the BIOS menu bar on top of the screen.



3. Use the down arrow key to select *Intel® VROC SATA Controller* as shown above.
4. With *Intel® VROC SATA Controller* submenu selected as shown above, press <Enter>. The following screens will display, showing Intel SATA drives information.



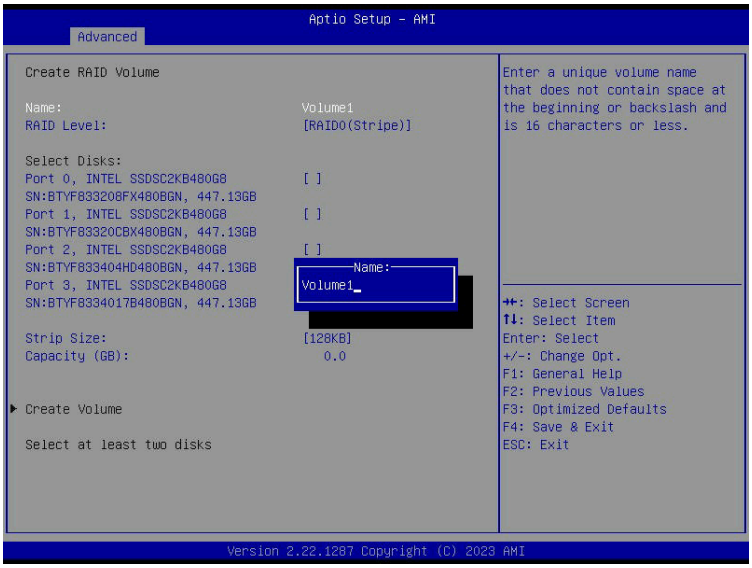
Create a RAID Volume and Enter a Name for the RAID Volume



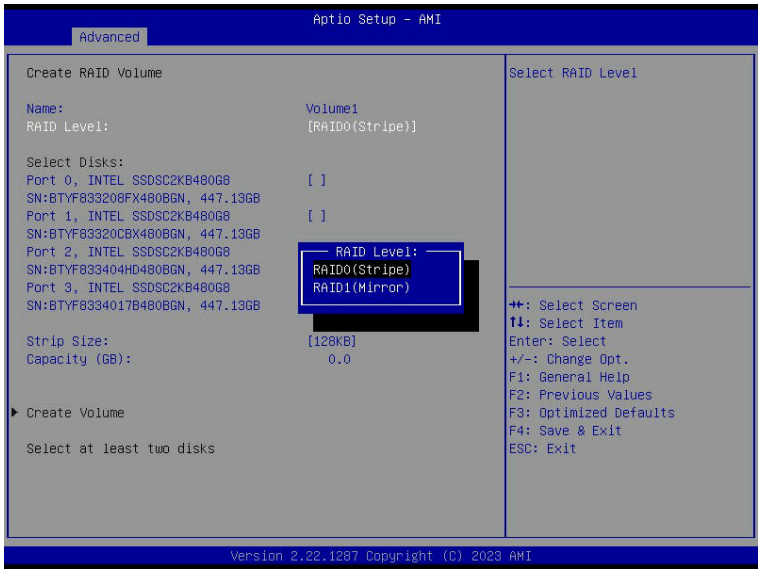
5. When the screen above displays, use the arrow key to select *Create RAID Volume* and press <Enter> to invoke its submenu as shown in the next screen:

Note: The SATA ports that are installed with SATA devices and available for RAID configuration are displayed as shown on the screen above.

6. Select *Name* and press <Enter> to invoke a pop-up window as shown below
7. . Enter a name in the pop-up window as shown below and press <Enter>.



8. After entering a name for a RAID volume, select *RAID Level* and press <Enter>.



9. From the pop-up window as shown above, select the desired RAID level to create and press <Enter>.

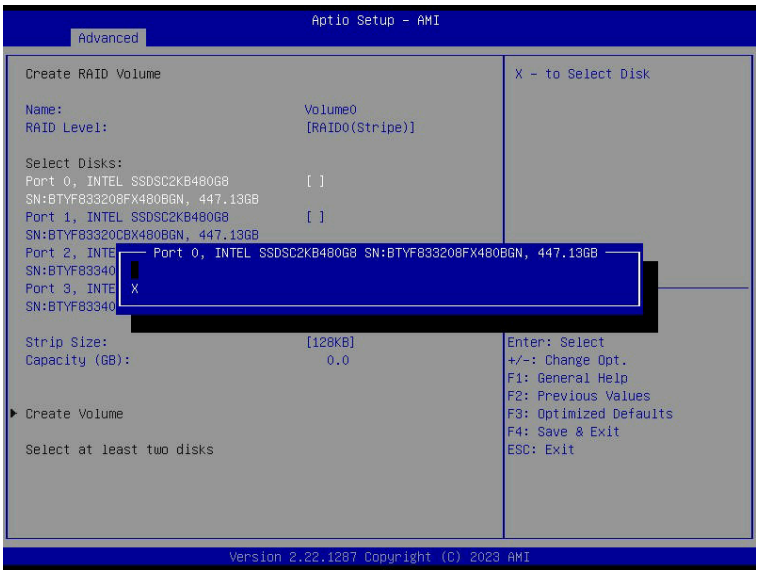
The following table displays the minimal number of SATA devices required by each RAID Setting:

RAID Setting	Minimum Number of SATA Devices Required
RAID 0 (Stripe)	Two
RAID 1 (Mirror)	Two
RAID 5 (Parity)	Three
RAID 10 (RAID0+1)	Four

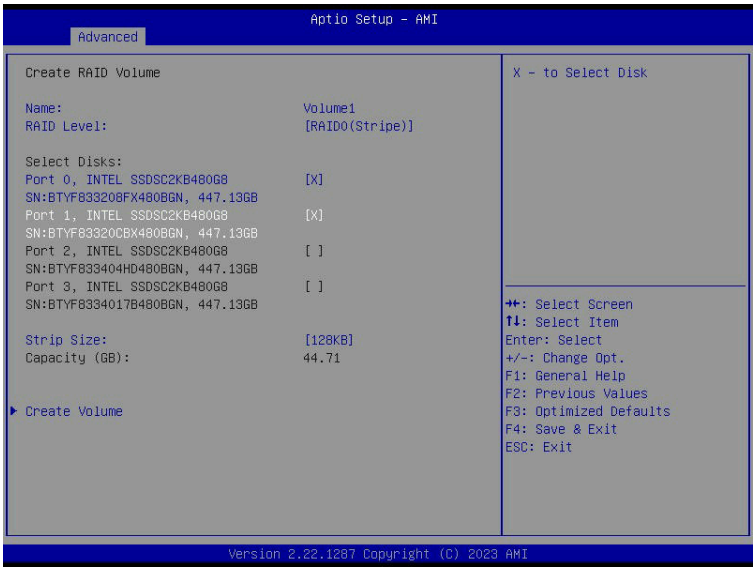
10. To Select desired SATA drives for RAID level configuration, scroll down to the list of available SATA drives, select the drive you want to configure and press <Enter>.
    A pop-up window will appear with a X mark displayed as shown in the first screen of the next section.

Select a Desired SATA Drive for the RAID Volume

Be sure to highlight the X mark and press <Enter> to select the drive for SATA RAID use as shown above.

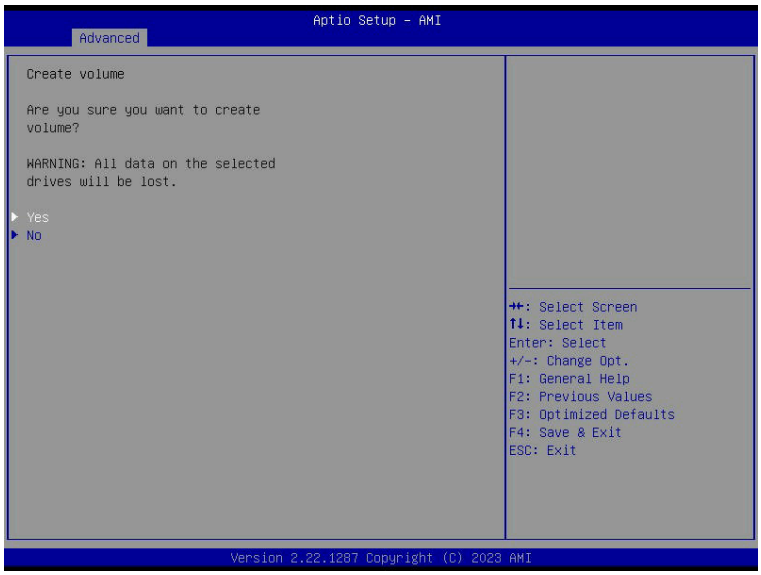


11. Repeat Step 8 to 10 to select all devices as needed for your RAID level use. Once completing device selection, press <Enter>.



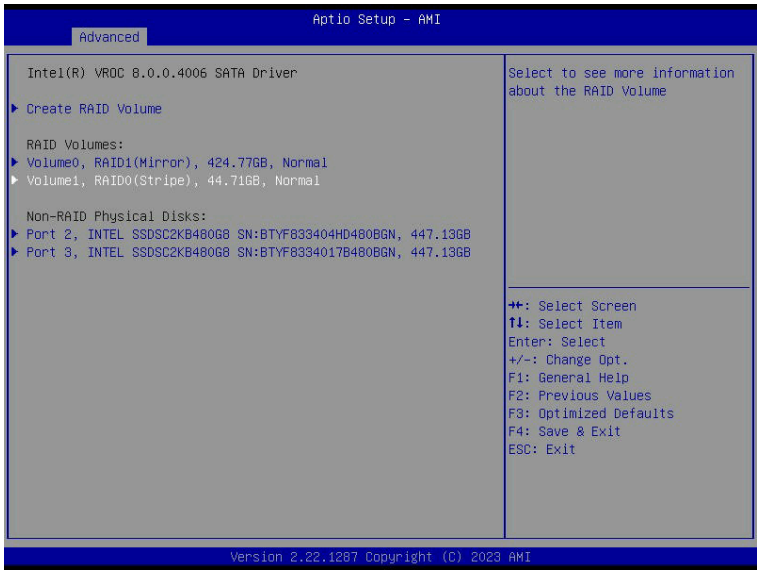
12. After selecting and enabling the desired SATA devices for SATA RAID use, scroll down to select *Create Volume* and press <Enter>. The following screen will display to confirm your selection.

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



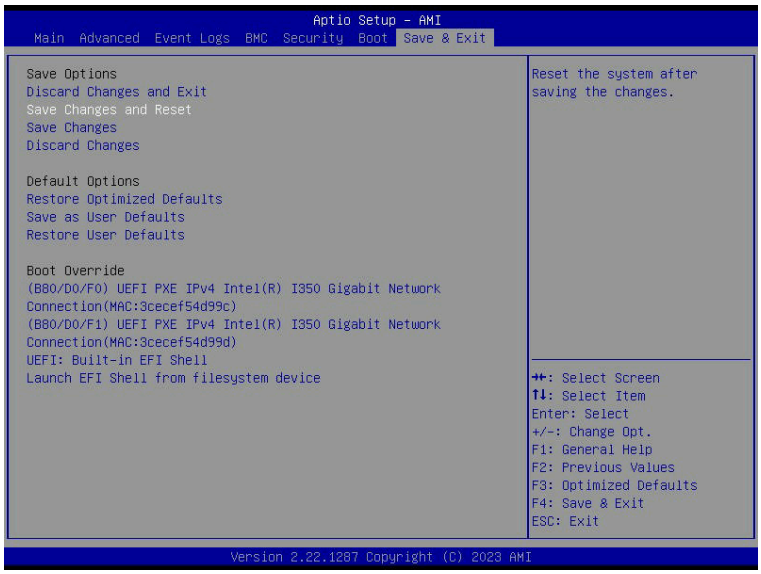
When the screen above displays, asking if you want to create RAID Volume, select *Yes* and press <Enter> to confirm and proceed with RAID Volume creation. If not, select *No* and press <Enter> to abort the process.

13. After selecting *Yes* and press <Enter>, the BIOS Setup utility will proceed with RAID creation as shown in the screen below.



14. Repeat Step 4 ~ Step 12 to create RAID Volume for all your SATA devices as you desire.

15. For the changes to take effect, please save the changes you've made and reboot the system by selecting *Save Changes and Reset* from the **Save & Exit** menu on the menu bar and pressing <Enter> as shown in the screen below.



During system boot, press <Del> to return to the BIOS Setup utility. Select **Advanced** from the menu bar on the top of the screen, scroll down to **select Intel® VROC SATA RAID** submenu to view the SATA RAID Volume(s) you've created and make changes.

Chapter 2

Detailed Instructions on How to Configure Intel® VROC SATA RAID Settings

2.1 Configuring Intel VROC SATA RAID/sSATA RAID/tSATA RAID Settings

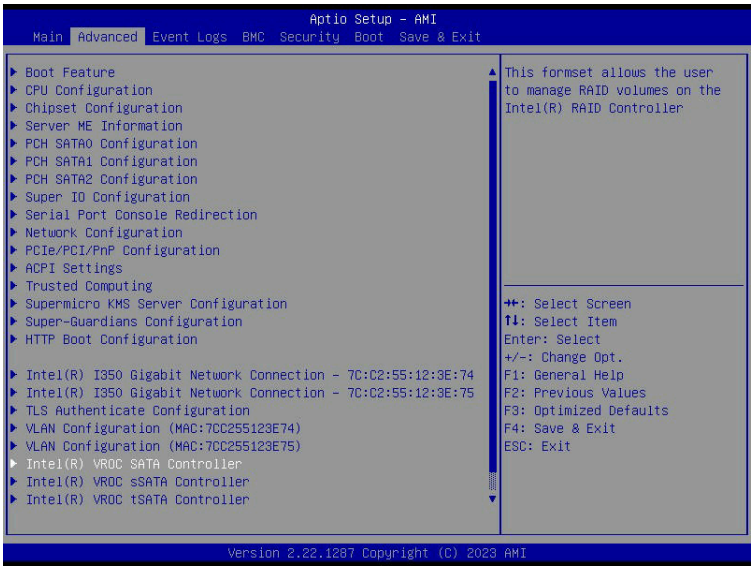
Note: The Configuration procedures for all three types of Intel VROC RAID Controllers mentioned above are identical. You can use the same instructions to configure all these types of VROC SATA_RAID settings.

This section provides detailed instructions on how to configure SATA RAID settings on the SATA devices installed on an X13 motherboard. Refer to Section 1.1 for instructions on how to enable Intel VROC SATA RAID support in the UEFi BIOS for Supermicro X13 motherboards.

Note 1: The images provided in this user guide may look different from the images displayed on your monitor. These images reflect the physical devices installed in your system. Since each system configuration differs, the BIOS screen displays will differ as well.

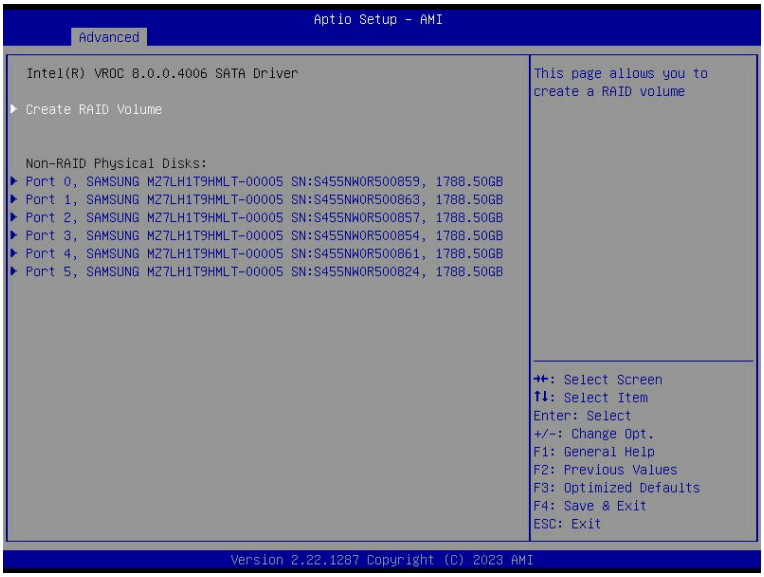
Note 2: If the Intel® VROC SATA RAID submenu is not displayed for configuration, follow the instructions given in **Section 1.1**.

Follow the instructions provided in Section 1.1 to access the **Intel® VROC SATA Controller** submenu as shown below.

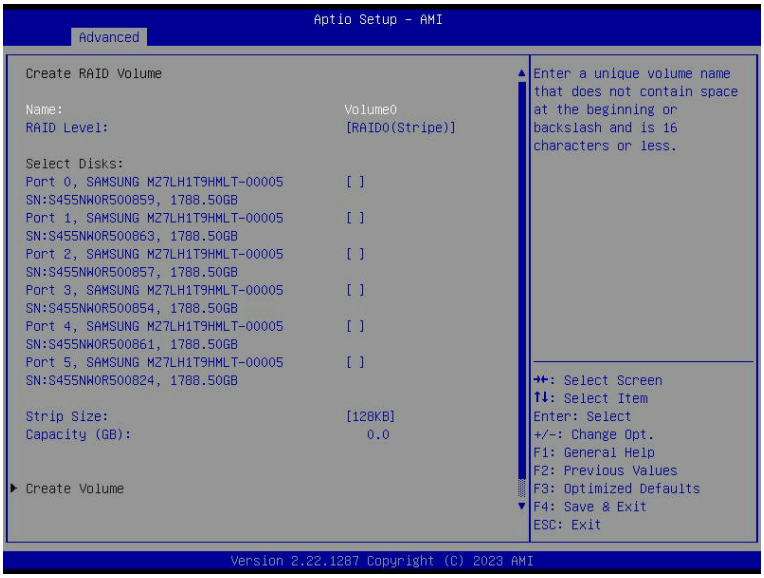


To Create a RAID Volume

When the **Intel® VROC SATA RAID** submenu is highlighted (selected) as shown in the previous screen, press <Enter> to invoke **Intel® VROC x.x.x.xxxx SATA** Driver submenu as shown below.



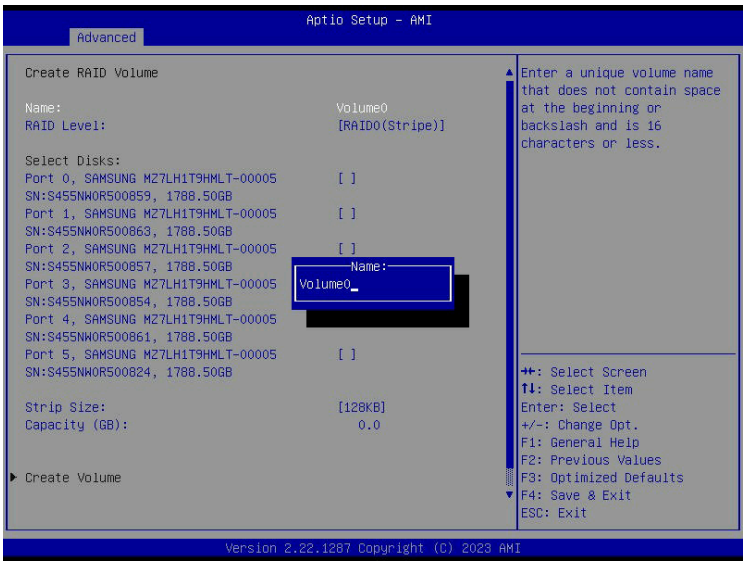
From the screen above, using the down arrow key, select **Create RAID Volume** and press <Enter> to invoke the **Create RAID Volume** submenu as shown in the screen below.



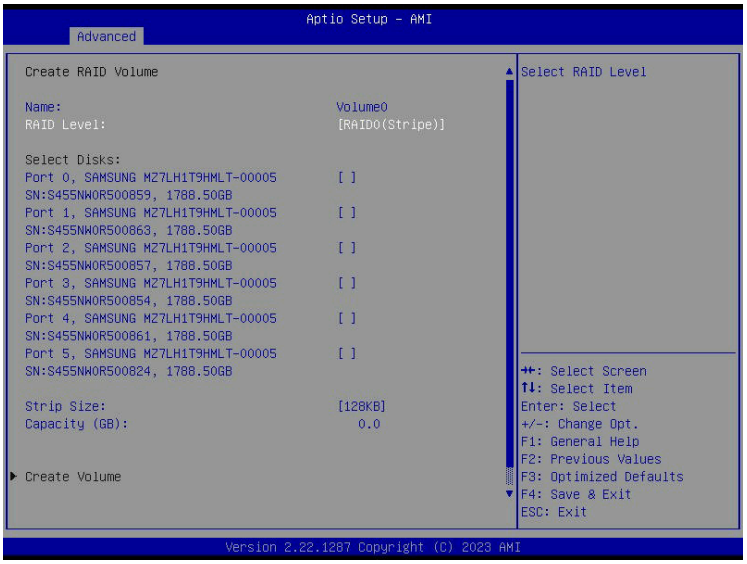
This submenu will allow you to create and configure RAID volume settings.

To Enter a Name for the RAID Volume

When the **Create RAID Volume** submenu displays as shown in the previous screen, using the arrow key, select **Name** and press <Enter>, and the following screen will display.



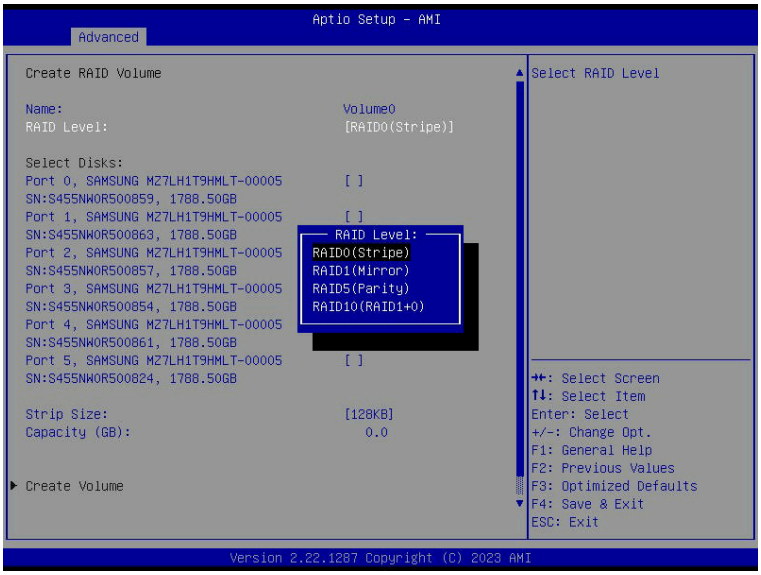
Enter a unique name for the RAID volume in the pop-up window as shown above and press <Enter>. The following screen will display for you to set the RAID Level for your drive.



To Set the RAID Level for the RAID Volume

When the previous screen displays, selected RAID Level and press <Enter>.

A RAID Level popup window as shown below.



From the pop-up window shown above, select the desired RAID level for your RAID volume configuration and press <Enter>. The options are **RAID0(Stripe)**, RAID1(Mirror), RAID5(Parity), and RAID10(RAID0+1).

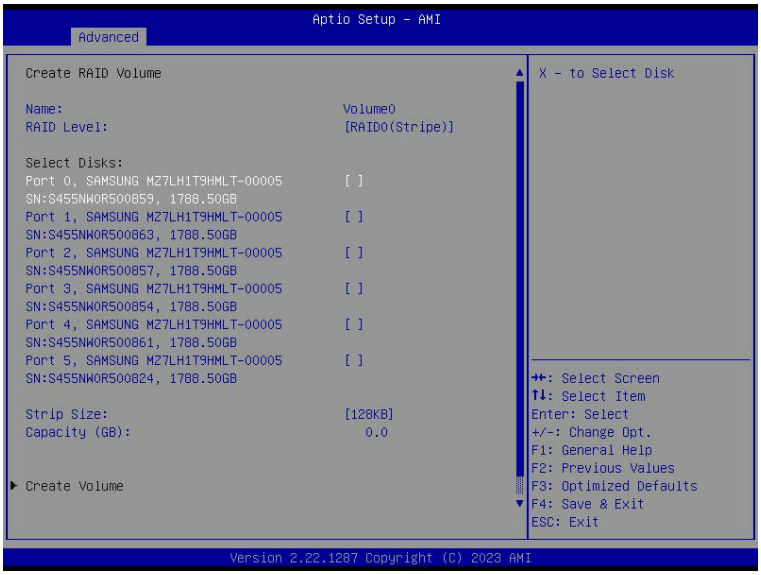
Note 1: The RAID level(s) displayed is(are) based on the number of SATA devices connected to the system.

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

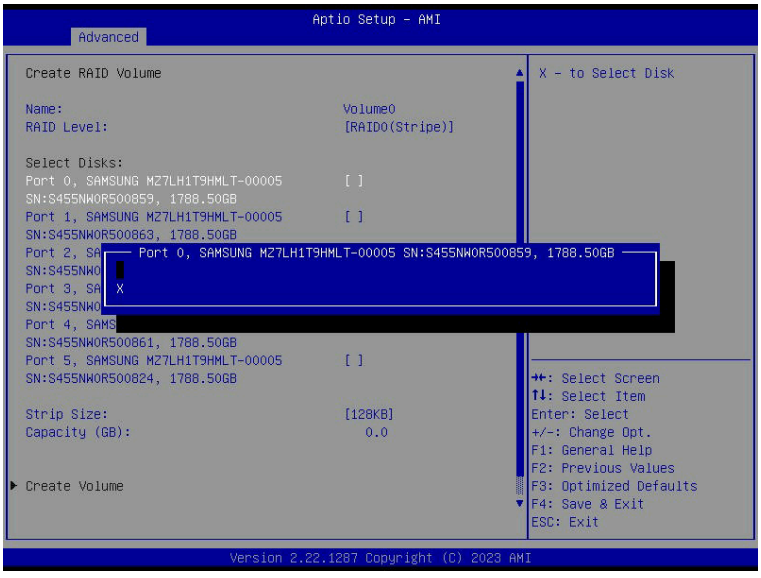
	Minimum Number of SATA Devices Required
RAID 0 (Stripe)	Two
RAID 1 (Mirror)	Two
RAID 5 (Parity)	Three
RAID 10 (RAID0+1)	Four

Selecting Desired SATA Drives to Create RAID Volume

Using the arrow keys select the SATA drives you want to use for RAID volume creation from the list of **Select Disks:** as shown below.



With your drive selected, press <Enter> to invoke the screen below.



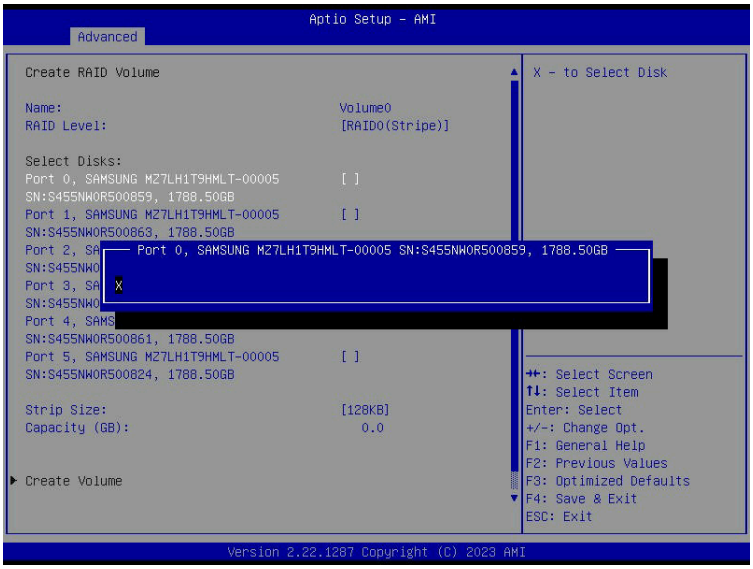
The options are **(not selected)** and X (selected). To select **X** and make it the default, press the down arrow key to select X and press <Enter>. This feature will allow the RAID level you've selected earlier to cross the VROC SATA domains.

Note: The feature above is for Data RAID only. For a bootable RAID volume, does not cross VROC SATA domains.

To Select Disks for the RAID Volumes

From the **Create RAID Volume** submenu, highlight *Select Disk:* and press <Enter> as shown in the previous screen.

The following screen will display.



Using the down arrow key select (highlight) X as shown above, press <Enter> to select it for RAID Volume configuration. Repeat the same step to select all your desired disks for your desired RAID volumes.

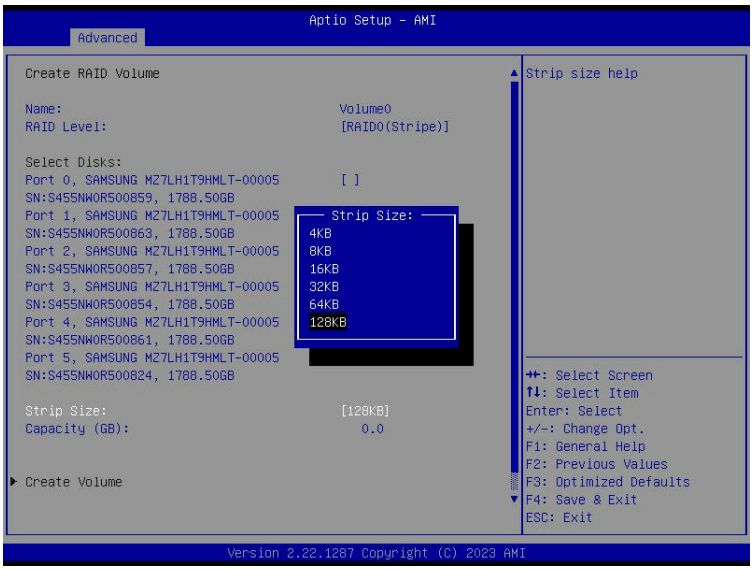
Note 1: To select a disk, you can also press the <Space Bar> to select it. With “X” highlighted, press <Enter>.

Note 2: After you’ve selected the disk drives for SATA RAID configuration, be sure to save the settings and reboot the system by select *Save and Reset* from the **Save and Exit** menu and press <Enter>.

To Set Stripe Size for the RAID Volume

From the **Create RAID Volume** submenu, select *Stripe Size:* and press <Enter>.

The following screen will display.

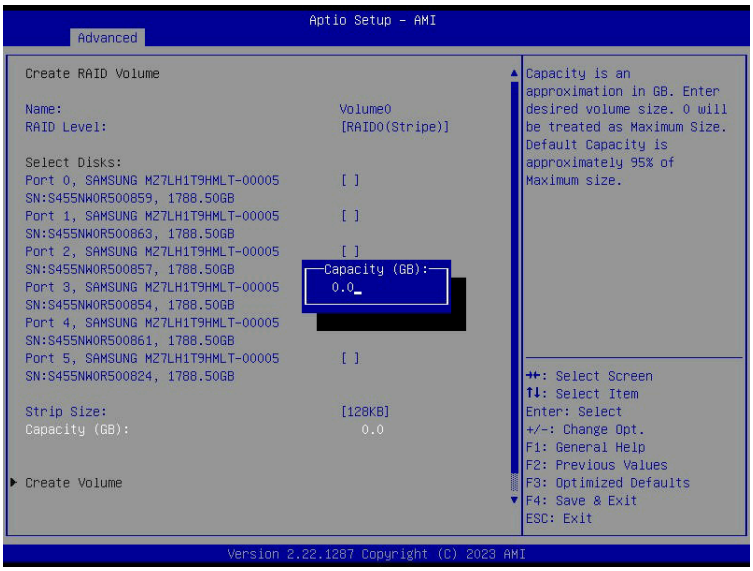


From the pop-up window as shown above, select the desired RAID stripe size for your RAID volume and press <Enter>. The options are 4KB, 8KB, 16KB, 32KB, 64KB, and **128KB**.

After setting the Stripe Size, scroll down to select *Create RAID* and press <Enter> to create the RAID volume.

To Set the Capacity (GB) for the RAID Volume

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

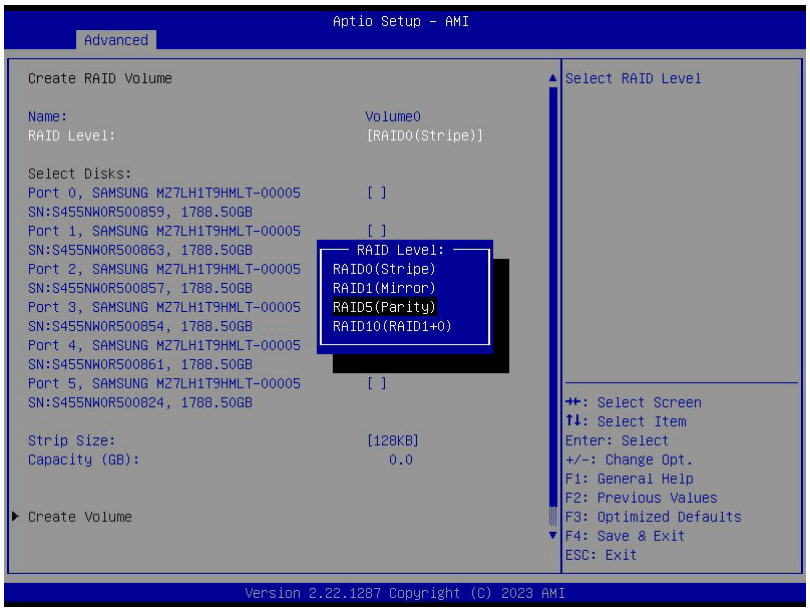


Enter the desired RAID capacity (in GB) in the pop-up window to set the capacity for your RAID volume.

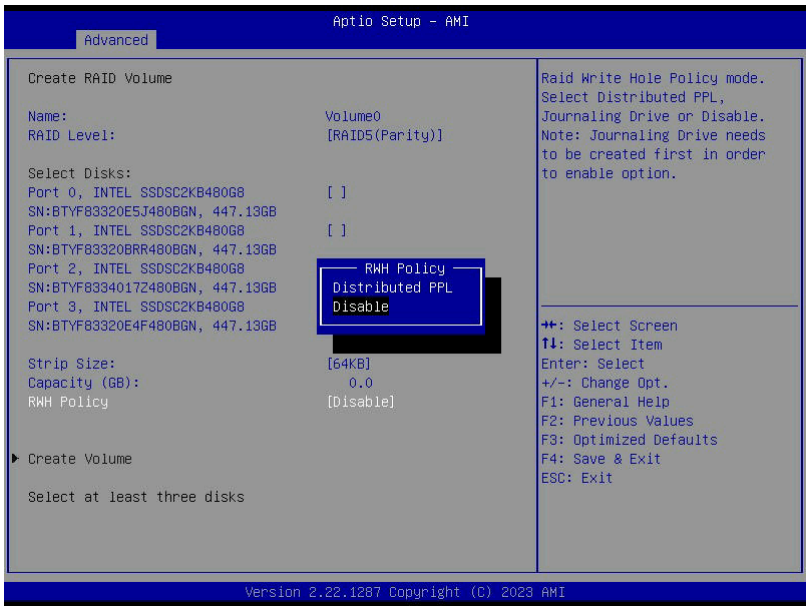
After setting the Capacity Size, scroll down to select *Create RAID* and press <Enter> to create the RAID volume.

To Set the RWH Policy for RAID 5 (*Available only when RAID 5 is selected and four disks or more are also installed in the system)

To set the RAID 5 level, select three disks for RAID 5 use. Select *RAID 5* from the RAID Level pop-up window in the **Create RAID Volume** submenu and press <Enter>.



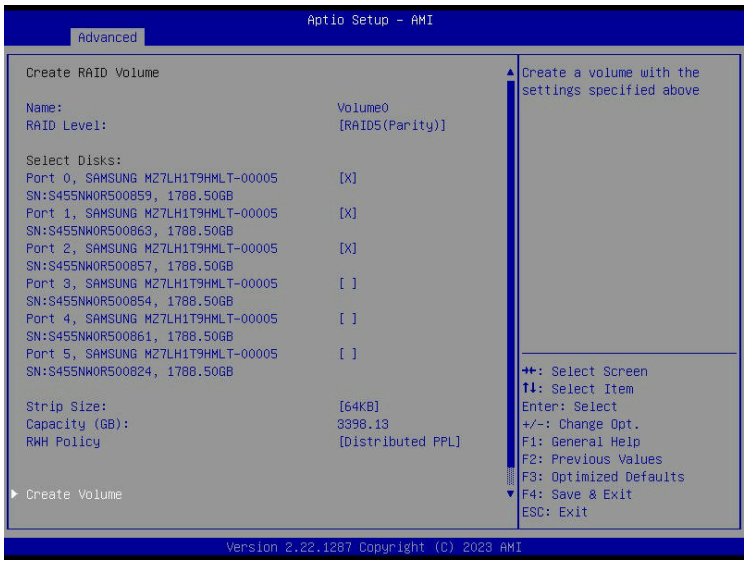
When the screen above displays, press <Enter> to invoke the following screen.



Scroll down to select *RWH Policy*, and press <Enter>. The available options will display: Distributed PPL and **Disable** (*Default) as show in the screen above. Select your desired option and press <Enter>.

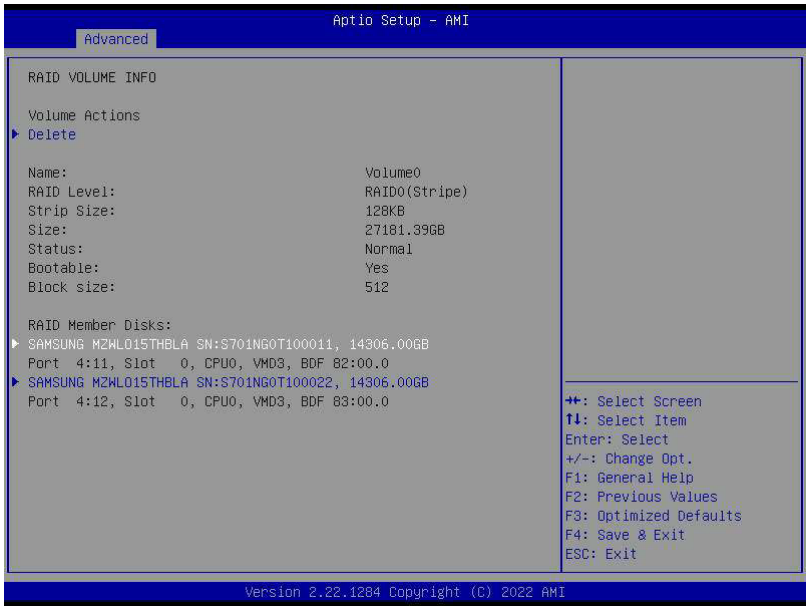
To Create Volumes

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



Note: To create RAID 0 or RAID 1, please select at least two disks from the list. For RAID 5, three disks (minimum) are needed. For RAID 10, four disks (minimum) are required.

After selecting **Create Volume**, press <Enter>, the following screen will appear, displaying the RAID volume you've created as shown below.

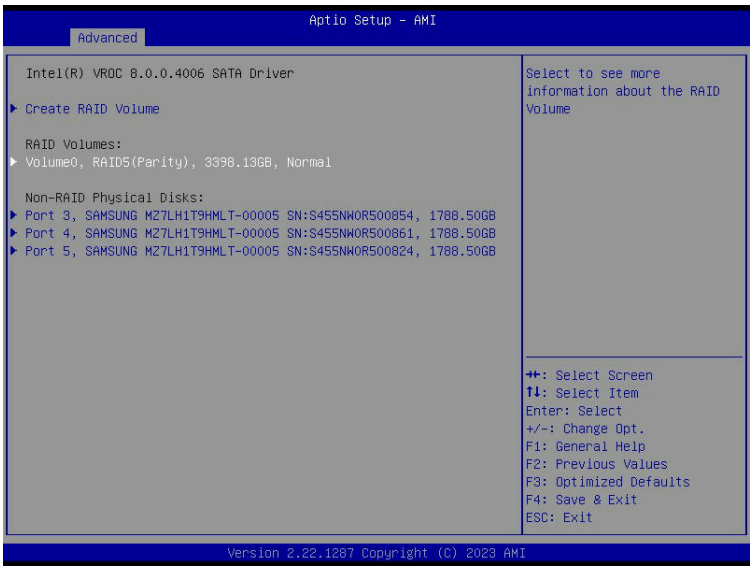


After you've configured the desired RAID volume settings, a confirmation screen will display, asking you if you want to create the selected RAID settings, select *Yes* and press <Enter> to confirm your choice. Select *No* to abort the process.

Be sure to save the changes and reboot the system for the changes you've made to take effect.

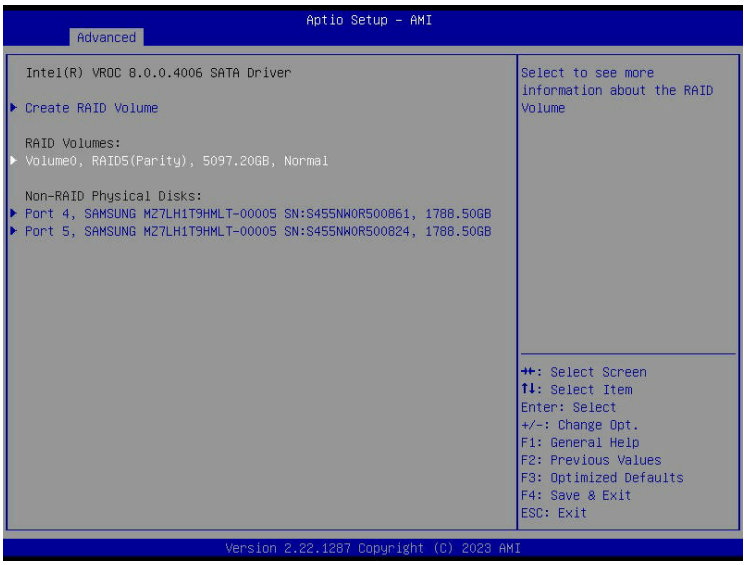
To Display RAID Volumes

To display the detailed information of a RAID volume, highlight the desired RAID volume and press <Enter>. The status of the selected RAID volume will display as shown below.

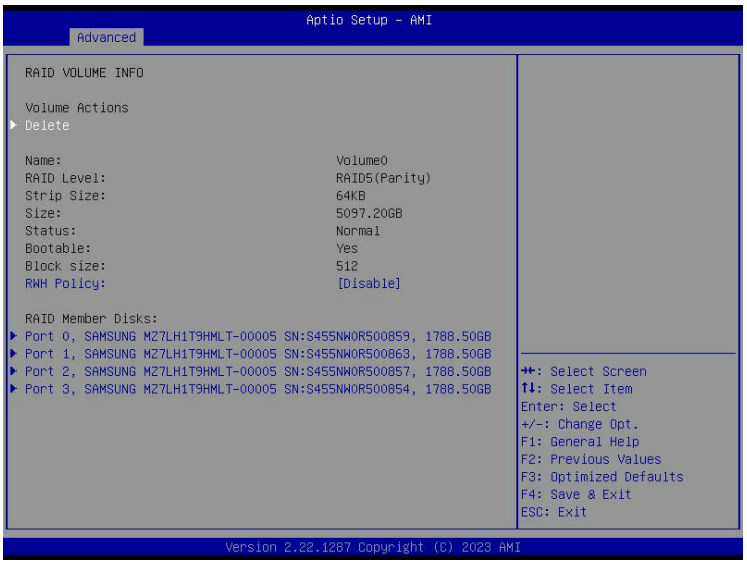


To Delete a RAID Volume from a Disk

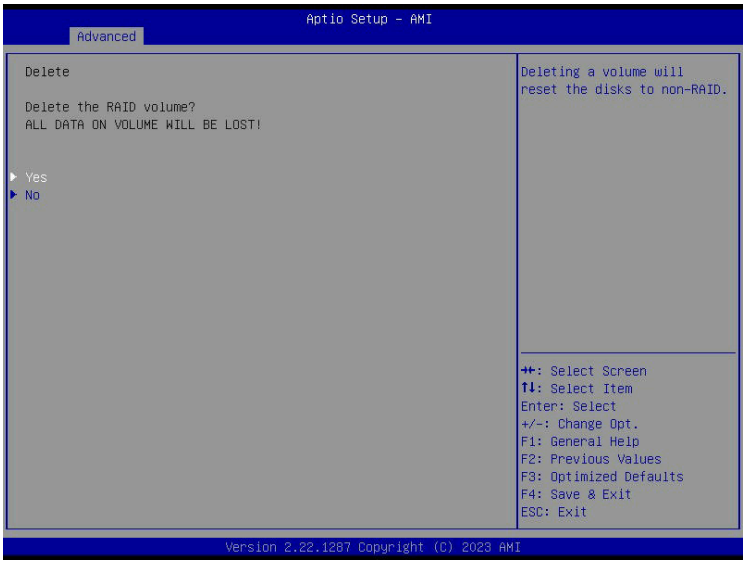
From the **RAID Volume submenu,** select *the* RAID volume you want to delete as shown below.



Once you've selected the RAID Volume to delete, press <Enter>. The following screen will display.



Select *Delete* and press <Enter>. The following screen will display to confirm if you want to delete the RAID Volume from the selected drive.

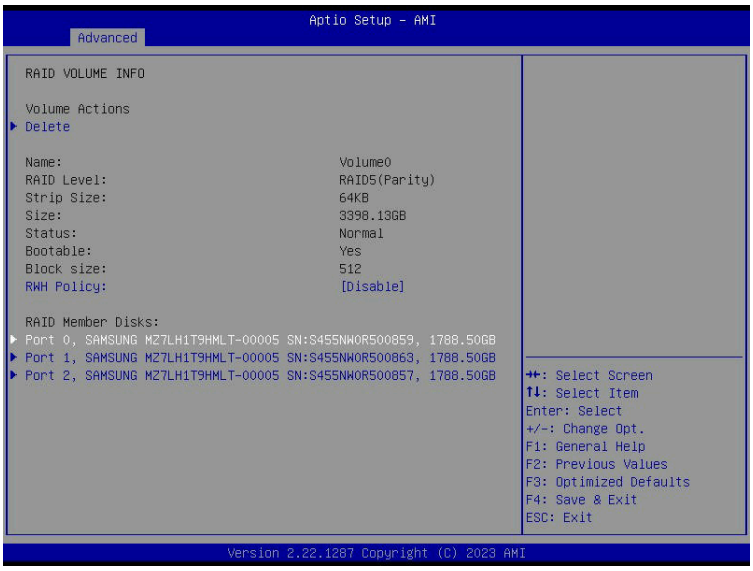


When the confirmation screen displays as shown above, press *Yes* to delete the RAID volume on the selected disk. Press No to cancel the selection. For the changes to take effect, select *Save and Reset* from the **Save and Exit** menu and press <Enter>.

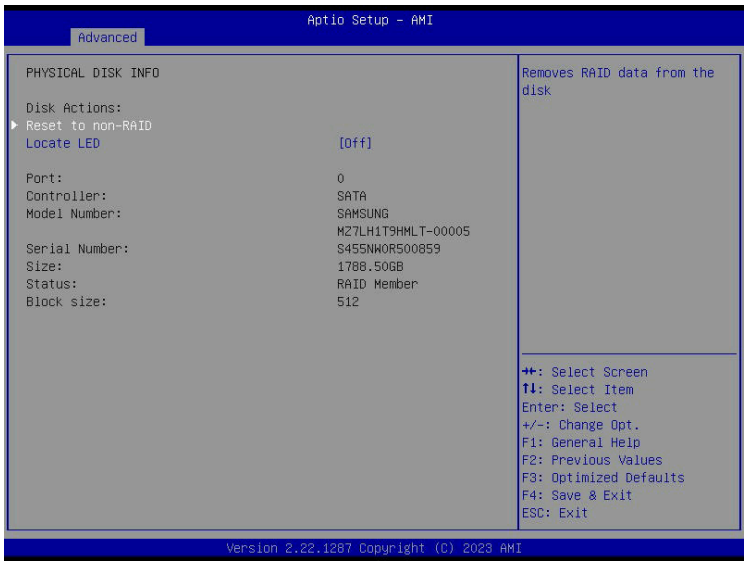
Note: When you choose to delete the RAID volume from a disk, all data on that disk will be deleted, including the user name and password.

To Reset the RAID Volume to non-RAID

On the **RAID VOLUME INFO** submenu as shown below, select the desired SATA device(s) from the list of **RAID Number Disks** to reset the devices of your choice to non-RAID as shown below.

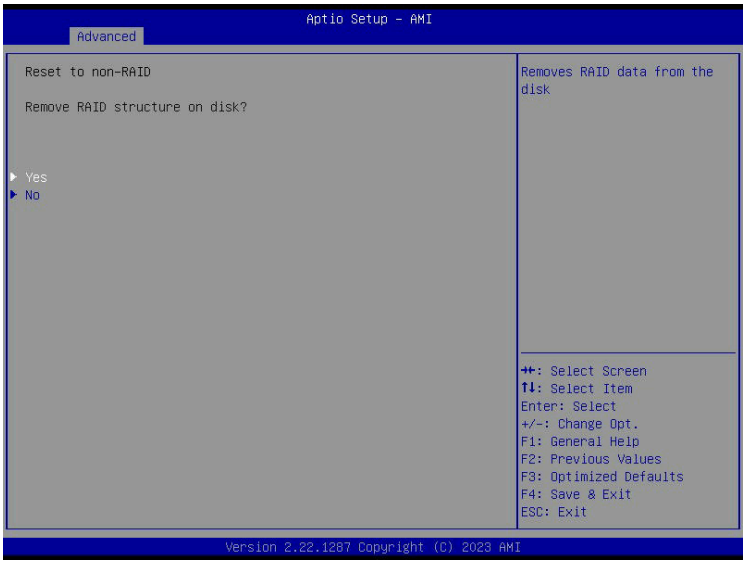


When a desired device that you want to set to “Non-RAID” is highlighted as shown above, press <Enter> and the following screen will display.



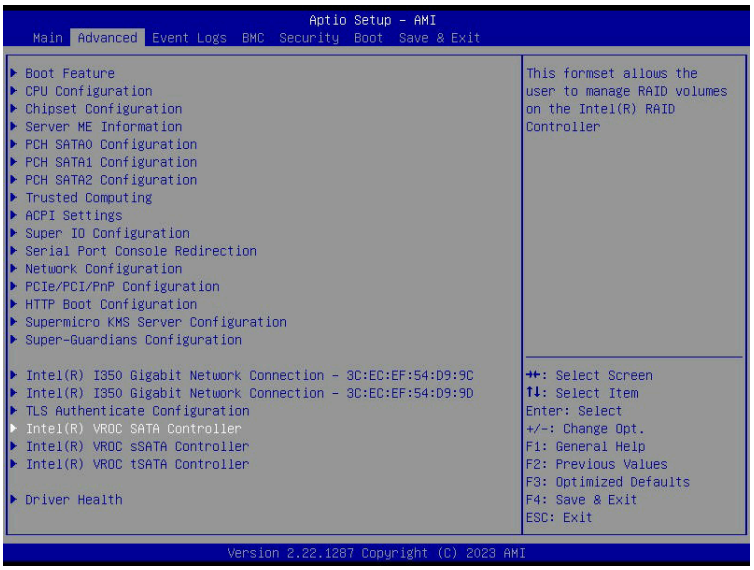
Select **Reset to Non-RAID** from the **PHYSICAL DISK INFO** screen as shown above and press <Enter> to reset the selected SATA device to a Non-RAID device..

When the following screen appears, select *Yes* to confirm your choice. Select *No* to abort RAID Volume reset. The options are **Yes** and No.

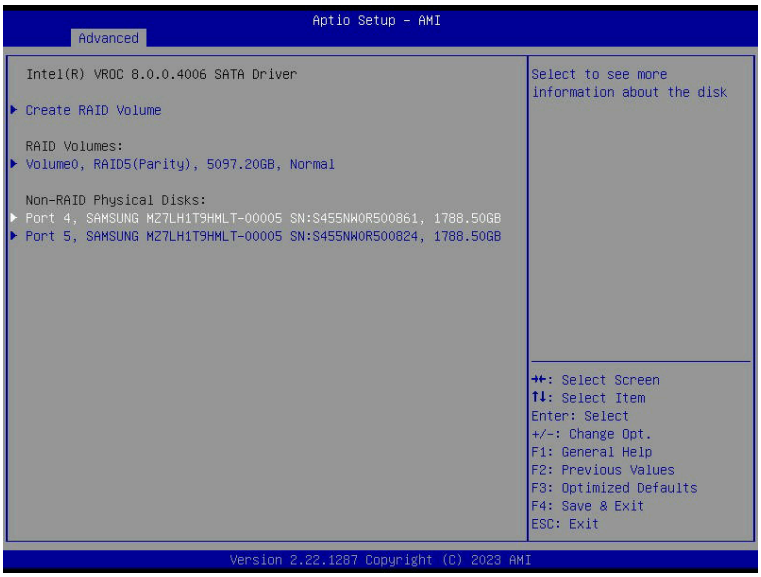


To Turn on the Disk Locator LED

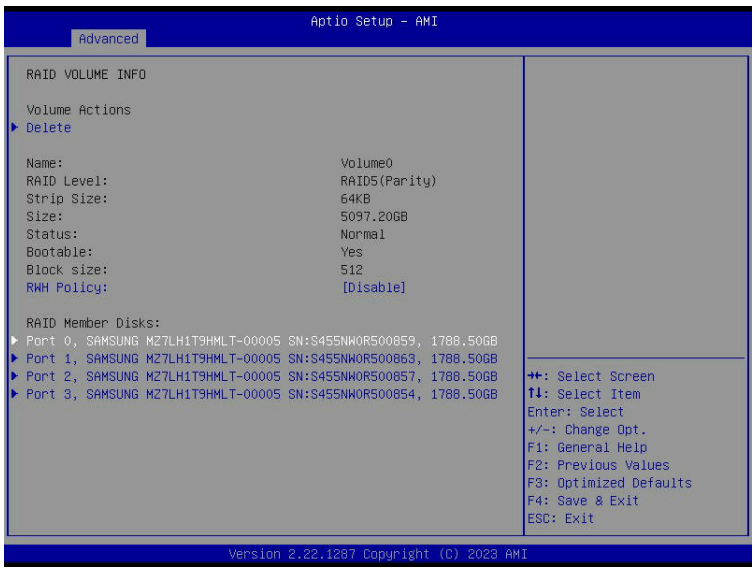
Follow the instructions stated in Section 1.1 to access the **Advanced** Menu. Scroll down the to select the **Intel® VROC SATA** submenu by highlighting it as shown below.



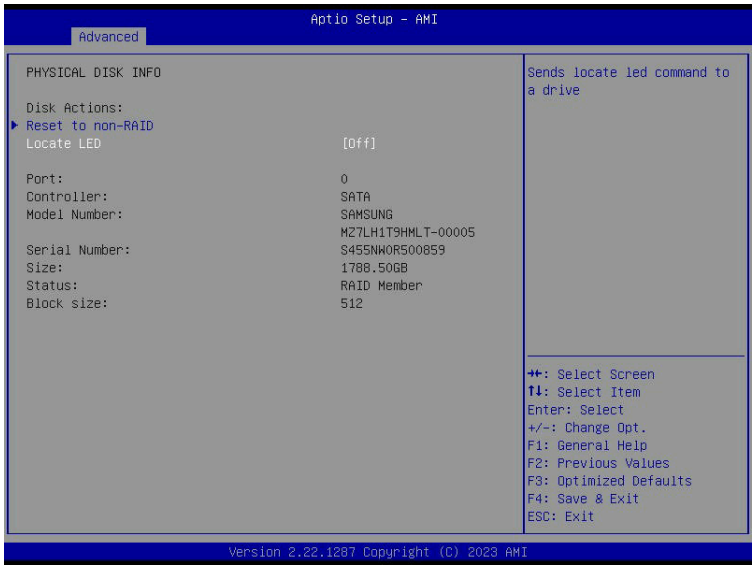
When the **Intel® VROC SATA Controller** submenu is selected, press <Enter> to invoke the **Intel® VROC x.x.x.xxxx SATA Driver** submenu as shown below.



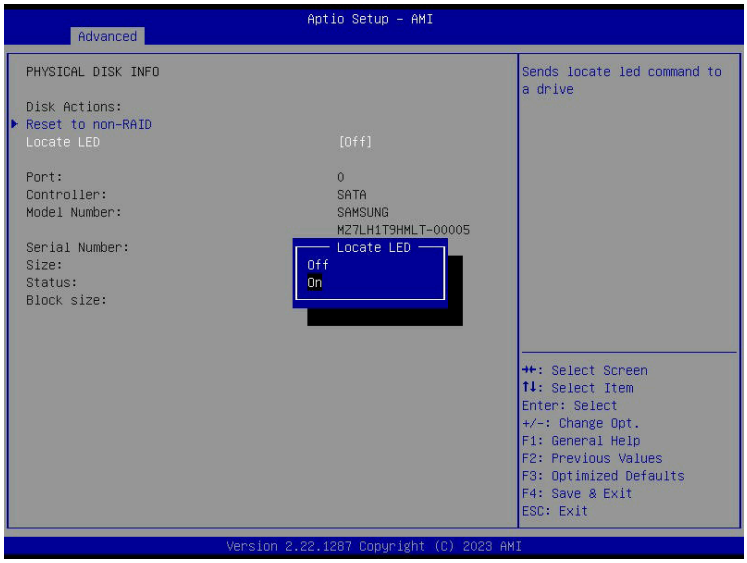
Select the disk drive you want to turn on the Locate LED by highlighting it as shown above.



After selecting the SATA device to turn on the Locate LED as shown above, press <Enter>. The following screen will display.



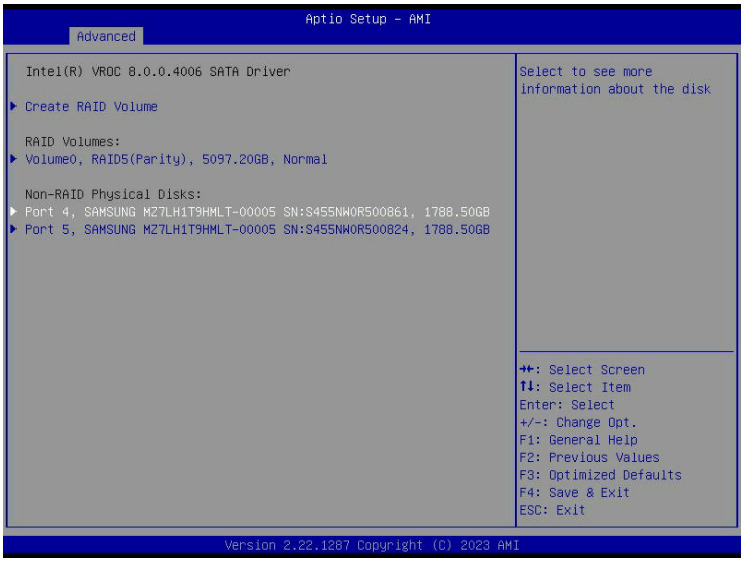
When the Locate LED feature is highlighted as shown in the previous screen, press <Enter>. A Locate LED pop-up window will display as shown below.



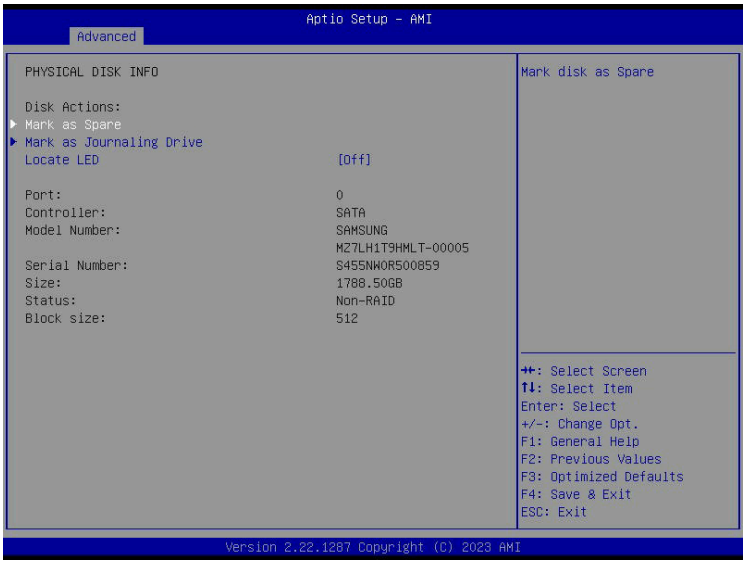
Select *On* and press <Enter> to enable Locate LED. The options are On and **Off**.

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® VROC SATA Controller** and press <Enter> to access the **Intel® VROC x.x.x.xxxx SATA Driver** submenu as shown below.

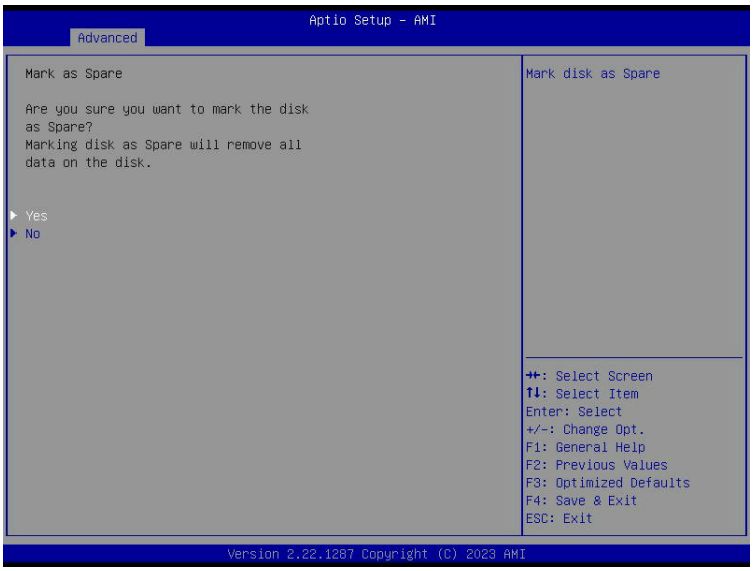


From the list of **Non-RAID Physical Disks,** select the disk you want to mark as a spare drive by highlighting it as shown above and press<Enter>. The following submenu screen will display.



From the screen as shown above, select **Mark as Spare** and press <Enter> to mark the selected device as a spare device.

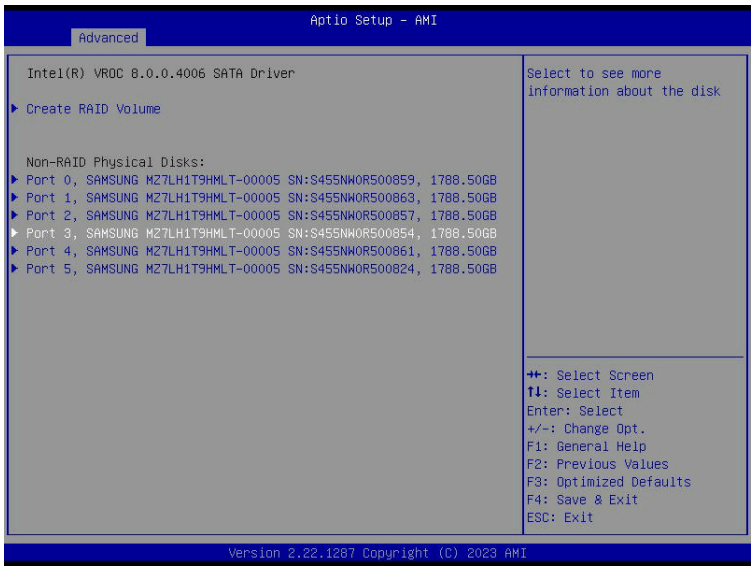
After marking the selected drive as Spare, a screen as shown below will display to confirm if you want to mark the selected device as spare. Select *Yes* and press <Enter> to make the selected drive as a spare drive. Select *No* and press <Enter> to cancel the selection.



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.

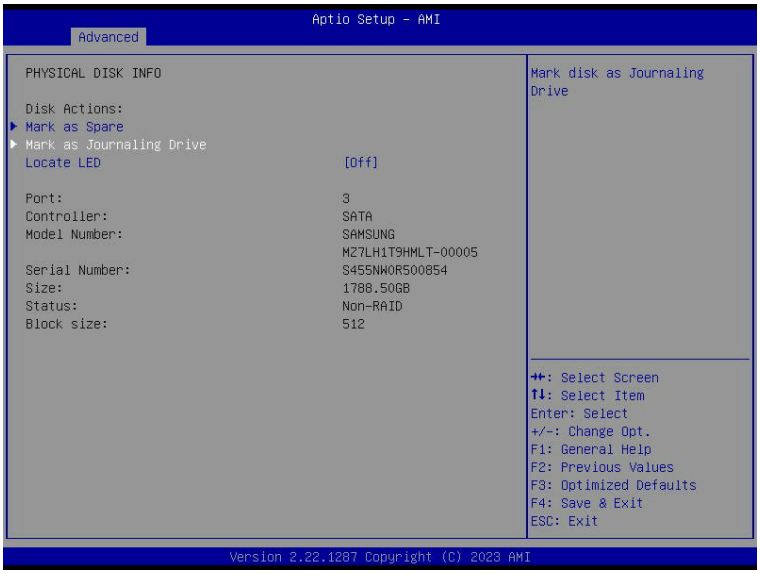
To Mark a Non-RAID Drive as a Journaling Drive (*Available only when four disks or more are installed in the system)

Refer to the instructions stated in Section 1.1 to access **Intel VROC SATA Controller Controllers** menu and press <Enter>. When the **Intel® VROC x.x.x.xxxx SATA Driver** submenu as shown below appears, select a desired SATA device from the list of **Non-RAID Physical Disks:** to mark as a journaling drive. A journaling drive is used as an error event log to record an event when an error occurs to the RAID5 volume.



After a disk is selected for Journaling Drive use as shown above, press <Enter>.

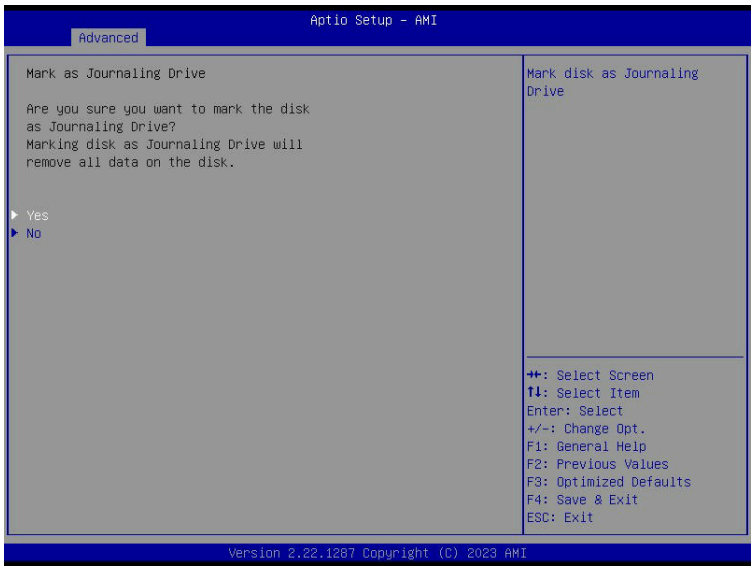
The following screen will display.



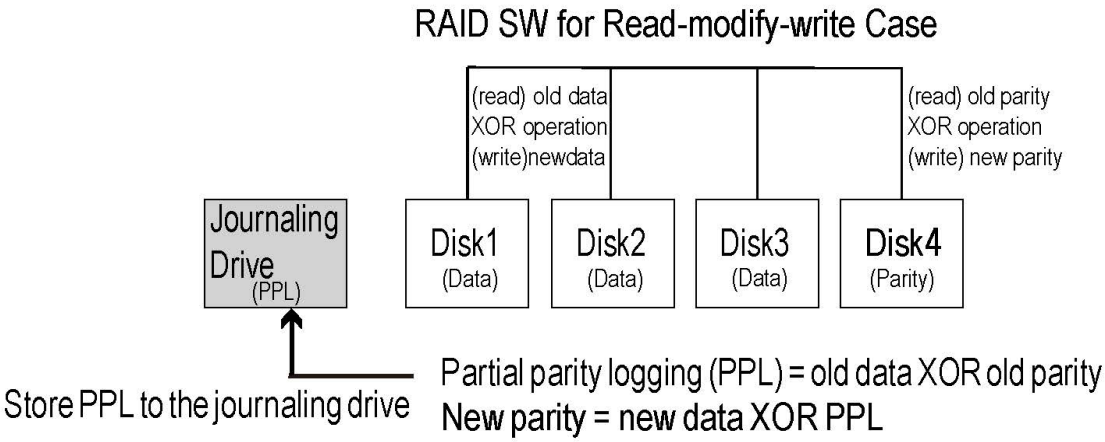
When the screen above displays, select *Mark as Journaling Drive* and press <Enter>.

The selected drive will be marked as a Journaling drive.

A confirming screen will display asking if you want to make the selected disk as a Journaling drive, select *Yes* to confirm your selection. The selected device will be used as a journaling drive. The options are **Yes** and No.

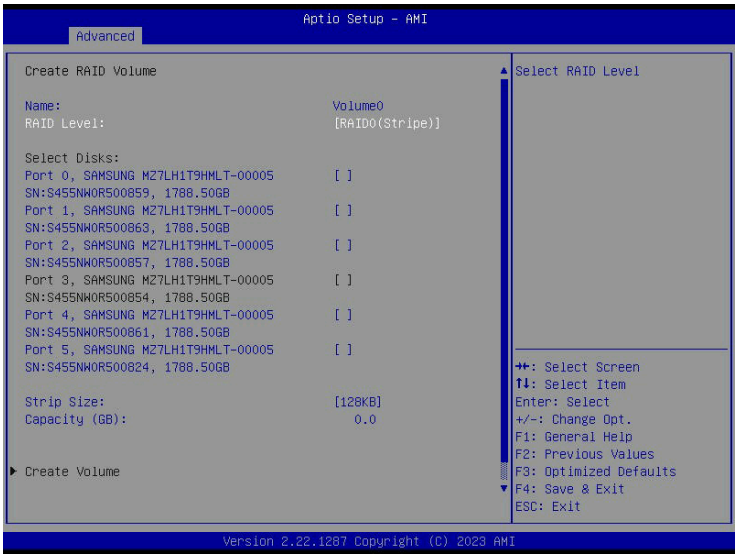


Note: RAID Write Hole (RWH) is used upon an event of power failure, a drive failure, or a crash when writing to a RAID5 volume. Using a journaling drive that contains partial parity logging (PPL) can reduce potential data loss. Refer to the following illustration for the use of journaling drive.

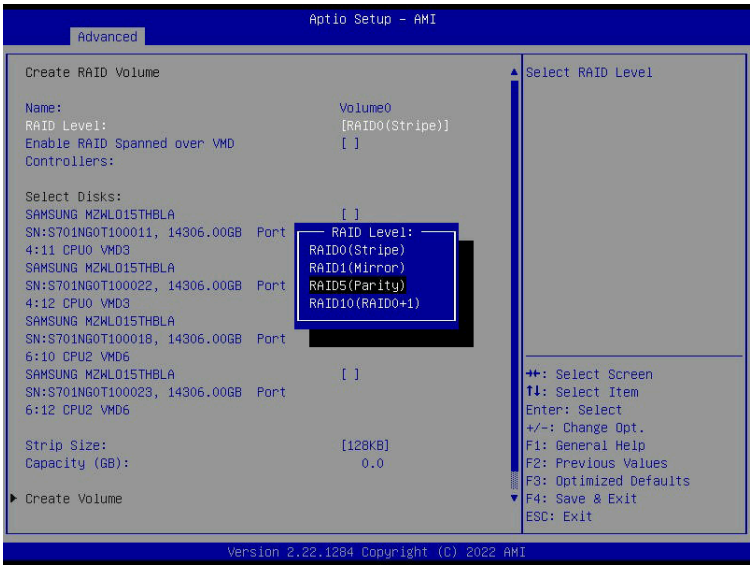


2.2 Using a Journaling Drive for RAID 5 (*Available when four disks or more are installed in the system)

The following section provides information on how to use a journaling drive for the RAID 5 volume, which is a parity-based RAID. A journaling drive, which is used as an error event log, records an event when an error occurs to a RAID5 volume.

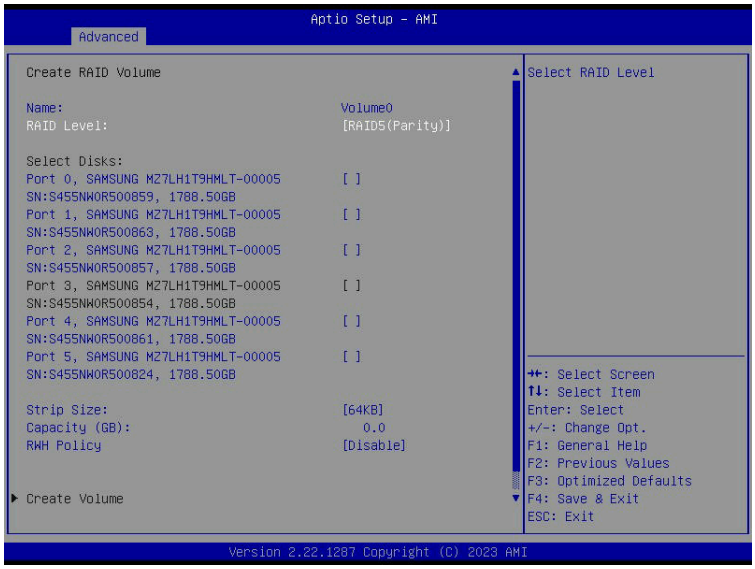


Step 1. Refer to the instructions stated in Section 1.1 to access the **Intel® VROC SATA Controller** menu and press <Enter> to access the **Intel® VROC x.x.x.xxxx SATA Driver** submenu as shown above. From the submenu, select *RAID Level* and press <Enter>. The screen as shown above will display.



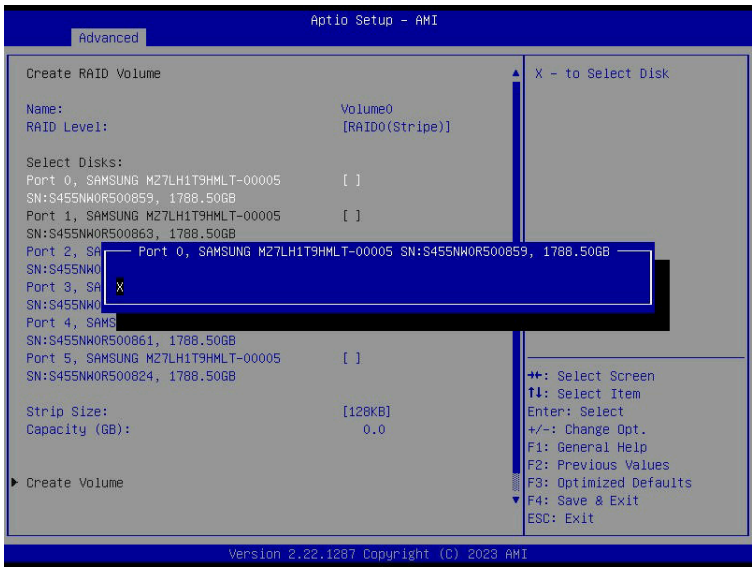
From the RAID Level pop-up window, select *RAID5 (Parity)* by highlighting it.

When RAID5 is selected as shown above, press <Enter>. The following screen will display showing the RAID Level for selected drive is set to **RAID5 (Parity)**.



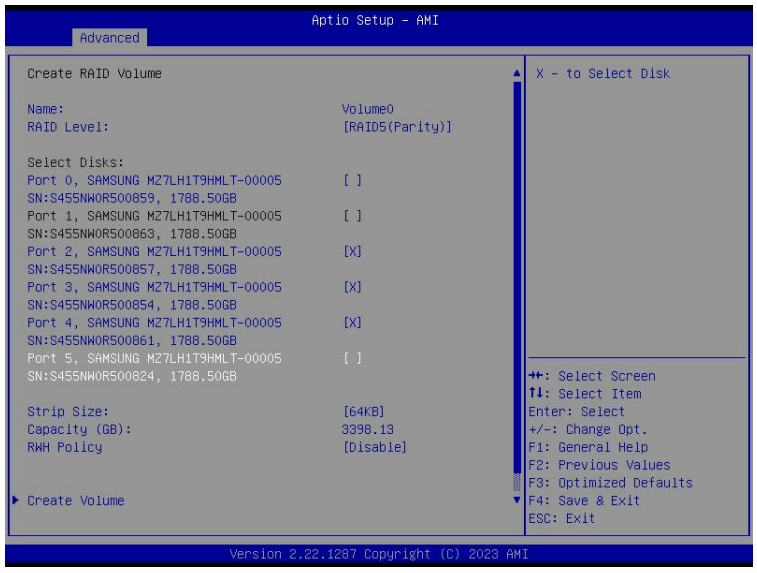
Note 1: If the **RAID5(Parity)** option or the **RAID10 (RAID0 & 1)** option does not display in the pop-up window as shown above, please enable three disks or more for the option: **RAID5** to display. For **RAID10**, four disks or more are needed. To create a journaling drive for RAID5, you will need to have at least four disks installed in the system.

Note 2: If a disk you want to use for a RAID volume is grayed out and unavailable for selection, please delete the RAID volume that is previously set on this disk. Deleting a preset RAID volume from a disk will make this disk available for RAID volume use. To delete a preset RAID volume, follow the instructions given in the section: **To Delete a RAID Volume from a Disk** for details.



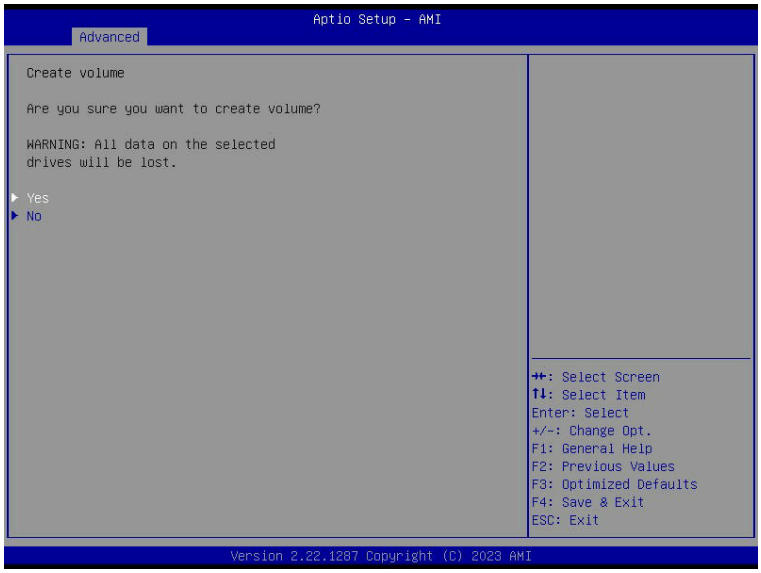
When the screen above displays, using the arrow keys, select a disk you want to mark as a RAID5 drive from the list of **Select Disks** as shown above and press <Enter>. An “X” will appear on the pop-up window of the selected drive. Use the down arrow key to select the “X” mark and press <Enter> to mark the selected drive as a RAID5 volume. You can also press the <Space Bar> to select the disk. Please note that you will need to have at least four disks installed in the system to support a journaling drive (--three disks are needed for RAID 5, and one drive will be used as the journaling drive.)

Repeat this step to select three drives (minimum) for RAID5 as shown in the screen below.

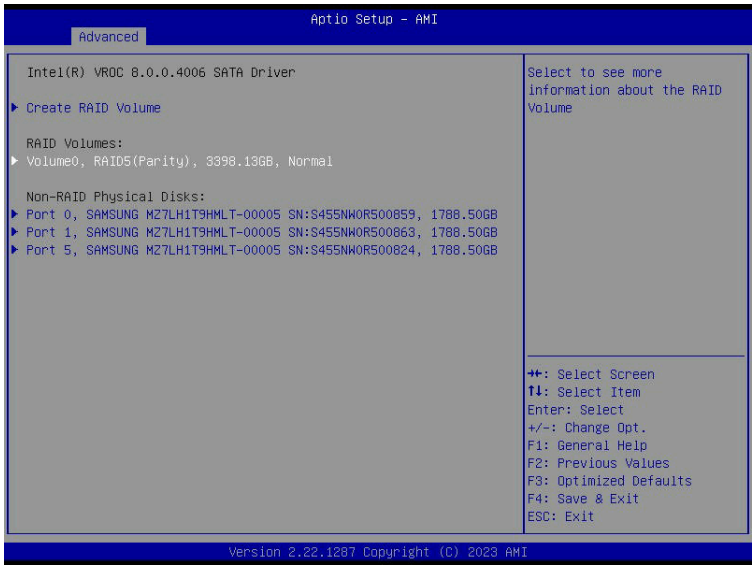


After you’ve selected at least three RAID5 drives, using the down arrow key, select **Create Volume** as shown above and press <Enter>.

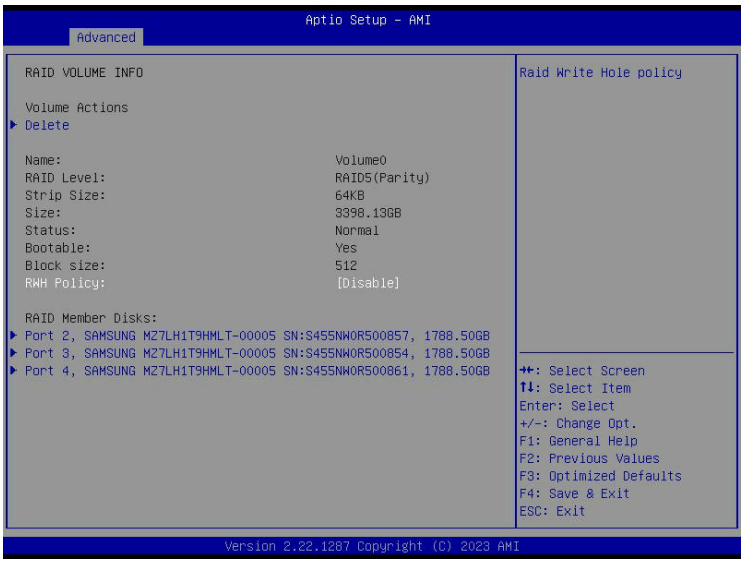
A confirmation screen will display to confirm if you want to proceed with RAID5 configuration. Select *Yes* to continue with your selection. Select No to cancel RAID5 creation.



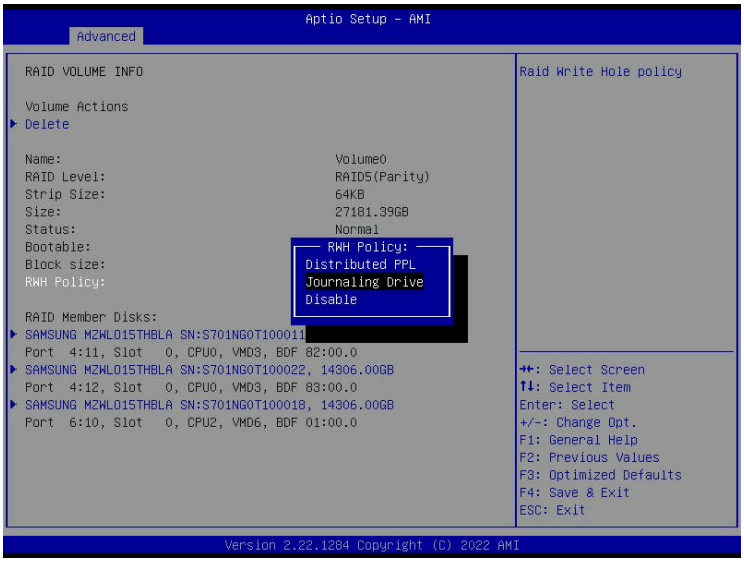
After you select *Yes* to create RAID5 and press <Enter>, the following screen will display.



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

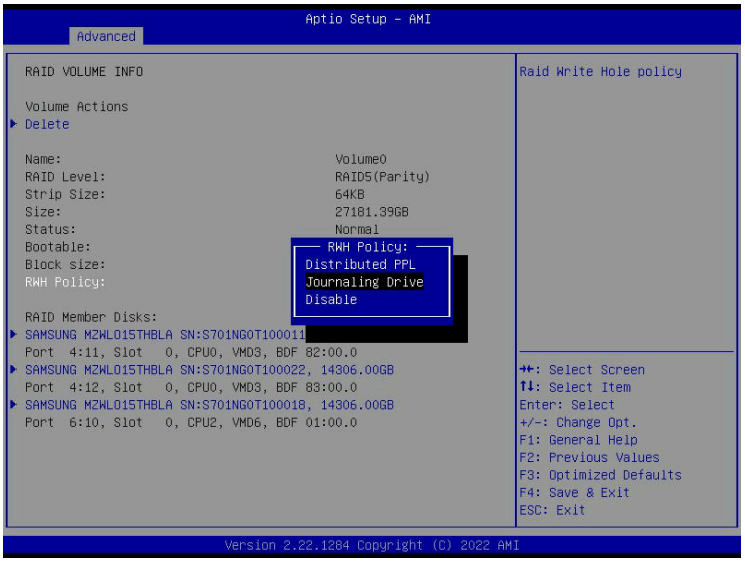


Using the down arrow key, select **RWH Policy** as shown above and press <Enter>, the following screen will appear with the RWH Policy pop-up window displayed .



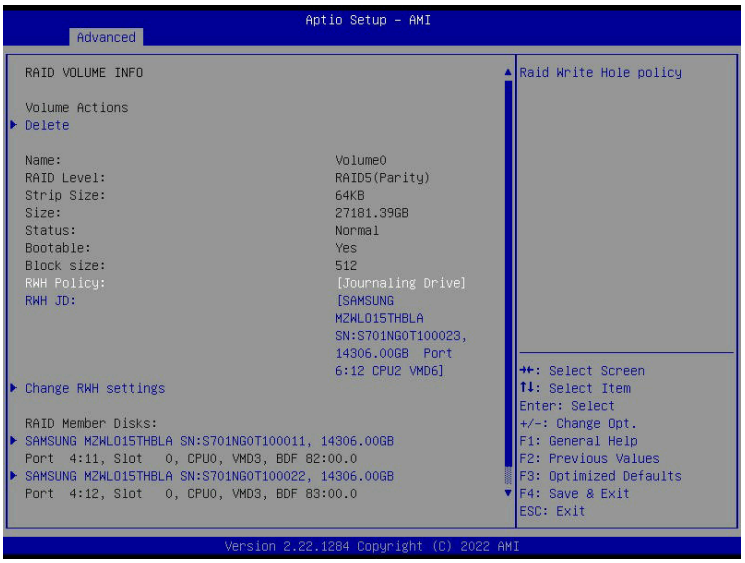
Note: For RWH support on RAID5, you will need to have at least four disks installed in the system.

Step 2. Use the arrow keys to select *Journaling Drive* as shown below. RWH is used when a power failure, drive failure, or a crash has occurred. Please note that for RWH Policy support on RAID5, your system will need to have at least four disks installed in the system.



RWH Policy

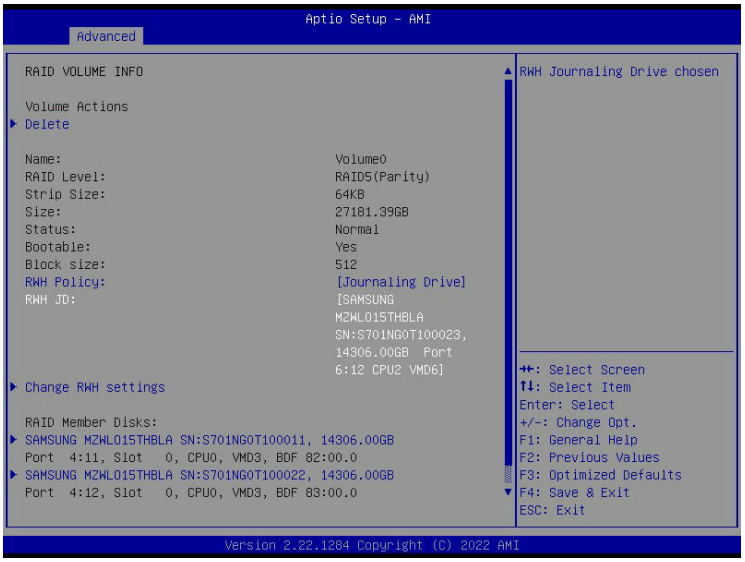
The options for RWH Policy are Distributed PPL, Journaling Drive, and **Disable**. (If there is no device set as a journaling drive, the options are Distributed PPL and **Disable**.) When *Journaling Drive* is selected (highlighted) as shown in the screen above, press <Enter>, the screen below will display.



Note 1: Partial Parity Logging (PPL), a feature available for a RAID5 volume, is a result of an XOR calculation based on the old data and old parity used in the system. When a power failure, a drive failure, or a crash occurs, PPL information can be used to help rebuild a RAID volume and reduce the potential data loss.

Note 2: The RWH closure algorithm provides an option to utilize an additional SATA device for RAID volume for rebuilds (via Journaling Drive RWH closure mode). Thus, your system requires four disks or more to support RWH Policy or a journaling drive. Without utilizing an additional SATA device, PPL distributed RWH closure mode can be used to close the RWH by via the parity drive.

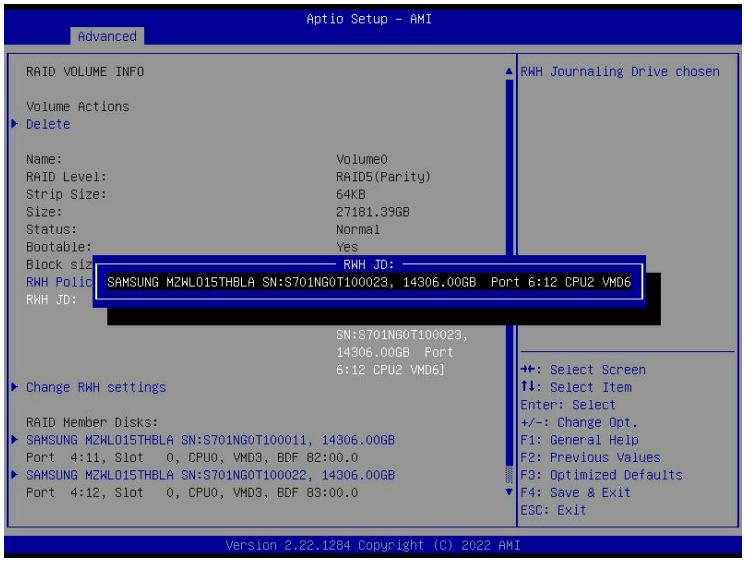
Step 3. Set the feature: RWH Policy to **Journaling Drive** as shown in the screen above. Please note that your system will need to have at least four disks installed to use this feature.



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

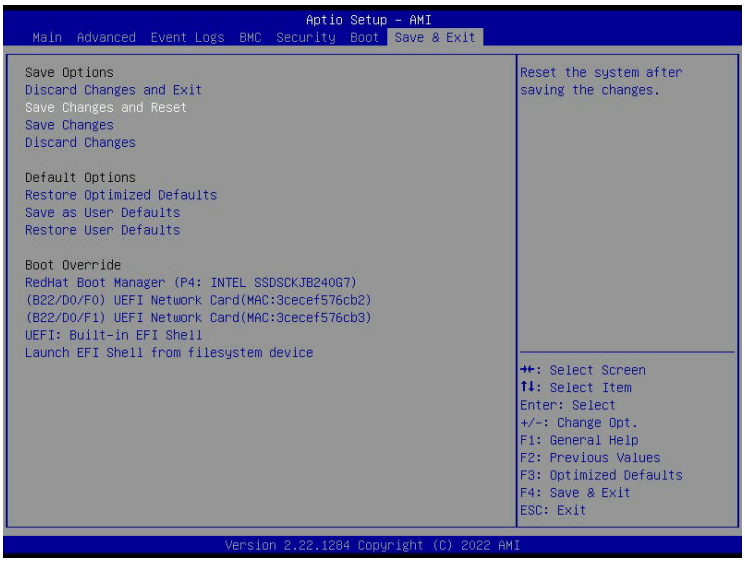
RWH JD (Journaling Drive) (*Available when the system has at least four disks installed)

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



Step 5. After marking a disk as your journaling drive, you will need to save the setting in the **Save & Exit** menu and reboot the system for the journaling drive to take effect by following the instructions below.

1. Exit from the RAID configuration submenu by pressing the <Esc> key. Using your arrow keys, select **Save & Exit** from the AMI BIOS menu and press <Enter>. The following screen will display.

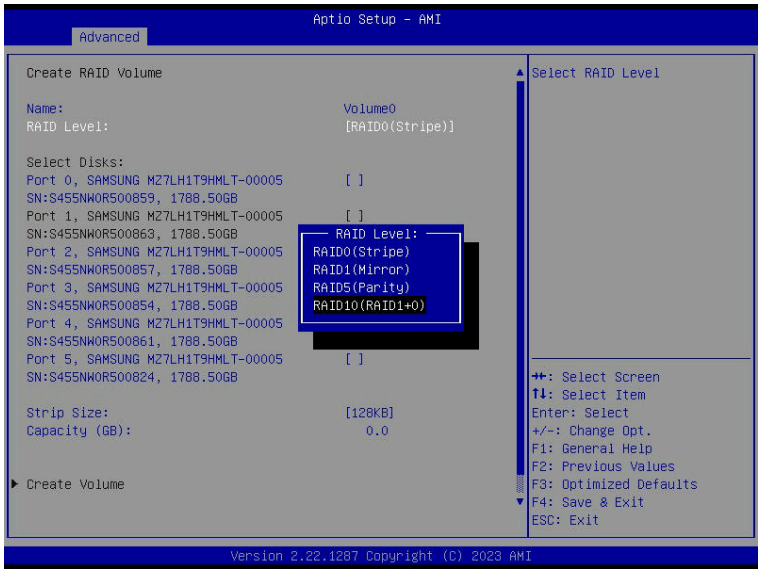


2. When the screen as shown above displays, select *Save Changes and Reset*, and press <Enter> to save all changes you've made. The system will reboot.
3. Press the <Del> key upon system reboot to return to the BIOS Setup Utility.

2.3 Creating a RAID 10 Volume (*Available when four disks or more are installed in the system)

The following section provides information on how to create and configure a RAID 10 (RAID 1 + 0) volume. If a disk you want to use for RAID 10 creation is grayed out, please delete the RAID volume that is previously set on this disk by following the instructions given on the section: **To Delete a RAID Volume from a Disk**. Deleting a previously set RAID volume from a disk will make it available for RAID configuration.

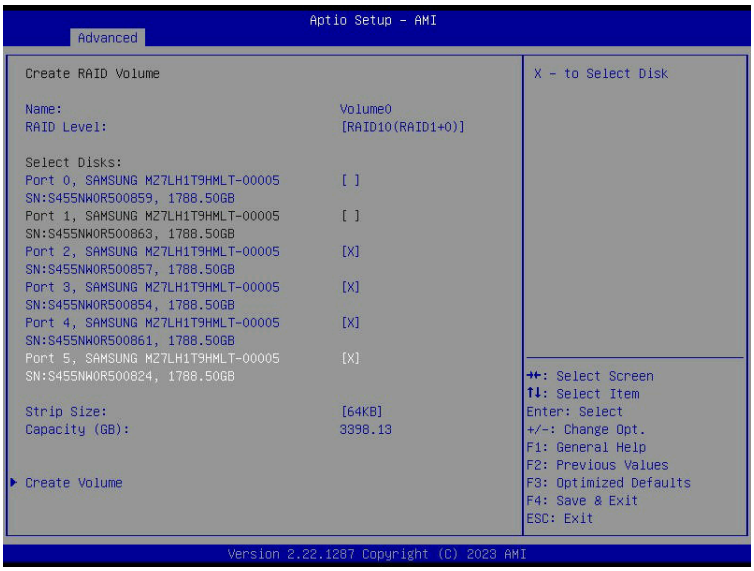
Step 1. Refer to the instructions stated in Section 1.1 to access the **Advanced** menu. Select the **Intel® VROC SATA Controller** submenu from **Advanced** and press <Enter>. When the **Intel® VROC x.x.x.xxxx SATA Driver** submenu displays, select *Create RAID Volume* and press <Enter>. The following screen will display.



When the screen as shown above displays, using the down arrow key, select *RAID Level* and press <Enter>. The following screen will display showing the RAID Level pop-up window.

Note: If the **RAID10 (RAID 1+ 0)** option does not display in the pop-up window as shown above, please enable four disks (minimum) for this option to display as illustrated in the screen below.

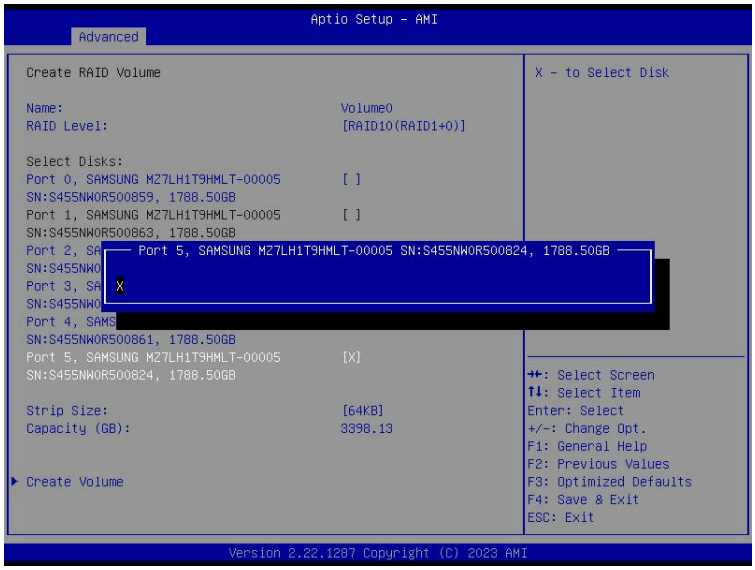
From the pop-up window, select *RAID 10* and press <Enter> for RAID 10 support. Be sure to select at least four drives for RAID 10 configuration as shown below.



Note 1: If a disk you want to use to create a RAID volume (such as RAID10) is grayed out and unavailable for selection, follow the instructions provided in the section: **To Delete a RAID Volume from a Disk** and delete the RAID volume that is previously set on this disk. Deleting a pre-set RAID volume from a disk will make the disk available for RAID use. Repeat this step as needed to make all your selected disks available for RAID configuration.

Note 2: To create a RAID10 volume, you will need to have at least four disks installed in the system.

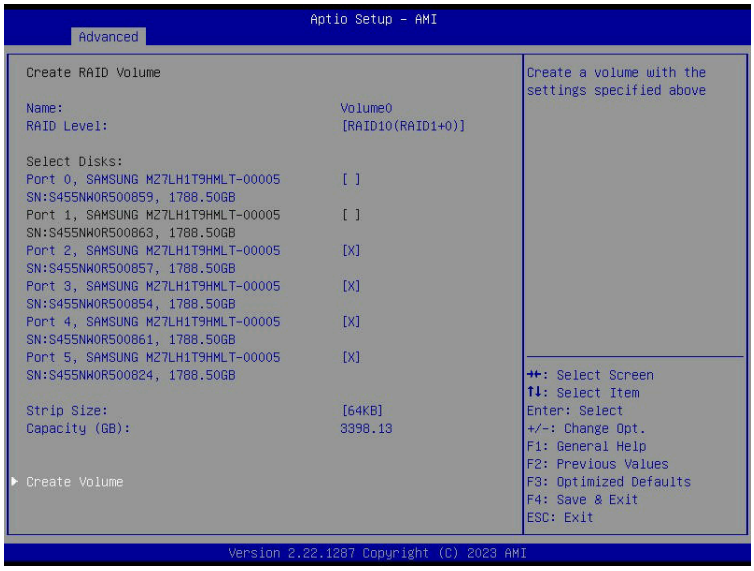
Step 2. After you've enabled RAID 10 support by following Step 1 above, using the arrow key, select the disk you want to use for RAID 10 and press <Enter>. When the pop-up window displays as shown below, use the down arrow key to highlight the **x** mark and press <Enter> to select the disk drive for RAID 10 use. (You can also press the <Space Bar> to select the disk for RAID 10 use.)



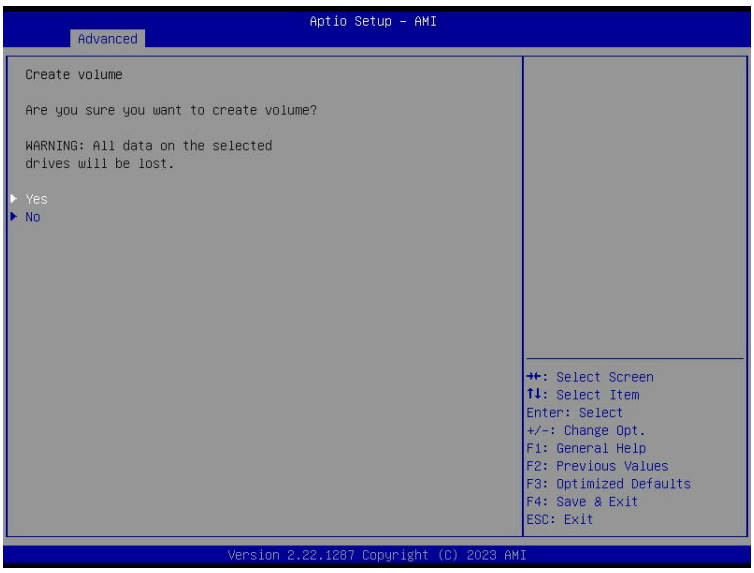
Step 3. Repeat **Step 2** to select at least four disks for RAID 10 support as shown in the screen below. See **Note 1** on the previous page to make grayed-out drives available for RAID 10 use as needed.

Step 4. Once you've enabled four disks for RAID 10 use, scroll down the screen to configure the stripe size and capacity for your RAID 10 volume as needed.

After configuring RAID 10 volume settings, scroll down to select *Create Volume* by highlighting it as shown in the screen below.



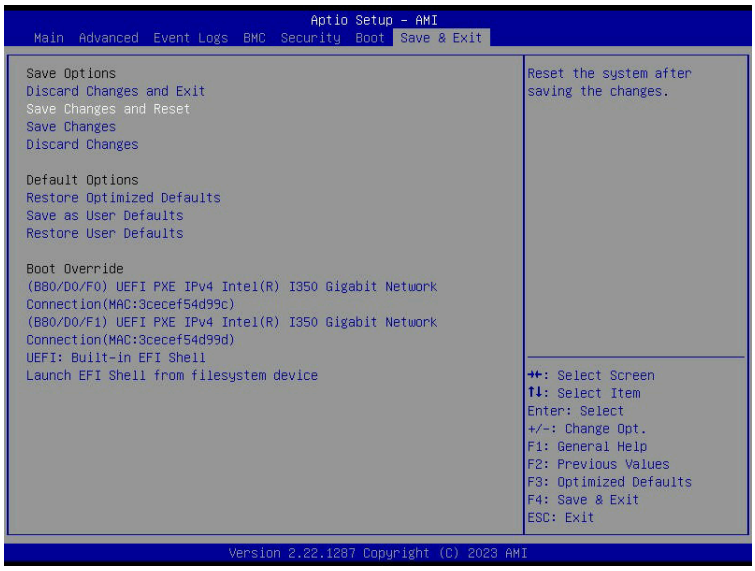
Step 5. When *Create Volume* is selected as shown above, press <Enter>. The following conformation screen will display asking you if you want to create the RAID 10 volume.



Step 6. Select *Yes* and press <Enter> to finalize your RAID 10 creation. Select No and press <Enter> to abandon the process.

Step 7. For your RAID 10 configuration to take effect, you will need to save the changes you've made and reboot the system by following the instructions below.

- Press the <Esc> key to exit the **Advanced** menu.
- Using the arrow keys, select the **Save & Exit** tab from the menu bar and press <Enter>.
- When the screen as shown below displays, select *Save Changes and Reset* and press <Enter>. Your system will start to reboot after saving all the changes you've made.



Your RAID configuration will take effect upon system reboot. To return to the AMI Setup utility, press the <Del> key during system boot.