ThinkStation P500, P700, and P900 How to Create and Configure RAID Arrays

Version 1.0

1. Introduction

The introduction of the new ThinkStation P500, P700, and P900 platforms brings with it several new storage options that are designed to increase the storage capacity and performance of the system. As with previous ThinkStation platforms, P500/700/900 will continue to support the standard SATA and SAS storage technologies to provide users with a wide variety of data storage solutions. This document will highlight the available SATA, SAS, and RAID storage solutions offered on this latest generation of ThinkStations as well as provide valuable information about how users can configure these solutions to provide the best performance possible.

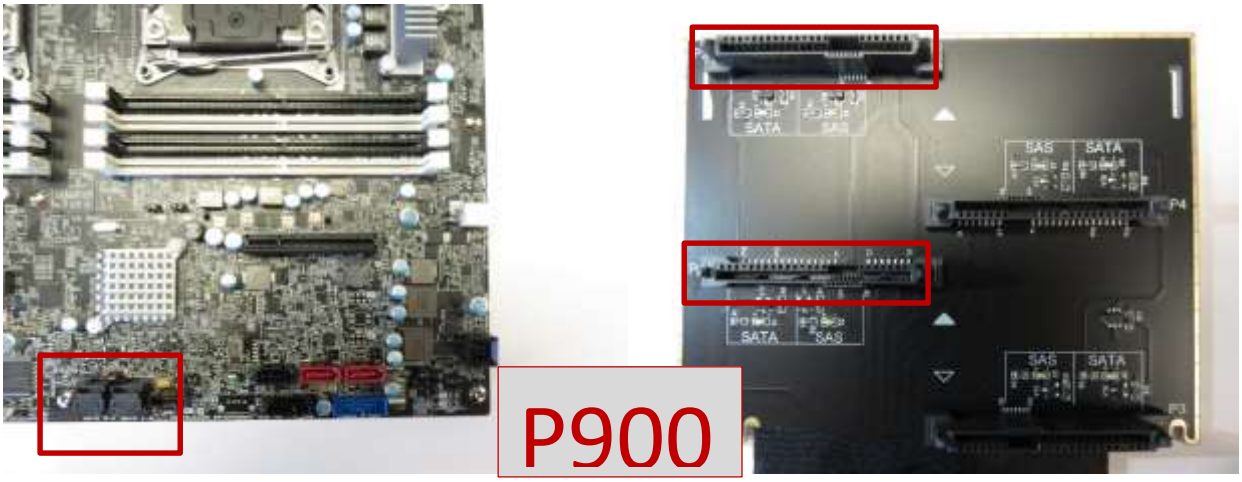
2. Configuring RAID Arrays

Configuring RAID arrays using the onboard Intel S-SATA controller

Legacy BIOS Method

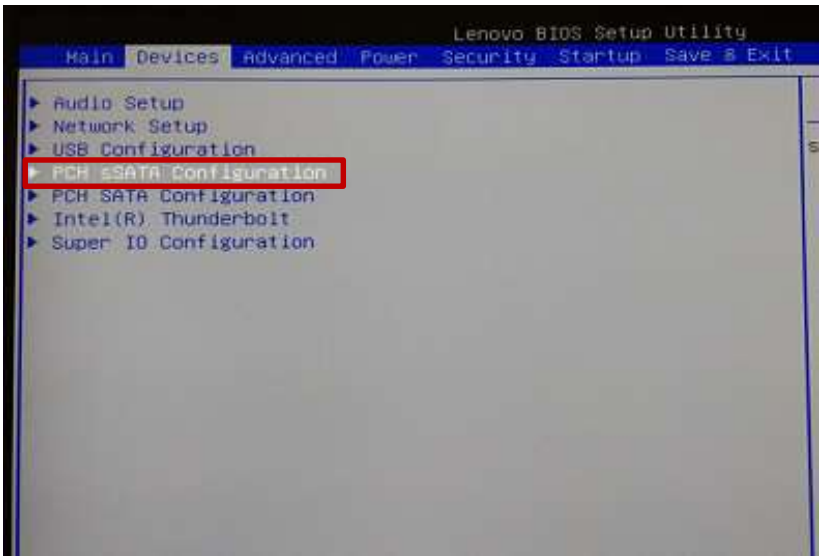
Use this method to create a basic RAID array using the onboard Intel S-SATA controller with the system BIOS set to Legacy mode.

1. Install the drives for the RAID array into the system.

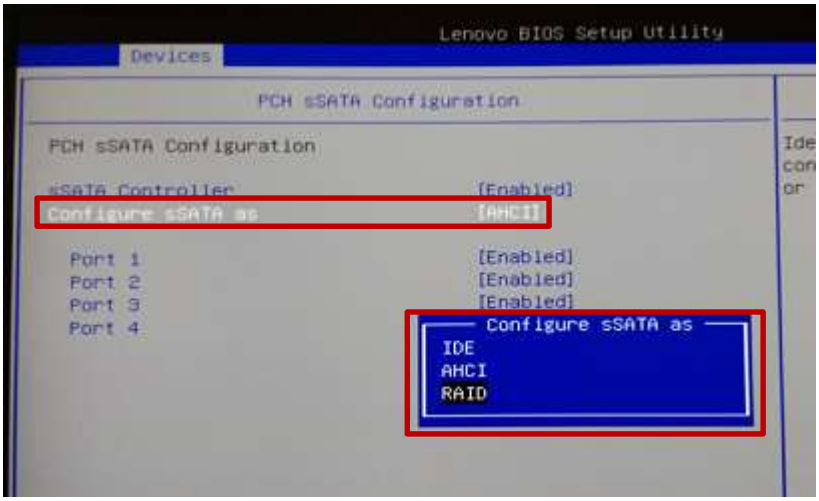


2. Power on the system and enter BIOS setup using the F1 key when prompted.
3. Once the BIOS setup window is visible, use the left and right arrow keys to select the “Devices” tab.

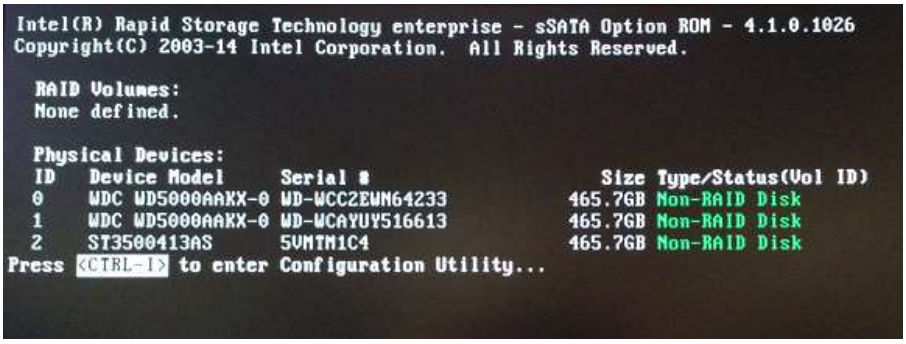
4. From this tab, use the up and down arrow keys to select “PCH S-SATA Configuration”.



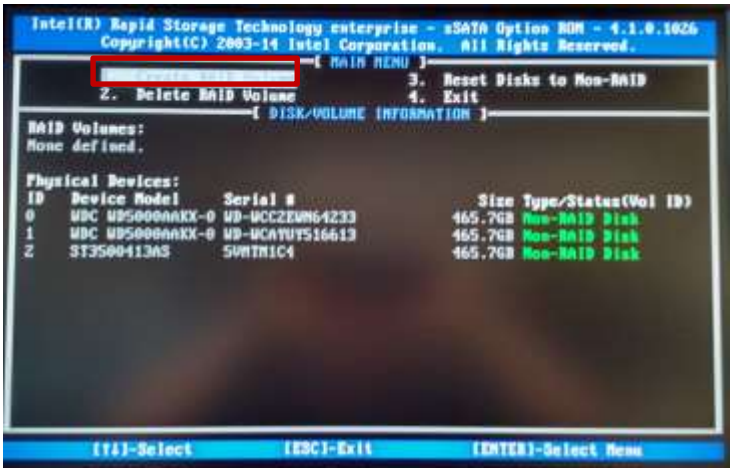
5. Under “Configure S-SATA as”, change the setting from “AHCI” to “RAID”.



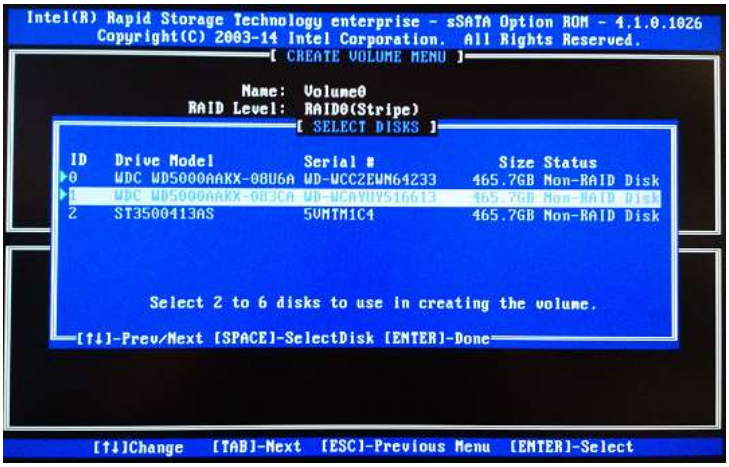
6. Press F10 key to Save and exit BIOS setup.
7. After exiting, the system will reboot and load the Intel option ROM (Note the option ROM requires at least two drives to be installed to load). Press CTRL+I when prompted to enter the Intel option ROM.



8. Once the RSTe Main Menu loads, select “1: Create RAID Volume” and press ENTER.

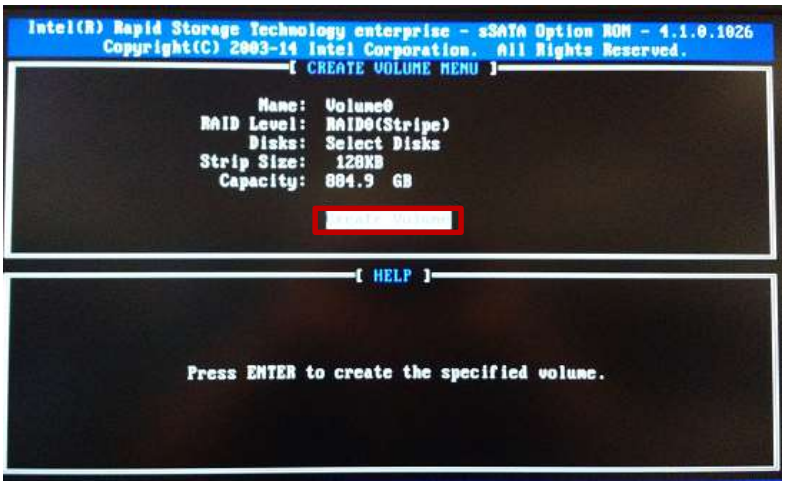


9. Enter a volume name (if desired) in the “Name” field and press ENTER.
10. Use TAB and the arrow keys to select the desired RAID type and press ENTER.
11. If necessary, the menu will prompt the user to select the disks to be included in the array. Select the desired disks by pressing SPACE (the disks to be used will be marked with green arrows). If the option to select disks is not available, it means RSTe has automatically selected the disks for the array. Press ENTER when finished.

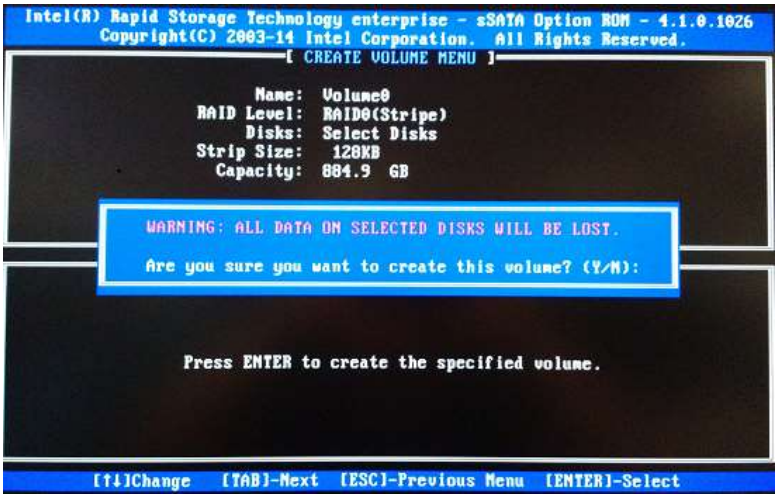


12. Select desired strip size and press ENTER.
13. Select desired capacity and press ENTER.

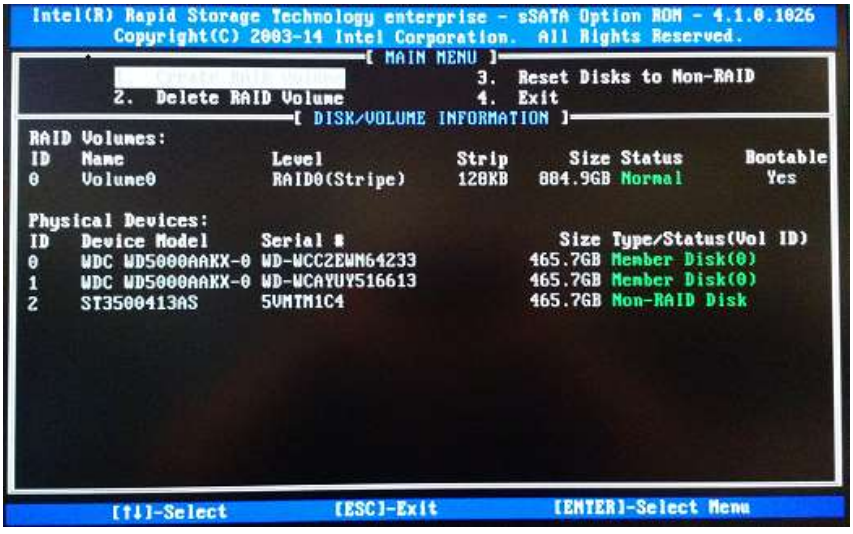
14. Press ENTER to create the volume/array.



Press “Y” to confirm.



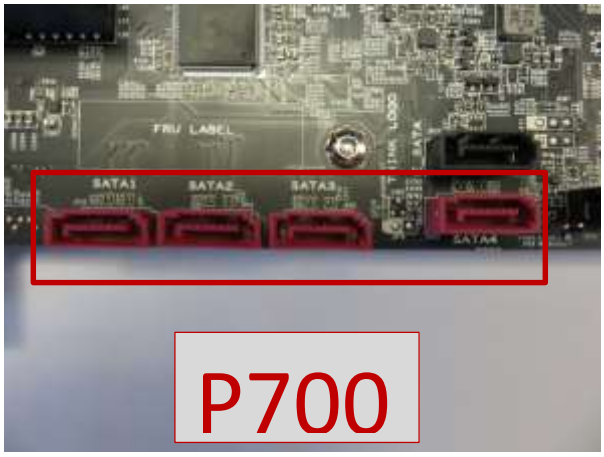
15. The user will then be returned to the RSTe menu. The array should now be listed under RAID Volumes and the disks that are part of the array listed under Physical Devices.

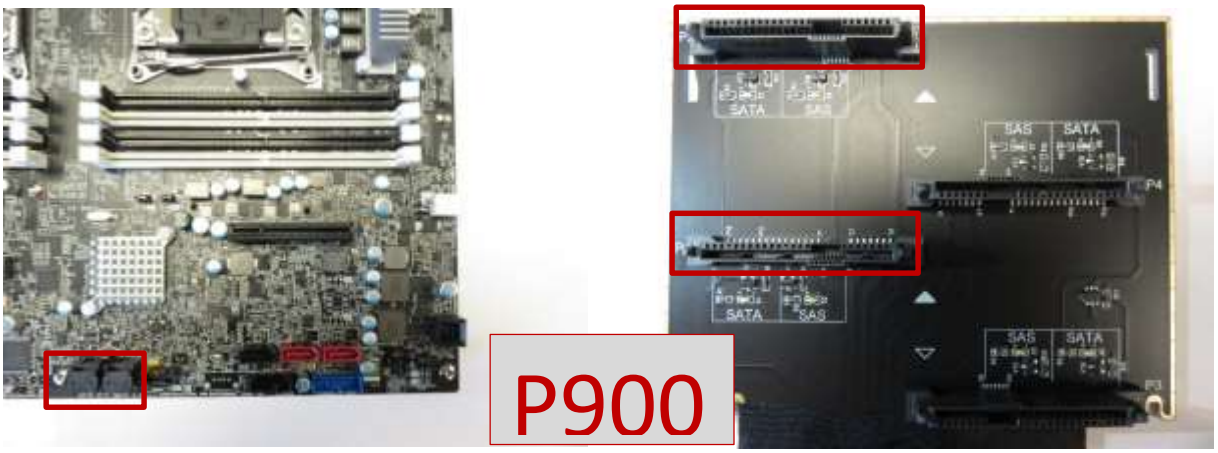


UEFI BIOS Method

Use this method to create a basic RAID array using the onboard Intel S-SATA controller with the system BIOS set to UEFI mode *(OS Optimized Defaults set to 'Enabled' or Storage CSM Configuration is set to 'UEFI')*.

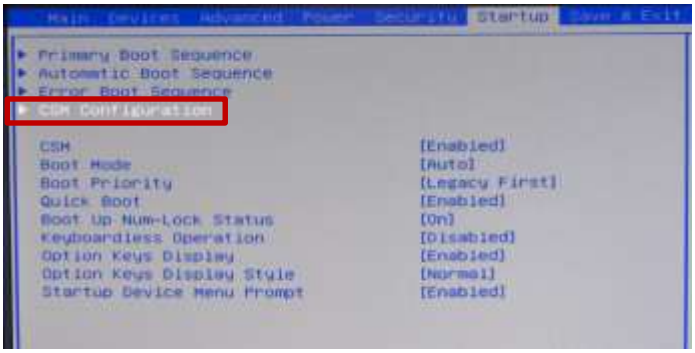
1. Install the drives for the RAID array into the system (see "How to Utilize Intel S-SATA controller" section above for installation instructions).



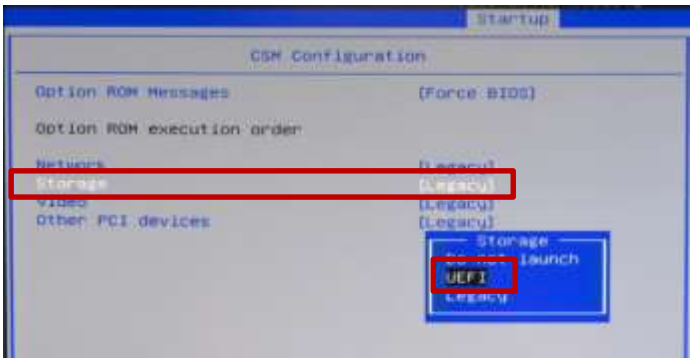


2. Power on the system and enter BIOS setup using the F1 key when prompted.

3. Once the BIOS setup window is visible, use the left and right arrow keys to select the ‘Startup’ tab. From this tab, use the up and down arrow keys to select ‘CSM Configuration’.

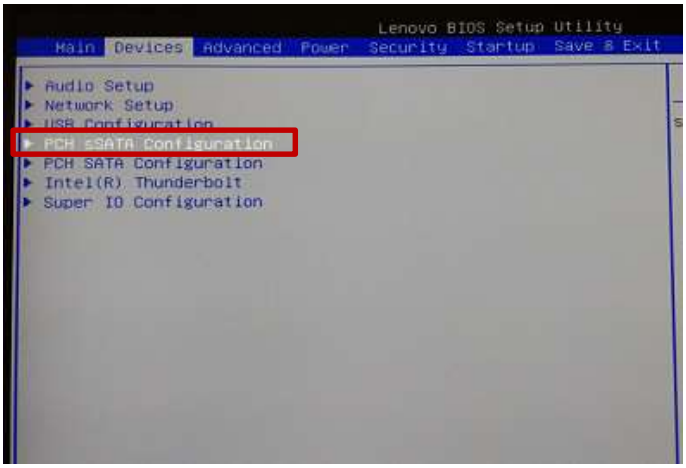


4. **For Windows 7:** Under ‘Storage’, change the setting from “Legacy” to “UEFI” and press F10 key to save and exit the BIOS setup menu.

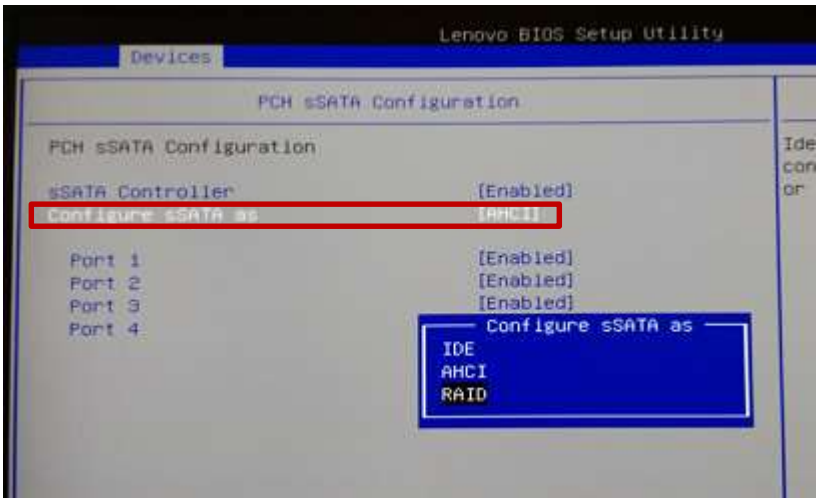


For Windows 8 & Windows 10: Under ‘Save & Exit’, change the setting for “OS Optimized Defaults” from “Disabled” to “Enabled” and press F10 key to save and exit the BIOS setup menu.

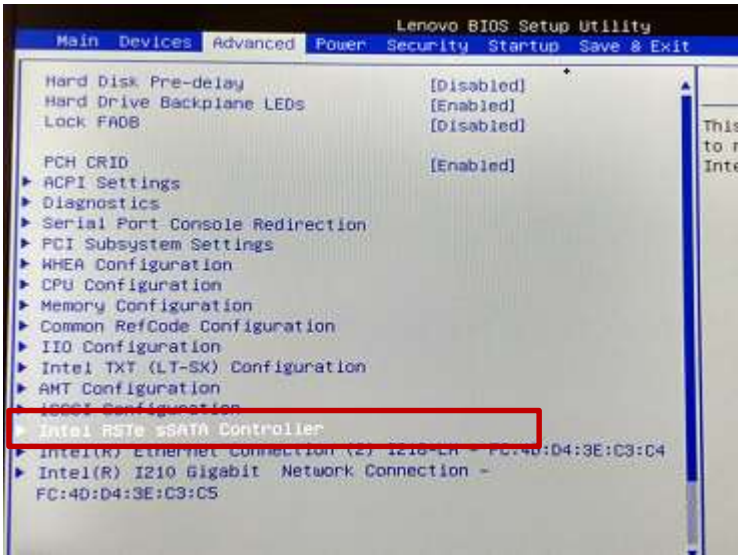
5. During the system reboot, enter BIOS setup using the F1 key when prompted. Once the BIOS setup window is visible, use the left and right arrow keys to select the ‘Devices’ tab. From this tab, use the up and down arrow keys to select “PCH S-SATA Configuration”.



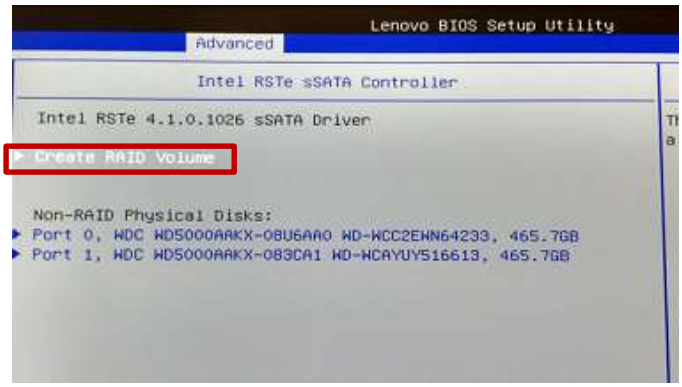
6. Under “Configure S-SATA as”, change the setting from “AHCI” to “RAID”.



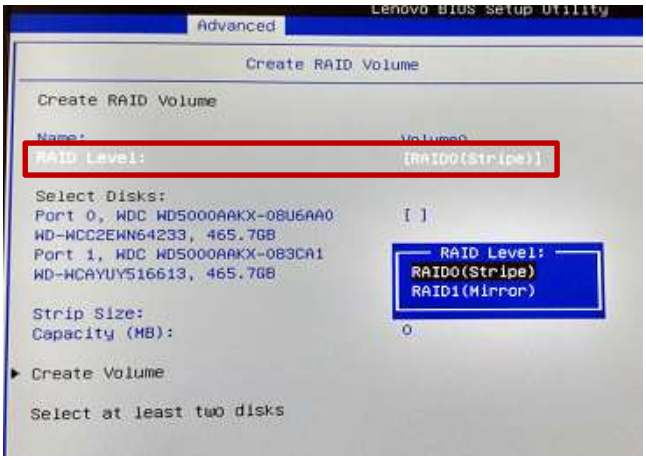
7. Save and exit BIOS setup.
8. After exiting, the system will reboot. Press F1 to enter BIOS setup.
9. Use the left and right arrow keys to select the “Advanced” tab.
10. Use the up and down arrow keys to select “Intel RSTe S-SATA Controller” and press ENTER.



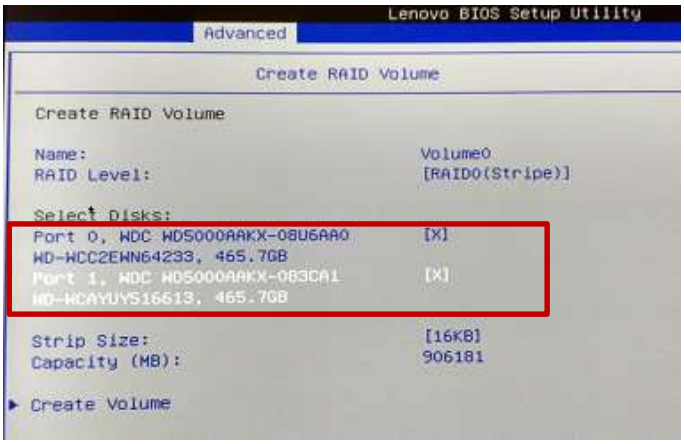
11. At this menu, the user should see a list of all drives connected to the S-SATA controller. To create a RAID volume, use the up and down arrow keys to select “Create RAID Volume” and press ENTER.



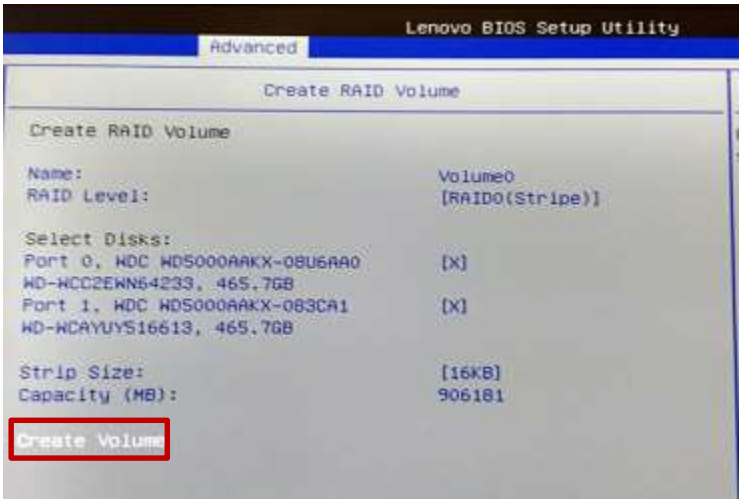
12. To give the volume a unique name, press ENTER to input the name and then press ENTER when finished.
13. Use the up and down arrow keys to highlight “RAID level” and press ENTER. Select the desired RAID level and press ENTER. Note : only supported RAID levels will be listed.



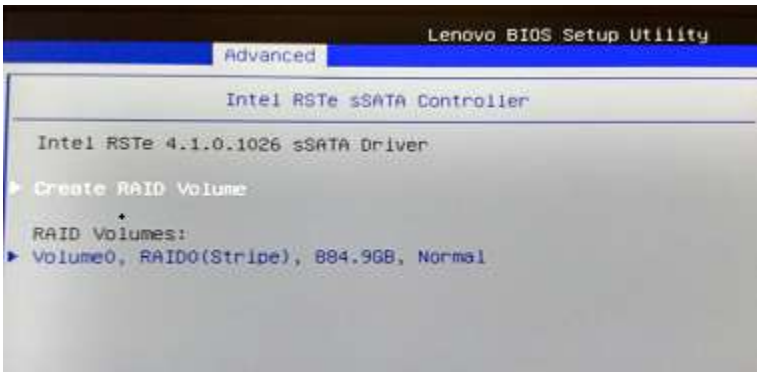
14. Use the up and down arrow keys to select the disks to be included in the volume. Use SPACE to select each disk.



15. When done, use the up and down arrow keys to select the strip size and/or capacity. Press ENTER to input the value and then press ENTER again when done.
16. When all values are set appropriately, use the up and down arrow keys to select “Create Volume” and press ENTER to create the array.



The user will then be returned to the RSTe menu. The newly created array is now listed in the menu.



17. Save and exit BIOS setup when finished.

Configuring RAID arrays using the Avago controllers

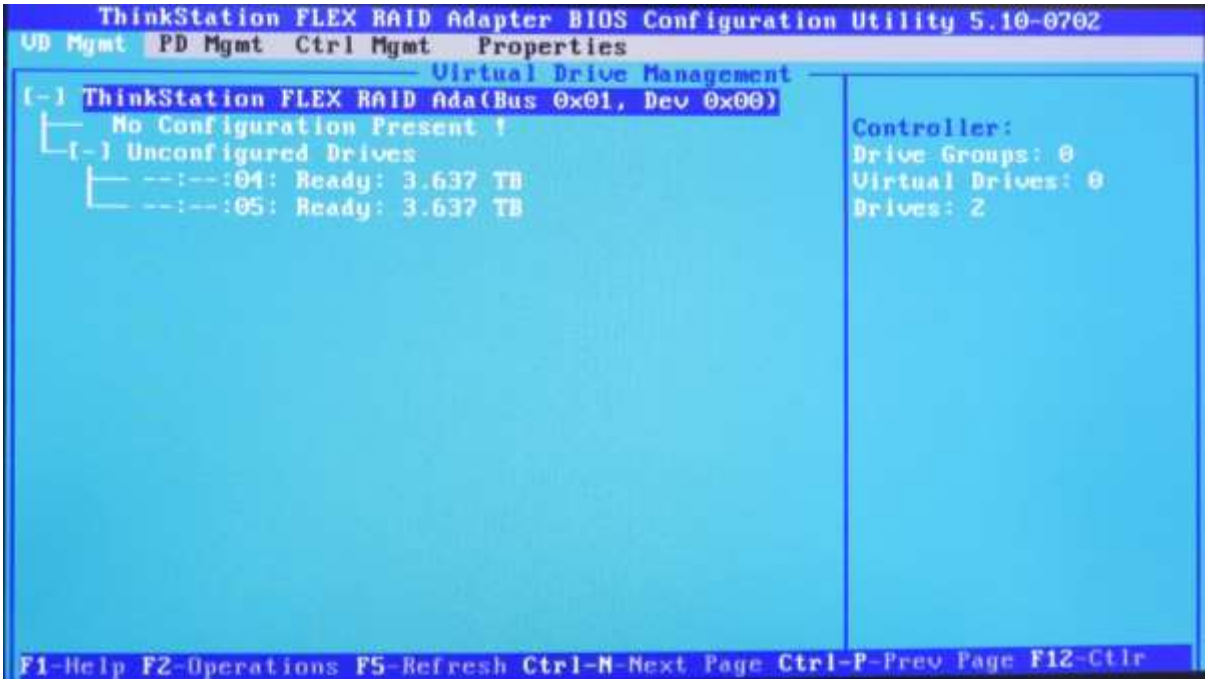
Legacy BIOS Method – Setting up a RAID array

****Note**: in order for the OS to recognize drive(s) attached to the Avago controller, the drive(s) must be configured as a RAID array or JBOD mode. Single drive RAID 0 arrays are acceptable.*

Use this method to create a basic RAID array using the Avago MegaRAID SAS/SATA FLEX RAID Adapter or Avago 9364-8i adapter with the system BIOS set to Legacy mode.

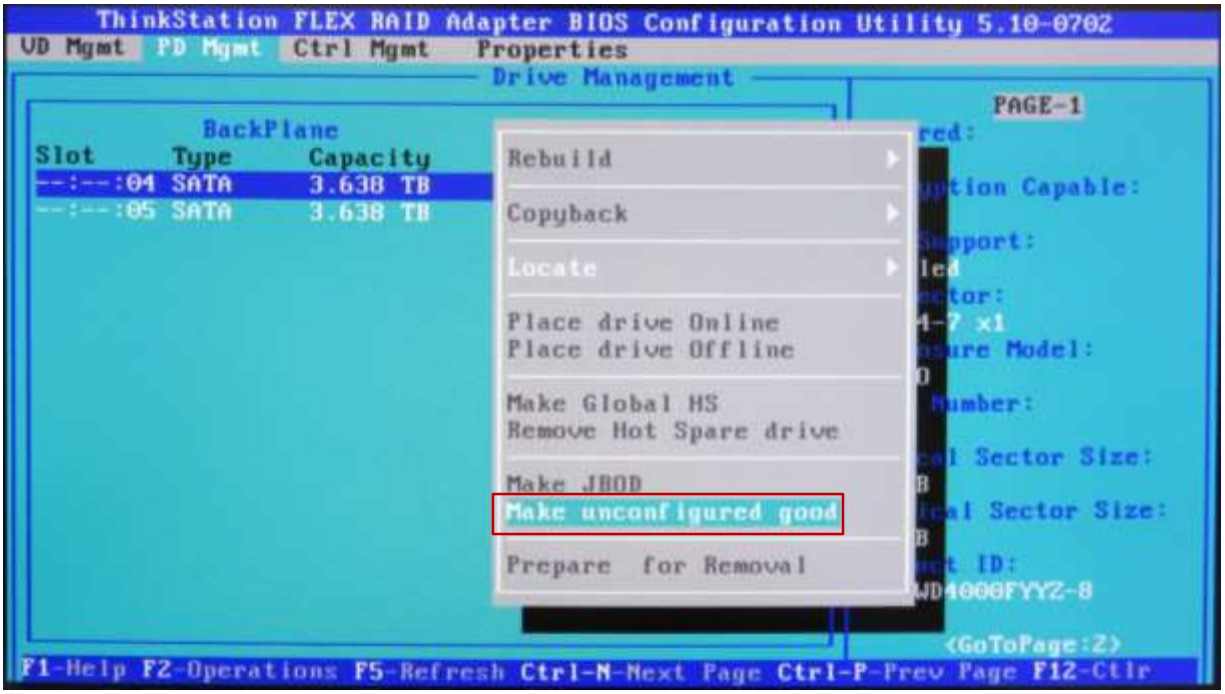
1. Install the desired drives and Avago controller into the system (see “P500-P700-P900 RAID Hardware Configuration” document for installation instructions).

2. Power on the system and wait for the Avago option ROM to load. Press CTRL + R when prompted to enter the Avago MegaRAID configuration utility.



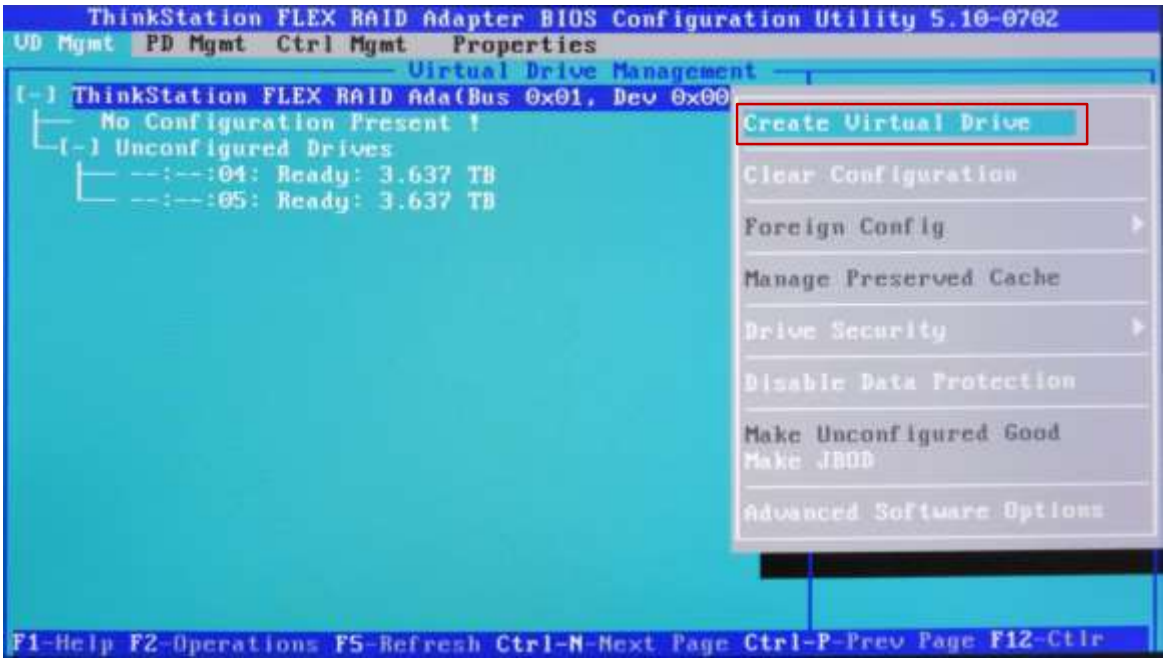
3. From the Avago MegaRAID configuration menu, press “Ctrl – N” to view the next page of the MegaRAID configuration menu to change the drive state from “JBOD” to “Unconfigured Good”.

4. Highlight a drive to use in a RAID array, press the F2 key, select the “Make unconfigured good” option and press Enter. Do this for each drive to use in a RAID array.

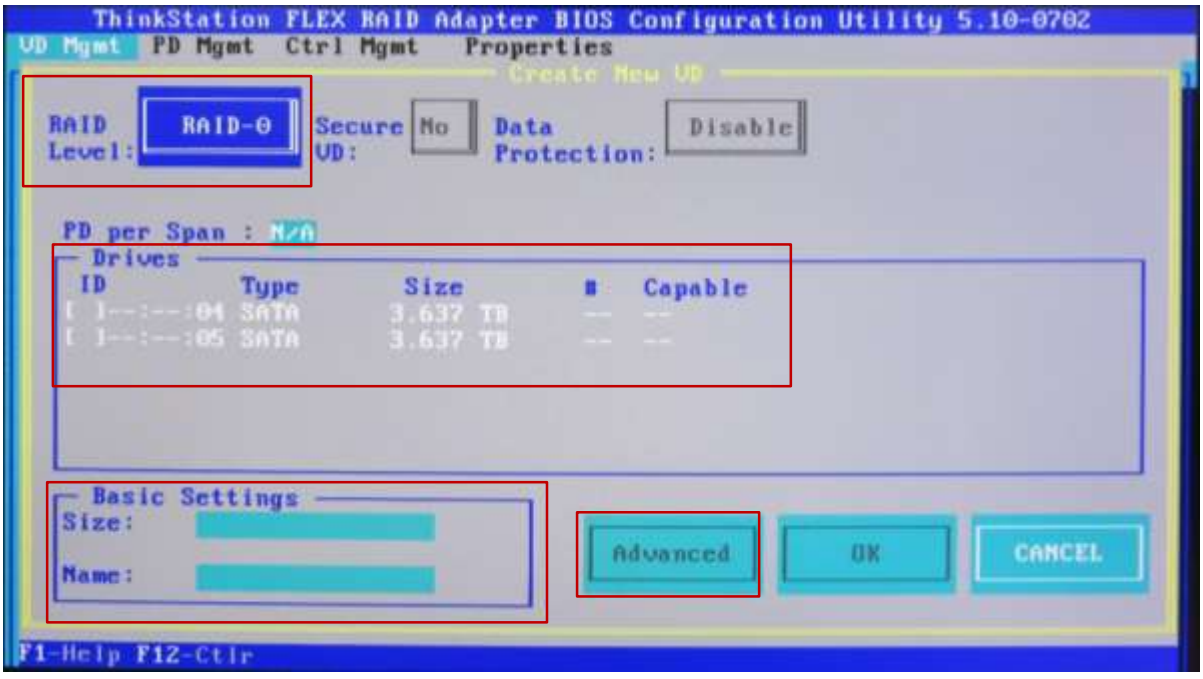


5. Notice the state of each drive will change from “JBOD” to “UG”.

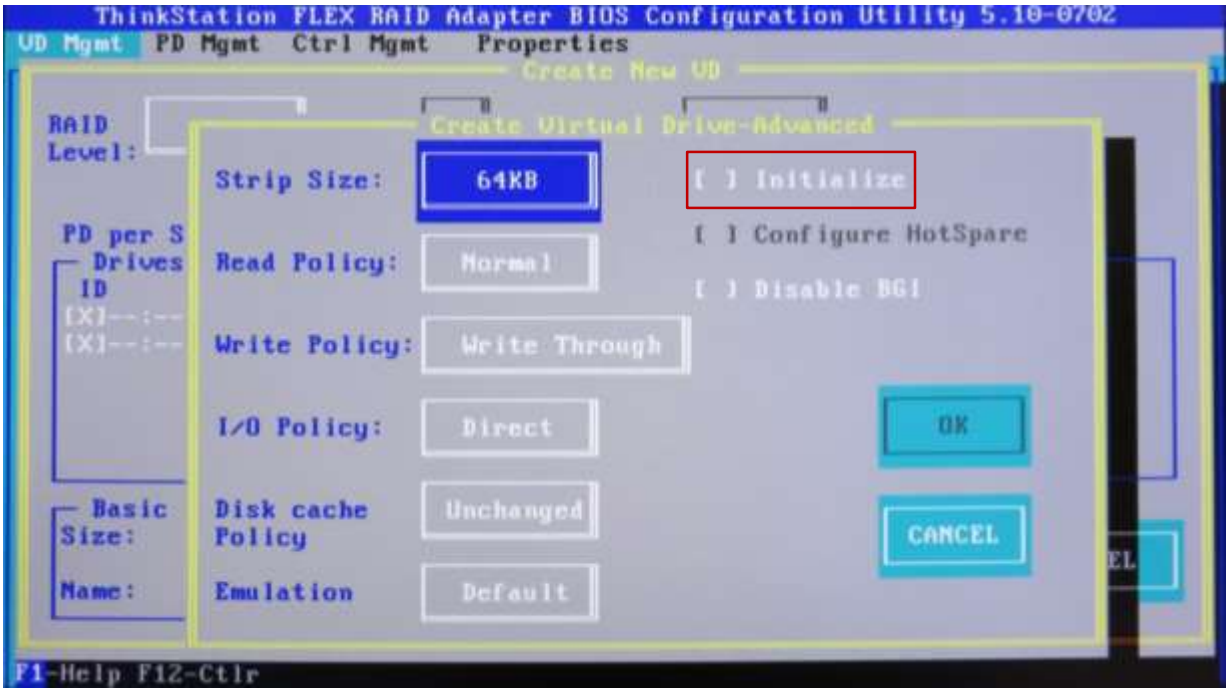
6. Press Ctrl-N three more times to go back to the “VD Mgmt” main menu option. Highlight the controller and then press F2 for options. From the options menu, select “Create Virtual Drive” and press Enter.



7. This will bring up the Create New VD window. From here, users can change the selected RAID level using Enter and the arrow keys. Users can also select the drives to be included in the array by highlighting the drive and pressing the Spacebar (an “X” will appear under the ID column to show drives to be added to the array).
   ******Note**: Single drive RAID 0 arrays are acceptable.*



8. Users can select “Advanced” to bring up a new window that will allow for advanced policies and settings (including drive initialization) to be changed. Selecting “Initialize” within the advanced menu is recommended. Selecting OK will return the user to the Create New VD window. If initialize was selected, a window will pop up once the array has completed initialization.



9. Once all settings have been finalized, select OK to create the array. Note that if “Initialize” was selected in the advance menu, a window will pop up as a warning message indicating data will be destroyed and another window will pop up indicating when the initialization has completed. Additionally, users can initialize the array by highlighting the newly created virtual drive, and choosing initialize from the list of options displayed after pressing F2.

10. The new Virtual Drive should now show in the main Virtual Drive Management window.

Legacy BIOS Method – Setting up single drives in JBOD mode

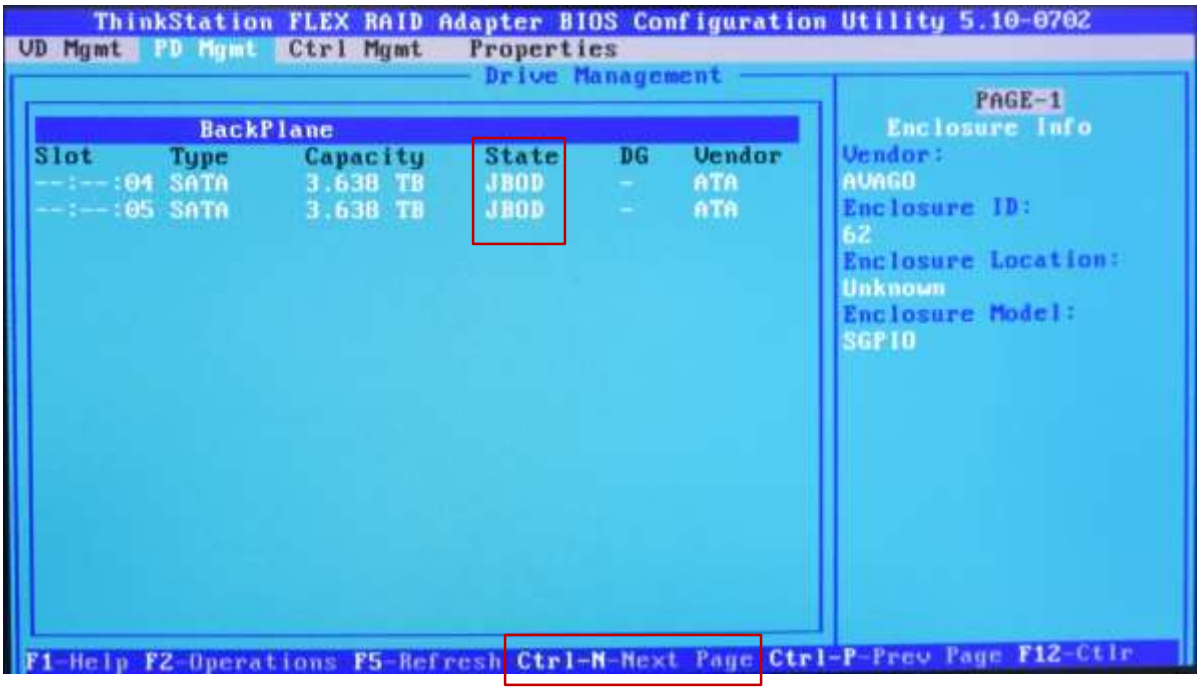
****__Note__: in order for the OS to recognize drive(s) attached to the Avago controller, the drive(s) must be configured as a RAID array or JBOD mode. Single drive RAID 0 arrays are acceptable.*

Use this method to create a basic single drive using the Avago MegaRAID SAS/SATA FLEX RAID Adapter or Avago 9364-8i adapter with the system BIOS set to Legacy mode.

1. Install the desired drives and Avago controller into the system (see "P500-P700-P900 RAID Hardware Configuration" document for installation instructions).

2. Power on the system and wait for the Avago option ROM to load. Press CTRL + R when prompted to enter the Avago MegaRAID configuration utility.

3. From the Avago MegaRAID configuration menu, press “Ctrl – N” to view the next page of the MegaRAID configuration menu. If the drive “State” is not set to “JBOD”, proceed to the next steps to change the drive state to “JBOD”.



4. Highlight each drive, press the F2 key, select the “Make JBOD” option and press Enter. Do this for each drive to use as a single drive.

****Note**: If "Make JBOD" option is grayed out and not selectable, download the Avago MegaRAID utility from the Avago website (www.avagotech.com). Run the following dos command to enable JBOD mode: **megacli –adpsetprop –enablejbod -1 –a0***

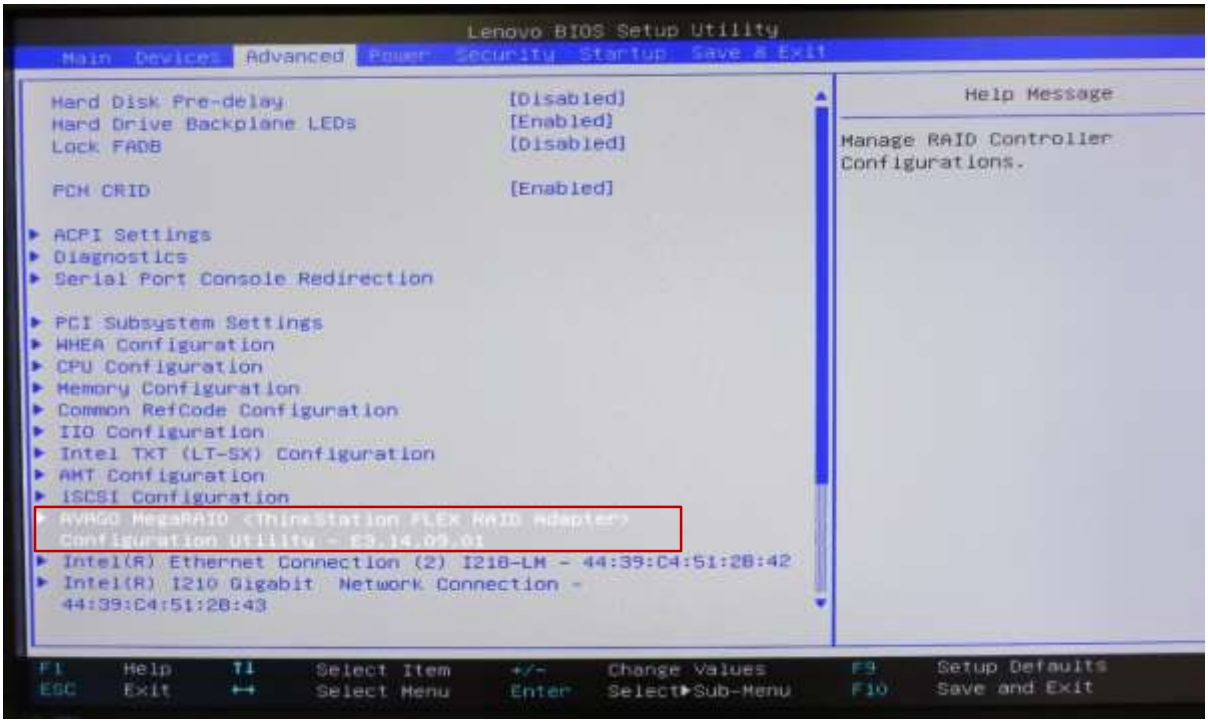
5. Notice the state of each drive will change from "UG" to "JBOD".

6. Press Ctrl-N three more times to go back to the "VD Mgmt" main menu option in which all drives in JBOD mode should be listed.

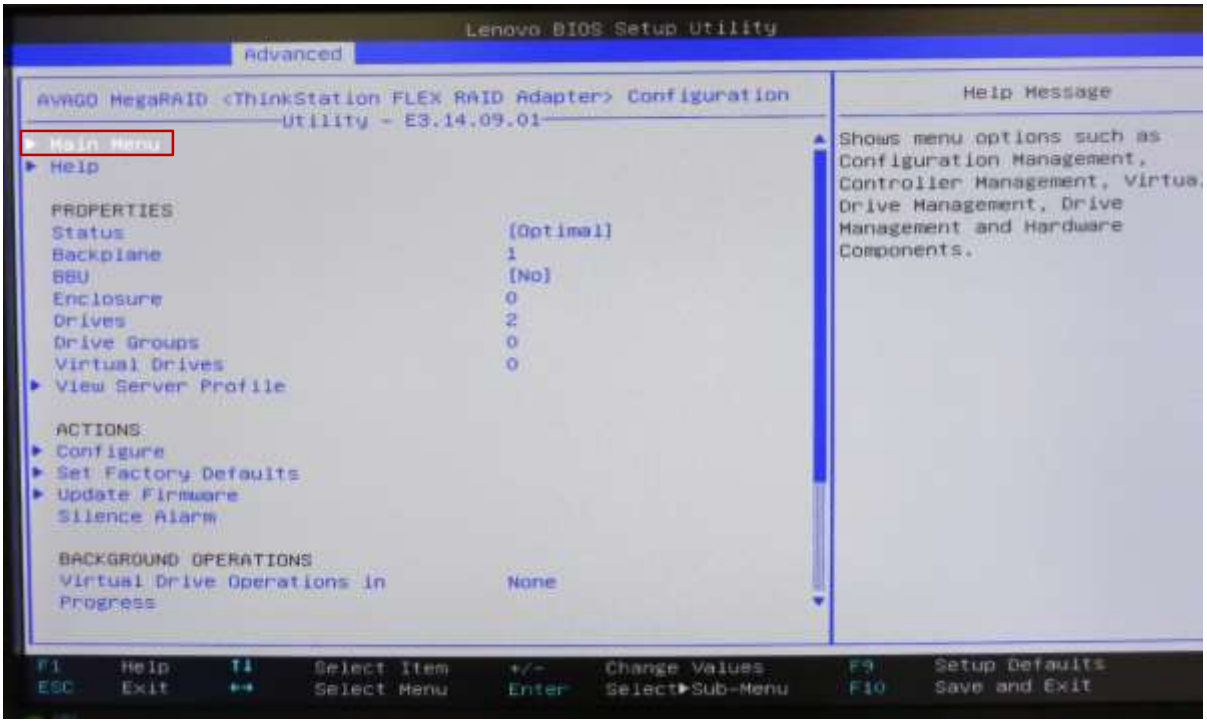
UEFI BIOS Method (HII Interface) – Setting up a RAID Array

Use this method to create a basic RAID array using the Avago MegaRAID SAS/SATA FLEX RAID Adapter or Avago 9364-8i adapter with the system BIOS set to UEFI mode.

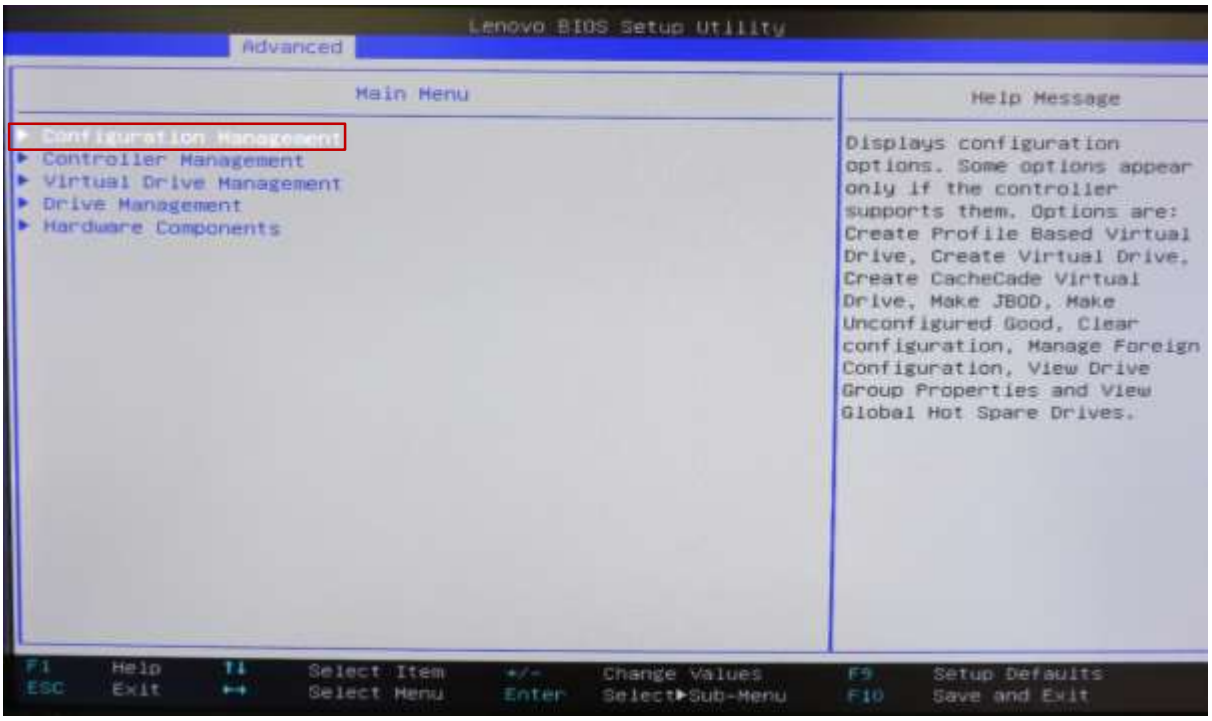
1. Install the desired drives and Avago controller into the system (see “P500-P700-P900 RAID Hardware Configuration” document for installation instructions).
2. After ensuring system BIOS is in UEFI mode, boot the system and enter the BIOS setup menu by pressing the F1 key during system boot.
3. Using the arrow keys, select the “Advanced” tab
4. Using the arrow keys, highlight the selection for “Avago MegaRAID Configuration Utility”, and press Enter.



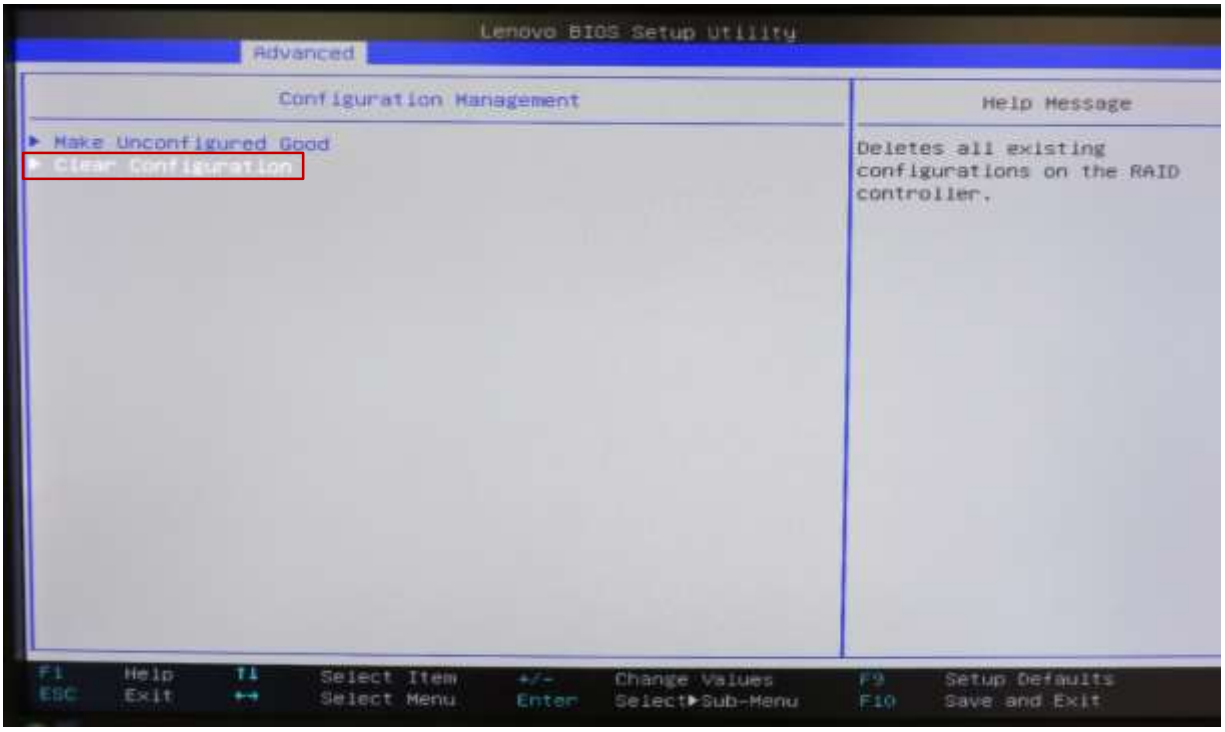
5. Select “Main Menu” and press Enter.



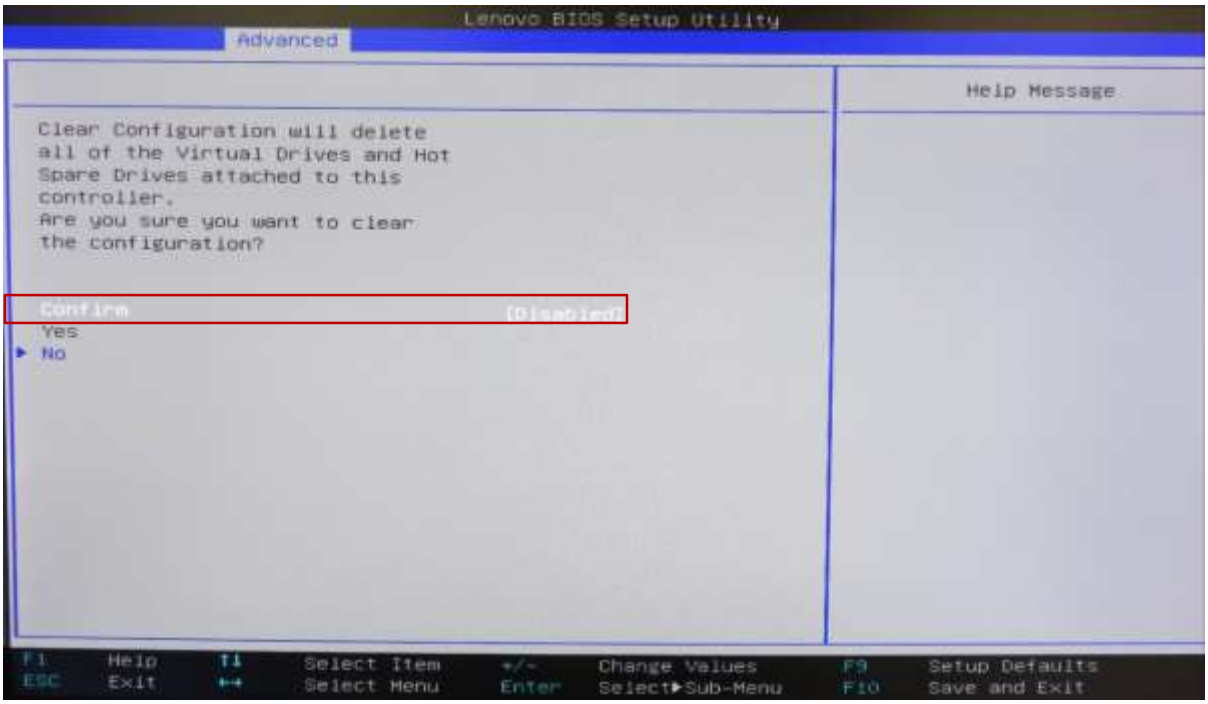
6. Select “Configuration Management” and press Enter.



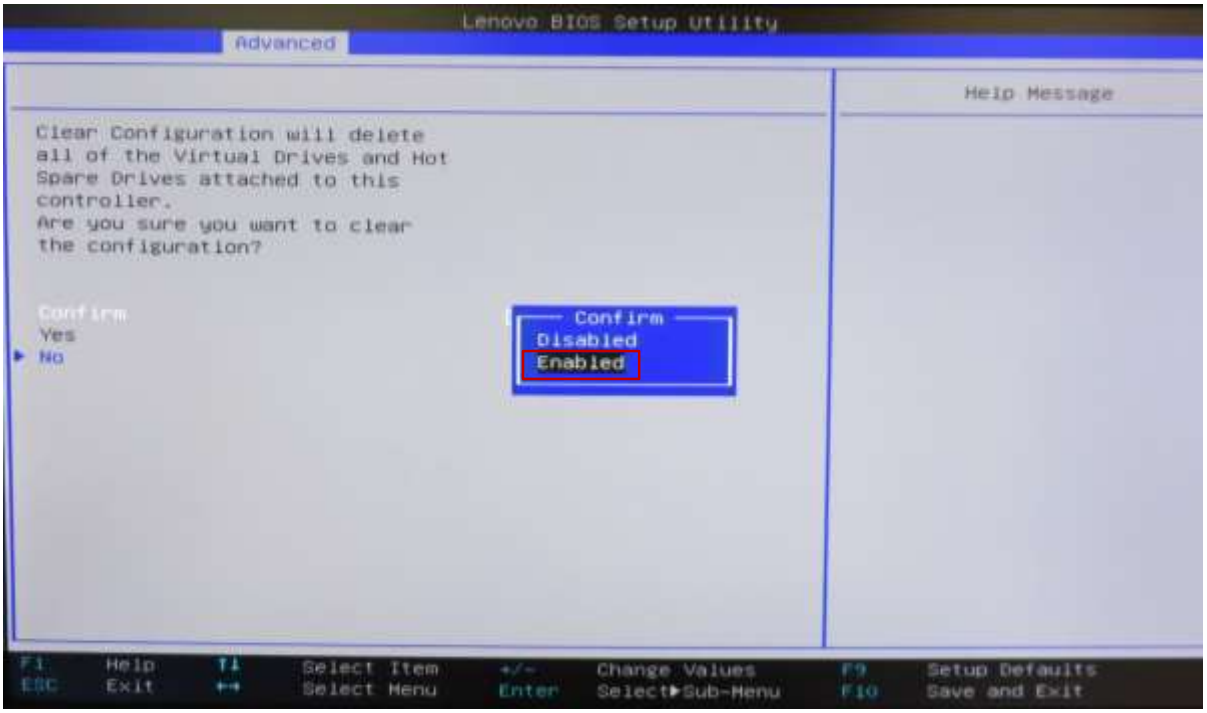
7. **OPTIONAL**: If there is a previous RAID setup, it is a good idea to clear the configuration before creating a new RAID array. Select “Clear Configuration” and press Enter.



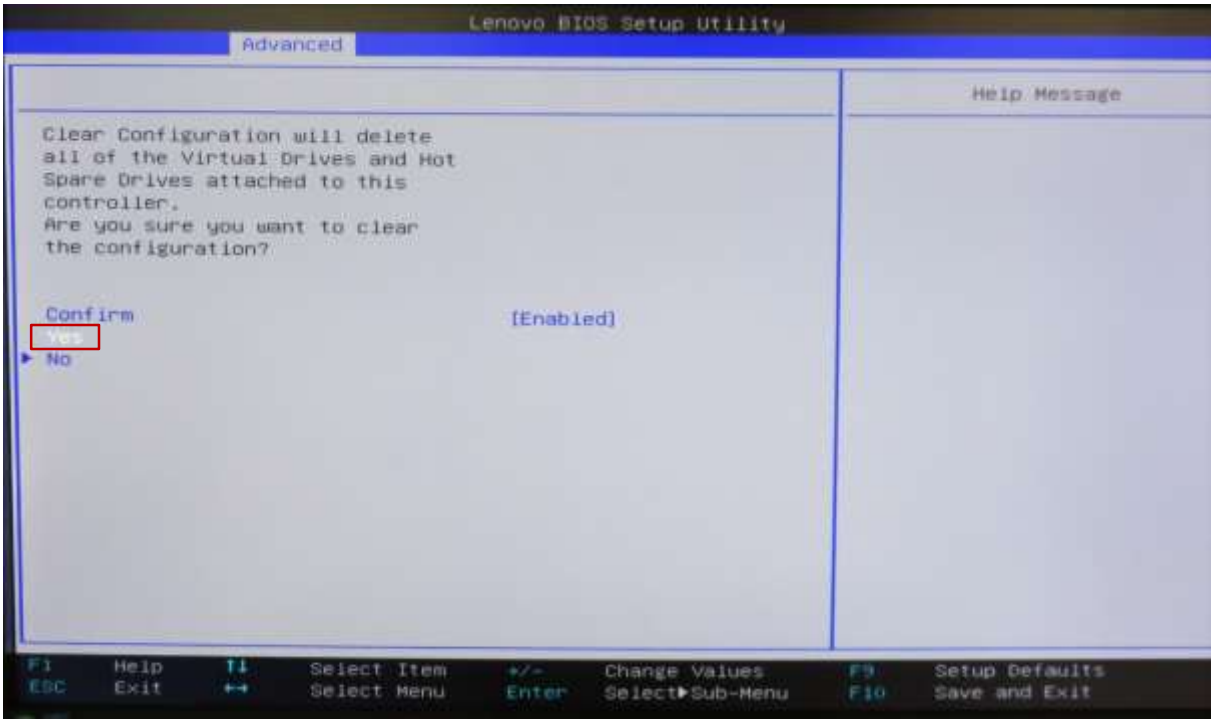
Select the “Confirm [Disabled]” option and press Enter.



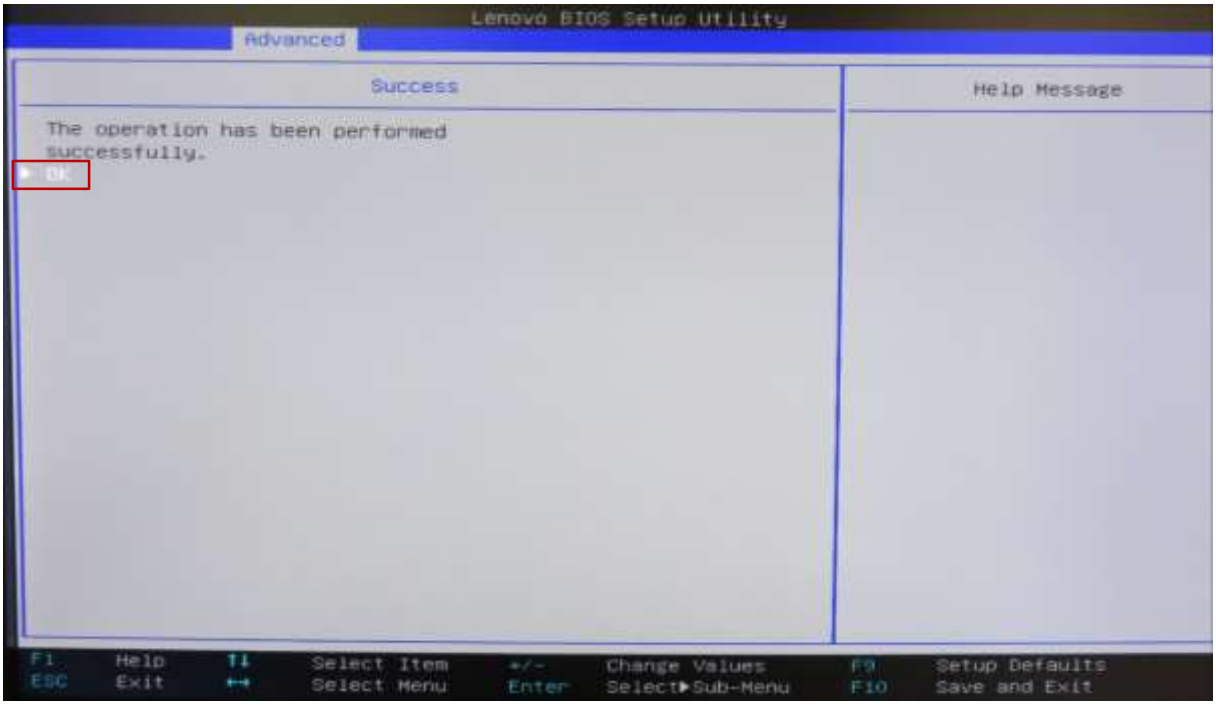
Select “Enabled” and press Enter.



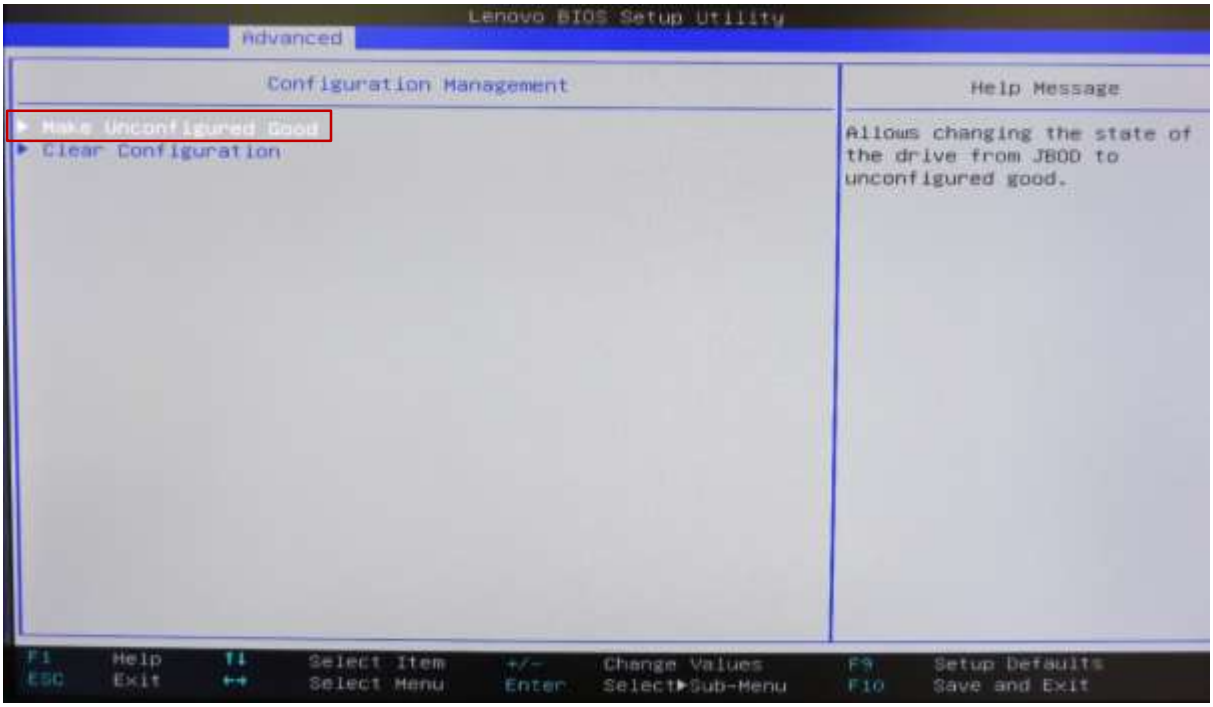
Select “Yes” and press Enter.



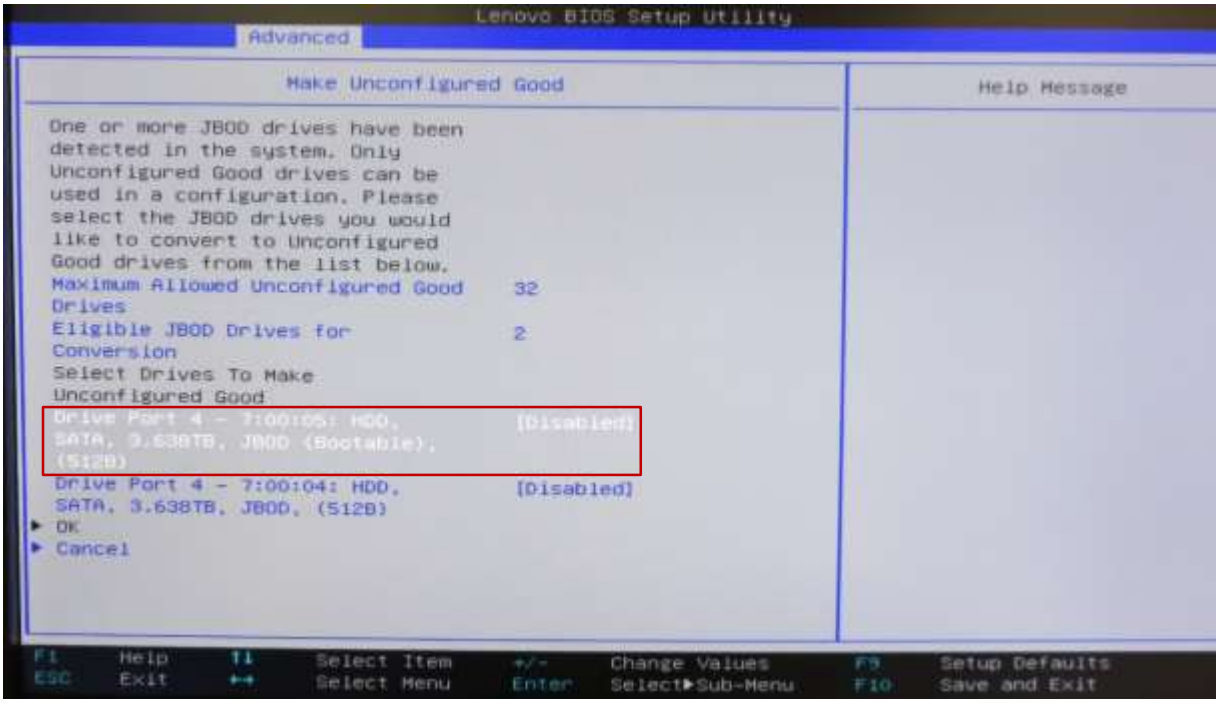
Select “Ok” at the Success screen and press Enter.

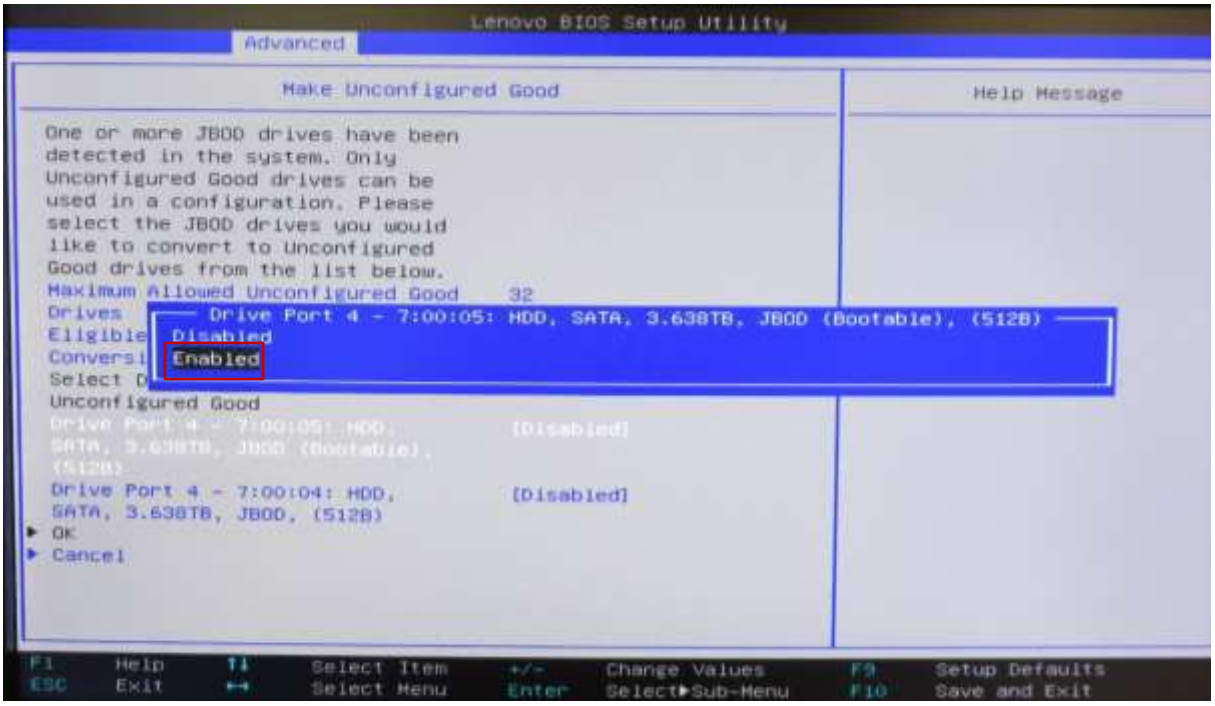


8. Select “Make Unconfigured Good” and press Enter.

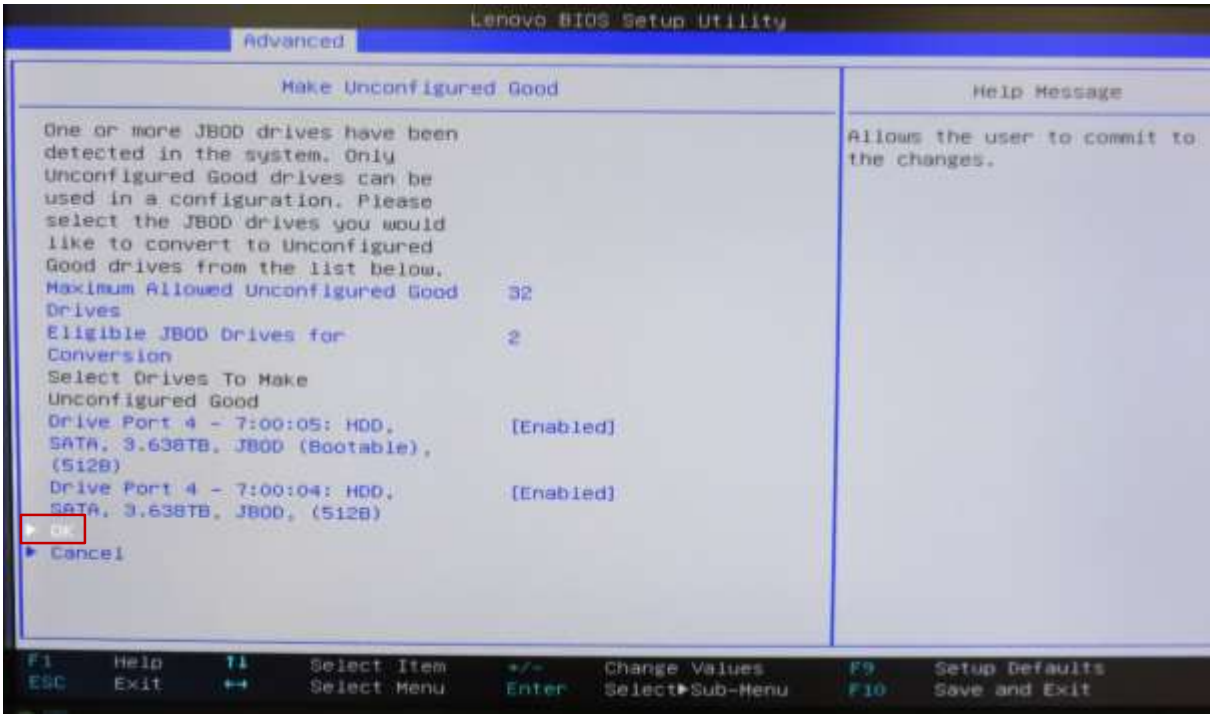


9. Select the drives to use in a RAID array one at a time and change “Disabled” to “Enabled”.

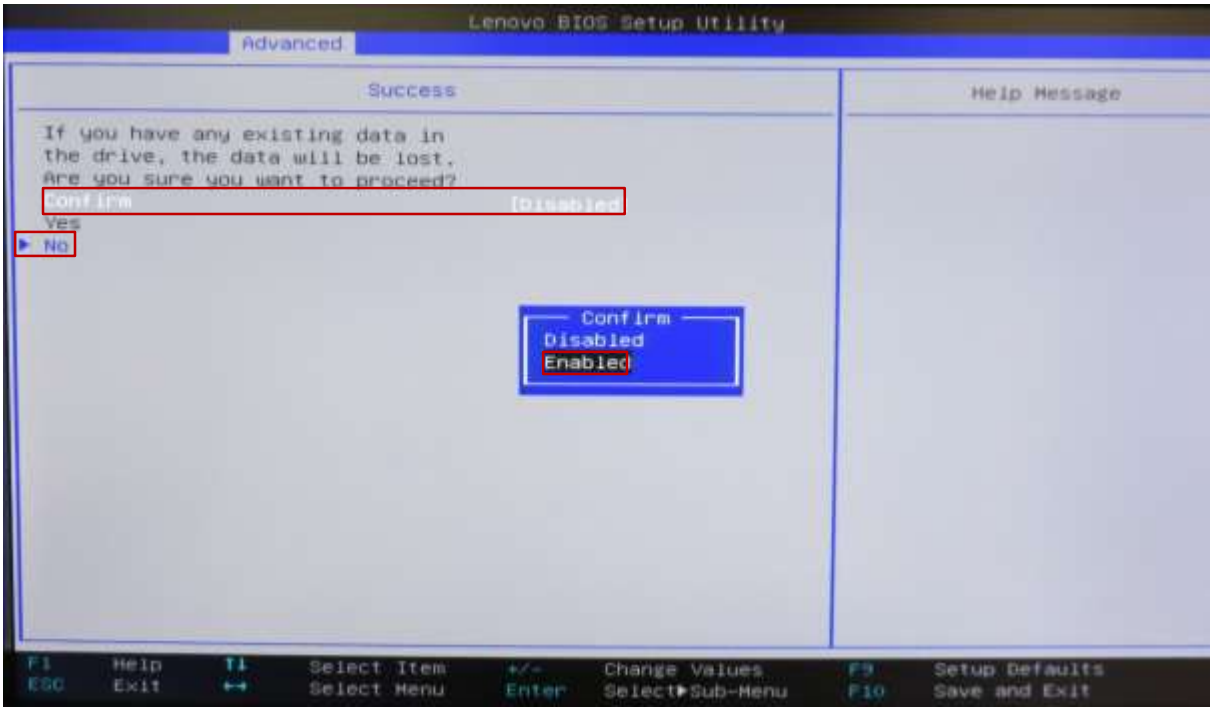




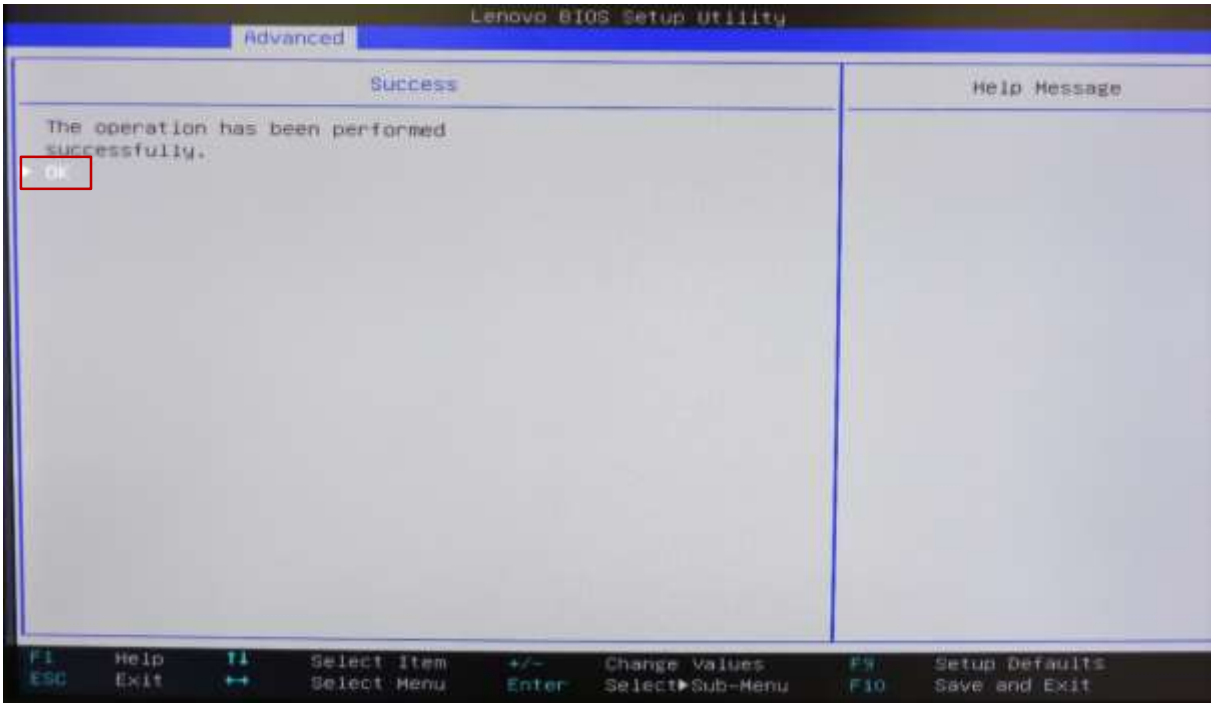
10. Select “OK” and press Enter.



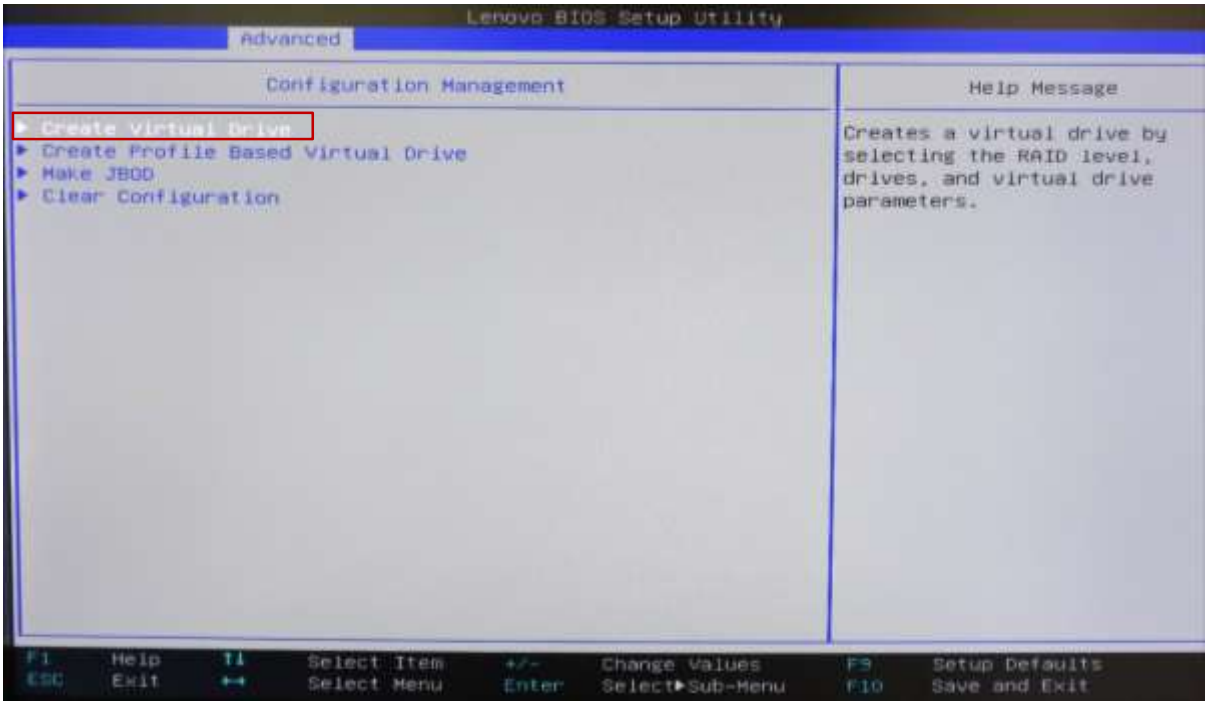
11. A.) Select “Confirm [Disabled]” and press Enter.
    B.) Select “Enabled” and press Enter.
    C.) Select “Yes” and press Enter.



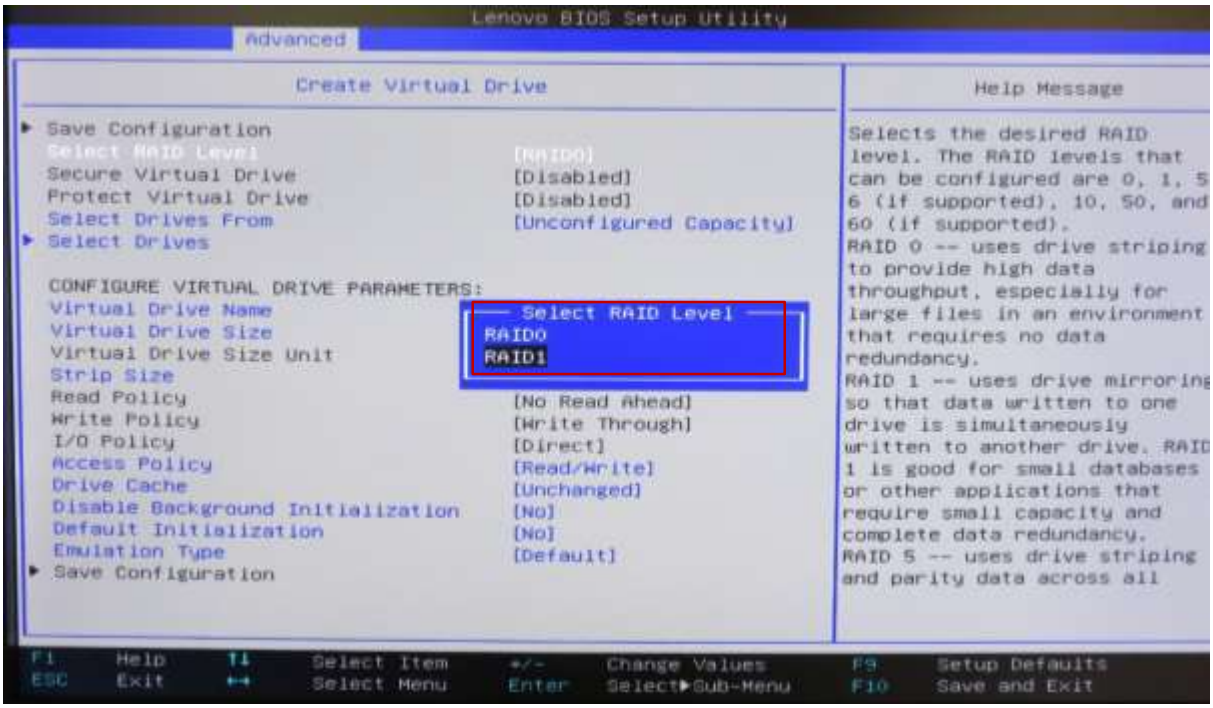
12. Select “OK” at the Success screen and press Enter.



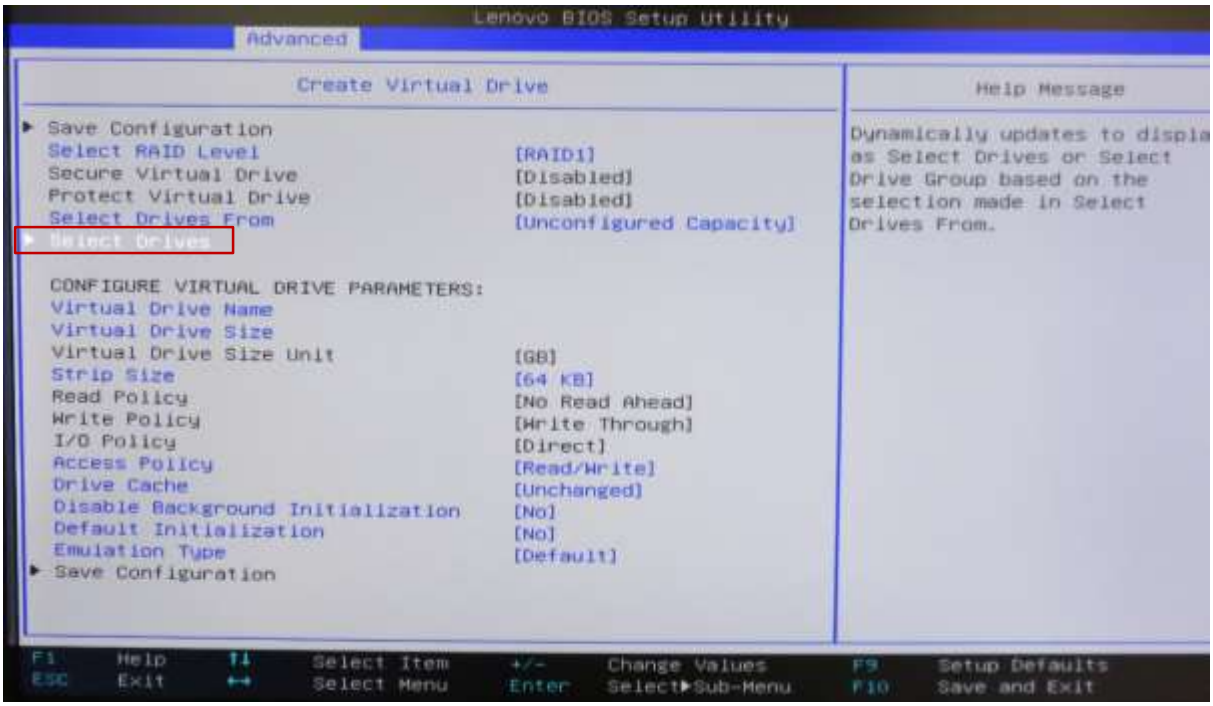
13. Select “Create Virtual Drive” and press Enter.



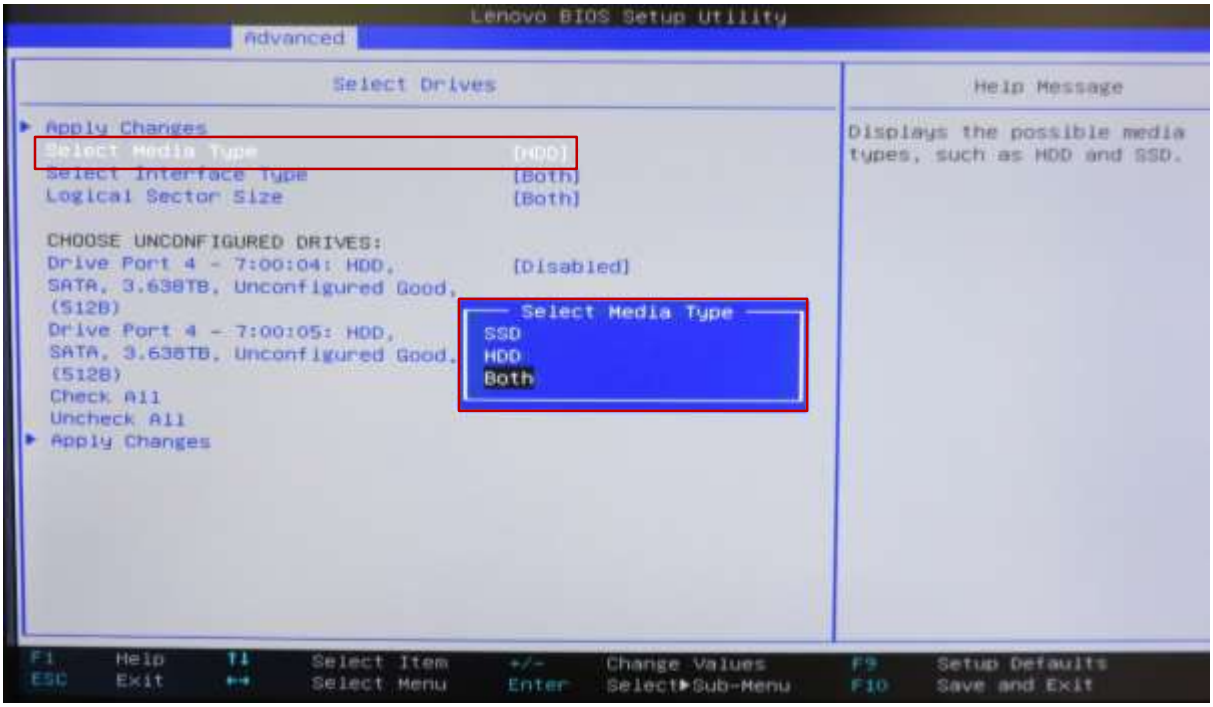
14. Highlight “Select RAID Level” and press Enter to show the list of supported RAID types. Choose the desired type and press Enter.
    ****__Note__: The available RAID types will vary based on drive configuration.*



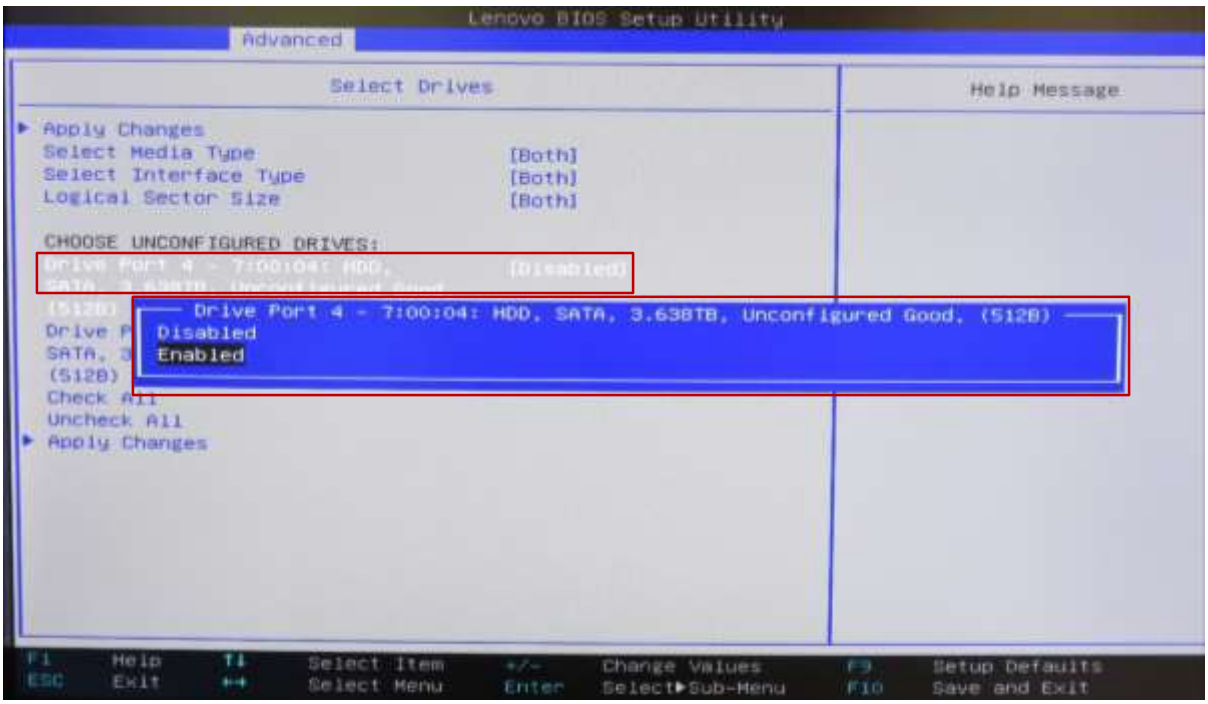
15. Using the arrow keys, highlight “Select Drives” and press Enter.



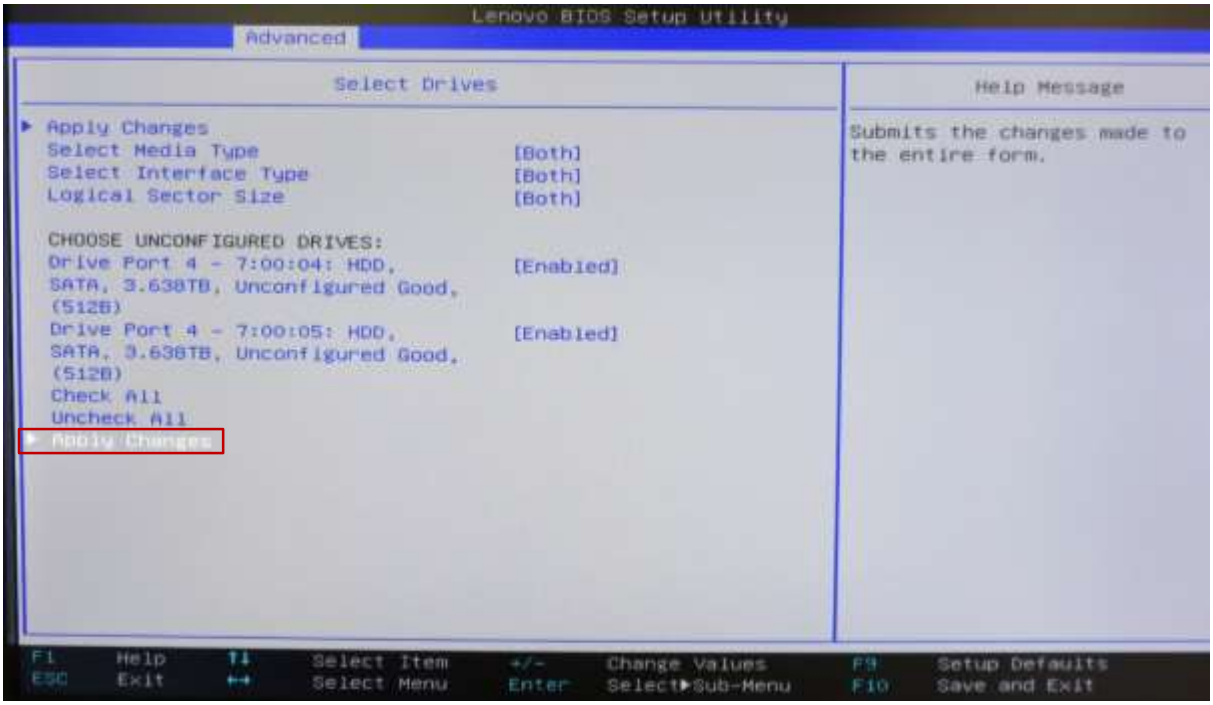
16. Using the arrow keys, highlight “Select Media Type”, press Enter and change the selected media type to “Both”.



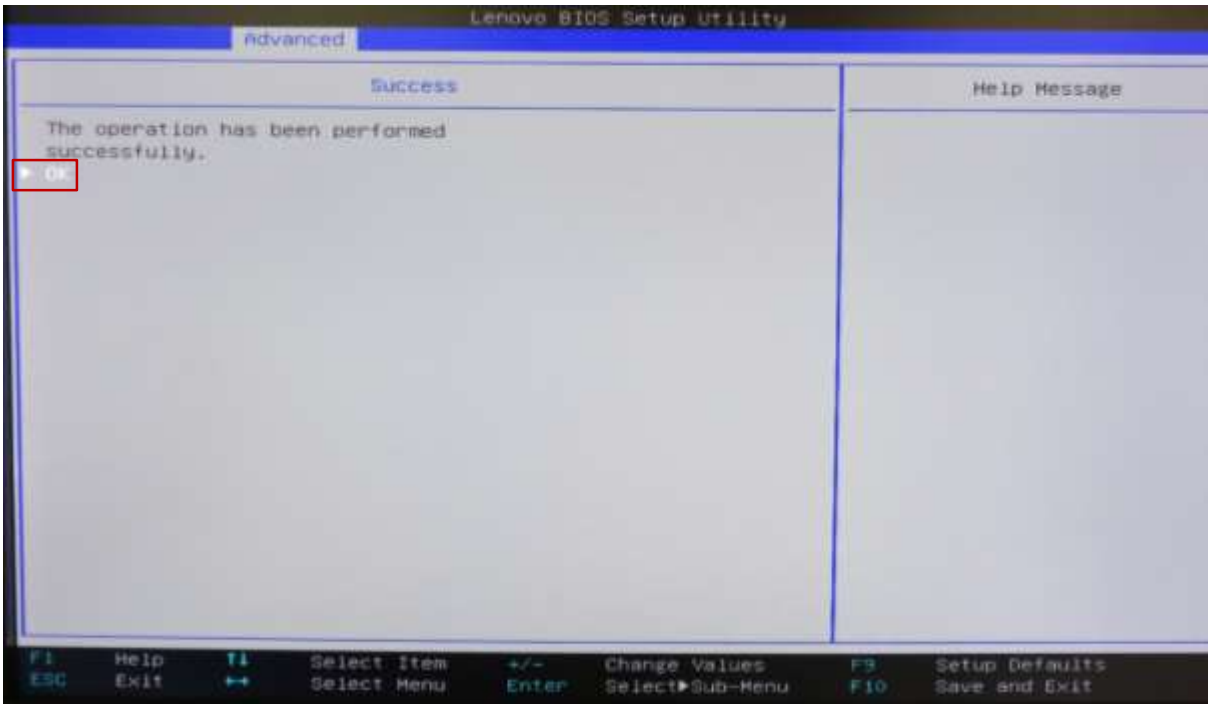
17. Using the arrow keys, highlight a drive to be included in the array, press Enter and change the setting to enabled. Repeat this process for each drive to be added to the array.



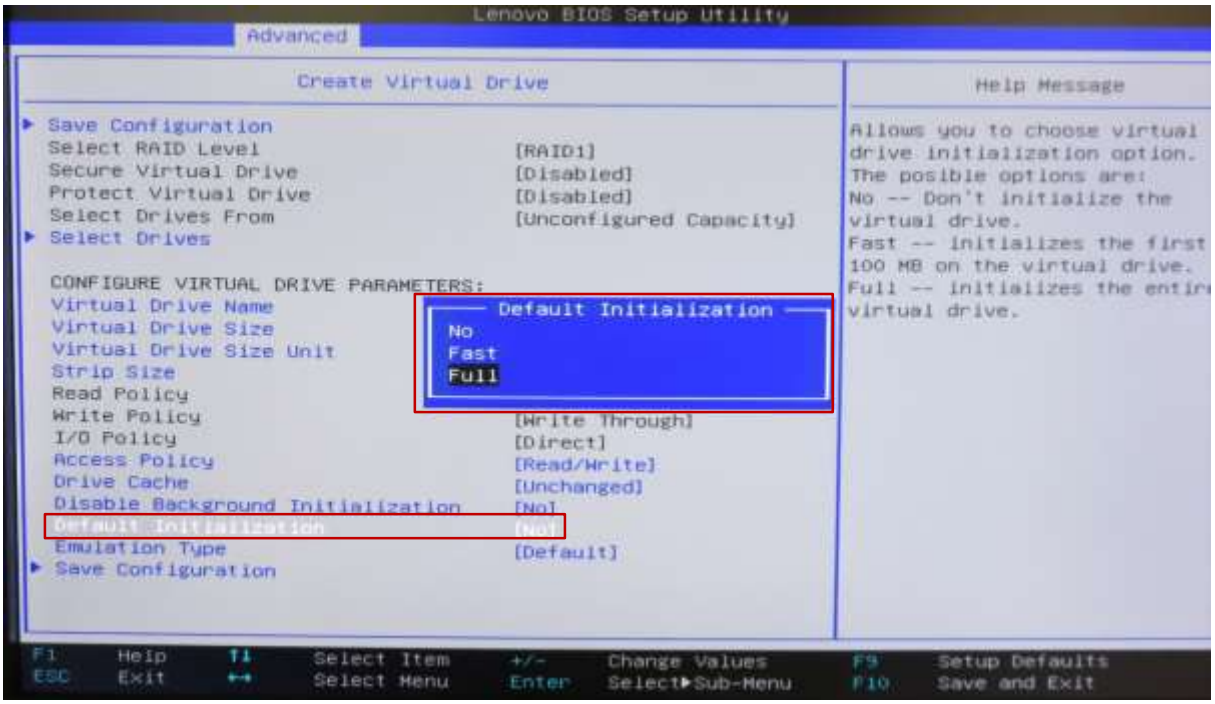
18. Once all desired drives are selected, use the arrow keys to highlight “Apply Changes” and press Enter.



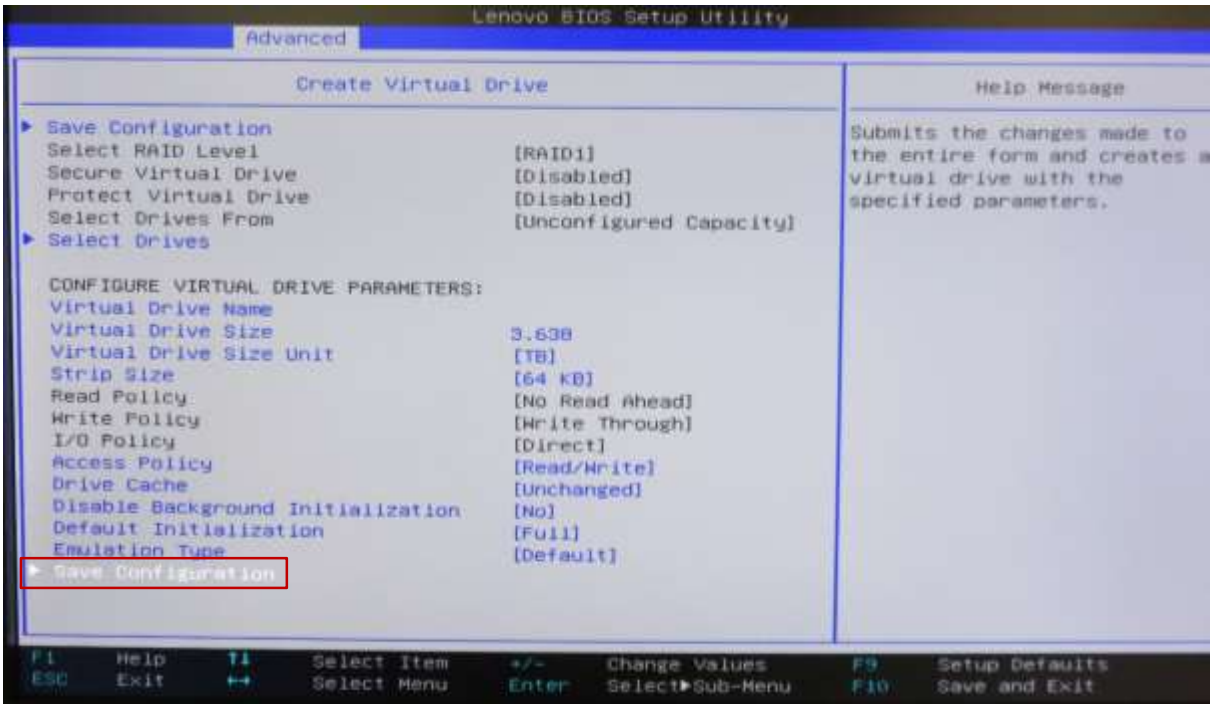
19. Press Enter again to confirm.



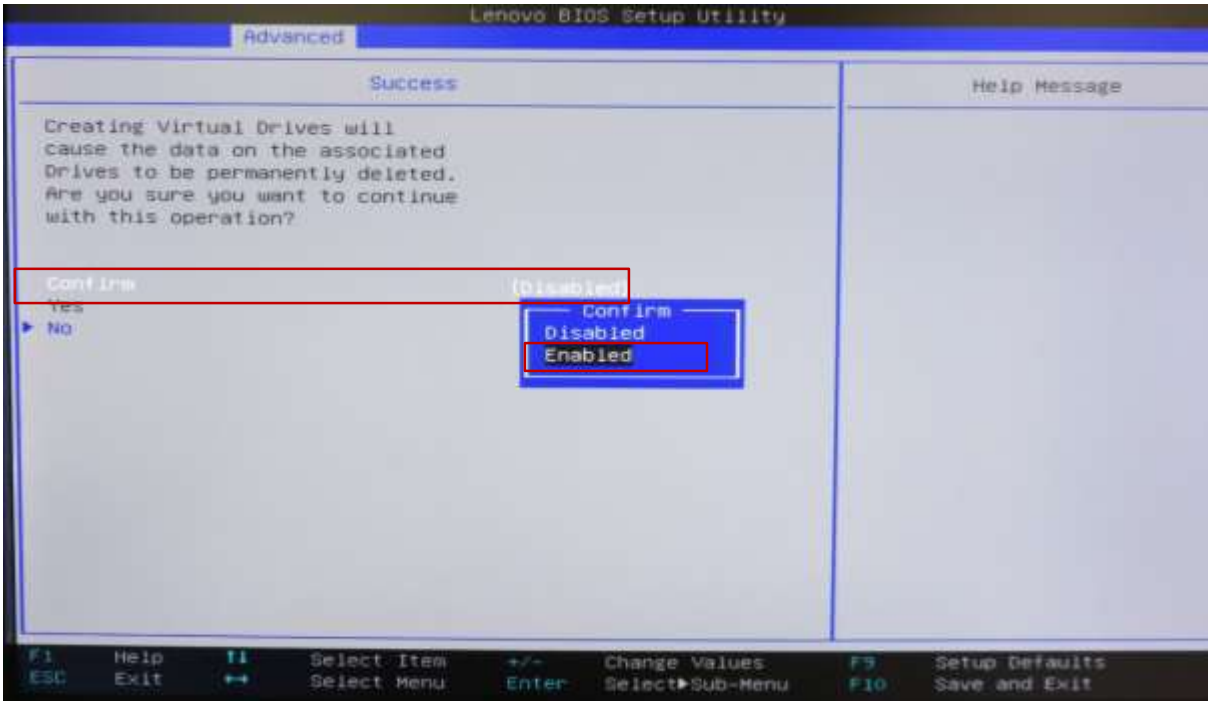
20. The “Create Virtual Drive” menu should appear again. From this menu, users can make additional changes to advanced settings (such as policies and initialization). It is recommended that users select “Default Initialization” and choose either the “Full” or “Fast” option to ensure the array is initialized.



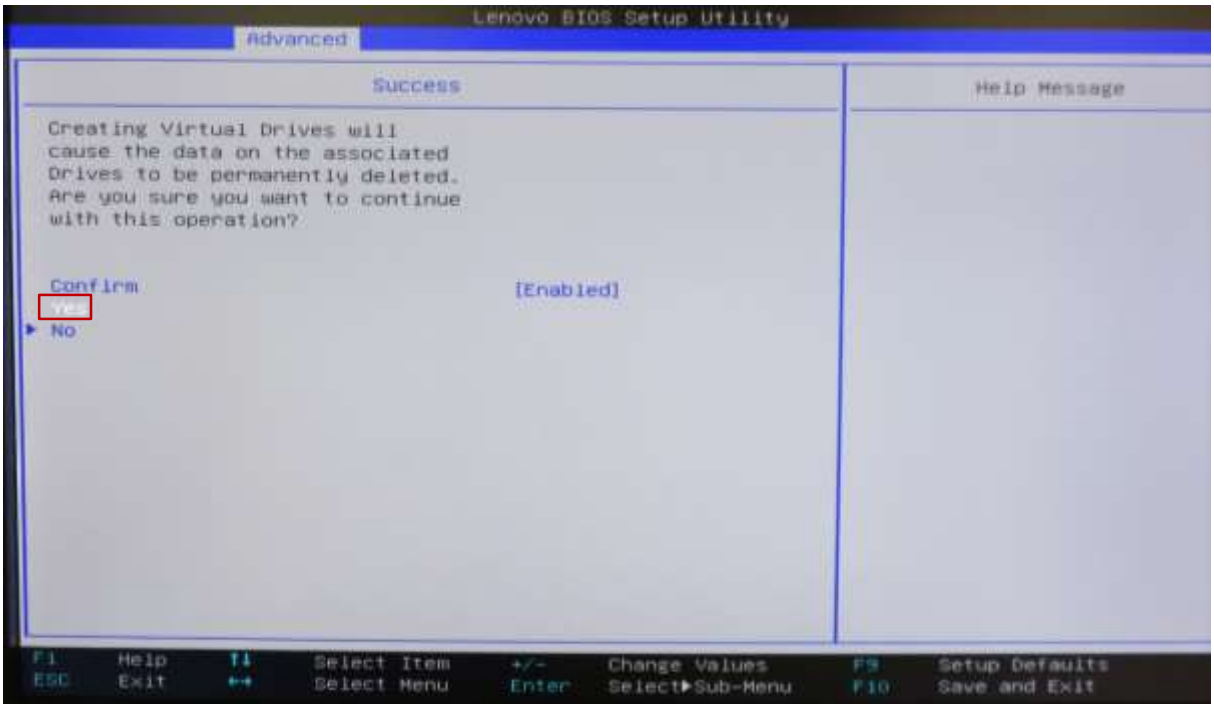
21. Once all changes have been finalized, choose “Save Configuration” and press Enter.



22. On the next screen, change the “Confirmed” setting to enabled, and press Enter.

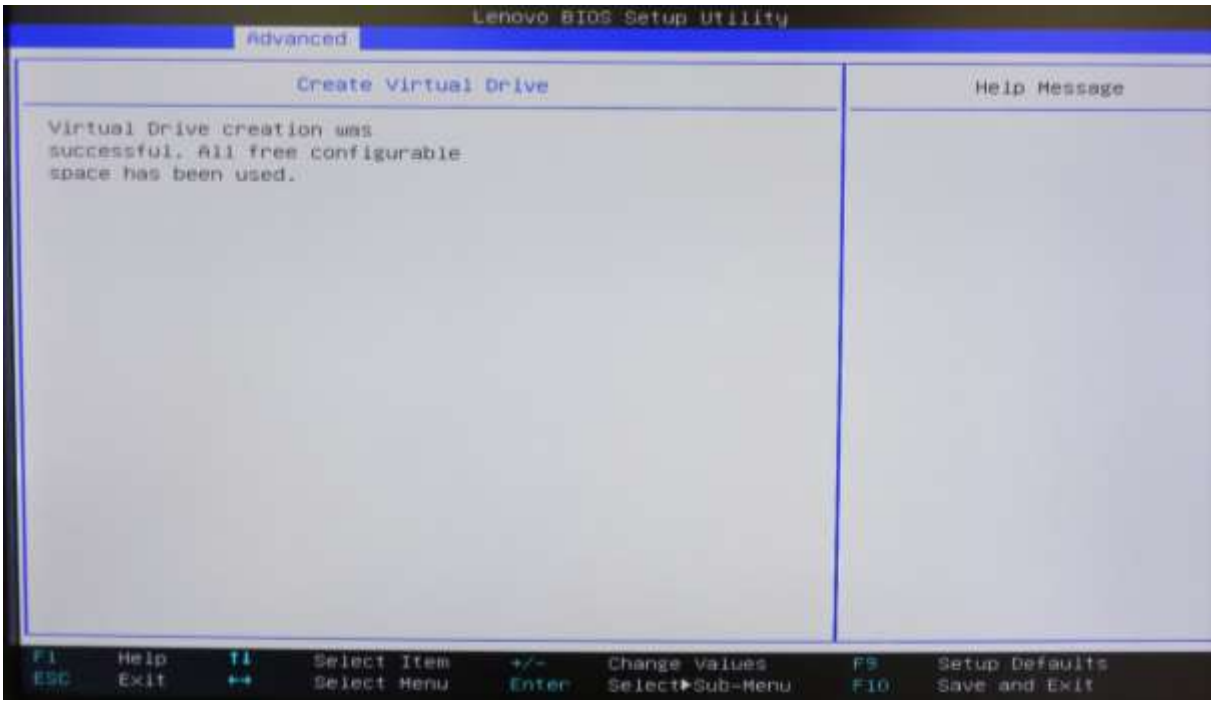


23. Highlight “Yes” and press Enter.



24. At the Success menu, press Enter.

25. Press ESC to return to the Create Virtual Drive menu.



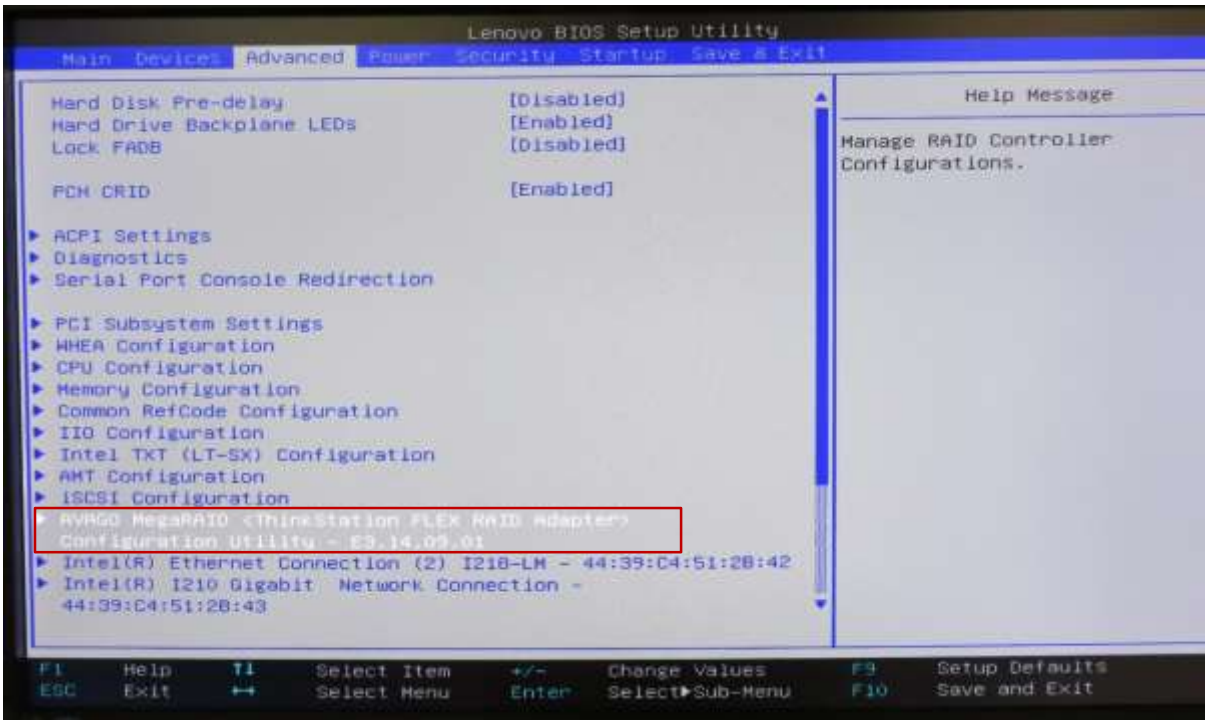
26. Press ESC again to return to the Configuration Utility main menu. Note that users can check the status of the array by choosing the Virtual Drive Management Option to view information on the array.

UEFI BIOS Method (HII Interface) – Setting up single drives in JBOD mode

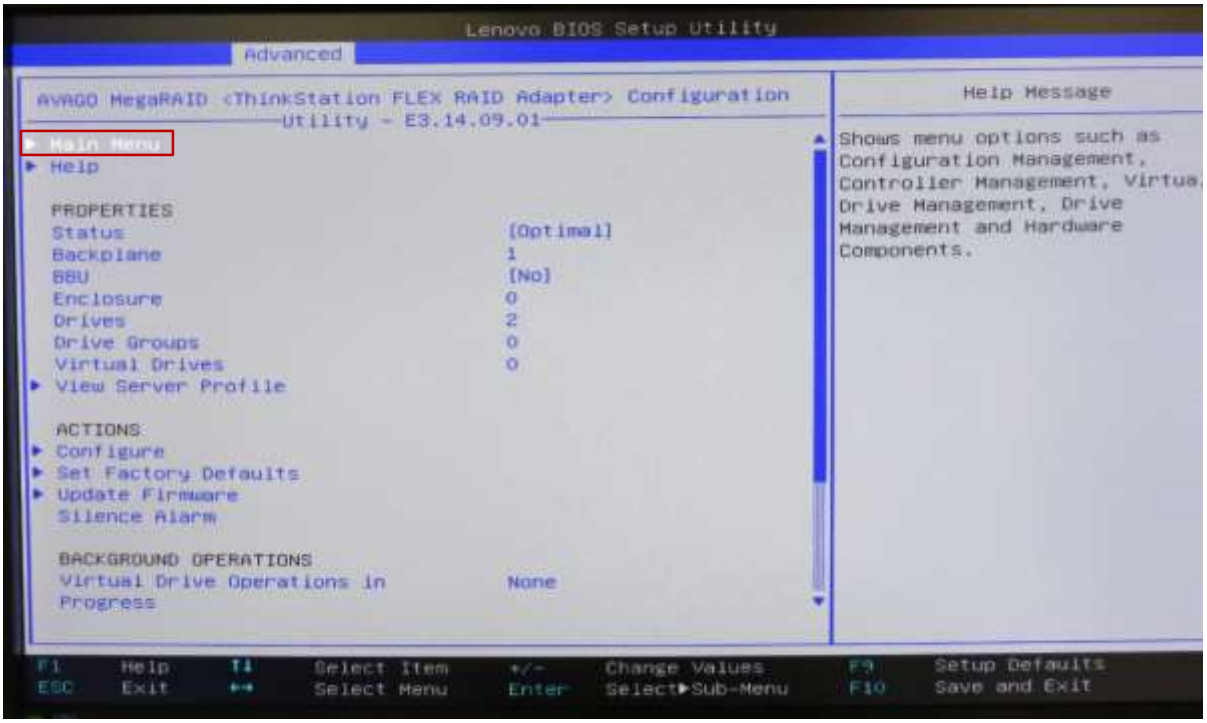
Use this method to create a basic single drive using the Avago MegaRAID SAS/SATA FLEX RAID Adapter or Avago 9364-8i adapter with the system BIOS set to UEFI mode.

*******Note**: in order for the OS to recognize drive(s) attached to the Avago controller, the drive(s) must be configured as a RAID array or JBOD mode. Single drive RAID 0 arrays are acceptable.*

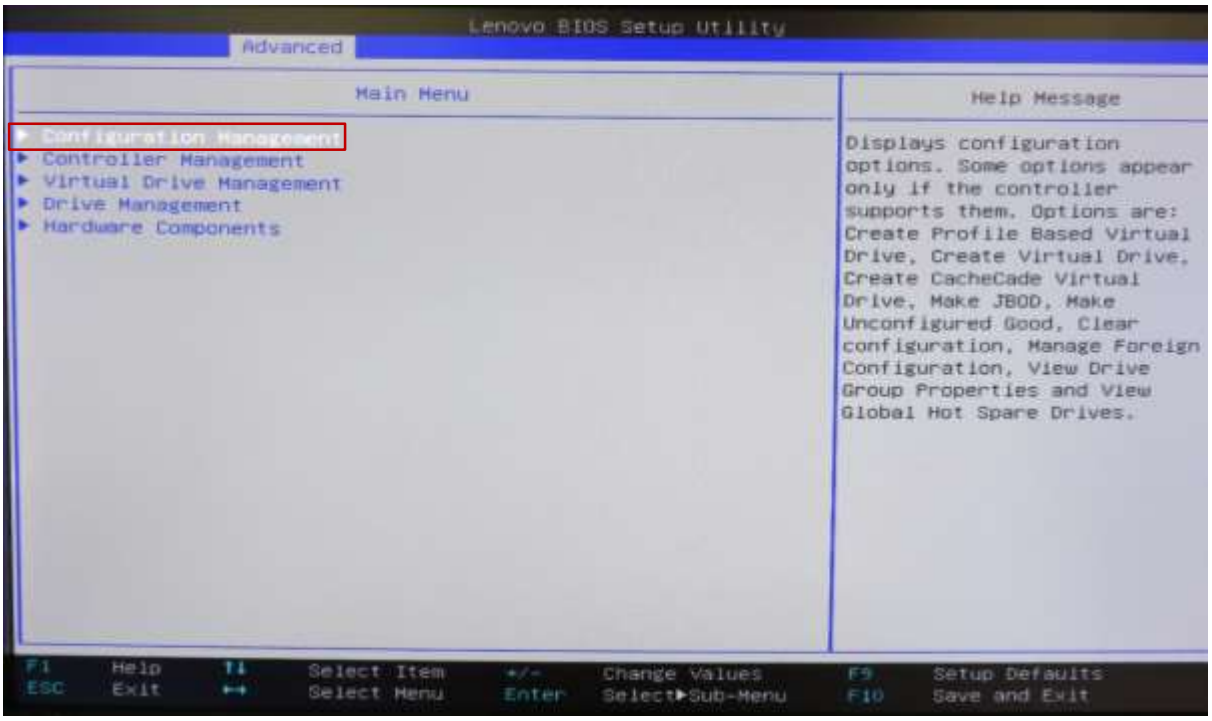
1. Install the desired drives and Avago controller into the system (see "P500-P700-P900 RAID Hardware Configuration" document for installation instructions).
2. After ensuring system BIOS is in UEFI mode, boot the system and enter the BIOS setup menu by pressing the F1 key during system boot.
3. Using the arrow keys, select the "Advanced" tab
4. Using the arrow keys, highlight the selection for "Avago MegaRAID Configuration Utility", and press Enter.



5. Select “Main Menu” and press Enter.

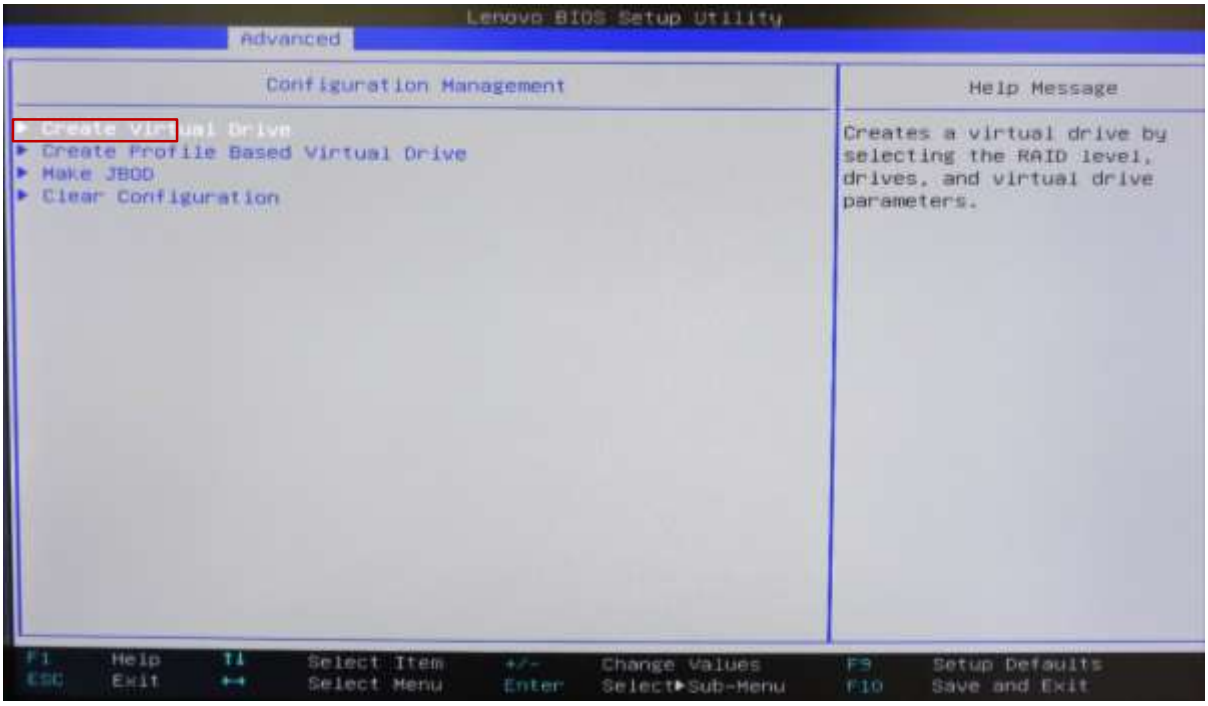


6. Select “Configuration Management” and press Enter.



7. Select “Make JBOD”.

   ****Note**: If drives are already in “JBOD” mode, the “Make JBOD” option will not be listed here.*



   ****Note**: If “Make JBOD” option is grayed out and not selectable, download the Avago MegaRAID utility from the Avago website (www.avagotech.com). Run the following dos command to enable JBOD mode: **megacli –adpsetprop –enablejbod -1 –a0***

8. Using the arrow keys, highlight each drive to convert to JBOD mode, press Enter and change the setting to enabled. Repeat this process for each drive to be added to be converted to JBOD.

Note: For Windows 7 and Windows 8 retail installations, users will have to manually provide the Avago driver in order for Windows to see any drives/arrays attached to the Avago controller.

More detailed information on the Avago controllers and the MegaRAID configuration utility can be found at the following location (Chapter 5 covers the HII configuration menus).

http://www.avagotech.com/support/download-search

Description of Commonly Used Storage Hardware in P-Series ThinkStations

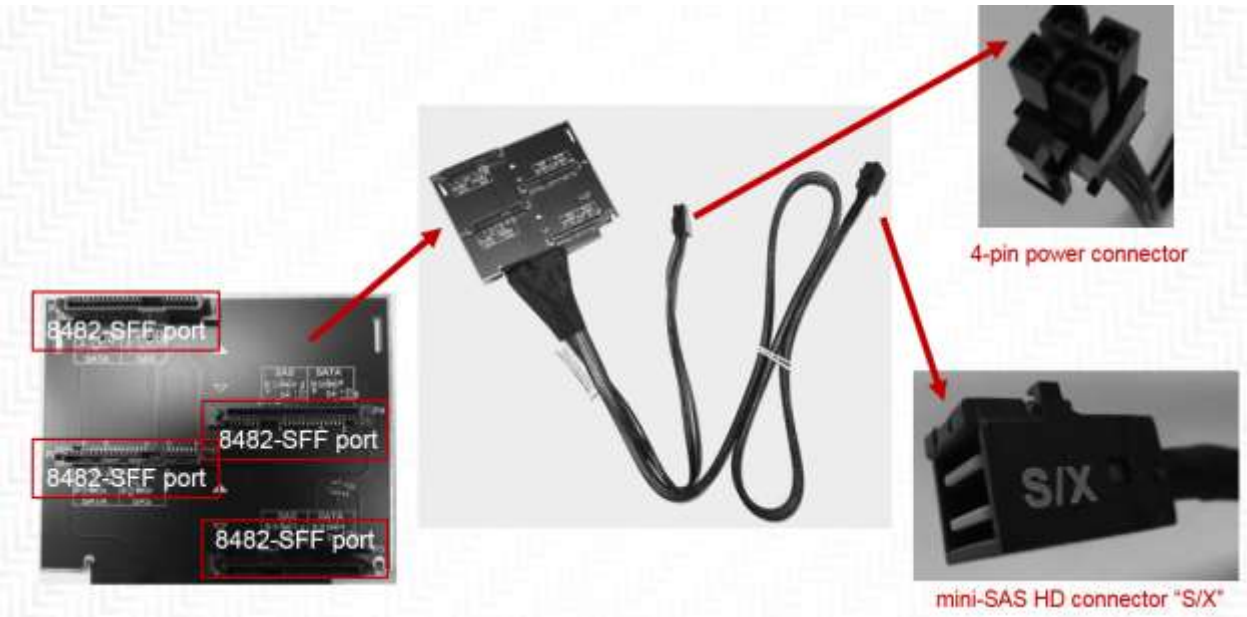
Blind Connect Assembly (BCA)

BCA-P : Blind Connect Assembly consisting of two 8639-SFF ports (supporting PCIe, SAS, or SATA drives) and two 8482-SFF ports (supporting SAS or SATA drives). The assembly also consists of the following cable connections:

- One 4-pin power connector that connect to the motherboard
- Two mini-SAS HD connectors that connect to the Multi-IO FLEX adapter (for PCIe connections) labeled “P1” and “P2”
- One mini-SAS HD connector that connect to either the onboard controller or Avago controller labeled “S/X”
- LED lights light up next to each port to show which ports on the BCA are available when either the Avago or Intel onboard controller is used.
- The Avago controller supports all the given ports on the BCA.
- The onboard Intel controller supports only two of the given ports on the BCA.

BCA-S : Blind Connect Assembly consisting of four 8482-SFF (U.2) ports (supporting SAS or SATA drives). The assembly also contains the following cable connections:

- One 4-pin power connector that connect to the motherboard
- One mini-SAS HD connector that connect to either the onboard controller or Avago controller labeled “S/X”
- LED lights light up next to each port to show which ports on the BCA are available when either the Avago or Intel onboard controller is used.
- The Avago controller supports all the given ports on the BCA.
- The onboard Intel controller supports only two of the given ports on the BCA.



Connector Type	Drives Supported
8639-SFF (U.2) PCIe port	SATA
	SAS (only with Avago controller)
	SSD
	2.5” PCIe SSDs
8482-SFF port	SATA
	SAS (only with Avago controller)
	SSD

FLEX Tray

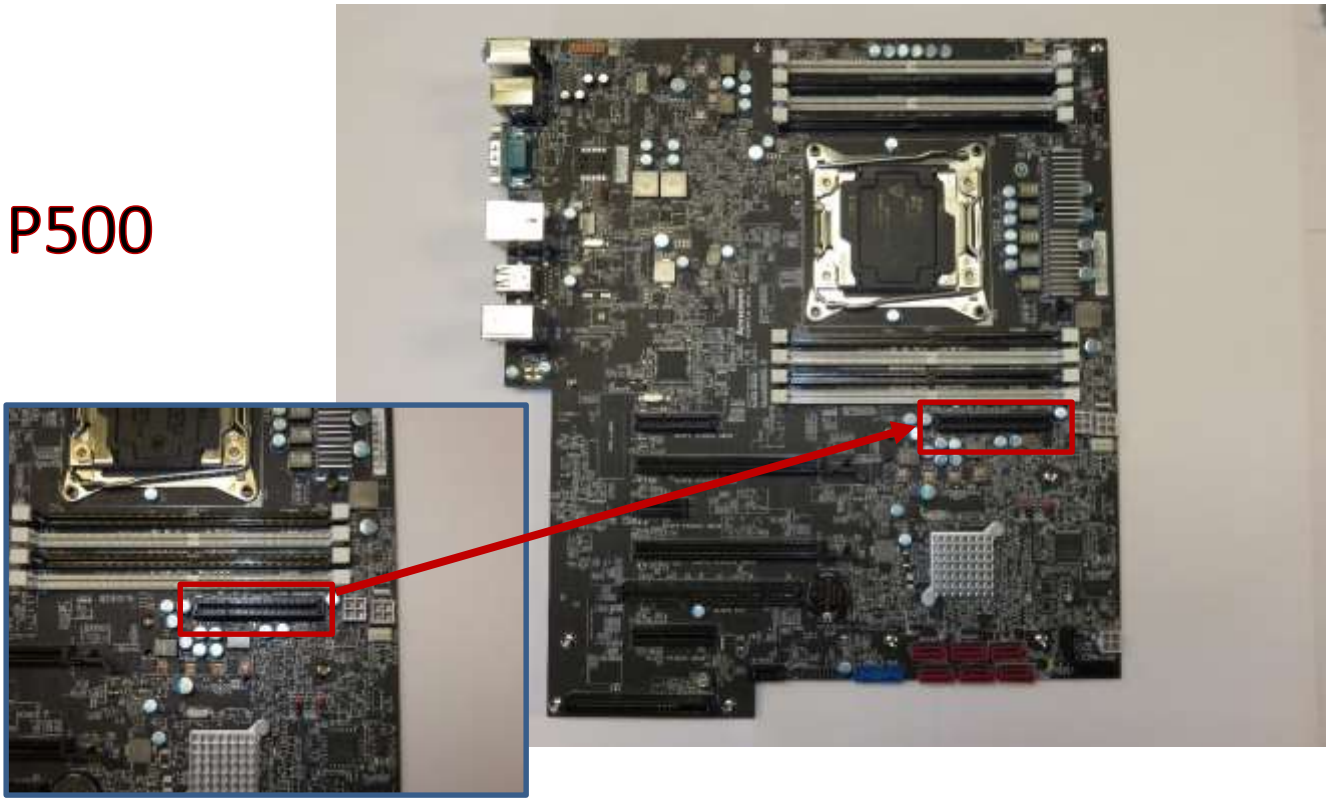
Blind Connect FLEX Tray : Tool-less tray that can hold up to two drives and utilizes a “pull-bar” style handle to connect drive(s) to the BCA

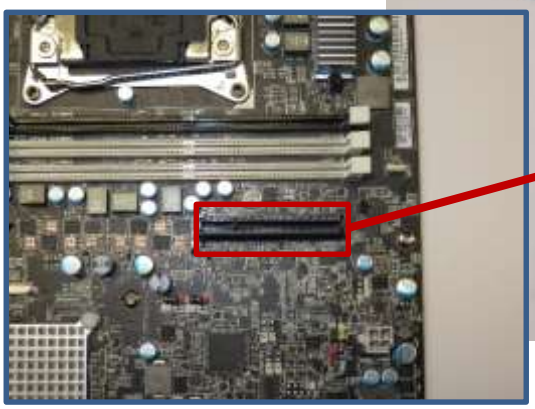
Manual Connect FLEX Tray : Tool-less tray that can hold up to two drives. These trays utilize hinged pulls that open and allow for cable access and manual cable connections.

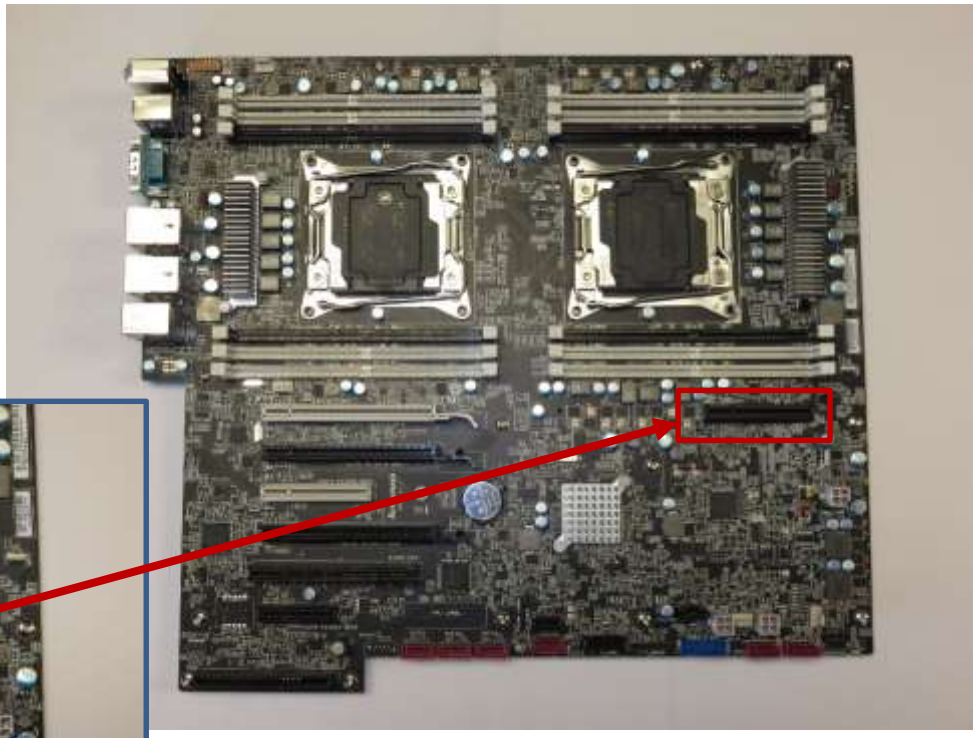
FLEX Connector

Specialized connector used to support FLEX Adapters. These connectors cannot support traditional PCIe devices.

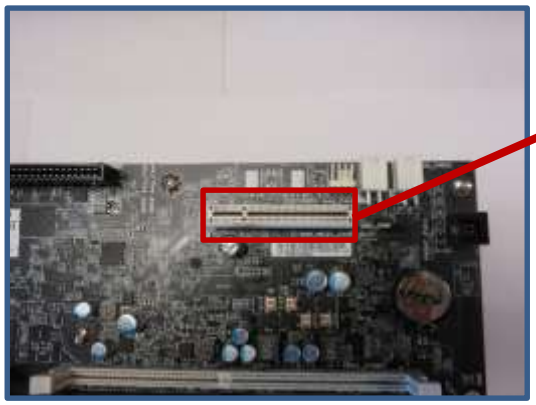
P500

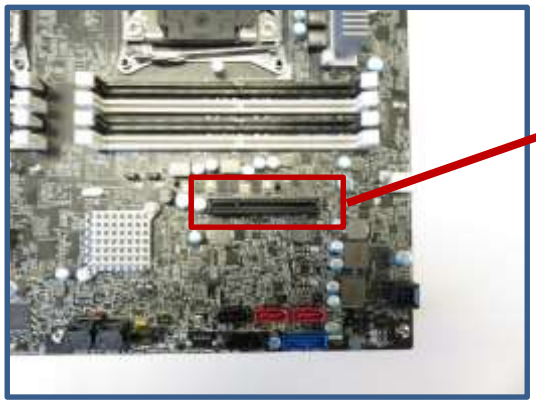


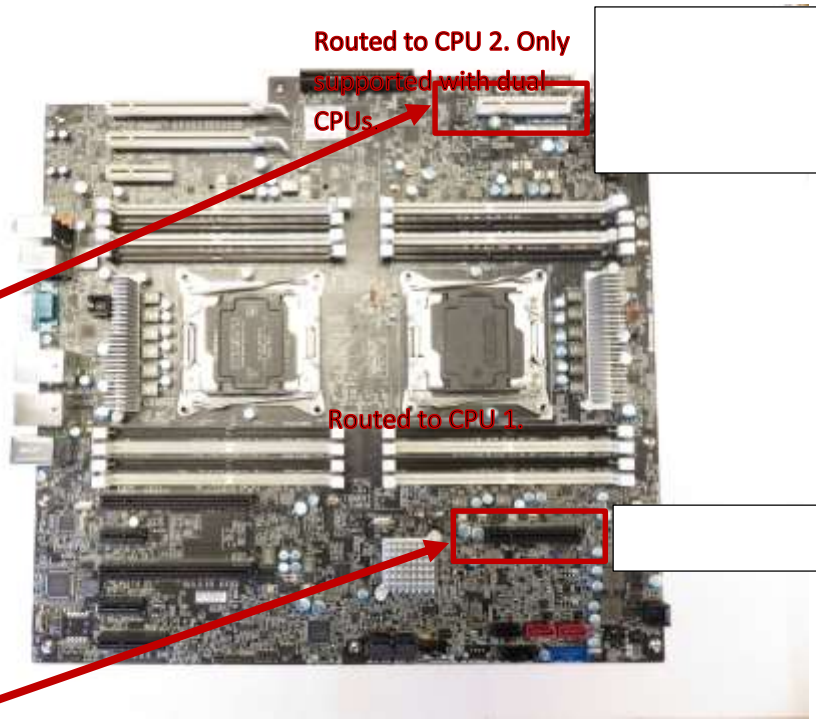




P900







FLEX Adapters

Specialized adapter cards used to support a variety of different functions

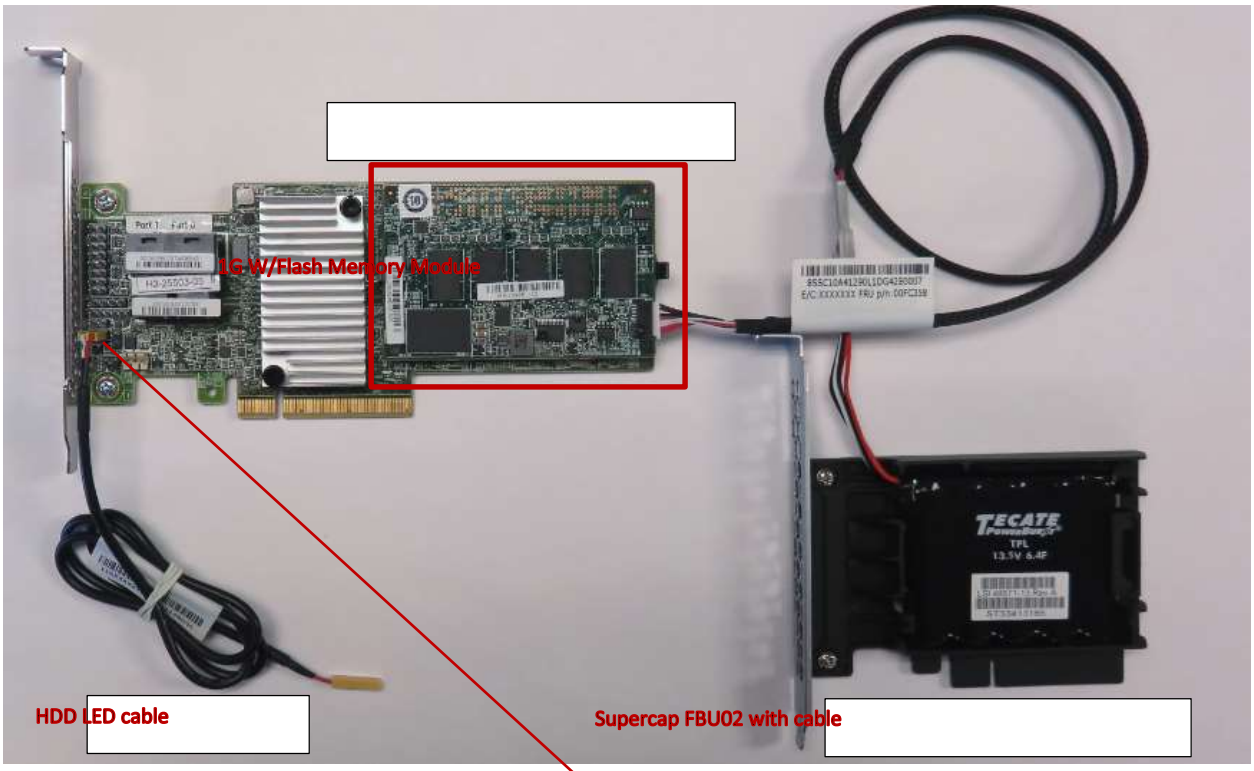
Multi IO FLEX Adapter: FLEX adapter primarily used to support 2.5” PCIe SSD drives via BCA-P. Also consists of a SATA (AHCI) port and USB2.0 port for additional connectivity.

M.2 SSD FLEX Adapter: FLEX adapter used to support M.2 PCIe drives and/or M.2 SATA drives.

LSI SAS/SATA RAID FLEX Adapter (IOC): FLEX adapter consisting of an LSI SAS/SATA RAID controller to support drives via BCA.

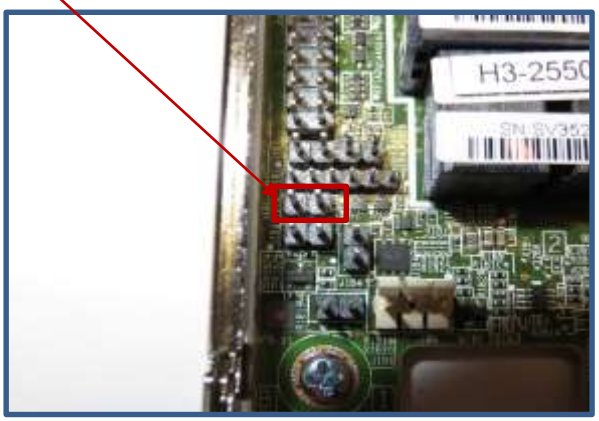
Avago 9364-8i 8-port SATA/SAS ROC Adapter (Protected Mode) w/ 1GB Flash Memory Module+SuperCap

PCIe based RAID-on-Card (ROC) adapter used to support SATA and SAS drives via BCA.



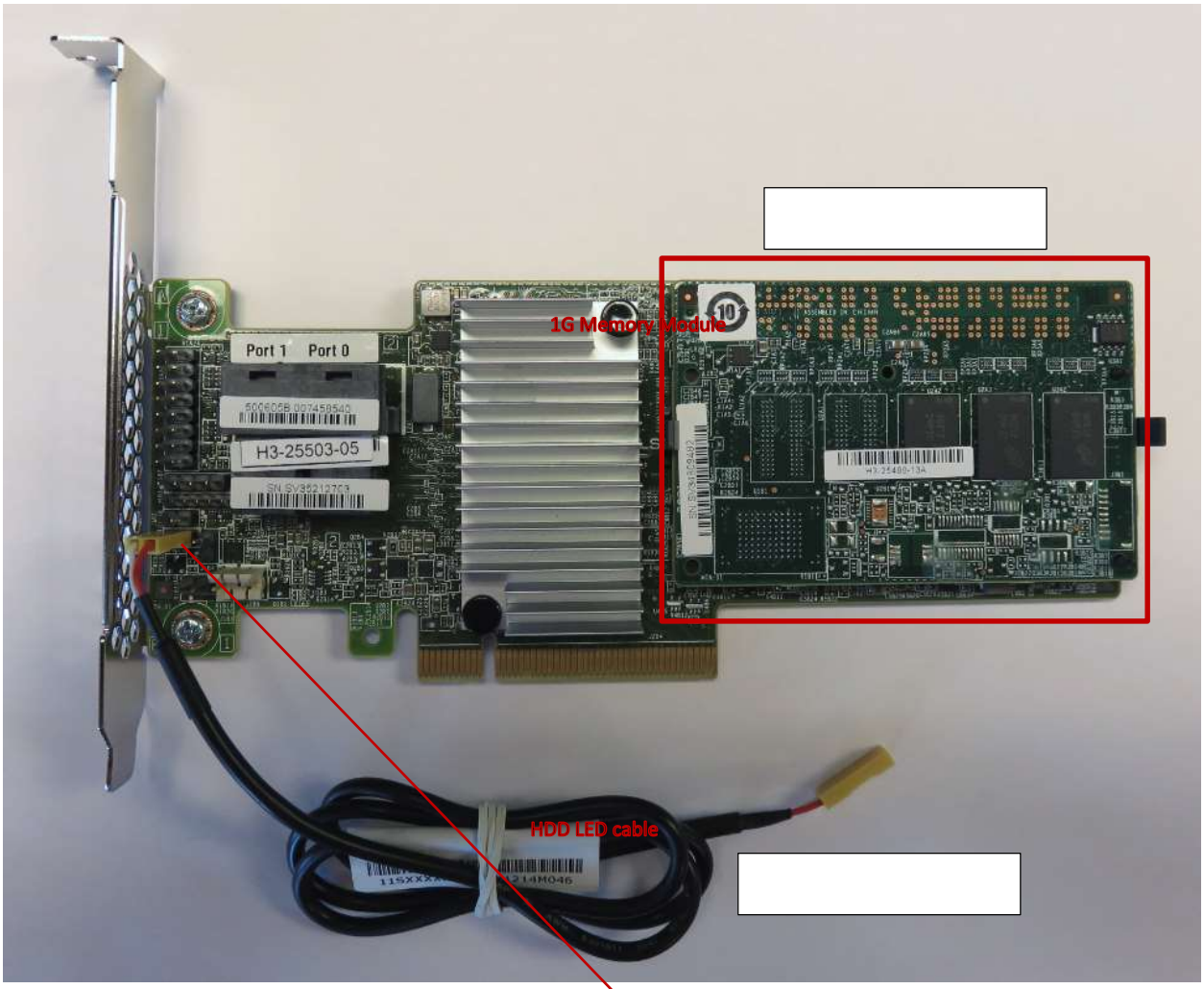
** The Supercap cable plugs directly into the 1G W/Flash Memory Module attached to the LSI adapter.*

*** The HDD LED cable plugs directly into the 2-pin yellow header on the motherboard.*

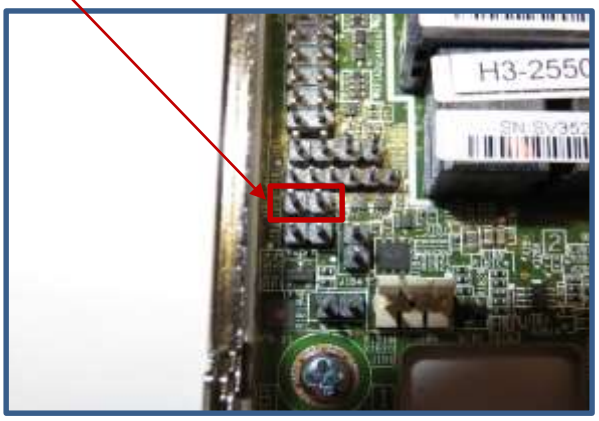


Avago 9364-8i 8-port SATA/SAS ROC Adapter (Base Mode) w/ 1GB DDR Memory Module

PCIe based RAID-on-Card (ROC) adapter used to support SATA and SAS drives via BCA.



** The HDD LED cable plugs directly into the 2-pin yellow header on the motherboard.*

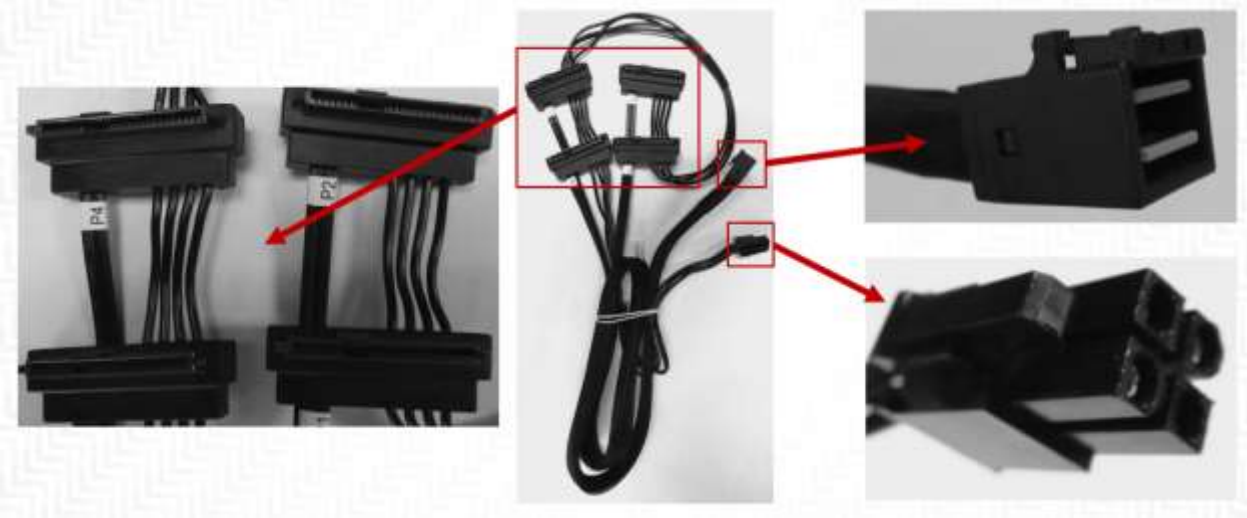


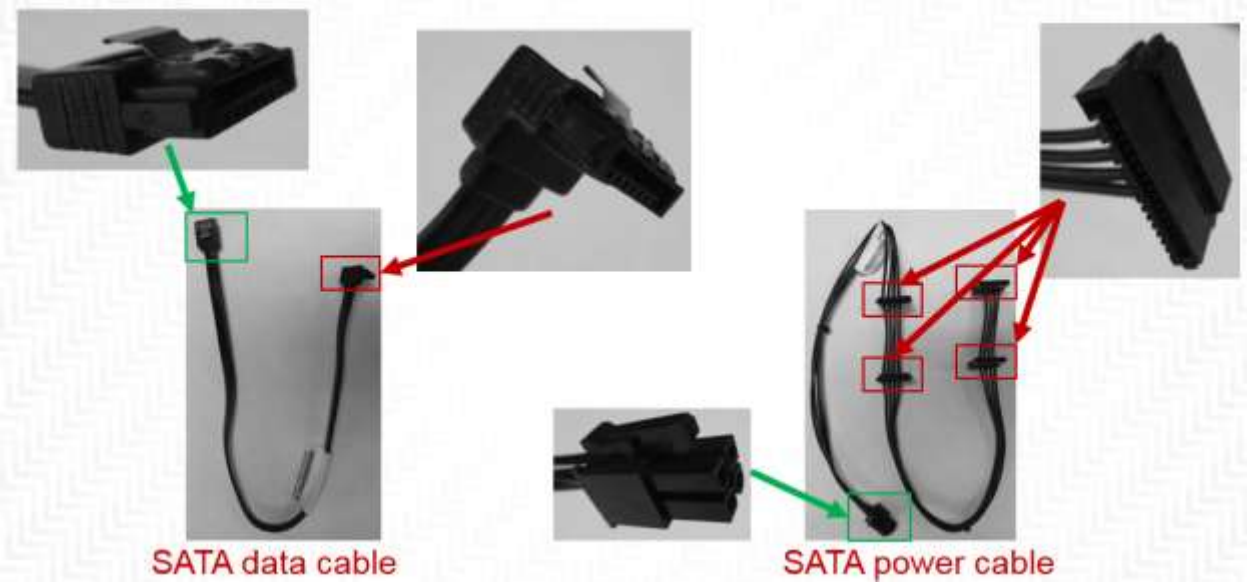
Blind Connect to SATA cable

Blind Connect to SATA cable used to support SATA drives on Intel Onboard Controller via BCA-S for P500/P700.

Avago to HDD manual tray cable

Avago to HDD manual tray cable used to support SATA and SAS drives using Avago controller without BCA's.



Manual HDD Connect Cables

Manual HDD connect cables are used to support SATA drives using Intel onboard SATA controller.