# ThinkStation P500/P510, P700/P710, and P900/P910 How to Create and Configure RAID Arrays

Version 1.1



# **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. Note that P510, P710, and P910 will function in the same way as their predecessors (P500, P700, and P900) when it comes to creating and configuring RAID arrays. Therefore, this document will cover all of these platforms.

# 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.

**NOTE:** This document shows the BIOS screens in Text Mode. P510/710/910 uses a GUI interface for the BIOS setup screens by default. The general structure/layout of the BIOS setup screens in GUI Mode are the same as Text Mode, but will look slightly different.



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



4. Under "Configure S-SATA as", change the setting from "AHCI" to "RAID".

Devices	Lenovo BIOS Setup Utility	
PCH SSAT	A Configuration	
PDH sSATA Configuration sSaTa Controller Configure sSATA as Port 1 Port 2 Port 3 Port 4	(Enabled) [Enabled] [Enabled] [Enabled] Configure sSATA as IDE AHCI RAID	Ide

5. Press F10 key to Save and exit BIOS setup.

 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.



7. Once the RSTe Main Menu loads, select "1: Create RAID Volume" and press ENTER.



- 8. Enter a volume name (if desired) in the "Name" field and press ENTER.
- 9. Use TAB and the arrow keys to select the desired RAID type and press ENTER.
- 10. 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.

	RAID Level:	RAIDO(Stripe) E SELECT DISKS 3	
1D	Drive Hodel	Serial #	Size Status
0	WDC WD5000AAKX-08U6r	WD-WCCZEWN64233	465.76B Non-RAID Disk
2	ST3500413AS	SUNTH1C4	465.7GB Non-RAID Disk
-[1]	Select 2 to 6 di	sks to use in crea	ting the volume.
	J-Preu/Mext [SPACE]-S	electDisk [ENTER]-	Done

- 11. Select desired strip size and press ENTER.
- 12. Select desired capacity and press ENTER.
- 13. Press ENTER to create the volume/array.

Intel(R) Rapid Storage Technology enterprise - s3ATA Option ROM - 4.1.0.1026 Copyright(C) 2003-14 Intel Corporation. All Rights Reserved. CREATE VOLUME MENU 3	
Mane: RAID Level: Disks: Strip Size: Capacity:	Volume® RAID0(Stripe) Select Disks 128KB 804.9 GB Enclose Social
Press ENTER to	C HELP ]

Press "Y" to confirm.

Name: RAID Level: Disks: Strip Size: Capacity:	Volume0 RAID0(Stripe) Select Disks 128KB 884.9 GB
WARNING: ALL DATA Are you sure you	ON SELECTED DISKS WILL BE LOST.
Press ENTER t	to create the specified volume.

14. 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.

	2. Delete RA	ID Volume	3. 4.	Reset Disks to Mon- Exit	RAID
RAID ID 8	Volunes: Nane Volune0	Level RAID0(Stripe)	Strip 120KB	Size Status 884.9GB Normal	Bootable Yes
Physi ID 0 1 2	ical Devices: Device Model WDC WD5000AAKX-0 WDC WD5000AAKX-0 ST3500413AS	Serial # WD-WCC2EWN64233 WD-WCAYUY516613 5VHTH1C4		Size Type/Stat 465.7GB Henber Di 465.7GB Henber Di 465.7GB Non-RAID	<b>us(Vol ID)</b> sk(0) sk(0) Disk

### **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'.

Halp, Devices Advanced Process	Securitur Startup Show a Exit
Primary Doot Requence     Automatic Boot Sequence     Error Boot Sequence	
CSH Boot Hode Boot Priority Quick Boot Boot Up Num-Lock Status Keyboardless Operation Option Keys Display Option Keys Display Style Startup Device Henu Prompt	[Enabled] [Auto] [Legacy First] [Enabled] [On] [Dismbled] [Enabled] [Enabled] [Enabled]

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.

STATUP
ation
(Force #100)
Li esterul
Legacu3 (Legacu3 Storage Leurch

**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".

Devices	Lenovo BIOS Setup Utility	
PCH SAT	A Configuration	
PCH sSATA Configuration		Ide
sSATA Controller	[Enabled]	OF
Port 1 Port 2	[Enabled] [Enabled] [Enabled]	
Port 4	Configure sSATA as IDE AHCI 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.

	Advanced	Lenovo BIOS Setup Utility	
	Intel RSTe sS	ATA Controller	
Intel RSTe 4 Greate RAID	.1.0.1026 sSATA D Volume	river	
Non-RAID Phy Port 0, HDC Port 1, HDC	ISICƏl DİSKS: HD5000AAKX-OBUGAA HD5000AAKX-OB3CA1	0 ND-NCC2ENN64233, 465.768 ND-NCAYUY516613, 465.768	

- 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.

Advanced	Lenovo bios setup offifity
Create RAID	Volume
Create RAID Volume	
Name :	Volumed
TAID Level:	[RAIDO(Stripe)]
HD-HC2ENK64233, 465.768 Port 1, HDC HD5000AAKX-083CA1 HD-HCAYUY516613, 465.768	RAID Level:
Capacity (MB):	0
• Create Volume	
Select at least two disks	

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

Create RAID Volume		
Volume0 [RAIDO(Stripe)]		
[X]		
(X)		
[16KB] 906181		

- 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.

Create RAID	Volume	
Create RAID Volume		
Name :	Volume0	
RAID Level:	[RAIDO(Stripe)]	
Select Disks:		
Port 0, HDC HD5000AAKX-08U6AA0	[X]	
HD-HCU2EWN54233, 465,768 Fort 1 HDC HDS00088KX-083C81	DV1	
HD-RCAYUYS16613, 465.768	Los I	
Strip Size:	(16KB)	
Capacity (MB):	906181	

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

A	dvanced	Lenovo BIOS Setup Utility
I	ntel RSTe sSATA	Controller
Intel RSTe 4.1.0. Create RAID Volume RAID Volumes: Volume0, RAIDO(Str	1026 sSATA Driv -ipe), 884.968,	Normal

17. Save and exit BIOS setup when finished.

### Configuring RAID arrays using the Avago controllers





Legacy BIOS Method – Setting up a RAID array

\*\*\*<u>Note</u>: 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/P510-P700/P710-P900/P910 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".

UD Mgmt	nkStation PD Mgmt	FLEX RAID A Ctrl Mgmt	dapter BI Properti	OS Cor es	nfiguratio	on Utility 5.10-0702
			- Drive M	lanager	ment	PAGE-1
Slot 	Backf Type M SATA 5 SATA	lane Capacity 3.638 TB 3.638 TB	State JBOD JBOD	DG	Vendor ATA ATA	Enclosure Info Vendor: AVAGO Enclosure ID: 62 Enclosure Location: Unknown Enclosure Model: SGPID
F1-Help	F2 Opera	tions <b>P5</b> -Refr	esh Ctrl-	N-Nex	t Page Ctr	-1-P-Prev Page F12-Ctlr

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.

D Mgmt PD	Hymt	Ctrl Mgmt	Properties - Drive Management	DACK A
Slot T	Backi ype	lanc Capacity	Rebuild	rac-1
::05 S	ATA	3.638 TH	Copyback	apport:
				b led tor:
			Place drive Online Place drive Offline	1-7 ×1 Sure Model:
			Make Global HS Remove Hot Spare drive	Sumber:
			Make JBOD	B B B B B B B B B B B B B B B B B B B
			Prepare for Removal	B net ID:
				(GoToPage : 2)

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

UD Mgmt	nkStation PD Mgmt	Ctrl Mgmt	dapter Bl Properti — Drive M	OS Cor es anager	nfiguratio ment	nn Utility 5.10-0702
Slot	Racki Type M SATA 95 SATA	<b>Plane</b> Capacity 3.637 TB 3.637 TB	State UG UG	DG	Vendor ATA	PAGE-1 Secured: No Encryption Capable: No EXM Support: Demabled Connector: Port4-7 x1 Enclosure Model: SSFI0 Slot Number: S Logical Sector Size: 512 B Physical Sector Size: 512 B Physical Sector Size: 512 B Product 1D: WDC WD4060FYYZ-8
Finite	F2-Doopal	Prove Presenter	and Ctal	News	Page 60	(GoToPage:2)

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).

evel:	VD	Pro	tection:	
PD per Sj - Drives	Tune	Size	8 Canable	
t ]:	04 SATA	3.637 TB 3.637 TB	. capable	
- Basic S	Settings -			
Size:	1		Advanced	UK CANCEL

\*\*\*<u>Note</u>: 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.



Initialization complete on VD 0
Οκ

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

\*\*\*<u>Note</u>: 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.

- 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.



 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".

UD Mgmt	PD Mgmt	ELEX RAID A Ctrl Mgmt	dapter Bl Properti - Drive M	US Con es anager	nfiguratio ment	om Utility 5.10-0702
Slot ::01 ::05	Backi Type I SATA SATA	Plane Capacity 3.638 TB 3.638 TB	State JBOD JBOD	DG	Vendor ATA ATA	PAGE=1 Enclosure Info Vendor: AUAGO Enclosure ID: 62 Enclosure Location: Unknown Enclosure Model: SGP10
F1-Help 1	F2 Opera	tions <b>F5</b> -Refr	ash Gtrl-	N-Nex	t Page Cti	1-P-Prev Page F12-Ctir

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.



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



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.

Main Devices Advanced Power	Lenovo BIOS Setup Ut Securaty Startup Se	silitg ive a sxit
Hard Disk Pre-delay Hard Drive Backplone LEDs Lock FADB PCH CRID	[Disabled] [Enabled] [Disabled] [Enabled]	Help Message Manage RAID Controller Configurations.
<ul> <li>ACPI Settings</li> <li>Diagnostics</li> <li>Serial Port Console Redirection</li> <li>PCI Subsystem Settings</li> <li>WHEA Configuration</li> <li>CPU Configuration</li> <li>Hemory Configuration</li> <li>Common RefCode Configuration</li> <li>Intel TXT (LT-SX) Configuration</li> <li>AKT Configuration</li> <li>ISCSI Configuration</li> </ul>	'n	
<ul> <li>Intel(R) Ethernet Connection ()</li> <li>Intel(R) I210 Gigabit Network 44:99:E4:51:28:43</li> <li>Intelp Select It</li> </ul>	em Change Va	alues F9 Setup Defaults

5. Select "Main Menu" and press Enter.

Advanced	www.BIOS Setup Utili	ty
Avado HegaRAID «ThinkStation FLEX RAID Utility - E3.14.09 Help PROPERTIES Status Backplane BBU Enclosure Drives Drive Groups Virtual Drives Vitew Server Profile ACTIONS Configure Set Factory Defaults Update Firmware Silence Alarm	(Optimal) 1 (No) 0 2 0 0	Ion Heip Message Shows menu options such as Configuration Management, Controlier Management, Virtua Orive Management, Drive Management and Hardware Components.
Virtual Drive Operations in Progress	None	÷
F1 Help T1 Select Item ESC Exit ++ Select Menu	+/- Change Values Enter Select⊁Sub-M	E P9 Setup Defaults mu F10 Save and Exit

6. Select "Configuration Management" and press Enter.

		Idvanced	Len	ovo BI	NS Setup Utility		
		На		Help Hessage			
Contr Virtu Drive Hardu	oller Manage al Drive Mar Management are Componen	ment negement its				Displ optio only suppo Creat Drive Creat Drive Unice Unice Unice Unice Group Global	ays configuration ns. Some options appear if the controlier ris them, Options are: e Profile Based Virtual , Create Virtual Drive, e CacheCade Virtual , Make JBOD, Make figured Good, Clear suration, Manage Foreign guration, View Drive Properties and View I Hot Spare Drives.
F1 ESC	Help Help	Select Select	Item Henu	ez-: Enter	Change Values Select⊨Sub-Menu	F9 F10	Setup Defaults Save and Exit

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.

		Adv	anced	l	enovo BI	OS Setup Utility		
		c	onfigurat	Lon Har	agement			Help Hessage
Make U	nconfig Config	ured G					Delet confi contr	es all existing gurations on the RAID oller.
F1 1	Help Fx1t	71	Select	Item	*/-	Change Values	1	Setup Defaults

Select the "Confirm [Disabled]" option and press Enter.

			and the second sec	Lenovo B1	OS Setup Utility		
		Adv	/anced	Construction of the second	where the effective setting the		
							Heip Message
Clea all Spar cont Are the	of the V of the V re Drives troller, you sure configur	uration /irtual i attach : you we ration?	n will delete Drives and Hot ned to this ant to clear				
Yes	Alem .			(Diseb			
► No							
	Helo	-	Salact Itam		Objects Helices		Onton Performance
	Exit	-	Select Menu	Enter	Select⊁Sub-Menu	ELC.	Save and Exit

Select "Enabled" and press Enter.

Advan	ced	enovo BI	05 Setup Utility		
Clear Configuration w all of the Virtual Dr Spare Drives attached controller. Are you sure you want the configuration? Contine Yes No	till delete ives and Hot to this to clear	DIS	Confirm abled		Heip Message
F1 Help TA E0C Exit ++	Select Item	4/-	Change Values	79	Setup Defaults

Select "Yes" and press Enter.

	1	enovo BI	05 Setup Utility		
Md	Zanced	_		_	
					Help Message
Clear Configuration all of the Virtual Spare Drives attack controller. Are you sure you w the configuration?	n will delete Drives and Hot hed to this ant to clear				
Confirm No		[Enabl	ed)		
Fi Help 11 EBC Exit ++	Select Item Select Menu	+/- Enter	Change Values Select⊨Sub-Menu	F9 E10	Setup Defaults Save and Exit

Select "Ok" at the Success screen and press Enter.

Rd	vanced	enovo BI	OS Setup Utility		
	Success				Help Message
The operation has successfully.	been performed				
F1 Help 14 ESC Exit ++	Select Item Select Menu	+/- Enter	Change Values Select⊳Sub-Menu	F9 F10	Setup Defaults Save and Exit

8. Select "Make Unconfigured Good" and press Enter.

	nds	vanced	Lenavo BI	as Setup Utility		
	(	Configuration Man	nagement			Help Message
Clear Conf	igurat ior				Allou the d uncon	s changing the state of rive from JBOD to figured good.
F1 Help ESC Exit	11 +++	Select Item Select Menu	+/- Enter	Change Values Select⊳Sub-Menu	F9 F10	Setup Defaults Save and Exit

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



Advanced.	ity
Make Unconfigured Good	Help Hessage
One or more JBDD drives have been detected in the system. Only Unconfigured Good drives can be used in a configuration. Please select the JBDD drives you would like to convert to Unconfigured Good drives from the list below. Maximum Allowed Unconfigured Good 32 Drives Only Port 4 = 7:00:05: NDD, SATA: 3:638TB. Eligible Disabled	JB00 (Bootable), (5128)
Select D Unconfigured Good	
Drive Port 4 - 7:00:04: HDD. [Disabled] SATA, 3.638TB, JBOD. (5128) - OK Cancel	
1 Help 11 Select Item +/- Change Value	s F9 Setup Defaults

10. Select "OK" and press Enter.

Advanced	enovo BIOS Setup Util	lity
Make Unconfigure	ed Good	Help Message
One or more JBOD drives have been detected in the system. Only Unconfigured Good drives can be used in a configuration. Please select the JBOD drives you would like to convert to Unconfigured Good drives from the list below. Maximum Allowed Unconfigured Good Drives Eligible JBOD Drives for Conversion Select Drives To Make Unconfigured Good Drive Port 4 - 7:00:05: HDD. SATA. 3.638TB. JBOD (Bootable). (Si28) Drive Port 4 - 7:00:04: HDD. SATA. 3.638TB. JBOD, (Si2B)	32 2 [Enabled] [Enabled]	Allows the user to commit to the changes.
Fi Help Ti Select Item ESC Exit ++ Select Menu	•/- Change Value Enter Select+Sub-+	es F9 Setup Defaults Henu F10 Save and Exit

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

	Adva	nced.	Lenovo BI	05 Setup Utility		
		Success				Help Hessage
If you h the driv Are you Ves ▶ No	ave any exis e, the data sure you wan	ting data in will be lost, t to proceed?	TO 1 S IN	Confirm		
			Ena	abled		
F1 He ESC EX	in H	Select Item Select Henu	Enter	Change Values Select Sub-Menu	F9 F10	Setup Defaults Save and Exit

12. Select "OK" at the Success screen and press Enter.

	Advanced	enovo BI	OS Setup Utility		
	Success				Help Hessage
The operation ha successfully.	s been performed				
FL Help T ESC Exit	Select Item Select Menu	+/- Enter	Change Values Select⊨Sub-Menu	E9 510	Setup Defaults Save and Exit

13. Select "Create Virtual Drive" and press Enter.

	Adv	anced		enovo BI	OS Setup Utility		
	0	configura	tion Har	nagement			Help Message
<ul> <li>Create VII</li> <li>Create Pro</li> <li>Make JB00</li> <li>Clear Cont</li> </ul>	figuration	d Virtua	1 Drive			Creat selec drive param	es a virtual drive by ting the RAID level, s. and virtual drive eters.
Fi Help CSC Exit	11 ++	Select Select	Item Menu	+/- Enter	Change Values Select•Sub-Henu	F9 F10	Setup Defaults Save and Exit

14. Highlight "Select RAID Level" and press Enter to show the list of supported RAID types. Choose the desired type and press Enter.

\*\*\*<u>Note</u>: The available RAID types will vary based on drive configuration.

**Advanced** Create Virtual Drive Help Message Save Configuration Selects the desired RAID level. The RAID levels that can be configured are 0, 1, 5 Secure Virtual Drive [Disabled] Protect Virtual Drive [Disabled] 6 (if supported), 10, 50, and Select Drives From [Unconfigured Capacity] 60 (if supported). Select Drives RAID 0 -- uses drive striping to provide high data CONFIGURE VIRTUAL DRIVE PARAMETERS: throughput, especially for Virtual Drive Name large files in an environment Select RAID Level Virtual Drive Size RAIDO that requires no data Virtual Drive Size Unit RAID1 redundancy. Strip Size RAID 1 -- uses drive mirroring Read Policy [No Read Ahead] so that data written to one Write Policy [Write Through] drive is simultaneously I/O Policy [Direct] written to another drive, RAID Access Policy [Read/Write] 1 is good for small databases Drive Cache [Unchanged] or other applications that Disable Background Initialization [NO] require small capacity and Default Initialization [NO] complete data redundancy. Emulation Type (Default) RAID 5 -- uses drive striping Save Configuration and parity data across all Select Item Setup Defaults Change Values Select⊫Gub-Menu ----

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

Advanced	Lenovo BIOS Setup Utility	
Create Vir	tual Drive	Help Message
<ul> <li>Save Configuration</li> <li>Select RAID Level</li> <li>Secure Virtual Drive</li> <li>Protect Virtual Drive</li> <li>Select Drives From</li> </ul>	[RAID1] [Disabled] [Disabled] [Unconfigured Capacity]	Dynamically updates to displa as Select Drives or Select Drive Group based on the selection made in Select Drives From.
CONFIGURE VIRTUAL DRIVE PARAME Virtual Drive Name Virtual Drive Size Virtual Drive Size Unit Strip Size Read Policy Write Policy I/O Policy Access Policy Drive Cache Disable Background Initializat Default Initialization Emulation Type Save Configuration	TERS: (G8) [64 KB] [No Read Ahead] [Write Through] [Direct] [Read/Write] [Unchanged] ion [No] [Default]	
F1 Help 14 Select it	em +/- Change Values	F9 Setup Defaults

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

Eenovo BIOS Setup Utility	
Select Drives	Heip Message
Apply Changes Select Interface Type (Both) Logical Sector Size (Both) CHOOSE UNCONFIGURED DRIVES: Drive Port 4 - 7:00:04: HDD, (Disabled) SATA, 3.638TB, Unconfigured Good, (S128) Drive Port 4 - 7:00:05: HDD, SATA, 3.638TB, Unconfigured Good, (S128) Check All Uncheck All Apply Changes	Displays the possible media types, such as MOD and SSD.
Fi Help 14 Select Item +/- Change Values ESC Exit ++ Select Menu Enter Select+Sub-Menu	F9 Setup Defaults F10 Save and Exit

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.

Select	Drives	Help Message
Apply Changes Select Media Type Select Interface Type Logical Sector Size	[Both] [Both] [Both]	
CHOOSE UNCONFIGURED DRIVES:		
Drive P Disabled	00:04: MDD, SATA, 3.638TB, Uncon	figured Good, (5128) ——
Drive P SATA, 0 (5128) Check All	00:04: HUD, SATA, 3.638TB, Uncon	figured Good, (S128)
Drive f SATA, 5 (S128) Check All Apply Changes	00:04: HUD, SATA, 3,638TB, Uncon	figured Good, (5128)
Drive f SATA, 3 (S128) Check All Uncheck All Apply Changes	00:04: HUD, SATA, 3,638TB, Uncon	figured Good, (5128)
Onive P SATA, 3 (S128) Check All Uncheck All Apply Changes	00:04: MDD, SATA, 3,638TB, Uncon	figured Good, (5128)

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

Advanced	Lenovo BIOS Setup Ut	11119
Select	Drives	Help Message
<ul> <li>Apply Changes Select Media Type Select Interface Type Logical Sector Size</li> </ul>	(Both) (Both) (Both)	Submits the changes made to the entire form.
CHOOSE UNCONFIGURED DRIVES: Drive Port 4 - 7:00:04: HDD, SATA, 3.638TB, Unconfigured Go (512B)	[Enabled]	
Drive Port 4 - 7:00:05: HDD, SATA, 3.638TB, Unconfigured Go (512B) Check All Uncheck All	[Enabled] od,	
Fi Help 14 Select It ESC Exit 44 Select Me	em <del>4∕-</del> Change Val nu Enter Select⊧Sub	Lues F9 Setup Defaults 3-Menu F10 Save and Exit

19. Press Enter again to confirm.

	ndv	vanced	Lenovo BI	OS Setup Utility		
		Success				Help Message
The operat successful	ion has t ly.	been performed				
F1 Help	11 ++	Select Item Select Manu	4/- Enter	Change Values	F9 F10	Setup Defaults

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.

Advanced	Lenovo BIOS Setup Utility			
Create Virtu	Create Virtual Drive			
<ul> <li>Save Configuration Select RAID Level Secure Virtual Drive Protect Virtual Drive Select Drives From</li> <li>Select Drives</li> <li>COMETOURS VIETNAL DELCE DEPORTS</li> </ul>	[RAID1] [Disabled] [Disabled] [Unconfigured Capacity]	Submits the changes made to the entire form and creates a virtual drive with the specified parameters.		
Virtual Drive Name Virtual Drive Name Virtual Drive Size Virtual Drive Size Virtual Drive Size Unit Strip Size Read Policy Write Policy Nrite Policy Access Policy Drive Cache Disable Background Initialization Default Initialization Emulsion Type	3.630 [T0] [64 KD] [No Read Ahead] [Hrite Through] [Direct] [Read/Hrite] [Unchanged] n. [No] [Full] [Default]			
P1 Help 14 Select Item ESC Exit ++ Select Menu	•/- Change Values Enter Select►Sub-Menu	F9 Setup Defaults F10 Save and Exit		

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

	Adv	/anced	Lenovo BI	OS Setup Utili	ty	
		Success				Help Message
Creating V cause the Drives to Are you su with this	data on t data on t be permar re you we operation	lves will the associated aently deleted. ant to continue a?				
Tes No			Dis	Confirm abled bled		

23. Highlight "Yes" and press Enter.

Lenava BIOS Set	ap Utility
Success	Heip Message
Creating Virtual Drives will cause the data on the associated Drives to be permanently deleted. Are you sure you want to continue with this operation? Confirm [Enabled] No	Heid Heisege
Fi Help 14 Select Item +/- Chang ESC Exit ++ Select Menu Enter Selec	e Values FS Setup Defaults t•Sub-Menu Pl0 Save and Exit

24. At the Success menu, press Enter.



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

	Advanced		enovo BI	OS Setup Utility		
	Create	virtual	Drive			Help Message
Virtual Drive successful. 4 space has bee	s creation was All free conf en used.	i igurable				
EL Help ESC Exit	11 Sele Sele	ct Item ct Henu	+/- Enter	Change Values Select⊨Sub-Menu	FS F10	Setup Defaults Save and Exit

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.

\*\*\*<u>Note</u>: 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/P510-P700/P710-P900/P910 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.

Main Devices Advanced Rower	Lenovo BIOS Setup Utility Security Startup Save &	9 EX11
Hard Disk Pre-délay Hard Drive Backplane LEDs Lock FADB FCH CRID ACPI Settings Diagnostics Serial Port Console Redirection	[Disabled] [Enabled] [Disabled] [Enabled]	Help Message Manage RAID Controller Configurations.
<ul> <li>PCI Subsystem Settings</li> <li>WHEA Configuration</li> <li>CPU Configuration</li> <li>Hemory Configuration</li> <li>Common RefCode Configuration</li> <li>IIO Configuration</li> <li>IIIO Configuration</li> <li>ANT Configuration</li> <li>ANT Configuration</li> </ul>	X KAID Adaptery	
Intel(R) Ethernet Connection (2   Intel(R) 1210 Gigabit Network 44:39:04:51:28:43    Help 11 Select Ite ESC Exit ↔ Select Men	) I218-LH - 44:39:C4:51:28: Connection - m +/- Change Values u Enter Select+Sub-Her	42 F9 Setup Defaults nu F10 Save and Exit

5. Select "Main Menu" and press Enter.

Advanced	www.BIOS Setup Uti	tity.	
Avado HegaRAID «ThinkStation FLEX RAID Utility - E3.14.09 Help PROPERTIES Status Backplane BBU Enclosure Drives Drive Groups Virtual Drives Virtual Drives Virtual Drives Stations Set Factory Defaults Update Firmware Silence Alarm	(Optimal) 1 (No) 2 0	Shows m Configu Control Drive H Hanagem Compone	Help Message enu options such as ration Management, ier Management, Virtua anagement, Drive ent and Hardware nts.
Virtual Drive Operations in Progress	None		
F1 Help T1 Select Item ESC Exit ++ Select Menu	t/- Change Val Enter Select>Sub	ies F9 -Menu F10	Setup Defaults Save and Exit

6. Select "Configuration Management" and press Enter.

		Idvanced	Len	ovo BI	NS Setup Utility		
		На	in Henú				Help Message
Contr Virtu Drive Hardu	oller Manage al Drive Mar Management are Componen	ment negement its				Displ optio only suppo Creat Drive Creat Drive Creat Uncom confis Confis Group Global	ays configuration ns. Some options appear if the controlier ris them, Options are: e Profile Based Virtual , Create Virtual Drive, e CacheCade Virtual , Make JBOD, Make figured Good, Clear suration, Manage Foreign guration, View Drive Properties and View I Hot Spare Drives.
F1 ESC	Help Help	Select Select	Item Henu	ez-: Enter	Change Values Select⊨Sub-Menu	F9 F10	Setup Defaults Save and Exit

### 7. Select "Make JBOD".

\*\*\*<u>Note</u>: If drives are already in "JBOD" mode, the "Make JBOD" option will not be listed here.

		enovo B1	OS Setup Utility		
	Advanced				
	Configuration Mar	agement			Help Message
<ul> <li>Create Vir uni D</li> <li>Create Profile B</li> <li>Make JBOD</li> <li>Clear Configurat</li> </ul>	ion			Creat selec drive paramo	es a virtual drive by ting the RAID level. s. and virtual drive eters.
F1 Help 11 CSC Exit +4	Select Item Select Menu	+/- Enter	Change Values Select⊳Sub-Menu	F3 610	Setup Defaults Save and Exit

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

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. Note that the images for P500, P700, and P900 also apply to P510, P710, and P910, respectively.











#### **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

<image>

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.

