Storage Configurator

Lenovo ThinkStation P360 Tower, Ultra, Tiny





Contents

Overview	3
Considerations	4
Section 1 – Installing NVMe Devices in the P360 Tower	5
Section 2 – Installing NVMe Devices in the P360 Ultra	.10
Section 3 – Installing NVMe Devices in the P360 Tiny	.14
Section 4 – Installing HDDs/SSDs in the P360 Tower	.16
Section 5 – Installing HDDs in the P360 Ultra	.18
Section 6 – Configuring RAID	.22
Section 5 – Document Revision History	.32

Overview

The purpose of this document is to provide guidelines for users on how to optimally configure the system storage in the ThinkStation P360 series platform to insure proper functionality.

The P360 Tiny utilizes up to two NVMe M.2 SSD drives and has an onboard RAID controller.

When there are two M.2 SSDs in the system, the P360 Tiny can support RAID 0 or 1. The RAID option will only be available or shown for selection if the system detects two M.2 SSDs.

The P360 Ultra utilizes up to two NVMe M.2 SSD drives and a single 2.5" SATA drive and has an onboard RAID controller.

When there are two M.2 SSDs in the system the P360 Ultra can support RAID 0 or 1. The RAID option will only be available or shown for selection if the system detects two M.2 SSDs.

The P360 Tower utilizes both 2.5" and 3.5" SATA HDDs as well as NVMe M.2 SSDs with an on-board RAID controller for both drive types. In the Tower chassis, there are a maximum of four SATA drive locations and three NVMe drive locations for a potential total of up to seven drives that can physically be installed in the system. A maximum of two 3.5" SATA HDDs are supported simultaneously, while up to four 2.5" SATA HDDs are supported simultaneously.

When the appropriate number of drives are present in the system, the P360 Tower can support RAID 0, 1, 5, or 10 for the SATA drives and RAID 0 or 1 for the M.2 drives. A given RAID level will only be available or shown for selection if the system detects enough of the appropriate drives to support it.

RAID configurations for the systems are discussed in Section 3.

Considerations

General:

- A given array should not mix drive types or logical sizes. Mixing drive brands does not pose any issues so long as the brands share the same Lenovo part numbers.
- Each RAID level requires a certain minimum and or maximum number of drives. If altering the system storage devices after purchase or a previous configuration, it will be necessary to verify the proper types and number of devices for a desired RAID configuration have been installed. Altering or creating an array will require any existing OS to be reinstalled.

P360 Tower:

- The P360 Tower has on-board RAID support for both the NVMe M.2 drives and SATA drives. At the time of writing there are no add-in RAID controllers certified to work on this system.
- The ability to maximize the number of M.2 drives is dependent upon using a single optional NVMe M.2 PCIe Add In Card (AIC), and the two on-board NVMe M.2 slots.
- The ability to maximize the number of SATA hard drives (HDDs) is dependent upon using a Flex Bay or Front-Access Storage Enclosure (FASE) and optional storage drive cage. For more information see Section 2. Use of 125W CPUs require a larger fan and heat sink that will limit the system to a maximum of three SATA HDDs. The larger fan and heat sink will block the installation of the fourth HDD bay. Additionally, the use of four SATA HDDs will utilize all the available SATA ports on the motherboard. The system cannot be configured with an optical disk drive (ODD) when using four SATA HDDs.
- Although the system can support various configurations of NVMe and SATA drives, care should be given when selecting drives based on the types of RAID arrays that are desired.
 - Only one additional M.2 can be added to the two onboard M.2 slots using an AIC. This card can only be used in PCIe Slot 3. The PCIe M.2 adapter is limited to Gen 3 specifications while the onboard M.2 slots are Gen 4. See Section 2 for slot identification. The single M.2 Add In Card is only capable of Gen 3 speeds, even if Gen 4 drives are used. Only drives in the two onboard Gen 4 M.2 slots can be utilized together in a RAID configuration.



Section 1 – Installing NVMe Devices in the P360 Tower

Please make sure the NVMe devices are installed into the following locations on the ThinkStation P360 Tower motherboard seen below. The NVMe drives may use the dedicated Gen 4 capable onboard M.2 slots, as seen in the image below, or use one M.2 NVMe drive in a Gen 3 limited PCIe M.2 AIC in PCIe slot 3.



For M.2 NVMe drives in the onboard M.2 slots:

1. Remove the film that covers the thermal pad on the bracket, if any. Then, install the M.2 solid-state drive by sliding the drive in the bracket.



2. Remove the film that covers the thermal pad at the bottom of the heat sink, if any. Then, install the heat sink onto the M.2 drive in the bracket.



3. Install the heat sink with the bracket into the system.



4. Insert the stopper.





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For M.2 NVMe drives installed in the Add-in Card:

1. Ensure that a thermal pad is placed in position on the M.2 solid-state drive PCIe adapter.



2. Pull the retention latch outward on the M.2 solid-state drive adapter.



3. Hold the new drive by its edges so as not to touch the circuit board and ensure that the circuit board side is facing upward. Align the notch in the new M.2 NVMe drive with the slot key in the M.2 slot. Insert the plug of the retention latch into the hole to secure the new drive.



Section 2 – Installing NVMe Devices in the P360 Ultra

Please make sure the NVMe devices are installed into the following locations on the ThinkStation P360 Ultra motherboard seen below. Both NVMe slots are Gen 4 capable. When opening the chassis the NVMe slots are on the top of the double sided motherboard. There will be a heat sink in place that needs to be removed to access the slots. The steps to access the M.2 slots are outlined in thie section.



Access the onboard M.2 NVMe slots:

1. Power down the system. Remove the power cable and all attached devices and cables from the system. Locate the chassis opening lever on the back of the system. Push in one side of the lever and pull on the extended lever.



2. While pulling on the lever, hold the chassis body in place until the motherboard assembly slides out of the chassis shell.



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- 3. The NVMe M.2 heat sink is now accessible as seen in the image below. To remove the heat sink, squeeze the locking handle and pull up on the heat sink.



4. Reverse the steps to reassemble the system.

Remove and install the onboard M.2 NVMe drives:

1. To remove a drive, pull up on the retaining plunger for the M.2. It may be necessary to gently pull up on the drive to free it from the heat sink pad underneath. When the drive is free, pull it sideways away from the slot as seen in step 2 below.





2. Reverse the steps to install a drive.

Section 3 – Installing NVMe Devices in the P360 Tiny

There are only two Gen 4 M.2 slots in the P360 Tiny. No other drives can be added to the system. The steps to access to these M.2 slots is explained in this section.

Accessing the M.2 drives:

- 1. Disconnect the power and all connected devices.
- 2. Remove the rear screw, (1) in the image.
- 3. Slide the cover forward and lift to remove it (2).



4. Turn the system over and slide the bottom plate towards the front of the system.



Removal and installation of the M.2 drives:

1. Locate the M.2 drive(s) and remove the retention latch(es).



2. With the retention latch removed the M.2 SSD should lift slightly. If it remains attached to the heat sink pad underneath it, pull up on it gently until it is free of the pad. Slowly slide the M.2 horizontally away from the M.2 slot. To install the M.2 drive(s), reverse the procedure.



3. Reverse steps 1-4 of "Accessing the M.2 drives" to reassemble the system.

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Section 4 – Installing HDDs/SSDs in the P360 Tower

The ThinkStation P360 can hold a maximum of four SATA HDDs/SSDs. The P360 motherboard has four SATA port connections, labelled SATA1, SATA2, SATA3, and SATA4 in the order they show up in the system BIOS. A DVD-ROM installed in the system will utilize one of the SATA ports and limit the system to a maximum of three SATA HDDs/SSDs.



P360 Tower





1 – Flex bay (optional) to install a 3.5" secondary storage drive cage or a 3.5" front-access storage enclosure (FASE)

- 2-2.5" secondary (optional) storage drive cage
- 3 Two M.2 solid-state drive slots
- 4 3.5" primary storage drive cage
- 5-2.5" secondary (optional) storage drive cage
- 6 Slot 3 for additional M.2 solid-state drive

Note: When adding additional drives after purchase, additional parts will likely be required such as, Add-In-Cards, enclosures, and cables.

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Section 5 – Installing HDDs in the P360 Ultra

The P360 Ultra supports one 2.5" SATA drive. Adding a SATA drive into a P360 Ultra will require additional parts and cables.



Accessing the SATA HDD:

1. Power down the system. Remove the power cable and all attached devices and cables from the system. Locate the chassis opening lever on the back of the system. Push in one side of the lever and pull on the extended lever.



2. While pulling on the lever, hold the chassis body in place until the motherboard assembly slides out of the chassis shell.



3. The NVMe M.2 heat sink is now accessible as seen in the image below. If it is necessary to install or remove the SATA cable from the motherboard it is necessary to remove the M.2 heatsink to access the motherboard SATA port. To remove the heat sink, squeeze the locking handle and pull up on the heat sink.



4. Reverse the steps to reassemble the system.

Remove and install the onboard M.2 NVMe drives:

1. To remove the drive, remove the drive plugs, then squeeze the locking handle and pull up on the drive carrier. When the carrier is free, remove it from the system and turn it over.



2. Gently stretch the drive carrier apart until the drive comes loose from the screw hole pins. Lift the drive up and out of the carrier.



3. Reverse the steps to install a new drive.

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Section 6 – Configuring RAID

Please refer to the following steps to configure RAID for both NVMe and SATA drives. Examples may show configurations that are not possible on all systems.

1. Boot into the BIOS by pressing the function F1 key at the "Lenovo" splash screen.



Sta	rt Menu	> System Time & Machine Type a	Date and Model		300000AAAA			
~	Mar I	System Brand I	D		P360			
uu 谷	Devices	System Se Asset Tag	General He	elp				
*	Advanced	System UL	Arrows	: Move Betwee	n Options	3-B8BC-436C7A	A62200	
Ο	Power	Ethernet N	Enter +/-	: Select>Sub-N : Change Value	lenu			
æ	Security	ME Firmwa	ESC E1	: Exit				
1	Startup	Embedded	F9	: Setup Defaul	ts			
5	Evit	BIOS Revi:	P10	: Save and Exit	-			
4	EXIL	Boot Block		Ok	_			
		BIOS Date (,,					
-	_	Preinstalled OS	License		Not Defined			
L	enovo	OA3 License Ke	y ID		NO DPK			
10 8		Language			English		~	

2. Select "System Summary" and scroll down to verify BIOS is recognizing all the drives installed in the system.



<u>Note</u>: From this point forward, the examples will utilize the M.2 NVMe drives. The process is the same for both drive types.

3. Select the "Devices" menu at the BIOS main screen setup utility and then select "ATA Drive Setup".

	Select this option to configure your system's USB port. ATA Drive Setup Select this option to configure your system's ATA drive		
tart Menu	> Video Setup		
A Mala	Select this option to configure your system's video.		
	> Audio Setup		
	Select this option to configure your system's audio.		
R Advanced	> Network Setup		
D Power	Select this option to configure your system's network.		
Security	> PCI Express Configuration		
Startup			
→ Exit	Bluetooth	Enabled	~
	[Enabled] Enables use of Bluetooth. [Disabled] Disables use of Bluetooth. Bluetooth will not be av	allable in OS.	
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AN ALLOW		-	

4. In the "ATA Drive Setup" menu, select "Configure SATA as" and change or verify the option is set to "RAID".

Start Menu	ATA Drive Setup SATA Controller Select whether to enable or disable SATA controller. SATA Drive 1 Select whether to enable or disable SATA drive 1.		Enabled V	
Main				
* Advanced	Configure SATA as		AHCI	~
O Power	Select AHCI/RAID Mode. NOTE:	Select AHCI/RAID Mode. NOTE:		
C Security	Device driver support is required for AHCI or RAID. Depending on how the hard disk image was installed, changing this setting may reveal the system from booting.		RAID	
💪 Startup	Hard Disk Pre-delay	Hard Disk Pre-delay		
[→ Exit	Adds a delay before the first acc Some hard disks hang if accesse This delay ensures the hard disk being accessed.	zess of a hard disk by the system software. d before they have initialized themselves. has initialized after power up, prior to		
Lenovo				
El Hele	1L Select Item	+/- Change Values	F9	Setup Defaults

<u>Notes</u>: In order to secure erase any drives, the 'Configure SATA as' option must be set to 'AHCI' mode.

The "Intel(R) RST with Intel (R) Optane" option utilizes an Optane device for RAID cache, but only when an Intel Optane device is present in the system.

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5. When selecting to enable RAID the system will prompt a warning that changing the setting may result in the failure of the system to boot. Select "Yes" to continue.

tart Menu	ATA Drive Setup SATA Controller Select whether to enable or disat SATA Drive 1	sle 5ATA controller.	Enabled	* *
	Select whet Configure Select AHCL NOTE: Device drive may preven Hard Disk Adds a dela Some hard This delay e being acceste	e do not disable SATA drives in RAID Otherwise you may not boot the n due to the failure of RAID on. u really want to continue?	AHCI	× ×
FI Help SC Exit	14 Select Item ♦€ Select Menu	+/- Change Values Enter Select > Sub-Menu	F9 Setup Defaults F10 Save and Exit	

6. Press F10 to save and Exit BIOS setup.

Start Menu	ATA Drive Setup SATA Controller Select whether to enable or disable SATA controller.	Enabled	*
A Main	SATA Drive 1	Enabled	~
40 Devices	Select whet	35	
Advanced Power Sociulty	Configure Select AHCL, NOTE: Device drive Depending 4	AHCI	¥
🔬 Startup	may prevent Hard Disk	Disabled	~
E Exit	Adds a dela Some hard d This delay e being acceste	No	
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7. As the system reboots, press the function F1 key at the Lenovo splash screen to enter the BIOS setup. Select the "Devices" menu at the BIOS main screen setup utility and then "Intel(R) Rapid Storage Technology".

⊖ Exit	Select to see more information about the disk Hard Disk Pre-delay	Disabled	
彩 Advanced ① Power 合 Security ふ Startup	Configure SATA as Select AHCI/RAID Mode. NOTE Device driver support is required for AHCI or RAID. Depending on how the hard disk image was installed, changing this set may prevent the system from booting.	RAID	×
Start Menu Gi Main	SATA Controller Select whether to enable or disable SATA controller. SATA Drive 1 Select whether to enable or disable SATA drive 1.	Enabled	* *

8. Verify all the desired drives are available.

	Intel(R) Rapid Storage Technology Intel(R) RST 19.0.5.5560 RST VMD Driver	
Start Menu	A Crosts BATD Volume	
🛱 Main	This page allows you to create a RAID volume	
A Devices		
# Advanced		
O Power		
🕂 Security		
🚣 Startup		
🗗 Exit	NOn-HALD Physical Disks: List of physical disks on the system that are not part of a recognized RAID Yolume	
	PCIe 1.0, KXG7APNV2T04 LA KIOXIA 814C305FELW4, 1.8TB Select to see more information about the disk	
	> PCIe 2.0, KXG7APNV2T04 LA KIOXIA 814C306BELW4, 1.8TB	
Lenovo	Select to see more information about the disk	

9. If all the disks installed are not shown as available, it may be necessary to clear any previous data from the disks. If no arrays have been created previously but there is an existing volume shown, it will be necessary to delete any previous arrays. Advance to step 16 to complete the process to delete any arrays. Return and proceed to step 11 once the desired drives are available.

10. Select "Create RAID Volume".

20		Intel(R) RST 19.0.5.5560 RST	VMD Driver			
Sta	rt Menu	> Create RAID Volume				
ଲ	Main	This page allows you to create a R	AID volume			
49	Devices					
*	Advanced					
O	Power					
₼	Security					
ż.	Startup					
5	5-3	Non-RAID Physical Disks:				
17	EXIC	List of physical disks on the system Volume	n that are not part of	a recognized RAID		
		> PCIe 1.0, KXG7APNV2T04 LA	KIOXIA 814C305F	ELW4, 1.8TB		
-		Select to see more information ab	out the disk			
L	enovo	> PCIe 2.0, KXG7APNV2T04 LA	KIOXIA 814C306E	BELW4, 1.8TB		
_		Select to see more information ab	out the disk			
1.1	Hale	The Salact Item		Change Valuer	CO. Cature	Defaulte

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11. Choose a name for the volume.

tart Menu	Create RAID Volume Create RAID Volume	
유 Main 양 Devices	Name: Enter a unique volume name that has no special characters and is 16 characters or less.	Volume1
क्स Advanced D Power मु Security	RAID Level: Select RAID Level	RAIDO (Stripe)
🛵 Startup	Select Disks:	
Startup → Exit	Select Disks: Select Disks: PCIe 1.0, KXG7APNV2T04 LA KIOXIA 814C305FELW4, 1.8TB X - to Select Disk	v
	Select Disks: Select Disks: PCIe 1.0, KXG7APNV2T04 LA KIOXIA 814C305FELW4, 1.8TB X - to Select Disk PCIe 2.0, KXG7APNV2T04 LA KIOXIA 814C306BELW4, 1.8TB X - to Select Disk	✓ ✓

12. Select the drop-down box for "RAID Level" and select the desired RAID level. The RAID level options displayed are based on the type and number of drives available in the system.

Start Menu	Create RAID Volume Create RAID Volume	
유 Main 谷 Devices	Name: Enter a unique volume name that has no special characters and is 16 characters or less.	Volume1
Advanced Power	RAID Level: Select RAID Level	RAID0 (Stripe)
 Startup Exit 	Select Disks: Select Disks: Prior 1:0: KYCZADNW2TO4 I A KIOYIA 814/2055EEI W4: 1:87B	
Lenovo	X- to Select Disk	v
F1 Help	1↓ Select Item +/- Change Values	F9 Setup Defaults

28

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- 13. On the same page, select the drop-down box for each drive and select "X" to add the drive to the array. Once all the required drives are added, select "Create Volume".

	RAID Level: Select RAID Level	RAID1 (Mirror)
Start Menu	Select Disks: Select Disks:	
A Main	PCIe 1.0, KXG7APNV2T04 LA KIOXIA 814C305FELW4, 1.8TB X - to Select Disk	X 🗸
* Advanced	PCIe 2.0, KXG7APNV2T04 LA KIOXIA 814C306BELW4, 1.8TB X - to Select Disk	x
 Power Security Startup Exit 	Capacity (MB): Capacity in MB	1953512
Lenovo	> Create Volume Create a volume with the settings specified above	
F1 Help	14 Select Item +/- Change Values	F9 Setup Defaults

14. From the opening page of the "Intel(R) Rapid Storage Technology", verify the volume was created properly.

	← Intel(R) Rapid Sto Intel(R) RST 19.0.5.5560 RS	rage Techno	blogy		
Start Menu A Main 산 Devices * Advanced O Power 윤 Security	RAID Volumes: List of recognized RAID Volumes	on the system			
La Startup ☐ Exit	 Volume1, RAID1 (Mirror), 1. Select to see more information a 	8TB, Normal bout the RAID Volume	8		
Lenovo_	1¥ Select Item ←> Select Menu	+/- Enter	Change Values Select > Sub-Menu	F9 F10	Setup Defaults Save and Exit

15. To delete an array, select a displayed volume to view information about it.

Intel(R) Rapid Storage Technolog Intel(R) RST 19.0.5.5560 RST VMD Driver	gy	
RAID Volumes		
List of recognized RAID Volumes on the system		
Volume1, RAID1 (Mirror), 1.8TB, Normal		
Select to see more information about the RAID Volume		
	_	

16. Select the "Delete" option.

	← RAID VOLUME INI RAID VOLUME INFO	FO		
Start Menu 유 Main & Devices	Volume Actions List of actions available for RAID	Volume		
# Advanced Power Escurity	> Delete			
🕹 Startup 🕞 Exit				
Lenovo.				
F1 Help	74 Select Rem	-/- Change Values	F9 Setup Defaults	

17. Select "Yes" to confirm the deletion of the volume.

	<	
	Delete	
tart Menu	Delete	
유 Main 상 Devices # Advanced ① Power	Delete the RAID volume? ALL DATA ON VOLUME WILL BE LOST!	
 Security Startup Exit 	Yes Deleting a volume will reset the disks to non-RAID. No	
Lenovo.		
F1 Help	T4 Select Item +/- Change Values P9 Setup Defaults	

18. To verify the array was deleted, return the opening page of the "Intel(R) Rapid Storage Technology" and verify the drives are once again seen as available for the creation of a new array.

	Intel(R) Rapid Storage Intel(R) RST 19.0.5.5560 RST VMD D	Technology ^{Driver}		
start Menu	> Create RAID Volume			
Main	This page allows you to create a RAID volu	ume		
4 Devices				
* Advanced				
Power				
A Security				
🛃 Startup	Non-RAID Physical Disks:			
Exit	List of physical disks on the system that a Volume	re not part of a recognized RAID		
	> PCIe 1.0, KXG7APNV2T04 LA KIOXIA	A 814C305FELW4, 1.8TB		
	Select to see more information about the	disk		
Lenovo.	> PCIe 2.0, KXG7APNV2T04 LA KIOXIA Select to see more information about the example.	A 814C306BELW4, 1.8TB disk		
F1 Help	14 Select Item	+/- Change Values	F9 Setup Defaults	_
ESC EVIL	Select Menu	Enter Select > Sub-Menu	F10 Save and Exit	

Note: The user may not see the RAID array show up in the BIOS boot sequence until after a bootable operating system has been installed on the array.

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Section 5 – Document Revision History

Version	Date	Author	Updates
1.0	5/31/22	Scott Crowe	Initial launch release
1.1	7/8/22	Scott Crowe	Update for new system