

Using HighPoint NVMe RAID AICs with the 2023 M2 Ultra Mac Pro Workstation

V1.03- Nov 8, 2023

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1. 2023 M2 Ultra Mac Pro Workstation introduction

This document provides guidelines and procedures for installing HighPoint NVMe AICs into the 2023 M2 Ultra Mac Pro Workstation platform. The guide examines the performance capabilities of each PCIe slot, and provides recommended hardware configurations that can be used to optimize NVMe storage configurations for maximum throughput and capacity.

1.1 Chipset

Apple M2 Ultra chip

- 24-core CPU with 16 performance cores and 8 efficiency cores
- 60-core GPU
- 32-core Neural Engine
- 800GB/s memory bandwidth
- Media engine
 - Hardware-accelerated H.264, HEVC, ProRes, and ProRes RAW
 - Two video decode engines
 - Four video encode engines
 - Four ProRes encode and decode engines
- Configurable to:
 - M2 Ultra with 24-core CPU, 76-core GPU, and 32-core Neural Engine

1.2 Memory

 64GB unified memory Configurable to 128GB or 192GB

1.3 PCIe slots

Slot	Height	Length	Width	Linkwidth	Linkspeed
Slot1	Full Height	Full Length	double-wide	x16	Gen4
Slot2	Full Height	Full Length	double-wide	x16	Gen4
Slot3	Full Height	Full Length	double-wide	x8	Gen4
Slot4	Full Height	Full Length	double-wide	x8	Gen4
Slot5	Full Height	Full Length	single-wide	x8	Gen4
Slot6	Full Height	Full Length	single-wide	x8	Gen4
Slot7	Full Height	Half Length	single-wide	x4	Gen3

Notes:

Single-wide indicates that this slot accepts the PCIe card with one standard expansion slot width.

Double-wide indicates that this slot accepts the PCIe card with two standard expansion slot widths.

1.4 PCIe bandwidth

The M2 Ultra chip provides the system with 32 lanes of PCIe Gen4 bandwidth.

- 8 of which are dedicated to the internal SSDs.
- the M2 Ultra chip connects to the PCIe slots via a PCIe switch and provides 24 lanes of PCIe gen 4.

Pool A provides up to 16 lanes of PCIe Gen4 bandwidth;

Pool B provides up to 8 lanes of PCIe Gen4 bandwidth.

Note: HighPoint NVMe RAID AIC must be allocated to Pool A and ensure that the percentage of Pool A Allocation is less than or equal to 100%. If the percentage of Pool A Allocation is more than 100%, we recommend that other devices be allocated to Pool B.

1.5 Use Expansion Slot Utility

When installing or removing PCIe cards, 2023 M2 Ultra Mac Pro Workstation detects the PCIe cards in each slot. You can view and change how cards are assigned through the Expansion Slot Utility.

1.5.1 Automatic Bandwidth Configuration

By default, PCIe bandwidth is allocated between the two pools (Pool A and Pool B) using automatic bandwidth configuration to maximize throughput.

• • •	Expansion Slot U	tilit	у				
Automatic bandwidth configuration allows your Mac to dynamically assign bandwidth between pools for best performance.							
Automatic Ba	ndwidth Configuration						
				A	в		
	·()	7	x4		۲		
		6	x8		-		
		5	x8		-		
		4	x8		-		
		3	x8	-	-		
		2	x16	-	-		
		1	x16		-		
Pool A Allocation	0%						
Pool B Allocation	1			88	3%		

1.5.2 Manual bandwidth configuration

To manually allocate PCIe bandwidth, turn off the Automatic Bandwidth Configuration and then select a pool (Pool A or Pool B) for each card to change. *Note:* Changes will not take effect until you save the changes and restart your Mac.

1.5.3 PCIe pools

There are two PCIe pools; Pool A and Pool B.

Pool A provides up to 16 lanes of PCIe Gen4 bandwidth; Pool B provides up to 8 lanes of PCIe Gen4 bandwidth.

1. Pool A

To ensure optimal performance of the HighPoint NVMe RAID AIC, we need to allocate the 16 lanes to Pool A.

Note: If the percentage of Pool A Allocation is more than 100%, we recommend that other devices be allocated to Pool B.

2. Pool B

The following built-in components are connected to the system through the PCIe switch and allocated to Pool B:

- SATA controller
- 10Gb Ethernet controllers
- Wireless (Wi-Fi, Bluetooth) controller
- USB-A port
- PCIe Slot 7 (Apple I/O card)

Note: This means that the system will always show a percentage allocated to Pool B, even if no PCIe cards are installed.

2. HighPoint NVMe RAID AIC compatibility in 2023 M2 Ultra

Mac Pro Workstation

HighPointNV	Slot1	Slot2	Slot3	Slot4	Slot5	Slot6	Slot7
Me RAID	PCle	PCle	PCle	PCle	PCle	PCle	PCle
AICs	4.0 x16	4.0 x16	4.0 x8	4.0 x8	4.0 x8	4.0 x8	3.0 x4
Gen3 AICs							
SSD7101A-1	X	V	N/A	N/A	N/A	N/A	N/A
SSD7104	V	V	N/A	N/A	N/A	N/A	N/A
SSD7105	V	V	N/A	N/A	N/A	N/A	N/A
SSD7202	V	V	V	V	V	V	N/A
SSD7204	V	V	V	V	V	V	N/A
SSD7140A	V	V	N/A	N/A	N/A	N/A	N/A
RocketAIC	V	V	N/A	N/A	N/A	N/A	N/A
7105HM							
RocketAIC	V	V	V	V	V	V	N/A
7202HM							
RocketAIC	V	V	V	V	V	V	N/A
7204HM							
RocketAIC	V	V	N/A	N/A	N/A	N/A	N/A
7140AM							
Gen4 AICs	-				-		
SSD7502	V	V	N/A	N/A	N/A	N/A	N/A
SSD7505	V	V	N/A	N/A	N/A	N/A	N/A
SSD7540	V	V	N/A	N/A	N/A	N/A	N/A
SSD7749E	V	V	N/A	N/A	N/A	N/A	N/A
RocketAIC	V	V	N/A	N/A	N/A	N/A	N/A
7505HM							
RocketAIC	V	V	N/A	N/A	N/A	N/A	N/A
7540HM							
RocketAIC	V	V	N/A	N/A	N/A	N/A	N/A
7749EM							

Notes:

✓ means that the HighPoint NVMe RAID AIC can be used normally in this slot.
 X means that the HighPoint NVMe RAID AIC is not compatible with this slot.
 N/A means that this slot is not recommended. This slot does not have enough electrical channels to work properly with the HighPoint NVMe RAID AIC.
 Slot7 is designated as the default slot for Apple I/O cards.

3. Installing HighPoint NVMe RAID AIC into 2023 M2 Ultra Mac

Pro Workstation

3.1 Install hardware

- a. Shut down the 2023 M2 Ultra Mac Pro Workstation.
- b. Wait a few minutes for the 2023 M2 Ultra Mac Pro Workstation to cool down.
- c. Then unplug all cables from the 2023 M2 Ultra Mac Pro Workstation.
- d. Flip the top latch of the 2023 M2 Ultra Mac Pro Workstation upward, then twist it to the left to unlock the housing.



e. Lift the housing vertically upward to detach it from the 2023 M2 Ultra Mac Pro Workstation.



Note: The 2023 M2 Ultra Mac Pro Workstation won't power up when its cover is removed.

f. Use a Phillips-head screwdriver to disassemble and remove the side bracket and slot cover from the slot where the card is to be installed.



g. Slide lock to unlocked position.



- h. If you are using the SSD7140A, SSD7540, SSD7749E, RocketAIC 7140AM, RocketAIC 7540HM, or RocketAIC 7749EM, you will need to purchase the Belkin AUX Power Cable Kit from the Apple Store. The kit includes seven AUX power cables; four 8-pin to 6+2 pin cables, two 6-pin to 6-pin cables, and a single 8-pin to dual 6-pin cable.
 - a) Connect the 6-pin power connector of the Belkin AUX Power Cable to the 2023 M2 Ultra Mac Pro Workstation.



b) Connect the 6-pin power connector of the Belkin AUX Power Cable to the side of the HighPoint NVMe RAID AICs.

i. Install the HighPoint NVMe RAID AIC into the appropriate PCIe slot. Slide lock to locked position and install the previously removed slot cover, then tighten the screws on the slot cover.

Note: Do not touch the gold connector on the HighPoint NVMe RAID AIC.

j. Place the housing back onto the 2023 M2 Ultra Mac Pro workstation. And twist the top latch right and flip it down to lock it.

k. Connect the power cord, display, and any other peripherals.

3.2 System Setting

3.2.1 Reduced Security Policy for Apple M2 Ultra Platform

Customers working with Apple M2 Ultra Platforms will need to reduce the Security Policy in order to load drivers for third party devices. HighPoint NVMe AICs affected by this requirement. Mac computers with Apple M2 Ultra chip, please visit the following website:

Mac computers with Apple silicon - Apple Support

3.2.1.1 Check Security Policy

Check the system's Security Policy settings to determine if they need to be changed. If Secure Boot is set to "Full Security", please change this to "Reduced Security":

System Information -> Hardware -> Controller -> Boot Policy

3.2.1.2 Reduced Security Policy

You can access this menu by:

Shutdown the system, pressing and holding the Power Button until you see Loading Startup Options.

3.3 Install software

3.3.1 Installing the Driver & RAID Management Software

Please refer to the <u>Data RAID Installation Guide (Mac)</u> to install the HighPoint NVMe RAID AIC Driver and RAID Management Software.

4. Test HighPoint NVMe RAID AIC

4.1 Performance Testing

• HighPoint NVMe RAID AICs:

Gen3 HighPoint NVMe RAID AICs	SSD7101A-1
	SSD7104
	SSD7105
	SSD7140A
	SSD7202
	SSD7204
	SSD7502
Gen4 HighPoint NVMe RAID AICs	SSD7505
	SSD7540

• Disk:

```
Samsung 980 Pro 2TB
Note: Samsung 980 Pro 2TB Disk spec.
```


4.1.1 Test tool

Benchmark Tool: Atto disk benchmark

	ATTO DISK BEN	ICHMA	RK	
Test Name:	ATTO Disk Benchmark			
File Size:	16 GiB 📀	Queue Dept	h/Disk: 8	٢
Write Pattern:	0x0000000 ᅌ	Stream	s/Disk: 2	٢
Stop on Error:				Add Disk
	Snapshot	Continuous		
I/O Size R	ange:		B	ar Graph
Start: 4 K	iB ᅌ			
End: 64	MiB 😒			Start

Gen3 RAID AIC **RAIDO** RAID1 RAID10 SSD7202 7.22 Seq-Read (GB/s) 7.06 1 Constant of Street File Stars 2018 Seq-Write (GB/s) 6.95 3.47 / DISK BENCHMARK National Agents 1 SSD7204 Seq-Read (GB/s) 7.28 7.08 7.27 See See Seq-Write (GB/s) 6.97 3.51 3.50 Anna I Anna I Annar An Line SSD7101A-1 Seq-Read (GB/s) 14.13 7.08 13.76 Seq-Write (GB/s) 13.61 3.52 6.75 SSD7104 Seq-Read (GB/s) 13.82 7.08 13.69 Seq-Write (GB/s) 13.09 3.46 6.93 National Apple

4.1.2 Gen3 HighPoint NVMe RAID AIC test results

SSD7105	Seq-Read (GB/s)	13.89	7.25	13.77
		An order to the second of the	No hourse allow and an an an and an an and an and an and an and an an an and an an	In the last of the second seco
	Seq-Write (GB/s)	13.23	3.48	6.74
		And have the other of the other other of the other othe	Exclusion: = 100 ■ EXClose Bandweit Concentration: Excentration	Notestation of a grant statement of the
SSD7140A	Seq-Read (GB/s)	14.08	7.08	14.22
			Nor Configuration Examples of the second se	Not Indiguate Description of the set of the set of the set of the set of t
	Seq-Write (GB/s)	13.67	3.50	6.84
		Not Confusion Co	No (orderson) Exact loss 10 Store 20 to 10 Store 20 to 10 To 20 To	Martingandar Law Hard (1) Martin Carlo Hard (1) Martin Carlo Hard (1) Martin Carlo Hard (1) Martin Martin (1) Martin Martin (1) Martin

Note: / means that this AIC does not support the creation of RAID10.

4.1.3 Gen4 HighPoint NVMe RAID AIC test results

Gen4 RAID AIC		RAIDO	RAID1	RAID10
SSD7502	Seq-Read (GB/s)	13.51	13.58	/
	Seq-Write (GB/s)	9.76	4.81	/

Note: / means that this AIC does not support the creation of RAID10.

5. Uninstalling a HighPoint NVMe RAID AIC from the 2023 M2

Ultra Mac Pro Workstation

5.1 Uninstall hardware

5.1.1 Uninstall the HighPoint NVMe RAID AIC

- a. Shut down the 2023 M2 Ultra Mac Pro Workstation.
- b. Wait a few minutes for the 2023 M2 Ultra Mac Pro Workstation to cool down.
- c. Then unplug all cables from the 2023 M2 Ultra Mac Pro Workstation.
- d. Flip the top latch of the 2023 M2 Ultra Mac Pro Workstation upward, then twist it to the left to unlock the housing.

e. Lift the housing straight up and off of the 2023 M2 Ultra Mac Pro Workstation. Carefully set it aside.

f. Slide the lock to the unlocked position.

g. Using a Phillips-head screwdriver, unscrew and remove the slot cover. Remove the HighPoint NVMe RAID AIC from the PCIe slot.

- h. Disconnect the 6-pin power connector of the Belkin AUX Power Cable from the 2023 M2 Ultra Mac Pro Workstation.
- i. Disconnect the 6-pin power connector of the Belkin AUX Power Cable from the HighPoint NVMe RAID AICs. (Required for the SSD7140A/ SSD7540/ SSD7749E/ RocketAIC 7140AM/ RocketAIC 7540HM/ RocketAIC 7749EM)
- j. Reinstall the slot cover you removed, then tighten the screws on the slot cover.
- k. Reinstall the housing.

I. After the housing is fully seated, twist the top latch right and flip it down to lock it.

5.2 Uninstall software

5.2.1 Uninstall the Driver

a. Power down the system and remove the HighPoint NVMe RAID AIC from the 2023 M2 Ultra Mac Pro Workstation.

Notes:

Failing to remove the HighPoint NVMe RAID AIC from the 2023 M2 Ultra Mac Pro Workstation during the uninstall process may result in data loss. The macOS will load the default NVMe support after the HighPoint driver has been uninstalled – this driver will only recognize the NVMe SSD's as separate disks.

- b. Power on the system.
- c. To uninstall the driver, you will need to open the terminal window and enter the following command:

sudo rm -rf /Library/Extensions/HighPointNVMe.kext sudo kextcache –i /

```
test@testsMB01610152 ~% sudo rm -rf /Library/Extensions/HighPointNVMe.kext
Password:
test@testsMB01610152 ~% sudo kextcache -i /
kextcache -i /
kextcache -arch x86_64 -local-root -all-loaded -kernel /System/Library/Kernels/k
ernel -prelinked-kernel /Library/Apple/System/Library/PrelinkedKernels/prelinked
kernel -volume-root / /Library/Extensions /AppleInternal/Library/Extensions /Lib
rary/Apple/System/Library/Extensions /System/Library/Extensions
KernelCache ID: 91AFAAB6216EDD61055A39A8E77A483C
test@testsMB01610152 ~%
```

d. After uninstalling the driver, manually reboot the system.

5.2.2 Uninstall the RAID Management Software

To uninstall the RAID Management Software, access **Applications**, click on **HPTWEBGUI**, select uninstall, and double-click the **uninstall-WEBGUI.command**. The uninstall command will automatically open a terminal and uninstall the software:

• • •		🔲 uninstall				
< >			Q Search			
Eavorites	AJA System Test Lite.app	HighPoint RAement.webloc	uninstall-WebGUI.command			
Applications	App Store.app	Hptsvr				
Desktop	ATTO ConfigTool		9			
Documents	ATTO Disk Benchmark.app					
Downloads	AutoSwitchInput app					
(1) test	Blackmagic Deed Test.app					
	Blackmagic RAW	>				
Locations	Books.app Calculator.app					
Macintosh HD	Calendar.app					
OSXRESERVED	🚱 Carbon Copy Cloner.app					
BOOTCAMP	3. Chess.app					
10136	DaVinci Resolve	>				
🔄 10154 - Data	Dictionary.app					
🖴 mocana	FaceTime.app					
Network	E Font Book.app					
	G Foxmail.app					
Tags	Home.app					
e Red	Timage Capture.app					
Orange	IORegistryEvolorer ann					
	🟫 test — uninstal	I-WebGUI.command —	94×30			
Last login: Thu Jul 2 /Applications/HPTWEBGU test@tests-Pro2019 ~ %	13:34:32 on ttys000 I/uninstall/uninstal /Applications/HPTWE) l-WebGUI.command ; e BGUI/uninstall/unins	xit; tall-WebGUI.command ; e	xit;		
This script will attem	pt to uninstall High	Point Web RAID Contr	oller Manage Service			
Note: You must be logg The script will prom	ed on as an administ pt you for an admini	rator to uninstall t strator password.	he software.			
If prompted for a password please enter your administrator password.						
The following service files will be deleted /Applications/HPTWEBGUI /Library/Receipts/wewfiles.pkg /Library/Receipts/webservice.pkg /Library/LaunchDaemons/HPTWebGUIDaemon.plist /usr/share/hpt /Library/LaunchDaemonctl /Library/LaunchDaemons/HPTWebGUIDaemon.plist: Operation now in progress Process has completed.						

[Process completed]