Power Configurator

Lenovo ThinkStation P8

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Overview

ThinkStation P8 is a single processor, 39L tower added to the Lenovo workstation portfolio in early 2024. The P8's processing capability is provided by AMD Ryzen Threadripper Pro 7000 WX-series processors and the WRX90 chipset. The P8 supports a wide array of memory, storage, and PCIe device configurations -- all of which are powered by a custom form factor power supply.

There are two power supply options, 1000W and 1400W, and this document will help users evaluate their system configuration and power supply choice accordingly.

Section 1 – Key System Power Design Points

The ThinkStation P8 system power is provided by a single, internal custom power supply unit (PSU). The PSU has a toolless service design that connects to the system motherboard via a single card edge connector. The edge connector provides the power transmission and signal line interface between the PSU and motherboard. The PSU is available in two options, 1000W and 1400W, with the following basic specifications:

1000W 92% efficiency, with 15A C14 AC input (via std C13 power cord)

1400W 92% efficiency, with 15A C14 AC input (via std C13 power cord)

To accommodate system expansion options, P8 provides six full length[1], full height PCIe slots. Additionally, P8 provides auxiliary power for expansion cards via 3 onboard 12VHPWR connectors, an example of which is shown in *Figure 1*.

Figure 1 – 12VHPWR Connector

For PCIe graphics cards that require aux power, Lenovo provides either a 12VHPWR to 12VHPWR, 12VHPWR to Dual PCIe, or a 12VHPWR to CPU cable, or various lengths, depending on the requirements of the card. Details about these cables can be found in *Table 4* in Section 2, as well as the Appendix at the end of this document.

[1] Multi-slot graphics card support in Slots 5 or 6 may be affected by the presence of the third M.2 heatsink, which can be seen in *Figure 2.*

Table 1 and *Figure 2* give details about the PCIe slots and auxiliary power connectors on the P8 motherboard.

Table 1 – PCIe Slot Information

PCIe Slot Number	Slot Width	Generation	Installation Priority
Slot 1	x16	Gen 5	3rd
Slot 2	x8	Gen 5	5th
Slot 3	x16	Gen 5	1st
Slot 4	x8	Gen 5	6th
Slot 5	x16	Gen 5	2nd
Slot 6	x16	Gen 5	4th
Slot 7	x8	Gen 4	7th

Figure 2 – PCIe Slots and Aux Power Connectors

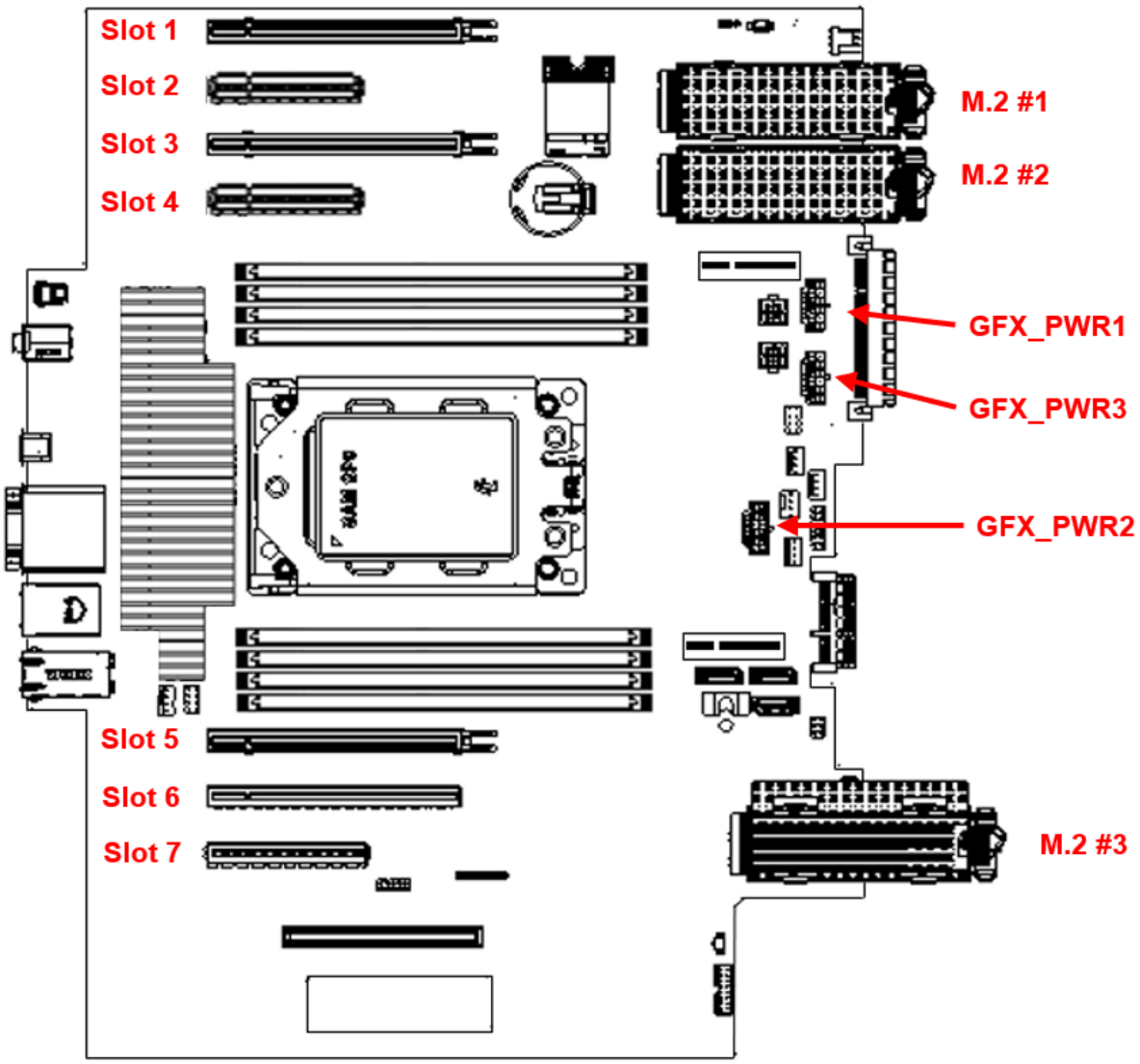


Figure 3 below provide examples of how GFX power cables may be connected between the graphics card and motherboard, depending on the type of cable. *Figure 4* shows how the Nvidia Quadro Sync II card may connect in the system.

Figure 3 – GFX Power Connection

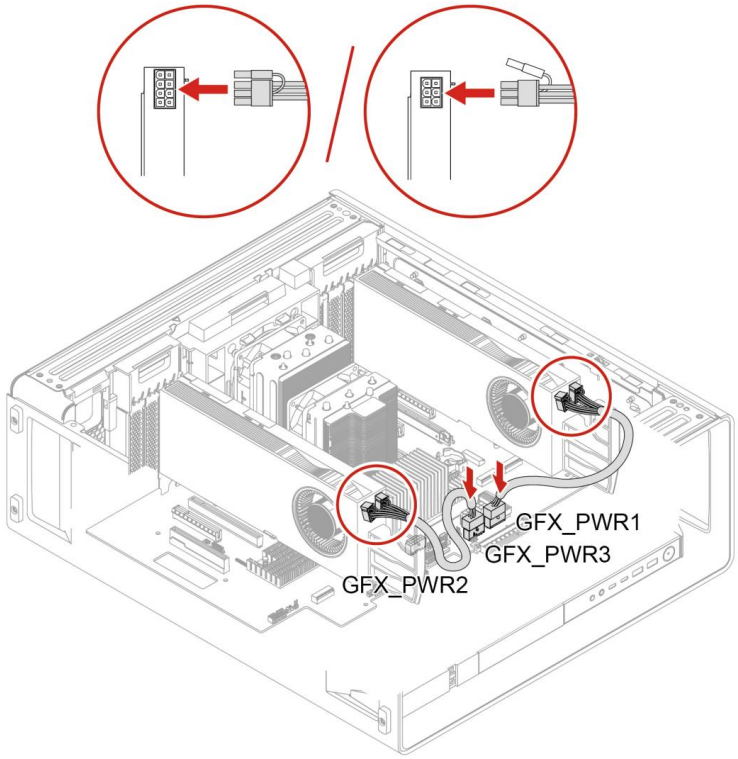
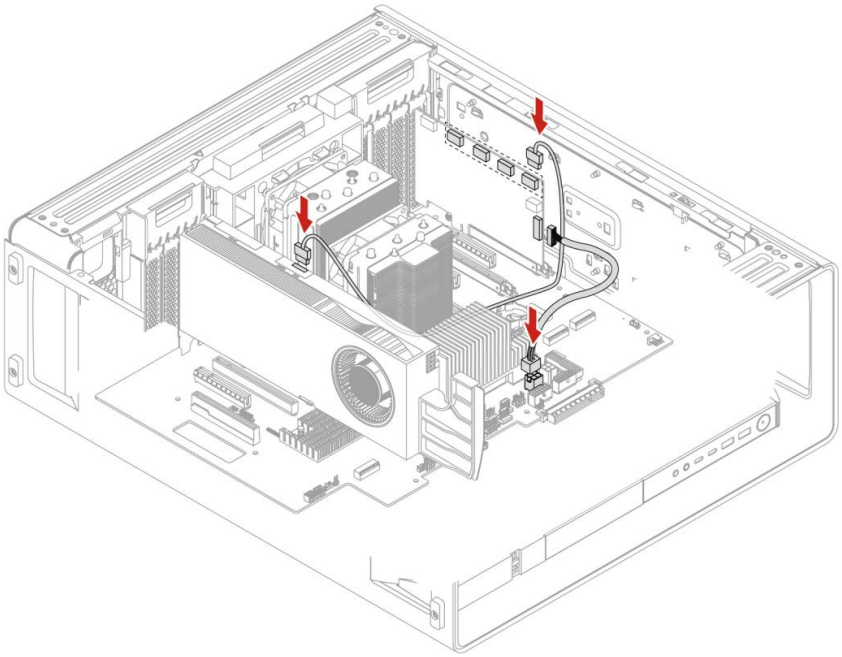


Figure 4 – Nvidia Quadro Sync II Connection



Section 2 – Power Ratings of Key System Components

To understand the overall power demand of your P8, it is important to know the power needs of each individual system component. This section contains a summary of several of these key individual components.

Table 2 lists the power requirements for each of the supported CPUs.

Table 2 – CPU power ratings

CPU Name (AMD Threadripper Pro)	CPU Power	Additional CPU Information
7995WX	350W	2.5GHz, 96 Cores, 384MB Cache, DDR5-5200
7985WX	350W	3.2GHz, 64 Cores, 256MB Cache, DDR5-5200
7975WX	350W	4.0GHz, 32 Cores, 128MB Cache, DDR5-5200
7965WX	350W	4.2GHz, 24 Cores, 128MB Cache, DDR5-5200
7955WX	350W	4.5GHz, 16 Cores, 64MB Cache, DDR5-5200
7945WX	350W	4.7GHz, 12 Cores, 64MB Cache, DDR5-5200

Tables 3A and 3B list the power and cable requirements for the add-in cards supported on P8. *Table 3A* lists supported AMD Radeon Pro GPUs, and *Table 3B* lists supported NVIDIA GPUs and other PCIe cards.

Table 3A – Add-in card power ratings (AMD)

Power Rating	Card Name (memory)	Card Type	Aux Power Connectors on GPU (if any)	Lenovo Aux Power Cables Required (if any)
295W	AMD Radeon Pro W7900 (48GB)	Graphics Card (Triple Slot)	2x 8-pin (PCIe)	12VHPWR to Dual PCIe 8pin
130W	AMD Radeon PRO W7600 (8GB)	Graphics Card (Single Slot)	6-pin (PCIe)	12VHPWR to Dual PCIe 8pin
50W	AMD Radeon Pro W6400 (4GB)	Graphics Card (Single Slot)	None	None

Table 3B – Add-in card power ratings (NVIDIA & other PCIe cards)

Power Rating	Card Name	Card Type	Aux Power Connectors on GPU(if any)	Lenovo Aux Power Cables Required (if any)
450W	GeForce RTX 4090D (24GB)*	Graphics Card (Quad Slot)	12VHPWR	12VHPWR to 12VHPWR R/A
320W	GeForce RTX 4080 (16GB)*	Graphics Card (Quad Slot)	12VHPWR	12VHPWR to 12VHPWR R/A
300W	RTX 6000 Ada (48GB), RTX 5880 Ada (48GB)*	Graphics Card (Dual Slot)	12VHPWR	12VHPWR to 12VHPWR
300W	RTX A6000 (48GB)	Graphics Card (Dual Slot)	8-pin (EPS)	12VHPWR to EPS 8pin
250W	RTX 5000 Ada (32GB)	Graphics Card (Dual Slot)	12VHPWR	12VHPWR to 12VHPWR
210W	RTX 4500 Ada (24GB)	Graphics Card (Dual Slot)	12VHPWR	12VHPWR to 12VHPWR
200W	GeForce RTX 4070 (12GB)*	Graphics Card (Triple Slot)	8-pin (PCIe)	12VHPWR to Dual PCIe 8pin
140W	RTX A4000 (16GB)	Graphics Card (Single Slot)	6-pin (PCIe)	12VHPWR to Dual PCIe 8pin
130W	RTX 4000 Ada (20GB)	Graphics Card (Single Slot)	12VHPWR	12VHPWR to 12VHPWR
75W max	RTX 2000 Ada (16GB) RTX A2000 (12GB)	Graphics Card (Dual Slot)	None	None
	A1000 (8GB) A400 (4GB) T1000 (8GB) T400 (4GB)	Graphics Card (Single Slot)	None	None
	Quadro Sync II	Graphics Sync Card (Single Slot)	SATA power	SATA power to 4-pin
	Other PCIe Cards	Other PCIe Cards (Single Slot)	None	None

*Availability dependent on geographic region

Table 4 lists the number of aux power cables that will be included in a system built with the indicated GPUs.

Table 4 – Quantity of Derived Cables

GPU	Quantity	Lenovo Aux Power Cables Derived				
	#	12VHPWR to Dual PCIe 6+2pin, 270mm	12VHPWR to 12VHPWR, 270mm	12VHPWR to 12VHPWR R/A, 450mm	12VHPWR to Dual PCIe 6+2pin, 375mm	12VHPWR to CPU 8pin, 270mm
None	0	1	N/A	N/A	N/A	N/A
GeForce RTX 4090D (24GB) **GeForce RTX 4080** (16GB)	1	1	N/A	1	N/A	N/A
RTX 6000 Ada (48GB) **RTX 5880 Ada** (48GB) **RTX 5000 Ada** (32GB) **RTX 4500 Ada** (24GB) **RTX 4000 Ada** (20GB)	1 2 3	1 1 0	1 2 3	N/A	N/A	N/A
RTX A6000 (48GB)	1 2 3	1 1 0	N/A	N/A	N/A	1 2 3
AMD Radeon Pro W7900 (48GB)	1 2	2 3	N/A	N/A	N/A	N/A
GeForce RTX 4070 (12GB)	1	1	N/A	N/A	1	N/A
RTX A4000 (16GB) **AMD Radeon PRO W7600** (8GB)	1 2 3 4	2 3 3 3	N/A	N/A	N/A	N/A
RTX 2000 Ada (16GB) **RTX A2000** (12GB)	≤3	1	N/A	N/A	N/A	N/A
Non-Aux GPUs	≤4	1	N/A	N/A	N/A	N/A

Section 3 – P8 Power Configuration Tables

As mentioned above, P8 supports a single 1000W or 1400W power supply, both of which provide power for many different GPU configurations. The total output of the 1400W power supply can vary depending on the input AC voltage, as shown in *Table 5*. *Table 6* shows a list of example countries sorted by their standard AC voltage.

The tables on the following pages show allowable PCIe card configurations for different environments, such as wattage, input AC voltage, and memory type. Since there are two memory types which have different power demands, the tables are grouped accordingly, listed two per page, where applicable.

Table 5 – Output wattage depending on input voltage

Power Supply	True Output Wattage @		
	100-110 V	115-127 V	200-240 V
1000W PSU	1000W	1000W	1000W
1400W PSU	1125W	1250W	1400W

Table 6 – Country Line Voltage Levels

	100-110 V	115-127 V	200-240 V
Country	Japan Taiwan Some Caribbean	USA Canada LA Some Caribbean Colombia Ecuador Panama Costa Rica	EMEA

*This is not an exhaustive list, rather intended for high level assessment only.

1000W PSU Configurations

Table 7 – 1000W PSU @ Any Input Voltage w/ RDIMM Memory

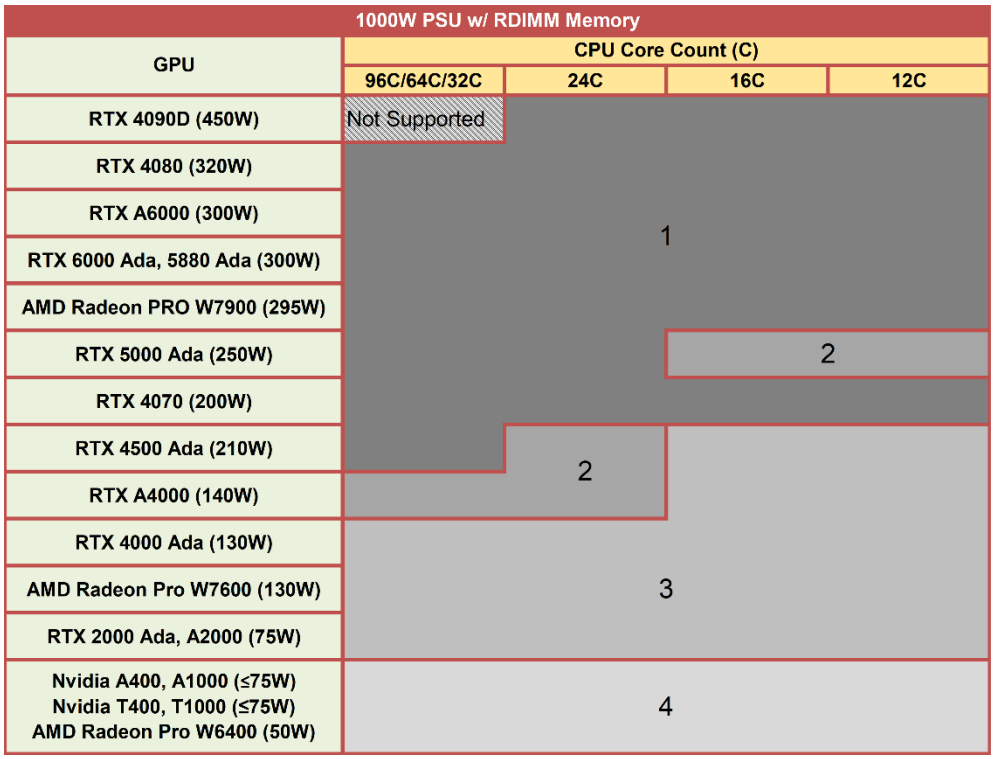
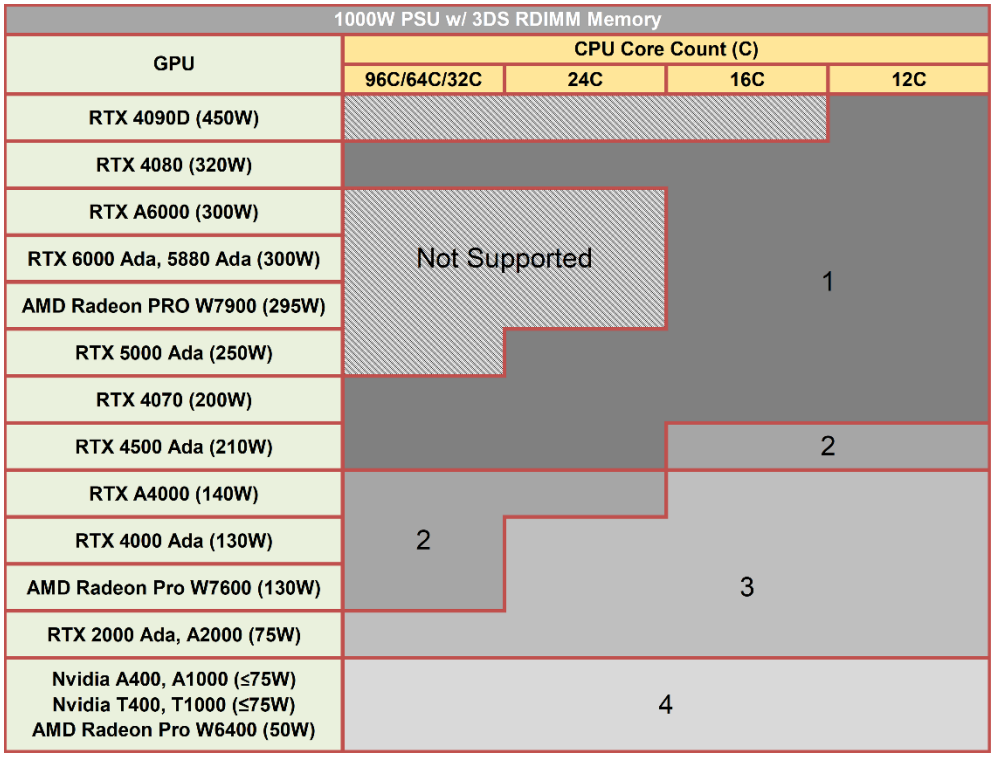


Table 8 – 1000W PSU @ Any Input Voltage w/ 3DS RDIMM Memory



1400W PSU Configurations (112-120VAC)

Table 9 – 1400W PSU @ 112-120VAC w/ RDIMM Memory

1400W PSU @ 112-120VAC w/ RDIMM Memory				
GPU	CPU Core Count (C)			
	96C/64C/32C	24C	16C	12C
RTX 4090D (450W)	1			
RTX 4080 (320W)				
RTX A6000 (300W)	2	3		
RTX 6000 Ada, 5880 Ada (300W)				
AMD Radeon PRO W7900 (295W)				
RTX 5000 Ada (250W)	3			
RTX 4070 (200W)	1			
RTX 4500 Ada (210W)	3			
RTX A4000 (140W)	4			
RTX 4000 Ada (130W)	3			
AMD Radeon Pro W7600 (130W)	4			
RTX 2000 Ada, A2000 (75W)	3			
Nvidia A400, A1000 (≤75W) Nvidia T400, T1000 (≤75W) AMD Radeon Pro W6400 (50W)	4			

Table 10 – 1400W PSU @ 112-120VAC w/ 3DS RDIMM Memory

1400W PSU @ 112-120VAC w/ 3DS RDIMM Memory				
GPU	CPU Core Count (C)			
	96C/64C/32C	24C	16C	12C
RTX 4090D (450W)	1			
RTX 4080 (320W)				
RTX A6000 (300W)	2		3	
RTX 6000 Ada, 5880 Ada (300W)				
AMD Radeon PRO W7900 (295W)				
RTX 5000 Ada (250W)	3			
RTX 4070 (200W)	1			
RTX 4500 Ada (210W)	3			
RTX A4000 (140W)	4			
RTX 4000 Ada (130W)	3			
AMD Radeon Pro W7600 (130W)	4			
RTX 2000 Ada, A2000 (75W)	3			
Nvidia A400, A1000 (≤75W) Nvidia T400, T1000 (≤75W) AMD Radeon Pro W6400 (50W)	4			

1400W PSU Configurations (200-240VAC)

Table 11 – 1400W PSU @ 200-240VAC w/ RDIMM or 3DS RDIMM Memory

1400W PSU @ 200-240VAC w/ RDIMM or 3DS RDIMM Memory				
GPU	CPU Core Count (C)			
	96C/64C/32C	24C	16C	12C
RTX 4090D (450W)	1			
RTX 4080 (320W)				
RTX A6000 (300W)	3			
RTX 6000 Ada, 5880 Ada (300W)				
AMD Radeon PRO W7900 (295W)	2			
RTX 5000 Ada (250W)	3			
RTX 4070 (200W)	1			
RTX 4500 Ada (210W)	3			
RTX A4000 (140W)	4			
RTX 4000 Ada (130W)	3			
AMD Radeon Pro W7600 (130W)	4			
RTX 2000 Ada, A2000 (75W)	3			
Nvidia A400, A1000 (≤75W) Nvidia T400, T1000 (≤75W) AMD Radeon Pro W6400 (50W)	4			

1400W PSU Configurations (100-112VAC)

Table 12 – 1400W PSU @ 100-112VAC w/ RDIMM Memory

1400W PSU @ 100-112VAC w/ RDIMM Memory				
GPU	CPU Core Count (C)			
	96C/64C/32C	24C	16C	12C
RTX 4090D (450W)	1			
RTX 4080 (320W)				
RTX A6000 (300W)		2		
RTX 6000 Ada, 5880 Ada (300W)				
AMD Radeon PRO W7900 (295W)				
RTX 5000 Ada (250W)	2	3		
RTX 4070 (200W)	1			
RTX 4500 Ada (210W)	3			
RTX A4000 (140W)	4			
RTX 4000 Ada (130W)	3			
AMD Radeon Pro W7600 (130W)	4			
RTX 2000 Ada, A2000 (75W)	3			
Nvidia A400, A1000 (≤75W) Nvidia T400, T1000 (≤75W) AMD Radeon Pro W6400 (50W)	4			

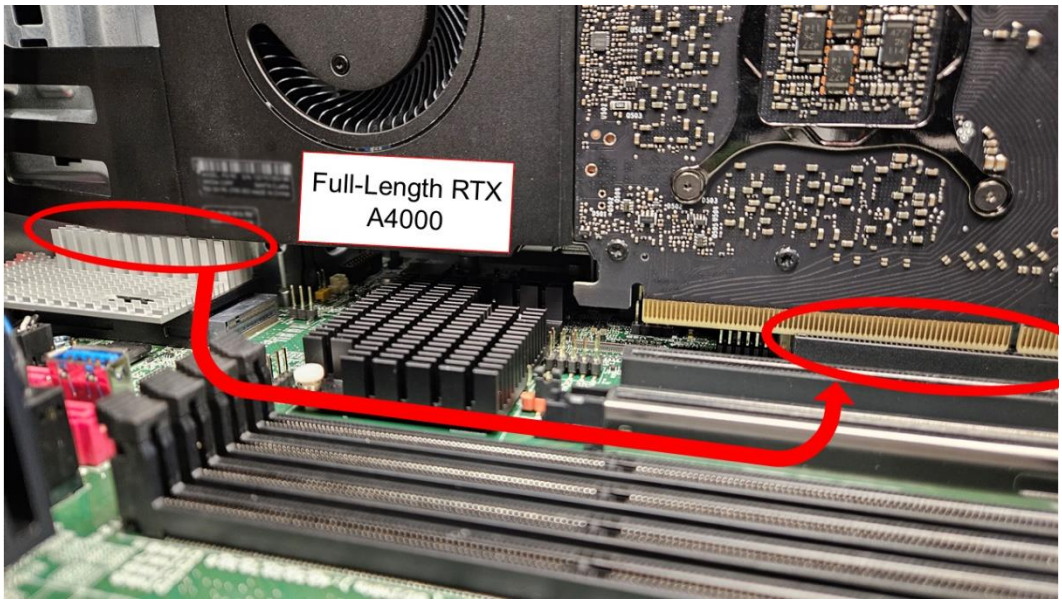
Table 13 – 1400W PSU @ 100-112VAC w/ 3DS RDIMM Memory

1400W PSU @ 100-112VAC w/ 3DS RDIMM Memory				
GPU	CPU Core Count (C)			
	96C/64C/32C	24C	16C	12C
RTX 4090D (450W)	1			2
RTX 4080 (320W)				
RTX A6000 (300W)				
RTX 6000 Ada, 5880 Ada (300W)				
AMD Radeon PRO W7900 (295W)				
RTX 5000 Ada (250W)		2		3
RTX 4070 (200W)	1			
RTX 4500 Ada (210W)	2	3		
RTX A4000 (140W)	4			
RTX 4000 Ada (130W)	3			
AMD Radeon Pro W7600 (130W)	4			
RTX 2000 Ada, A2000 (75W)	3			
Nvidia A400, A1000 (≤75W) Nvidia T400, T1000 (≤75W) AMD Radeon Pro W6400 (50W)	4			

Section 4 – Configuration Notes

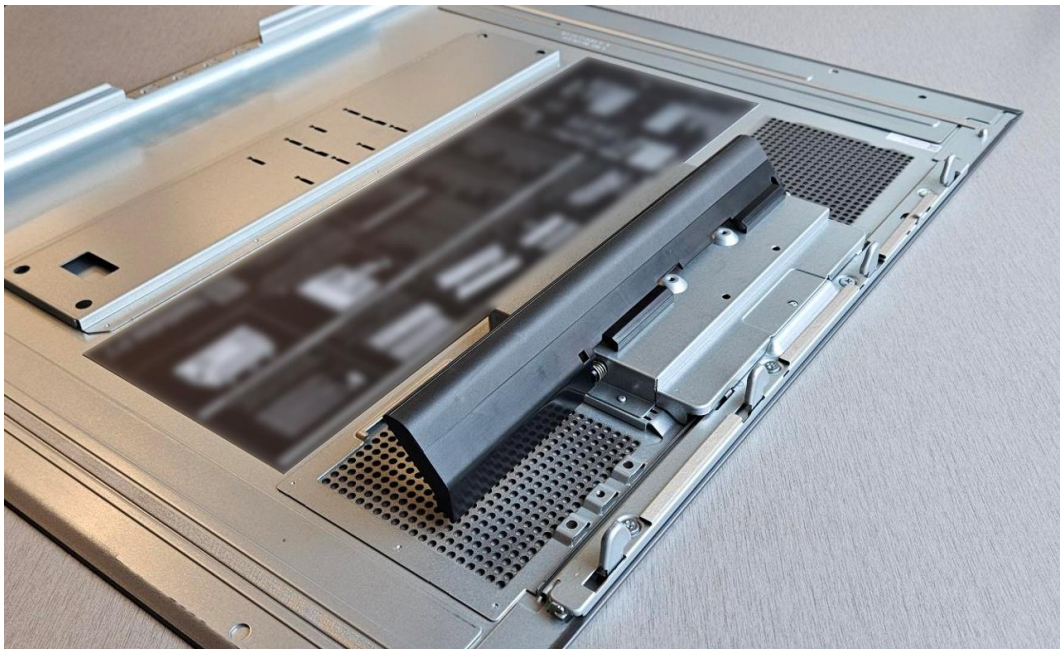
- P8 has a single 12V rail.
- Mixed graphics card types are not supported in P8 standard models.
- Due to thermal concerns, if any supported GeForce RTX graphics cards (RTX 4090D, 4080, or 4070) are installed, the max supported quantity of SATA drives is two.
- Due to limited motherboard connections, if the NVIDIA Quadro Sync II card is installed, the max supported quantity of SATA drives is two.
- Supported GeForce RTX graphics cards must be installed in Slot 1.
- AMD Radeon Pro W7900 must be installed in either Slot 1 or Slot 5.
    - For 2x W7900's to be installed, the third M.2 assembly must be removed for the W7900 in Slot 5.
- Multi-slot graphics card support in Slots 5 or 6 may be affected by the presence of the 3rd M.2 heatsink.

Figure 5 – Full Length Card installed in Slot 7



- P8 models with 96, 64, or 32 core CPUs require the front dual fan assembly for additional cooling. This assembly is optional on configs with 24, 16, or 12 core CPUs, but is required if the quantity of SATA drives is three or if a RTX 4090D is installed in the system.
- When a supported RTX 4090D or RTX 4080 is installed in the system, an additional air duct should be installed on the chassis door to assist in cooling the card.

Figure 6 – RTX4080 air duct installed on P8 side door



- Officially supported configurations could still be limited by additional factors not defined within this document.
- **For configurations that are not listed above but appear to be feasible, please work with the Workstation Technical Solutions Team to have the configuration validated/vetted.**

Appendix

Details of the auxiliary power cables & other parts used in ThinkStation P8. Cables can be purchased through the option kit below, or through FRU numbers. The RTX 4080 Air Duct is not included in an option kit and must be purchased as a FRU.

[4XF1M24240] ThinkStation Cable Kit for P7/PX contains the following cables/parts:

- 12VHPWR to 12VHPWR Cable
- 12VHPWR to 12VHPWR Right-Angle Cable
- 12VHPWR to Dual PCIe 6+2pin Cable
- 12VHPWR to CPU 8pin Cable
- Customized GPU Extender Bracket
- Customized RTX4080 Extender Bracket
- Extender Bracket Screws

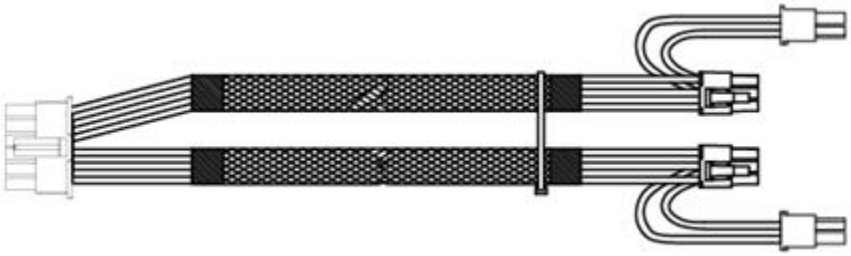
[4XH1M73929] ThinkStation Internal HDD Kit for P7/P8 contains the following cables/parts:

- Dual CPU Fan Assembly
- Optional HDD Bracket & Cage
- 300mm SATA Power Cable
- 350mm SATA Data Cable (Right-Angle)
- Optional P7 CPU Cooling Duct
    - Compatible only with ThinkStation P7

[4XH1L18997] ThinkStation NVLINK Bridge

*Only supported on ThinkStation P8 for 2x RTX A6000 GPUs.

12VHPWR 2x6+4pin to Dual PCIe 6+2pin, 270mm (FRU# 5C10U58708)



12VHPWR 2x6+4pin to CPU 8pin, 270mm (FRU# 5C10U58707)

SATA Power to 4-pin for Quadro Sync II Adapter (FRU# 5C10U58668)

12VHPWR 2x6+4pin to 12VHPWR 2x6+4pin cable, 270mm (FRU# 5C10U58732)

12VHPWR 2x6+4pin to 12VHPWR 2x6+4pin R/A cable, 450mm (FRU# 5C10U58774)

Optional GPU Air Block Cover for RTX4080 (FRU# 5M11H28771)

Revision History

Version	Date	Author	Changes/Updates
v1.0	2/16/24	Chris C.	Initial Release
v1.1	8/1/24	Chris C.	Updated GPU list and notes
v1.2	10/1/24	Chris C.	Updated GPU list