Power Configurator

Lenovo ThinkStation P7

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Overview

ThinkStation P7 is a single processor, 39L tower added to the Lenovo workstation portfolio in the spring of 2023. The P7's processing capability is provided by Intel Xeon W processors and the W790 chipset. The P7 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 you evaluate your system configuration and size your PSU choice accordingly.

Section 1 – Key System Power Design Points

The ThinkStation P7 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, P7 provides seven full length[1], full height PCIe slots. Additionally, P7 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 Dual PCIe cable or a 12VHPWR to CPU cable, depending on the requirements of the card. Details about both of these cables can be found in the Appendix at the end of this document.

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[1] PCIe Slot 7 is limited to half-length when the vertical M.2 option is selected. The vertical M.2 header is highlighted in *Figure 2* to show where it would interfere with a full length PCIe card.

Table 1 and Figure 2 give details about the PCIe slots and auxiliary power connectors on the P7 motherboard.

Table 1 – PCIe Slot Information

PCIe Slot Number	Slot Width	Generation	Installation Priority
Slot 1	x16	Gen 5	3
Slot 2	x8	Gen 4	5
Slot 3	x16	Gen 5	1
Slot 4	x4	Gen 4	6
Slot 5	x16	Gen 5	2
Slot 6	x16	Gen 4	4
Slot 7	x4	Gen 5	7

Figure 2 – PCIe Slots and Aux Power Connectors
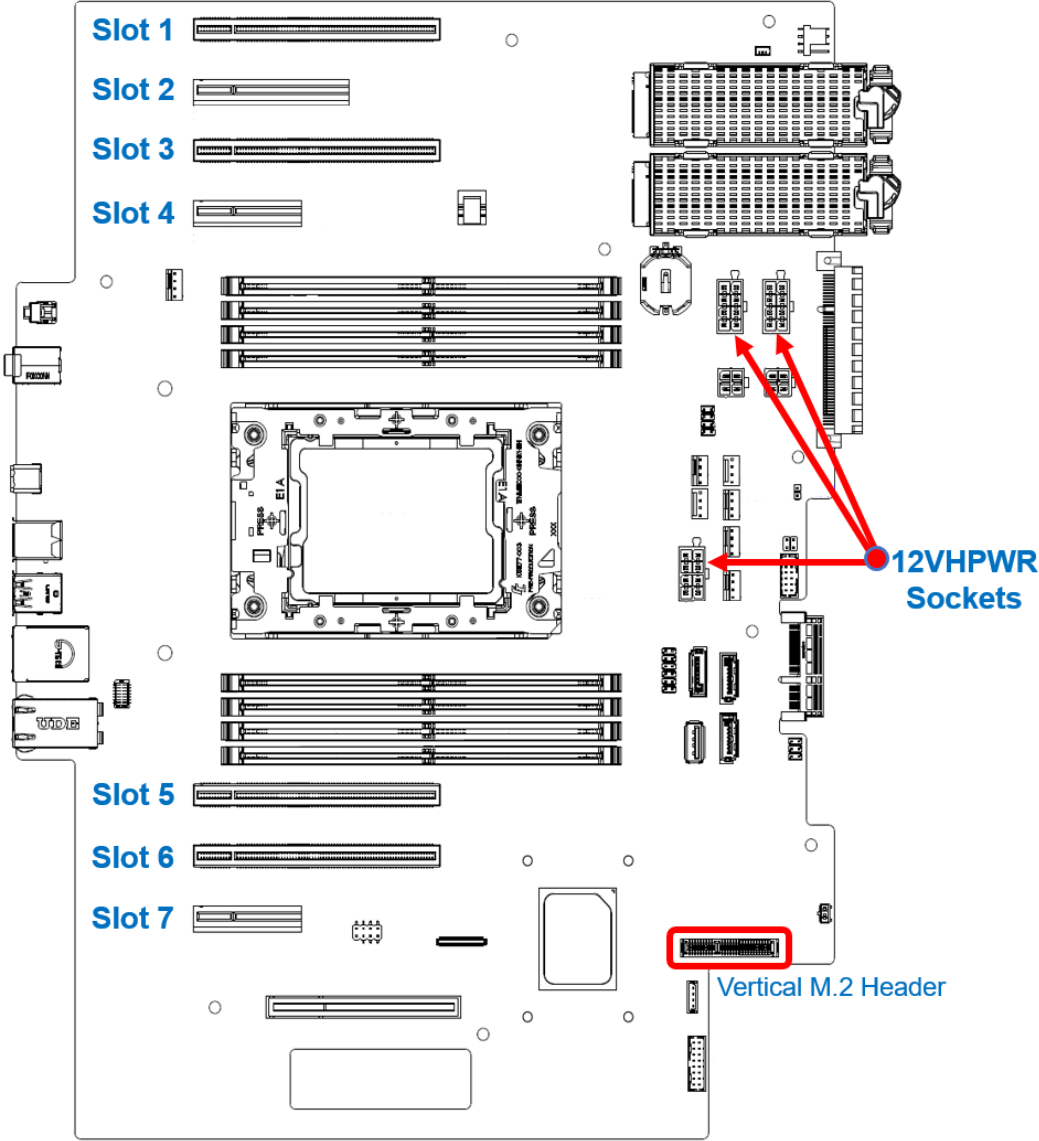
Section 2 – Power Ratings of Key System Components

To understand the overall power demand of your P7, 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 (Intel Xeon W)	CPU Power	Additional CPU Information
W9-3495X	350W	1.9GHz, 56 Cores,105MB, DDR5-4800
W9-3475X	300W	2.2GHz, 36 Cores, 82.5MB, DDR5-4800
W7-3465X	300W	2.5GHz, 28 Cores, 75MB, DDR5-4800
W7-3455	270W	2.5GHz, 24 Cores, 67.5MB, DDR5-4800
W7-3445	270W	2.6GHz, 20 Cores, 52.5MB, DDR5-4800
W5-3435X	270W	3.1GHz, 16 Cores, 45MB, DDR5-4800
W5-3433	220W	2.0GHz, 16 Cores, 45MB, DDR5-4400
W5-3425	270W	3.2GHz, 12 Cores, 30MB, DDR5-4800
W5-3423	220W	2.1GHz, 12 Cores, 30MB, DDR5-4400

Table 3 lists the power requirements for the add in cards supported on P7.

Table 3 – Add-in card power ratings

Max Power	Card Name (memory)	Card Type	Aux Power Connectors on GPU(if any)	Lenovo Aux Power Cables Required (if any)
300W*	RTX A6000 (48GB)	Graphics Card (Dual Slot)	8-pin (EPS)	12VHPWR to EPS 8pin
250W	RTX A5500 (24GB)	Graphics Card (Dual Slot)	8-pin (PCIe)	12VHPWR to Dual PCIe 8pin
200W	RTX A4500 (20GB)	Graphics Card (Dual Slot)	8-pin (PCIe)	12VHPWR to Dual PCIe 8pin
	GeForce RTX 3060Ti (8GB)	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
75W max	RTX A2000 (12GB)	Graphics Card (Dual Slot)	None	None
	T1000 (8GB), T400 (4GB), AMD Radeon Pro W6400 (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

* Note: The 300W power rating listed in this table does not apply to the Nvidia RTX 6000 Ada card

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	GPU Quantity	Lenovo Aux Power Cables Derived	
		12VHPWR 2x6+4pin to Dual PCIe 6+2pin, 270mm	12VHPWR 2x6+4pin to CPU 8pin, 270mm
None	0	1	0
RTX A6000 (48GB)	1 2 3	1 1 0	1 2 3
RTX A5500 (24GB) RTX A4500 (20GB)	1 2 3	2 3 3	N/A
GeForce RTX 3060Ti (8GB)	1	2	N/A
RTX A4000 (16GB)	1 2 3 4	2 3 3 3	N/A
Non-Aux GPUs	Up to 4	1	N/A

Section 3 – P7 Power Configuration Tables

As mentioned above, P7 supports a single 1000W or 1400W power supply, both of which provide power for many different GPU configurations. The tables on the following pages show allowable PCIe card configurations for different environments. The tables are arranged by PSU wattage, input AC voltage, and memory type. Since there are two memory types which have different power demands, the tables are grouped accordingly and listed two per page.

1000W PSU Configurations

Table 5 – 1000W PSU @ 100-240VAC w/ RDIMM Memory

1000W PSU @ 100-240VAC w/ RDIMM Memory				
GPU	**CPU Power**			
	350W	**300W**	**270W**	**220W**
300W Dual Slot	0	1	1	1
250W Dual Slot	1	1	1	1
200W Dual & Triple Slot	1	1	1	2
140W Single Slot	2	2	2	3
75W Max Dual Slot	3	3	3	3
75W Max Single Slot	4x Nvidia or 2x AMD			

Table 6 – 1000W PSU @ 100-240VAC w/ 3DS RDIMM Memory

1000W PSU @ 100-240VAC w/ 3DS RDIMM Memory				
GPU	**CPU Power**			
	350W	**300W**	**270W**	**220W**
300W Dual Slot	0	0	0	1
250W Dual Slot	0	1	1	1
200W Dual & Triple Slot	0	1	1	2
140W Single Slot	1	2	2	3
75W Max Dual Slot	3	3	3	3
75W Max Single Slot	4x Nvidia or 2x AMD			

1400W PSU Configurations (112-120VAC)

Table 7 – 1400W PSU @ 112-120VAC w/ RDIMM Memory

1400W PSU @ 112-120VAC w/ RDIMM Memory				
GPU	**CPU Power**			
	350W	**300W**	**270W**	**220W**
300W **Dual Slot**	2	2	3	3
250W **Dual Slot**	2	3	3	3
200W **Dual & Triple Slot**	3	3	3	3
140W **Single Slot**	4	4	4	4
75W Max **Dual Slot**	3	3	3	3
75W Max **Single Slot**	4x Nvidia or 2x AMD			

Table 8 – 1400W PSU @ 112-120VAC w/ 3DS RDIMM Memory

1400W PSU @ 112-120VAC w/ 3DS RDIMM Memory				
GPU	**CPU Power**			
	350W	**300W**	**270W**	**220W**
300W **Dual Slot**	1	2	2	3
250W **Dual Slot**	2	2	2	3
200W **Dual & Triple Slot**	3	3	3	3
140W **Single Slot**	4	4	4	4
75W Max **Dual Slot**	3	3	3	3
75W Max **Single Slot**	4x Nvidia or 2x AMD			

1400W PSU Configurations (200-240VAC)

1400W PSU @ 200-240VAC w/ RDIMM Memory				
GPU	**CPU Power**			
	350W	**300W**	**270W**	**220W**
300W Dual Slot	2	3	3	3
250W Dual Slot	3	3	3	3
200W Dual & Triple Slot	3	3	3	3
140W Single Slot	4	4	4	4
75W Max Dual Slot	3	3	3	3
75W Max Single Slot	4x Nvidia or 2x AMD			

1400W PSU @ 200-240VAC w/ 3DS RDIMM Memory				
GPU	**CPU Power**			
	350W	**300W**	**270W**	**220W**
300W Dual Slot	2	2	3	3
250W Dual Slot	2	2	3	3
200W Dual & Triple Slot	3	3	3	3
140W Single Slot	4	4	4	4
75W Max Dual Slot	3	3	3	3
75W Max Single Slot	4x Nvidia or 2x AMD			

1400W PSU Configurations (100-112VAC)

1400W PSU @ 100-112VAC w/ RDIMM Memory				
GPU	**CPU Power**			
	350W	**300W**	**270W**	**220W**
300W Dual Slot	1	1	1	2
250W Dual Slot	2	3	3	3
200W Dual & Triple Slot	3	3	3	3
140W Single Slot	4	4	4	4
75W Max Dual Slot	3	3	3	3
75W Max Single Slot	4x Nvidia or 2x AMD			

| 1400W PSU @ 100-112VAC w/ 3DS RDIMM Memory				
GPU	**CPU Power**			
	350W	**300W**	**270W**	**220W**
300W Dual Slot	1	1	1	2
250W Dual Slot	1	2	2	3
200W Dual & Triple Slot	2	3	3	3
140W Single Slot	3	4	4	4
75W Max Dual Slot	3	3	3	3
75W Max Single Slot	4x Nvidia or 2x AMD			

Section 4 – Configuration Notes

- P7 has a single 12V rail
- Mixed graphics card types are not supported in P7 standard models
- Due to thermal concerns, if two dual slot 200W, 250W, or 300W graphics cards are installed, only two onboard M.2 drives are allowed
- Any 300W power ratings listed in this document do not apply to the Nvidia RTX 6000 Ada card
- 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 used in ThinkStation P7

12VHPWR 2x6+4pin to Dual PCIe 6+2pin, 270mm (FRU# 5C10U58708)
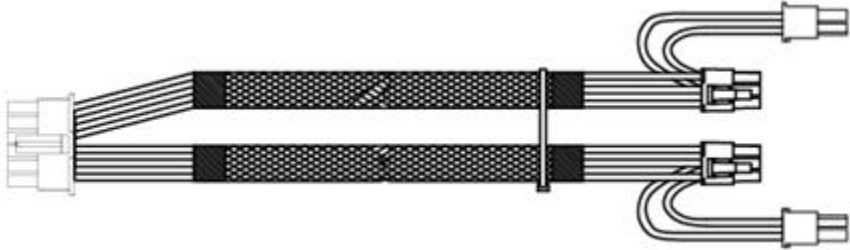
12VHPWR 2x6+4pin to CPU 8pin, 270mm (FRU# 5C10U58707)

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

Revision History

Version	Date	Author	Changes/Updates
1.0	4/26/2023	Jim P	Initial Version