Power Configurator

Lenovo ThinkStation P520 & P520c

Contents

Overview

With the introduction of the ThinkStation P520 and P520c platforms, there are changes in the way each system accommodates total power and power delivered to devices within the system as compared to their predecessor platforms. The purpose of this document is to highlight those changes such that users can make informed decisions regarding which power supply to configure in the system and which add-in cards can be officially supported.

Section 1 – Key Architectural Changes

There are some key architectural changes that have been made to the overall power design of the P520 platform. In the predecessor P500 and P510 platforms, the power supply had two methods to deliver power to the components within the system:

- A printed circuit board (PCB) "edge" style connector that provided power to the motherboard
- A cable connection that allowed for power to be distributed to add in cards, such as auxiliary power for GPUs.

With the P520, all power is now delivered to the system in a single connection via the PCB edge connector. Instead of using a separate cable connection for auxiliary powered devices, power for those devices is now cabled directly off the motherboard.

This becomes particularly advantageous when considering the upgradability of the P520 power supply. For previous P5XX platforms, upgrading the power supply to one with higher wattage sometimes also meant upgrading the auxiliary power cabling associated with that supply. This was a bit of a daunting task as the auxiliary cabling was routed underneath the motherboard requiring technicians to disassemble a large portion of the system to fully upgrade the power supply and cabling. With this new design, upgrading a power supply is as simple as installing the new power supply unit, and attaching any auxiliary power cable updates directly to the top of the motherboard. No system disassembly/reassembly is necessary. Figure 1 below shows the basis of this new design.

P520c utilizes a more traditional approach to powering system components since it supports a single capacity design. All onboard components and add-in cards are powered through direct cable connections from the power supply.

Figure 1 – P520 Power Design

Aux Power Connectors

GPU_PWR1

GPU_PWR2

Power Supply Edge Connector

Onboard Power Routing
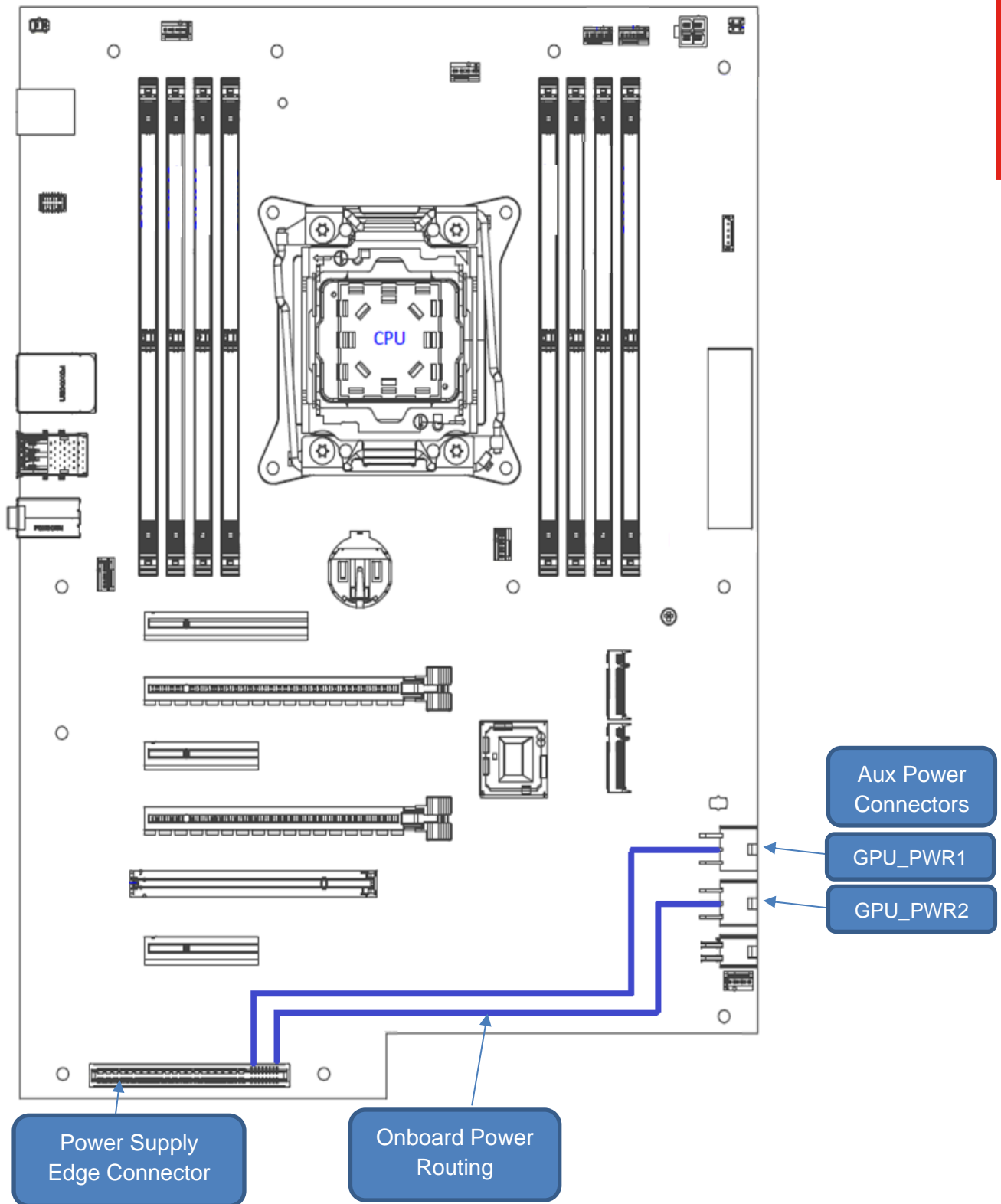
Section 2 – Power Ratings for Key System Components

To fully understand the power capabilities of the ThinkStation P520 and P520c platforms, it's important to understand the defined power ratings for the various internal components used within the system. Figure 2 below describes the power ratings for the various CPUs supported on the P520 and P520c.

Figure 2 - CPU Power Ratings

CPU Name (Xeon Skylake-W)	CPU Power	Additional CPU Information
W-2102	120W	2.9GHz, 4 cores, DDR4-2400
W-2104	120W	3.2GHz, 4 cores, DDR4-2400
W-2123	120W	3.6GHz, 4 cores, DDR4-2666, Turbo, Hyper-threading
W-2125	120W	4.0GHz, 4 cores, DDR4-2666, Turbo, Hyper-threading
W-2133	140W	3.6GHz, 6 cores, DDR4-2666, Turbo, Hyper-threading
W-2135	140W	3.7GHz, 6 cores, DDR4-2666, Turbo, Hyper-threading
W-2145	140W	3.7Ghz, 8 cores, DDR4-2666, Turbo, Hyper-threading
W-2155	140W	3.3GHz, 10 cores, DDR4-2666, Turbo, Hyper-threading
W-2195	140W	2.3GHz, 18 cores, DDR4-2666, Turbo, Hyper-threading

CPU Name (Xeon Cascade Lake-W)	CPU Power	Additional CPU Information
W-2223	120W	3.6GHz, 4 cores, DDR4-2933, Turbo, Hyper-threading
W-2225	105W	4.1GHz, 4 cores, DDR4-2933, Turbo, Hyper-threading
W-2235	130W	3.8GHz, 4 cores, DDR4-2933, Turbo, Hyper-threading
W-2245	155W	3.9GHz, 8 cores, DDR4-2933, Turbo, Hyper-threading
W-2255	165W	3.7GHz, 10 cores, DDR4-2933, Turbo, Hyper-threading
W-2265	165W	3.5GHz,12 cores, DDR4-2933, Turbo, Hyper-threading
W-2275	165W	3.3Ghz, 14 cores, DDR4-2933, Turbo, Hyper-threading
W-2295	165W	3.0GHz, 18 cores, DDR4-2666, Turbo, Hyper-threading

Figure 3 below lists the power ratings for the various add-in cards supported across P520 and P520c. Note that not all cards are supported on both platforms.

Figure 3 - Add-in Card Power Ratings

Max Power Rating	Card Name	Card Type	Aux Power Connectors Required (if any)
320W	RTX 3080 RTX A6000	Graphics Card (Triple Slot) Graphics Card (Dual Slot)	8-pin + 8-pin (PCIe) 8-pin + 8-pin (PCIe)
295W	RTX 8000, RTX 6000	Graphics Card (Dual Slot)	8-pin + 6-pin (PCIe)
265W	RTX 5000	Graphics Card (Dual Slot)	8-pin + 6-pin (PCIe)
250W	RTX 2080 RTX 2080 Super	Graphics Card (Dual Slot) Graphics Card (Triple Slot)	8-pin + 6-pin (PCIe)
250W	P6000	Graphics Card (Dual Slot)	8-pin (PCIe)
250W	GV100	Graphics/Compute Card (Dual Slot)	8-pin (PCIe)
235W	GP100	Graphics/Compute Card (Dual Slot)	8-pin (PCIe)
230W	RTX A5000	Graphics Card (Dual Slot)	8-pin (PCIe)
215W	RTX 2070 Super	Graphics Card (Triple Slot)	8-pin + 6-pin (PCIe)
210W	RTX 2070	Graphics Card (Dual Slot)	8-pin (PCIe)
200W	RTX 3060Ti	Graphics Card (Triple Slot)	8-pin (PCIe)
180W	P5000, GTX 1080	Graphics Card (Dual Slot)	8-pin (PCIe)
170W	RTX 2060	Graphics Card (Dual Slot)	8-pin (PCIe)
160W	RTX 4000	Graphics Card (Single Slot)	8-pin (PCIe)
150W	GTX 1070	Graphics Card (Dual Slot)	6-pin (PCIe)
	W7000 WX7100 (130W)	Graphics Card (Single Slot) Graphics Card (Single Slot)	6-pin (PCIe)
140W	RTX A4000	Graphics Card (Single Slot)	6-pin (PCIe)
120W	GTX 1060	Graphics Card (Dual Slot)	6-pin (PCIe)
105W	P4000	Graphics Card (Single Slot)	6-pin (PCIe)

75W (or less)	NVS810, NVS510, NVS315, NVS310 P2200, P2000, P1000, P600, P400 P620, T400, T600, T1000	Graphics Card (Single Slot)	None
	W5100, W4100, W2100 FirePro 2270 WX3100, WX4100, WX5100	Graphics Card (Single Slot)	None
	Broadcom 9460-8i Broadcom 9440-8i	Storage Controller (Single Slot)	None
	I210-T1, I350-T2, I350-T4, Bitland BN8E88, 7260 Wifi, X540-T2 X710-DA2, Aquantia 5G,	Networking (Single Slot)	None
	Thunderbolt	High Speed Bus (Single Slot)	None

Section 3 – P520 Power Configurations

P520 supports 690W, 900W, and 1000W power supplies, which allows customers to tailor their system to better meet the requirements of the components they intend to support.

P520 Power Supply Configuration Notes:

- **For configurations that are not listed below but appear to be feasible, please work with the Technical Solutions Team to have the configuration validated/vetted.**
- Officially supported configurations could still be limited by additional factors not defined within this document.
- Both onboard GPU power connections (GFX_PWR1 and GFX_PWR2) are active when either the 690W, 900W, or 1000W power supply is installed.
- P520 supports either the 690W, 900W, or 1000W power supply.
- Some configurations might require additional cabling (see Appendix).

P520

690 Watt PSU (max 140W CPU)

- Both onboard power connections are active (GFX_PWR1 and GFX_PWR2).
- Includes dual 8-pin (6+2) drop cables for powering GPUs or other cards.
- Provides 2 dedicated 12V rails.
- Some supported GPU configurations might require additional cabling (See Appendix).

CPU (up to 140W)

All RDIMM Memory

No Storage Limitations

GPU Support

1x up to 265W
PLUS
1x up to 180W

Dual 6+2 pin Power Drop

P520

690 Watt PSU (max 165W CPU)

- Both onboard power connections are active (GFX_PWR1 and GFX_PWR2).
- Includes dual 8-pin (6+2) drop cables for powering GPUs or other cards.
- Provides 2 dedicated 12V rails.
- Some supported GPU configurations might require additional cabling (See Appendix).

CPU (up to 165W)

All RDIMM Memory

No Storage Limitations

GPU Support

1x up to 180W
PLUS
1x up to 180W

Dual 6+2 pin Power Drop

P520

900 Watt PSU

- Both onboard power connections are active (GFX_PWR1 and GFX_PWR2).
- Includes dual 8-pin (6+2) drop cables for powering GPUs or other cards.
- Provides 2 dedicated 12V rails.
- Some supported GPU configurations might require additional cabling (See Appendix).

CPU (up to 165W)

All RDIMM Memory

No Storage Limitations

GPU Support

Up to 2x 250W

OR

1x 295W + 1x 75W

OR

1x 250W + 1x 75W

NOTE:
2x RTX 2070 is not allowed

Dual 6+2 pin Power Drop

P520

1000 Watt PSU

- Both onboard power connections are active (GFX_PWR1 and GFX_PWR2).
- Includes dual 8-pin (6+2) + 6-pin drop cables for powering GPUs or other cards.
- Provides 2 dedicated 12V rails.
- Some supported GPU configurations might require additional cabling (See Appendix).

CPU (up to 165W)

All RDIMM Memory

No Storage Limitations
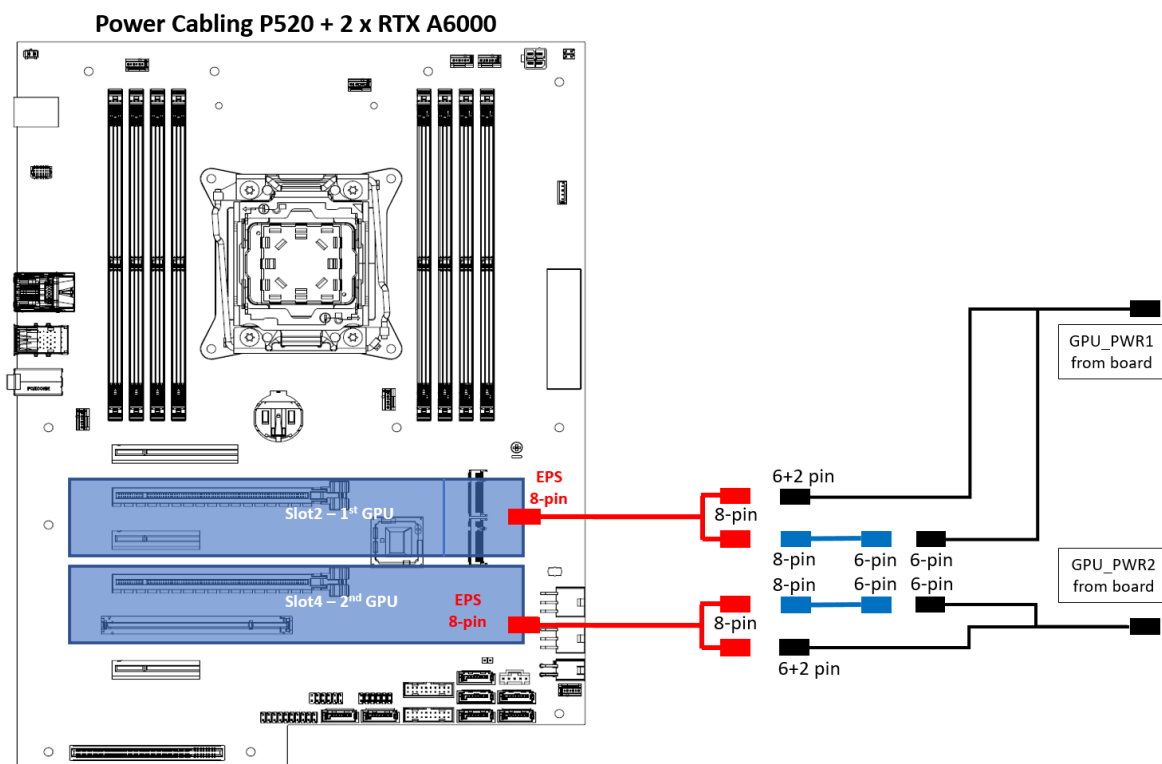
GPU Support

Up to 2x 295W

OR

2x 320W

Dual 8 + 6 pin Power Drop

Section 4 – P520 with dual RTX A6000

Use the following diagram to assist with configuring P520 with dual RTX A6000 adapters.

Power Cabling P520 + 2 x RTX A6000

Notes:

1. The RTX A6000 adapter has an EPS12V 8-pin connector, not to be confused with a PCIe 8-pin connector. This card ships with the EPS 8-pin to dual PCIe 8-pin splitter cable (Red Cable) listed above.

2. Part numbers for the other cable listed above:
    Blue Cable, PCIe 8-pin to PCIe 6-pin (100mm): FRU 00XL159

3. This configuration is only approved with 1000W PSU models.

Section 5 – P520c Power Configurations

P520c supports 500W and 625W power supplies. Unlike the P520, this power supply uses direct cabled connections from the power supply to support auxiliary powered graphics cards.

P520c

500 Watt PSU (max 140W CPU)

- Single 6-pin PCIe auxiliary power drop.
- Provides single dedicated 12V rail.
- Some supported GPU configurations might require additional cabling (See Appendix)
- **Use of double-wide cards requires the removal of the lower HDD bay (Fig 4).**

CPU (up to 140W)	All RDIMM Memory	No Storage Limitations	GPU Support
			1x up to 180W PLUS 1x up to 75W
			OR
			Up to 2x 150W
			OR
			Up to 2x 75W
			Single 6-pin Power Drop

P520c

500 Watt PSU (max 155W CPU)

- Single 6-pin PCIe auxiliary power drop.
- Provides single dedicated 12V rail.
- Some supported GPU configurations might require additional cabling (See Appendix)
- **Use of double-wide cards requires the removal of the lower HDD bay (Fig 4).**

CPU (up to 155W)	All RDIMM Memory	No Storage Limitations	GPU Support
			1x up to 150W PLUS 1x up to 75W
			Single 6-pin Power Drop

P520c

625 Watt PSU

- 8-pin (6+2) and 6-pin PCIe auxiliary power drops.
- Provides single dedicated 12V rail.
- Some supported GPU configurations might require additional cabling (See Appendix)
- **Use of double-wide cards requires the removal of the lower HDD bay (Fig 4).**

| CPU (up to 155W)	All RDIMM Memory	No Storage Limitations	GPU Support
			1x up to 265W PLUS 1x up to 75W
			OR
			2x 105W
			OR
			2x 75W
			6+2 pin + 6 pin Power Drop

P520c Power Supply Configuration Notes:

- **For configurations that are not listed above but appear to be feasible, please work with the Technical Solutions Team to have the configuration validated/vetted.**
- Officially supported configurations could still be limited by additional factors not defined within this document.
- Power supply comes with a single 6-pin PCIe power drop.
- Some supported GPU/add-in-card configurations might require additional cabling to be supported. See Appendix.
- Use of a double-wide graphics card (such as P5000) requires that the lower HDD bay be removed from the system in order to avoid physical interference issues. See Figure 4 below.

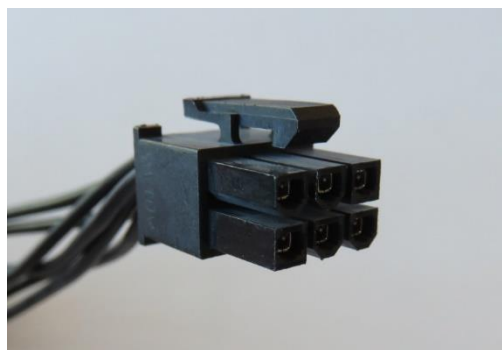*Figure 4 - P520c Lower HDD Bay Removal for Double-Wide Graphics Cards*
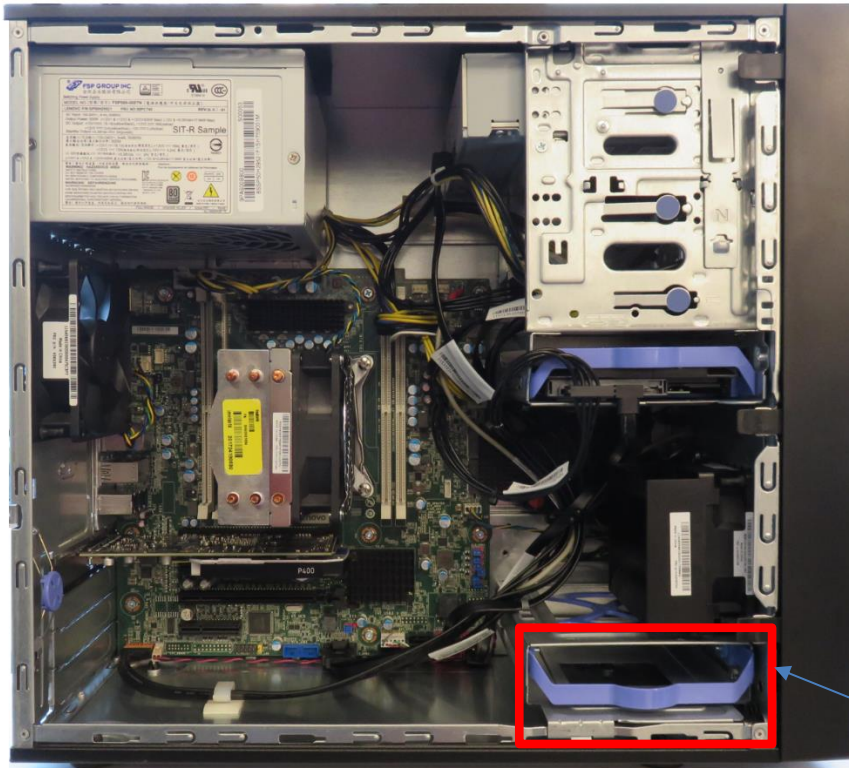
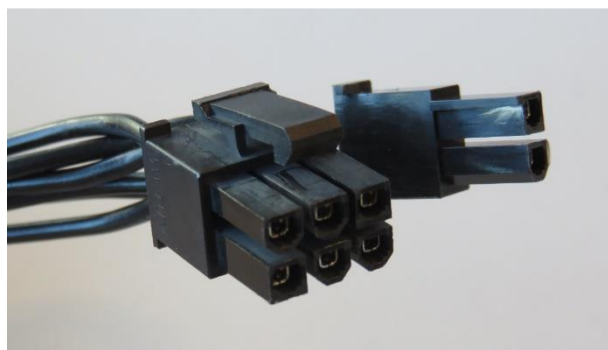This HDD bay must be removed for installation of double-wide full length graphics cards.

Section 6 – Appendix

This section contains additional useful information about the hardware used to power adapter cards in ThinkStation systems.

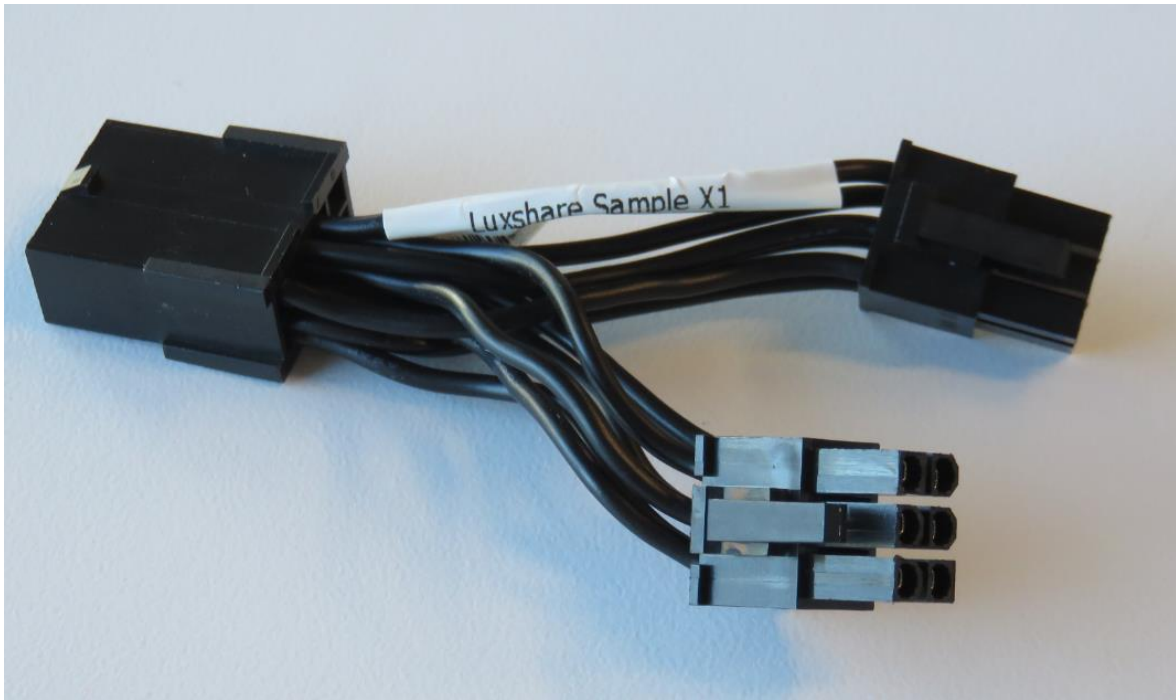## *PCIe Power Connectors*

6-pin PCIe Power Connector

6+2 pin PCIe Power Connector

Supported PCIe Power Cable Adapters

6-pin PCIe to 8-pin PCIe Converter, 100mm (FRU = 00XL159)

8-pin to dual 6-pin PCIe Splitter, 50mm (FRU = 04X2387)

6-pin to 8+6-pin PCIe Splitter, 250mm (FRU = 5C10U58233)

EPS 8-pin to dual PCIe 8-pin

Section 7 – Revision History

Version	Date	Author	Changes/Updates
1.6	8/25/2021	Jim Pfaltzgraff	Added newer GPUs Added section for dual A6000 cabling Added some new cable pictures in the Appendix
1.5	1/31/2021	Jim Pfaltzgraff	Added card widths Updated power bubble diagrams
1.4	4/15/2020	Jason Moebs	Updated CPU chart for Figure 2 to add Cascade Lake CPUs. Updated Section 2 to incorporate RTX class GPU's within the table.
1.3	4/18/2019	Cory Chapman	Added update to Section 2 regarding RTX class GPUs. Those GPUs are not covered by this document. Please reference the whitepaper "ThinkStation RTX GPU Support Matrix".
1.2	1/31/2018	Cory Chapman	Adjusted guidance for P520 with 690W to remove dual 250W cards. Dual 250W supported with 900W. Corrected description in Figure 4 to add "full length". Also removed 2 x 235W support for P520 with 690W (max dual card wattage is 2 x 180W). Removed references to 300W cards. See TSET team for usage if necessary. Added GV100 and P620 to adapter list in Figure 3.
1.1	12/11/2017	Cory Chapman	Updated CPU chart for Figure 2 to add more CPU detail.
1.0	11/21/2017	Cory Chapman	Initial launch release