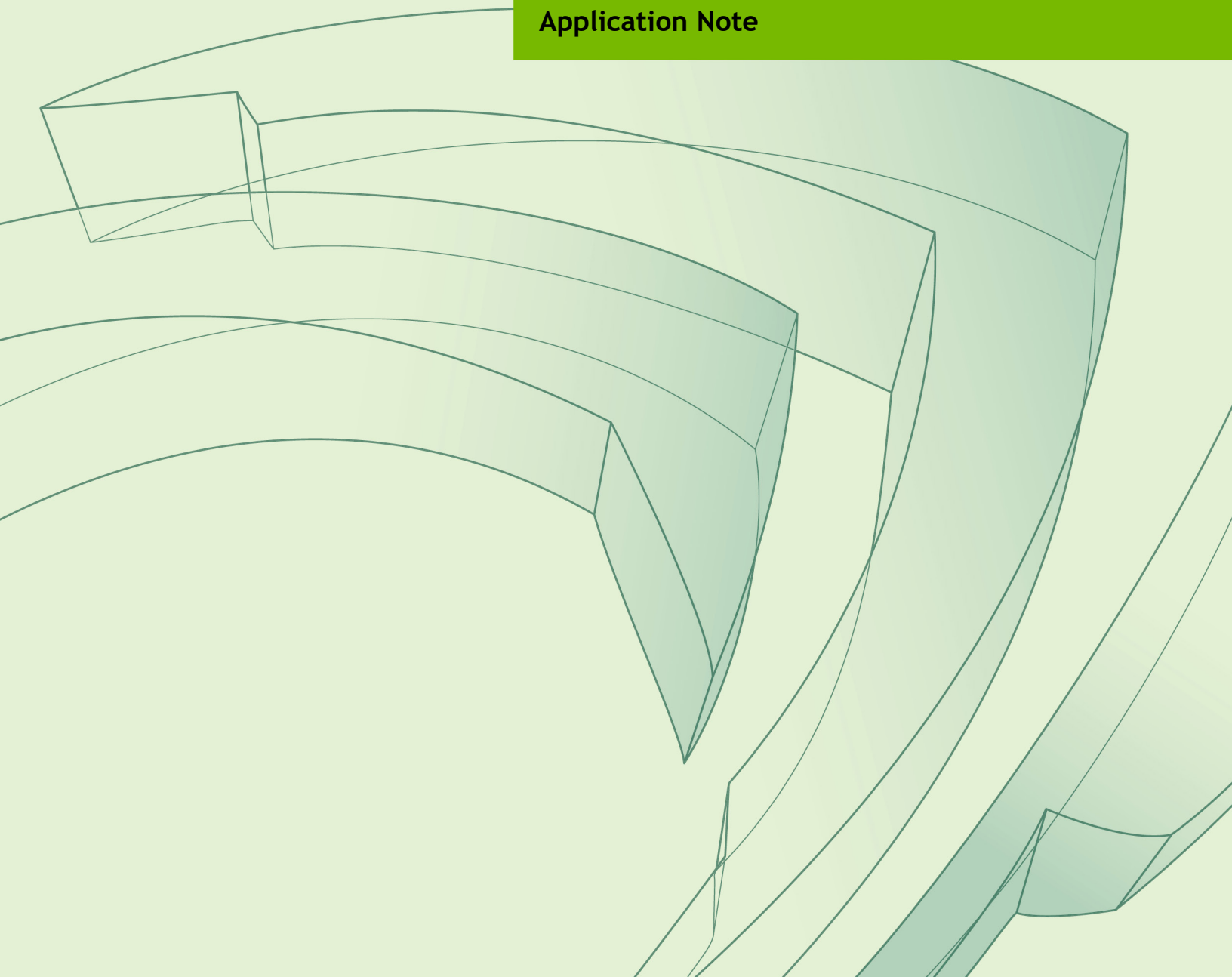




POWER GUIDELINES FOR WORKSTATION PRODUCTS

DA-07261-001_v09 | July 2021

Application Note



DOCUMENT CHANGE HISTORY

DA-07261-001_v09

Version	Date	Authors	Description of Change
01	June 6, 2014	VL, SM	Initial Release
02	June 2, 2015	JK, SM	<ul style="list-style-type: none"> • Updated to include Quadro M6000, Quadro K5200, Quadro K4200, Quadro K2200, Quadro K1200, Quadro K620, and Quadro K420 • Updated with Quadro M6000 power guidelines • Updated PCIe connectors figure (Figure 2) • Added a power requirements for 250 W cards (single 8-pin connector) section • Added a dual 6-pin to 8-pin adapter cable section
03	July 8, 2015	JK, SM	Updated error Table 1
04	May 5, 2017	JK, SM	Updated to include Quadro GP100, Quadro P6000, Quadro P5000, Quadro P4000, Quadro P2000, Quadro P1000, Quadro P600, and Quadro P400
05	March 21, 2018	PV, SM	<ul style="list-style-type: none"> • Updated Figure 1 • Updated Table 1
06	December 12, 2018	JK, SM	Updated to include Quadro RTX 4000, Quadro RTX 5000, Quadro RTX 6000, and Quadro RTX 8000
07	January 25, 2019	HG, SM	Updated pin numbers in Figure 2
08	October 22, 2020	AS, SM	<ul style="list-style-type: none"> • Added NVIDIA RTX A6000 information to Table 1 • Updated “Power Connectors” section and Figure 2 to reflect CPU 8-Pin connection option • Updated “Power Adapters” section with CPU 8-Pin standard cable information
09	July 29, 2021	AS, SM	Added NVIDIA RTX A5000, A4000, and A2000 information to Table 1

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OVERVIEW

This application note discusses the power requirements of the NVIDIA® workstation products based on NVIDIA RTX™, and Quadro RTX™ line of graphics cards. A suitable power supply is necessary to maintain system integrity under computational load.



Figure 1. NVIDIA Workstation Graphics Cards

POWER REQUIREMENTS

The workstation desktop graphics cards may require auxiliary power within the host chassis. Ensure that your system can deliver the necessary wattage and auxiliary power connectors for all cards in the system. If the supplied power is not adequate, the cards will not function properly. Table 1 specifies the power requirements and power connectors for the various workstation desktop graphics cards.

Table 1. Workstation GPU Power Specifications

Model	TGP	Required Auxiliary Power Connectors
NVIDIA RTX A6000	300 W	CPU 8-pin (EPS-12V)
NVIDIA RTX A5000	230 W	PCIe 8-pin
NVIDIA RTX A4000	140 W	PCIe 6-pin
NVIDIA RTX A2000	70 W	N/A
Quadro RTX 8000	260 W	PCIe 8-pin + PCIe 6-pin
Quadro RTX 6000	260 W	PCIe 8-pin + PCIe 6-pin
Quadro RTX 5000	230 W	PCIe 8-pin + PCIe 6-pin
Quadro RTX 4000	125 W	PCIe 8-pin
Quadro GV100	250 W	PCIe 8-pin
Quadro GP100	235 W	
Quadro P6000	250 W	
Quadro M6000 24GB	250 W	
Quadro M6000	250 W	
Quadro K6000	225 W	PCIe 6-pin + PCIe 6-pin
Quadro P5000	180 W	PCIe 8-pin
Quadro M5000	150 W	PCIe 6-pin
Quadro K5200	150 W	PCIe 6-pin
Quadro K5000	122 W	PCIe 6-pin
Quadro P4000	105 W	PCIe 6-pin
Quadro M4000	120 W	
Quadro K4200	108 W	
Quadro K4000	80 W	
Quadro P2000	75 W	N/A
Quadro M2000	75 W	
Quadro K2200	60 W	
Quadro K2000	51 W	
Quadro K2000D	51 W	
Quadro P1000	47 W	N/A
Quadro K1200	45 W	
Quadro P620	40 W	N/A
Quadro P600	40 W	
Quadro K620	41 W	
Quadro P400	30 W	N/A
Quadro K420	41 W	

The TGP (total graphics power) represents the maximum amount of graphics board power that the system power supply should be able to provide to the graphics card.

POWER CONNECTORS

Depending on the workstation graphics card the end customer is utilizing, external power connectors may be required to fully power up the graphics card. The supported power connectors on workstation graphics card are CPU 8-pin, PCIe 8-pin and PCIe 6-pin.

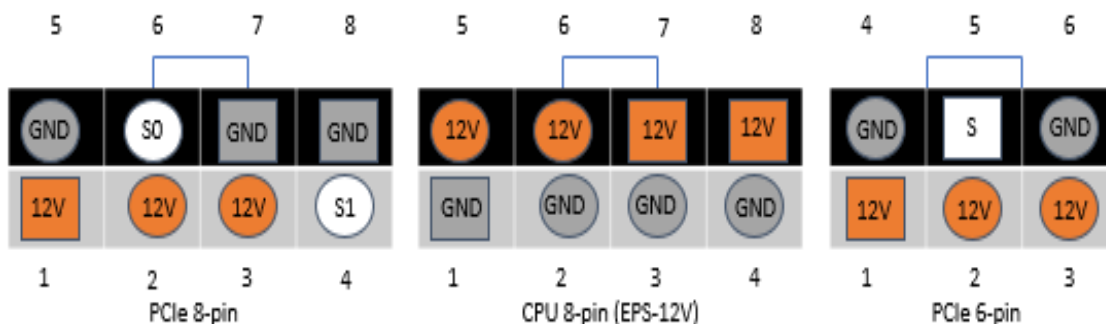


Figure 2. Power Connectors

Table 2. Power Connectors Pin Description

Pin	CPU 8-Pin	PCIe 8-Pin	PCIe 6-Pin
1	GND	12V	12V
2	GND	12V	12V
3	GND	12V	12V
4	GND	SENSE1	GND
5	12V	GND	SENSE
6	12V	SENSE0	GND
7	12V	GND	NA
8	12V	GND	NA

POWER REQUIREMENTS FOR 250 W CARDS WITH A SINGLE PCIe 8-PIN CONNECTOR

Typically, the PCIe slot is rated for 75 W and the 8-pin PCIe connector is rated for 150 W. However, based on our testing and surveying the current ecosystem, it was found that the 8-pin PCIe connector can drive up to 175 W. Along with the PCIe slot, it can support a graphics card consuming up to 250 W.

However, due to the increased power delivery on the 8-pin PCIe connector, PSU with a 12V rail capable of driving at least 18A needs to be dedicated for the 8-pin PCIe connector.

POWER ADAPTERS

It is extremely important to understand the board power requirements when selecting power supplies. It is recommended to use a power supply that has all the required connectors. However, if the required connector is not available on a given power supply, it is possible to use adapters to convert existing connectors to PCIe or CPU auxiliary connectors.

When using power adapters, it is important to evaluate the rated amperage on the 12V rail that is being used to source the adapter cable. The information is available in the power supply's user manual or it is printed on the power supply casing.



CAUTION: System builders should review the power specifications and guidelines outlined on their system power supply to ensure that the connector limits are not exceeded when using adapters.

PCIe 6-Pin Y-Splitter Cable

It is possible to split a single 6-pin auxiliary PCIe connector into two 6-pin auxiliary PCIe connectors. While NVIDIA does not recommend using the Y-splitter with the Quadro cards, it is extremely important to ensure that the 12V rail on the power supply driving this is capable of handling the additional connector, if one has to use the splitters.

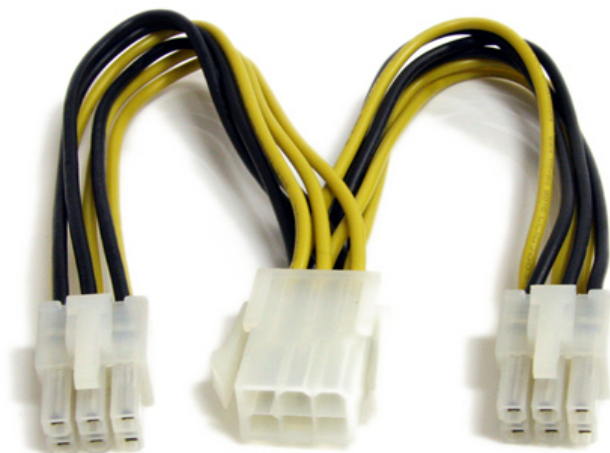


Figure 3. 6-Pin Y-Splitter Cable

PCIe 8-Pin to 6-Pin Adapter Cable

It is possible to split a single 8-pin auxiliary PCIe connector into a single or two 6-pin auxiliary PCIe connectors. If you are using such a splitter, it is important to ensure that the 12V rail on the power supply driving this is capable of handling the additional connector. Refer to the rated amperage on the 12V rail sourcing the splitter to ensure that the connector limits are not exceeded.



Figure 4. 8-Pin to 6-Pin Adapter Cable

PCIe Dual 6-Pin to 8-Pin Adapter Cable

It is possible to combine two 6-pin auxiliary PCIe connectors into a single 8-pin auxiliary PCIe connector. If you are using such an adapter, it is important to ensure that the 12V rail on the power supply driving this adapter is rated for at least 18A.



Figure 5. Dual 6-Pin to 8-Pin Adapter Cable

CPU 8-Pin Standard Power Adapter Cable

For NVIDIA products with a CPU 8-pin connector, a power adapter to convert two PCIe 8-pin connectors to a single CPU 8-pin may be used.

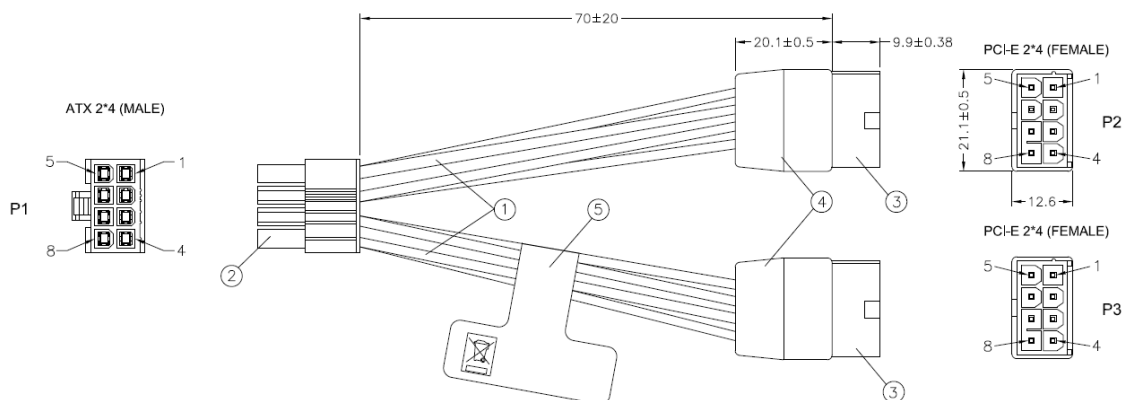


Figure 6. CPU 8-Pin Standard Power Adapter Cable

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