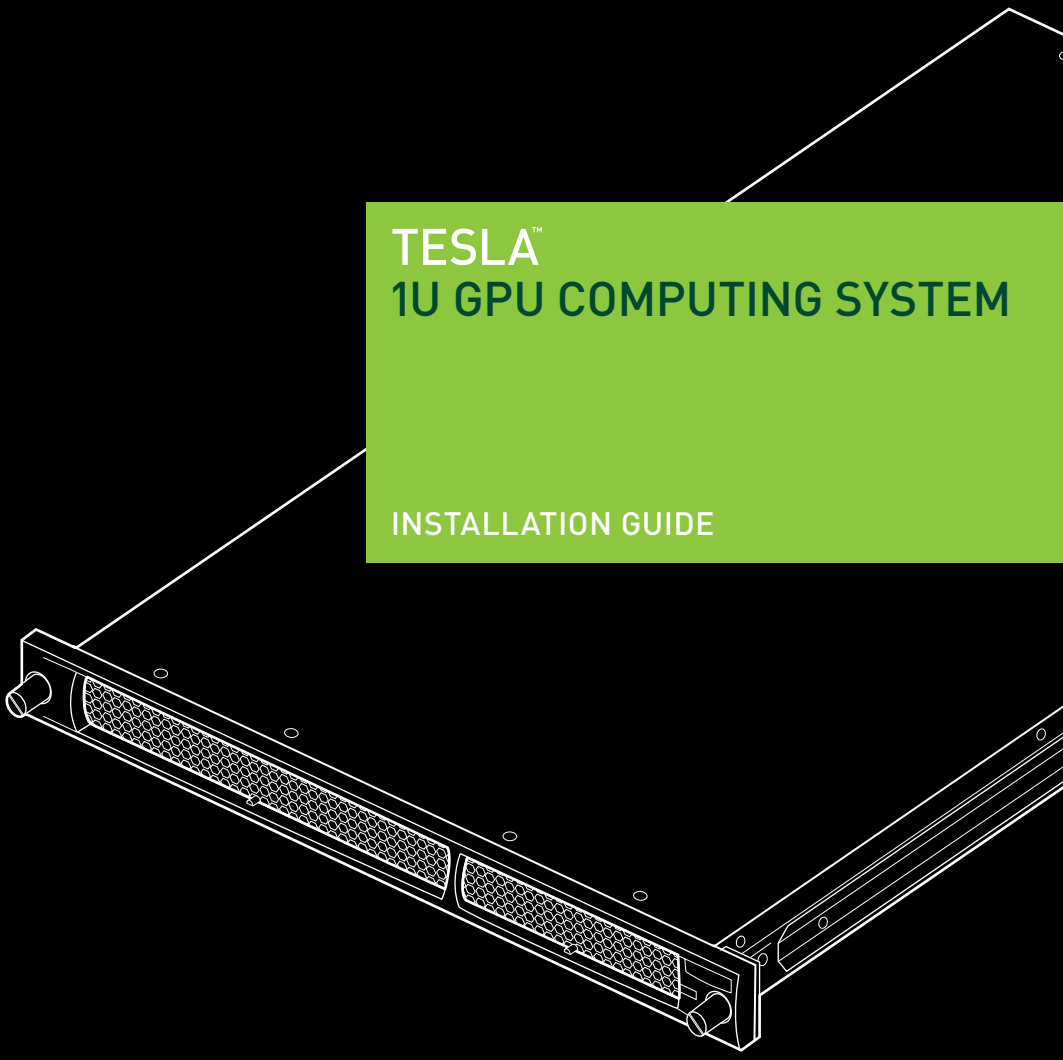
TESLA™
1U GPU COMPUTING SYSTEM

INSTALLATION GUIDE



NVIDIA

NVIDIA Tesla
1U GPU Computing System

TABLE OF CONTENTS

01 INTRODUCTION

The NVIDIA® Tesla™ 1U GPU Computing System simplifies adding GPU computing to rack-mount installations. With Tesla, you can tackle massive problems with the unprecedented performance of the many-core architecture and the C programming enabled by a suite of developer tools. Tesla enables you to solve problems faster.

Note: It is important to register your Tesla 1U GPU Computing System in order to receive NVIDIA Customer Care online and phone support. To register, please visit: www.nvidia.com/register.

About This Guide

This installation guide provides instructions to connect the Tesla 1U GPU Computing System to an NVIDIA-tested host system in a rack-mount environment. For a list of NVIDIA-tested host systems, of for information on using the system with applications, refer to the NVIDIA web site at www.nvidia.com/tesla.

01

Minimum System Requirements

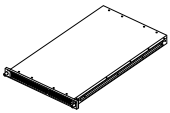
Prior to unpacking your new NVIDIA Tesla system, confirm that your host system meets all the system requirements for a smooth installation.

- **System and Platform**
  - NVIDIA-tested system or platform
- **Operating System**
  - Linux 32-bit or 64-bit (Red Hat Enterprise
  - Linux 3, 4, and 5; SUSE 10.3)
- **Processor**
  - Intel Pentium 4 or Xeon processor or higher
  - AMD Opteron processor or higher
- **RAM**
  - 2 GB minimum, 4 GB recommended
- **System Interface**
  - PCI Express x16 slot
  - PCI Express x8 slot if you are using the optional x8 interface card

02 UNPACKING

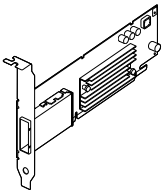
Equipment

Check that you have all of the items you need for installing your Tesla system. Depending on which Tesla product you purchased and from whom you purchased it, some accessories may have been ordered and shipped separately. You should have:



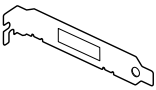
One (1) Tesla 1U GPU Computing System chassis

The 1U chassis includes four (4) Fermi GPUs.



Two (2) NVIDIA Interface Cards

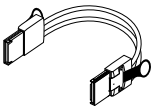
Installs into the PCI Express x16 slot in the host system. The card comes with the standard ATX-height bracket attached. A lowprofile bracket is also provided and can replace the standard bracket on the card. Your solution provider may have already configured your cards, brackets and cables to your specific installation needs.



Two (2) Low-Profile Brackets

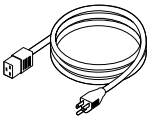
Used to replace the standard ATX (long) bracket shipped attached to the interface card. Your solution provider may have already configured your cards, brackets, and cables to your specific installation needs.

02



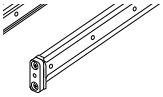
Two (2) Interconnect Cables

Connects from the interface card in the host system to the Tesla 1U GPU Computing System.



Power Cords

Used to supply power to the Tesla 1U GPU Computing System. The host system controls the power. Your solution provider may have already configured your cards, brackets, and cables to your specific installation needs.

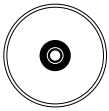


One (1) Rail Kit

Each rail kit includes two (2) rails for use with a standard 4-post 19 inch, EIA compliant rack.

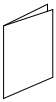
Registration Card

Register to gain priority access to NVIDIA's Customer Care.



Installation CD

Contains this file (Installation Guide) and all the necessary drivers to enable the Tesla system. To keep your drivers current, visit http://developer.nvidia.com/object/cuda.html and download the latest drivers.



Quick Start Guide

Provides the basic procedures necessary to install and bring up the Tesla 1U GPU Computing System.

03 HARDWARE INSTALLATIONS

Installing the NVIDIA Tesla 1U GPU Computing System hardware involves opening up your computer. Follow all of the safety instructions provided here to ensure that there is no damage to you, your host system, or the Tesla unit.

Note: All hardware must be installed prior to installation of the drivers.

Safety Instructions

To reduce the risk of fire, electric shock, and injury always follow basic safety precautions. Remember to remove power from your host system by disconnecting the AC main source before installing any equipment into the host system chassis. For more information regarding important safety instructions, refer to the Important Safety Information section. Do not allow anything to rest on the power cord. Do not place this product where a person can step or trip on the power cord.

Before You Begin

The Tesla system must be connected to a host system. The host system accessing the Tesla system must have one or more open PCIe slots. Any NVIDIA graphics drivers on your host system should be uninstalled prior to installing the hardware and software associated with the Tesla system.

03

Optional Low-Profile Bracket

Before beginning the installation, determine if you are going to need the Tesla interface card with the standard (full-height ATX) bracket or the shorter low-profile bracket. If you require the lowprofile bracket, use the following instructions to replace the standard bracket. Replacing the bracket requires a Philips #2 screwdriver.

1. Remove the two (2) screws holding the bracket to the card.

2. Re-use those screws to attach the new bracket.

Tesla 1U GPU Computing System Installation

Mounting the Tesla System in a Rack

Plan your rack configuration to ensure you have the proper cables to reach from the Tesla system to your host system. The Tesla system ships with 0.5-meter cables by default. An optional 2-meter cable is available.

The Tesla system also ships with rails to fit a 4-post 19-inch EIA rack as the default configuration.

If installed in a closed or multi-unit rack assembly, the operating ambient temperature of the rack environment may be greater than room ambient temperature. Therefore, consideration should be given to installing the equipment in an environment compatible with the manufacturer's maximum rated ambient temperature (Tmra). The maximum operating ambient temperature is 35 ºC.

1. Remove one of the rails from the packing box.
2. Remove the mounting screws attached to either end of the rail. Set aside as you will need these to secure the rail to the rack at the end of the steps. Remove any existing graphics card (if there is one). Save hardware (such as screws and brackets) to use when installing the NVIDIA graphics card.

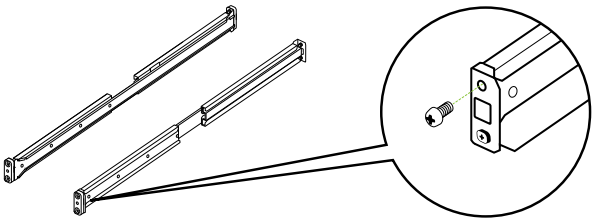


Figure 1. Detail of rail for rack mounting

3. Choose either the front or the rear of the rack to start your rail installation.

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4 Slide the rail into the side of the rack, and adjust the length accordingly. Make sure the flare end of the rail is positioned at the front of the rack.

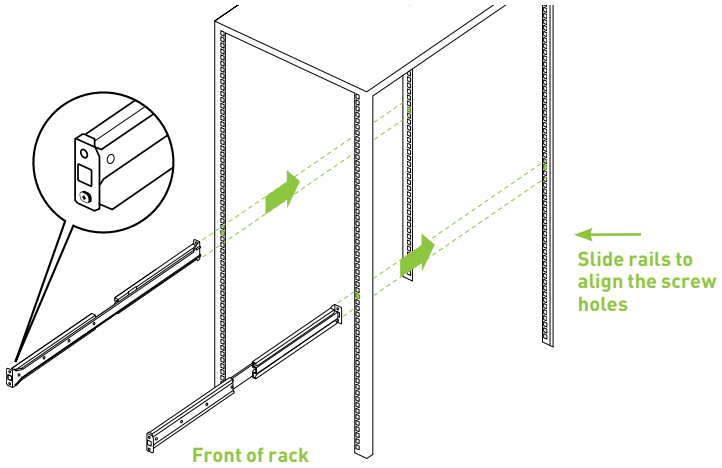


Figure 2. Detail of putting rail into rack

5 Slide the rail onto rack post. The studs in the front and back should hold the rail in place temporarily.

6 Use the supplied screws to secure the rails to the rack firmly.

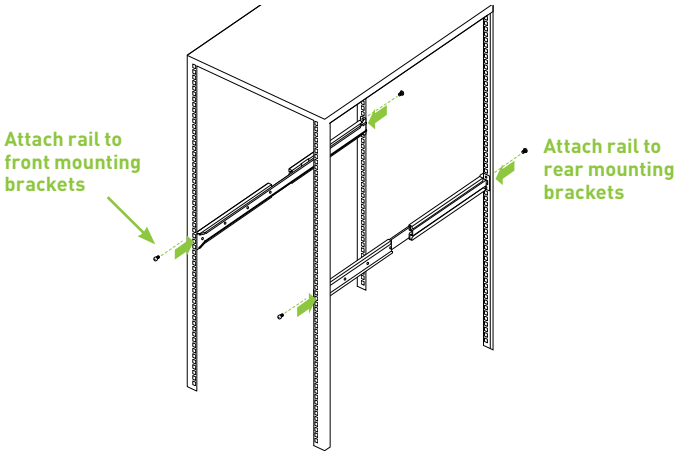


Figure 3. Detail of securing rails in rack

7 Repeat Step 1 through Step 7 to install the other rail.

8 Unpack the Tesla system.

9 Align the Tesla system with the installed rails and slide it into the rack.

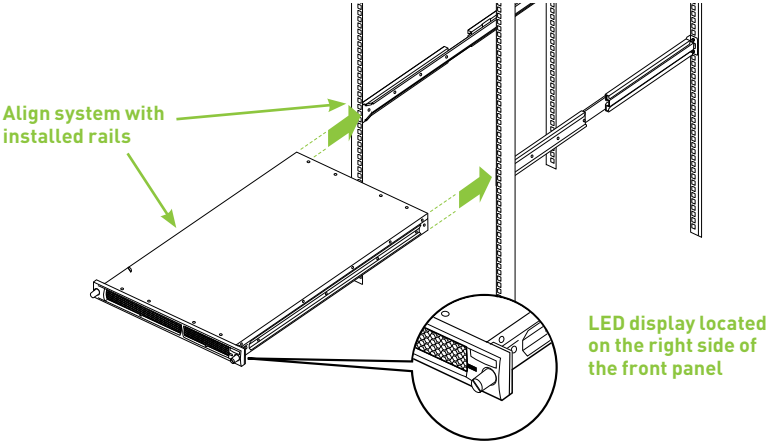


Figure 4. Slide the system onto the rails

10 Make sure the status LED on the front panel of the system is located on the right side for proper installation.

11 Tighten the thumb screws on the front of the unit to secure the Tesla system to the rack system.

03

Connecting to the Host System

Use the following procedures to connect the Tesla 1U GPU Computing System system to a host system. Before you begin, make sure you disconnect the power cord to the host system.

1. Install the NVIDIA Interface Card in an open PCIe slot. If your host system requires a low-profile bracket on the card, replace the standard bracket with the low profile bracket provided in the box. Refer to bottom of page 9 of this document for more info.
2. Connect one end of one of the PCIe cables supplied with your system.

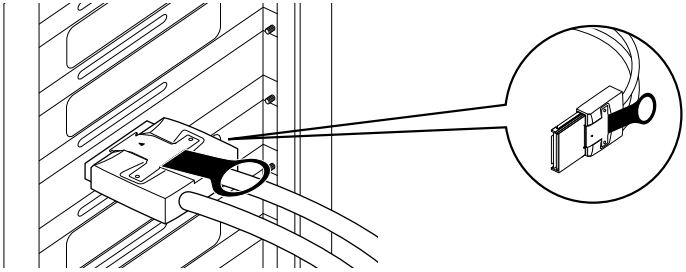


Figure 5. Connecting cable to host system

3. Connect the other end of the cable to the back of the Tesla system. The thumb tabs on the cable should face outward for the cable to engage properly.

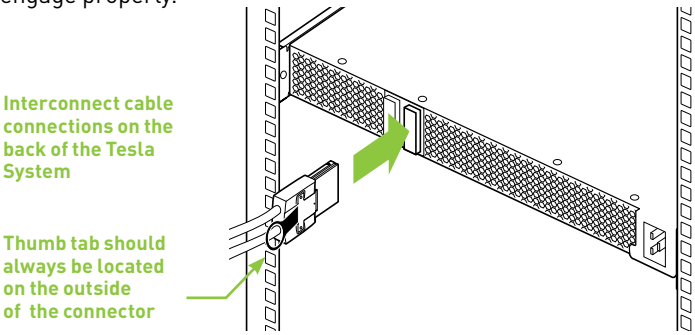


Figure 6. Connecting PCIe cable to Tesla system

Note: There is no specific order when connecting the inter-connect cables between the host system and the Tesla system.

4 Connect the power cord to the Tesla system.

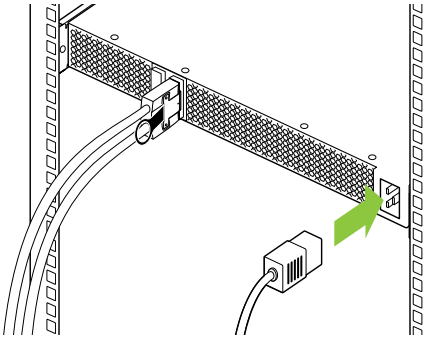


Figure 7. Connecting the power cord

5 Plug the power cord from the Tesla system to an AC outlet (it is recommended to use a power surge protected outlet).

6 Reconnect the power cord to your host system. The host power cord should have been unplugged at the beginning of the whole installation process.

7 Power on the host system. At this time, power is also applied to the Tesla system.

Note: The power-on state of the Tesla system is controlled by the host system. The Tesla system is powered on only when the host system is powered on.

03

04 DRIVER INSTALLATION

This section contains the instructions to install the software drivers within a Linux environment.

In addition to the NVIDIA drivers located on the Installation CD included with your computing board, the drivers can be downloaded from the NVIDIA web site at www.nvidia.com.

The driver follows a unified architecture model in which a single driver set is used for all supported NVIDIA GPUs. Your previous NVIDIA unified driver may not support your Tesla board. In that case, you will need to install the drivers from the CD or download from www.nvidia.com.

Driver Installation

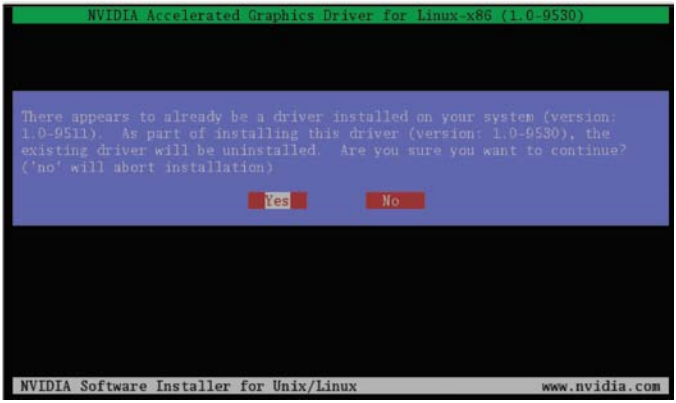
Before you begin the installation, you should exit the X server and close all OpenGL applications (it is possible that some OpenGL applications persist even after the X server has stopped). You should also set the default run level on your system such that it will boot to a VGA console and not directly to X. Doing so will make it easier to recover if there is a problem during the installation process.

Note: Refer to **readme.txt** located at /usr/share/doc/NVIDIA_GLX-1.0/README.txt for more detailed information regarding the linux driver installation.

04

1. Download the 32-bit or 64-bit Linux driver (the driver will have a name similar to "**NVIDIA-Linux-x86-100.14.11-pkg1. run**" or "**NVIDIA-Linux-x86_64-100.14.11-pkg2.run**").
2. Change to the directory containing the downloaded file.
3. Run as root the **NVIDIA-Linux*.run** file downloaded in Step 1. As the root user you can run the following executables:

   In the cd.download_directory, choose either **NVIDIA-Linux-x86-100.14.11-pkg1.run** or **NVIDIA-Linux-x86_64-100.14.11-pkg2.run.** The **NVIDIA-Linux*.run** file is a self-extracting archive. When executed, it extracts the content of the archive and runs the contained *nvidia installer* utility, which provides an interactive interface to walk you through the installation. *nvidia-installer* will also install itself to /usr/bin/nvidia-installer, which may be used at some later time to uninstall drivers, auto download updated drivers, etc.
4. Select **Accept** to accept the License Agreement.
5. Select **Yes** if a warning window displays indicating that there are drivers already installed. Selecting **Yes** tells the installation process to overwrite the previously installed drivers.
6. Select **Yes** when the Kernel Interface window displays. When the installer runs, it will check for a precompiled kernel interface. If it does not find one, it will attempt to locate an interface on the NVIDIA ftp site and then download it.



7 Select **OK** to compile a kernel interface. If a kernel interface cannot be downloaded, either because the FTP site cannot be reached or because one is not provided, the installer will check your system for the required kernel sources and compile the interface for you. You must have the source code for your kernel installed for compilation to work. On most systems this means that you will need to locate and install the correct kernel source, kernel headers or kernel development package.

   Linking of the kernel interface (in the case that the interface downloaded or compiled at installation) required you to have a linker installed on your system. The linker, usually /usr/bin/ld is part of the *binutils* package. If a precompiled kernel interface is not found, you must install a linker prior to installing the NVIDIA driver.

8 Run the *nvidia-xconfig* utility. *nvidia-xconfig* will find the X configuration file and modify it to use the NVIDIA X driver. If you have an NVIDIA device that is graphics output capable, you can answer **Yes** when the installer asks if it should run it. If you have no device capable of displaying graphics output, answer **No**. If you need to reconfigure your X server later, you can run *nvidia-xconfig* again from a terminal. *nvidia-xconfig* will make a backup copy of your configuration file before modifying it.

9 Installation is now complete.

Note: The X server must be restarted for configuration file changes to take effect. More information about **nvidia-xconfig** can be found in the **nvidia-xconfig** manual page by running: %man.nvidia.config.

04

CUDA Toolkit

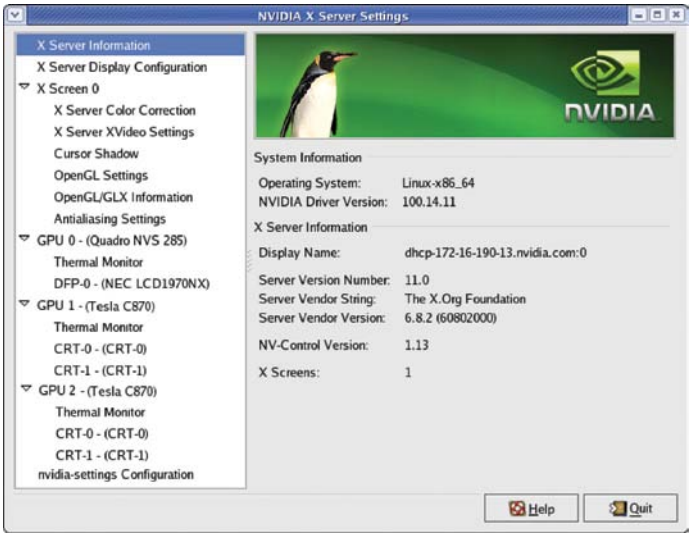
1. If desired, download the CUDA Toolkit from www.nvidia.com/object/cuda_get.html.
2. Change to the directory containing the downloaded file.
3. Run, as root, the **NVIDIA_CUDA_TOOLKIT*.run** file downloaded in Step 1.
4. You can either take the default location or installation or change to the directory of your choice. This document will assume installation in the default location.
5. Installation of the TOOLKIT is now complete.

CUDA Software Developer's Kit (SDK)

1. If desired, download the CUDA SDK from www.nvidia.com/object/cuda_get.html.
2. Change to the directory containing the downloaded file.
3. Run, as root, the **NVIDIA_CUDA_SDK*.run** file downloaded in Step 1.
4. You can either take the default location or installation or change to the directory of your choice. This document will assume installation in the default location.
5. Installation of the SDK is now complete.

Verifying Installation if Running X Server

1. Run nvidia-settings to display the server settings window.
2. Verify that the information displayed is correct, indicating proper functioning.
3. Run an application to verify that your Tesla system is working.



Verifying Linux Installation if Not Running X Server

1. As root, execute the command:
nvidia-bug-report.shd: **nvidia-bugreport.sh**

This will create a log file called nvidia-bug-report in your present working directory. Under the section called lspci in the log file, verify that there are two GPUs per PCI Express connection. The output should look something like the example below with the GPUs clearly identified as NVIDIA Corporation devices, but the device ID may be different depending on the generation of Tesla system you have:

```
16:00.0 3D controller: nVidia Corporation: Unknown device 0197 (rev a2)
18:00.0 3D controller: nVidia Corporation: Unknown device 0197 (rev a2)
```

04

2 Make sure that the following locations of the library files and NVIDIA compiler are included in your $PATH. The **.bashrc** file may need to be modified if the $PATH does not point to the correct files.

These are assuming the default locations were used.

```
PATH=$PATH:/usr/local/cuda/bin
export PATH
LD_LIBRARY_PATH=/usr/local/cuda/lib
export LD_LIBRARY_PATH
```

3 Go to the directory or folder that contains the CUDA SDK samples. In Linux, the default path is: /root/NVIDIA_CUDA_SDK

4 Compile the SDK samples by typing **make** make from this working directory.

5 As root, run the sample file called deviceQuery. The user may need to change to the directory where the NVIDIA SDK files are located. Usually these are located at /NVIDIA_CUDA_SDK/bin/linux/release.

For Tesla systems, there are two GPUs per PCI Express connection. Only two devices (Device 0 and Device 1) are shown. Output should look something like the following:

Device 0:	"Tesla 1U GPU"
Major revision number:	1
Minor revision number:	0
Total amount of global memory:	4294268245 bytes
Total amount of constant memory:	65536 bytes
Total amount of shared memory per block:	16384 bytes
Total number of registers available per block:	8192
Warp size:	32
Maximum number of threads per block:	512
Maximum sizes of each dimension of a block:	512 x 512 x 64
Maximum sizes of each dimension of a grid:	65535 x 65535 x 1
Maximum memory pitch:	262144 bytes
Texture alignment:	256 bytes
Clock rate:	1440000 kilohertz
Device 1:	"Tesla 1U GPU"
Major revision number:	1
Minor revision number:	0
Total amount of global memory:	4294268245 bytes
Total amount of constant memory:	65536 bytes
Total amount of shared memory per block:	16384 bytes

```
Total number of registers available per block:  8192
Warp size:                                      32
Maximum number of threads per block:            512
Maximum sizes of each dimension of a block:     512 x 512 x 64
Maximum sizes of each dimension of a grid:      65535 x 65535 x 1
Maximum memory pitch:                           262144 bytes
Texture alignment:                              256 bytes
Clock rate:                                     1440000 kilohertz
Test PASSED
Press ENTER to exit...
```

6 As root, run the sample file called bandwidthTest. The user may need to change to the directory where the NVIDIA SDK files are located. Usually they are located at /NVIDIA_CUDA_SDK/bin/linux/release. Output should look something like the example below, but bandwidth will be higher if your host supports PCIe Gen2 speeds:

```
Quick Mode
Host to Device Bandwidth for Pageable memory
Transfer Size (Bytes)                   Bandwidth(MB/s)
33554432                                999.4

Quick Mode
Device to Host Bandwidth for Pageable memory
Transfer Size (Bytes)                   Bandwidth(MB/s)
33554432                                720.8

Quick Mode
Device to Device Bandwidth
Transfer Size (Bytes)                   Bandwidth(MB/s)
33554432                                57204.1

&&&& Test PASSED
Press ENTER to exit...
```

04

05 REFERENCES AND RESOURCES

Getting Driver Updates

During NVIDIA software installation, the installation wizard provides an option to check for updated software online. You can also download software updates by visiting: www.nvidia.com/cuda.

05

06 REGISTRATION, WARRANTY, AND SUPPORT

Registering Your Tesla 1U GPU Computing System

Registering your Tesla system gives you priority access to the NVIDIA Customer Care support center. Once you have completed registration, you will be given a user ID and password for online Customer Care. You can also elect to receive automatic email notification of special promotions and software updates to ensure that your Tesla system continues to operate optimally.

Warranty and Support

The Tesla 1U GPU Computing System is covered by a 36-month warranty. Complete warranty details are available at www.nvidia.com/warranty.

For support, please visit the Customer Care center at www.nvidia.com/support. The site offers access to a broad range of product information.

06

07 COMPLIANCE AND CERTIFICATIONS

The NVIDIA Tesla 1U GPU Computing System is compliant with the relevant regulations and has received the required certifications from:

- Bureau of Standards, Metrology, and Inspection (BSMI)
- Australian Communications Authority (C-Tick)
- Conformité Européenne (CE)
- Federal Communications Commission (FCC)
- IECEE CB Scheme (CB)
- Industry Cananda Interference-Causing Equipment Standard (ICES)
- Ministry of Information and Communication (MIC)
- Russian System GOST R (GOST-R)
- Underwriters Laboratories (UL, CUL)
- Voluntary Control Council for Interference (VCCI)

07

US Federal Communications Commission Compliance

FCC – Federal Communications Commission

Title 47 of Code of Federal Regulation (CFR) part 15 - Radio frequency devices; Subpart B - Unintentional Radiator.

CAUTION: Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

Canada Compliance

Industry Canada

ICES-003: Digital Apparatus: Spectrum Management and Telecommunications Policy; Interference-Causing Equipment Standard.

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

Australia and New Zealand Compliance

C-Tick

The Australian Communications Authority (ACA) and the Radio Spectrum Management Group (RSM) of New Zealand

AS/NZS CISPR 22:2006 Standard

Information technology equipment-Radio disturbance characteristics-limit and methods of measurement.

ATTENTION: This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Japan Compliance

VCCI: Voluntary Control Council

For Interference by Information Technology Equipment.

- V-1/07.04: Agreement of Voluntary Control Council for Interference by Information Technology Equipment
- V-2/07.04: Rules for Voluntary Control Measures
- V-3/07.04: Normative Annex 1 Technical Requirements
- V-4/07.04: Normative Annex 1-1 Supplementary Test Conditions for Equipment under Test

この装置は、情報処理装置等電波障害自主規制協議会（ＶＣＣＩ）の基準に基づくクラスＡ情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

07

Korea Compliance

MIC - Ministry of Information and Communication

NVA-P804-000 (A)

- KN 22 (CISPR 22): Information technology equipment-Radio disturbance characteristics - limit and methods of measurement
- KN 24 (CISPR 24): Information technology equipment - immunity characteristics-limit and methods of measurement

B급기기(가정용 방송통신기기)
이 기기는 가정용(B급)으로 전자파적합등록을 한 기기로서 주로 가정에서 사용하는 것을 목적으로 하며, 모든 지역에서 사용할 수 있습니다.

Taiwan Compliance

BSMI - Bureau of Standards, Metrology and Inspection

D33088

- CNS 13438 (CISPR 22): Information technology equipment-Radio disturbance characteristics-limit and methods of measurement
- CNS 14336 (IEC 60950-1): Information Technology Equipment – Safety - Part 1: General Requirement

警告使用者：

此為甲類資訊技術設備，於居住環境中使用時，可能會造成射頻擾動，在此種情況下，使用者會被要求採取某些適當的對策。

European Union Compliance

CE: European Conformity (Conformité Européenne)

The equivalent international standards are in parentheses:

- Product complies with both the EMC Directive (2004/108/EC) and the Low Voltage Directive (2006/95/EC) issued by the Commission of the European Community.
- Compliance with these directives implies conformity to the following European Norms
- EN-55022 (CISPR 22): Information technology equipment-Radio disturbance characteristics - limit and methods of measurement
- EN 55024 (IEC 61000-4-2, 3, 4, 5, 6, 8, 11): Information technology equipment - immunity characteristics limit and methods of measurement
- EN 61000-3-2 (IEC 61000-3-2): Electromagnetic compatibility (EMC)-Part 3-2: Limits-Limits for harmonic current emissions (equipment input current ≤16 A per phase)
- EN 61000-3-3 (IEC 61000-3-3): Electromagnetic compatibility (EMC)-Part 3-3: Limits-Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤16 A per phase and not subject to conditional connection)
- EN 60950-1 (IEC 60950-1): Information Technology Equipment-Safety-Part 1: General Requirement

WARNING: This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to make adequate measures.

Russian System GOST R (GOST-R)

GOST-R Certification System

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- GOST R IEC 60950-1: Information technology equipment – Safety –Part 1: General Requirement

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- GOST R 51318.22-99: Information technology equipment – Radio disturbance characteristics - limit and methods of measurement
- GOST R 51318.24-99(IEC 61000-4-2, 3, 4, 5, 6, 8, 11): Information technology equipment – immunity characteristics - limit and methods of measurement
- GOST R 51317.3.2-2006(passage 6 and 7) (IEC 61000-3-2): Electromagnetic compatibility(EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current ⩽ 16A per phase)
- GOST R 51317.3.3-99(IEC 61000-3-3): Electromagnetic compatibility(EMC)- Part 3-3: Limits-Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ⩽ 16A per phase and not subject to conditional connection)
- "Class A" Equipment(Business purpose info/telecommunications equipment)

UL, CUL Compliance

UL– Underwriters Laboratories

- UL60950-1:2006: Information technology equipment - Safety - Part 1: General requirement
- CSA C22.2 No. 60950-1:2006: Information Technology equipment - Safety - Part 1: General requirement

CB Scheme

CB–IECEE CB Scheme

- IEC 60950-1:2001: Information technology equipment – Safety – Part 1: General requirement

08 IMPORTANT SAFETY INFORMATION

NVIDIA products are designed to operate safely when installed and used according to the product instructions and general safety practices. The guidelines included in this document explain the potential risks associated with computer operation and provide important safety practices designed to minimize these risks. By carefully following the information contained in this document and the specific instructions provided with your product, you can protect yourself from hazards and create a safer computer work environment.

The product is designed and tested to meet IEC-60950, the Standard for the Safety of Information Technology Equipment. This also covers the national implementation of IEC-60950 based safety standards around the world (e.g., UL-60950). These standards reduce the risk of injury from the following hazards:

- Electric shock: Hazardous voltage levels contained in parts of the product.
- Fire: Overload, temperature, material flammability.
- Mechanical: Sharp edges, moving parts, instability.
- Energy: Circuits with high energy levels (240 voltamperes) or potential as burn hazards.
- Heat: Accessible parts of the product at high temperatures.
- Chemical: Chemical fumes and vapors.
- Radiation: Noise, ionizing, laser, ultrasonic waves
- Neutral Fusing: CAUTION - DOUBLE POLE/NEUTRAL FUSING

To reduce the risk of bodily injury, electric shock, fire and damage to the equipment, observe all precautions included in this guide.

08

Symbols on Equipment

	This symbol in conjunction with any of the following symbols indicates the presence of a potential hazard. The potential for injury exists if warnings are not observed. Consult your documentation for specific details.
	This symbol indicates the presence of hazardous energy circuits or electric shock hazards. Refer all servicing to qualified personnel. **WARNING:** To reduce the risk of injury from electric shock hazards, do not open this enclosure. Refer all maintenance, upgrades and servicing to qualified personnel.
	This symbol indicates the presence of electric shock hazards. The area contains no user or field service able parts. Do not open for any reason. **WARNING:** To reduce risk of injury from electric shock hazards, do not open this enclosure.
	This symbol indicates the presence of a hot surface or hot component. If this surface is contacted the potential for injury exists. **WARNING:** To reduce the risk of injury from a hot component, allow the surface to cool before touching.
	This symbol indicates that the component exceeds the recommended weight for one individual to handle safety. **WARNING:** To reduce the risk of personal injury or damage to the equipment, observe local occupational health and safety require and guidelines for manual material handling.
	This symbol indicates the presence of a sharp edge or object that can cause cuts or other bodily injury. **WARNING:** To prevent cuts or other bodily injury, do not contact sharp edge or object.
	This symbol indicates the presence of mechanical parts that can result in pinching, crushing or other bodily injury. **WARNING:** To avoid risk of bodily injury, keep away from moving parts.
	This symbol indicates the presence of a potential tip over hazard that can result in bodily injury. **WARNING:** To avoid risk of bodily injury, follow all instructions for maintaining stability of the equipment during transport, installation.

General Precautions

To reduce the risk of personal injury or damage to the equipment:

- Shut down the product and disconnect all AC power cords and cables before installation.
- Do not connect or disconnect any cables when performing installation, maintenance, or reconfiguration of this product during an electrical storm.
- Never turn on any equipment when there is evidence of fire, water, or structural damage.
- Place the product away from radiators, heat registers, stoves, amplifiers, or other products that produce heat.
- Never use the product in a wet location.
- Use only with a rack, cart, stand, tripod, or bracket recommended by NVIDIA, or sold with the product. Or it will cause serious bodily injury and serious damage to the product.
- Avoid inserting foreign objects through openings in the product.
- Do not use conductive tools that could bridge live parts.
- Do not make mechanical or electrical modifications to the equipment.
- Use the product only with approved equipment.
- Follow all cautions and instructions marked on the equipment.
- Do not attempt to defeat safety interlocks (where provided).

If the product sustains damage requiring service, disconnect the product from the AC electrical outlet and refer servicing to an NVIDIA authorized service provider. Examples of damage requiring service include:

- The power cord, extension cord or plug has been damaged.
- Liquid has been spilled on the product or an object has fallen into the product.
- The product has been exposed to rain or water.
- The product has been dropped or damaged.
- Noticeable signs of overheating.

08

Precautions for Installation, Maintenance and Servicing

To reduce the risk of electric shock or damage to the equipment when installing, maintaining or servicing products, observe the following precautions.

Installation

- Follow the pre- and post-installation procedures in other parts of the manual.
- Follow the installation and configuration instructions in the manual.
- In some geographical areas it may be advisable to install lightning protection for product.
- Ensure reliable grounding of rack mounted equipment have been maintained.

Maintaining and Servicing:

- Product contains power supplies that are capable of producing hazardous energy levels. The installation of internal options and routine maintenance and service of this product should be performed by individuals who are knowledgeable about the procedures, precautions, and hazards associated with equipment containing hazardous energy levels.
- Do not exceed the level of repair specified in the procedures in the product documentation. All troubleshooting and repair procedures are detailed to allow only subassembly or modulelevel repair. Because of the complexity of the individual boards and subassemblies, do not attempt to make repairs at the component level or to make modifications to any printed wiring board. Improper repairs can create a safety hazard.
- Verify that the AC power supply branch circuit that provides power to the rack is not overloaded. This will reduce the risk of personal injury, fire, or damage to the equipment. The total rack load should not exceed 80 percent of the branch circuit rating. Consult the electrical authority having jurisdiction over your facility wiring and installation requirements.
- The covers should remain locked during normal operation.

- The system should be installed in a controlled access location where only qualified personnel have access to the system.
- Upon completion of any services or repairs to the product, have your authorized service provider perform any safety checks required by the repair procedure or by local codes to determine that the product is in proper operating condition.
- Power down the equipment and disconnect all AC power cords and cable before removing any access covers.
- Do not replace components while power is applied to the product.
- First, shut down the product and disconnect all AC power cords.
- Allow the product to cool before removing covers and touching internal components.
- Move products with casters carefully. Avoid quick stops and uneven surfaces.
- Do not block the opening used for ventilation, since these ensure reliable operation of product and protect it from overheating. And opening should be kept free of dust and debris.
- Allow sufficient air circulation around and prevent direct exposure to radiant heat sources.
- Before cleaning, unplug the product from the power source. Use a damp cloth for cleaning. Do not use liquid cleaners or aerosol cleaners.

Precautions for Power Connection

Power Cords

To reduce the risk of electric shock or damage to the equipment:

- Use power cables provided with this product.
- If you have to change the power cords for any reason, use an approved power cord.
- Not all power cords have the same current ratings. If you have questions about the type of power cord to use, contact an authorized service provider.

08

- You must use a power cord rated for your product and for the voltage and current marked on the electrical ratings label of the product. The voltage and current rating of the cord must be greater than the voltage and current rating marked on the product.
- Make sure that the total amperage rating of all products plugged into an extension cord or power strip does not exceed 80 percent of the ampere ratings limit for the extension cord or power strip.
- The product is equipped wit a three-wire electrical grounding type plug that has a third pin for ground. This plug only fits into a grounded electrical power outlet.
- Plug the power cord into a grounded (earthed) electrical outlet that is easily accessible at all times.
- Do not disable the power cord grounding plug. The grounding plug is an important safety feature.
- Do not place objects on AC power cords or cables. Arrange them so that no one may accidentally step on or trip over them.
- Do not pull on a cord or cable. When unplugging from the electrical outlet grasp the cord by the plug.
- When possible, use one hand only to connect or disconnect cables.
- Do not modify power cables or plugs. Consult a licensed electrician or your power company for site modifications.
    - For Finland: *Laite on liitettävä suojamaadoituskoskettimilla varustettuun pistorasiaan*
    - For Norway: *Apparatet må tilkoples jordet stikkontakt*
    - For Sweden: *Apparaten skall anslutas till jordat uttag*

Power Supply

- Ensure that the voltage and frequency of your power source match the voltage and frequency inscribed on the equipment's electrical rating label. If you have the question about the type of power source to use, contact your authorized service.
- Connect to a properly wired and grounded electrical outlet. Always follow your local/national wiring rules.

- The socket-outlet shall be installed near the equipment and shall be easily accessible.
- If want to help protect your system from sudden, transient increases and decreases in electrical power, a surge suppressor, line conditioner and so on could be used.
- This system is suitable for connection to an IT power system.

Precautions for Communication Cable

To reduce the risk of exposure to shock hazard from communication cable:

- Do not connect communication cable during a lightening storm.
- There may be a remote risk of electric shock from lightening.
- Do not connect or use communication cable in a wet location.
- Disconnect the communication cable before opening a product enclosure, touching or installing internal components.

Precautions for Installing System Unit in Racks

Stability

To reduce the risk of personal injury or damage to the equipment, be sure that:

- The rack is properly stabilized and supported before installing.
- The leveling jacks are extended to the floor.
- The full weight of the rack rests on the leveling jacks.
- The stabilizing feet are attached to the rack if it is a single-rack installation.
- The racks are coupled together in multiple-rack installations.
- Only one component is extended at a time. A rack may become unstable if more than one component is extended for any reason.
- You load the rack from the bottom up and load the heaviest item into the rack first.
- You do not attempt to move a fully loaded equipment rack. Remove equipment from the rack before moving the rack.

08

- The product is properly mated with the rails. Products that are improperly mated with the rails may be unstable.
- No objects are placed on top of a rack-mounted device.
- Installation of the equipment in a rack should be such that the amount of airflow required for safe operation of the equipment is not compromised.
- Reliable earthing (grounding) of rack-mounted equipment should be maintained. Particular attention should be given to supply connections other than direct connections to the branch circuit (for example, use of a power strip).

Manual Material Handling

To reduce the risk of personal injury or damage to the equipment:

- Observe local occupational health and safety requirements and guidelines for manual materials handling.
- Obtain adequate assistance to lift and stabilize the product during installation or removal. Do not move large racks by yourself.
- Remove all pluggable power supplies and modules to reduce the weight of the product.
- Use caution when pressing the component rail release latches and sliding a component into the rack. The slide rails could pinch your fingers.
- Do not extend the components from the rack too quickly as the moving weight may damage the supporting rails.

Mounting of the equipment in the rack should be such that a hazardous condition is not achieved due to uneven mechanical loading.

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