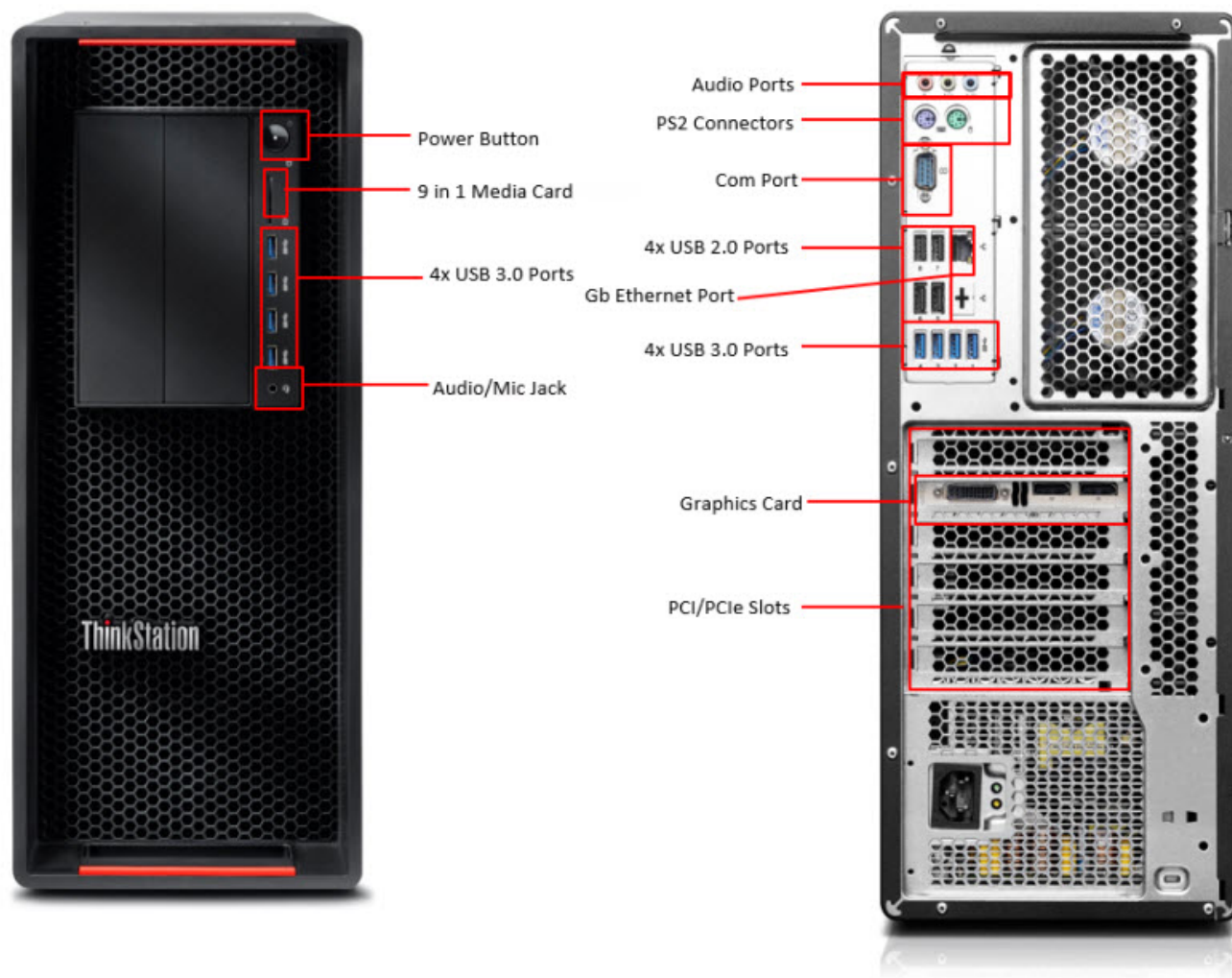
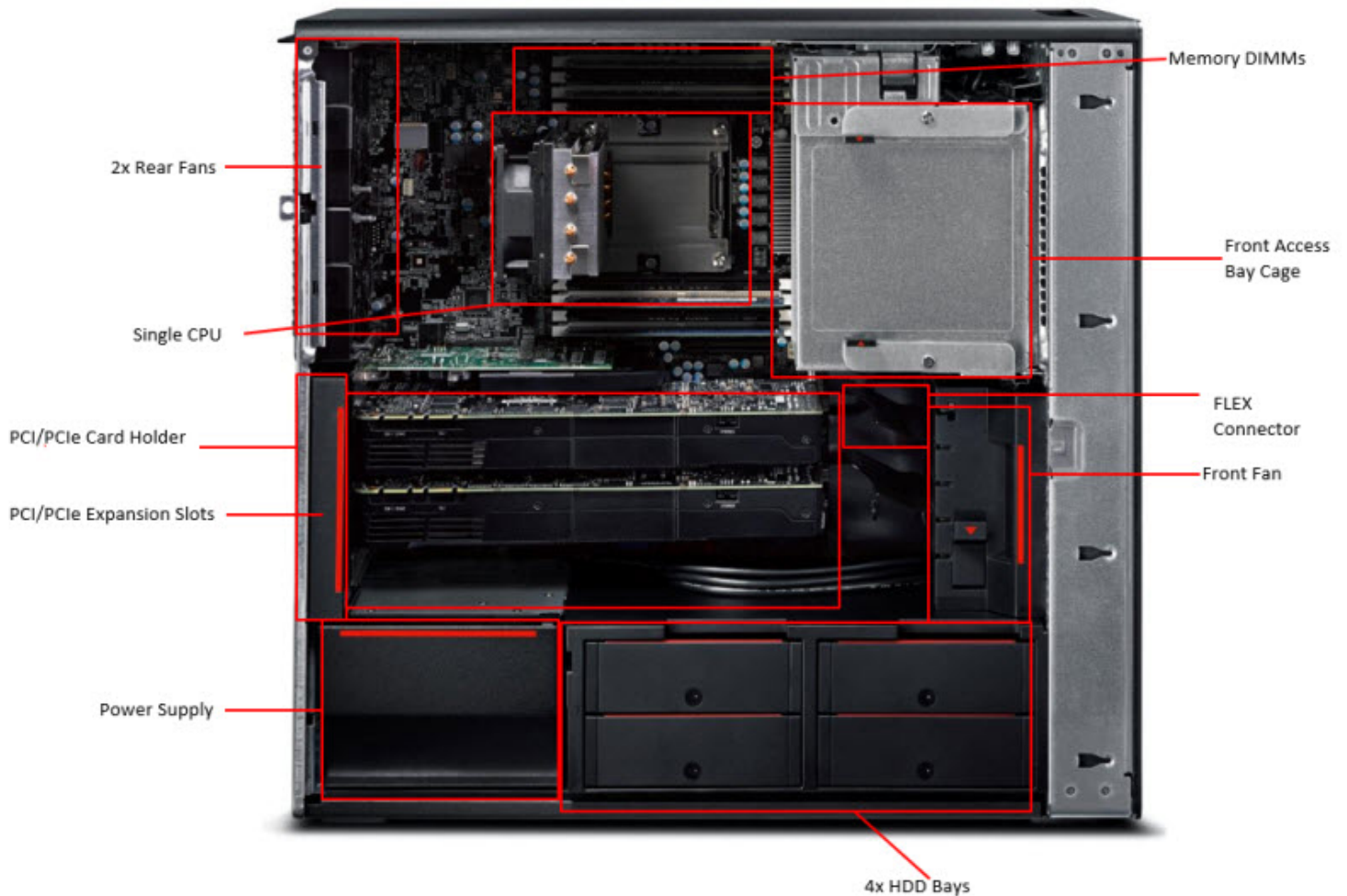




## THINKSTATION P500





## Product Overview

The ThinkStation P500 is high performance single socket workstation. An Intel® Grantley-based product, the P500 provides excellent performance and quality for applications where processor, memory, graphics, and storage requirements are key. The P500 is positioned between two Grantley-based dual socket workstations, the P700 and P900, and the Denlow-refresh single socket workstations, P300 and P300SFF.

The P500 motherboard consists of the Intel® C612 Chipset, a single Socket-R processor socket, with support for up to eighteen core processors from the Intel® Xeon line. Memory support consists of error-correcting code (ECC) unbuffered Double Data Rate 4 (DDR4) Synchronous Dynamic Random Access Memory (SDRAM). Maximum memory support of up to 256GB (512GB pending 64GB RDIMM availability).

## SECTION I: SYSTEM OVERVIEW

### Operating Systems

#### Preloaded

- Genuine Windows 8.1® Professional 64-bit
- Genuine Windows 8.1® 64-bit
- Genuine Windows 8.1® China Addition 64-bit
- Genuine Windows 8.1® Single Language Addition 64-bit
- Genuine Windows 7® Professional 64-bit
- Genuine Windows 7® Professional 32-bit

#### Supported

Motherboard - P500

Form Factor

Board Size	13.15" x 11.8" (334mm x 300mm)
Layout	Custom ATX

Motherboard Core

Processor Support	Intel® Xeon™ Quad Core (Haswell EP)
	Intel® Xeon™ Six Core (Haswell EP)
	Intel® Xeon™ Eight Core (Haswell EP)
	Intel® Xeon™ Ten Core (Haswell EP)
	Intel® Xeon™ Twelve Core (Haswell EP)
	Intel® Xeon™ Fourteen Core (Haswell EP)
	Intel® Xeon™ Sixteen Core (Haswell EP)
	Intel® Xeon™ Eighteen Core (Haswell EP)
Socket Type	Socket-R3 (LGA 2011)
Memory Support	1333/1600/1866/2133 MHz
QPI (GTPS)	6.4/8.0/9.6 GTPS Links
Voltage Regulator	Intel VR12.5 - 145W TDP Capable
Chipset (PCH)	Wellsburg (Intel 612)
Flash	16MB + Depoped 16MB
HW Monitor	
Super I/O	Nuvoton NCT6683D
Clock	Wellsburg (Intel 612) Native isCLK
Audio	Realtek ALC662
Ethernet	Intel Clarkville WGI218LM
SAS	Optional via Flex Adapter

Memory

Slots	8 Slots, 4 Slots on each side of CPU
Channels	4 Channels per CPU
Type	DDR4 288-Pin, 1333/1600/1866/2133 MHz ECC UDIMM, RDIMM, and LRDIMM support
ECC Support	YES
Speed	Up to 2133 MHz
Max DIMM Size	Up to 16GB RDIMM, 32GB LRDIMM
Max System Memory	Up to 256 LRDIMM (w/ 32GB)

Ethernet

Vendor	Intel
Count	2
EEPROM	None for Clarkville
Speeds	10/100/1000 Mbps

Functions	PXE, ASF, WOL, Jumbo Frames, Teaming
Connectors	(1) x RJ45 on Rear I/O

Audio

Vendor	Realtek
Type	HD (5.1)
Internal Speaker	Yes, using SSM2211 amplifier
Connectors	(3) x Rear 3.5mm Jacks (Line In, Line Out, Microphone In)
	Global Headphone Jack (Headphone + MIC in)
	(1) x 2-Pin Internal Speaker Header

Video

Onboard	<Not Supported>
Adapter	(2) x PCI-E 3.0 16-Lane Slots
	Additional adapters may be supported in x4 slots for Spec Bids
Multi-GPU Support	BIOS supported, card dependent

Storage

Floppy	None
IDE	None
SATA/SAS	(6) x SATA Connectors, Gen. 3
	(1) x eSATA Connector, Gen. 3 (eSATA bracket)
	(1) x SATA Connector, Gen. 3 supported by Flex Slot
eSATA	(1) x eSATA Connector, Gen. 3 (Optional eSATA bracket)

Slots

Slot 1 (Near CPU)	4-Lane PCI-E v3.0 (16-Lane Mechanical) - Half Length, Full Height
Slot 2	16-Lane PCI-E v3.0 - Full Length, Full Height
Slot 3	PCI v2.3 - Full Length, Full Height
Slot 4	16-Lane PCI-E v3.0 - Full Length, Full Height
Slot 5	PCI v2.3 - Half Length, Full Height
Slot 6 (Near Edge)	4-Lane PCI-E v2.0 Full Length, Full Height open tailgate (RF 2.5)

Rear I/O

COM	(1) x Serial Port (COM1)
eSATA	(1) x eSATA Port (Gen. 2), optional via bracket
LPT	None
Video	<No Onboard Video>
Audio	Microphone-In, Line In, Line Out
Ethernet	(1) x RJ45
USB 2.0	(4) x USB 2.0 Ports
USB 3.0	(4) x USB 3.0 Ports
Firewire	Optional

Internal I/O

USB 2.0	6 Total (4 Rear, 1 Internal to Flex Slot, 1 Internal to MCR)
USB 3.0	9 total (4 front, 4 rear, 1 internal header for HSMCR)
PS/2	Yes (2)
Audio	2×7-pin (Mic In, Headphone) Global Version
COM2	None
Clear CMOS	3-Pin Clear CMOS Header
Speaker	2-Pin Internal Speaker Header
Chassis Intrusion	2-Pin Chassis Intrusion Switch Header
Firewire	None

Thermal

Temp Sensors	Ambient Thermal Sensor - Thermal diode Connected to Super I/O
	VR1 Thermal Sensor - Thermal diode Connected to Super I/O
	VR2 Thermal Sensor- Thermal diode Connected to Super I/O
	PSU Thermal Sensor
Fans	CPU Fan 4-pin header with 3-pin key
	Rear SYSTEM Fan X2 4-pin header with 4-pin key
	Front Fan 4-pin header with 4 pin key
	ODD bay Fan X2 4-pin header with 3-pin key
	PSU Fan Main PSU power connector

Power Connectors

Main	Single Card Edge Connector
Memory & CPU	
Graphics	

Security

TPM	Version 1.2, Infineon SLB9660TT1.3
Asset ID	Yes, 1024X8bit, might depoped in future
vPro	Intel vPro for WS (AMT 9.x)

BIOS

Vendor	AMI
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Chassis Summary

Chassis Information

Format	36L Rack Mountable Tower
Dimensions	440mm H x 175mm W x 470mm D (chassis only)446mm H x 175mm W x 485mm D (with rear handle & feet)
Weight	28.66lbs
Color	
PSU	490 watt 90% efficient tool-less power supply650 watt 92% efficient tool-less power supply850 watt 92% efficient tool-less power supply
Thermal Solutions	Three (3) fans standard

One (1) additional front fan required for high-power PCIe adapters and to retain the flex slot (mezzanine) adapter

## Physical Security & Serviceability

Access Panel	Tool-less side cover removal
Optical Drive	Tool-less
Hard Drives	Tool-less
Expansion Cards	Tool-less
Processor Socket	Tool-less
Color coded User Touch Points	Yes
Color-coordinated Cables and Connectors	Yes
Memory	Tool-less
System Board	Tool-less
Green Color Power LED on Front of Computer	Yes
Restore CD/DVD Set	Restore system to original factory shipping image - Can be obtained via Lenovo Support
Cable Lock Support	Yes, Optional Kensington Cable Lock
Serial, Parallel, USB, Audio, Network, Enable/Disable Port Control	Yes
Power-On Password	Yes
Setup Password	Yes
NIC LEDs (integrated)	Yes
Security Chip	Yes
Access Panel Key Lock	Optional
Boot Sequence Control	Yes
Padlock Support	Yes, loop in rear for optional padlock, prevents side panel removal
Boot without keyboard and/or mouse	Yes

## Operating Environment

### Air Temperature

- Operating: 10° C to 35° C (50° F to 95° F)
- Storage: -40° C to 60° C (-40° F to 140° F) in original shipping carton
- Storage: -10° C to 60° C (14° F to 140° F) without carton

### Humidity

- Relative Humidity Operating: 10% to 80% (non-condensing)
- Relative Humidity Storage/Transit: 10% to 90% (non-condensing)
- Wet Bulb Temperature Operating: 25° C max
- Wet Bulb Temperature Non-operating: 40° C max

### Altitude

- Operating: -15.2 m to 3048 m (-50 ft to 10 000 ft)

## Regulations and Standards

### EMC

- FCC (DoC)/Canada
- CE (EMC)

- VCCI
- JEIDA
- C-Tick
- BSMI
- CCIB

**Safety**

- FCC (DoC)/Canada
- CE (EMC)
- VCCI
- JEIDA
- C-Tick
- BSMI
- CCIB
- PSB
- CE (LVD)

**Environmentals**

**Energy Star**

- Energy Star Program Requirements for Computers: Version 6.0 (select models)

**EPEAT**

- EPEAT™ Gold rating (select models)

**EuP Lot-6 2012**

- EuP Lot-6 2012 (Enabled via system setup. Default on for systems shipped to EMEA.)

**Hazardous Substances**

- Products do not contain more than; 0.1% lead, 0.01% cadmium, 0.1% mercury, 0.1% hexavalent chromium, 0.1% polybrominated biphenyls (PBB) or 0.1% polybrominated diphenol ethers (PBDE).
- Products do not contain Asbestos.
- Products do not contain Ozone Depleting Substances: Chlorofluorocarbons (CFC), hydrobromofluorocarbons (HBFC), hydrochlorofluorocarbons (HCFC), Halons, carbontetrachloride, 1,1,1-trichloroethane, methyl bromide
- Products do not contain more than; 0.005% polychlorinated biphenyl (PCB), 0.005% polychlorinated terphenyl (PCT) in preparation.
- Products do not contain more than 0.1% short chain chloroparaffins (SCCP) with 10-13 carbon atoms in the chain containing at least 48% per mass of chlorine in the SCCP
- Parts with direct and prolonged skin contact do not release nickel in concentrations above 0.5 microgram/cm<sup>2</sup>/week.

**SECTION II: SUPPORTED COMPONENTS**

**CPU Specifications**

2S Processor SKUs - These SKUs have 2 QPI links and are targeted for dual CPU systems but will also work on single CPU systems

Intel Xeon E5-2687W v3 - 10 Cores, 3,1GHz, 9.6 QPI, 25MB Cache, DDR4-2133, Turbo, HT, 160W
Intel Xeon E5-2699 v3 - 18 Cores, 2.3GHz, 9.6 QPI, 45MB Cache, DDR4-2133, Turbo, HT, 145W
Intel Xeon E5-2698 v3 - 16 Cores, 2.3GHz, 9.6 QPI, 40MB Cache, DDR4-2133, Turbo, HT, 135W
Intel Xeon E5-2697 v3 - 14 Cores, 2.6GHz, 9.6 QPI, 35MB Cache, DDR4-2133, Turbo, HT, 145W
Intel Xeon E5-2695 V3 - 14 Cores, 2.3GHz, 9.6 QPI, 35MB Cache, DDR4-2133, Turbo, HT, 120W
Intel Xeon E5-2690 v3 - 12 Cores, 2.6GHz, 9.6 QPI, 30MB Cache, DDR4-2133, Turbo, HT, 135W

Intel Xeon E5-2685 v3 - 12 Cores, 2.6GHz, 9.6 QPI, 30MB Cache, DDR4-2133, Turbo, 120W

Intel Xeon E5-2683 v3 - 14 Cores , 2.0GHz, 9.6 QPI, 35MB Cache, DDR4-2133,Turbo, HT, 120W

Intel Xeon E5-2680 v3 - 12 Cores, 2.5GHz, 9.6 QPI, 30MB Cache, DDR4-2133, Turbo, HT, 120W

Intel Xeon E5-2670 v3 - 12 Cores, 2.3GHz, 9.6 QPI, 30MB Cache, DDR4-2133,Turbo, HT, 120W

Intel Xeon E5-2667 v3, EP2S - 8 Cores, 3.2 GHz, 9.6 QPI, 20MB Cache, DDR4-2133, Turbo, HT, 135W

Intel Xeon E5-2660 v3 - 10 Cores, 2.6GHz, 9.6 QPI, 25MB Cache, DDR4-2133, Turbo, HT, 105W

Intel Xeon E5-2650 v3 - 10 Cores, 2.3GHz, 9.6 QPI, 25MB Cache, DDR4-2133, Turbo, HT, 105W

Intel Xeon E5-2643 v3 - 6 Cores, 3.4GHz, 9.6 QPI, 20MB Cache, DDR4-2133 , Turbo, HT, 135W

Intel Xeon E5-2640 v3 - 8 Cores, 2.6GHz, 8.0 QPI, 20MB Cache, DDR4-1866, Turbo, HT, 90W

Intel Xeon E5-2637 v3 - 4 Cores, 3.5GHz, 9.6 QPI, 15MB Cache, DDR4-2133, Turbo, HT, 135W

Intel Xeon E5-2630 v3 - 8 Cores, 2.4GHz, 8.0 QPI, 20MB Cache, DDR4-1866, Turbo, HT, 85W

Intel Xeon E5-2623 v3 - 4 Cores, 3.0GHz, 8.0 QPI, 10MB Cache, DDR4-1866, Turbo, HT, 105W

Intel Xeon E5-2620 v3 - 6 Cores, 2.4GHz, 8.0 QPI, 15MB Cache, DDR4-1866, Turbo, HT, 85W

Intel Xeon E5-2609 v3 - 6 Cores, 1.9GHz, 6.4 QPI, 15MB Cache, DDR4-1600, 85W

Intel Xeon E5-2603 v3 - 6 Cores, 1.6GHz, 6.4 QPI, 15MB Cache, DDR4-1600, 85W

Intel Xeon E5-2650L v3 - 12 Cores, 1.8GHz, 9.6 QPI, 30MB Cache, DDR4-2133, Turbo, HT, 65W

Intel Xeon E5-2630L v3 - 8 Cores, 1.8GHZ, 8.0 QPI, 20MB Cache, DDR4-1866, Turbo, HT, 55W

**1S Processor SKUs - These SKUs have 1 QPI link and are targeted for single CPU systems. If these are to be used in a dual processor system, only one 1S CPU can be installed and the CPU2 memory slots will not be functional.**

Intel Xeon E5-1680 v3 - 8 Cores,3.2 GHz, 20MB Cache, DDR4-2133, Turbo, HT, 140W

Intel Xeon E5-1660 v3 - 8 Cores, 3.0 GHz, 20MB Cache, DDR4-2133, Turbo, HT, 140W

Intel Xeon E5-1650 v3 - 6 Cores,3.5 GHz, 15MB Cache, DDR4-2133, Turbo, HT, 140W

Intel Xeon E5-1630 v3 - 4 Cores, 3.7 GHz, 10MB Cache, DDR4-2133, Turbo, HT,140W

Intel Xeon E5-1620 v3 - 4 Cores, 3.5 GHz, 10 MB Cache, DDR4-2133, Turbo, HT, 140W

Intel Xeon E5-1607 v3 - 4 Cores, 3.1 GHz,10 MBCache, DDR4-1866, 140W

Intel Xeon E5-1603 v3 - 4 Cores, 2.8 GHz, 10 MB Cache, DDR4-1866, 140W

## Notes

When ordering two processors, the second processor must be the same as the first. Intel processor numbers are not a measurement of higher performance. Processor numbers differentiate features within each processor family, not across different processor families.

Multi core technologies are designed to improve performance of multithreaded software products and hardware-aware multitasking operating systems and may require appropriate operating system software for full benefits; check with software provider to determine suitability; not all customers or software applications will necessarily benefit from use of these technologies.

64-bit computing on Intel® 64 architecture requires a computer system with a processor, chipset, BIOS, operating system, device drivers, and applications enabled for Intel® 64 architecture. Processors will not operate (including 32-bit operation) without an Intel® 64 architecture-enabled BIOS. Performance will vary depending on your hardware and software configurations

## Memory Specifications

### RAID



#### **RDIMMs - 2133MHz**

4GB DDR4 ECC RDIMM PC4-2133-R

8GB DDR4 ECC RDIMM PC4-2133-R 1Rx4 4Gbit

16GB DDR4 ECC RDIMM PC4-2133-R 2Rx4 4Gbit

#### **LRDIMMs - 2133MHz**

32GB DDR4 ECC LRDIMM PC4-2133-L 4Rx4 4Gbit

### **Storage - Hard Drive/SSD Specifications**

#### **3.5" SATA Hard Disk Drive (HDD)**

500GB SATA - 7200rpm, 6Gb/s, 3.5"

1TB SATA - 7200rpm, 6Gb/s, 3.5"

2TB SATA - 7200rpm, 6Gb/s, 3.5"

3TB SATA - 7200rpm, 6Gb/s, 3.5"

#### **3.5" Enterprise SATA Hard Disk Drive (HDD)**

4TB SATA - 7200rpm, 6Gb/s, 3.5"

#### **3.5" Hybrid Drive**

1TB SATA - 7200rpm, 6Gb/s, 3.5" Hybrid

2TB SATA - 7200rpm, 6Gb/s, 3.5" Hybrid

#### **2.5" SAS Hard Disk Drive (HDD)**

300GB SAS - 15000rpm, 12Gb/s, 2.5"

450GB SAS - 15000rpm, 12Gb/s, 2.5"

600GB SAS - 15000rpm, 12Gb/s, 2.5"

#### **2.5" SAS Solid State Drive (SSD)**

200GB SAS SSD - 12Gb/s, 2.5"

400GB SAS SSD - 12Gb/s, 2.5"

800GB SAS SSD - 12Gb/s, 2.5"

#### **2.5" SATA Solid State Drive (SSD)**

128GB SATA - Solid State Drive (SSD), 6Gb/s, MLC, 2.5"

180GB SATA - Solid State Drive (SSD), 6Gb/s, MLC, 2.5"

240GB SATA - Solid State Drive (SSD), 6Gb/s, MLC, 2.5"

256GB SATA - Solid State Drive (SSD), 6Gb/s, MLC, 2.5", OPAL

480GB SATA - Solid State Drive (SSD), 6Gb/s, MLC, 2.5"

512GB SATA - Solid State Drive (SSD), 6Gb/s, MLC, 2.5"

#### **M.2 (NGFF) PCIe Solid State Drive (SSD)**

256 GB M.2 PCIe - Solid State Drive (SSD), Gen2x4, MLC

#### **PCIe Half Height / Half Length Solid State Drive (SSD)**

410GB PCIe - FusionIO ioFX-2 410GB HHHL PCIe SSD, Gen2, x4 electrical x4 physical

1.6TB PCIe - FusionIO ioFX-2 1.6TB HHHL PCIe SSD, Gen2, x4 electrical x4 physical

### **RAID**

Supported RAID levels for a system will vary from the stated capabilities of the RAID

controller due to dependencies on the number and capacity of physical disks in the system and on customer requirements for performance, fault tolerance, or data redundancy. Max support RAID 0,1,5,10

RAID levels and requirements:

- RAID 0 (striping) provides increased performance by writing data across multiple drives.
- RAID 1 (mirroring) provides fault tolerance by writing the data on two drives.
- RAID 5 (striping with parity) uses distributed parity data to provide fault tolerance more efficiently than RAID 1. Requires three or more drives.
- RAID 10 (or RAID 1+0) combines
- RAID 1 and RAID 0 to create a stripe of mirrors that is fault tolerant while offering increased performance. Requires four drives.

### Optional Hard Disk Drive Controllers

- LSI 9364-8i 8-port SATA/SAS ROC Adapter(Base Mode) w/ 1GB DDR Memory Module
- LSI 9364-8i 8-port SATA/SAS ROC Adapter(Protected Mode) w/ 1GB Flash Memory Module+SuperCap

### Optical Drive/Removable Media

DVD-ROM Drive (SATA)

DVD-ROM Drive - 16x/48x (SATA)

DVD Burner/CD-RW Rambo Drive (SATA)

DVD Burner/CD-RW Rambo Drive (SATA)

Blu-Ray Burner Drive (SATA)

Blu-Ray Burner Drive w/AACS encryption (SATA)

DVD Burner/CD-RW Rambo Drive (Slim SATA)

DVD Burner/CD-RW Rambo Drive (9.5mm Slim SATA)

Media Card Reader

Front 9 in 1 Media Card reader Standard

Front 29 in 1 Media card reader, USB3.0, MPOB, 760mm (Requires FLEX Module)

### Keyboard

#### Pointing Devices

- Preferred Pro Fullsize Keyboard (USB)
- Preferred Pro Fullsize Keyboard (PS/2)

#### Pointing Devices

- Optical Wheel Mouse (1000 DPI), USB - red wheel

### Graphics Cards

Nvidia NVS310 (DP x 2) - 512MB DDR3

Nvidia NVS315 (with DMS-59 to Dual DVI single link dongle) - 1GB GDDR3

Nvidia NVS315 (with DMS-59 to Dual Display Port dongle) - 1GB GDDR3

Nvidia NVS 510 (mini DP x 4) - 2GB DDR3

NVQuadro K420(DP/DVI)-1GB DDR3- ATX

Nvidia Quadro K620 (DVI, DP) - 2GB DDR3 ATX

Nvidia Quadro K2200 (DVI, DP, DP) - 4GB DDR5 ATX

Nvidia Quadro K4200 (2xDP+DVI) - 4GB DDR5 ATX-Long Offset Ext Bracket

Nvidia Quadro K5200 (DVI x 2, DP, DP) - 8GB DDR5 - Long Offset Ext Bracket, ATX Lext

Nvidia Quadro K6000 (Dual link DVI x 2, DP, DP) - 12GB GDDR5 - Long Offset Ext Bracket, 2\*6-pin Pwr

#### NVIDIA SLI Implementations

2 x Nvidia Quadro K5200 with SLI cable

2 x Nvidia Quadro K6000 with SLI Cable

#### NVIDIA GPU Computing Processor

Nvidia Tesla K20 - 5GB GDDR5 - Long Offset Ext Bracket

NVIDIA Tesla K40 GPU Active Accelerator - 12GB GDDR5 Long Ext

#### NVIDIA Stereo 3D Bracket

Nvidia Stereo 3D Connector Bracket

## FLEX Components

Flex Bay: Formerly known as ODD bays. Will support not only ODD, but also HDDs and Flex Module

Flex Module: Module supported in the Flex Bay with several options integrated. Will support slim ODD, High Speed Media Card Reader or 2 universal ports supporting IEEE1394, eSATA, etc...

Flex Connector: Mezzanine connector in the motherboard, that enables expanded storage and I/O. 2 available in P900, 1 available in P500/P700

Flex Tray: New HDD Tray design enables that two drives on a single tray (when used in a blind connect configuration)

## PCIe

Network Intel 82574L Gigabit CT2 Desktop Ethernet Adapter

Intel 1 Gigabit ET Dual Port Server Adapter

Thunderbolt

IEE 1394 IEEE 1394a (Firewire-400) PCI Express x1 Adapter (1 external, 1 internal port)

USB USB 3.0 PCI Express x1 Adapter

Audio Devices SoundBlaster Recon3D Audio Card (PCIe x1)

Lenovo Branded 2-Piece Speaker Set

Speaker Brick

## SECTION III: SYSTEM TECHNICAL SPECIFICATIONS

### Power Supply Specifications

Power Supply	490W PSU	650W PSU	850W PSU	1300W PSU
Operating Voltage Range	90-264VAC	90-264VA	90-264VA	90-264VA
Rated Voltage Range	100-240V	100-240V	100-240V	100-240V
	50/60Hz	50/60Hz	50/60Hz	50/60Hz
Rated Line Frequency	47Hz/63Hz	47Hz/63Hz	47Hz/63Hz	47Hz/63Hz
Operating Line Frequency Range	8A-4A	10A - 5A	13A - 6A	15A-9A
Rated Input Current	92x38mm, 5000rpm max	92x38mm,	92x38mm,	(2) 60x38mm, 14000rpm max
Power Supply Fan		7500rpm max	5700rpm max	
ENERGY STAR® qualified (Config Dependent)	*System level select	*System level select	*System level select	*System level select

	models	models	models	models
80 PLUS Compliant	Yes 80 PLUS Gold	Yes 80 PLUS Platinum	Yes 80 PLUS Platinum	Yes 80 PLUS Platinum
Built-in Self Test (BIST) LED	YES	YES	YES	YES
Surge Tolerant Full Ranging Power Supply (withstands power surges up to 2000V)	YES	YES	YES	YES

[Click here to access the ThinkStation Power Calculator.](#)

## BIOS Specifications

WMI Support	Compliant with Microsoft WBEM and the DMTF Common Information Model
ROM-Based Setup Utility (F1)	System Configuration Setup program available at power-on with F1 key
Bootblock Recovery	Recovers system BIOS when Flash ROM corrupted.
Replicated Setup	Saves System Configuration settings to file that can then be used replicated to other systems.
Boot Control	Boot control available through ROM-Based Setup Utility or with F12 key at power-on
Memory Change Alert	Power-on Error message in event of decrease in system memory
Thermal Alert	Power-on Error message in event of fan failure
Asset Tag	Support ability to set SMBIOS Type 2 Baseboard Asset Tag field.
System/Emergency ROM Flash Recovery with Video	Support process to recover system BIOS when Flash ROM corrupted
Remote Wakeup/Remote Shutdown	System admin can power on/off a client computer from remote location to provide maintenance
Quick Resume time	Support for power S3 (suspend to RAM) and prompt resume times
ROM revision level	System UEFI (BIOS) version reported in SMBIOS Type 0 structure and in BIOS Setup
Keyboard-less Operation	System can be booted without a keyboard
Per-port Control	Allows I/O ports to be individually enabled/disabled through ROM-based setup or WMI interface
Adaptive Cooling	Fans dynamically controlled by system BIOS based on temperature. User has ability to provide custom fan control table
Security	User and Administrator passwords can protect boot and ROM-based Setup. Chassis intrusion detection protect
Intel(R) AMT (includes ASF 2.0)	Allows system to be supported from a remote location
Intel(R) TXT	Intel(R) Trusted Execution Technology provides a security foundation to build protections against software base attacks.
Memory modes	Supports mirroring, lock step, and sparing memory modes
Windows 8 ready	Supports Windows 8 requirements - Secure flash, UEFI v 2.3.1 spec
Industry Standard Specification Support	
UEFI	Unified Extensible Firmware Interface v2.3.1d

ACPI (Advanced Configuration and power Management Interface)	Advanced Configuration and Power Interface v5.0
ASF 2.0	DMTF Alert Standard Format Specification v2.0
ATA (IDE)	AT Attachment 6 with Packet Interface (ATA/ATAPI-6)
CD Boot	“El Torito” Bootable CD-Rom Format Specification, Version 1.0
EHCI	Enhanced Host Controller Interface for Universal Serial Bus, Revision 1.0
PCI	PCI Local Bus v3.0
	PC Firmware Specification 3.1
PCI Express	PCI Express Base Specification 3.0
SATA	Serial ATA Revision 3.0 Specification
TPM	Trusted Computing Group TPM Specification Version 1.2
UHCI	Universal Host Controller Interface Design Guide, Revision 1.1
USB	Universal Serial Bus Revision 1.1
	Universal Serial Bus v2.0
	Universal Serial Bus v3.0
SMBIOS	DMTF System Management Spec v2.8.0

## Social and Environmental Responsibility

### Quality Control

- Lenovo is a member of an eco declaration system that enforces regular independent quality control

### Hazardous substances and preparation

- Products do not contain more than; 0.1% lead, 0.01% cadmium, 0.1% mercury, 0.1% hexavalent chromium, 0.1% polybrominated biphenyls (PBB) or 0.1% polybrominated diphenyl ethers (PBDE). (See legal
- reference and Note B1
- Products do not contain Asbestos
- Products do not contain Ozone Depleting Substances: Chlorofluorocarbons (CFC), hydrobromofluorocarbons (HBFC), hydrochlorofluorocarbons (HCFC), Halons, carbontetrachloride, 1,1,1-trichloroethane, methyl bromide
- Products do not contain more than; 0.005% polychlorinated biphenyl (PCB), 0.005% polychlorinated terphenyl (PCT) in preparation
- Products do not contain more than 0.1% short chain chloroparaffins (SCCP) with 10-13 carbon atoms in the chain containing at least 48% per mass of chlorine in the SCCP
- Parts with direct and prolonged skin contact do not release nickel in concentrations above 0.5 microgram/cm<sup>2</sup>/week
- REACH Article 33 information about substances in articles is available at: [http://www.lenovo.com/social\\_responsibility/us/en/ThinkGreen\\_products.html#environment](http://www.lenovo.com/social_responsibility/us/en/ThinkGreen_products.html#environment)

### Batteries

- If the product contains a battery or an accumulator, it is labeled with the disposal symbol and if it contains more than 0.0005% of mercury (for button cells only) by weight, or more than 0.004% of lead, it shall be marked with the chemical symbol for

the metal concerned, Hg or Pb. Information on proper disposal is provided in user manual

- Button cells used in the product do not contain more than 2% by weight of mercury. Other batteries or accumulators do not contain more than 0.0005% of mercury or 0.002% of cadmium
- Batteries and accumulators are easily removable by either users or service providers (as dependent on the design of the product). Exception: Batteries that are permanently installed for safety, performance, medical or data integrity reasons do not have to be “easily removable

**Safety, EMC connection to the telephone network and labeling**

- The product complies with legally required safety standards as specified
- The product complies with legally required standards for electromagnetic compatibility
- If product is intended for connection to a public telecom network or contains a radio transmitter, it complies with legally required standards for radio and telecommunication devices
- The product is labeled to show conformance with applicable legal requirements

**Product packaging**

- Packaging and packaging components do not contain more than 0.01% lead, mercury, cadmium and hexavalent chromium by weight of these together.
- Plastic packaging material is marked according to ISO 11469 referring ISO 1043
- The product packaging material is free from ozone depleting substances as specified in the Montreal Protocol

**Manageability**

Industry Standard Specifications	This product meets the following industry standard specifications for manageability functionality:
	Intel LAN with AMT
Remote Manageability Software Solutions	Lenovo ThinkStation is supported on the following remote manageability software consoles:
	Lenovo ThinkManagement Console
	<a href="http://www.lenovo.com/lenovo">LANDesk Management Suite for ThinkVantage Technologies (www.lenovo.com/lenovo)</a>
	Microsoft System Center Configuration Manager
System Software Manager	Lenovo ThinkStation supports software management tools from the ThinkVantage System Update suite:
	System Update
	Update Retriever
	Thin Installer
Service, Support, and Warranty	On-site Warranty and Service: Three-years, limited warranty and service offering delivers on-site, next business-day service for parts and labor and includes free telephone support 8am - 5pm. Global coverage ensures that any product purchased in one country and transferred to another, non-restricted country will remain fully covered under the original warranty and service offering.

Go to [www.lenovo.com/support](http://www.lenovo.com/support) and [www.lenovo.com/warranty](http://www.lenovo.com/warranty) for more details

**SECTION IV: COMPONENT SPECIFICATIONS**

**HDD Specifications**

2.5" SAS Hard Disk Drive (HDD)

300GB SAS - 15000rpm, 12Gb/s, 2.5"

450GB SAS - 15000rpm, 12Gb/s, 2.5"

600GB SAS - 15000rpm, 12Gb/s, 2.5"

### 3.5" SATA Hard Disk Drive (HDD)

500GB SATA - 7200rpm, 6Gb/s, 3.5"

1TB SATA - 7200rpm, 6Gb/s, 3.5"

2TB SATA - 7200rpm, 6Gb/s, 3.5"

3TB SATA - 7200rpm, 6Gb/s, 3.5"

4TB SATA - 7200rpm, 6Gb/s, 3.5"

### 3.5" Hybrid Drive

1TB SATA - 7200rpm, 6Gb/s, 3.5"  
Hybrid

2TB SATA - 7200rpm, 6Gb/s, 3.5"  
Hybrid

	2.5" 15K	3.5" 7200	3.5" Hybrid
Connector	SAS SFF-8482	SATA	SATA
Transfer Rate (Gb/sec)	12Gb	600MB/sec	600MB/sec

### Performance

Spindle Speed(RPM)	15,000 +/-	7200	7200
Power off to Spindle Stop(sec)	30 max	11 max	11 max
DC Power to Drive Ready(sec)	30 max	17 max	<1
Receipt of Start Unit Command to Drive Ready(sec)	30 max	17 max	<1
Average Latency(msec)	2 +/- 0.25	4.16	4.16

### Power Management

Input(VDC)	+5v +/- 5%+12v +/- 5%	+5v +/- 5%+12v +/- 5%	+5v +/- 5%+12v +/- 5%
Typical(Watts)	TBD	8 max	6.7 max
Idle(Watts)	TBD	0.75	0.75

### Dimensions

Height(mm - Max)	26.11	26.11	26.11
Width(mm)	101.6 +/- 0.25	101.6	101.6
Depth(mm - Max)	146.99	146.99	146.99
Weight(grams)	800 max	626 max	535 max

### Temperature

Operating(C) Ambient	5 to 55	0 to 60	0 to 60
Operating(C) Base Casting	60 max		
Non-Operating(C) Ambient	-40 to 70	-40 to 70	-40 to 70
Gradient(C per Hour)	20 max	30 max	30 max

### Shock

Operating(Gs @ 2ms)	60 max	80 max	80 max
Non-Operating(Gs @ 2ms)	250 max	350 max	350 max

SSD Specifications

2.5" SAS Solid State Drive (SSD)

200GB SAS SSD - 12Gb/s, 2.5"

400GB SAS SSD - 12Gb/s, 2.5"

800GB SAS SSD - 12Gb/s, 2.5"

2.5" SATA Solid State Drive (SSD)

128GB SATA - Solid State Drive (SSD), 6Gb/s, MLC, 2.5"

180GB SATA - Solid State Drive (SSD). 6Gb/s. MLC, 2.5"

240GB SATA - Solid State Drive (SSD), 6Gb/s, MLC, 2.5"

256GB SATA - Solid State Drive (SSD), 6Gb/s, MLC, 2.5", OPAL

480GB SATA - Solid State Drive (SSD), 6Gb/s, MLC, 2.5"

512GB SATA - Solid State Drive (SSD), 6Gb/s, MLC, 2.5"

M.2 (NGFF) PCIe Solid State Drive (SSD)

256 GB M.2 PCIe - Solid State Drive (SSD), Gen2x4, MLC

	2.5" SATA	2.5" SAS	M.2 SATA	M.2 PCIe
Interface				
Connector	SATA	SAS	M.2	M.2
Ports	Single	Single	Single	4 lanes
Transfer Rate	6Gb/s	12Gb/s	6 Gb/s	20 Gb/s
Temprature				
Ambient (C)	0 to 55	5 to 60	0 to 55	0-70
Base Casting (C)	55 max	60 max	NA	NA
Gradient(C per Hour)	20 max	20 max	20 max	NA
Ambient(C))	-40 to +65	-40 to +70	-40 to +65	-40 to +85
Gradient(C per Hour)	20 max	20 max	20 max	NA
Humidity				
Relative Non-Condensing Wet bulb (%)	5 to 95	5 to 95	5 to 95	5 to 95
Gradient (% per hour)	NA	NA	NA	NA
Relative Non-Condensing Wet bulb (%)	5 to 95	5 to 95	5 to 95	5 to 95
Gradient (% per hour)	NA	NA	NA	NA
Altitude				
Operating(feet)	-1000 to 10,000	-1000 to 10,000	-1000 to 10,000	NA
Non-Operating(feet)	-1000 to 40,000	-1000 to 40,000	-1000 to 40,000	NA
Shock All axis				
½ Sine @ 2ms (Read & Write) (G)	1000G, 1ms half-sine	1000G, 0.5ms half-sine	1000G, 1ms half-sine	NA
Rotational (Rad/sec**2)	NA	NA	NA	NA



½ Sine @ 2ms (G)	1000G, 1ms half-sine	1000G, 0.5ms half-sine	1000G, 1ms half-sine	1500G, 0.5ms half-sine
Rotational (Rad/sec**2)	NA	NA	NA	NA

### HDD Controllers

	LSI 9364-8i 8-port SATA/SAS ROC Adapter(Base Mode) w/ 1GB DDR Memory Module	LSI 9364-8i 8-port SATA/SAS ROC Adapter(Protected Mode) w/ 1GB Flash Memory Module+SuperCap
PCI Bus	x8 lane PCI Express® 3.0	x8 lane PCI Express® 3.0
PCI Modes		
RAID Levels	RAID 0, 1, 5, 10, 50 and JBOD mod	RAID 0, 1, 5, 10, 50 and JBOD mod
Data Transfer Rates	Up to 12Gb/s per port	Up to 12Gb/s per port
PCI Card Type		
PCI Voltage	+3.3V, +12V	+3.3V, +12V
PCI Power		
Bracket	Full Height and Low-Profile	Full Height and Low-Profile
Certification Level		
Internal Connectors	2 HD Mini-SAS SFF8643 (Vertical mount)	2 HD Mini-SAS SFF8643 (Vertical mount)

### Optical Drives Specifications

	DVD-ROM Drive - 16x/48x (SATA)	DVD Burner/CD-RW Rambo Drive (SATA)
Description	5.25-inch, half-height, tray-load	5.25-inch, half-height, tray-load
Mounting Orientation	Either horizontal or vertical	Either horizontal or vertical
Interface Type	SATA/ATAPI	SATA/ATAPI
Dimensions	(WxHxD) 15.0 x 4.4 x 20.3 cm (5.9 x 1.7 x 8.0 in)	(WxHxD) 15.0 x 4.4 x 20.3 cm (5.9 x 1.7 x 8.0 in)
Disc Capacity DVD-ROM	Single layer: Up to 4.7 GB Double layer: Up to 8.5 GB	Single layer: Up to 4.7 GB Double layer: Up to 8.5 GB
Access Times		
DVD-ROM Single Layer	< 140 ms (typical)	< 140 ms (typical)
CD-ROM Mode 1	< 125 ms (typical)	< 125 ms (typical)
Full Stroke DVD	< 250 ms (seek)	< 250 ms (seek)
Full Stroke CD	< 210 ms (seek)	< 210 ms (seek)
Power		
Source	SATA DC power receptacle	SATA DC power receptacle
DC Power Requirements	5 VDC ± 5%-100 mV ripple p-p	5 VDC ± 5%-100 mV ripple p-p
	12 VDC ± 5%-200 mV ripple p-p	12 VDC ± 5%-200 mV ripple p-p
DC Current	5 VDC - <1000 mA typical, < 1600 mA	5 VDC - <1000 mA typical, < 1600 mA
	maximum	maximum
	12 VDC - < 600 mA typical, < 1400 mA	12 VDC - < 600 mA typical, < 1400 mA
	maximum	maximum
Operating Environmental		
Temperature	5° to 50° C (41° to 122° F)	5° to 50° C (41° to 122° F)
Relative Humidity	10% to 90%	10% to 90%

Maximum Wet Bulb Temperature	30° C (86° F)	30° C (86° F)
Operating Systems Supported	Windows 7 Professional 32-bit and 64-bit, Windows XP Professional or Windows XP Home 32*. Red Hat Enterprise Linux(RHEL) WS4**, 5, 6	Windows 7 Professional 32-bit and 64-bit, Windows XP Professional or Windows XP Home 32*. Red Hat Enterprise Linux(RHEL) WS4**, 5, 6
	Desktop/Workstation. No driver is required for this device. Native	Desktop/Workstation. No driver is required for this device. Native
	support is provided by the operating system.	support is provided by the operating system.

### Graphics Cards

	K6000	K5200	K4200	K2200	K620	K420
# CUDA Cores	2880	2304	1344	640	384	192
Single Precision	5.2 TFLOPs	3.1 TFLOPs	2.1 TFLOPs	1.3 TFLOPs	0.8 TFLOPs	0.3 TFLOPs
PCIe Gen	3	3	2	2	2	2
Memory Size	12 GB	8 GB	4 GB	4 GB	2 GB	1 GB
Memory BW	288 GB/s	192 GB/s	173 GB/s	80 GB/s	29 GB/s	29 GB/s
Slots + Display Connectors	2x DP + 2x DVI	2x DP + 2x DVI	2x DP + DVI	2x DP + DVI	DP + DVI	DP + DVI
Display Support	4	4	4	4	4	4
Advanced Display	SDI, SYNC, Stereo	SDI, SYNC, Stereo	SDI, SYNC, Stereo	SDI, SYNC, Stereo	SDI, SYNC, Stereo	SDI, SYNC, Stereo
Board Power	225 W	150 W	108 W	68 W	45 W	41 W
SLI Support	Yes	Yes	Yes	No	No	No
Form Factor	FH	FH	FH	FH	HH	HH

	NVS310	NVS315	NVS510
# CUDA Cores	48	48	192
PCIe Gen	2	2	2
Memory Size	512 MB	1GB	2GB
Memory BW	14 GB/s	14 GB/s	28.5 GB/s
Slots + Display Connectors	DMS-59	DMS-59	Mini DP
Max Display	2	2	4
Max Power	19.5 W	19.3 W	35 W
Max Resolution	2560 × 1600 at 60Hz (DP)	2560 × 1600 at 60Hz (DP)	3840×2160 at 60Hz (DP)
Form Factor	HH	HH	HH

	K20	K40
# CUDA Cores	2496	2880
PCIe Gen	Gen 2	Gen 3
Memory Size	5GB	12GB
Memory BW	208 GB/sec	288 GB/sec
Display Support		
Board Power	225 W	235W
Supported APIs	C Based	C Based

Form Factor	FL/FH/2x W	FL/FH/2x W
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- Available Graphics Drivers**
- Microsoft Windows 8.1 (64-bit and 32-bit)
  - Microsoft Windows 7 Professional (64-bit and 32-bit)
  - Red Hat Enterprise Linux(RHEL) 6 Desktop/Workstation

**Networking**

	P500
Connector	RJ-45
Controller	Intel 82574L
Memory	Integrated Dual 48K configurable transit receive FIFO Buffers
Data Rates Supported	10/100/1000 Mbps
Compliance	IEEE 802.1p, Quality of Service (QoS) Support
Bus Architecture	PCI-E 1.1
Typical Power Consumption	1.9W
Operating Temperature	32° to 131° F (0° to 55° C)
Storage Humidity	90% at 35°C
Dimensions (H x W x D)	12cm x 5.53cm x 11.92cm
Operating System Driver Support	Windows 7 Professional 32-bit and 64-bit, Red Hat Enterprise Linux 4 (4.8 or newer), 5 (5.3 or newer), 6
Cabling Type	Category-5 up to 100m
Bracket Height	Low Profile & Full Height
Max TDP	2.9 W
# of Ports	Single
System Interface Type	PCIe v2.0 (2.5GT/s)
Intel® Virtualization Technology for Connectivity (VT-c)	VMDq, VMDc
Speed & Slot Width	2.5 GT/s, x4 Lane

**Other**

MEDIA CARD READER	9 in 1	29 in 1
	Description	Description
	The Media card reader device is standard in our Pseries products. The device connects to a 2×5 two channel USB header on the motherboard of the system. There is no USB controller card provided. Please see the Disc Formats section below for a list of flash memory card formats that are supported.	The Media Card Reader device uses the same physical form factor and mounting as a Floppy Disk Drive. The device connects to a 2×5 two channel USB header on the motherboard of the system. There is no USB controller card provided. Please see the Disc Formats section below for a list of flash memory card formats that are supported.
	Mounting Orientation The Media Card Reader can not be changed and is hard wired into the system	Mounting Orientation The Media Card Reader can be mounted in a dedicated Floppy Drive bay (if the chassis provides one) or in an appropriate Optical Bay adapter. It will operate in any orientation.
	Interface Type	Interface Type
	USB 2.0 (one channel dedicated to the separate USB port; one channel dedicated to the flash memory card slots)	USB 2.0 (one channel dedicated to the separate USB port; one channel dedicated to the flash memory card slots)

	Disc Formats	Disc Formats
	SD	xD-H
	SDHC	xD-M
	SDXC	Micro SD
	Mini SD	Micro SDHC
	Mini SDHC	SD
	Micro SD*	SDHC
	Micro SDHC*	SDXC
	Micro SDXC*	Mini SD
	RS-MMC	Mini SDHC
	MMC	MultiMediaCard (MMC)
	MMC Micro	Reduced Size MultiMediaCard (RS MMC)
	MMC Mobile	(MMC Plus)
	MMC Plus	(MMC Mobile)
	M2	CompactFlash Card Type I (CF Type 1)
		CF Type 2
		MicroDrive (MD)
		Memory Stick (MS)
		Memory Stick Select
		MS Duo
		MS PRO
		MS PRO DuMS PRO-HG Duo
		MS XS Duo
		MS XC-HG Duo
		MS HG Micro*
		MS XC Micro*
		MS XC-HG Micro*
		MMC Micro
		Memory Stick Micro (M2)*
	*Available with adapter	*Available with adapter

**IEEE 1394a (Firewire-400) PCI Express x1 Adapter (1 internal port, 1 external port)**

Data Transfer Rate	Supports up to 400 Mbps
Devices Supported	IEEE-1394 compliant devices
Bus Type	PCIe card full height PCIe slots
Ports	One IEEE-1394a bilingual 6-Pin Connector (Rear)
System Requirements	<div>Windows 7 Professional 32-bit and 64-bit, Microsoft® Windows® XP</div> <div>Professional. Not supported on Linux. Pentium® III or higher processor 128-MB RAM 1-GB Hard Drive CD-ROM drive Built in sound system Available PCI slot</div>
Temperature -	50° to 131° F (10° to 55° C)
Operating	

Temperature - Storage	-22° to 140° F (-30° to 60° C)
Relative Humidity -	20% to 80%
Operating	
Compliances	FCC Part 15B, cULus 60950, CE Mark EN55022B(1995)/EN55024- 1998 STD, Taiwan BSMI CNS13438, Korea MIC
Operating Systems	Windows 7 Professional 32-bit and 64-bit,
Supported	Windows® XP Professional, XP Professional 64-bit.
	Not supported on Linux