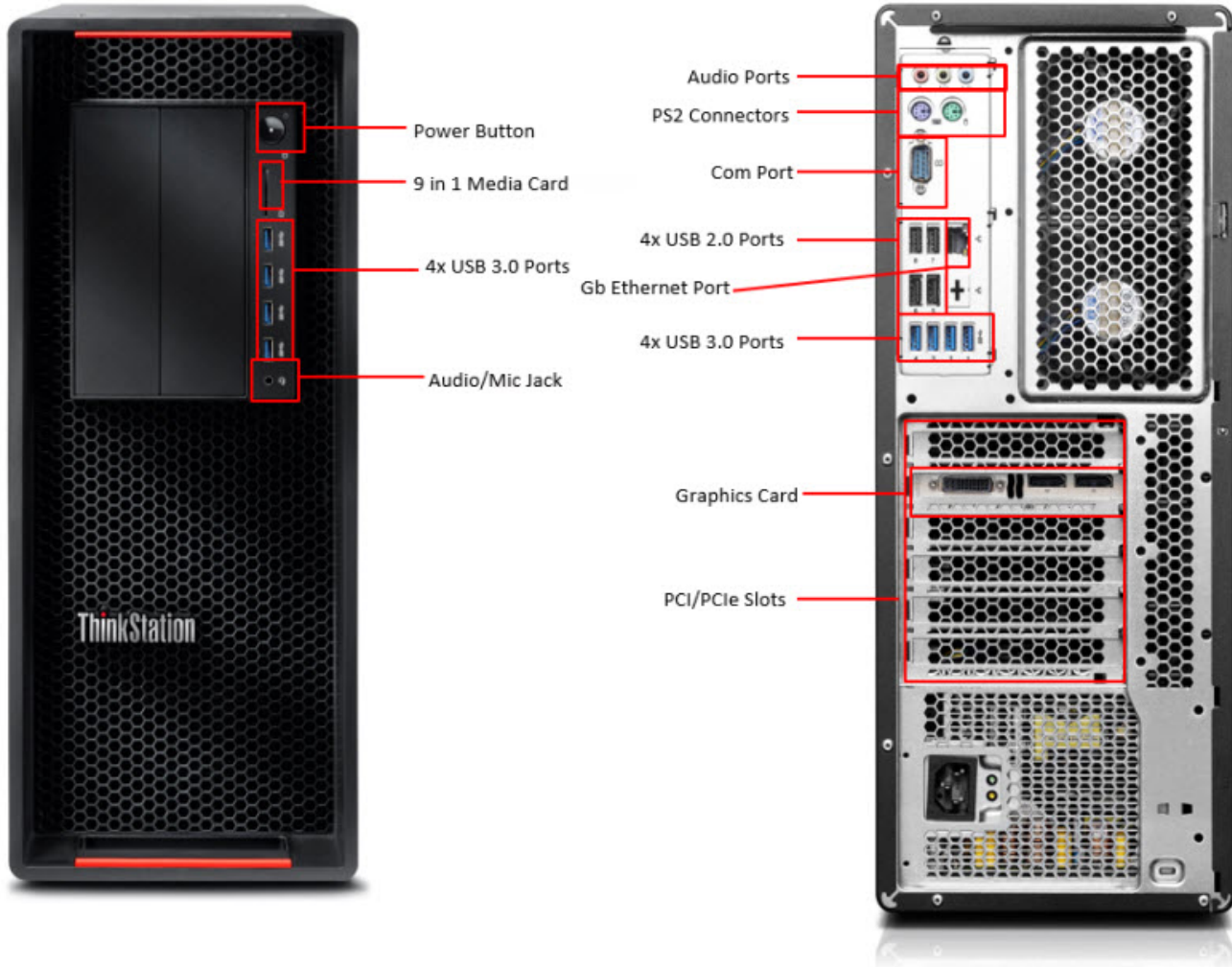
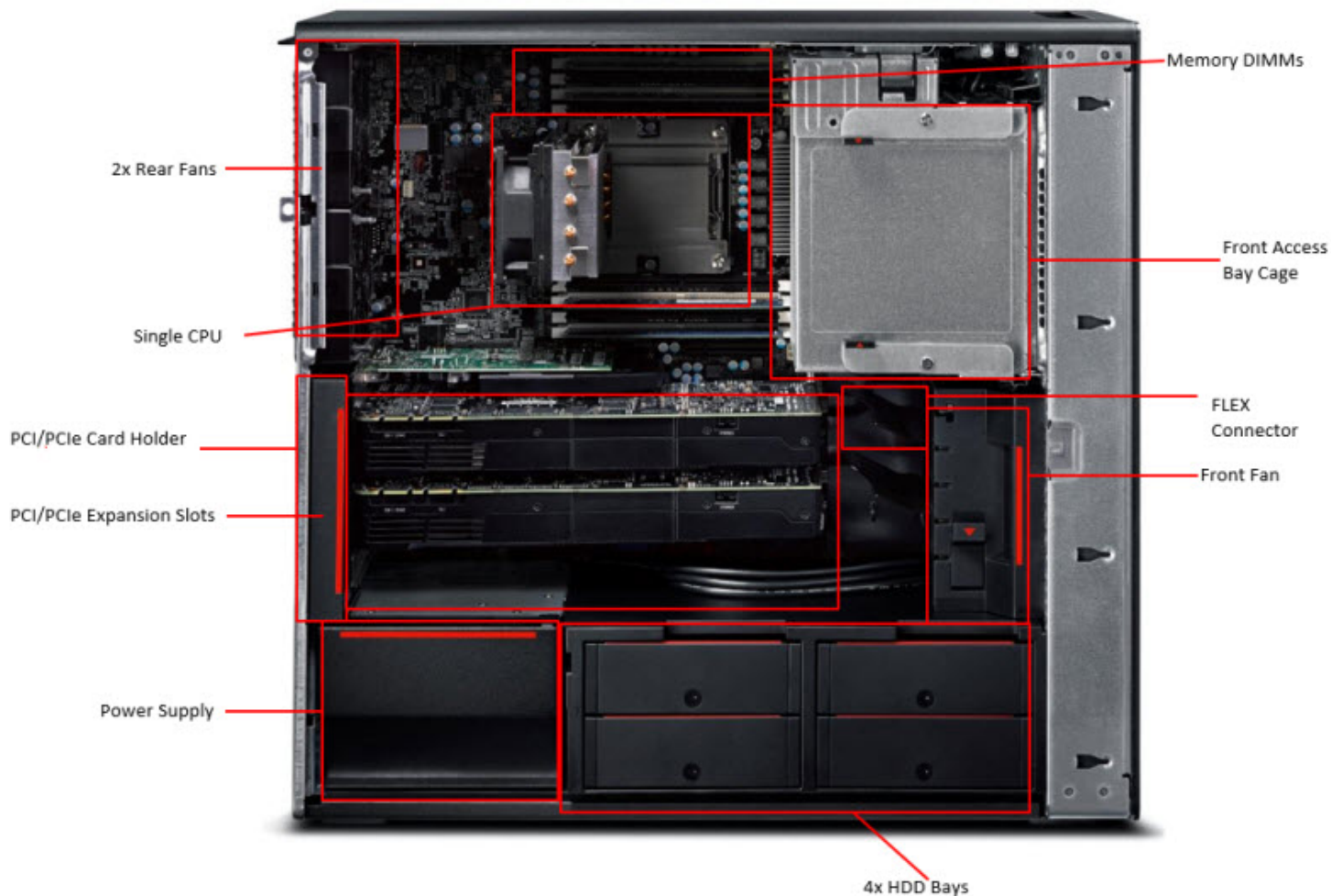


THINKSTATION P510





Product Overview

The ThinkStation P500 is high performance single socket workstation. An Intel® Grantley-based product, the P510 provides excellent performance and quality for applications where processor, memory, graphics, and storage requirements are key. The P510 is positioned between two Grantley-based dual socket workstations, the P710 and P910, and the Denlow-refresh single socket workstations, P310 and P310SFF.

The P510 motherboard consists of the Intel® C612 Chipset, a single Socket-R processor socket, with support for up to 22 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.

SECTION I: SYSTEM OVERVIEW

Operating Systems

Preloaded

Genuine Windows 10® Professional 64-bit

Genuine Windows 10DG to 7® Professional 64-bit

Genuine Windows 10® 64-bit

Supported

Red Hat Enterprise Linux 7

Motherboard - P510**Form Factor**

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

Motherboard Core

Processor Support	Intel® Xeon™ Quad Core (Broadwell EP) Intel® Xeon™ Six Core (Broadwell EP) Intel® Xeon™ Eight Core (Broadwell EP) Intel® Xeon™ Ten Core (Broadwell EP) Intel® Xeon™ Twelve Core (Broadwell EP) Intel® Xeon™ Fourteen Core (Broadwell EP) Intel® Xeon™ Sixteen Core (Broadwell EP) Intel® Xeon™ Twenty-Two Core (Broadwell EP) Intel® Xeon™ Six Core (Haswell EP)
Socket Type	Socket-R3 (LGA 2011)
Memory Support	1600/1866/2133/2400 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, 1600/1866/2133/2400 MHz RDIMM support
ECC Support	YES
Speed	Up to 2400 MHz
Max DIMM Size	Up to 32GB RDIMM
Max System Memory	Up to 256GB RDIMM

Ethernet

Vendor	Intel, Clarkville WGI218LM
Count	1
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) PCIe x4, gen3, "open ended", Full Length without FLEX card; Half Length with FLEX card, FH

Slot 2 PCIe x16, gen3, Full Length, FH

Slot 3 PCIe x1, gen2, Full Length, FH

Slot 4 PCIe x16, gen3, Full Length, FH

Slot 5 PCI, Full Length, FH

Slot 6 (Near Edge) PCIe x4, gen2, "open ended", Half Length, FH

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	2x7-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 Program Requirements for Computers: Version 6.0 (select models)

Energy Star

- EPEAT™ Gold rating (select models)

EPEAT

- ErP Lot-6 2014 (via system setup option; 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/cm²/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 E5-2699 v4 - 22 Cores, 2.2 GHz, 9.6 QPI, 55MB Cache, DDR4-2400, Turbo, HT, 145W

Intel Xeon E5-2697A v4 - 16 Cores, 2.6 GHz, 9.6 QPI, 40MB Cache, DDR4-2400, Turbo, HT, 145W

Intel Xeon E5-2690 v4 - 14 Cores, 2.6 GHz, 9.6 QPI, 35MB Cache, DDR4-2400, Turbo, HT, 135 W

Intel Xeon E5-2680 v4 - 14 Cores, 2.4 GHz, 9.6 QPI, 35MB Cache, DDR4-2400, Turbo, HT, 120W

Intel Xeon E5-2660 v4 - 14 Cores, 2.0 GHz, 9.6 QPI, 35MB Cache, DDR4-2400, Turbo, HT, 105W

Intel Xeon E5-2658 v4 - 14 Cores, 2.3 GHz, 9.6 QPI, 35MB Cache, DDR4-2400, Turbo, HT, 105W

Intel Xeon E5-2650 v4 - 12 Cores, 2.2 GHz, 9.6 QPI, 30MB Cache, DDR4-2400, Turbo, HT, 105W

Intel Xeon E5-2643 v4 - 6 Cores, 3.4 GHz, 9.6 QPI, 20MB Cache, DDR4-2400 , Turbo, HT, 135W

Intel Xeon E5-2640 v4 - 10 Cores, 2.4 GHz, 8.0 QPI, 25MB Cache, DDR4-2133 , Turbo, HT, 90W

Intel Xeon E5-2637 v4 - 4 Cores, 3.5 GHz, 9.6 QPI, 15MB Cache, DDR4-2400 , Turbo, HT, 135W

Intel Xeon E5-2630 v4 - 10 Cores, 2.2 GHz, 8.0 QPI, 25MB Cache, DDR4-2133 , Turbo, HT, 85W

Intel Xeon E5-2623 v4 - 4 Cores, 2.6 GHz, 8.0 QPI, 10MB Cache, DDR4-2133 , Turbo, HT, 85W

Intel Xeon E5-2620 v4 - 8 Cores, 2.1 GHz, 8.0 QPI, 20MB Cache, DDR4-2133 , Turbo, HT, 85W

Intel Xeon E5-2609 v4 - 8 Cores, 1.7 GHz, 6.4 QPI, 20MB Cache, DDR4-1866 , 85W

Intel Xeon E5-2603 v4 - 6 Cores, 1.7 GHz, 6.4 QPI, 15MB Cache, DDR4-1866 , 85W

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

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

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 E5-1660 v4 - 8 Cores, 3.2GHz, 20MB Cache, DDR4-2400, Turbo, HT, 140W

Intel Xeon E5-1660 v4 - 8 Cores, 3.2GHz, 20MB Cache, DDR4-2400, Turbo, HT, 140W

Intel Xeon E5-1650 v4 - 6 Cores, 3.6GHz, 15MB Cache, DDR4-2400, Turbo, HT, 140W

Intel Xeon E5-1630 v4 - 4 Cores, 3.7GHz, 10MB Cache, DDR4-2400, Turbo, HT, 140W

Intel Xeon E5-1620 v4 - 4 Cores, 3.5GHz, 10MB Cache, DDR4-2400, Turbo, HT, 140W

Intel Xeon E5-1607 v4 - 4 Cores, 3.1GHz, 10MB Cache, DDR4-2133, 140W

Intel Xeon E5-1603 v4 - 4 Cores, 2.8GHz, 10MB Cache, DDR4-2133, 140W

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

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

Notes

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

RDIMMs - 2400MHz

4GB DDR4 ECC RDIMM PC4-2400-R 1Rx8

8GB DDR4 ECC RDIMM PC4-2400-R 2Rx8

16GB DDR4 ECC RDIMM PC4-2400-R 2Rx4

32GB DDR4 ECC RDIMM PC4-2400-R 2Rx4

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

2.5" SAS Hard Disk Drive (HDD)

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

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

2.5" SATA Solid State Drive (SSD)

128GB SATA SSD, 6Gb/s, 2.5" Non-OPAL

256GB SATA SSD, 6Gb/s, 2.5" Non-OPAL

256GB SATA SSD, 6Gb/s, 2.5" OPAL

512GB SATA SSD, 6Gb/s, 2.5" Non-OPAL

1 TB SATA SSD , 6Gb/s, 2.5" Non-OPAL

180GB SATA SDD.6Gb/s, , 2.5" OPAL

240GB SATA SDD.6Gb/s, , 2.5" OPAL

480GB SATA SDD.6Gb/s, , 2.5" OPAL

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

256 GB M.2 PCIe - Solid State Drive (SSD), Gen3x4, OPAL NVMe

512 GB M.2 PCIe - Solid State Drive (SSD), Gen3x4, NVMe

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

400GB PCIe - Intel P3700 PCIe Gen 3x4 NVMe, Non-Opal

2.5" PCIe Solid State Drive (SSD)

400GB PCIe - Intel 750 2.5" PCIe Gen 3x4 NVMe

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

- LLSI 9364-8i 8-port SATA/SAS ROC Adapter(Base Mode) w/ 1GB DDR Memory Module
- LSI SAS/SATA RAID Flex adapter

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)
- Smart Card KYB
- Chicony KUF1256 fingerprint KB Win8
- Lenovo Slim New F5 USB Keyboard

Pointing Devices

- Optical Wheel Mouse (1000 DPI), USB - red wheel
- Lenovo USB Laser Mouse for win7 and win10
- PS2 black optical mouse with new logo
- 3DConnexion CadMouse

Graphics Cards

Nvidia NVS310 (DP x 2) - 1GB 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

NVS 810 (miniDPx8) - 4GB DDR3-ATX Long Offset Ext Bracket

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

NVIDIA Quadro K1200(miniDPx4) - 4GB GDDR5 - HP

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

Nvidia Quadro M2000 (Dp x 4) - 4GB ATX

Nvidia Quadro M4000 (DP x 4I) - 8GB GDDR5- ATX Long Offset Ext Bracket

Nvidia Quadro M5000 (DVI, DP x 4) - 8GB GDDR5- ATX Long Offset Ext Bracket

Nvidia Quadro M6000 (DP x 4, DVI) - 12GB GDDR5 - Long Offset Ext Bracket, 8-pin Pwr

NVIDIA SLI Implementations

2 x Nvidia Quadro M5000 with SLI cable

NVIDIA GPU Computing Processor

NVIDIA Tesla K40C 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 I210-T1 Single Port Gigabit Ethernet Adapter
	Intel I350-T2 Dual Port Gigabit Ethernet Adapter
	Intel I350-T4 Quad Port Gigabit Ethernet Adapter
	Bitland BN8E88 1000M PCIE ASF FH
Thunderbolt	Intel Thunderbolt PCIe Add-In-Card
IEE 1394	IEEE 1394a (Firewire-400) PCI Express x1 Adapter (1 external, 1 internal port)
USB	USB 3.0 PCI Express x1 Adapter
Wifi Card	Intel 7260 AC Wifi card
Parallel Card	Sunix 1 - Port IEEE1284 Parallel PCI Express x1 Communication card full Height

SECTION III: SYSTEM TECHNICAL SPECIFICATIONS

Power Supply Specifications

Power Supply	490W PSU	650W PSU	850W PSU
Operating Voltage Range	90-264VAC	90-264VA	90-264VA
Rated Voltage Range	100-240V	100-240V	100-240V
Rated Line Frequency	50/60Hz	50/60Hz	50/60Hz
Operating Line Frequency Range	47Hz/63Hz	47Hz/63Hz	47Hz/63Hz
Rated Input Current	8A-4A	10A - 5A	13A - 6A
Power Supply Fan	92x38mm, 5000rpm max	92x38mm, 7500rpm max	92x38mm, 5700rpm max
ENERGY STAR® qualified (Config Dependent)	*System level select models	*System level select models	*System level select models
80 PLUS Compliant	Yes 80 PLUS Gold	Yes 80 PLUS Platinum	Yes 80 PLUS Platinum
Built-in Self Test (BIST) LED	YES	YES	YES

Surge Tolerant Full Ranging Power Supply (withstands power surges up to 2000V)	YES	YES	YES
Aux Power Drop	Single Drop 6Pin	Dual Drop 6 + 8 pin Single Drop 6Pin	Dual Drop 6 + 8 pin

[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-base 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)	ATA 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/cm²/week
- REACH Article 33 information about substances in articles is available at: 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 LANDesk Management Suite for ThinkVantage Technologies www.lenovo.com/lenovo 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 for more details

SECTION IV: COMPONENT SPECIFICATIONS

HDD 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

2.5" SAS Hard Disk Drive (HDD)

300GB SAS - 10000rpm, 12Gb/s, 2.5"

600GB SAS - 10000rpm, 12Gb/s, 2.5"

	2.5 10K SAS 300G/600G (Model:Thunderbolt)	3.5 7200 Enterprise 4T/6T (Model:Makara)	3.5 7200 Enterprise 4T/6T (Model:MakaraBP)	3.5" 7200 2T/3T (Model:Grenada BP-R)	3.5" 7200 500G/1T (Model:Pharaoh Oasis)	3.5" 7200RPM Hybrid2T/1T (Model:Grenada BP2H)
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Connector	SAS	SATA	SATA	SATA	SATA	SATA
Transfer Rate (Gb/sec)	12Gb	600MB/sec	600MB/sec	600MB/sec	600MB/sec	600MB/sec

Performance

Spindle Speed(RPM)	10,000 +/-	7200	7200	7200	7200	7200
Power off to Spindle Stop(sec)	20 max	23 max	23 max	11 max	10 max	11 max
DC Power to Drive Ready(sec)	20 max	30 max	30 max	10 max	10 max	
Receipt of Start Unit Command to Drive Ready(sec)	20 max	30 max	30 max	17 max	10 max	
Average Latency(msec)	2	4.16	4.16	4.16	4.16	4.16

Power Management

Input(VDC)	+5v +- 5%+12v +- 5%	+5v +- 5%+12v +- 5%	+5v +- 5%+12v +- 5%	+5v +- 5%+12v +- 5%	+5v +- 5%+12v +- 5%	+5v +- 5%+12v +- 5%
Typical(Watts)	7.8(1.8T)	10.62(6T)	10(6T)	8 max	5.57 max	6.7 max
Idle(Watts)	4.55(1.8T)	8(6T)	6.2(6T)	5.4 (Idle 2)	4.21	4.5 (Idle 2)

Dimensions

Height(mm - Max)	15	26.11	26.11	26.1	20	26.11
Width(mm)	69.85	101.6	101.6	101.6	101.6	101.6
Depth(mm - Max)	100.45	146.99	146.99	146.99	146.99	146.99
Weight(grams)	199 (maximum)	780 max	705 max	626 max	415 max	535

Temperature

Operating(C) Ambient	5 to 55	5 to 60	5 to 60	0 to 60	0 to 60	0 to 60
Operating(C) Base Casting	60 max					
Non-Operating(C)	-40 to 70	-40 to 70	-40 to 70	-40 to 70	-40 to 70	-40 to 70

Ambient

Gradient(C per Hour)	20 max	20 max	20 max	30 max	30 max	30 max
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Shock

Operating(Gs @ 2ms)	25	70(read) 40(write)	70(read) 40(write)	70 max	80 max	80 max
Non-Operating(Gs @ 2ms)	400	250 6T,300 other	250 6T,300 other	350 max	300 max	300 max

SSD Specifications

2.5" SATA Solid State Drive (SSD)

128GB SATA SSD, 6Gb/s, , 2.5" Non-OPAL

180GB SATA SSD. 6Gb/s, , 2.5" OPAL

240GB SATA SSD, 6Gb/s, , 2.5" OPAL

256GB SATA SSD, 6Gb/s, , 2.5" Non-OPAL

256GB SATA SSD, 6Gb/s, , 2.5" OPAL

480GB SATA SSD, 6Gb/s, , 2.5" OPAL

512GB SATA SSD, 6Gb/s, , 2.5" Non-OPAL

1 TB SATA SSD , 6Gb/s, , 2.5" Non-OPAL

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

256 GB M.2 PCIe - Solid State Drive (SSD), Gen3x4, OPAL NVMe

512 GB M.2 PCIe - Solid State Drive (SSD), Gen3x4, NVMe

2.5 PCIe Solid State Drive (SSD)

400GB PCIe -Intel 750 2.5" PCIe Gen 3x4 NVMe

400GB PCIe -Intel 3700 2.5" PCIe Gen 3x4 NVMe Non-Opal

	180GB SATA SSD. 6Gb/s. OPAL.2.5"	240GB SATA SSD, 6Gb/s,OPAL. 2.5"	480GB SATA SSD, 6Gb/s,OPAL. 2.5"	128GB SATA SSD, 6Gb/s, 2.5" Non-OPAL	256GB SATA SSD, 6Gb/s, 2.5" OPAL	256GB SATA SSD, 6Gb/s, 2.5" Non-OPAL	512GB SATA SSD, 6Gb/s, 2.5" Non-OPAL	1 TB SATA SSD , 6Gb/s, 2.5" Non-OPAL
Min Sequential Read	540 MB/s	540 MB/s	540 MB/s	460 MB/s	520 MB/s	520 MB/s	520 MB/s	560 MB/s
Min Sequential Write	490 MB/s	490 MB/s	490 MB/s	270 MB/s	450 MB/s	450 MB/s	440 MB/s	510 MB/s
Min Random Read (8GB Span)	41000 IOPS	41000 IOPS	48000 IOPS	77000 IOPS	92000 IOPS	92000 IOPS	86000 IOPS	100,000 IOPS
Min Random Write (8GB Span)	49000 IOPS	49000 IOPS	37000 IOPS	60000 IOPS	38000 IOPS	38000 IOPS	53000 IOPS	88,000 IOPS
Min Power - Active	165 mW	165 mW	165 mW	155 mW	155 mW	155 mW	155 mW	150 mW
Min Power - Idle	55 mW	55 mW	55 mW	75 mW	75 mW	75 mW	75 mW	70 mW
Min MTBF	1.2 M hours	1.2 M hours	1.2 M hours	1.5 M hours	1.5M hours	1.5M hours	1.5M hours	1.5M hours
Hardware Encryption	AES 256 bit	AES 256 bit	AES 256 bit	AES 256 bit	AES 256 bit	AES 256 bit	AES 256 bit	AES 256 bit

Interface		PCIe Gen3 x4 OPAL NVMe	PCIe Gen3 x4 NVMe
Capacity		256GB	512GB
Performance	Sequential Read	2,250 MB/s	2,600 MB/s
	Sequential Write	1,250 MB/s	1,500 MB/s
	Random Read	295,000 IOPS	310,000 IOPS
	Random Write	93,000 IOPS	100,000 IOPS
Power Consumption		6.5W	5.5W

		400GB PCIe - Intel P3700	400GB PCIe -Intel 750 2.5"
Sequential Read		2700 MB/s	2300 MB/s
Sequential Write		1080 MB/s	1000 MB/s
Random Read (100% Span)		450000 IOPS	450000 IOPS
Random Write (100% Span)		75000 IOPS	200000 IOPS
Latency - Read		20 µs	20 µs
Latency - Write		20 µs	20 µs
Power - Active		12W (write), 9W (read)	12
Power - Idle		4w	4
Operating Temperature Range		0° C to 55° C	0° C to 35° C
Endurance Rating (Lifetime Writes)		10 DWPD	70GB per day
Mean Time Between Failures (MTBF)		2,000,000 Hrs	1.2M hours
Interface		PCIe Gen 3x4	PCIe Gen 3x4

HDD Controllers

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

LSI SAS/SATA RAID Flex adapter

		LSI 9364-8i 8-port SATA/SAS ROC Adapter(Base Mode) w/ 1GB DDR Memory Module	LSI SAS/SATA RAID Flex adapter
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)	Blu-Ray Burner Drive w/AACS encryption (SATA)	DVD Burner/CD-RW Rambo Drive (9.5mm Slim SATA)
Description	5.25-inch, half-height, tray-	5.25-inch, half-height, tray-	5.25-inch, half-height, tray-	9.5mm slim, tray-load

	load	load	load	load
Mounting Orientation	Either horizontal or vertical	Either horizontal or vertical	Either horizontal or vertical	Either horizontal or vertical
Interface Type	SATA/ ATAPI	SATA/ ATAPI	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)	(WxHxD) 15.0 x 4.4 x 20.3 cm (5.9 x 1.7 x 8.0 in)	(WxHxD) 128 x 9.5 x 127cm MAX
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	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)	< 140 ms (typical)	< 160 ms (typical)
CD-ROM Mode 1	< 125 ms (typical)	< 125 ms (typical)	< 125 ms (typical)	< 140 ms (typical)
Full Stroke DVD	< 250 ms (seek)	< 250 ms (seek)	< 250 ms (seek)	< 250 ms (seek)
Full Stroke CD	< 210 ms (seek)	< 210 ms (seek)	< 210 ms (seek)	< 210 ms (seek)
Power				
Source	SATA DC power receptacle	SATA DC power receptacle	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	5 VDC ± 5%-100 mV ripple p-p	5 VDC ± 5%-100 mV ripple p-p
	12 VDC ± 10%-200 mV ripple p-p	12 VDC ± 10%-200 mV ripple p-p	12 VDC ± 10%-200 mV ripple p-p	12 VDC ± 10%-200 mV ripple p-p
DC Current	5 VDC - <1000 mA typical, < 1600 mA	5 VDC - <1000 mA typical, < 1600 mA	5 VDC - <1100 mA typical, < 2000 mA	5 VDC - <1000 mA typical, < 1500 mA
	maximum	maximum	maximum	maximum
	12 VDC - < 1000 mA typical, < 2000 mA	12 VDC - < 1000 mA typical, < 2000 mA	12 VDC - < 1600 mA typical, < 2500 mA	
	maximum	maximum	maximum	
Operating Environmental				
Temperature	5° to 50° C (41° to 122° F)	5° to 50° C (41° to 122° F)	5° to 50° C (41° to 122° F)	5° to 50° C (41° to 122° F)
Relative Humidity	8% to 80%	8% to 80%	8% to 80%	8% to 80%
Maximum Wet Bulb Temperature	30° C (86° F)	30° C (86° F)	30° C (86° F)	30° C (86° F)
Operating Systems Supported	Windows 10 Professional or Home 64-bit	Windows 10 Professional or Home 64-bit	Windows 10 Professional or Home 64-bit	Windows 10 Professional or Home 64-bit
	Windows 7 Professional 64-bit	Windows 7 Professional 64-bit	Windows 7 Professional 64-bit	Windows 7 Professional 64-bit
	Red Hat Enterprise Linux (RHEL) 7.2	Red Hat Enterprise Linux (RHEL) 7.2	Red Hat Enterprise Linux (RHEL) 7.2	Red Hat Enterprise Linux (RHEL) 7.2
	Desktop/Workstation. No driver is required for this device. Native support is provided by the operating system.	Desktop/Workstation. No driver is required for this device. Native support is provided by the operating system.	Desktop/Workstation. No driver is required for this device. Native support is provided by the operating system.	Desktop/Workstation. No driver is required for this device. Native support is provided by the operating system.

Graphics Cards

	M6000	M5000	M4000	M2000
# CUDA Cores	3072	2048	1664	768
Single Precision	7.1 TFLOPs	4.3 TFLOPs	2.6 TFLOPs	1.8 TFLOPs
PCIe Gen	3	3	3	3
Memory Size	12GB	8 GB	8 GB	4GB
Memory BW	317 GB/s	211 GB/s	192 GB/s	105.7 GB/s
Slots + Display Connectors	4x DP + DVI-I	4x DP + 1x DVI	4x DP	4x DP

Display Support	4	4	4	4
Advanced Display	SDI, SYNC, Stereo	SYNC	SYNC	N/A
Board Power	250W	150 W	120 W	75W
SLI Support	Yes	Yes	Yes	No
Form Factor	FH	FH	FH	FH
	K2200	K1200	K620	K420
# CUDA Cores	640	512	384	192
Single Precision	1.3 TFLOPs	1 TFLOPs	0.8 TFLOPs	0.3 TFLOPs
PCIe Gen	2	2	2	2
Memory Size	4 GB	4GB	2 GB	1 GB
Memory BW	80 GB/s	80 GB/s	29 GB/s	29 GB/s
Slots + Display Connectors	2x DP + DVI	4x mDP	DP + DVI	DP + DVI
Display Support	4	4	4	4
Advanced Display	N/A	N/A	N/A	N/A
Board Power	68 W	46 W	45 W	41 W
SLI Support	No	No	No	No
Form Factor	FH	LP	HH	HH
	NVS310	NVS315	NVS510	NVS810
# CUDA Cores	48	48	192	1024(512 per GPU)
PCIe Gen	2	2	2	3
Memory Size	512 MB	1GB	2GB	4GB
Memory BW	14 GB/s	14 GB/s	28.5 GB/s	28.8 GB/s
Slots + Display Connectors	DMS-59	DMS-59	Mini DP	Mini DP
Max Display	2	2	4	8
Max Power	19.5 W	19.3 W	35 W	68 W
Max Resolution	2560 × 1600 at 60Hz (DP)	2560 × 1600 at 60Hz (DP)	3840×2160 at 60Hz (DP)	4096×2160 at 30Hz (DP)
Form Factor	HH	HH	HH	FH
	K40C			
# CUDA Cores	2880			
PCIe Gen	Gen 3			
Memory Size	12GB			
Memory BW	288 GB/sec			
Display Support				
Board Power	235W			
Supported APIs	C Based			
Form Factor	FL/FH/2x W			

Available Graphics Drivers

- Microsoft Windows 7 Professional (64-bit and 32-bit)

- Microsoft Windows 10 Professional (64-bit)
- Red Hat Enterprise Linux(RHEL) 7 Desktop/Workstation

Networking

	P510
Connector	RJ-45
Controller	Intel, Clarkville WGI210AT Intel, Clarkville WGI218LM

Intel i218 Gigabit Ethernet - LM

Lithography	40 nm
TDP	0.5 W
Operating Temperature Range	0° C to 85° C
# of Ports	Single
Data Rate Per Port	1 Gbps
Jumbo Frames Supported	Yes
1000Base-T	Yes
Supported Under vPro	Yes

Intel i210 Gigabit Ethernet - AT

Operating Temperature Range	0° C to 70° C
# of Ports	Single
Data Rate Per Port	1 Gbps
System Interface Type	PCIe v2.1 (2.5GT/s)
NC Sideband Interface	Yes
Jumbo Frames Supported	Yes
1000Base-T	Yes
MACsec IEEE 802.1 AE	No
IEEE 1588	Yes

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 mounts into our FLEX module which fits into a standard 5.25" Optical bay.
	Mounting Orientation The Media Card Reader can not be changed and is hard wired into the system	Mounting Orientation The Media Card Reader can not be changed, it only fits into the FLEX Module one way.
	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 3.0 (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	Genuine Windows 10® Professional 64-bit, Genuine Windows 10DG to 7® Professional 64-bit Not supported on Linux. Premium® III or higher processor 128-MB RAM 1-GB Hard Drive CD-ROM drive Built in sound system available PCI slot
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

	Intel I210-T1 Single Port Gigabit Ethernet Adapter	Intel I350-T2 Dual Port Gigabit Ethernet Adapter	Intel I350-T4 Quad Port Gigabit Ethernet Adapter
Cable Medium	Copper	Copper	Copper
Cabling Type	RJ-45 Category-5, up to 100 m	Cat 5 up to 100m	Cat 5 up to 100m
Bracket Height	Low Profile and Full Height	Low Profile and Full Height	Low Profile and Full Height
TDP	1W	4.4W	5W
# of Ports	Single	Dual	Quad
System Interface Type	PCIe 2.1(2.5GT/s)	PCIe v2.1 (5.0GT/s)	PCIe v2.1 (5.0GT/s)
Intel® Virtualization Technology for Connectivity (VT-c)		Yes	Yes
Speed & Slot Width	2.5 GT/s, x1 Lane	5 GT/s, x4 Lane	5 GT/s, x4 Lane
Controller	Intel I210	Intel I350	Intel I350
iWARP/RDMA	No	No	No
Intel® Ethernet Power Management	Yes	Yes	Yes
Intel® Data Direct I/O Technology	No		
Intelligent Offloads	Yes	Yes	Yes
Storage Over Ethernet		iSCSI, NFS	iSCSI, NFS
On-chip QoS and Traffic Management	No	Yes	Yes
Flexible Port Partitioning	No	Yes	Yes
Virtual Machine Device Queues (VMDq)	No	Yes	Yes
PCI-SIG* SR-IOV Capable	No	Yes	Yes