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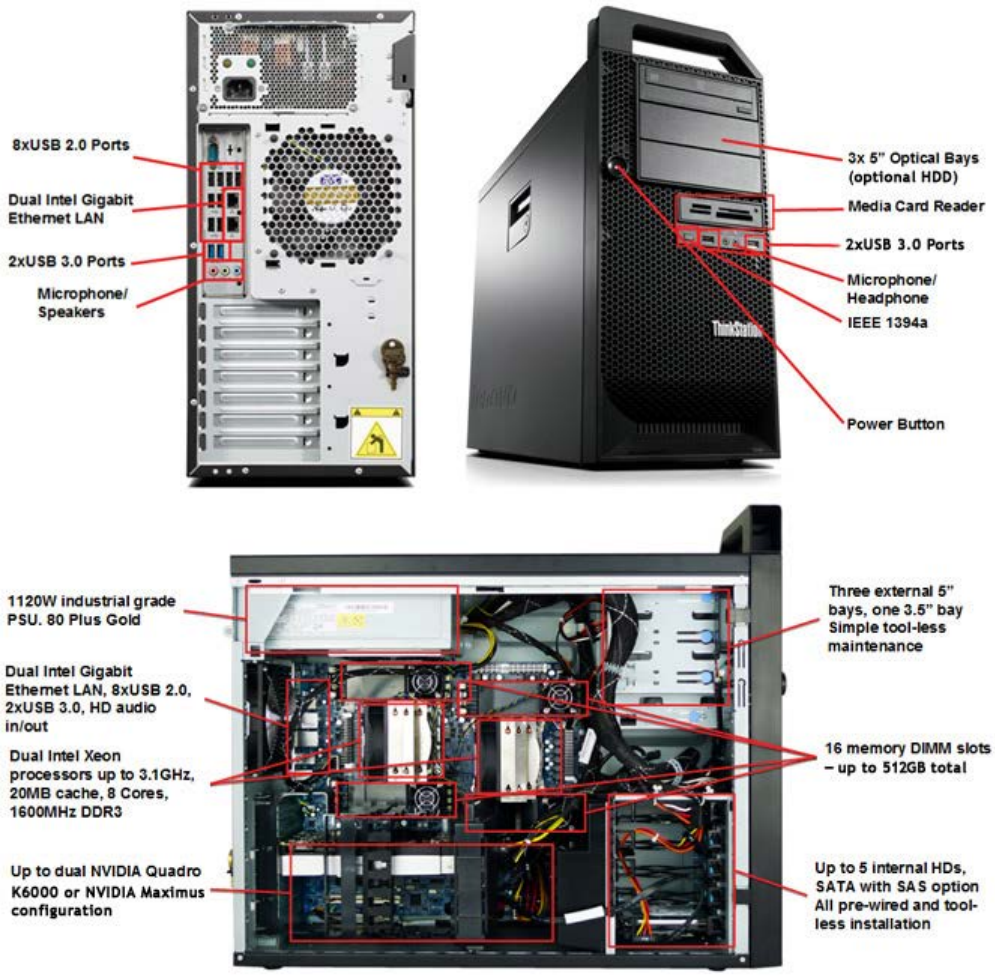
THINKSTATION D30



Product Overview

The dual-processor D30 workstation uses an Extended-ATX/EEB based motherboard, an 1120 Watt (W) power supply unit (PSU), and a 49-liter ATX form factor tower. The D30 motherboard consists of the Intel® C602 Chipset and two 2011-pin Land Grid Array (LGA2011) Socket-R processor sockets, with support for quad core, six core, and eight core, ten core and Twelve processors from the Intel® Xeon line. Memory support consists of error-correcting code (ECC) unbuffered Double Data Rate 3 (DDR3) Synchronous Dynamic Random Access Memory (SDRAM). Maximum memory supported is 128GB for UDIMMs and 512GB for RDIMMs.

SECTION I: SYSTEM OVERVIEW

Operating Systems

Preloaded
Genuine Windows 8® Professional 64-bit
Genuine Windows 8.1® Professional 64-bit
Genuine Windows 7® Professional 64-bit
Genuine Windows 7® Professional 32-bit

Supported
Genuine Windows 7® Home Basic / Home Premium 64-bit
Genuine Windows 7® Home Basic / Home Premium 32-bit
Genuine Windows® XP Professional 64-bit

Genuine Windows® XP Professional 32-bit
Red Hat Enterprise Linux 6.4

Motherboard – D30

Table 1. D30 Motherboard Summary

D30 Motherboard Summary	
Form Factor	
Board Size	12.23" x 14.01" (310.68mm x 355.9mm)
Layout	Custom, based on Extended-ATX/EEB Standard
Motherboard Core	
Processor Support	Intel® Xeon™ Dual Core (Sandy Bridge EP) Intel® Xeon™ Quad Core Intel® Xeon™ Six Core Intel® Xeon™ Eight Core Intel® Xeon™ Ten Core Intel® Xeon™ Twelve Core
Socket Type	(2) x Intel Socket-R (LGA2011)
Memory Support	1866/1600/1333/1066/800 MHz
QPI (GTPS)	6.4/7.2/8.0 GTPS Links
Voltage Regulator	VR12.1 – 150W TDP
Chipset (PCH)	Patsburg-A (Intel C602) Support for Intel HW module to allow enablement of Patsburg-D
Flash	128Mbit SPI Flash with FWH
HW Monitor	N/A
Super I/O	Nuvoton 6681D
Clock	ICS932SQ420B
Audio	Realtek ALC662-VD
Ethernet	Intel 82579 and 82574
SAS	Integrated with Patsburg –A + Enablement Module (Patsburg –D equivalent)
Memory	
Slots	8 per CPU socket
Channels	4 per CPU socket
Type	DDR3 Unbuffered SDRAM (UDIMM, RDIMM, LRDIMM)
ECC Support	Yes
Speed	Up to PC3-14900 (1866MHz)
Max DIMM Size	Up to 8GB UDIMM, up to 32GB RDIMM
Max System Memory	UDIMM: up to 128GB (w/8GB modules) RDIMM: up to 512GB RDIMM (w/32GB modules)
Ethernet	
Vendor	Intel
Count	2
EEPROM	None for Lewisville (part of SPI flash), AT25320 for Hartwell
Speeds	10/100/1000 Mbps
Functions	PXE, WOL, AMT (Lewisville), NC-SI (Hartwell), Jumbo Frames, Teaming
Connectors	(2) 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) (2) x Front 3.5mm Jacks (Headphone out, Microphone 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	(2) x SATA Connectors, Gen. 2 (AHCI) (2) x SATA Connectors, Gen. 3 (AHCI) (4) x SATA/SAS Connectors, Gen. 2 (SCU) [See Note below] (1) x eSATA Connector, Gen. 2 (eSATA bracket) • SATA RAID 0,1, 5 supported natively • SAS RAID 0,1 and SATA RAID 0,1 supported vua SAS Enablement Module • SAS RAID 0,1,5 and SATA RAID 0,1,5 supported via LSI 9260-8i adapter SAS RAID 0,1 5 and SATA RAID 0,1, 5 supported via LSI 9240-8i adapter (with RAID5 key) NOTE: 4 SCU ports are standard. Adding the SATA enablement module adds a 5th port with similar SATA support. Adding the SAS Enablement Module adds a 5th port with similar SATA/SAS support.
eSATA	(1) x eSATA Connector, Gen. 2, cabled to Slot via 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	4-Lane PCI-E v2.0 Full Length, Full Height open tailgate (RF 2.5)
Slot 6 (Near Edge)	PCI v2.3 - Half Length, Full Height
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	(2) x RJ45
USB 2.0	(8) x USB 2.0 Ports
USB 3.0	(2) x USB 3.0 Ports
Firewire	None
Internal I/O	
USB 2.0	• (1) x Front Panel USB Header (2 ports, Base MTM) • (1) x Media Card Reader Header • (1) x Internal USB connector Front
USB 3.0	(1) x Front Panel USB 3.0 edge connector (2 ports)

PS/2	(1) x 2-port PS/2 Header (Rear)
Audio	(1) x Front Panel Mic & Line-Out Header
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	CPU Temperature Sensors via PECI 2 on-board Temperature Sensors PCH Temperature Sensor via SMLINK Ambient Temp Sensor
Fans	(2) x 4-Wire CPU Fans (1) x 4-Wire Rear Fan (5 wire header) (1) x 4-Wire Front Fan (2) x 5-Wire Memory Fan (one header supplies 2 fans per CPU) (1) x 3-Wire PCH Fan (PCH fan not installed)
Power Connectors	
Main	(1) 24-Pin (2×12) ATX Standard
Memory & CPU	(2) 8-Pin (2×4) ATX 12V Standard
Graphics	(1) 4-Pin (2×2) ATX 12V Standard
Security	
TPM	Version 1.2, Nuvoton NPCT421LA0WX (Base MTMs) Version 1.2, ST Micro ST33TPM12LPC (Ivy Bridge MTMs and later)
Asset ID	NXP PCA24S08
vPro	AMT 8.0
BIOS	
Vendor	AMI

Ethernet
The D30 motherboard implements 2 onboard gigabit Ethernet ports via the Intel (82579) and Intel (82574) controllers. These integrated solutions have support for the industry standard functions of Wake on LAN (WOL) and Preboot Execution Environment (PXE), Teaming, and Jumbo Frames. Additionally, for Manageability features, the 82579 will support AMT and the 82574 will support NC-SI.

LPC SUPER IO
D30 will use the Nuvoton 6681D Super IO chip.

Audio
The ALC662-VD chip from Realtek provides D30 with stereo audio capability that meets Windows7 Premium performance requirements. There are 2 front analog jacks, and 3 rear color-coded analog jacks.

Clock Generator
The clock generator chip on D30 is an ICS932SQ420B. It is compliant with the Intel requirement for CK420 clock generation, and had downstream support with a DB1900Z clock buffer.

Chassis Summary
Chassis Info
Chassis Format: Tower

Chassis Dimension – cm: 602mm D x 210mm W x 485mm H

Chassis Dimension – in: 22.7″ D x 8.27″ W x 19.1″ H

Chassis Weight: 60 lbs (27.1kg) maximum configuration

Chassis color: Raven Black

Power supply: 1120W 90% Efficient

2P Thermal Solutions

The D30 utilizes 2 fansink solutions, one supporting 135W or lower CPUs and the other supporting 150W CPUs. In addition to the CPU fansinks, the D30 contains a rear system fan, a front PCI fan, and 2 optional memory cooler assemblies (2 fans each, 1 assembly per CPU).

Security & Serviceability

Physical Security and 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	Yes
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 package
- Storage: -10°C to 60°C (14°F to 140°F) without package
- Note: The allowable upper temperature limit decreases by 1°C (1.8°F) for every 300 m (1000 ft) above sea level.

Humidity

- Operating: 10% to 80% (non-condensing)
- Storage: 10% to 90% (non-condensing)

Altitude

- Operating: -50 to 10 000 ft (-15.2 to 3 048 m)

Regulations and Standards

EMC

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

Safety

UL (C-UL)
TUV-GS
ISO-9241 – parts 3, 7, 8
NOM
IRAM
CCIB
PSB
CE (LVD)

Energy Star

All D30 systems are designed to with the premise of maximizing energy efficiency. Select models will meet the workstation requirements outlined the Energy Star specification:

Energy Star Program Requirements for Computers: Version 6.0

EPEAT™

D30 models which are Energy Star 6.0 compliant will also qualify for the EPEAT™ Gold rating.

EuP Lot-6 2012

D30 systems are complaint with the EuP Lot-6 2012 standard for low power consumption. This is enabled by default for all systems shipping to EMEA, and can be toggled on or off in the system BIOS.

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 v2 – 8 cores, 3.4 GHz, 8.0 QPI, 25MB Cache, DDR3-1866, Turbo, HT, 150W
Intel Xeon E5-2697 v2 – 12 cores, 2.7 GHz, 8.0 QPI, 30MB Cache, DDR3-1866, Turbo, HT, 130W
Intel Xeon E5-2695 v2 – 12 cores, 2.4 GHz, 8.0 QPI, 30MB Cache, DDR3-1866, Turbo, HT, 115W
Intel Xeon E5-2690 v2 – 10 cores, 3.0 GHz, 8.0 QPI, 25MB Cache, DDR3-1866, Turbo, HT, 130W
Intel Xeon E5-2680 v2 – 10 cores, 2.8 GHz, 8.0 QPI, 25MB Cache, DDR3-1866, Turbo, HT, 115W
Intel Xeon E5-2670 v2 – 10 cores, 2.5 GHz, 8.0 QPI, 25MB Cache, DDR3-1866, Turbo, HT, 115W
Intel Xeon E5-2667 v2 – 8 cores, 3.3 GHz, 8.0 QPI, 25MB Cache, DDR3-1866, Turbo, HT, 130W
Intel Xeon E5-2660 v2 – 10 cores, 2.2 GHz, 8.0 QPI, 25MB Cache, DDR3-1866, Turbo, HT, 95W
Intel Xeon E5-2650 v2 – 8 cores, 2.6 GHz, 8.0 QPI, 20MB Cache, DDR3-1866, Turbo, HT, 95W
Intel Xeon E5-2643 v2 – 6 cores, 3.5 GHz, 8.0 QPI, 25MB Cache, DDR3-1866, Turbo, HT, 130W
Intel Xeon E5-2640 v2 – 8 cores, 2.0 GHz, 7.2 QPI, 20MB Cache, DDR3-1600, Turbo, HT, 95W
Intel Xeon E5-2637 v2 – 4 cores, 3.5 GHz, 8.0 QPI, 15MB Cache, DDR3-1866, Turbo, HT, 130W
Intel Xeon E5-2630 v2 – 6 cores, 2.6 GHz, 7.2 QPI, 15MB Cache, DDR3-1600, Turbo, HT, 80W

Intel Xeon E5-2620 v2 – 6 cores, 2.1 GHz, 7.2 QPI, 15MB Cache, DDR3-1600, Turbo, HT, 80W
Intel Xeon E5-2609 v2 – 4 cores, 2.5 GHz, 6.4 QPI, 10MB Cache, DDR3-1333, 80W
Intel Xeon E5-2603 v2 – 4 cores, 1.8 GHz, 6.4 QPI, 10MB Cache, DDR3-1333, 80W
2S Low Power Processor SKUs - These SKUs have 2 QPI links and are targeted for dual CPU systems, but will also work on single CPU systems. They also have a lower TDP than standard power CPUs.
Intel Xeon E5-2650L v2 - 10 cores, 1.7 GHz, 8.0 QPI, 25MB Cache, DDR3-1600, Turbo, HT, 70W
Intel Xeon E5-2630L v2 – 6 cores, 2.4 GHz, 7.2 QPI, 15MB Cache, DDR3-1600, Turbo, HT, 60W
1S Processor SKUs - These SKUs have 1 QPI link and are targeted for single CPU configurations
Intel Xeon E5-1660 v2 – 6 cores, 3.7 GHz, 15MB Cache, DDR3-1866, Turbo, HT, 130W
Intel Xeon E5-1650 v2 – 6 cores, 3.5 GHz, 15MB Cache, DDR3-1866, Turbo, HT, 130W
Intel Xeon E5-1620 v2 – 4 cores, 3.7 GHz, 10MB Cache, DDR3-1866, Turbo, HT, 130W
Intel Xeon E5-1607 v2 – 4 cores, 3.0 GHz, 10MB Cache, DDR3-1600, 130W

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

Part Description
UDIMMs - 1866MHz
4GB DDR3 ECC UDIMM PC3-14900E (1866MHz) 1Rx8 4Gbit
8GB DDR3 ECC UDIMM PC3-14900E (1866MHz) 2Rx8 4Gbit
RDIMMs - 1866MHz
4GB DDR3 ECC RDIMM PC3-14900R (1866MHz) 1Rx8 4Gbit
8GB DDR3 ECC RDIMM PC3-14900R (1866MHz) 2Rx8 4Gbit
UDIMMs - 1600MHz
2GB DDR3 ECC UDIMM PC3-12800 (1600MHz) 1Rx8 2Gbit
4GB DDR3 ECC PC3-12800 (1600MHz) 2Rx8 2Gbit
RDIMMs - 1600MHz
2GB DDR3 ECC RDIMM PC3-12800R (1600MHz) 1Rx8 2Gbit
4GB DDR3 ECC RDIMM PC3-12800R (1600MHz) 2Rx8 2Gbit
8GB DDR3 ECC RDIMM PC3-12800R (1600MHz) 2Rx4 2Gbit
16GB DDR3 ECC RDIMM PC3-12800R (1600MHz) 2Rx4 4Gbit
32GB DDR3 ECC RDIMM PC3-12800R (1333MHz) 2Rx4 4Gbit (performance is configuration dependant)

Memory Support Matrix

Single CPU								
Number of DIMMs	Processor 1							
	Ch 1		Ch 2		Ch 3		Ch 4	
	DIMM 5	DIMM 1	DIMM 6	DIMM 2	DIMM 7	DIMM 3	DIMM 8	DIMM 4
1		x						
2		x		x				
3		x		x		x		
4		x		x		x		x
5	x	x		x		x		x
6	x	x	x	x		x		x
7	x	x	x	x	x	x		x
8	x	x	x	x	x	x	x	x

Dual CPU																
Number of DIMMs	Processor 1								Processor 2							
	Ch 1		Ch 2		Ch 3		Ch 4		Ch 1		Ch 2		Ch 3		Ch 4	
	DIMM 5	DIMM 1	DIMM 6	DIMM 2	DIMM 7	DIMM 3	DIMM 8	DIMM 4	DIMM 5	DIMM 1	DIMM 6	DIMM 2	DIMM 7	DIMM 3	DIMM 8	DIMM 4
2		x								x						
4		x		x						x		x				
6		x		x		x				x		x		x		
8		x		x		x		x		x		x		x		x
10	x	x		x		x		x	x	x		x		x		x
12	x	x	x	x		x		x	x	x	x	x		x		x
14	x	x	x	x	x	x		x	x	x	x	x	x	x		x
16	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

Storage - Hard Drive/SSD Specifications

Part Description
3.5" SATA Hard Disk Drive (HDD)
250GB SATA - 7200rpm, 6Gb/s, 3.5"
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"
2.5" SATA Hard Disk Drive (HDD)
250GB SATA - 10000rpm, 6Gb/s, 2.5"
500GB SATA - 10000rpm, 6Gb/s, 2.5"
1TB SATA - 10000rpm, 6Gb/s, 2.5"
3.5" SAS Hard Disk Drive (HDD)
300GB SAS - 15000rpm, 6Gb/s, 3.5"
450GB SAS - 15000rpm, 6Gb/s, 3.5"
600GB SAS - 15000rpm, 6Gb/s, 3.5"
2.5" SAS Hard Disk Drive (HDD)
146GB SAS - 15000rpm, 6Gb/s, 2.5"
300GB SAS - 15000rpm, 6Gb/s, 2.5"
2.5" SATA Solid State Drive (SSD)
128GB SATA - Solid State Drive (SSD), 6Gb/s, MLC, 2.5"
256GB SATA - Solid State Drive (SSD), 6Gb/s, MLC, OPAL, 2.5"
mSATA Drives
128GB mSATA Drive, 6Gb/s, MLC
256GB mSATA Drive, 6Gb/s, MLC
3.5" Hybrid Drives
1TB - 7200 rpm 8GB Flash
2TB - 7200 rpm 8GB Flash

HDD to ODD Conversion

Kits are available through the special bid process to convert a 5.25" HDD bay into either a 3.5" or 2.5" optical drive.

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.

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 Controllers:

LSI 9240-8i SATA/SAS RAID adapter
Description: PCIe x8 adapter card
Enables: Up to 5 SAS or SATA drives @ SATA3 (6GB/s) speeds, RAID 0,1,10

RAID 5 Support available with optional RAID key

SATA HDD enablement module (1-5 drives)
Description: D30 SAS HDD enablement module (SATA
Enables: Up to 5 SATA drives at SATA2 (3Gb/s) speeds, RAID 0,1, 10, 5 (software based)

SAS HDD enablement module (1-5 drives)
Description: D30 SAS HDD enablement module (SAS)
Enables: Up to 5 SATA or SAS drives at SATA2 (3Gb/s) speeds, RAID 0,1,10

Storage – Optical Drive/Removable Media

Part Description
DVD-ROM Drive – 16x/48x (SATA)
DVD Burner/CD-RW Rambo Drive (SATA)
Blu-Ray Burner Drive w/AACS encryption (SATA)
29-in-1 Media Card Reader, 3.5" (with GPIO detect, longer cable)

Keyboard

Part Description
Preferred Pro Fullsize Keyboard (USB)

Pointing Devices

Part Description
Optical Wheel Mouse (800 DPI), USB – red wheel

Graphics Cards

Part Description
NVIDIA NVS300 (DMS-59 to Dual DVI, DMS-59 to Dual DP) – 512MB GDDR3
NVIDIA NVS310 (Dual DP) 512MB DDR3
NVIDIA NVS315 (DMS-59) 1GB DDR3
NVIDIA NVS 510 (mini DP x 4) – 2GB DDR3
NVIDIA Quadro 410 (Dual link DVI, DP) 512MB DDR3
NVIDIA Quadro 600 (Dual link DVI, DP) – 1GB DDR3
NVIDIA Quadro K2000 (Dual link DVI, DP, DP) – 2GB GDDR5

NVIDIA Quadro K2000D (Dual link DVI x 2) - 2GB GDDR5
NVIDIA Quadro K4000 (Dual link DVI, DP, DP, Stereo 3D) - 3GB GDDR5
NVIDIA Quadro K5000 (Dual link DVI x 2, DP, DP) - 4GB GDDR5
NVIDIA Quadro 6000 (Dual link DVI, DP, DP, Stereo 3D) - 6GB GDDR5
SLI Implementations
2 x NVIDIA Quadro K5000 with SLI Cable
2 x NVIDIA Quadro 5000 with SLI Cable
2 x NVIDIA Quadro 5000
SLI Cable
2 x NVIDIA Quadro 6000 with SLI Cable
2 x NVIDIA Quadro 6000
SLI Cable
Compute Adapters
NVIDIA Tesla K20 - 5GB GDDR5

PCI/PCIe Adapters Specifications

Part Description
IEEE 1394a (Firewire-400) PCI Express x1 Adapter (1 external, 1 internal port)
Intel 82574L Gigabit CT2 Desktop Ethernet Adapter
Intel 1 Gigabit ET Dual Port Server Adapter
USB 3.0 PCI Express x1 Adapter
SoundBlaster Recon3D Audio Card (PCIe x1)

Speakers Specifications

Part Description
Lenovo Branded 2-Piece Speaker Set
Speaker Brick

SECTION III: SYSTEM TECHNICAL SPECIFICATIONS

Power Supply Specifications

Power Supply	1120w PSU
Operating Voltage Range	90-264 VAC
Rated Voltage Range	100-127V 200-240V
Rated Line Frequency	50/60Hz.
Operating Line Frequency Range	47Hz/63Hz
Rated Input Current	15A @ 100-127 VAC 7.5A @ 200-240 VAC
Power Supply Fan	120x25mm, 2800rpm max
ENERGY STAR® qualified (Config Dependent)	YES
80 PLUS Compliant	YES, 80 PLUS Gold
Built-in Self Test (BIST) LED	YES
Surge Tolerant Full Ranging Power Supply (withstands power surges up to 2000V)	YES

Aux Power connectors	Two (2) 6-Pin (2×3) PCI-E Auxiliary Power Connector (75 W) Two (2) 6-Pin/8-Pin (2×4) PCI-E Auxiliary Power Connector (150 W)

Click here to access the ThinkStation Power Calculator.

BIOS Specifications

Features	
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 lor 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 v2.3.1
ACPI (Advanced Configuration and power Management Interface)	Advanced Configuration and Power Interface v4.0
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 2.1
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 v2.7.1

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), hydrochlorofluorcarbons (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^2/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

For more information on Lenovo social environmental practices visit:
http://www.lenovo.com/social_responsibility/us/en/ThinkGreen_products.html#environment

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.landesk.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 and www.lenovo.com/warranty for more details

SECTION IV: TECHNICAL SPECIFICATIONS

HDD Specifications

3.5″ SAS Hard Disk Drive (HDD)
300GB SAS – 15000rpm, 6Gb/s, 3.5″
450GB SAS – 15000rpm, 6Gb/s, 3.5″
600GB SAS – 15000rpm, 6Gb/s, 3.5″
2.5″ SAS Hard Disk Drive (HDD)
146GB SAS – 15000rpm, 6Gb/s, 2.5″
300GB SAS – 15000rpm, 6Gb/s, 2.5″

Specification		3.5″ 15K	2.5″ 15K
Interface			
	Connector	SAS SFF-8482	
	Transfer Rate (Gb/sec)	3Gb	
Performance			
	Spindle Speed(RPM)	15,000 +/-	15,000 +/-
	Power off to Spindle Stop(sec)	30 max	
	DC Power to Drive Ready(sec)	30 max	
	Receipt of Start Unit Command to Drive Ready(sec)	30 max	
	Average Latency(msec)	2 +/- 0.25	
	Full Stroke Seek for Read/Write(ms max)	8 / 9	
Power Management			
	Input(VDC)	+5v +- 5%+12v +- 5%	
	Typical(Watts)	TBD	
	Idle(Watts)	TBD	
Dimensions			
	Height(mm – Max)	26.11	15
	Width(mm)	101.6 +/- 0.25	69.85 +/- 0.25
	Depth(mm – Max)	146.99	100 +/- 0.45
	Weight(grams)	800 max	

Temperature

	Operating(C) Ambient	5 to 55
	Operating(C) Base Casting	60 max
	Non-Operating(C) Ambient	-40 to 70
	Gradient(C per Hour)	20 max
Shock		
	Operating(Gs @ 2ms)	60 max
	Non-Operating(Gs @ 2ms)	250 max

Part Description

3.5″ SATA Hard Disk Drive (HDD)
250GB SATA - 7200rpm, 6Gb/s, 3.5″
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″
2.5″ SATA Hard Disk Drive (HDD)
250GB SATA - 10000rpm, 6Gb/s, 2.5″
500GB SATA - 10000rpm, 6Gb/s, 2.5″
1TB SATA - 10000rpm, 6Gb/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″

mSATA Drives
128GB mSATA Drive, 6Gb/s, MLC
256GB mSATA Drive, 6Gb/s, MLC

Specification

Interface		
	Connector	SATA
	Ports	Single
	Transfer Rate	6Gb
Temperature		
Operational	Ambient (C)	0 to 55
	Base Casting (C)	60 max
	Gradient(C per Hour)	20 max
Non-Operational	Ambient(C))	-40 to 70
	Gradient(C per Hour)	30 max
Humidity		
Operational	Relative Non-Condensing Wet bulb (%)	5 to 90

	Gradient (% per hour)	20
Non-Operational	Relative Non-Condensing Wet bulb (%)	5 to 95
	Gradient (% per hour)	20
Altitude		
	Operating(feet)	-1000 to 10,000
	Non-Operating(feet)	-1000 to 40,000
Shock – All Axis		
OperationalNo Data loss. Data recovery is allowed	½ Sine @ 2ms (Read & Write) (G)	60
	Rotational (Rad/sec**2)	8.5
Non-Operational No damage allowed	½ Sine @ 2ms (G)	250
	Rotational (Rad/sec**2)	20,000

HDD Controller Specifications

LSI 9240-8i SATA/SAS RAID adapter

PCI Bus	PCI-Express 2.0 x8 lanes
PCI Modes	Bus Master DMA
RAID Levels	RAID 0, 1, 5, 10, 50 and JBOD mod
Data Transfer Rates	Up to 6 Gb/s per port
PCI Card Type	3.3V Add-in card
PCI Voltage	+12V ±10
PCI Power	13.5W
Bracket	Full Height and Low-Profile
Certification Level	PCI-Express 2.0
Internal Connectors	Two X4 Mini-SAS SFF8087 (vertical orientation)

SSD Technical Specifications

Solid State Drives for Workstations

Capacity	128GB, 180GB, 240GB, 256GB
Physical Size	Model Height (mm) 6.80 ± 0.20 Width (mm) 69.85 ± 0.25 Length (mm) 100.00 ± 0.25 Weight (gram) Max 58
Interface	SATA
Synchronous Transfer Rate	6Gb/s
Operating Temperature	0°C to 60°C (32° to 140°F)

CD – RW Rambo Drive

Description	5.25-inch, half-height, tray-load
Mounting Orientation	Either horizontal or vertical
Interface Type	SATA/ATAPI
Dimensions	(WxHxD) 15.0 x 4.4 x 20.3 cm (5.9 x 1.7 x 8.0 in)
Disc Formats	DVD-RAM DVD+R DVD+RW DVD+R DL DVD-R DL DVD-R DVD-RW

	CD-R CD-RW

Disc Capacity

DVD-ROM	8.5 GB DL or 4.7 GB standard
Full Stroke DVD	< 250 ms (seek)
Full Stroke CD	< 210 ms (seek)

Maximum Data Transfer Rates

CD ROM Read	CD-ROM, CD-R Up to 40X CD-RW Up to 32X
DVD ROM Read	DVD-RAM Up to 12X DVD+RW Up to 8X DVD-RW Up to 8X DVD+R DL Up to 8X DVD-R DL Up to 8X DVD-ROM Up to 16X DVD-ROM DL Up to 8X DVD+R Up to 16X DVD-R Up to 16X

Power

Source	SATA DC power receptacle
DC Power Requirements	5 VDC ± 5%-100 mV ripple p-p 12 VDC ± 5%-200 mV ripple p-p
DC Current	5 VDC – <1000 mA typical, <1600 mA maximum 12 VDC – <600 mA typical, <1400 mA Maximum

Operating Environmental

Temperature	5° to 50° C (41° to 122° F)
Relative Humidity	10% to 90%
Maximum Wet Bulb Temperature	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) 6
Desktop/Workstation. No driver is required for this device. Native support is provided by the operating system.

Kit Contents
SATA SuperMulti DVD Writer Drive, Roxio Easy Media Creator software, Intervideo WinDVD Software, installation guide, and DVD+R media.

DVD – ROM Drive

Description	5.25-inch, half-height, tray-load
Mounting Orientation	Either horizontal or vertical
Interface Type	SATA/ATAPI
Dimensions	(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

Access Times

DVD-ROM Single Layer	< 140 ms (typical)
CD-ROM Mode 1	< 125 ms (typical)
Full Stroke DVD	< 250 ms (seek)
Full Stroke CD	< 210 ms (seek)

Power

Source	SATA DC power receptacle
DC Power Requirements	5 VDC ± 5%-100 mV ripple p-p 12 VDC ± 5%-200 mV ripple p-p
DC Current	5 VDC - <1000 mA typical, < 1600 mA maximum 12 VDC - < 600 mA typical, < 1400 mA maximum

Operating Environmental

Temperature	5° to 50° C (41° to 122° F)
Relative Humidity	10% to 90%
Maximum Wet Bulb Temperature	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
Desktop/Workstation. No driver is required for this device. Native support is provided by the operating system.

Blu-Ray Burner Drive w/ AACS encryption

Description	5.25-inch, half-height, tray-load
Mounting Orientation	Either horizontal or vertical
Interface Type	SATA
Dimensions	(WxHxD) 15.0 x 4.4 x 20.3 cm (5.9 x 1.7 x 8.0 in)
Disc Formats	BD-RW BD-ROM BD-R BD-RE DVD-RAM DVD+R DVD+RW DVD+R DL DVD-R DL DVD-R DVD-RW CD-R CD-RW

Disc Capacity

DVD-ROM	8.5 GB DL or 4.7 GB standard
Blu-ray	50 GB DL or 25 GB standard
Full Stroke DVD	< 250 ms (seek)
Full Stroke CD	< 210 ms (seek)
Blu-ray	<275 ms (seek)
Startup Time	BD-ROM (SL/DL) 25S / 28S BD-R (SL/DL) 25S / 28S BD-RE (SL/DL) 25S / 28S DVD-ROM (SL/DL) 18S / 18S

	DVD-R (SL/DL) 25S / 25S DVD-RW 25S DVD+R (SL/DL) 25S / 25S DVD+RW 25S DVD-RAM 45S CD-ROM 45S
Maximum Data Transfer Rates CD ROM Read	CD-ROM CD-R CD-RW Up to 40X Up to 40X Up to 40X
DVD ROM Read	DVD-RAM Up to 5X DVD+RW Up to 10X DVD-RW Up to 10X DVD+R DL Up to 8X DVD-R DL Up to 8X DVD-ROM Up to 16X DVD-ROM DL Up to 8X DVD+R Up to 12X DVD-R Up to 12X
Blu-Ray	BD-ROM Up to 6X BD-ROM DL Up to 4.8X BD-R Up to 6X BD-R DL Up to 4.8X BD-R Up to 6X BD-RE SL/DL Up to 4.8X

Power

Source	SATA DC power receptacle
DC Power Requirements	5 VDC ± 5%-100 mV ripple p-p 12 VDC ± 10%-100 mV ripple p-p
DC Current	5 VDC -900 mA typical, 1200 mA maximum 12 VDC -1000 mA typical, 1600 mA maximum

Operating Environmental

Temperature	5° to 50° C (41° to 122° F)
Relative Humidity	15% to 80%
Maximum Wet Bulb Temperature	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) WS 6

Kit Contents
Blue Laser RW Drive, Roxio Easy Media
Creator software, Intervideo WinDVD
Software, installation guide.

Disclaimer
As Blu-Ray is a new format containing new technologies, certain disc, digital connection, compatibility and/or performance issues may arise, and do not constitute defects in the product. Flawless playback on all systems is not guaranteed. In order for some Blu-Ray titles to play, they may require a DVI or HDMI digital connection and your display may require HDCP support. HD-DVD movies cannot be played on this workstation.

29-in-1 Media Card Reader

Description
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 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
USB 2.0 (one channel dedicated to the separate USB port; one channel dedicated to the flash memory card slots)

Disc Formats
xD-H
xD-M
Micro SD
Micro SDHC
SD
SDHC
SDXC
Mini SD
Mini SDHC
MultiMediaCard (MMC)
Reduced Size MultiMediaCard (RS MMC)
(MMC Plus)
(MMC Mobile)
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

Video Cards

NVIDIA NVS 300 512MB Graphics Card

Form Factor
2.7 inches (H) x 5.7 inches (L), Half-Height

Graphics Controller
NVIDIA NVS 300 Graphics Board

Bus Type
PCI Express x16, Generation 2.0

Memory
512 MB GDDR3 SDRAM unified graphics memory

Connectors
DMS-59
Includes DMS-59 to Dual DVI-I adapter or DMS-59 to Dual DP adapter

Maximum Resolution
DVI: two digital displays up to 1920 x 1200
DisplayPort: two digital displays up to 2560 x 1600
VGA: two analog displays up to 1920 x 1080

Image Quality Features

Display Output
This card support up to two displays: Drives DVI enabled digital displays at resolutions up to 1920 × 1200 at 60 Hz with reduced blanking Drives DisplayPort enabled digital displays at resolutions up to 2560 × 1600 at 60 Hz with reduced blanking (through optional DMS-59 to DisplayPort adapter)

Drives VGA enabled analog displays at resolutions up to 1920 x 1080 (through optional DMS-59 to VGA adapter)

Supported Graphics APIs
OGL 3.3

DirectX 10.1

Available Graphics Drivers
Genuine Windows 7 Professional (64-bit and 32-bit)
Microsoft Windows XP Professional (64-bit and 32-bit)
Red Hat Enterprise Linux(RHEL) 6 Desktop/Workstation

Power Consumption
<18 Watts

NVIDIA NVS 310 512MB Graphics Card

Form Factor
Low Profile: 2.713 inches in height × 6.150 inches in length

Graphics Controller
NVIDIA NVS 310

Bus Type
PCI Express x16, 2.0 compliant

Memory
Size: 512MB DDR3
Clock: 875Mhz
Memory Bandwidth: 14GB/s
Connectors
2 x DisplayPort 1.2

Maximum Resolution
Up to 2560 x 1600 (digital display) per display.

Image Quality Features
See Display Output section.
The following video formats are supported:
- MPEG2
- MPEG4 Part 2 Advanced Simple Profile
- H.264 SVC codec support
- Support for 3D Blu Ray
- VC1
- DivX version 3.11 and later
- MVC

A full range of video resolutions are supported including 1080p, 1080i, 720p, 480p and 480i. The NVS 310 GPU provides hardware acceleration for the computationally intensive parts of video processing, as well as provides improved video playback speeds via faster decode and transcode.

Display Output
Up to 2 displays in the following configurations:

Drives two DisplayPort enabled digital display at resolutions up to 2560 × 1600 at 60 Hz with reduced blanking, when connected natively using the 2 DisplayPort connectors on the NVS 310 graphics card Supports 2 monitors up to resolution of 1920 × 1200 at 60 Hz with reduced blanking using DisplayPort 1.2 multi stream topology technology.

DVI-D output:

Drives two digital display at resolutions up to 1920 × 1200 at 60Hz with reduced blanking using DisplayPort to DVI-D single-link cable adaptors Drives two digital display at resolutions up to 2560× 1600 at 60 Hz with reduced blanking using DisplayPort to DVI-D dual-link cable adaptors HDMI output:
NVS 310 is capable of driving two high definition (HD) panels up to resolutions of 1920 × 1080P at 60 Hz using DisplayPort to HDMI cable adaptors

VGA display output:
Drives two analog display at resolutions up to 1920 × 1200 at 60 Hz using DisplayPort to VGA cable adaptors

Shading Architecture
Shader Model 5.0

Supported Graphics APIs
DX11, OpenGL 4.1

Available Graphics Drivers
Genuine Windows 7 Professional (64-bit and 32-bit)
Microsoft Windows XP Professional (64-bit and 32-bit)
Red Hat Enterprise Linux(RHEL)

Power Consumption
19.5 Watts

Note

The thermal solution used on this card is an active fan heatsink.

NVIDIA Quadro NVS 315 1GB PCIe Graphics Card

Form Factor
Low Pofile, 1/2 length Active cooling

Bus Type
PCI Express x16, Generation 2.0

Memory
1GB GDDR3

Connectors
DMS59

Maximum Resolution
DisplayPort: 2560 x 1600
DVI: 1920 x 1200
VGA: 2048 x 1536

Supported Graphics APIs
OpenGL 4.1 DirectX 11

Available Graphics Drivers
Microsoft Windows 8 (64-bit and 32-bit)
Microsoft Windows 7 Professional (64-bit and 32-bit)
Microsoft Windows XP Professional (64-bit and 32-bit)
Red Hat Enterprise Linux(RHEL) 6 Desktop/Workstation

NVIDIA Quadro NVS 510

CUDA Cores
192

Memory Size Total
2.0 GB DDR3

Memory Interface
128-bit

Memory Bandwidth (GB/sec)
28.5

Display Connector
Mini DisplayPort (mDP)

# of Connectors
4

DisplayPort
4

Single-Link DVI-D
4[1]

Dual-Link DVI-D
4[2]

VGA

4[3]

Maximum Display Resolution (Digital @ 60Hz)
3840×2160[4]

Maximum Display Resolution (Analog @ 60 Hz)
1920×1200[5]

Number of Slots
1

Audio Support (via DisplayPort)
✓

1 using mDP to SL-DVI, or included mDP-DP Cable with a DP to SL-DVI Cable Adaptor
2 using included mDP-DP cable with DP to DL-DVI Cable Adaptor
3 using included mDP-DP cable with DP to VGA Cable Adaptor
4 Through native DisplayPort (DP)
5 Through DP to VGA Cable Adaptor

NVIDIA Quadro 410 512MB Graphics

Form Factor
Low Profile: 2.713 inches × 5.7 inches, single slot

Graphics Controller
NVIDIA Quadro 410

Bus Type
PCI Express x16, 3.0 compliant

Memory
Size: 512MB DDR3
Clock: 900MHz
Memory Bandwidth: 14GB/s

Connectors
One dual-link DVI-I connector
One DisplayPort connector

Maximum Resolution
Up to 2560 x 1600 (digital display) per display.

RAMDAC
400 MHz integrated RAMDAC

Display Output
Maximum resolution over DisplayPort: 2560 × 1600 × 32 bpp at 60 Hz (reduced blanking)
Maximum resolution over DVI port: 2560 × 1600 × 32 bpp at 60 Hz (reduced blanking)
Maximum resolution over VGA (through DVI to VGA cable): 2048 × 1536 × 32 bpp at 85 Hz

Shading Architecture
Shader Model 5.0

Supported Graphics APIs
DX11, OpenGL 4.2

Available Graphics Drivers
Genuine Windows 7 Professional (64-bit and 32-bit)
Microsoft Windows XP Professional (64-bit and 32-bit)
Red Hat Enterprise Linux(RHEL) 6 Desktop/Workstation

Power Consumption
< 35 Watts

QUADRO K600

CUDA Parallel-Processing Cores
192

Frame Buffer Memory

1 GB DDR3

Max Power Consumption
41W

Graphics Bus
PCI Express 2.0 x16

Display Connectors
DVI-I (1), DP 1.2 (1)

Form Factor
2.713" H x 6.3 L Single Slot

QUADRO K2000

CUDA Parallel-Processing Cores
384

Frame Buffer Memory
2 GB GDDR5

Max Power Consumption
51W

Graphics Bus
PCI Express 2.0 x16

Display Connectors
DVI-I (1), DP 1.2 (1)

Form Factor
4.376" H x 7.97 L Single Slot

NVIDIA Quadro 4000 2GB Graphics Card

Form Factor
4.376" H x 9.50" L
Single Slot

Graphics Controller
NVIDIA Quadro 4000 Graphics Card

Bus Type
PCI Express 2.0 x16

Memory
2 GB GDDR5
256-bit

Connectors
1 DVI-I output, 2 DisplayPort outputs;
Stereo bracket included

Maximum Resolution
Dual DisplayPort (up to 2560 x 1600 @ 60Hz and 1920×1200 @ 120Hz)
Dual-link DVI-I output (up to 2560 x 1600 @ 60Hz and 1920×1200 @ 120Hz)

RAMDAC
400 MHz integrated RAMDAC

Image Quality Features
Up to 16K x16K texture and render processing
Transparent multisampling and super sampling
16x angle independent anisotropic filtering
128-bit floating point performance
32-bit per-component floating point texture filtering and blending
Support for any combination of two connected displays
DisplayPort 1.1a, HDMI 1.3a, and HDCP support
NVIDIA 3D Vision™ technology, 3D DLP, Interleaved, and other
3D stereo format support
Full OpenGL quad buffered stereo support

Underscan/overscan compensation and hardware scaling
NVIDIA nView® multi-display technology

Shading Architecture
Shader Model 5.0

Supported Graphics APIs
OpenGL 4.0
DirectX 11
CUDA API support includes:
CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran

Available Graphics Drivers
Genuine Windows 7 Professional (64-bit and 32-bit)
Microsoft Windows XP Professional (64-bit and 32-bit)
Red Hat Enterprise Linux (RHEL) 6 Desktop/Workstation

Power Consumption
142 Watts

QUADRO K4000

CUDA Parallel-Processing Cores
768

Frame Buffer Memory
3 GB GDDR5

Max Power Consumption
80W

Graphics Bus
PCI Express 2.0 x16

Display Connectors
DVI-I (1), DP 1.2 (2)

Form Factor
4.376" H x 9.5 L Single Slot

NVIDIA Quadro K5000 4GB Graphics Card

CUDA Cores
1536

Single Precision Compute Performance
2.1 Teraflops

Memory Size Total
4GB GDDR5

Memory Interface
256-bit

Memory Bandwidth (GB/sec)
173 GB/s

Dual Link DVI-I
1

Dual Link DVI-D
1

DisplayPort 1.2
2

# of Digital Outputs
4

Stereo (3-pin Mini-DIN)
Optional

Maximum Display Resolution (Digital)
DVI-DL: Up to 330M Pixels/sec: (ex 1920×1200@120Hz, 2560×1600@60Hz)
DisplayPort 1.2: Up to 540M Pixels/sec & 17.3 Gbps data rate
(ex 3840×2160@60Hz 30bpp, 2560×1440@120Hz 30bpp, 4096×2160@24Hz 36bpp,
4096×2160@50Hz 30bpp)

NVIDIA Quadro 6000 6GB Graphics Card

Form Factor
4.376″ H x 9.75″ L
Dual Slot

Graphics Controller
NVIDIA Quadro 6000 Graphics Card

Bus Type
PCI Express 2.0 x16

Memory
6 GB GDDR5
384-bit
ECC Memory

Connectors
1 DVI-I output, 2 DisplayPort outputs, 1 Stereo(3-pin mini DIN);
One DP to DVI adapter included with card
DVI to VGA, DisplayPort to VGA and DisplayPort to dual link DVI
adapters available as accessories

Maximum Resolution
Dual DisplayPort (up to 2560 x 1600 @ 60Hz and 1920×1200 @ 120Hz)
Dual-link DVI-I output (up to 2560 x 1600 @ 60Hz and 1920×1200 @
120Hz)

Image Quality Features
30-bit color
Up to 16K x16K texture and render processing
Transparent multisampling and super sampling
16x angle independent anisotropic filtering
128-bit floating point performance
32-bit per-component floating point texture filtering and blending
64x full scene antialiasing (FSAA) / 128x FSAA in SLI Mode
Support for any combination of two connected displays
DisplayPort 1.1a, HDMI 1.3a, and HDCP support
NVIDIA 3D Vision™ technology, 3D DLP, Interleaved, and other
3D stereo format support
Full OpenGL quad buffered stereo support
Underscan/overscan compensation and hardware scaling
NVIDIA nView® multi-display technology

Shading Architecture
Shader Model 5.0

Supported Graphics APIs
OpenGL 4.0
DirectX 11
CUDA API support includes:
CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran

Available Graphics Drivers
Genuine Windows 7 Professional (64-bit and 32-bit)
Microsoft Windows XP Professional (64-bit and 32-bit)
Red Hat Enterprise Linux (RHEL) 6 Desktop/Workstation

Power Consumption
<250 Watts

NVIDIA Tesla C2075 Compute Processor

Form Factor
4.376 inches by 9.75 inches
Dual Slot

System Interface
PCI Express Gen2 ×16

Video Outputs
One Dual Link DVI-I
(Video output on this connector is not supported in Maximus configurations per NVIDIA)

Memory
6GB GDDR5

Peak Memory Bandwidth
+170 GB/s

Supported APIs
CUDA API support includes:
CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran

Supported Operating Systems
Genuine Windows 7 Professional (64-bit)
Genuine Windows Vista Business (64-bit)
Microsoft Windows XP Professional (64-bit)
Red Hat Enterprise Linux (RHEL) 6 Desktop/Workstation (64-bit)

Processor Cores
448 CUDA cores

Power Consumption
~215 Watts

Audio Devices

SoundBlaster Recon3D Audio Card (PCIe x1)

24-bit Analog-to-Digital conversion of analog inputs	96kHz sample rate
24-bit Digital-to-Analog conversion of digital sources	96kHz to analog
16-bit to 24-bit recording sampling rates	8,11.025,16, 22.05, 24, 32, 44.1, 48 and 96kHz
16-bit to 24-bit playback sampling rates	8,11.025,16, 22.05, 24, 32, 44.1, 48, 96 and 192kHz
Rear Panel Connectivity	Line in / Microphone In: Shared 1/8″ mini jack Headphone: 1 x 1/8″ mini jack Speaker Out: 3x 1/8″ mini jacks Optical Out: TOSLINK Optical In: TOSLINK
Speaker Support	Stereo/2.1 Speakers 5.1 Speakers Headphones
Bus Connection	PCI Express 1x
Package Contents	Sound Card Quick Start leaflet Installation CD containing: • Drivers for Windows® • Creative Software Suite • User's Guide
Software	Sound Blaster Recon3D PCIe Control Panel • THX® TruStudio Pro™ effects • THX® TruStudio Pro Surround™ • THX® TruStudio Pro Crystalizer™ • THX® TruStudio Pro Bass™ • THX® TruStudio Pro Smart Volume™ • THX® TruStudio Pro Dialog Plus™ CrystalVoice effects • CrystalVoice™ Acoustic Echo Cancellation • CrystalVoice™ Noise Reduction • CrystalVoice™ Smart Volume • CrystalVoice™ FX • CrystalVoice™ Focus EAX Advanced HD OpenAL Creative Alchemy
Minimum System Requirements	Intel® Core™ 2 Duo or AMD® equivalent processor,

2.2 GHz or faster
Intel®, AMD® or 100% compatible motherboard
Microsoft® Windows® 7 (32/64-bit)
1 GB RAM
600 MB of free hard disk space
Available PCI Express® (x1, x4 or x16) slot
Available CD-ROM or DVD-ROM drive

Networking

Intel 82574L Gigabit CT2 Desktop Ethernet Adapter

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, Windows XP Professional 64-bit, Red Hat Enterprise Linux 4 (4.8 or newer), 5 (5.3 or newer), 6

Intel 1 Gigabit ET Dual Port Server Adapter

Cabling Type	Category-5 up to 100m
Bracket Height	Low Profile & Full Height
Max TDP	2.9 W
Networking Specifications	
# of Ports	Dual
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
Controller	Intel 82576

USB 3.0

Interface:	Single-Lane (x1) PCI Express Gen2
Mode:	Universal Serial Bus 3.0
Controller:	Renesas (NEC) μPD720200
PCB Version:	Ver1.1
Port:	2 external USB3.0 ports
Speed:	Data Transfer rate of 1.5/12/480/5000 Mbps. Low Speed (1.5Mbps), Full Speed(12Mbps), High Speed(480Mbps), Super Speed(5Gpbs)
Power Output:	+5V / 900mA (each port)
Bracket:	Standard 121mm / Low Profile 79.2mm
O.S. support:	Windows XP/2003/Vista/7/2008, (32/64-bit) Linux 2.6.31 or later (Linux OS already implemented USB3.0 driver)
Environment:	Operation temp. 0 °C ~ 57 °C

Operation humidity:	5 ～ 95% RH
Storage temp.	-20 °C ～ 85 °C

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	Windows 7 Professional 32-bit and 64-bit, Microsoft® Windows® XP 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
Temperature - Operating	50° to 131° F (10° to 55° C)
Temperature - Storage	-22° to 140° F (-30° to 60° C)
Relative Humidity - Operating	20% to 80%
Compliances	FCC Part 15B, cULus 60950, CE Mark EN55022B(1995)/EN55024-1998 STD, Taiwan BSMI CNS13438, Korea MIC
Operating Systems Supported	Windows 7 Professional 32-bit and 64-bit, Windows® XP Professional, XP Professional 64-bit. Not supported on Linux