THINKSTATION C30

8xUSB 2.0 Ports

Intel Gigabit Ethernet LAN

2xUSB 3.0 Ports

Microphone/ Speakers

Power Button

2xUSB 3.0 Ports

Microphone/ Headphone

One 5" Optical Bays

Thermostatically controlled chassis cooling system

One optional 5" bay; toolless, quick release system to enable access to CPU and memory

Removable expansion card support brace

810W industrial grade PSU. 80 Plus Gold

Innovative, custom wiring loom for clutter free maintenance

Intel Gigabit Ethernet LAN, 8xUSB 2.0, 2xUSB 3.0, HD audio in/out

Dual Intel Xeon processors up to 2.9GHz, 20MB cache, 8 Cores, 1600MHz DDR3

Up to dual NVIDIA Quadro K5000 or NVIDIA Maximus configuration

8 memory DIMM slots – up to 256GB totalC

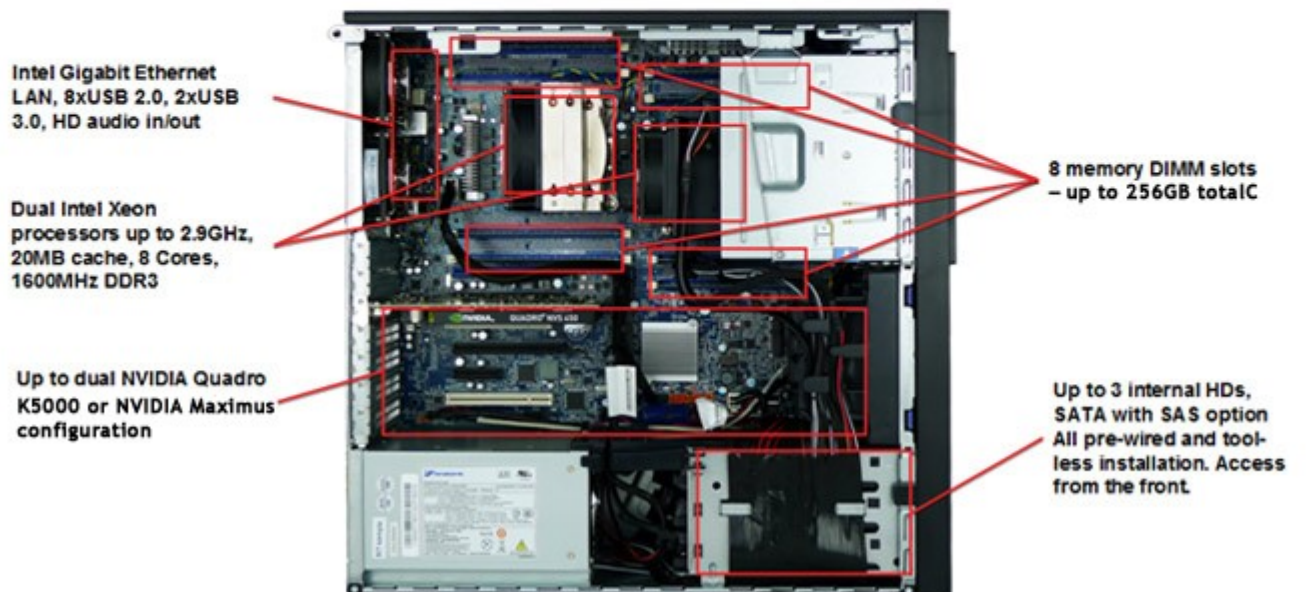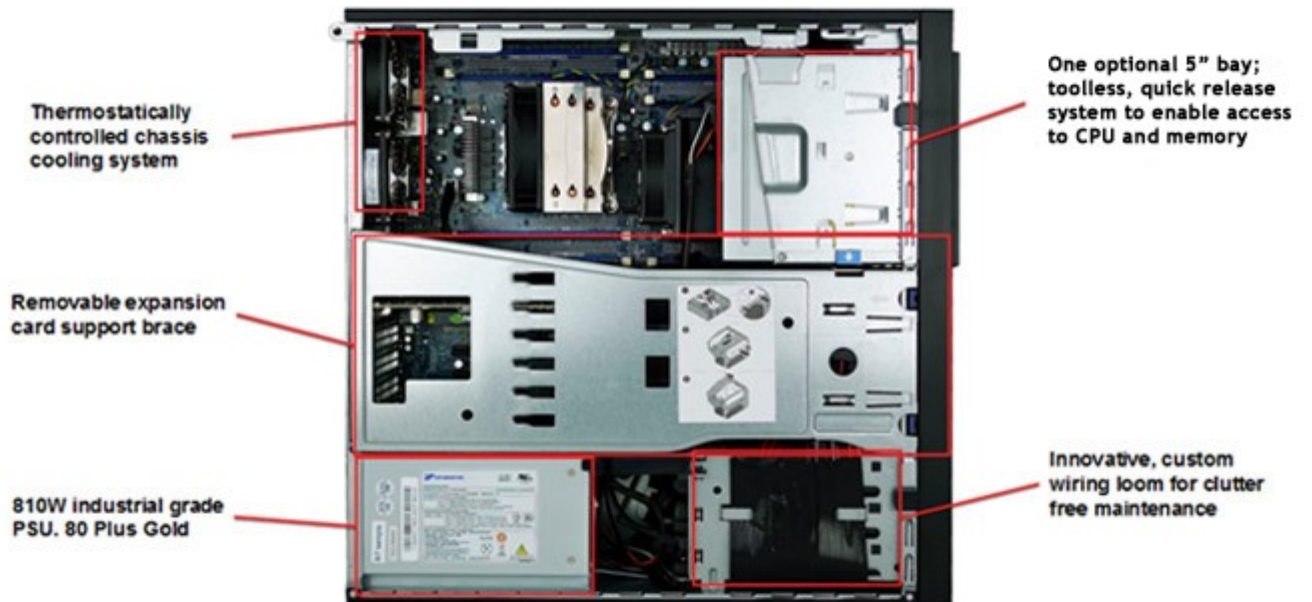**Up to 3 internal HDs, SATA with SAS option All pre-wired and tool-less installation. Access from the front.**

Product Overview

The dual-processor C30 workstation uses an Extended-ATX/EEB based motherboard, an 800 Watt (W) power supply unit (PSU), and a 24-liter ATX form factor tower. The C30 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 processors from the Intel® Xeon line (Sandy Bridge EP). 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 256GB (pending 32GB RDIMM availability).

SECTION I: SYSTEM OVERVIEW

Operating Systems

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

Supported
Genuine Windows XP Professional 64-bit
Genuine Windows XP Professional 32-bit
Red Hat Enterprise Linux 6.2

Motherboard – C30

Table 1. C30 Motherboard Summary

C30 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 (Sandy Bridge EP) Intel® Xeon™ Six Core (Sandy Bridge EP) Intel® Xeon™ Eight Core (Sandy Bridge EP)
Socket Type	(2) x Intel Socket-R (LGA2011)
Memory Support	1600/1333/1066/800 MHz
QPI (GTPS)	6.4/7.2/8.0 GTPS Links
Voltage Regulator	VR12.1 – 130W TDP
Chipset (PCH)	Patsburg-A (Intel C602) Support for Intel HW module to allow enablement of Patsburg-B
Flash	128Mbit SPI Flash with FWH
HW Monitor	N/A
Super I/O	Nuvoton 6681D

Clock	ICS932SQ420B
Audio	Realtek ALC662-VD
Ethernet	Intel Lewisville(82579)
SAS	Integrated with Patsburg –A + Enablement Module (Patsburg –B equivalent)

Memory

Slots	4 per CPU socket
Channels	4 per CPU socket
Type	DDR3 Unbuffered SDRAM (UDIMM, RDIMM, LRDIMM)
ECC Support	Yes
Speed	Up to PC3-12800 (1600MHz)
Max DIMM Size	Up to 8GB UDIMM, up to 32GB RDIMM
Max System Memory	UDIMM: up to 64GB (w/8GB modules) RDIMM: up to 256GB RDIMM (w/32GB modules)

Ethernet

Vendor	Intel
Count	1
EEPROM	None (part of SPI flash)
Speeds	10/100/1000 Mbps
Functions	PXE, WOL, AMT (82579), NC-SI (82574), 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) (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) (3) x SATA/SAS Connectors, Gen. 2 (SCU) (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 via 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)(
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	(1) x RJ45
USB 2.0	(2) x USB 2.0 Ports
USB 3.0	(2) x USB 3.0 Ports
Firewire	None
Internal I/O	
USB 2.0	• x Front Panel USB Header (2 ports, Base MTM) • x Media Card Reader Header • x Internal USB connector
USB 3.0	• x Front Panel USB 3.0 edge connector (2 ports, RF 2.5 MTM)
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	
Fans	(1) x 4-Wire CPU Fans
	(1) x 5-Wire Rear Fans (1 header, two fans)
	(1) x 4-Wire Front Fan
	(2) x 5-Wire Memory Fan (not used on C30)
	(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 (RF 2.5 MTMs and later)
Asset ID	NXP PCA24S08
vPro	vPro for WS (AMT 7.0)
BIOS	
Vendor	AMI

Ethernet

The C30 motherboard implements an onboard gigabit Ethernet port via the Intel (82579) PHY. This integrated solution has support for the industry standard functions of Wake on LAN (WOL) and Preboot Execution Environment (PXE), Teaming, and Jumbo Frames. Additionally, for Manageability features, (82579) will support AMT 7.0.

Audio

The ALC662-VD chip from Realtek provides C30 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 C30 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: 444mm D x 130mm W x 427mm H
Chassis Dimension – in: 17.48″ D x 5.12″ W x 16.81″ H
Chassis Weight = 40.7 lbs (18.5kg) maximum configuration
Chassis color: Raven Black
Power supply: 800W 90% Efficient

2P Thermal Solutions

The C30 2P system will utilize 4 fansink solutions. For the 2 rear CPU versions, one will support 80W/95W CPUs and the other will support 130W CPUs. For the 2 front CPU versions, one will support 80W/95W CPUs and the other will support 130W CPUs. Due to space requirements, the front CPU fansinks will be a different design point, and unique to the C30.

In addition to the CPU fansinks, the C30 2P system will contain a 2 rear system fans which share the same connector, a front PCI fan, a PCH fansink, and 2 optional memory chiller 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

C30 is expected to be compliant to the Lenovo Standards Compliance Reference List

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 C30 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™

C30 models which are Energy Star 6.0 compliant will also qualify for the EPEAT™ Gold rating. The Development team is currently assessing whether some or all of these models may also qualify for EPEAT™ Gold.

EuP Lot-6 2012

C30 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

Part Description
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 E5-2690 – 8 cores, 2.9GHz, 8.0 QPI, 20MB Cache, DDR3-1600, Turbo+, HT, 135W
Intel Xeon E5-2680 – 8 cores, 2.7GHz, 8.0 QPI, 20MB Cache, DDR3-1600, Turbo+, HT, 130W
Intel Xeon E5-2670 – 8 cores, 2.6GHz, 8.0 QPI, 20MB Cache, DDR3-1600, Turbo+, HT, 115W
Intel Xeon E5-2665 – 8 cores, 2.4GHz, 8.0 QPI, 20MB Cache, DDR3-1600, Turbo+, HT, 115W

Intel Xeon E5-2660 – 8 cores, 2.2GHz, 8.0 QPI, 20MB Cache, DDR3-1600, Turbo+, HT, 95W

Intel Xeon E5-2650 – 8 cores, 2.0GHz, 8.0 QPI, 20MB Cache, DDR3-1600, Turbo+, HT, 95W

Intel Xeon E5-2667 – 6 cores, 2.9GHz, 8.0 QPI, 15MB Cache, DDR3-1600, Turbo+, HT, 130W

Intel Xeon E5-2640 – 6 cores, 2.5GHz, 7.2 QPI, 15MB Cache, DDR3-1333, Turbo+, HT, 95W

Intel Xeon E5-2630 – 6 cores, 2.3GHz, 7.2 QPI, 15MB Cache, DDR3-1333, Turbo+, HT, 95W

Intel Xeon E5-2620 – 6 cores, 2.0GHz, 7.2 QPI, 15MB Cache, DDR3-1333, Turbo+, HT, 95W

Intel Xeon E5-2643 – 4 cores, 3.3GHz, 8.0 QPI, 10MB Cache, DDR3-1600, Turbo+, HT, 130W

Intel Xeon E5-2609 – 4 cores, 2.4GHz, 6.4 QPI, 10MB Cache, DDR3-1067, 80W

Intel Xeon E5-2603 – 4 cores, 1.8GHz, 6.4 QPI, 10MB Cache, DDR3-1067, 80W

Intel Xeon E5-2637 – 2 cores, 3.0GHz, 8.0 QPI, 5MB Cache, DDR3-1600, Turbo+, HT, 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 – 8 cores, 1.8GHz, 8.0 QPI, 20MB Cache, DDR3-1600, Turbo+, HT, 70W

Intel Xeon E5-2630L – 6 cores, 2.0GHz, 7.2 QPI, 15MB Cache, DDR3-1333, Turbo+, HT, 60W

1S Processor SKUs – These SKUs have 1 QPI link and are targeted for single CPU systems, will NOT work in dual CPU systems

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.

Quad, six and eight 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

RAM Specifications

Part Description

UDIMMs – 1333MHz

2GB DDR3 ECC UDIMM PC3-10600E (1333MHz) 1Rx8 2Gbit

4GB DDR3 ECC UDIMM PC3-10600E (1333MHz) 2Rx8 2Gbit

8GB DDR3 ECC UDIMM PC3-10600E (1333MHz) 2Rx8 4Gbit

UDIMMs – 1600MHz

2GB DDR3 ECC UDIMM PC3-10600E (1333MHz) 1Rx8 2Gbit

4GB DDR3 ECC UDIMM PC3-10600E (1333MHz) 2Rx8 2Gbit

8GB DDR3 ECC UDIMM PC3-10600E (1333MHz) 2Rx8 4Gbit

RDIMMs – 1333MHz

2GB DDR3 ECC RDIMM PC3-10600R (1333MHz) 1Rx8 2Gbit

4GB DDR3 ECC RDIMM PC3-10600R (1333MHz) 2Rx8 2Gbit

8GB DDR3 ECC RDIMM PC3-10600R (1333MHz) 2Rx4 2Gbit

16GB DDR3 ECC RDIMM PC3-10600R (1333MHz) 2Rx4 4Gbit

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 (1600MHz) 2Rx4 4Gbit (performance is configuration dependant)

Memory Support Matrix

Single CPU

Number of DIMMs	Ch 1 DIMM 5	Ch 1 DIMM 1	Ch 2 DIMM 6	Ch 2 DIMM 2	Ch 3 DIMM 7	Ch 3 DIMM 3	Ch 4 DIMM 8	Ch 4 DIMM 4
1	NA	x	NA		NA		NA	
2	NA	x	NA	x	NA		NA	
3	NA	x	NA	x	NA	x	NA	
4	NA	x	NA	x	NA	x	NA	x

Dual CPU

Number of DIMMs	P1 Ch 1 DIMM 5	P1 Ch 1 DIMM 1	P1 Ch 2 DIMM 6	P1 Ch 2 DIMM 2	P1 Ch 3 DIMM 7	P1 Ch 3 DIMM 3	P1 Ch 4 DIMM 8	P1 Ch 4 DIMM 4	P2 Ch 1 DIMM 5	P2 Ch 1 DIMM 1	P2 Ch 2 DIMM 6	P2 Ch 2 DIMM 2	P2 Ch 3 DIMM 7
2	NA	x	NA		NA		NA		NA	x	NA		
4	NA	x	NA	x	NA		NA		NA	x	NA	x	
6	NA	x	NA	x	NA	x	NA		NA	x	NA	x	x
8	NA	x	NA	x	NA	x	NA	x	NA	x	NA	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"

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"

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, OPAL, 2.5"

mSATA Drives

128GB mSATA Drive, 6Gb/s, MLC

256GB mSATA Drive, 6Gb/s, MLC

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 Drive 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

SAS HDD enablement module (1-3 drives)
Description: S30 / C30 SAS HDD enablement module
Enables: Up to 3 SATA or SAS drives at SATA2 (3Gb/s) speeds, RAID 0,1

Storage – Optical Drive

Part Description
DVD-ROM Drive – 16x/48x (SATA)
DVD Burner/CD-RW Rambo Drive (SATA)
Blu-Ray Burner Drive w/AACS encryption (SATA)

Keyboard Specifications

Part Description
Preferred Pro Fullsize Keyboard (USB)

Pointing Devices Specifications

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

Video Adapters Specifications

Part Description
NVIDIA NVS300 (DMS-59 to Dual DVI, DMS-59 to Dual DP) – 512MB GDDR3
NVIDIA NVS310 (Dual DP) 512MB DDR3
NVIDIA NVS450 (DPx4) – 512MB GDDR3
NVIDIA NVS 510 (mini DP x 4) – 2GB DDR3
NVIDIA Quadro 400 (Dual link DVI, DP) – 512MB DDR3
NVIDIA Quadro 410 (Dual link DVI, DP) 512MB DDR3
NVIDIA Quadro 600 (Dual link DVI, DP) – 1GB DDR3
NVIDIA Quadro K600 (Dual link DVI, DP) – 1GB DDR3
NVIDIA Quadro 2000 (Dual link DVI, DP, DP) – 1GB GDDR5
NVIDIA Quadro K2000 (Dual link DVI, DP, DP) – 2GB GDDR5
NVIDIA Quadro 2000D (Dual link DVI x 2) – 1GB GDDR5
NVIDIA Quadro K2000D (Dual link DVI x 2) – 2GB GDDR5
NVIDIA Quadro 4000 (Dual link DVI, DP, DP, Stereo 3D) – 2GB GDDR5

NVIDIA Quadro K4000 (Dual link DVI, DP, DP, Stereo 3D) – 3GB GDDR5

NVIDIA Quadro 5000 (Dual link DVI, DP, DP, Stereo 3D) – 2.5GB 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

Compute Adapters

NVIDIA Tesla C2075 – 6GB GDDR5

PCI/PCIe Adapters Specifications

Part Description

IEEE 1394a (Firewire-400) PCI Express x1 Adapter (2 external ports)

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	800w 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	12A @ 100-127 VAC6A @ 200-240 VAC
Power Supply Fan	92x38mm, 2400rpm 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

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	Sustem 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 v3.0PC 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 1.1Universal Serial Bus v2.0Universal 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/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

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
CPU Specifications

Part Description
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 E5-2690 – 8 cores, 2.9GHz, 8.0 QPI, 20MB Cache, DDR3-1600, Turbo+, HT, 135W
Intel Xeon E5-2680 – 8 cores, 2.7GHz, 8.0 QPI, 20MB Cache, DDR3-1600, Turbo+, HT, 130W
Intel Xeon E5-2670 – 8 cores, 2.6GHz, 8.0 QPI, 20MB Cache, DDR3-1600, Turbo+, HT, 115W
Intel Xeon E5-2665 – 8 cores, 2.4GHz, 8.0 QPI, 20MB Cache, DDR3-1600, Turbo+, HT, 115W
Intel Xeon E5-2660 – 8 cores, 2.2GHz, 8.0 QPI, 20MB Cache, DDR3-1600, Turbo+, HT, 95W
Intel Xeon E5-2650 – 8 cores, 2.0GHz, 8.0 QPI, 20MB Cache, DDR3-1600, Turbo+, HT, 95W
Intel Xeon E5-2667 – 6 cores, 2.9GHz, 8.0 QPI, 15MB Cache, DDR3-1600, Turbo+, HT, 130W
Intel Xeon E5-2640 – 6 cores, 2.5GHz, 7.2 QPI, 15MB Cache, DDR3-1333, Turbo+, HT, 95W
Intel Xeon E5-2630 – 6 cores, 2.3GHz, 7.2 QPI, 15MB Cache, DDR3-1333, Turbo+, HT, 95W
Intel Xeon E5-2620 – 6 cores, 2.0GHz, 7.2 QPI, 15MB Cache, DDR3-1333, Turbo+, HT, 95W
Intel Xeon E5-2643 – 4 cores, 3.3GHz, 8.0 QPI, 10MB Cache, DDR3-1600, Turbo+, HT, 130W
Intel Xeon E5-2609 – 4 cores, 2.4GHz, 6.4 QPI, 10MB Cache, DDR3-1067, 80W
Intel Xeon E5-2603 – 4 cores, 1.8GHz, 6.4 QPI, 10MB Cache, DDR3-1067, 80W
Intel Xeon E5-2637 – 2 cores, 3.0GHz, 8.0 QPI, 5MB Cache, DDR3-1600, Turbo+, HT, 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 – 8 cores, 1.8GHz, 8.0 QPI, 20MB Cache, DDR3-1600, Turbo+, HT, 70W
Intel Xeon E5-2630L – 6 cores, 2.0GHz, 7.2 QPI, 15MB Cache, DDR3-1333, Turbo+, HT, 60W
1S Processor SKUs – These SKUs have 1 QPI link and are targeted for single CPU systems, will NOT work in dual CPU systems

HDD

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″

2.5″ SATA Hard Disk Drive (HDD)

150GB SATA – 10000rpm, 6Gb/s, 2.5″

300GB SATA – 10000rpm, 6Gb/s, 2.5″

600GB SATA – 10000rpm, 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

Specification

Interface

	Connector	SATA
	Ports	Single
	Transfer Rate	6Gb

Temperature

Operational	Ambient (C)	0 to 55
	Base Casting (C)	60 max

Non-Operational	Gradient(C per Hour)	20 max	
	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 <u>is</u> 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-RAMDVD+RDVD+RWDVD+R DLDVD-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 40XCD-RW Up to 32X
DVD ROM Read	DVD-RAM Up to 12XDVD+RW Up to 8XDVD-RW Up to 8XDVD+R DL Up to 8XDVD-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-p12 VDC ± 5%-200 mV ripple p-p

DC Current	5 VDC – <1000 mA typical, <1600 mA maximum12 VDC – <600 mA typical, <1400 mAMaximum

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-p12 VDC ± 5%-200 mV ripple p-p
DC Current	5 VDC – <1000 mA typical, < 1600 mAmaximum12 VDC – < 600 mA typical, < 1400 mAmaximum

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-ROMBD-RBD-REDVD-RAMDVD+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 / 28SBD-R (SL/DL) 25S / 28SBD-RE (SL/DL) 25S / 28SDVD-ROM (SL/DL) 18S / 18SDVD-R (SL/DL) 25S / 25S DVD-RW 25S DVD+R (SL/DL) 25S / 25S DVD+RW 25S DVD-RAM 45SCD-ROM 45S
Maximum Data Transfer Rates CDCD-ROMCD-RCD-RWUp to 40XUp to 40XUp to 40X ROM Read	
DVD ROM Read	DVD-RAM Up to 5XDVD+RW Up to 10XDVD-RW Up to 10XDVD+R DL Up to 8XDVD-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 6XBD-ROM DL Up to 4.8XBD-R Up to 6XBD-R DL Up to 4.8XBD-R Up to 6XBD-RE SL/DL Up to 4.8X

Power

Source	SATA DC power receptacle
DC Power Requirements	5 VDC ± 5%-100 mV ripple p-p12 VDC ± 10%-100 mV ripple p-p
DC Current	5 VDC -900 mA typical, 1200 mA maximum12 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.

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 450

512 MB PCIe Graphics Card

Form Factor
ATX Full Height, 1/2 length Passive cooling

Bus Type
PCI Express x16, Generation 2.0

Memory
512 MB GDDR3 (256MB per GPU)

Connectors
Four DisplayPort;

Maximum Resolution
DisplayPort connectors support ultra-high-resolution panels (up to 2560 x 1600)
NOTE: This card supports up to four displays

Supported Graphics APIs
OpenGL 3.0
DirectX 10.0

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

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)
✓

NVIDIA Quadro 400 512MB Graphics Card

Form Factor
Low Profile, 2.7 inches (H) x 5.6 inches (L)

Graphics Controller
NVIDIA Quadro 400 Graphics Board

Bus Type
PCI Express x 16, Generation 2.0

Memory
512MB DDR3 SDRAM

Connectors
One (1) Dual-link DVI-I
One (1) DisplayPort 1.1

Maximum Resolution
DisplayPort 1.1: 2560 x 1600 @ 60 Hz
Dual Link DVI-I: 2560 x 1600 @ 60 Hz
Analog: 2048 x1536 @ 85 Hz

RAMDAC
Dual internal 400 MHz DACs

Display Output
This card supports up to two displays

Supported Graphics APIs
OpenGL 3.2
DirectX 10.1 Shader Model 4.1

Available GraphicsDrivers 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

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

NVIDIA Quadro 600 1GB Graphics Card

Form Factor
2.731″ H x 6.6″ L
Single Slot
Small Form Factor

Graphics Controller
NVIDIA Quadro 600 Graphics Card

Bus Type
PCI Express 2.0 x16

Memory
1 GB GDDR3
128-bit

Connectors
1 DVI-I output, 1DisplayPort output

Maximum Resolution
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)

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
40 Watts

NVIDIA Quadro 2000 1GB Graphics Card

Form Factor
4.376″ H x 7″ L
Single Slot

Graphics Controller
NVIDIA Quadro 2000 Graphics Card

Bus Type
PCI Express 2.0 x16

Memory
1 GB GDDR5
128-bit

Connectors
1 DVI-I output, 2 DisplayPort outputs

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
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 GraphicsDrivers
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
62 Watts

NVIDIA Quadro 2000D (Spec DVI only card)

Form Factor
4.376″ H x 7″ L
Single Slot

Graphics Controller
NVIDIA Quadro 2000D Graphics Card

Bus Type
PCI Express 2.0 x16

Memory
1 GB GDDR5
128-bit

Connectors
2 Dual Link DVI outputs

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

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
Dual Link DVI, 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
62 Watts

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 GraphicsDrivers
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

NVIDIA Quadro 5000 2.5GB Graphics Card

Form Factor
4.376″ H x 9.75″ L
Dual Slot

Graphics Controller
NVIDIA Quadro 5000 Graphics Card

Bus Type
PCI Express 2.0 x16

Memory
2.5 GB GDDR5 320-bit

Connectors
DVI-I (1), DP (2), Stereo (1)

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 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
152 Watts

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 35ºC
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

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 6-Pin Connector
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