

Version: 1.2, March 20, 2013

THINKSTATION E31

Product Overview

The single-processor E31 workstation uses a Micro Advanced Technology Extended (MATX) motherboard, both 280 watt (W), and an optional 450 watt (W) power supply unit (PSU) for Tower and 240 watt(W) for SFF, Both 25-liter and a 11-liter ATX form factor tower. The motherboard chipset consists of the Intel® PCH supporting error-correcting code (ECC) Double Data Rate 3 (DDR3) . Maximum memory supported is 32GB for UDIMMs. The processor socket is an Intel® 1055-pin Land Grid Array (LGA1155) Socket-H2 with support for dual core, quad core, processors from the Intel® Xeon line (Ivy Bridge/Sandy Bridge H2).

SECTION I: SYSTEM OVERVIEW

Operating Systems

Preloaded

Genuine Windows 7® Professional 64-bit
 Genuine Windows 7® Professional 32-bit
 Genuine Windows 8® Professional 64-bit
 Genuine Windows 8® 64-bit
 Genuine Windows 8® 64-bit China

Supported

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

Motherboard - E31

Table 1. E31 Motherboard Summary

E31 Motherboard Summary	
Form Factor	
Board Size	9.6" x 9.6" (244mm x 244mm)
Layout	Custom ATX
Motherboard Core	
Processor Support	Intel® Xeon™ E3-1200V2 (Ivy Bridge H2) Intel® i7™ Quad Core Intel® i5™ Quad Core Intel® i3™ Dual Core Intel® Pentium™ Dual Core Intel® Celeron™ Dual Core
Socket Type	(1) x Intel Socket-R (LGA2011)
Memory Support	1600/1333/1066 MHz
Voltage Regulator	87W TDP
Chipset (PCH)	Carlow (Intel C216)
HW Monitor	N/A
Super I/O	IT8731F

Audio	ALC662VC1-GR/ALC662VD-GR (co-lay)
Ethernet	Lewisville (Intel 82579LM)
Memory	
Slots	4
Channels	2
Type	DDR3 Unbuffered DRAM (UDIMM)
ECC Support	Yes
Speed	Up to PC3-12800 (1600MHz)
Max DIMM Size	up to 8GB UDIMM, up to 32GB UDIMM
Max SystemMemory	Up to 32GB UDIMM (w/8GB)
Ethernet	
Vendor	Intel
Count	1
EEPROM	None (part of SPI flash)
Speeds	10/100/1000 Mbps
Functions	PXE WOL AMT
Connectors	(1) x RJ45 on Rear I/O
Audio	
Vendor	Realtek
Type	HD (5.1)
Internal Speaker	Yes
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	Supported
Adapter	(1) x PCI-E 3.0 16-Lane Slots Additional adapters may be supported in x1 slots
Storage	
Floppy	None
IDE	None
SATA	(2) x SATA Connectors, Gen. 2 (AHCI)(2) x SATA Connectors, Gen. 3 (AHCI)(1) x eSATA Connector, Gen. 2 (eSATA bracket) SATA RAID 0,1, supported natively via Intel Controller
eSATA	(1) x eSATA Connector, Gen. 2, cabled to slot via bracket
Slots	
Slot 1 (Near CPU)	16-Lane PCI-E v3.0 - Half Length, Full Height
Slot 2	1-Lane PCI-E v2.0 - Half Length, Full Height

Slot 3	PCI v2.3 - Half Length, Full Height
Slot 4	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	1 VGA 1 Display Port
Audio	Microphone-In, Line In, Line Out
Ethernet	(1) x RJ45
USB 2.0	(2) x USB 2.0 Ports
USB 3.0	(4) x USB 3.0 Ports

Internal I/O

USB 2.0	• Front Panel USB Header (2 ports) • Media Card Reader Header • Internal USB connector
PS/2	(1) x 2-port PS/2 Header, ports optional via bracket
Audio	(1) x Front Panel Mic & Line-Out Header
COM2	(1) x Serial Port (COM2)
Clear CMOS	3-Pin Clear CMOS Header
Speaker	2-Pin Internal Speaker Header
Chassis Intrusion	2-Pin Chassis Intrusion Switch Header

Thermal

Fans Headers	(1) x 4-Wire CPU Fan (1) x 4-Wire Rear Fan (1) x 3-Wire Front PCI Fan
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Power Connectors

Main	(1) 14-Pin (2×7) ATX Standard
VRM	(1) 4-Pin (2×2) ATX 12V Standard

Security

Nuvoton	Nuvoton NPCT421LA0WX / STMicro ST33ZP24AR28PVQC (co-lay)
Asset ID	Rohm BUL08-1FJ-W/FVJ-W / NXP PCA24S08AD
vPro	vPro for WS (AMT 8.0)

BIOS

Vendor	AMI
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Ethernet

The E31 motherboard implements onboard gigabit Ethernet via one Intel Lewisville - 82579LM controller. This integrated solution has support for the industry standard functions of Wake on LAN (WOL) and Preboot Execution Environment (PXE). Additionally, for Manageability features, Lewisville will support AMT.

Audio

The ALC662-VD chip from Realtek provides E31 with stereo audio capability that meets Windows7 Premium performance requirements. HD 5.1 audio is supported via jack remapping. There are 2 front analog jacks, and 3 rear color-coded (per MS Vista Logo Specification SYSFUND-0041) analog jacks.

Chassis Summary

E31 Chassis is a 25-liter ATX-form factor tower mechanical with 2 external 5.25" drive bays, 1 external 3.5" drive bay, and 2 internal 3.5" drive bays.

E31 another Chassis is a 11-liter ATX-form factor tower mechanical with 1 external 5.25" drive bays, 1 external 3.5" drive bay, and 1 internal 3.5" drive bays.

Chassis Info:

Chassis Format: Tower

Chassis color: Raven Black:

Chassis Dimension - cm: 431mm D x 175mm W x 425.2mm H

Chassis Dimension - in: 16.97" D x 6.89" W x 16.74" H

Chassis Weight: 27.56 lbs (12.5kg) maximum configuration

Power supply: 280W 85% Efficient (Optional 450W 92% Efficient available)

Chassis Format: SFF

Chassis color: Raven Black:

Chassis Dimension - cm: 381.1mm D x 339mm W x 99.7mm H

Chassis Dimension - in: 15.00" D x 13.35" W x 3.93" H

Chassis Weight: 16.53 lbs (7.5kg) maximum configuration

Power supply: 240W 85% Efficient

1P Thermal Solution

The E31 1P system will utilize a single fansink solution supporting 87W, 69W, 77W, 55W, and 65W CPUs. In addition to the CPU fansink, the E31 1P system will contain a rear system fan, an optional front PCI fan (to be used only with Inactive powered graphics adapters).

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, USB, Audio, Network, Enable/Disable Port Control	Yes

Power-On Password	Yes
Setup Password	Yes
NIC LEDs (integrated)	Yes
Security Chip	Yes
Boot Sequence Control	Yes
Padlock Support	Yes, loop in rear for optional padlock, prevents side panel removalE31 SFF do not support it.
Boot without keyboard and/or mouse	Yes

OPERATING ENVIRONMENT

Temperature

- **Operating**
 - 10 - 35 degrees C
- **Non-Operating**
 - -40 - 60 degrees C

Humidity

- **Relative Humidity**
 - Operating: 20 - 80% non-condensing (10% per hour)
 - Storage: 20 - 90% non-condensing (10% per hour)
- **Wet Bulb Temperature**
 - Operating: 25 degrees C (max)
 - Non-Operating: 40 degrees C (max)

Altitude

Operating: -15.2 to 3048 m (-50 to 10,000 ft)
Storage: -15.2 to 10,668 m (-50 to 35,000 ft)

Regulations and Standards

EMC

FCC (DoC) for North America
EU/EFTA CE Mark & Doc
VCCI
BSMI
CCIB

Safety

UL/C-UL
GS
IEC60950-1 CB Report/Certificate
Saudi Arabia ICCP(SASO)
China CCC Mark
Argentina S-mark
Singapore - PSB
South Africa - SABS
Russia-GOST
Mexico-NOM
Kazakhstan -GOST-K
Belarus- Belgiss
Croatia-KONCAR
Serbia - KVALITET
Ukraine - UKrCEPRO

Energy Star

All E31 systems are designed to with the premise of maximizing energy efficiency. The latest version of the Energy Star standard is still being defined. Pending ratification of the newest Energy Star spec, the Development team will assess which models will be able to be Energy Star compliant.

EPEAT™

E31 models which are Energy Star compliant (pending ratification of latest Energy Star spec) will also qualify for the EPEAT™ Gold rating.

EuP Lot-6 2012

E31 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
Intel Xeon E3-1290V2 - 4 cores, 3.7GHz, 8MB Cache, DDR3-1600, Turbo+, 87W
Intel Xeon E3-1280V2 - 4 cores, 3.6GHz, 8MB Cache, DDR3-1600, Turbo+, 69W
Intel Xeon E3-1270V2 - 4 cores, 3.5GHz, 8MB Cache, DDR3-1600, Turbo+, 69W
Intel Xeon E3-1240V2 - 4 cores, 3.4GHz, 8MB Cache, DDR3-1600, Turbo+, 69W
Intel Xeon E3-1230V2 - 4 cores, 3.3GHz, 8MB Cache, DDR3-1600, Turbo+, 69W
Intel Xeon E3-1220V2 - 4 cores, 3.1GHz, 8MB Cache, DDR3-1600, Turbo+, 69W
Intel Xeon E3-1275V2 - 4 cores, 3.5GHz, 8MB Cache, DDR3-1600, Turbo+, 77W
Intel Xeon E3-1245V2 - 4 cores, 3.4GHz, 8MB Cache, DDR3-1600, Turbo+, 77W
Intel Xeon E3-1225V2 - 4 cores, 3.2GHz, 8MB Cache, DDR3-1600, Turbo+, 77W
Intel Core i7-3770 - 4 cores, 3.4GHz, 8MB Cache, DDR3-1600, Turbo+, 77W
Intel Core i5-3570 - 4 cores, 3.4GHz, 6MB Cache, DDR3-1600, Turbo+, 77W
Intel Core i5-3470 - 4 cores, 3.2GHz, 6MB Cache, DDR3-1600, Turbo+, 77W
Intel Core i5-33350P - 4 cores, 3.1GHz, 6MB Cache, DDR3-1600, 69W
Intel Core i3-3240 - 2 cores, 3.4GHz, 3MB Cache, DDR3-1600, 55W
Intel Core i3-3220 - 2 cores, 3.3GHz, 3MB Cache, DDR3-1600, 55W
Intel Core i3-3210 - 2 cores, 3.2GHz, 3MB Cache, DDR3-1600, 55W
Intel Pentium G2130- 2 cores, 3.2GHz, 3MB Cache, DDR3-1600, 55W
Intel Pentium G2020- 2 cores, 2.9GHz, 3MB Cache, DDR3-1333, 55W
Intel Pentium G2010- 2 cores, 2.8GHz, 3MB Cache, DDR3-1333, 55W
Intel Pentium G1620- 2 cores, 2.7GHz, 2MB Cache, DDR3-1333, 55W
Intel Pentium G1610- 2 cores, 2.6GHz, 2MB Cache, DDR3-1333, 55W

Intel processor numbers are not a measurement of higher performance. Processor numbers differentiate features within each processor family, not across different processor families.

Quad, Dual 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

UDIMMs (non-ECC)
2GB DDR3 non-ECC UDIMM PC3-12800 (1600MHz)
4GB DDR3 non-ECC UDIMM PC3-12800 (1600MHz)
8GB DDR3 non-ECC UDIMM PC3-12800 (1600MHz)
UDIMMs (ECC)
2GB DDR3 ECC UDIMM PC3-12800E (1600MHz)

4GB DDR3 ECC UDIMM PC3-12800E (1600MHz)

8GB DDR3 ECC UDIMM PC3-12800E (1600MHz)

Storage - HDD/SSD

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"

2.5" SATA Solid State Drive (SSD)

128GB SATA - Solid State Drive (SSD), 6Gb/s, MLC, 2.5"
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180GB SATA - Solid State Drive (SSD), 6Gb/s, MLC, 2.5"
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256GB SATA - Solid State Drive (SSD), 6Gb/s, MLC, OPAL, 2.5"
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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 5 only supported on E31 Tower. Not supported on E31 SFF

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"

Keyboard Specifications

Part Description

Preferred Pro Fullsize Keyboard (USB)

Preferred Pro Fingerprint Keyboard (USB) (for EPEAT gold)

Pointing Devices Specifications

Part Description

Optical Wheel Mouse (800 DPI), USB - red wheel

Graphics Cards

Part Description (E31 SFF only can support LP Graphics Cards)	Intel Integrated HD Graphics P4000	NVIDIA NVS300 (with DMS-59 to Dual DVI single link dongle) - 512MB GDDR3 (HP/LP)	NVIDIA NVS300 (with DMS-59 to Dual Display Port dongle) - 512MB GDDR3 (HP/LP)	NVIDIA NVS310 (Dual DP) 512MB DDR3 (HP/LP)	NVIDIA NVS450 (DPx4) - 512MB GDDR3 (HP)	NVIDIA NVS510 (x4 DP, mini-DP, Single Link DVI-D, Dual Link DVI-D, VGA) - 2GB DDR3 (HP)	NVIDIA Quadro 410 (Dual link DVI, DP) - 512MB GDDR3 (HP/LP)	NVIDIA Quadro 400 (Dual link DVI, DP) - 512MB GDDR3 (HP/LP)	NVIDIA Quadro 600 (Dual link DVI, DP) - 1GB GDDR3 (HP/LP)	NVIDIA Quadro K600 (DVI-I 1.2 (1)) - 1GB GDDR3 (HP/LP)	NVIDIA Quadro 2000 (Dual link DVI, DP) - 1GB GDDR5 (HP)	NVIDIA Quadro 2000D (Dual link DVI x 2) - 1GB GDDR5 (HP)	NVIDIA Quadro K2000 (DVI-I 1.2 (2)) - 2GB GDDR5 (HP)	NVIDIA Quadro 4000 (Dual link DVI, DP, Stereo 3D) - 2GB GDDR5 (HP)
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Network/Audio Devices

Part Description

USB 3.0 PCI Express x1 Adapter

IEEE 1394(Firewire) PCI Express x1 Adapter

Intel 1 Gigabit ET Dual Port Server Adapter

1000M Ethernet PCI Express 1x Adapter

SECTION III: SYSTEM TECHNICAL SPECIFICATIONS

Power Supply Specifications

Power Supply	280w PSU (Optional 450w available)
Rated Voltage Range	100-127V 200-240V
Rated Line Frequency	50/60Hz.
Rated Input Current	8A @ 100-127 VAC 4A @ 200-240 VAC
ENERGY STAR® qualified (Config Dependent)	YES
80 PLUS Compliant	YES, 80 PLUS Bronze

[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 low 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.
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 PCI Firmware Specification 3.0
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

The company is a member of an eco declaration system that enforces regular independent quality control

Hazardous substances and preparation

Products do not contain more than; 0.1% lead, 0.01% cadmium, 0.1% mercury, 0.1% hexavalent chromium, 0.1% polybrominated biphenyls (PBB) or 0.1% polybrominated diphenyl ethers (PBDE). (See legal reference and Note B1

Products do not contain Asbestos

Products do not contain Ozone Depleting Substances: Chlorofluorocarbons (CFC), hydrobromofluorocarbons (HBFC), hydrochlorofluorocarbons (HCFC), Halons, carbontetrachloride, 1,1,1-trichloroethane, methyl bromide

Products do not contain more than; 0.005% polychlorinated biphenyl (PCB), 0.005% polychlorinated terphenyl (PCT) in preparation

Products do not contain more than 0.1% short chain chloroparaffins (SCCP) with 10-13 carbon atoms in the chain containing at least 48% per mass of chlorine in the SCCP

Parts with direct and prolonged skin contact do not release nickel in concentrations above 0.5 microgram/cm²/week

REACH Article 33 information about substances in articles is available at:
http://www.lenovo.com/social_responsibility/us/en/ThinkGreen_products.html#environment

Batteries

If the product contains a battery or an accumulator, it is labeled with the disposal symbol and if it contains more than 0.0005% of mercury (for button cells only) by weight, or more than 0.004% of lead, it shall be marked with the chemical symbol for the metal concerned, Hg or Pb. Information on proper disposal is provided in user manual

Button cells used in the product do not contain more than 2% by weight of mercury. Other batteries or accumulators do not contain more than 0.0005% of mercury or 0.002% of cadmium

Batteries and accumulators are easily removable by either users or service providers (as dependent on the design of the product). Exception: Batteries that are permanently installed for safety, performance, medical or data integrity reasons do not have to be “easily removable

Safety, EMC connection to the telephone network and labelin

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" 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"		
1280GB SATA - Solid State Drive (SSD), 6Gb/s, MLC, 2.5"		
256GB SATA - Solid State Drive (SSD), 6Gb/s, MLC, OPAL, 2.5"		

Specifications		
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		
Operational No 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

Optical Drives Specifications

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 $\pm$ 5%-100 mV ripple p-p 12 VDC $\pm$ 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-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
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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%

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 twochannel 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

29 in 1 Card Reader (5 slots)				Support directly	With adapter	
SD	✓	Micro SDXC	✓	MS PRO DUO	✓	MS DUO
SDHC	✓	RS-MMC	✓	MS PRO-HG Duo	✓	MS
SDXC	✓	MMC	✓	MS HG Micro	○	MS PRO
Mini SD	✓	MMC Micro	✓	MS XS Duo	✓	CF Type I
Mini SDHC	✓	MMC Mobile	✓	MS XC-HG Duo	✓	CF Type II
Micro SD	✓	MMC Plus	✓	MS XC Micro	○	MD
Micro SDHC	✓	M2	○	MS XC-HG Micro	○	XD-H
XD-M	✓					

Video Cards

INTEL Integrated HD Graphics P4000

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
OpenGL 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

4¹

Dual-Link DVI-D

4²

VGA

4³

Maximum Display Resolution (Digital @ 60Hz)

3840×2160⁴

Maximum Display Resolution (Analog @ 60 Hz)

1920×1200⁵

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 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 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, 1 DisplayPort 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 K600 1GB Graphics Card

Product Specifications:

CUDA Parallel Processing cores	192
Frame Buffer Memory	1 GB DDR3
Memory Interface	128-bit
Memory Bandwidth	29 GB/s
Max Power Consumption	41 W
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
Thermal Solution	Active
NVIDIA® 3D Vision® and 3D Vision Pro	Support via USB connection to 3D Vision Hub

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 K2000 2GB Graphics Card**Product Specifications:**

CUDA Parallel Processing cores	384
Frame Buffer Memory	2 GB GDDR5
Memory Interface	128-bit
Memory Bandwidth	64 GB/s
Max Power Consumption	51 W
Graphics Bus	PCI Express 2.0 x16
Display Connectors	DVI-I (1), DP 1.2 (2)
Form Factor	4.376" H x 7.97 L Single Slot
Thermal Solution	Active
NVIDIA® 3D Vision® and 3D Vision Pro	Support via USB connection to 3D Vision Hub

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 1920x1200 @ 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

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