

Lenovo P330 Tower G2

Version: 2.0 | 06/10/2024

Product Name	P330 TWR
Product Display Name	ThinkStation P330 TWR
Information Date	2-Feb-21
Hardware Maintenance Manual	P330 HMM
Drivers & Software	P330 Drivers & Software
Available Whitepapers	P330 Whitepapers

SECTION I: Platform Overview

Description	POWER OF A WORKSTATION PRICE OF A DESKTOP Mission-critical tasks require superior reliability and powerful performance; the ThinkStation® P330 leads on both counts and does it with exceptional all-around value.
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CPU

Processor Support	Intel Coffee Lake Xeon E3-1200 Series/Core/Pentium
Socket Type	Socket-H4 (LGA 1151)

Operating Systems

Preloaded	Windows 10 Pro 64-bit for Workstations Windows 10 Pro 64-bit Ubuntu 18.04 LTS (configuration specific)
Supported	Windows 10 Home 64-bit Ubuntu 18.04 LTS Red Hat Enterprise Linux 8.0

Memory

Slots	Up to 4 DIMMs
Channels	Supports up to 4 DIMM Sockets, 2 Channels
Type	288-Pin, 1866/2133/2400/2666MHz ECC and non-ECC UDIMM
ECC Support	Yes, CPU Dependent
Speed	Up to 2666MHz
Max DIMM Size	32GB DDR4 UDIMM

Max System Memory	128GB
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Storage

Total Bays/Size	2 x 3.5" 1 x 2.5"
SATA	4 x SATA Connectors, Gen 3
PCIe	1 x M.2 PCIe Connector Onboard Additional M.2 NVMe Drives Supported by Single Adapters
eSATA	1 x eSATA Connector, Gen 3
Disclaimers	Additional parts/enclosures may be required for some configurations

Video

Integrated Graphics	Intel Integrated UHD Graphics 630
Discrete Graphics	PCIe Add-In-Card, Details in Section Below
Multi-GPU Support	Yes
Type	PCIe Add-In-Card
Bus Interface	PCIe x16

Slots

Slot 1	PCIe 3.0 x16, Full Height, Full Length, 75W, With Latch
Slot 2	PCIe 2.0 x1, Full Height, Full Length, 25W
Slot 3	PCIe 3.0 x4, Full Height, Full Length, 25W, With Latch

Front I/O

USB	2 x USB 3.1 Gen 2 Type-A 2 x USB 3.1 Gen 1 Type-A 1 x USB 3.1 Gen 1 Type-C
Audio	1 x Combo Audio/Microphone Jack (3.5mm)
Media Card Reader	Optional: Front 7-in-1 Media Card Reader (USB 2.0)
Flex Module	One 5.25" Flex Bays, Supports the Following: <ul style="list-style-type: none"> · Up to one 5.25" to 3.5" HDD Kit · Up to one 5.25" Front Access Storage Enclosure · Up to one 5.25" Flex module for one or more of the following options: 9.0mm optical/front eSATA/front Thunderbolt/front USB 3.1 Gen 1 Type-C Note: 1. Only one can be supported from the following: dual Thunderbolt ports 2. Up to two ports are supported from 1394, eSATA, and USB Type-C
Disclaimers	Not all components above available concurrently in a single Flex Module.

Rear I/O

USB	2 x USB 2.0 Type-A 2 x USB 3.1 Gen 1 Type-A
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Audio	1 x Rear (Line Out); Retaskable to 5.1
DisplayPort	2 x Standard (CPU dependent) Optional 1 x Rear Port (CPU dependent)
HDMI	Optional 1 x Rear Port (CPU dependent)
Serial Port	1 x Standard Optional 1 x Rear Port
Ethernet	1 x 1GbE – RJ45
PS/2	Optional 2 x PS/2
Parallel Port	Optional 1 x Rear Bracket
Optional USB Adapter	Dual Type-C ports USB 3.1 Dual Type-A ports USB 2.0
Optional Network Adapter	Bitland BN8E88 Single Port Gigabit Ethernet Adapter Intel I210-T1 Single Port Gigabit Ethernet Adapter Intel I350-T2 Dual Port Gigabit Ethernet Adapter Aquantia Single Port 10G Ethernet Adapter Aquantia Single Port 5G Ethernet Adapter PCI-E 1 x WiFi Card With BT HP External Antenna Kit (9560 AC)

Ethernet

Vendor	Intel Jacksonville I219LM
Speeds	10/100/1000Mbps
Functions	PXE, ASF, WOL, Jumbo Frames, Teaming
Connectors	1 x RJ45

Audio

Vendor	Realtek
Type	HD (5.1)
Internal Speaker	Yes
Connectors	1 x Rear 3.5mm Jacks (Line Out)
Chipset	ALC233
Number of Channels	2 Channels
Number of Bits/Audio Resolution	2 Channel DAC supports 16/20/24 bit PCM 2 Stereo ADC supports 16/20 bit PCM

Thermal

Temp Sensors	Ambient Sensor VR1 Sensor PCIe Sensor MB Sensor
Fans	1 x CPU Fans 1 x Rear Fan 1 x Front Fans 1 x Power Supply Fan (internal) 1 x ODD Bay Fans (optional)

Power Specifications

Power Supply	250W	400W
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Power Efficiency	92% Efficient @ 50% Load	92% Efficient @ 50% Load
Main	C14	C14
Operating Voltage Range	100 – 240V	100 – 240V
Rated Voltage Range	90-264VAC	90-264VAC
Rated Line Frequency	47Hz / 63Hz	47Hz / 63Hz
Operating Line Frequency Range	50Hz / 60Hz	50Hz / 60Hz
Rated Input Current	4A	6A
Graphics	Not Available	1 x 8 pin (6+2)
Power Supply Fan	Yes	Yes
ENERGY STAR® Qualified (config dependent)	Yes	Yes
80 PLUS Compliant	Yes	Yes
Built-in Self Test (BIST) LED	Yes	Yes
Aux Power Drop	No	Yes

BIOS

Vendor	AMI
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Chassis Information

Color	Raven Black
PSU	400W and 250W Available, Autosensing, 92% PSU, 80 PLUS Platinum Qualified
Thermal Solutions	Two System Fans Standard (1 front, 1 rear), One Fan per CPU, One PSU Fan
Dimensions	165mm/6.5" W x 311mm/12.25" D x 371mm/14.6" H
Weight	9.8kg / 21.6lbs

Packaging Dimensions

Height (mm/in)	540mm / 21.26"
Width (mm/in)	280mm / 11"
Depth (mm)	420mm / 16.5"

Security & Serviceability

TPM	Infineon SLB9670VQ2.0FW7.63 TPM 2.0
Asset ID	Yes, 1024 x 8bit
vPro	Intel vPro for WS (AMT 12.X)
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
Access Panel Key Lock	No
Boot Sequence Control	Yes
Padlock Support	Yes
Boot without keyboard and/or mouse	Yes
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	Retained With Screws
Restore CD/DVD/USB Set	Not Included, Restore Media Available via Lenovo Customer Support Center

Operating Environment

Air Temperature	Operating: 10°C to 35°C (50°F to 95°F)
Storage	Storage: -40°C to 60°C (-40°F to 140°F) in Original Shipping Carton Storage: -10°C to 60°C (14°F to 140°F) Without Carton
Humidity	Relative Humidity Operating: 10% to 80% (non-condensing) Relative Humidity Storage/Transit: 10% to 90% (non-condensing) Wet Bulb Temperature Operating: 25°C (77°F) max Wet Bulb Temperature Non-operating: 40°C (104°F) max
Altitude	Operating: -15.2m to 3048m (-50ft to 10000ft) Storage: -15.2m to 10668m (-50ft to 35000ft)
Vibration	Package Vibration: Random,1.04G at 2-200 Hz, 15 Minutes XYZ 6 faces Operating Vibration: Random,0.27G at 5-500 Hz, 30 Minutes Per Surface (X,Y,Z) Non-Operating Vibration: Random,1.04G at 2-200 Hz, 15 Minutes Per Surface (±X,±Y,±Z)
Shock	Operation Shock: 3ms (15G) for 4 Axis (+X, -X, +Y,-Y) 3ms (30G) for 2 Axis (+Z, -Z), Half-sine Wave, Each Side Will do One Time Rack Operation Shock: 5ms (15G) for 6 Axis (+X, -X, +Y,-Y,+Z, -Z), Half-sine Wave, Each Side Will do One Time Non-operating Shock: Trapezoidal Wave, 50G, 9ms, 6 Sides (+X, -X, +Y,-Y, +Z, -Z), Filter 300Hz, Each Side Shock One Time

SECTION II: Platform Detail

Board Size	10.51" x 9.65" (267mm x 245mm)
Layout	Custom ATX

Motherboard Core

Processor Support	Intel Coffee Lake Xeon E3-1200 Series/Core/Pentium
Socket Type	Socket-H4 (LGA 1151)
Memory Support	DDR4 up to 2666MHz UDIMM Memory (ECC and non-ECC)
Voltage Regulator	95W TDP Capable
Chipset (PCH)	Intel C246 Chipset
Flash	16MB
Super I/O	Nuvoton NCT6686D-L
Clock	Intel Native isCLK
Audio	Realtek ALC233 Codec
Ethernet	Intel Jacksonville I219LM

Supported Components

Processor Level	Intel Coffee Lake – Xeon	Intel Coffee Lake – Core
Processor	E-2288G E-2286G E-2278G E-2276G E-2274G E-2246G E-2244G E-2226G E-2224G E-2236 E-2234 E-2224 E-2186G E-2174G E-2124G	i9-9900K i9-9900 i7-9700 i7-9700K i5-9600 i5-9600K i5-9500 i5-9400F i5-9400 i3-9300 i3-9100F i3-9100 i7-8700 i5-8500 i3-8300 i3-8100
Memory Type	ECC UDIMMs – 2666MHz	non-ECC UDIMMs – 2666MHz
Memory	8GB DDR4 ECC UDIMM PC4-2666 16GB DDR4 ECC UDIMM PC4-2666	4GB DDR4 non-ECC UDIMM PC4-2666 8GB DDR4 non-ECC UDIMM PC4-2666 16GB DDR4 non-ECC UDIMM PC4-2666 32GB DDR4 non-ECC UDIMM PC4-2666

Storage

3.5" SATA Hard Disk Drive (HDD)	1TB SATA HDD 7200rpm, 6Gb/s, 3.5" 2TB SATA HDD 7200rpm, 6Gb/s, 3.5" 4TB SATA HDD 7200rpm, 6Gb/s, 3.5" (enterprise class)
2.5" SATA Hard Disk Drive (HDD)	500GB 2.5" SATA HDD 7200rpm (FIPS certified)
2.5" SATA Solid State Drive (SSD)	256GB SATA SSD, 6Gb/s, TLC, 2.5", OPAL 512GB SATA SSD, 6Gb/s, TLC, 2.5" OPAL 512GB SATA SSD, 6Gb/s, TLC, 2.5", Non-OPAL 1024GB SATA SSD, 6Gb/s, TLC, 2.5" OPAL
M.2 PCIe Solid State Drive (SSD)	256GB M.2 PCIe SSD, Gen 3 x4, NVMe, OPAL 512GB M.2 PCIe SSD, Gen 3 x4, NVMe, OPAL 1024GB M.2 PCIe SSD, Gen 3 x4, NVMe, OPAL 2048GB M.2 PCIe SSD, Gen 3 x4, NVMe, OPAL
Intel Optane Storage Technology	32GB M.2 Optane Memory

RAID

RAID Levels and Requirements	Supported RAID 0/1/5/10
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Notes	Supported RAID levels for a system will vary from the stated capabilities of the RAID controller due to dependencies on the number and capacity of physical disks in the system and on customer requirements for performance, fault tolerance, or data redundancy. Max supported RAID 0/1/5/10.
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Optical Drive/Removable Media

DVD-ROM Drive	Slim DVD-ROM Drive
DVD Burner/CD-RW Drive	Slim DVD Burner/CD-RW Drive
Blu-Ray Burner Drive	Slim Blu-Ray ODD DVD Burner
Media Card Reader Specifications	Optional Front 7-in-1 USB 2.0 Media Card Reader

Keyboard and Pointing Devices

Keyboard	Calliope USB Keyboard Traditional USB Keyboard Traditional PS/2 Keyboard Calliope USB Wireless Keyboard
Pointing Devices	Calliope USB Mouse Calliope Wireless Mouse PS/2 Optical Mouse Fingerprint USB Mouse

Expansion Bays

5.25" External Access Bays	One 5.25" Flex Bay, Supports the Following: <ul style="list-style-type: none"> · Up to One 5.25" to 3.5" HDD Kit · Up to One 5.25" Front Access Storage Enclosure · Up to One 5.25" Flex Module for One or More of the Following Options: 9.0mm Optical/Front eSATA/Front Thunderbolt/Front USB 3.1 Gen 1 Type-C Note: 1. Only one can be supported from the following: dual Thunderbolt ports 2. Up to two ports are supported from 1394, eSATA, and USB Type-C
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PCIe Adapters

Network	Intel I210-T1 Single Port Gigabit Ethernet Adapter Intel I350-T2 Dual Port Gigabit Ethernet Adapter Bitland BN8E88 1000M PCIe ASF FH Aquantia 5G Ethernet Adapter (single port) Aquantia 10G Ethernet Adapter (single port)
Thunderbolt	Front Thunderbolt Card Kit – Supports Two Optional Thunderbolt Ports (USB Type-C) on Flex Module, One of Two Ports Supports Video Out Rear Thunderbolt PCIe Adapter
USB	2 Port USB Expansion Card (USB3.0) PCIe x1 Rear Dual Port USB 3.1 Type-C PCIe Adapter
WiFi Cards	Intel PCIe WiFi Card With BT External Antenna Kit (9560 AC)
PCIe to M.2 Adapter Card	PCIe x4 to M.2 Adapter (for NVMe SSD)

SECTION III: Supported Component Detail

CPU Specifications Part 1

CPU	Intel Xeon E-2286G	Intel Xeon E-2278G	Intel Xeon E-2276G	Intel Xeon E-2274G	Intel Xeon E-2246G
# of Cores	6	8	6	4	6
# of Threads	12	16	12	8	12
Processor Base Frequency	4GHz	3.4GHz	3.8GHz	4GHz	3.6GHz
Max Turbo Frequency	4.9GHz	5GHz	4.9GHz	4.9GHz	4.8GHz
Cache	12MB	16MB	12MB	8MB	12MB
TDP	95W	80W	80W	83W	80W
Intel ARK Spec Link	Intel Xeon E-2286G	Intel Xeon E-2278G	Intel Xeon E-2276G	Intel Xeon E-2274G	Intel Xeon E-2246G

CPU Specifications Part 2

CPU	Intel Xeon E-2244G	Intel Xeon E-2226G	Intel Xeon E-2224G	Intel Xeon E-2236	Intel Xeon E-2234
# of Cores	4	6	4	6	4
# of Threads	8	6	4	12	8
Processor Base Frequency	3.8GHz	3.4GHz	3.5GHz	3.4GHz	3.6GHz
Max Turbo Frequency	4.8GHz	4.7GHz	4.7GHz	4.8GHz	4.8GHz
Cache	8MB	12MB	8MB	12MB	8MB
TDP	71W	80W	71W	80W	71W
Intel ARK Spec Link	Intel Xeon E-2244G	Intel Xeon E-2226G	Intel Xeon E-2224G	Intel Xeon E-2236	Intel Xeon E-2234

CPU Specifications Part 3

CPU	Intel Xeon E-2224	Intel i9-9900K	Intel i9-9900	Intel i7-9700K	Intel i7-9700
# of Cores	4	8	8	8	8
# of Threads	4	16	16	8	8
Processor Base Frequency	3.4GHz	3.6GHz	3.1GHz	3.6GHz	3GHz
Max Turbo Frequency	4.6GHz	5GHz	5GHz	4.9GHz	4.7GHz
Cache	8MB	16MB	16MB	12MB	12MB
TDP	71W	95W	65W	95W	65W
Intel ARK Spec Link	Intel Xeon E-2224	Intel i9-9900K	Intel i9-9900	Intel i7-9700K	Intel i7-9700

CPU Specifications Part 4

CPU	Intel i5-9500	Intel i5-8500	Intel i5-9400	Intel i3-9300	Intel i3-8300
# of Cores	6	6	6	4	4
# of Threads	6	6	6	4	4

Processor Base Frequency	3GHz	3GHz	2.9GHz	3.7GHz	3.7GHz
Max Turbo Frequency	4.4GHz	4.1GHz	4.1GHz	4.3GHz	Not Available
Cache	9MB	9MB	9MB	8MB	8MB
TDP	65W	65W	65W	62W	62W
Intel ARK Spec Link	Intel i5-9500	Intel i5-8500	Intel i5-9400	Intel i3-9300	Intel i3-8300

CPU Specifications Part 5

CPU	Intel i3-9100
# of Cores	4
# of Threads	4
Processor Base Frequency	3.6GHz
Max Turbo Frequency	4.2GHz
Cache	6MB
TDP	65W
Intel ARK Spec Link	Intel i3-9100

HDD Specifications

Drive	500GB SATA – 7200rpm, 6Gb/s, 2.5"	1TB SATA – 7200rpm, 6Gb/s, 3.5"	2TB SATA – 7200rpm, 6Gb/s, 3.5"	4TB SATA – 7200rpm, 6Gb/s, 3.5"	6TB SATA – 7200rpm, 6Gb/s, 3.5"
3.5" SATA Hard Disk Drive (HDD)	Not Available	Yes	Yes	Yes	Yes
2.5" SATA Hard Disk Drive (HDD)	Yes	Not Available	Not Available	Not Available	Not Available
Connector	SATA	SATA	SATA	SATA	SATA
Transfer Rate (Gb/sec)	160MB/s OD Read	Average Data Rate, Read/Write 156MB/s	Average Data Rate, Read/Write 156MB/s	Sustained Data Transfer Rate 216-226MB/s	Sustained Data Transfer Rate 216-226MB/s
Spindle Speed (RPM)	7,200	7,200	7,200	7,200	7,200
Power Off to Spindle Stop (sec)	NA	NA	NA	NA	NA
DC Power to Drive Ready (sec)	3.5	<10.0	<17.0	<17.0	<17.0
Average Latency (msec)	4.2	4.16	4.16	4.16	4.16
Input (VDC)	5	5	5	5	5
Typical (Watts)	1.9	6.19	6.7	7.35	8.13
Idle (Watts)	0.7	4.6	4.5	5.45	6.21
Physical Dimensions	69.85mm x 100.34mm x 7mm	101.6mm x 146.99mm x 19.88mm	101.6mm x 146.99mm x 26.1mm	101.85mm x 147mm x 26.1mm	101.85mm x 147mm x 26.1mm
Weight (grams)	90	420	535	680	705
Operating (C) Ambient	0 to 60	0 to 60	0 to 60	5 to 60	5 to 60
Operating (C) Base Casting	60	60	60	60	60

Non-Operating (C Ambient)	(-40 to 70)	(-40 to 70)	(-40 to 70)	(-40 to 70)	(-40 to 70)
Gradient (C per Hour)	20	20	20	20	20
Operating (Gs @ 2ms)	400	70	80	Read 70 Gs / Write 40 Gs	Read 70 Gs / Write 40 Gs
Non-Operating (Gs @ 2ms)	1000	350	300	300	250

Solid State Storage Specifications Part 1

Drive	256GB SATA3 – SSD, 6Gb/s, 2.5" OPAL	512 GB SATA3 – SSD, 6Gb/s, 2.5" OPAL	1024 GB SATA3 – SSD, 6Gb/s, 2.5" OPAL	512GB SATA3 – SSD, 6Gb/s, 2.5" Non-OPAL	M.2 256GB PCIe SSD (OPAL)
Dimensions Millimeters (W x D x H)	70 x 100 x 7.0	70 x 100 x 7.0	70 x 100 x 7.0	70 x 100 x 7.0	22 x 80 x 3
Interface Type	SATA-III	SATA-III	SATA-III	SATA-III	PCIe Gen 3×4
Power Active (AVG)	1.8W	1.9W	2.2W	1.9W	5.0W
Power Idle	50 mW	50 mW	50 mW	50 mW	50 mW
Typical Sequential Read	540 MB/s	540 MB/s	540 MB/s	540 MB/s	3000 MB/s
Typical Sequential Write	500 MB/s	500 MB/s	500 MB/s	500 MB/s	1500 MB/s
Operating Temperature Range	0 to 55°C	0 to 55°C	0 to 55°C	0 to 55°C	0 to 55°C
Endurance Rating (Lifetime Writes)	85TB	150TB	300TB	150 TB	85 TB
Mean Time Between Failures (MTBF)	2.0M POH	2.0M POH	2.0M POH	2.0M POH	2.0M POH
Hardware Encryption	AES 256 bit	AES 256 bit	AES 256 bit	Not Available	AES 256 bit
Disclaimers	SSD performance measured with Crystal Disk Mark version 6.0.2 with the default 1000 MB data set. Sequential measurements are with 1 Thread, Queue-Depth 32. Random measurements are with 4 threads and queue-depth 32.				

Solid State Storage Specifications Part 2

Drive	M.2 512GB PCIe SSD (OPAL)	M.2 1TB PCIe SSD (OPAL)	M.2 2TB PCIe SSD (OPAL)
Dimensions Millimeters (W x D x H)	22 x 80 x 3	22 x 80 x 3	22 x 80 x 3
Interface Type	PCIe Gen 3×4	PCIe Gen 3×4	PCIe Gen 3×4
Power Active (AVG)	5.0W	5.0W	5.0W
Power Idle	50 mW	50 mW	50 mW
Typical Sequential Read	3000 MB/s	3000 MB/s	3000 MB/s
Typical Sequential Write	2400 mB/s	2700 MB/s	3000 MB/s
Operating Temperature Range	0 to 55°C	0 to 55°C	0 to 55°C
Endurance Rating (Lifetime Writes)	150 TB	300 TB	600 TB
Mean Time Between Failures (MTBF)	2.0M POH	2.0M POH	2.0M POH

Hardware Encryption	AES 256 bit	AES 256 bit	AES 256 bit
Disclaimers		SSD performance measured with Crystal Disk Mark version 6.0.2 with the default 1000 MB data set. Sequential measurements are with 1 Thread, Queue-Depth 32. Random measurements are with 4 threads and queue-depth 32.	

Optical Drive Specifications

Description	9.0mm Slim DVD ROM	9.0mm Slim DVD Writer	9.0mm Slim UHD BD
	SATA 1.5 Gb/s	SATA 1.5 Gb/s	SATA 1.5 Gb/s
Interface Type	128±0.4×9.0 ±0.4×127±0.4(Max) Unit:mm (Without Bezel-W x H x D)	128±0.4×9.0 ±0.4×127±0.4(Max) Unit:mm (Without Bezel-W x H x D)	128±0.4×9.0 ±0.4×127±0.4(Max) Unit:mm (Without Bezel-W x H x D)
Dimensions	NA	NA	NA
Disc Capacity	DVDROM	DVDWriter	BD Rambo
Type	NA	NA	NA
External Dimensions	NA	NA	NA
Speed	9.0mm Tray	9.0mm Tray	9.0mm Tray
Bay Type	Business Black or without bezel	Business Black or without bezel	Business Black or without bezel
Color	No	No	No
Removable	0.5MB Min	0.5MB Min	4MB
Internal Buffer Size	NA	8XDVD+R / 8XDVD+RW / 6XDVD+R DL 8XDVD-R / 6XDVD-RW / 6XDVD-R DL 24XCD-R / 16XCD-RW	6x BD-R / 2x BD-RE 8XDVD+R / 8XDVD+RW / 6XDVD+R DL 8XDVD-R / 6XDVD-RW / 6XDVD-R DL 5XDVD-RAM 24XCD-R / 16XCD-RW
Writes	8XDVD-ROM / 24XCD-ROM	8XDVD-ROM / 24XCD-ROM	6x BD-ROM / 8x DVD-ROM / 5x DVD-RAM / 24x CD-ROM
Reads	DC Power 5V	DC Power 5V	DC Power 5V
Source	+5V±5%	+5V±5%	+5V±5% Ripple less than 100mVp-p
DC Power Requirements	Max 2.5A@5v	Max 2.5A@5v	Max 2A@5v
DC Current	All Windows OS	All Windows OS	All Windows OS
Operating Systems Supported	Operating: 5°C to 45 °C Non-Operating:-30°C to 60°C	Operating: 5°C to 45 °C Non-Operating:-30°C to 60°C	Operating: 5°C to 45 °C Non-Operating:-30°C to 60°C
Temperature	Operating > Read: 15 % to 85 % (Non-Condensing) Write 15 % to 80 % (Depend on the Temperature) Storage/Transportation> 10 % to 80 % (Non-Condensing)	Operating > Read: 15 % to 85 % (Non-Condensing) Write 15 % to 80 % (Depend on the Temperature) Storage/Transportation> 10 % to 80 % (Non-Condensing)	Operating > Read: 15 % to 85 % (Non-Condensing) Write 15 % to 80 % (Depend on the Temperature) Storage/Transportation> 10 % to 80 % (Non-Condensing)

Integrated Graphics Adapter

Type	Intel UHD Graphics 630
Display Interface	1x DP 1.2, 1x HDMI 1.4
Video Resolution (max)	4096×2304 @ 60Hz (DP), 4096×2304 @ 24Hz (HDMI)

Discrete Graphics Adapter Part 1

Adapter	NVIDIA NVS 810	Quadro P400	Quadro P600	Quadro P620	Quadro P1000
Bus Interface	PCIe 3.0 x16	PCIe 3.0 x16	PCIe 3.0 x16	PCIe 3.0 x16	PCIe 3.0 x16
Display Interface	8 x mDP 1.2	3 x mDP 1.4	4 x mDP 1.4	4 x mDP 1.4	4 x mDP 1.4
Graphics Chipset	Maxwell	Pascal	Pascal	Pascal	Pascal
Memory Clock Frequency (MHz)	900MHz	1003MHz	1002MHz	1252MHz	1253MHz
Memory Size	4GB DDR3 (2GB per GPU)	2GB GDDR5	2GB GDDR5	2GB GDDR5	4GB GDDR5
Memory Interface	128-bit (64-bit per GPU)	64-bit	128-bit	128-bit	128-bit
Memory Bandwidth	28.8GB/s	Up to 32GB/s	Up to 64GB/s	Up to 80GB/s	Up to 82GB/s
GPU Cores	CUDA Cores: 1024 (512 cores per GPU)	CUDA Cores: 256	CUDA Cores: 384	CUDA Cores: 512	CUDA Cores: 640
GPU Core Frequency (MHz)	1033MHz	1228MHz	1329MHz	1266MHz	1266MHz
Maximum Power Consumption	68W	30W	40W	40W	47W
Supported Resolutions and Max Refresh Rates (Hz) (Note: Analog and/or Digital)	8 x 4096x2160 @ 30Hz 4 x 4096x2160 @ 60Hz	3 x 4096x2160 @ 60Hz 1 x 5120x2880 @ 60Hz	4 x 4096x2160 @ 60Hz 4 x 5120x2880 @ 60Hz	4 x 4096x2160 @ 60Hz 4 x 5120x2880 @ 60Hz	4 x 4096x2160 @ 60Hz 4 x 5120x2880 @ 60Hz
Thermal Solution	Ultra-quiet Active Fansink	Ultra-quiet Active Fansink	Ultra-quiet Active Fansink	Ultra-quiet Active Fansink	Ultra-quiet Active Fansink
Dimension	4.4" H x 7.8" L Single Slot	2.713" H x 5.7" L Single Slot, Low Profile	2.713" H x 5.7" L Single Slot, Low Profile	2.713" H x 5.7" L Single Slot, Low Profile	2.713" H x 5.7" L Single Slot, Low Profile
Advanced Display	Not Available	Not Available	Not Available	Not Available	Not Available
SLI/NVLink Support	Not Available	Not Available	Not Available	Not Available	Not Available

Discrete Graphics Adapter Part 1

Adapter	Quadro P2000	Quadro P2200	Quadro P4000	Quadro P5000	Quadro RTX 4000
Bus Interface	PCIe 3.0 x16	PCIe 3.0 x16	PCIe 3.0 x16	PCIe 3.0 x16	PCIe 3.0 x16
Display Interface	4 x DP 1.4	4 x DP 1.4	4 x DP 1.4	4 x DP 1.4 1 x DVI-D DL	3 x DP 1.4 1 x VirtualLink
Graphics Chipset	Pascal	Pascal	Pascal	Pascal	Turing
Memory Clock Frequency (MHz)	1752MHz	1251MHz	1901MHz	1127MHz	1625MHz
Memory Size	5GB GDDR5	5GB GDDR5X	8GB GDDR5	16GB GDDR5X	8GB GDDR6
Memory Interface	160-bit	160-bit	256-bit	256-bit	256-bit
Memory Bandwidth	Up to 140GB/s	Up to 200GB/s	Up to 243GB/s	Up to 288GB/s	Up to 416GB/s
GPU Cores	CUDA Cores: 1024	CUDA Cores: 1280	CUDA Cores: 1792	CUDA Cores: 2560	CUDA Cores: 2304 Tensor Cores: 288 RT Cores: 36
GPU Core Frequency (MHz)	1076MHz	1000MHz	1202MHz	1607MHz	1005MHz
Maximum Power Consumption	75W	75W	105W	180W	Total board power: 160W Total graphics power: 125W

Supported Resolutions and Max Refresh Rates (Hz) (Note: Analog and/or Digital)	4 x 4096x2160 @ 120Hz 4 x 5120x2880 @ 60Hz	4 x 4096x2160 @ 120Hz 4 x 5120x2880 @ 60Hz	4 x 4096x2160 @ 120Hz 4 x 5120x2880 @ 60Hz	7680 x 4320 @ 30Hz (Max DP 1.4) 2560 x 1600 @ 60Hz (Max DVI-D DL)	4 x 3840x2160 @ 120Hz 4 x 5120x2880 @ 60Hz 4 x 7680x4320 @ 60Hz
Thermal Solution	Ultra-quiet Active Fansink	Ultra-quiet Active Fansink	Ultra-quiet Active Fansink	Ultra-quiet Active Fansink	Ultra-quiet Active Fansink
Dimension	4.4" H x 7.9" L Single Slot	4.4" H x 7.9" L Single Slot	4.4" H x 9.5" L Single Slot, Full Height	4.4" H x 10.5" L Dual Slot, Full Height	4.4" H x 9.5" L Single Slot
Advanced Display	Not Available	Not Available	SYNC 2	SYNC 2	SYNC 2
SLI/NVLink Support	Not Available	Not Available	Not Available	SLI	Not Available

Ethernet Specifications Group 1 Part 1

Card	Intel I210-T1 Single Port Gigabit Ethernet Adapter (Springville)	Intel I350-T2 Dual Port Gigabit Ethernet Adapter (Stony Lake T2)	Intel I350-T4 Quad Port Gigabit Ethernet Adapter (Stony Lake T4)
Supplier PN	I210T1, MM# 941033	I350T2G1P20, MM# 928941	I350T4G1P20, MM# 928942
Data Rates Supported	10/100/1000Mbps copper	10/100/1000Mbps (Copper), 1000Mbps (Fiber)	10/100/1000Mbps (Copper), 1000Mbps (Fiber)
Controller Details	Intel® Ethernet Controller I210	Intel Ethernet Controller I350	Intel Ethernet Controller I351
Controller Bus Architecture	PCIe 2.1 (5GT/s)	PCIe 2.1 (5GT/s)	PCIe 2.1 (5GT/s)
Data Transfer Mode	Ethernet	Ethernet	Ethernet
Power Consumption	0.81W	Copper: I350-T2 V2= 4.4W Fiber: I350-F2= 5.5W	Copper: I350T4V2= 5W LC-Fiber: I350F4= 6W
IEEE Standards Compliance	IEEE 802.3/10BASE-T, 100BASE-TX, 1000BASE-T	IEEE 802.3/10BASE-T, 100BASE-TX, 1000BASE-T	IEEE 802.3/10BASE-T, 100BASE-TX, 1000BASE-T
Boot ROM Support	PXE boot, Intel iSCSI Remote Boot for Windows, Linux and VMware, Intel BootAgent Software via PXE or BootP, WDMS or UEFI	PXE boot, Intel iSCSI Remote Boot for Windows, Linux and VMware, Intel BootAgent Software via PXE or BootP, WDMS or UEFI	PXE boot, Intel iSCSI Remote Boot for Windows, Linux and VMware, Intel BootAgent Software via PXE or BootP, WDMS or UEFI
Network Transfer Mode (Full/Half Duplex)	Supported	Supported	Supported
Network Transfer Rate	1,000Mbps Full Duplex	1,000Mbps Full Duplex	1,000Mbps Full Duplex
Operating System Driver Support	Windows 7/8/10, Linux, Free BSD, XEN, VMware	Windows 7/8/10, Linux, Free BSD, XEN, VMware	Windows 7/8/10, Linux, Free BSD, XEN, VMware
Manageability	Supported	Supported	Supported
Manageability Capabilities Alerting	Supported	Supported	Supported
TDP	Firmware Based Thermal Management	Firmware Based Thermal Management	Firmware Based Thermal Management
Operating Temperature Range	0°C to 55°C (32°F to 131°F)	0°C to 55°C (32°F to 131°F)	0°C to 55°C (32°F to 131°F)
# of Ports	1	2	4
Data Rate Per Port	10/100/1000Mbps (copper)	10/100/1000Mbps (copper), 1000Mbps (fiber)	10/100/1000Mbps (copper), 1000Mbps (fiber)
System Interface Type	PCIe Gen 2.1	PCIe Gen 2.1	PCIe Gen 2.1
NC Sideband Interface	Not Available	Not Available	Not Available
Jumbo Frames Supported	Yes	Yes	Yes
1000Base-T	Yes	Yes	Yes
IEEE 1588	Supported	Supported	Supported

Supported Under vPro	Not Available	Not Available	Not Available
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Ethernet Specifications Group 1 Part 2

Model	i210-T1	Dual Port Copper= I350-T2V2 Dual Port LC-Fiber= I350-F2	Dual Port Copper= I350-T4 V2 Dual Port LC-Fiber= I350-F4
Connector	RJ-45 Copper	2 x Ports RJ-45 Copper or 2 x Ports LC-Fiber	4 x Ports RJ-45 Copper or 4 x Ports LC-Fiber
Website	i210 T1	i350 T2/F2	i350 T4/F4
Auto-Negotiation	IEEE* 802.3* Auto-negotiaton	IEEE* 802.3* Auto-negotiaton	IEEE* 802.3* Auto-negotiaton
Intel® vPro™	Not Available	Not Available	Not Available
Intel® Standard Manageability	Supported	Supported	Supported
Power Optimizer Platform Low-power Management Systems	Supported	Supported	Supported
Energy Efficient Ethernet	Supported	Supported	Supported
TCP/UDP Checksum and Segmentation Offload (IPv4 and IPv6)	Supported	Supported	Supported
Receive Side Scaling	Supported	Supported	Supported
Dual Tx and Rx Queues	Yes	Yes	Yes
Jumbo Frames (up to 9KB)	Supported	Supported	Supported
Teaming	Not Available	Supported	Supported
Wake from Deep Sx	Supported	Supported	Supported
Server Operating System Support	Windows Server 2008, 2012, 2016, 2019 Linux (RHEL/SLES), Free BSD, Xen, Vmware	Windows Server 2008, 2012, 2016, 2019 Linux (RHEL/SLES), Free BSD, Xen, Vmware	Windows Server 2008, 2012, 2016, 2019 Linux (RHEL/SLES), Free BSD, Xen, Vmware
Network Proxy/ARP Support	Supported	Supported	Supported

Media Card Reader

Description	Front 7 in 1 Media Card reader Standard
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SECTION IV: BIOS / Certifications / Standards / Environmental

BIOS Specifications

WMI Support	Compliant With Microsoft WBEM and the DMTF Common Information Model
ROM-Based Setup Utility (F1)	System Configuration Setup Program (text only interface) Available at Power-on With F1 Key
Bootblock Recovery	Recovers System BIOS if the Flash ROM Becomes Corrupted
Replicated Setup	Saves System Configuration Settings to a File That Can Then be Used to Replicate the Settings 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 the Event of a Decrease in System Memory

Thermal Alert	Power-on Error message in the Event of a Fan Failure
Asset Tag	Supports Ability to Set SMBIOS Type 2 Baseboard Asset Tag Field
System/Emergency ROM Flash Recovery with Video	Supports Process to Recover the System BIOS if the Flash ROM Becomes Corrupted
Remote Wakeup/Remote Shutdown	System Admin Can Power On/Off a Client Computer from a Remote Location to Provide Maintenance
Quick Resume Time	Supports 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	Offers Multiple Settings for Fan Control Ranging Between Better Performance and Better Acoustics
Security	User and Administrator Passwords Can Protect Boot and ROM-based Setup <ul style="list-style-type: none"> - Support Electronic Lock - Chassis Intrusion Detection - UEFI Secure Boot Support - HDD Password Can Protect HDD Data - Windows UEFI Firmware Update Support - Device Guard Support - Optional Access Panel Lock, Kensington Lock, and Pad Lock
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 Based Attacks
Memory Modes	Supports Mirroring, Lock Step, and Sparring Memory Modes
Windows 10 Ready	Supports Windows 10 Requirements for Secure Flash, UEFI v 2.6 Device Guard Support Spec

Industry Standard Specification Support

UEFI	Unified Extensible Firmware Interface v2.7
ACPI (Advanced Configuration and power Management Interface)	Advanced Configuration and Power Interface v6.1
ASF 2.0	DMTF Alert Standard Format Specification v2.0
ATA (IDE)	AT Attachment 6 with Packet Interface (ATA/ATAPI-6)
CD Boot	EI Torito Bootable CD-Rom Format Specification, v1.0
EHCI	Enhanced Host Controller Interface for Universal Serial Bus, Revision v1.0
PCI	NA (No PCI slot)
PCI Express	PCI Express Base Specification v3.0
SATA	Serial ATA Revision 3.0 Specification
TPM	Trusted Computing Group TPM Specification v2.0
UHCI	Universal Host Controller Interface Design Guide, Revision v1.1
USB	Universal Serial Bus Revision v1.1 Universal Serial Bus v2.0 Universal Serial Bus v3.0
SMBIOS	DMTF System Management Spec v3.2.1
XHCI	XHCI SPEC Revision v1.2

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	<ul style="list-style-type: none"> · 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	Not Available
Safety, EMC Connection to the Telephone Network and Labeling	Not Applicable, no Connection to a Telephone Network

Safety, EMC Connection to the Telephone Network and Labeling

System Software Manager	Lenovo ThinkStation Supports Software Management Tools by Lenovo Vantage
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Regulations & Standards

EMC & Safety	FCC DoC for North America VCCI Certification for Japan BSMI Certification for Taiwan EU/EFTA CE Mark & DoC UL/CUL(P920,P720,P520,P520c), cTUVus(P330) UL-GS(P920,P720,P520,P520c), TUV-GS(P330) IEC60950-1 CB Report/Certificate Saudi Arabia SASO Kuwait KUCAS China CCC Mark Hong Kong SAR (CB report) Singapore PSB South Africa SABS Russia-EAC Morocco-CM Mexico-NOM Kazakhstan-EAC Belarus-EAC Serbia KVALITET Ukraine UKrCEPRO India-BIS USA Chemical Emission Test
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Environmentals

Energy Star	ENERGY STAR® v7.0
EPEAT	EPEAT Certification Available on Select Models
ErP Lot-3 2013	Yes
Hazardous Substances	<ul style="list-style-type: none"> · Products do not contain more than; 0.1% lead, 0.01% cadmium, 0.1% mercury, 0.1% hexavalent chromium, 0.1% polybrominated biphenyls (PBB) or 0.1% polybrominated diphenol ethers (PBDE)

- Products do not contain Asbestos
- Products do not contain Ozone Depleting Substances: Chlorofluorocarbons (CFC), hydrobromofluorocarbons (HBFC), hydrochlorofluorocarbons (HCFC), Halons, carbontetrachloride, 1,1,1-trichloroethane, methyl bromide
- Products do not contain more than; 0.005% polychlorinated biphenyl (PCB), 0.005% polychlorinated terphenyl (PCT) in preparation
- Products do not contain more than 0.1% short chain chloroparaffins (SCCP) with 10-13 carbon atoms in the chain containing at least 48% per mass of chlorine in the SCCP
- Parts with direct and prolonged skin contact do not release nickel in concentrations above 0.5 microgram/cm₂/week