

Lenovo P350 Tower

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Product Name	P350 Tower
Product Display Name	ThinkStation P350 Tower
Information Date	1-Sep-22
Hardware Maintenance Manual	P350 Tower HMM
Drivers & Software	P350 Drivers & Software

SECTION I: Platform Overview

Description	Looking for value without sacrificing performance? This is the place. The ThinkStation® P350 Tower workstation offers the latest high-performance Intel® Core™ and Xeon® processors and up to NVIDIA® RTX™ professional graphics.
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CPU

Processor Support	Intel Rocket Lake Xeon W-1300 Series/Core Series Intel Comet Lake Xeon W-1200 Series/Core Series
Socket Type	Socket-H4 (LGA 1200)

Operating Systems

Preloaded	Windows 10 Pro 64-bit for Workstations Windows 10 Pro 64-bit Windows 10 Home 64-bit Ubuntu 20.04 LTS (configuration specific)
Supported	Ubuntu 20.04 LTS Red Hat Enterprise Linux 8.3

Memory

Slots	Up to 4 DIMMs
Channels	Supports up to 4 DIMM Sockets, 2 Channels
Type	288-Pin, 1866/2133/2400/2666/2933/3200 MHz ECC and non-ECC UDIMM
ECC Support	Yes, CPU Dependent
Speed	Up to 3200MHz
Max DIMM Size	32GB DDR4 UDIMM

Max System Memory	128GB
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Storage

Total Bays/Size	2 x 3.5" 2 x 2.5"
SATA	4 x SATA Connectors, Gen 3
PCIe	1 x M.2 PCIe Connector, Gen 3 Onboard 1 x M.2 PCIe Connector, Gen 4 Onboard Additional M.2 NVMe Drive Supported by Single Adapter
Disclaimers	1. Additional parts/enclosures may be required for some configurations. 2. For Comet Lake CPU's, only one M.2 PCIe Connector is available and limited to Gen 3 Onboard.

Video

Integrated Graphics	Intel Integrated UHD Graphics 750
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 4.0 x16, Full Height, Full Length, 75W, With Latch
Slot 2	PCIe 3.0 x1, Full Height, Half Length, 25W
Slot 3	PCIe 3.0 x4, Full Height, Half Length, 45W, With Latch
Disclaimers	1. The above refers to the standard Rocket Lake CPU's. 2. For Comet Lake CPU's, Slot 1 is limited to PCIe 3.0.

Front I/O

USB	2 x USB 3.2 Gen 2 Type-A 10Gb/s 2 x USB 3.2 Gen 1 Type-A 5Gb/s 1 x USB 3.2 Gen 2 Type-C 10Gb/s
Audio	1 x Audio Jack (3.5mm) 1x Microphone Jack (3.5mm)
Media Card Reader	Optional: Front 3-in-1 Media Card Reader (USB 2.0)
Flex Bay	One 3.5" Flex Bay, Supports the Following: – Flex storage enclosure – Front-access storage enclosure
Disclaimers	Note: Actual USB throughout will vary depending on the type and quantity of USB devices used.

Rear I/O

USB	4 x USB 3.2 Gen 1 Type-A 5Gb/s
Audio	1 x Rear (Line Out); Retaskable to 5.1
DisplayPort	2 x Standard (CPU dependent)

HDMI	Optional 1 x Rear Port (CPU dependent)
Type-C	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	2-Port USB Expansion Card (USB3.0) PCIe x1-HP/LP 4-Port Serial Expansion Card PCIe x1-HP/LP Rear USB 3.2 Gen2x2 Type C PCIe x4 Adapter
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
Disclaimers	Note: Actual USB throughput will vary depending on the type and quantity of USB devices used.

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	2 x Front 3.5mm Jacks (Mic & Headphone) 1 x Rear 3.5mm Jacks (Line Out)
Chipset	ALC623-CG
Number of Channels	2 Channels (5.1 via driver selection)
Number of Bits/Audio Resolution	6 Channel DAC supports 16/20/24 bit PCM 4 Channel ADC supports 16/20/24 bit PCM

Thermal

Temp Sensors	Ambient Sensor VR Sensor Graphics Card Sensor (if applicable)
Fans	1 x CPU Fan 1 x Front Fan 1 x Rear Fan (optional) 1 x Power Supply Fan (inside PSU)

Power Specifications

Power Supply	750W	500W
Power Efficiency	90% 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	10A	7A
Graphics	1 x 8 pin (6+2)	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	No	No
Aux Power Drop	Yes	Yes

BIOS

Vendor	AMI
Self-Healing BIOS	Yes

Chassis Information

Color	Raven Black
PSU	750W and 500W Available, Autosensing, 80 PLUS Platinum Qualified for 750w and 500w
Thermal Solutions	Two System Fans Standard (1 front, 1 rear), One Fan per CPU, One PSU Fan
Dimensions	376mm/14.8" H 315.4mm/12.4" D 170mm/6.7" W
Weight	9.4kg / 20.7lbs

Packaging Dimensions

Height (mm/in)	540mm / 21.26"
Width (mm/in)	280mm / 11.02"
Depth (mm)	420mm / 16.54"
Weight (kgs/lbs)	12.01kg / 26.47lbs

Security & Serviceability

TPM	Infineon SLB9670 TPM 2.0
Asset ID	Yes, 1024 x 8bit
vPro	Intel vPro for WS (AMT 14.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, 45G, 11ms, 6 Sides (+X, -X, +Y,-Y, +Z, -Z), Filter 300Hz, Each Side Shock One Time

SECTION II: Platform Detail

Board Size	10.51" x 9.72" (267mm x 247mm)
Layout	Custom ATX

Motherboard Core

Processor Support	Intel Rocket Lake Xeon W-1300 Series/Core Series
Socket Type	Socket-H4 (LGA 1200)
Memory Support	DDR4 up to 3200MHz UDIMM Memory (ECC and non-ECC)
Voltage Regulator	125W TDP Capable
Chipset (PCH)	Intel W580 Chipset
Flash	32MB
Super I/O	Nuvoton NCT6692D
Clock	Intel Native isCLK
Audio	Realtek ALC623-CG Codec
Ethernet	Intel Jacksonville I219LM

Supported Components

Processor Level	Intel Rocket Lake – Xeon	Intel Rocket Lake – Core	Intel Comet Lake – Core
Processor	W-1390P W-1390 W-1370P W-1370 W-1350P W-1350	i9-11900K i9-11900 i7-11700K i7-11700 i5-11600K i5-11600 i5-11500 i5-11400	i9-10900K i9-10900 i7-10700K i7-10700 i5-10500 i5-10400 i3-10325 i3-10305 i3-10105
Memory Type	ECC UDIMMs – 3200MHz	non-ECC UDIMMs – 3200MHz	non-ECC UDIMMs – 3200MHz
Memory	8GB DDR4 ECC UDIMM PC4-3200 16GB DDR4 ECC UDIMM PC4-3200 32GB DDR4 ECC UDIMM PC4-3200	8GB DDR4 non-ECC UDIMM PC4-3200 16GB DDR4 non-ECC UDIMM PC4-3200 32GB DDR4 non-ECC UDIMM PC4-3200	8GB DDR4 non-ECC UDIMM PC4-3200 16GB DDR4 non-ECC UDIMM PC4-3200 32GB DDR4 non-ECC UDIMM PC4-3200

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)	1TB 2.5" SATA HDD 7200rpm, 6Gb/s, 2.5" (FIPS certified) 1TB SATA 2.5" SATA HDD 7200rpm, 6Gb/s, 2.5" (non-FIPS certified)
M.2 PCIe Solid State Drive (SSD)	256GB M.2 PCIe SSD, Gen 4 x4, NVMe, OPAL 512GB M.2 PCIe SSD, Gen 4 x4, NVMe, OPAL 1024GB M.2 PCIe SSD, Gen 4 x4, NVMe, OPAL 1024GB M.2 PCIe SSD, Gen 4 x4, NVMe, NON-OPAL 2048GB M.2 PCIe SSD, Gen 4 x4, NVMe, OPAL

RAID

RAID Levels and Requirements	NVMe Drives Support RAID 0/1 SATA Drives Support RAID 0/1/5/10
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.

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 3-in-1 USB 2.0 Media Card Reader

Keyboard and Pointing Devices

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

PCIe Adapters

Network	Bitland BN8E88 Single Port Gigabit Ethernet Adapter Intel I210-T1 Single Port Gigabit Ethernet Adapter Intel I350-T2 Dual Port Gigabit Ethernet Adapter
Thunderbolt	Rear Thunderbolt PCIe Adapter
USB	Rear Dual Port USB 2.0 Cable Adapter Rear Dual Port USB 3.2 Gen 2 Type-C PCIe Adapter
WiFi Cards	Intel PCIe WiFi Card With BT External Antenna Kit (AX201)
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 W-1390P	Intel Xeon W-1370P	Intel Xeon W-1350P	Intel Xeon W-1390	Intel Xeon W-1370
# of Cores	8c	8c	6c	8c	8c
# of Threads	16	16	12	16	16
Processor Base Frequency	3.5GHz	3.6GHz	4.0Ghz	2.8GHz	2.9GHz
Max Turbo Frequency	5.3GHz	5.2GHz	5.1GHz	5.2GHz	5.1GHz
Cache	16M	16M	12M	16M	16M
TDP	125W	125W	125W	80W	80W

CPU Specifications Part 2

CPU	Intel Xeon W-1350	Intel Core i9-11900K	Intel Core i7-11700K	Intel Core i5-11600K	Intel Core i9-11900
# of Cores	6c	8c	8c	6c	8c
# of Threads	12	16	16	12	16
Processor Base	3.3GHz	3.5GHz	3.6GHz	3.9Ghz	2.5GHz

Frequency					
Max Turbo Frequency	5.0GHz	5.3GHz	5.0GHz	4.9GHz	5.2GHz
Cache	12M	16M	16M	12M	16M
TDP	80W	125W	125W	125W	65W

CPU Specifications Part 3

CPU	Intel Core i7-11700	Intel Core i5-11600	Intel Core i5-11500	Intel Core i5-11400	Intel Core i3-10325
# of Cores	8c	6c	6c	6c	4c
# of Threads	16	12	12	12	8
Processor Base Frequency	2.5GHz	2.8GHz	2.7GHz	2.6GHz	3.9GHz
Max Turbo Frequency	4.9GHz	4.8GHz	4.6GHz	4.4GHz	4.7GHz
Cache	16M	12M	12M	12M	8M
TDP	65W	65W	65W	65W	65W

CPU Specifications Part 4

CPU	Intel Core i3-10305	Intel Core i3-10105	Intel Core i9-10900K	Intel Core i9-10900	Intel Core i7-10700K
# of Cores	4c	4c	10c	10c	8c
# of Threads	8	8	20	20	16
Processor Base Frequency	3.8GHz	3.7GHz	3.7GHz	2.8GHz	3.8GHz
Max Turbo Frequency	4.5GHz	4.4GHz	5.2GHz	5.1GHz	5.1GHz
Cache	8M	6M	20M	20M	16M
TDP	65W	65W	125W	65W	125W

CPU Specifications Part 5

CPU	Intel Core i7-10700	Intel Core i5-10500	Intel Core i5-10400
# of Cores	8c	6c	6c
# of Threads	16	12	12
Processor Base Frequency	2.9GHz	3.1GHz	2.9GHz
Max Turbo Frequency	4.8GHz	NA	NA
Cache	16M	12M	12M
TDP	65W	65W	65W

HDD Specifications Part 1

Drive	1TB SATA – 7200rpm, 6Gb/s, 2.5"	1TB SATA – 7200rpm, 6Gb/s, 3.5"	1TB SATA – 7200rpm, 6Gb/s, 3.5" Enterprise	2TB SATA – 7200rpm, 6Gb/s, 3.5"	4TB 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
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	10.09	6.7	11.33
Idle (Watts)	0.7	4.6	4.86	4.5	5.45
Physical Dimensions	69.85mm x 100.34mm x 7mm	101.6mm x 146.99mm x 19.88mm	101.85mm x 147mm x 26.1mm	101.6mm x 146.99mm x 26.1mm	101.85mm x 147mm x 26.1mm
Weight (grams)	90	420	620	535	650
Operating (C) Ambient	0 to 60	0 to 60	5 to 60	0 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	Read 70 Gs / Write 40 Gs	80	Read 70 Gs / Write 40 Gs
Non-Operating (Gs @ 2ms)	1000	350	300	300	300
Disclaimers					

HDD Specifications Part 2

Drive	6TB SATA – 7200rpm, 6Gb/s, 3.5"
3.5" SATA Hard Disk Drive (HDD)	Yes
2.5" SATA Hard Disk Drive (HDD)	Not Available
Connector	SATA
Transfer Rate (Gb/sec)	Sustained Data Transfer Rate 216-226MB/s
Spindle Speed (RPM)	7,200
Power Off to Spindle Stop (sec)	NA
DC Power to Drive Ready (sec)	<17.0
Average Latency (msec)	4.16
Input (VDC)	5
Typical (Watts)	1318
Idle (Watts)	6.21
Physical Dimensions	101.85mm x 147mm x 26.1mm
Weight (grams)	716

Operating (C) Ambient	5 to 60
Operating (C) Base Casting	60
Non-Operating (C) Ambient	(-40 to 70)
Gradient (C per Hour)	20
Operating (Gs @ 2ms)	Read 70 Gs / Write 40 Gs
Non-Operating (Gs @ 2ms)	250
Disclaimers	

Solid State Storage Specifications

Drive	NVMe 2280 M.2 256GB PCIe SSD (OPAL)	NVMe 2280 M.2 512GB PCIe SSD (OPAL)	NVMe 2280 M.2 1TB PCIe SSD (OPAL)	NVMe 2280 M.2 2TB PCIe SSD (OPAL)	NVMe 2280 M.2 1TB PCIe SSD (non-OPAL)
Dimensions Millimeters (W x D x H)	22 x 80 x 3	22 x 80 x 3	22 x 80 x 3	22 x 80 x 3	22 x 80 x 3
Interface Type	PCIe Gen 4x4	PCIe Gen 4x4	PCIe Gen 4x4	PCIe Gen 4x4	PCIe Gen 4x4
Power Active (AVG)	5.8W	5.8W	5.8W	5.8W	5.8W
Power Idle	35 mW	35 mW	35 mW	35 mW	35 mW
Typical Sequential Read	5000 MB/s	6000 MB/s	6400 MB/s	6400 MB/s	6400 MB/s
Typical Sequential Write	1600 MB/s	3200 MB/s	3800 MB/s	5000 MB/s	3800 MB/s
Burst Random Read (4K Queue Depth 32/8 thread);	250K IOPS	500K IOPS	550K IOPS	550K IOPS	550K IOPS
Burst Random Write (4K Queue Depth 32/8 thread)	200K IOPS	370K IOPS	400K IOPS	400K IOPS	400K IOPS
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)	85 TB	150 TB	300 TB	600 TB	300 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	AES 256 bit	Not Available
Disclaimers					
HDD Controllers					
PCI Bus					
PCI Modes					
Data Transfer Rates					
Disclaimers					

Optical Drive Specifications Part 1

Description	9mm Slim DVD ROM Drive (SATA)- No OS/Linux	9mm Slim DVD ROM Drive (SATA)- Win10	9mm Slim DVD Burner/CD-RW Drive (SATA)- No OS/Linux	9mm Slim DVD Burner/CD-RW Drive (SATA)- Win10	9mm Slim Blu-Ray ODD DVD Burner (SATA)- No OS/Linux
Interface Type	SATA 1.5 Gb/s	SATA 1.5 Gb/s	SATA 1.5 Gb/s	SATA 1.5 Gb/s	SATA 1.5 Gb/s

Dimensions	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)	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)
Disc Capacity	NA	NA	NA	NA	NA
Type	DVDROM	DVDROM	DVDWriter	DVDWriter	BD Rambo
External Dimensions	NA	NA	NA	NA	NA
Speed	NA	NA	NA	NA	NA
Bay Type	9.0mm Tray	9.0mm Tray	9.0mm Tray	9.0mm Tray	9.0mm Tray
Color	Business Black or without bezel	Business Black or without bezel	Business Black or without bezel	Business Black or without bezel	Business Black or without bezel
Removable	No	No	No	No	No
Internal Buffer Size	0.5MB Min	0.5MB Min	0.5MB Min	0.5MB Min	4MB
Writes	NA	NA	8XDVD+R / 8XDVD+RW / 6XDVD+R DL 8XDVD-R / 6XDVD- RW / 6XDVD-R DL 24XCD-R / 16XCD- RW	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 24XCD-R / 16XCD- RW
Reads	8XDVD-ROM / 24XCD-ROM	8XDVD-ROM / 24XCD-ROM	8XDVD-ROM / 24XCD-ROM	8XDVD-ROM / 24XCD-ROM	6x BD-ROM / 8x DVD-ROM / 5x DVD-RAM / 24x CD-ROM
Source	DC Power 5V	DC Power 5V	DC Power 5V	DC Power 5V	DC Power 5V
DC Power Requirements	+5V±5%	+5V±5%	+5V±5%	+5V±5%	+5V±5% Ripple less than 100mVp-p
DC Current	Max 2.5A@5v	Max 2.5A@5v	Max 2.5A@5v	Max 2.5A@5v	Max 2A@5v
Operating Systems Supported	All Windows OS	All Windows OS	All Windows OS	All Windows OS	All Windows OS
Temperature	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	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
Relative Humidity	Operating > Read: 15 % to 85 % (Non-Condensing) Write 15 % to 80 % (Depend on the Temperature) Storage/Transporta tion> 10 % to 80 % (Non- Condensing)	Operating > Read: 15 % to 85 % (Non-Condensing) Write 15 % to 80 % (Depend on the Temperature) Storage/Transporta tion> 10 % to 80 % (Non- Condensing)	Operating > Read: 15 % to 85 % (Non-Condensing) Write 15 % to 80 % (Depend on the Temperature) Storage/Transporta tion> 10 % to 80 % (Non- Condensing)	Operating > Read: 15 % to 85 % (Non-Condensing) Write 15 % to 80 % (Depend on the Temperature) Storage/Transporta tion> 10 % to 80 % (Non- Condensing)	Operating > Read: 15 % to 85 % (Non-Condensing) Write 15 % to 80 % (Depend on the Temperature) Storage/Transporta tion> 10 % to 80 % (Non- Condensing)
Maximum Wet Bulb Temperature					
Disclaimers					

Optical Drive Specifications Part 2

Description	9mm Slim Blu-Ray ODD DVD Burner (SATA)- Win10
Interface Type	SATA 1.5 Gb/s
Dimensions	128±0.4×9.0 ±0.4×127±0.4(Max) Unit:mm (Without Bezel-W x H x D)
Disc Capacity	NA
Type	BD Rambo

External Dimensions	NA
Speed	NA
Bay Type	9.0mm Tray
Color	Business Black or without bezel
Removable	No
Internal Buffer Size	4MB
Writes	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
Reads	6x BD-ROM / 8x DVD-ROM / 5x DVD-RAM / 24x CD-ROM
Source	DC Power 5V
DC Power Requirements	+5V±5% Ripple less than 100mVp-p
DC Current	Max 2A@5v
Operating Systems Supported	All Windows OS
Temperature	Operating: 5°C to 45 °C Non-Operating:-30°C to 60°C
Relative Humidity	Operating > Read: 15 % to 85 % (Non-Condensing) Write 15 % to 80 % (Depend on the Temperature) Storage/Transportation> 10 % to 80 % (Non-Condensing)
Disclaimers	

Integrated Graphics Adapter		
Type	Intel® UHD Graphics 750	Intel UHD Graphics 630
Display Interface	1x DP 1.4, 1x HDMI 2.0	1x DP 1.2, 1x HDMI 1.4
Video Resolution (max)	5120 x 3200 @60Hz (DP) ,4096×2160@60Hz (HDMI)	4096×2304 @ 60Hz (DP), 4096×2304 @ 24Hz (HDMI)
Disclaimers		

Discrete Graphics Adapter Part 1

Adapter	Quadro T400	Quadro T600	Quadro T1000	Quadro P2200	Quadro RTX A4000
Bus Interface	PCIe 3.0 x16	PCIe 3.0 x16	PCIe 3.0 x16	PCIe 3.0 x16	PCIe 4.0 x16
Display Interface	3 x mDP 1.4a	4 x mDP 1.4a	4 x mDP 1.4a	4 x DP 1.4	4 x DP 1.4a
Graphics Chipset	TU117-825	TU117-850	TU117-875	Pascal	GA104-875
Memory Clock Frequency (MHz)	5001MHz	5001MHz	5001MHz	1251MHz	7000MHz
Memory Size	2GB GDDR6	4GB GDDR6	4GB GDDR6	5GB GDDR5X	16GB GDDR6
Memory Interface	64-bit	128-bit	128-bit	160-bit	256-bit
Memory Bandwidth	Up to 80GB/s	Up to 160GB/s	Up to 160GB/s	Up to 200GB/s	Up to 448GB/s
GPU Cores	CUDA Cores: 384	CUDA Cores: 640	CUDA Cores: 896	CUDA Cores: 1280	Coming Soon
GPU Core Frequency (MHz)	2100MHz	2100MHz	2100MHz	1000MHz	2100MHz
Maximum Power Consumption	30W	40W	50W	75W	140W
Supported Resolutions and Max Refresh Rates (Hz) (Note: Analog and/or Digital)	7680 x 4320 x 24 bpp @ 120Hz 7680 x 4320 x 24 bpp @ 60Hz 7680 x 4320 x 36	7680 x 4320 x 24 bpp @ 120Hz 7680 x 4320 x 24 bpp @ 60Hz 7680 x 4320 x 36	7680 x 4320 x 24 bpp @ 120Hz 7680 x 4320 x 24 bpp @ 60Hz 7680 x 4320 x 36	4 x 4096×2160 @ 120Hz 4 x 5120×2880 @ 60Hz	7680 x 4320 x 24 bpp @ 120Hz 7680 x 4320 x 24 bpp @ 60Hz 7680 x 4320 x 36

	bpp @ 60Hz 5120 x 3200 x 24 bpp @ 60Hz 5120 x 2880 x 24 bpp @ 60Hz	bpp @ 60Hz 5120 x 3200 x 24 bpp @ 60Hz 5120 x 2880 x 24 bpp @ 60Hz	bpp @ 60Hz 5120 x 3200 x 24 bpp @ 60Hz 5120 x 2880 x 24 bpp @ 60Hz		bpp @ 60Hz 5120 x 3200 x 24 bpp @ 60Hz 5120 x 2880 x 24 bpp @ 60Hz
Thermal Solution	Ultra-quiet Active Fansink	Ultra-quiet Active Fansink	Ultra-quiet Active Fansink	Ultra-quiet Active Fansink	Active Fansink
Dimension	2.713" H x 6.137" L Single Slot, Low Profile	2.713" H x 6.137" L Single Slot, Low Profile	2.713" H x 6.137" L Single Slot, Low Profile	4.4" H x 7.9" L Single Slot	4.4" H x 9.5" L Single Slot
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
Disclaimers					

Discrete Graphics Adapter Part 2

Adapter	Quadro RTX A5000	RTX 3060	WX3200
Bus Interface	PCIe 4.0 x16	PCIe 4.0 x16	PCIe 3.0 x8
Display Interface	4 x DP 1.4a	HDMI*1: 7680*4320@60Hz DP*3: 5120*2880@60Hz	4 x mDP
Graphics Chipset	GA102-850		Dev team, pls help to fill in
Memory Clock Frequency (MHz)	8001MHz	8000MHz	Dev team, pls help to fill in
Memory Size	24GB GDDR6	12GB GDDR6	4GB GDDR5
Memory Interface	384-bit	192-bit	128-bit
Memory Bandwidth	up to 768 GB/s		
GPU Core Frequency (MHz)	2100MHz		
Maximum Power Consumption	230W	170W	55W
Supported Resolutions and Max Refresh Rates (Hz) (Note: Analog and/or Digital)	7680 x 4320 x 24 bpp @ 120Hz 7680 x 4320 x 24 bpp @ 60Hz 7680 x 4320 x 36 bpp @ 60Hz 5120 x 3200 x 24 bpp @ 60Hz 5120 x 2880 x 24 bpp @ 60Hz		HDMI*1: 7680*4320@60Hz DP*3: 5120*2880@60Hz
Thermal Solution	Active Fansink	Active Fansink	Active Fansink
Dimension	4.4 inches x 10.5 inches, Double wide	225.55mm*117.5mm*35.8mm	6.6" L, single slot
Advanced Display	Not Available	Not Available	Not Available
SLI/NVLink Support	Yes	Not Available	Not Available
Disclaimers			

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)	Bitland BN8E88 1000M PCIe1 noASF – FH/LP	Intel® I350-F2 Dual Ports PCIe4 Gigabit Ethernet Adapter
Supplier PN	I210T1, MM# 941033	I350T2G1P20, MM# 928941	I350T4G1P20, MM# 928942	1218-00934/1218-00933	Coming Soon
Data Rates Supported	10/100/1000Mbps copper	10/100/1000Mbps (Copper), 1000Mbps (Fiber)	10/100/1000Mbps (Copper), 1000Mbps (Fiber)	10M, 100M, and 1000M	10/100/1000Mbps (Fiber),
Controller Details	Intel® Ethernet Controller I210	Intel Ethernet Controller I350	Intel Ethernet Controller I351	REALTEK RTL8168E-VB-CG	AQC107

Controller Bus Architecture	PCIe 2.1 (5GT/s)	PCIe 2.1 (5GT/s)	PCIe 2.1 (5GT/s)	PCI Express 1.1 2.5GT/s	Coming Soon
Data Transfer Mode	Ethernet	Ethernet	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	RTL8168E=0.53W	I350-F2= 5.5W
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	IEEE 802.1P Layer 2 Priority Encoding IEEE 802.1Q VLAN tagging IEEE 802.3az Draft 3.2 (EEE)	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	Supported	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	Supported	Supported
Network Transfer Rate	1,000Mbps Full Duplex	1,000Mbps Full Duplex	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	Win10	Windows 7/8/10, Linux, Free BSD, XEN,Vmware
Manageability	Supported	Supported	Supported	Supported	Supported
Manageability Capabilities Alerting	Supported	Supported	Supported	Supported	Supported
TDP	Firmware Based Thermal Management	Firmware Based Thermal Management	Firmware Based Thermal Management	Not Available	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)	0 °C, 50 °C (32 ° F to 122 ° F)	0°C to 55°C (32°F to 131°F)
# of Ports	1	2	4	1	1
Data Rate Per Port	10/100/1000Mbps (copper)	10/100/1000Mbps (copper), 1000Mbps (fiber)	10/100/1000Mbps (copper), 1000Mbps (fiber)	10M, 100M, and 1000M	10/100/1000Mbps (fiber)
System Interface Type	PCIe Gen 2.1	PCIe Gen 2.1	PCIe Gen 2.1	PCI Express 1.1	PCIe Gen 2.1
NC Sideband Interface	Not Available	Not Available	Not Available	Not Available	Not Available
Jumbo Frames Supported	Yes	Yes	Yes	Yes	Yes
1000Base-T	Yes	Yes	Yes	Yes	Yes
MACsec IEEE 802.1 AE	Coming Soon	Coming Soon	Coming Soon	Coming Soon	Coming Soon
IEEE 1588	Supported	Supported	Supported	Not Available	Supported
Supported Under vPro	Not Available	Not Available	Not Available	Not Available	Not Available
Disclaimers					

Ethernet Specifications Group 1 Part 2

Model	i210-T1	I350-T2	I350-T4	Bitland BN8E88 1000M PCIe1 noASF – FH/LP	Intel® I350-F2 Dual Ports PCIe4
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					Gigabit Ethernet Adapter
Connector	RJ-45 Copper	2 x Ports RJ-45 Copper	4 x Ports RJ-45 Copper	1 Port RJ-45	LC Fiber Optic
Website	i210 T1	i350 T2	i350 T4	IC Datasheet	Coming Soon
Auto-Negotiation	IEEE* 802.3* Auto-negotiation	IEEE* 802.3* Auto-negotiation	IEEE* 802.3* Auto-negotiation	Auto-Negotiation with Next Page capability	IEEE* 802.3* Auto-negotiation
Intel® vPro™	Not Available	Not Available	Not Available	Not Available	Not Available
Intel® Stable Image Platform Program (SIPP)	Coming Soon	Coming Soon	Not Available	Coming Soon	
Intel® Standard Manageability	Supported	Supported	Supported	Not Available	Supported
Power Optimizer Platform Low-power Management Systems	Supported	Supported	Supported	Supported	Supported
Energy Efficient Ethernet	Supported	Supported	Supported	Supported	Supported
TCP/UDP Checksum and Segmentation Offload (IPv4 and IPv6)	Supported	Supported	Supported	Supported	Supported
Receive Side Scaling	Supported	Supported	Supported	Supported	Supported
Dual Tx and Rx Queues	Yes	Yes	Yes	Not Available	Yes
Jumbo Frames (up to 9KB)	Supported	Supported	Supported	Supported	Supported
Teaming	Supported	Supported	Supported	Supported	Supported
Wake from Deep Sx	Supported	Supported	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	Windows Server 2008, 2012, 2016, 2019 Linux (RHEL/SLES), Vmware	Windows Server 2008, 2012, 2016, 2019 Linux (RHEL/SLES), Free BSD, Xen, Vmware
Network Proxy/ARP Support	Supported	Supported	Supported	Supported	Supported
Disclaimers					

Ethernet Specifications Group 1 Part 1

Card	Aquantia PCIe4 10GbE AQN-107 Gigabit Ethernet Adapter	2 x 2 AX WiFi with BT (M.2) vPro AX201-TWR/SFF
Supplier PN	AQN-107-124-SBL	Coming Soon
Data Rates Supported	10G/5G/2.5G/1G/100Mbps	Coming Soon
Controller Details	Coming Soon	Coming Soon
Controller Bus Architecture	PCIe Gen3	Coming Soon
Data Transfer Mode	Ethernet	Coming Soon
Power Consumption	Coming Soon	Coming Soon
IEEE Standards Compliance	IEEE802.3an 10GBASE-T/5GBASE-T/2.5GBASE-T/1000BASE-T/100BASE-TX	Coming Soon
Boot ROM Support	PXE boot UEFI boot	Coming Soon

Network Transfer Mode (Full/Half Duplex)	Supported	Coming Soon
Network Transfer Rate	10Gbps Full Duplex	Coming Soon
Operating System Driver Support	Microsoft® Windows® 10, 8.1, 8, 7 (32/64-bit), and Linux 3.2. 3.10, 3.12, 4.2, and 4.4 drivers	Coming Soon
Manageability	Coming Soon	Coming Soon
Manageability Capabilities Alerting	Coming Soon	Coming Soon
TDP	Coming Soon	Coming Soon
Operating Temperature Range	0°C – 108°C	Coming Soon
# of Ports	1	Coming Soon
Data Rate Per Port	10G/5G/2.5G/1G/100Mbps	Coming Soon
System Interface Type	PCIe Gen3 x4	Coming Soon
NC Sideband Interface	Coming Soon	Coming Soon
Jumbo Frames Supported	Yes	Coming Soon
1000Base-T	Yes	Coming Soon
MACsec IEEE 802.1 AE	Supported	Coming Soon
IEEE 1588	Supported	Coming Soon
Supported Under vPro	Not	Coming Soon
Disclaimers		

Ethernet Specifications Group 1 Part 2

Model	Aquantia PCIe4 10GbE AQN-107 Gigabit Ethernet Adapter	2 x 2 AX WiFi with BT (M.2) vPro AX201-TWR/SFF
Connector	1xRJ45	Coming Soon
Website	Coming Soon	Coming Soon
Auto-Negotiation	IEEE* 802.3* Auto-negotiaton	Coming Soon
Intel® vPro™	Coming Soon	Coming Soon
Intel® Stable Image Platform Program (SIPP)	Coming Soon	Coming Soon
Intel® Standard Manageability	Coming Soon	Coming Soon
Power Optimizer Platform Low-power Management Systems	Coming Soon	Coming Soon
Energy Efficient Ethernet	Supported	Coming Soon
TCP/UDP Checksum and Segmentation Offload (IPv4 and IPv6)	Supported	Coming Soon
Receive Side Scaling	Supported	Coming Soon
Dual Tx and Rx Queues	Coming Soon	Coming Soon
Jumbo Frames (up to 9KB)	Supported(Up to 16KB)	Coming Soon
Teaming	Coming Soon	Coming Soon
Wake from Deep Sx	Coming Soon	Coming Soon
Server Operating System Support	Microsoft® Windows® 10, 8.1, 8, 7 (32/64-bit), and Linux 3.2. 3.10, 3.12, 4.2, and 4.4 drivers	Coming Soon
Network Proxy/ARP Support	Supported	Coming Soon
Disclaimers		

Media Card Reader

Description	Media Card reader (3 in 1) TWR
Interface Type	USB2.0
Form Factor	USB 2.0 Mass Storage Device
Disclaimers	

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	Supervisor, SMP and Power-On 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, BIOS Guard, Boot Guard-BIOS Self-Healing Gen 2 (RoT: EC)-Secure Wipe 2.0-Subscription Certificate Storage
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

Industry Standard Specification Support

UEFI	Unified Extensible Firmware Interface v2.7
ACPI (Advanced Configuration and power Management Interface)	Advanced Configuration and Power Interface v6.2
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 v4.0
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 Universal Serial Bus v3.2
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	GDX Scip control
Batteries	UN38.3,MSDS
Safety, EMC Connection to the Telephone Network and Labeling	Not applicable

Acoustic Noise Emissions Declaration

LWAd(bels) Idle	4.3
LWAd(bels) Oper	4.8

Safety, EMC Connection to the Telephone Network and Labeling

Industry Standard Specifications	not applicable
Remote Manageability Software Solutions	not applicable
System Software Manager	Lenovo ThinkStation supports software management tools by Lenovo Vantage.

Regulations & Standards

EMC & Safety	FCC/IC VCCI BSMI KC RCM Brazil-INMETRO TUV-GS cTUVus IEC60950-1&IEC62368 CB Report/Certificate Saudi Arabia EQM Kuwait KUCAS China CCC Mark Singapore PSB South Africa SABS Russia/Belarus/Kazakhstan/Kyrgyzstan/Armenia-EAC Morocco-CM Mexico-NOM Serbia KVALITET Ukraine UKrCEPRO India-BIS China SRRC Indonesia-SDPPI Malaysia-SIRIM Philippines-NTC
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Environmentals

Energy Star	ENERGY STAR 8.0
EPEAT	EPEAT Certification Available on Select Models
ErP Lot-3 2013	Yes
Hazardous Substances	GDX Scip control
TCO Certification	9.0