Lenovo P5

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Product Name	P5
Product Display Name	ThinkStation P5
Information Date	22-Feb-24
Hardware Maintenance Manual	P5 HMM
Drivers & Software	P5 Drivers & Software
Available Whitepapers	Power Configurator Memory Configurator Storage Configurator Intel VROC Configurator Discrete RAID Configurator Windows 11 Installation Windows 10 Installation Red Hat Enterprise Linux 9 Installation Ubuntu Linux 22.04 LTS Installation

SECTION I: Platform Overview

Description	Engineered for ultimate versatility, the Lenovo ThinkStationP5 is the all-around industry workhorse for professionals that demand scalable, future-proof solutions. Featuring an all-new Aston Martin inspired chassis design, the latest Intel® Xeon® W processors, and support for up to two NVIDIA RTX™A6000 graphics cards, you can rely on the P5 to pack enough punch for any workflow, even in mission-critical environments.

CPU

Processor Support	4th Generation Intel Xeon Scalable Processors
Socket Type	Socket-E (LGA-4677)
Disclaimers	

Operating Systems

Preloaded	Windows 11 Pro 64-bit for Workstation Ubuntu 22.04 LTS (configuration specific)
Supported	Red Hat Enterprise Linux 9.x Ubuntu 22.04 LTS
Disclaimers	

Memory

Slots	Up to 8 DIMMS
Channels	Processor Supports up to 8 DIMMs, 4 Channels
Type	DDR5, 288-Pin, ECC RDIMM
ECC Support	Yes
Speed	Up to 4800MHz
Max DIMM Size	64GB DDR5 ECC RDIMM
Max System Memory	512GB
Disclaimers	*Memory speed is dependent on the CPU

Storage

Total Bays/Size	3
SATA	3 x SATA 3.0 Connectors
PCIe (M.2)	2 x M.2 NVMe 2280/22110 PCIe Connectors Onboard Up to 1 x M.2 NVMe 2280 Flex Bay Drive
Disclaimers	*See Storage Whitepaper for details on the available usage options.

Video

Integrated Graphics	Not Available
Discrete Graphics	NVIDIA T400(MiniDP x3) – 4GB GDDR6, PCIe3, Single-Slot NVIDIA T1000(MiniDP x4) – 8GB GDDR6, PCIe3, Single-Slot NVIDIA RTX A2000(MiniDP x4) – 12GB GDDR6, PCIe4, Dual-Slot NVIDIA RTX A4000 (4xDP) – 16GB GDDR6, PCIe4, Single-Slot NVIDIA RTX A4500(DP x4) – 20GB, GDDR6, PCIe4, Dual-Slot NVIDIA RTX A5500(DP x4) – 24GB GDDR6, PCIe4, Dual-Slot NVIDIA RTX A6000(DP x4) – 48GB GDDR6, PCIe4, Dual-Slot NVIDIA Quadro SYNC II card
Multi-GPU Support	Yes
Type	PCIe Add-In-Card
Bus Interface	PCIe x16
Disclaimers	

Slots

Slot 1	PCIe 5.0 x16, Full Height, Full Length, 75W
Slot 2	PCIe 4.0 x4, Full Height, Full Length, 25W, Open Ended
Slot 3	PCIe 5.0 x16, Full Height, Full Length, 75W
Slot 4	PCIe 4.0 x4, Full Height, Full Length, 25W, Open Ended
Slot 5	PCIe 4.0 x8, Full Height, Full Length, 25W, Open Ended
Slot 6	PCIe 4.0 x4, Full Height, Full Length, 25W, Open Ended
Disclaimers	

Front I/O

USB	1 x USB-A 3.2 Gen 2 (10Gbps) 1 x USB-A 3.2 Gen 2 (10Gbps) (with Always On Charging) 2 x USB-C 3.2 Gen 2 (10Gbps)
Audio	1 x 3.5mm Global Headset Jack (Headphone + Mic in)
Media Card Reader	15-in-1 Media Card Reader
Flex Bay	Front access drive bay
Disclaimers	Note: Actual USB throughout will vary depending on the type and quantity of USB devices used.

Rear I/O

USB	2 x USB-A 2.0 (480Mbps) 3 x USB-A 3.2 Gen 1 (10Gbps) 1 x USB-C 3.2 Gen 2×2 (20Gbps)
Audio	2 x Rear (Line Out, Line In retasked as Mic)
DisplayPort	As Supported by GPU
HDMI	As Supported by GPU
Serial Port	Optional 1x Rear Port
Ethernet	1 x 1GbE – RJ45
PS/2	Optional PS/2 (2 port) PCIe adapter
Optional Network Adapter	Broadcom 5720 Dual Port Gigabit PCIe Ethernet Adapter Broadcom 5719 Quad Port Gigabit PCIe Ethernet Adapter Bitland RTL8168H 1000M PCIe Ethernet Adapter Intel I210-T1 Single Port Gigabit PCIe Ethernet Adapter Intel I350-T2 Dual Port Gigabit PCIe Ethernet Adapter Intel I350-T4 Quad Port Gigabit PCIe Ethernet Adapter Intel AX211 WIFI (via onboard M.2) with Internal Antennas
Disclaimers	Note: Actual USB throughout will vary depending on the type and quantity of USB devices used.

Ethernet

Vendor	Intel 1GbE I219 (Vpro, AMT)
Speeds	10/100/1000Mbps
Functions	PXE, ASF, WOL, Jumbo Frames, Teaming
Connectors	1 x RJ45
Disclaimers	Note: Network speeds listed are theoretical.

Audio

Vendor	Realtek
Type	HD (2.0)
Internal Speaker	1 x 1.5 watt 4 ohm
Connectors	2 x Rear 3.5mm Jacks (Line Out, Line In retasked as Mic) 1 x Front 3.5mm Global Headset Jack (Headphone + Mic in)
Chipset	Realtek ALC897Q (rear) Realtec ALC4032 (front)
Number of Channels	Rear Audio: 2 Channels Front Audio: 2 Channels
Number of Bits/Audio Resolution	Rear Codec: 10 Channel DAC Supports 16/20/24-bit PCM 2 Stereo ADC Supports 16/20/24-bit PCM Front Codec: One stereo DAC supports 8/16/22.05/24/32/44.1/48/96/176.4/192KHz Sample Rate, 16/24-bit One stereo ADC supports 8/16/22.05/24/32/44.1/48/96KHz Sample Rate, 16/24-bit
Disclaimers	*Note: Audio Codec ALC897Q can support 7.1 channel, but motherboard only has 2 rear jacks – MIC in and Line out, only 2 channel for Line out.

Thermal

Temp Sensors	Ambient Cabled Sensor – Thermistor, MB Header cabled to chassis front bezel PCIe Zone 1 Sensor – Thermistor PCIe Zone 2 Sensor – Thermistor PCIe Zone 3 Sensor – Thermistor M.2 Zone 1 Sensor – Thermistor M.2 Zone 2 Sensor – Thermistor VCORE Thermal Sensor – Thermistor HDD Bay – Thermistor Flex Bay Sensor – 1 I2C Temp Sensor, placed at Flex Bay
Fans	1 x Front Fan (FRONT_FAN) – 4-pin header with 3-pin key 1 x Rear Fan (REAR_FAN) – 4-pin header with 3-pin key 1 x CPU 1 Fan (CPU_FAN) – 4-pin header with 3-pin key 2 x DDR5 Fan (DUCT_FANX) – 4-pin header with 3-pin key 1 x HDD Optional Fan (HDD_FAN) – 4-pin header with 3-pin key 1 x Flex Bay Optional Fan (FLEX_BAY_FAN) – 4-pin header with 4-pin key PSU1 Fans – provided by PSU vendor
Disclaimers	

Power Specifications

Power Supply	750 watts / 1000 watts
Power Efficiency	92% Efficient @ 50% Load
Main	C14 socket to std C13 line cord
Operating Voltage Range	100 – 240V (autosensing)
Rated Voltage Range	90-264VAC
Rated Line Frequency	47Hz / 63Hz
Operating Line Frequency Range	50Hz / 60Hz
Rated Input Current	750W 10A 1000W 6A-12A
Graphics	Up to 4 x 8-pin (6+2) PCIe*
Power Supply Fan	Yes
ENERGY STAR® Qualified (config dependent)	Yes
80 PLUS Compliant	Yes
Built-in Self Test (BIST) LED	Yes
Disclaimers	*Quantity of Graphics power cables is configuration dependent *See Power Configuration Whitepaper for additional details.

BIOS

Vendor	AMI
Disclaimers	

Chassis Information

Color	Storm Gray
PSU	Standard: 750W, Autosensing, 92% PSU, 80 PLUS Platinum Qualified Optional: 1000W, Autosensing, 92% PSU, 80 PLUS Platinum Qualified
Thermal Solutions	1 Rear Fan 1 Front Fan 1 CPU Fan 1 Fan HDD Bay (Optional) 1 Fan Flex Bay (Optional) 2 Memory Fans 2 PSU Fans
Dimensions	440mm/17.3" H (without feet) 446mm/17.6" H (with feet) 453.9mm/17.9" D 165mm/6.5" W
Weight	19kg /41.9lbs
Disclaimers	

Packaging Dimensions

Height (mm/in)	600mm / 23.62"
Width (mm/in)	295mm / 11.61"
Depth (mm)	571mm / 22.48"
Weight (kgs/lbs)	21.5kg /47.4lbs
Disclaimers	

Security & Serviceability

TPM	Infineon SPI TPM SLB9672 TPM 2.0
Asset ID	Yes, 1024 x 8bit
vPro	Yes
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	Common or Random Key Lock Kit – Optional
Boot Sequence Control	Yes
Padlock Support	Yes
Boot Without Keyboard and/or Mouse	Yes
Access Panel	Tool-less Side Cover Removal
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 Phillips Head Screws
Restore CD/DVD/USB Set	Not Included, Restore Media Available via Lenovo Downloaad Recovery Service or available through Lenovo Support.
Disclaimers	*Note: CPU Heatsink assembly requires a T30 bit.

Operating Environment

Air Temperature	Operating: 10ºC to 35ºC (50ºF to 95ºF)
Storage	Storage: -40ºC to 60ºC (-40ºF to 140ºF) in Original Shipping Carton Storage: -10ºC to 60ºC (14ºF to 140ºF) Without Carton
Humidity	Relative Humidity Operating: 10% to 80% (non-condensing) Relative Humidity Storage/Transit: 10% to 90% (non-condensing) Wet Bulb Temperature Operating: 25ºC (77ºF) max Wet Bulb Temperature Non-operating: 40ºC (104ºF) max
Altitude	Upper limits decrease 1°C (1.8°F) per 300 m (1000 ft) above sea level
Vibration	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	Operating: X,Y axis: +- 15G/3ms Z axis: +- 30G/3ms Operating (Rack mounted): X,Y,Z axis: +- 15G/3ms Non-operating target: Trapezoidal shock, 35g average, 11ms
Disclaimers	Extended operating temperatures are possible – please contact your Lenovo Rep

SECTION II: Platform Detail

Board Size	11.94" x 9.88" (303.3mm x 251mm)
Layout	Lenovo Custom Extended ATX
Disclaimers	

Motherboard Core

Processor Support	Intel(R) – Xeon(R) W-2400 Series Processors
Socket Type	Socket E (LGA 4677)
Memory Support	Max 8 DDR5 RDIMMs up to 4800MHz
Voltage Regulator	Intel VR14.0 – 250W TDP Capable
Chipset (PCH)	Intel Alder Lake S PCH W790
Flash	2 x 64Mb
Super I/O	One MEC1723 (176pin)
Clock	External Clock
Audio	Rear Codec: Realtek ALC897Q (Rear I/O) Front Codec: Realtek ALC4032 (FPIO)
Ethernet	Intel 1Gb I219
Disclaimers	

Supported Components

Processor Level	Intel(R) – Xeon(R) W-2400 Series Processors
Processor	Intel Xeon W7-2495X Intel Xeon W7-2475X Intel Xeon W5-2465X Intel Xeon W5-2455X Intel Xeon W5-2445 Intel Xeon W3-2435 Intel Xeon W3-2425 Intel Xeon W3-2423
Memory Type	RDIMMs – 4800MHz, CPU Dependent
Memory	16GB DDR5 ECC RDIMM PC5-4800 32GB DDR5 ECC RDIMM PC5-4800 64GB DDR5 ECC RDIMM PC5-4800
Disclaimers	Additional CPU SKUs Certified

Storage

3.5" SATA Hard Disk Drive (HDD)	2TB SATA – 7200rpm, 6Gb/s, 3.5" 6TB SATA – 7200rpm, 6Gb/s, Enterprise, 3.5" 12TB SATA – 7200rpm, 6Gb/s, Enterprise, 3.5"
2.5" SAS Hard Disk Drive (HDD)	
2.5" SATA Hard Disk Drive (HDD)	
2.5" SATA Solid State Drive (SSD)	
M.2 PCIe Solid State Drive (SSD)	512GB M.2 PCIe – SSD, 2280, Gen4 (x4), NVMe, TLC, OPAL2.0 1024GB M.2 PCIe – SSD, 2280, Gen4 (x4), NVMe, TLC, OPAL2.0 2048GB M.2 PCIe – SSD, 2280, Gen4 (x4), NVMe, TLC, OPAL2.0 4096GB M.2 PCIe – SSD, 2280, Gen4 (x4), NVMe, TLC, OPAL2.0
U.2 PCIe Solid State Drive (SSD)	
PCIe Add-in-Card Solid State Drive (SSD)	
Intel Optane Storage Technology	
Disclaimers	Additional Storage Devices Certified

RAID

RAID Requirements	M.2 and SATA RAID via Intel VROC Controller
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.
Optional Hard Disk Drive Controllers	
Intel VROC	Intel Virtual RAID On CPU (VROC) – Basic, Supports 0/1/10

	Intel Virtual RAID On CPU (VROC) – Premium, Supports 0/1/5/10

Optical Drive/Removable Media

Disclaimers	

Keyboard and Pointing Devices

Keyboard	USB Traditional Keyboard PS/2 Traditional Keyboard Smart Card Keyboard USB Calliope Keyboard
Pointing Devices	USB Fingerprint Mouse USB Calliope Mouse PS/2 Black Optical Mouse
Disclaimers	

Expansion Bays

5.25" External Access Bays	Front access drive bay
Disclaimers	

PCIe Adapters

Network	Broadcom 5720 Dual Port Gigabit Ethernet Adapter Broadcom 5719 Quad Port Gigabit Ethernet Adapter Bitland RTL8168H 1000M PCIE Ethernet Adapter Intel I210-T1 Single Port Gigabit Ethernet Adapter Intel I350-T2 Dual Port Gigabit Ethernet Adapter Intel I350-T4 Quad Port Gigabit Ethernet Adapter Intel X550-T2 Dual Port Copper 10Gb Ethernet Adapter Intel X710-DA2 Dual Port 10G Ethernet Converged Network Adapter
Thunderbolt	
USB	
WiFi Cards	Intel PCIe WiFi Card With BT Internal Antenna Kit (AX211)
PS/2	PS/2 (2 Port) PCIe adapter
Com port	Serial COM port cable with 5V transceiver
PCIe to M.2 Adapter Card	ThinkStation Quad AIC Gen 3 M.2 Adapter
Disclaimers	Note: The Intel X710 requires SFP+ modules for operation

SECTION III: Supported Component Detail

CPU Specifications Group 1

CPU	Intel Xeon W7-2495X	Intel Xeon W7-2475X	Intel Xeon W5-2465X	Intel X 2455X
Disclaimers				

CPU Specifications Group 2

CPU	Intel Xeon W3-2435	Intel Xeon W3-2425	Intel Xeon W3-2423
Disclaimers			

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 SA 7200r 3.5"
3.5" SATA Hard Disk Drive (HDD)	Not Available	Yes	Yes	Yes
2.5" SATA Hard Disk Drive (HDD)	Yes	Not Available	Not Available	Not Av
Connector	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	Sustai transfe 226ME
Spindle Speed (RPM)	7,200	7,200	7,200	7,200
DC Power to Drive Ready (sec)	3.5	<10.0	<17.0	<17.0
Average Latency (msec)	4.2	4.16	4.16	4.16
Input (VDC)	5	5	5	5
Typical (Watts)	1.9	6.19	6.7	7.35
Idle (Watts)	0.7	4.6	4.5	5.45
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	101.85r x 26.1n
Weight (grams)	90	420	535	680
Operating (C) Ambient	0 to 60	0 to 60	0 to 60	5 to 6(
Operating (C) Base Casting	60	60	60	60
Non-Operating (C) Ambient	(-40 to 70)	(-40 to 70)	(-40 to 70)	(-40 to
Gradient (C per Hour)	20	20	20	20
Operating (Gs @ 2ms)	400	70	80	Read 40 Gs

Non-Operating (Gs @ 2ms)	1000	350	300	300
Disclaimers				

Solid State Storage Specifications Group 1

Drive	256GB 2.5" SATA SSD	512GB 2.5" SATA SSD	1TB 2.5" SATA SSD	2TB 2.5
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 10
Interface Type	SATA-III	SATA-III	SATA-III	SATA-
Power Active (AVG)	1.8W	1.9W	2.2W	6W
Power Idle	50mW	50mW	50mW	50mW
Typical Sequential Read	540MB/s	540MB/s	540MB/s	530MB
Typical Sequential Write	500MB/s	500MB/s	500MB/s	500MB
Operating Temperature Range	0 to 55°C	0 to 55°C	0 to 55°C	0 to 55
Endurance Rating (Lifetime Writes)	85TB	150TB	300TB	600TB
Mean Time Between Failures (MTBF)	2.0M POH	2.0M POH	2.0M POH	2.0M P
Hardware Encryption	AES 256 bit	AES 256 bit	AES 256 bit	AES 25
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 Group 1

Drive	512GB NVMe M.2 SSD TLC	1024GB NVMe M.2 SSD TLC	2048GB NVMe M.2 SSD TLC	480GB Optan
Dimensions Millimeters (W x D x H)	22 x 80 x 2.3	22 x 80 x 2.3	22 x 80 x 2.3	20 x 16
Interface Type	PCIe Gen 3.0 x4 NVMe	PCIe Gen 3.0 x4 NVMe	PCIe Gen 3.0 x4 NVMe	PCIe G NVMe
Power Active (AVG)	5W	5W	5W	18W
Power Idle	50mW	50mW	50mW	7W
Typical Sequential Read	3200MB/s	3200MB/s	3500MB/s	2700M
Typical Sequential Write	1600MB/s	1600MB/s	3000MB/s	2200M
Operating Temperature Range	0 to 55°C	0 to 55°C	0 to 55°C	0 to 85
Endurance Rating (Lifetime Writes)	150TB	300TB	600TB	8.76PB

Mean Time Between Failures (MTBF)	2.0M POH	2.0M POH	2.0M POH	2.0M F
Hardware Encryption	AES 256 bit	AES 256 bit	AES 256 bit	No

HDD Controllers

PCI Bus	PCH Integrated
PCI Modes	SATA 3.0
RAID Levels	0/1/5/10
Data Transfer Rates	6Gb/s
Internal Connectors	2 x MiniSAS HD (2 ports each) + 3 x SATA
Disclaimers	
Optical Drive Specifications	
Relative Humidity	
Maximum Wet Bulb Temperature	
Disclaimers	
Integrated Graphics Adapter	
Disclaimers	

Discrete Graphics Adapter Group 1

Adapter	T400	T1000	RTX A2000	RTX A
Bus Interface	PCIe 3.0 x16	PCIe 3.0 x16	Coming Soon	PCIe 4
Display Interface	3 x mDP 1.4	4 x mDP 1.4	Coming Soon	4 x DP
Graphics Chipset	Turing	Turing	Coming Soon	Ampe
Memory Clock Frequency (MHz)	Coming Soon	Coming Soon	Coming Soon	Comir
Memory Size	2GB GDDR6	4GB GDDR6	Coming Soon	16GB (
Memory Interface	64-bit	128-bit	Coming Soon	256-bi
Memory Bandwidth	80GB/s	160GB/s	Coming Soon	448 G
GPU Cores	CUDA Cores: 384	CUDA Cores: 896	Coming Soon	CUDA Tenso RT Co
Maximum Power Consumption	30W	50W	Coming Soon	140W
Supported Resolutions and Max Refresh Rates (Hz) (Note: Analog and/or Digital)	Coming Soon	Coming Soon	Coming Soon	4 x 40 120Hz 4 x 512 60Hz 2 x 768 60Hz
Thermal Solution	Active	Active	Coming Soon	Active
Dimension	2.7" H x 6.1" L Single Slot	2.7" H x 6.1" L Single Slot	Coming Soon	4.4" H Single

Advanced Display	Coming Soon	Coming Soon	Coming Soon	SYNC
SLI/NVLink Support	Coming Soon	Coming Soon	Coming Soon	Comir
Disclaimers				

Discrete Graphics Adapter Group 2

Adapter	RTX A5500	RTX A6000
Bus Interface	Coming Soon	PCIe 4.0 x16
Display Interface	Coming Soon	4 x DP 1.4a
Graphics Chipset	Coming Soon	Ampere
Memory Clock Frequency (MHz)	Coming Soon	2000MHz
Memory Size	Coming Soon	48GB GDDR6
Memory Interface	Coming Soon	384-bit
Memory Bandwidth	Coming Soon	Up to 768GB/s
GPU Cores	Coming Soon	CUDA Cores: 10,752 Tensor Cores: 336 RT Cores: 84
Maximum Power Consumption	Coming Soon	300W
Supported Resolutions and Max Refresh Rates (Hz) (Note: Analog and/or Digital)	Coming Soon	4 x 4096×2160 @ 120Hz 4 x 5120×2880 @ 60Hz 2 x 7680×4320 @ 60Hz
Thermal Solution	Coming Soon	Active
Dimension	Coming Soon	4.4" H x 10.5" L Dual Slot, Full Height
Advanced Display	Coming Soon	SYNC 2
SLI/NVLink Support	Coming Soon	NVLink
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)	Intel X Port C Etherr
Supplier PN	I210T1, MM# 941033	I350T2G1P20, MM# 928941	I350T4G1P20, MM# 928942	MM#9
Data Rates Supported	10/100/1000Mbps copper	10/100/1000Mbps (Copper), 1000Mbps (Fiber)	10/100/1000Mbps (Copper), 1000Mbps (Fiber)	100/10 10Gbp
Controller Details	Intel® Ethernet Controller I210	Intel Ethernet Controller I350	Intel Ethernet Controller I351	Intel E Contro
Controller Bus Architecture	PCIe 2.1 (5GT/s)	PCIe 2.1 (5GT/s)	PCIe 2.1 (5GT/s)	PCIe 2

Data Transfer Mode	Ethernet	Ethernet	Ethernet	Etherr
Power Consumption	0.81W	Copper: I350-T2 V2= 4.4W Fiber: I350-F2= 5.5W	Copper: I350T4V2= 5W LC-Fiber: I350F4= 6W	X540- 10Gps 1Gbps 100Mb X540- 10Gbp 1Gbps 100Mb
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 8 100/10 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	PXE b iSCSI for Wi and V BootA Softwa BootP UEFI
Network Transfer Mode (Full/Half Duplex)	Supported	Supported	Supported	Suppo
Network Transfer Rate	1,000Mbps Full Duplex	1,000Mbps Full Duplex	1,000Mbps Full Duplex	1,000 Duple
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	Windo Windo Server FreeB
Manageability	Supported	Supported	Supported	Suppo
Manageability Capabilities Alerting	Supported	Supported	Supported	Suppo
TDP	Firmware Based Thermal Management	Firmware Based Thermal Management	Firmware Based Thermal Management	Firmw Therm Manag
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 to 131°F)
# of Ports	1	2	4	2
Data Rate Per Port	10/100/1000Mbps (copper)	10/100/1000Mbps (copper), 1000Mbps (fiber)	10/100/1000Mbps (copper), 1000Mbps (fiber)	100/1,0 10Gbp
System Interface Type	PCIe Gen 2.1	PCIe Gen 2.1	PCIe Gen 2.1	PCIe G
NC Sideband Interface	Not Available	Not Available	Not Available	Not Av
Jumbo Frames Supported	Yes	Yes	Yes	Yes
1000Base-T	Yes	Yes	Yes	Yes
IEEE 1588	Supported	Supported	Supported	Not Av
Supported Under vPro	Not Available	Not Available	Not Available	Not Av
Disclaimers				

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	Dual P X540-T
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	2 x Po Coppe
Website	i210 T1	i350 T2/F2	i350 T4/F4	x540 T
Auto-Negotiation	IEEE* 802.3* Auto-negotiaton	IEEE* 802.3* Auto-negotiaton	IEEE* 802.3* Auto-negotiaton	IEEE* negot
Intel® vPro™	Not Available	Not Available	Not Available	Not Av
Intel® Standard Manageablity	Supported	Supported	Supported	Suppo
Power Optimizer Platform Low-power Management Systems	Supported	Supported	Supported	Suppo
Energy Efficient Ethernet	Supported	Supported	Supported	Not Av
TCP/UDP Checksum and Segmentation Offload (IPv4 and IPv6)	Supported	Supported	Supported	Suppo
Receive Side Scaling	Supported	Supported	Supported	Suppo
Dual Tx and Rx Queues	Yes	Yes	Yes	Yes
Jumbo Frames (up to 9KB)	Supported	Supported	Supported	Not Av
Teaming	Supported	Supported	Supported	Suppo
Wake from Deep Sx	Supported	Supported	Supported	Not Av
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	Windo 2003, 2 4, Linu Vmwa
Network Proxy/ARP Support	Supported	Supported	Supported	Suppo
Disclaimers				

Ethernet Specifications Group 2 Part 1

Card	Intel Ethernet SFP+ SR Optics Module	Intel Dual Band Wireless-AC 7260 ASM	Intel Winstorm Peak 8265 2×2 AC+BT 4.2 Vpro M.2 Combo
Supplier PN	MM#: 941243	7260HMWDTX.R, MM# 936170	MM#: 946658
Data Rates Supported	Not Available	Intel Dual Band Wireless-AC 7260	Intel Dual Band Wireless-AC 8265
Controller Details	Not Available	Intel Dual Band Wireless-AC 7260, Dual Band, 2×2, WiFi+BT	Intel Dual Band Wireless-AC 8265, 2×2, WiFi+BT, MU-MIMO
Controller Bus Architecture	Not Available	PCIe M.2	PCIe M.2
Data Transfer Mode	Not Available	WiFi (802.11ac), 2.4GHz, 5GHz	WiFi (802.11ac), 2.4GHz, 5GHz

Power Consumption	Not Available	Not Available	Not Available
IEEE Standards Compliance	Not Available	IEEE 802.11abgn, 802.11ac, 802.11d, 802.11e, 802.11i, 802.11h, 802.11w	IEEE 802.11abgn, 802.11ac, 802.11d, 802.11e, 802.11i, 802.11h, 802.11w, 802.11r, 802.11k, 802.11v (pending)
Boot ROM Support	Not Available	Not Available	Not Available
Network Transfer Mode (Full/Half Duplex)	Not Available	Not Available	Not Available
Network Transfer Rate	Not Available	300/867Mbps	867Mbps
Operating System Driver Support	Not Available	Windows 10, 32-bit*, Windows 10, 64-bit*, Windows 8.1, 32-bit*, Windows 8.1, 64-bit*, Windows 8, 32-bit*, Windows 8, 64-bit*, Windows 7, 32-bit*, Windows 7, 64-bit*, Linux*	Windows 10, 64-bit*, Windows 8.1, 64-bit*, Windows 7, 32-bit*, Windows 7, 64-bit*, Linux*
Manageability	Not Available	Not Available	Not Available
Manageability Capabilities Alerting	Not Available	Not Available	Not Available
TDP	Not Available	Not Available	Not Available
Operating Temperature Range	Not Available	0°C to 80°C (32°F to 176°F)	0°C to 80°C (32°F to 176°F)
# of Ports	Not Available	Not Available	Not Available
Data Rate Per Port	Not Available	Not Available	Not Available
System Interface Type	Not Available	PCIe M.2	PCIe M.2
NC Sideband Interface	Not Available	Not Available	Not Available
Jumbo Frames Supported	Not Available	Not Available	Not Available
1000Base-T	Not Available	Not Available	Not Available
IEEE 1588	Not Available	Not Available	Not Available
Supported Under vPro	Not Available	Supported	Supported
Disclaimers			

Ethernet Specifications Group 2 Part 2

Model	AC 7260 NGW	AC 8265 NGW
Connector	2 x Antennas	2 x Antennas
Website	7260 NGW	8265 NGW
Auto-Negotiation	Not Available	Not Available
Intel® vPro™	Supported	Supported
Intel® Standard Manageablity	Not Available	Not Available
Power Optimizer Platform Low-power Management Systems	Supported	Supported

Energy Efficient Ethernet	Not Available	Not Available
TCP/UDP Checksum and Segmentation Offload (IPv4 and IPv6)	Not Available	Not Available
Receive Side Scaling	Not Available	Not Available
Dual Tx and Rx Queues	Not Available	Not Available
Jumbo Frames (up to 9KB)	Not Available	Not Available
Teaming	Not Available	Not Available
Wake from Deep Sx	Not Available	Not Available
Server Operating System Support	Not Available	Not Available
Network Proxy/ARP Support	Not Available	Not Available
Disclaimers		

Media Card Reader

Description	9-in-1 (USB 2.0)
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	User and Administrator Passwords Can Protect Boot and ROM-based Setup – 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 Sparing 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	El 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	· Products do not contain more than; 0.1% lead, 0.01% cadmium, 0.1% mercury, 0.1% hexavalent chromium, 0.1% polybrominated biphenyls (PBB) or 0.1% polybrominated diphenyl ethers (PBDE). (See legal reference and Note B1) · Products do not contain Asbestos · Products do not contain Ozone Depleting Substances: Chlorofluorocarbons (CFC), hydrobromofluorocarbons (HBFC), hydrochlorofluorcarbons (HCFC), Halons, carbontetrachloride, 1,1,1-trichloroethane, methyl bromide · Products do not contain more than; 0.005% polychlorinated biphenyl (PCB), 0.005% polychlorinated terphenyl (PCT) in preparation · Products do not contain more than 0.1% short chain chloroparaffins (SCCP) with 10-13 carbon atoms in the chain containing at least 48% per mass of chlorine in the SCCP · Parts with direct and prolonged skin contact do not release nickel in concentrations above 0.5 microgram/cmÂ²/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
Acoustic Noise Emissions Declaration	

Safety, EMC Connection to the Telephone Network and Labeling

System Software Manager	Lenovo ThinkStation Supports Software Management Tools by Lenovo Vantage

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

Environmentals

Energy Star	ENERGY STAR® v7.0
EPEAT	EPEAT® Silver Certification Available on Select Models
Greenguard	Greenguard
RoHS	RoHS Compliant
ErP Lot-3 2013	Yes
Hazardous Substances	• 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), hydrochlorofluorcarbons (HCFC), Halons, carbontetrachloride, 1,1,1-trichloroethane, methyl bromide • Products do not contain more than; 0.005% polychlorinated biphenyl (PCB), 0.005% polychlorinated terphenyl (PCT) in preparation • Products do not contain more than 0.1% short chain chloroparaffins (SCCP) with 10-13 carbon atoms in the chain containing at least 48% per mass of chlorine in the SCCP • Parts with direct and prolonged skin contact do not release nickel in concentrations above 0.5 microgram/cm_/week
TCO Certification	9.0
Disclaimers	EPEAT registered where applicable. EPEAT registration varies by country. See www.epeat.net for registration status by country.