

Lenovo ThinkServer RD450 (E5-2600 v3) Product Guide (withdrawn product)

The Lenovo ThinkServer RD450 is a versatile, 2U, two-socket server that features Intel Xeon E5-2600 v3 processors and supports up to 512 GB of DDR4 memory, 12 cores, and 24 threads per socket. With the capability to support mix and match internal hard disk drive (HDD) and solid-state drive (SSD) storage with up to 64 TB of storage, up to four redundant fans, hot-swap redundant power supplies, a dedicated Gigabit Ethernet out-of-band management port and two integrated Gigabit Ethernet onboard ports, the ThinkServer RD450 provides leading features and capabilities in a highly flexible design.

The following figure shows the ThinkServer RD450.



Figure 1. The ThinkServer RD450

Did you know?

The ThinkServer RD450 provides a variety of drive configurations, including support for 2.5-inch or 3.5-inch hot-swap drives. Some configurations also support an internal tape drive and optical drive.

The ThinkServer RD450 delivers impressive compute power per watt and incorporates energy-smart features for minimized costs and efficient performance. The 80 PLUS Titanium power supply units (PSUs) can deliver 96% efficiency at 50% load.

The RD450 provides outstanding memory performance that is achieved by supporting two-RDIMMs-per-channel configurations at speeds up to 12% faster than the Intel specification, while still maintaining world-class reliability.

Key features

The RD450 is a versatile 2U two-socket business-critical server that offers improved performance and pay-as-you-grow flexibility along with new features that improve server management capability. This powerful system is designed for your most important business applications and cloud deployments.

Combining balanced performance and flexibility, the RD450 is a great choice for small and medium businesses. It can provide outstanding uptime to keep business-critical applications and cloud deployments running safely. Ease of use and comprehensive systems management tools help make deployment easier. Outstanding reliability, availability, and serviceability (RAS) and high-efficiency design improve your business environment and help save operational costs.

Scalability and performance

The RD450 offers numerous features to boost performance, improve scalability, and reduce costs:

- Improves productivity by offering superior system performances with up to 12-core processors, up to 30 MB of L3 cache, and up to 9.6 GT/s QPI interconnect links.
- Supports up to two processors, 24 cores, and 48 threads maximize the concurrent execution of multi-threaded applications.
- Intelligent and adaptive system performance with energy efficient Intel Turbo Boost Technology allows CPU cores to run at maximum speeds during peak workloads by temporarily going beyond processor thermal design power (TDP).
- Intel Hyper-Threading Technology boosts performance for multithreaded applications by enabling simultaneous multithreading within each processor core, up to two threads per core.
- Intel Virtualization Technology integrates hardware-level virtualization hooks that allow operating system vendors to better utilize the hardware for virtualization workloads.
- Intel Advanced Vector Extensions 2.0 (AVX 2.0) enable acceleration of enterprise-class workloads such as databases, enterprise resource planning, and others.
- Up to 2133 MHz memory speeds with two DIMMs per channel running at 2133 MHz to help maximize system performance.
- Up to 1024 GB of memory capacity by using 64 GB load-reduced DIMMs (LRDIMMs).
- The 12 Gbps SAS internal storage connectivity doubles the data transfer rate compared to 6 Gb SAS solutions to maximize performance of storage I/O-intensive applications.
- Flexible and scalable internal storage configurations provide for up to 80 TB of storage capacity (eight 10TB drives) in a 2U rack form factor.
- The use of solid-state drives (SSDs) instead of or along with traditional spinning drives (HDDs) can significantly improve I/O performance. An SSD can support up to 100 times more I/O operations per second (IOPS) than a typical HDD.
- The server offers up to six PCI Express (PCIe) 3.0 I/O expansion slots.
- The RD450 provides Lenovo AnyRAID® technology, a midplane RAID adapter that connects directly to the drive backplane without consuming a PCIe slot.
- With Intel Integrated I/O Technology, the PCI Express 3.0 controller is integrated into the Intel Xeon processor E5 family. This helps to dramatically reduce I/O latency and increase overall system performance.

Availability and serviceability

The RD450 provides many features to simplify serviceability and increase system uptime:

- Tool-less cover removal provides easy access to upgrades and serviceable parts, such as processors, memory DIMMs, and adapter cards.
- The server offers hot-swap drives supporting RAID redundancy for data protection and greater

system uptime.

- The server offers redundant hot-swap power supplies and redundant fans to provide availability for business-critical applications.
- Solid-state drives (SSDs) offer significantly better reliability than traditional mechanical HDDs for greater uptime.
- Built-in ThinkServer System Manager TSM continuously monitors system parameters and triggers alerts to minimize downtime.
- One or three-year customer replaceable unit and onsite limited warranty (depending on model), next business day 9x5. Optional service upgrades are available.

Manageability and security

Powerful systems management features simplify local and remote management of the RD450:

- The server includes ThinkServer Service Module (TSM) to monitor server availability and perform remote management.
- TSM Premium is an optional upgrade key that provides support for ThinkServer Energy Manager (TEM). TEM uses TSM to capture real-time power and temperature data from the server and provides automated controls to lower energy costs.
- Embedded ThinkServer Deployment Manager (TDM) provides a complete set of provisioning capabilities from a single interface, automating many of the tasks associated with server provisioning.
- An optional Trusted Platform Modules (TPM) enables advanced cryptographic functionality such as digital signatures and Windows BitLocker encryption, a Windows data protection feature. The server supports TPM 2.0 or TPM 1.2 depending on the TPM option selected.
- Intel Execute Disable Bit functionality can help prevent certain classes of malicious buffer overflow attacks when combined with a supporting operating system.
- Intel Trusted Execution Technology provides enhanced security through hardware-based resistance to malicious software attacks, allowing an application to run in its own isolated space, protected from all other software running on a system.

Energy efficiency

The RD450 offers the following energy-efficiency features to save energy, reduce operational costs, increase energy availability, and contribute to the green environment:

- Energy-efficient planar components help lower operational costs.
- High-efficiency power supplies with 80 PLUS Platinum and Titanium certifications.
- Intel Intelligent Power Capability powers individual processor elements on and off as needed, to reduce power draw.
- Low-voltage Intel Xeon processors draw less energy to satisfy the demands of power and thermally constrained data centers and telecommunication environments.
- Low-voltage 1.2 V DDR4 memory DIMMs consume up to 20% less energy compared to 1.35 V DDR3 DIMMs.
- Solid-state drives (SSDs) consume less power than traditional spinning HDDs.
- ThinkServer Energy Manager™ provides advanced data center power notification and management to help achieve lower heat output and reduced cooling needs.

Locations of key components and connectors

The RD450 is available either with 3.5-inch hot-swap drive bays or 2.5-inch hot-swap drive bays. The following figure shows the front of the server.

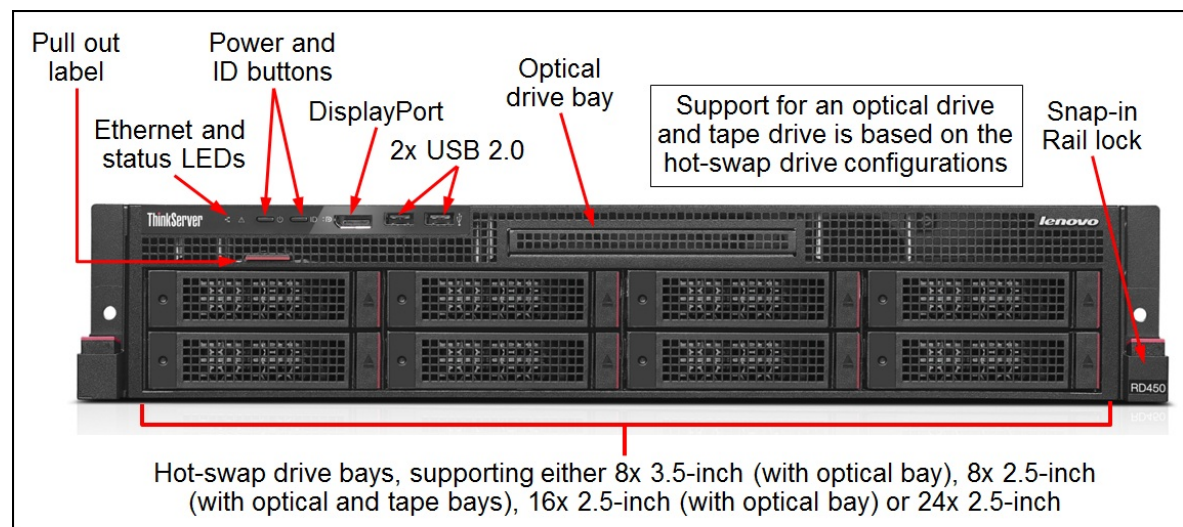


Figure 2. Front view of the ThinkServer RD450 (3.5-inch drive-bay model)

The RD450 supports an optical drive and a tape drive depending on the drive bay configuration selected. The four different drive bay configurations are shown in the following figure.

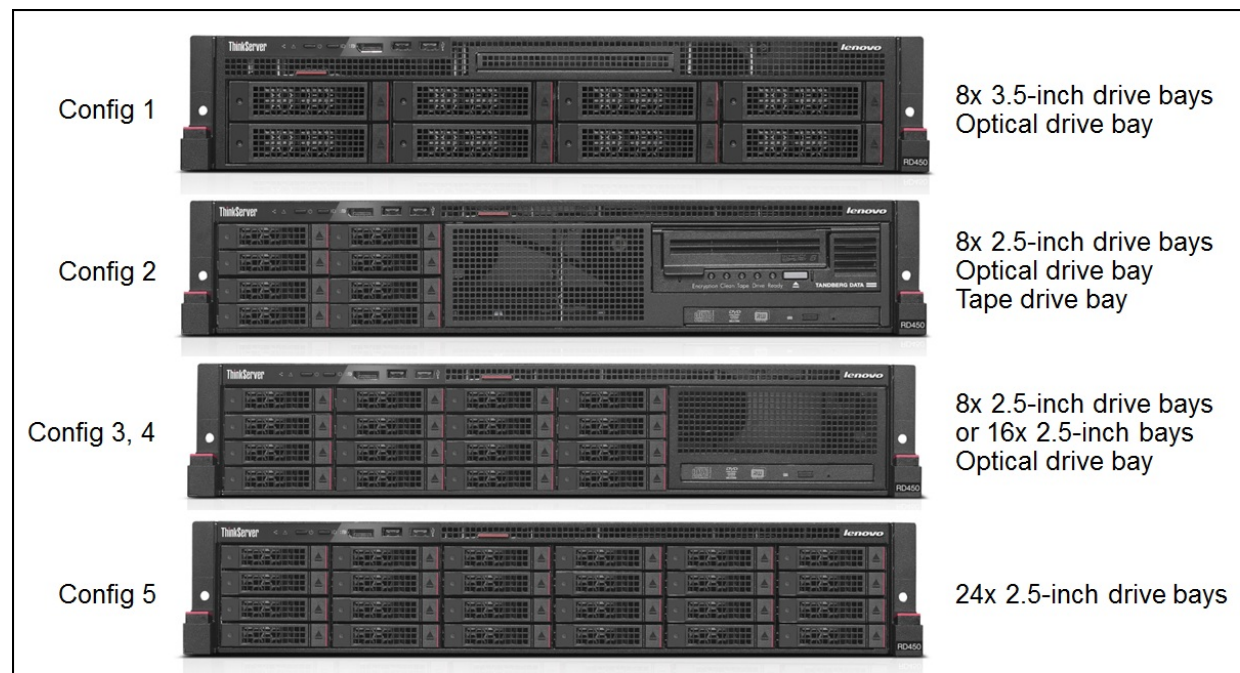


Figure 3. Available drive bay configurations

The following figure shows the rear of the RD450 server.

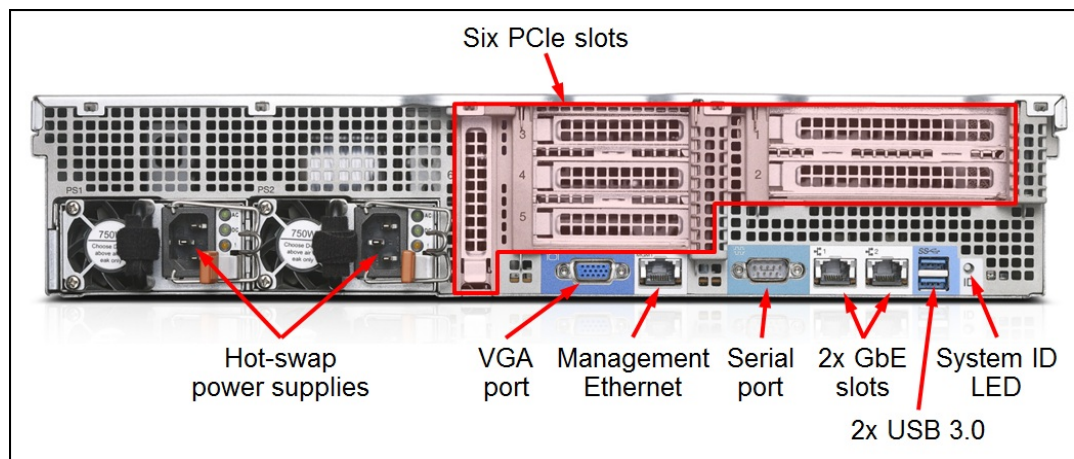


Figure 4. Rear view of the ThinkServer RD450

The following figure shows the locations of key components inside the server.

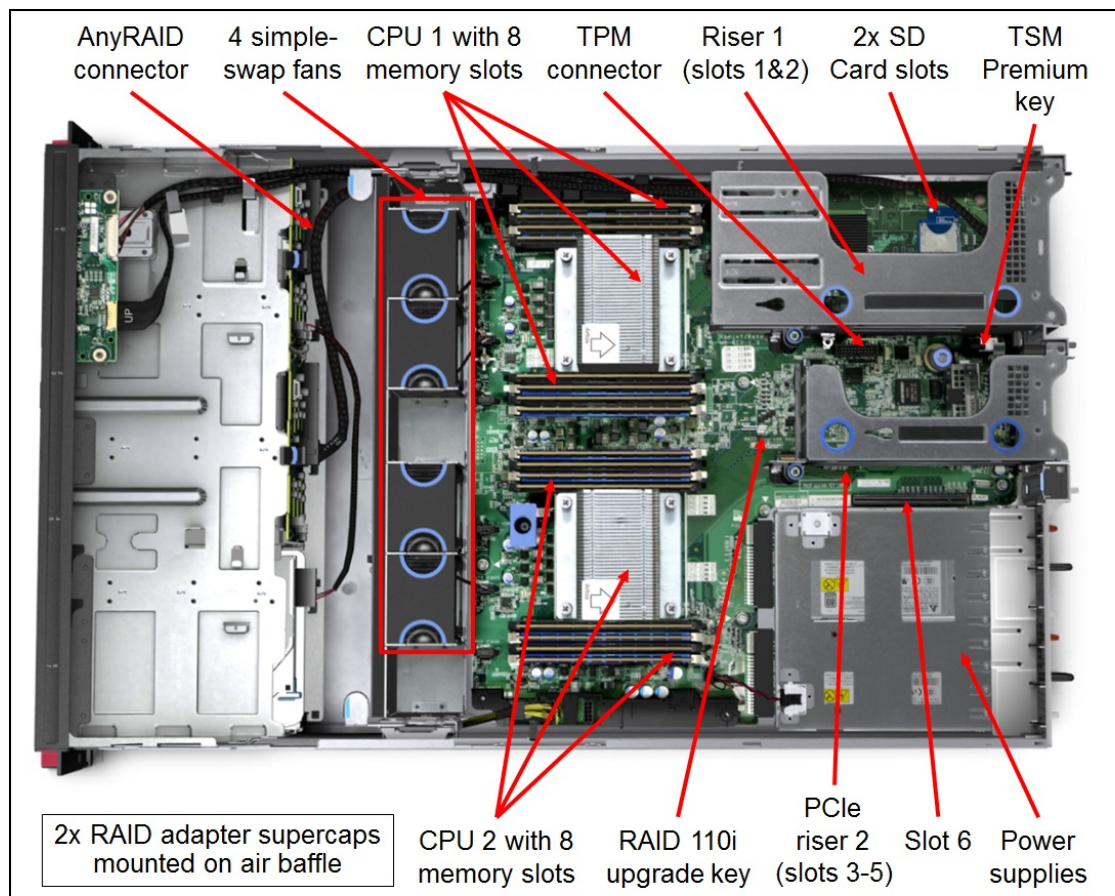


Figure 5. Inside view of the ThinkServer RD450

Standard specifications

The following table lists the standard specifications.

Table 1. Standard specifications

Components	Specification
Machine type	3.5-inch drives: 70DC, 70DD 2.5-inch drives: 70DA, 70DE, 70DV, 70DB, 70DF, 70DW
Form factor	2U rack.
Processor	Up to two Intel Xeon E5-2600 v3 Series CPUs, with up to 105 W SKUs and up to 12 cores per CPU
Chipset	Intel C610 Series
Memory	Up to 16 DDR4 DIMM sockets (8 DIMMs per processor). RDIMMs and Load Reduced (LR)-DIMMs are supported. Memory types cannot be intermixed. Memory speed up to 2133 MHz
Memory maximums	With RDIMMs: Up to 512 GB with 16x 32 GB RDIMMs and two processors With LRDIMMs: Up to 1024 GB with 16x 64 GB LRDIMMs and two processors
Memory protection	ECC, Patrol Scrubbing, Demand Scrubbing, Sparing, Mirroring, and Lockstep Mode
Disk drive bays	Up to 24x 2.5" hot-swap SAS/SATA HDDs, or up to 8x 3.5" hot-swap SAS/SATA HDDs. All backplanes support 6 Gbps hot-swap drives.
Maximum internal storage	With 3.5-inch drives, up to 96 TB with 8x 12 TB NL SATA drives or 12.8 TB with 8x 1.6 TB SSDs. With 2.5-inch drives, up to 48 TB with 24x 2 TB SATA drives or 43.2 TB with 24x 1.8 TB SSDs. Intermix of SAS/SATA is supported.
Storage controllers for 2.5-inch drive bay models	Models with 2.5-inch drives support an AnyRAID adapter, installed on a dedicated slot on the drive backplane. Supported controllers are as follows: <ul style="list-style-type: none"> AnyRAID 110i 6 GB SATA RAID 0/1/10 with optional RAID 5. This is a pass-through card that routes the embedded controller in the Intel C610 PCH to the backplane. Maximum 6 SATA drives. AnyRAID 510i 6 GB SAS & SATA RAID 0/1/10 with optional RAID 5/50. Maximum 8 drives. AnyRAID 720i 12Gb RAID 0/1/5/6/10/50/60 with optional 1 GB cache (without flash), or 1 GB, 2 GB or 4 GB cache each with CacheVault (flash), CacheCade, and FastPath support. Maximum 8 drives. AnyRAID 720ix 12 GB RAID 0/1/5/6/10/50/60 with optional 1 GB cache (without flash), or 1 GB, 2GB or 4GB cache each with CacheVault (flash), CacheCade, and FastPath support. Includes SAS Expander to support up to 24 drives.
Storage controllers for 3.5-inch drive bay models	Models with 3.5-inch drives support either an embedded controller or a PCIe RAID adapter. Supported controllers are as follows: <ul style="list-style-type: none"> Embedded RAID 110i controller in the Intel C610 PCH routed via cable to the backplane. SATA drives only. RAID arrays can include at most six drives. RAID 500 adapter supporting RAID 0/1/10 with optional RAID 5/50 RAID 710 adapter supporting RAID 0/1/5/6/10/50/60 with 1 GB cache standard. Optional CacheVault, CacheCade, and FastPath support.

Components	Specification
Optical drive bays	One optional slimline drive, either a DVD-ROM or Multiburner, is supported with these configurations: <ul style="list-style-type: none"> • 8x 3.5-inch drive bays • 8x 2.5-inch drive bays • 16x 2.5-inch drive bays
Tape drive bays	Support for an LTO6 internal tape drive in configurations with 8x 2.5-inch drive bays.
Network interfaces	Two integrated RJ-45 Gigabit Ethernet 1000BASE-T ports (Intel i210) for the operating system, Port 1 can be configured as shared with systems management. Dedicated Gigabit Ethernet port for systems management
PCI Expansion slots	Up to six slots, depending on the riser cards installed. The slots are numbered as follows (see the rear view in Locations of key components and connectors for slot locations). <ol style="list-style-type: none"> 1. PCIe 3.0 x8 (x16 mechanical) FHHL slot (riser 1) 2. PCIe 3.0 x8 (x16 mechanical) FHHL slot (riser 1) 3. PCIe 3.0 x8 (x16 mechanical) Low Profile slot (riser 2, requires CPU 2) 4. PCIe 3.0 x8 (x16 mechanical) Low Profile slot (riser 2, requires CPU 2) 5. PCIe 3.0 x8 (x16 mechanical) Low Profile slot (riser 2, requires CPU 2) 6. PCIe 3.0 x8 (x16 mechanical) Low Profile slot (requires CPU 2)
Ports	<ul style="list-style-type: none"> • Front: 2x USB 2.0 and 1x DisplayPort video. Optional DisplayPort to VGA dongle, part number 4X90F92980 • Rear: 2x USB 3.0, 1x DB-15 VGA video, 1x RJ-45 systems management, 2x RJ-45 GbE network ports, 1x DB-9 serial port • Internal: 2x SD Card slots (supporting SDHC cards; for embedded hypervisor)
Cooling	Up to 4 simple-swap (non-hot-swap) redundant fans: <ul style="list-style-type: none"> • With 1 processor: 3 fans (2 + 1 redundant) • With 2 processors: 4 fans (3 + 1 redundant)
Power supply	Up to two redundant hot-swap AC power supplies, Energy Star 2.0 compliant: <ul style="list-style-type: none"> • 450W 80 PLUS Gold (110-240V AC) (machine types 70DA, 70DC only) • 550 W 80 PLUS Platinum (110-240V AC) • 750 W 80 PLUS Platinum AC (110-240V AC) • 750 W 80 PLUS Titanium AC (220-240V AC) • 1100 W 80 PLUS Platinum AC (110-240V AC)
Hot-swap parts	Hard drives and power supplies
Systems management	Unified Extensible Firmware Interface (UEFI), Onboard Aspeed AST2400 graphics/management processor, IPMI 2.0-compliant baseboard management controller (BMC). Supports ThinkServer management software: <ul style="list-style-type: none"> • ThinkServer System Manager (TSM) • ThinkServer System Manager Premium (TSM Premium; adds iKVM remote control and remote media) • ThinkServer Deployment Manager • ThinkServer Energy Manager (activated with TSM Premium) • Partner Pack for Microsoft System Center Operations Manager • Partner Pack for VMware vCenter
Security features	Power-on and administrator password. Optional Trusted Platform Module (TPM) 2.0 or 1.2. Chassis intrusion switch standard on some models, not available on others.

Components	Specification
Video	Onboard Aspeed AST2400 with 16MB memory, one DisplayPort on front, one VGA on rear. Maximum resolution: 1920x1200@60Hz
Operating systems supported	Microsoft Windows Server, Red Hat Enterprise Linux, SUSE Linux Enterprise Server, VMware ESXi, Citrix XenServer. See the Operating system support section for specifics.
Limited warranty	One or three-year limited onsite service with 9x5/Next Business Day
Service and support	Optional service upgrades are available through Lenovo Services
Dimensions	Height: 87 mm (3.4 in), width: 482 mm (19 in), depth: 783 mm (30.8 in)
Weight	Minimum configuration: 16 kg (35.3 lb), maximum: 27 kg (59.5 lb)

Models

ThinkServer RD450 models are region-specific; that is, each region may define their own server models, and not all server models are available in every region.

Machine types for the RD450 are 70DA, 70DB, 70DC, 70DD, 70DE, 70DF, 70DV, and 70DW.

For a list of the RD450 models available in the US or EMEA, see PSREF:
http://psref.lenovo.com/Product/ThinkServer_RD450

For models in other regions, contact a local Lenovo or Lenovo Business Partner representative.

The RD450 server models are shipped with the following items:

- Rail kit (some models)
- Cable management arm (some models)
- One or two rack power cords or power cords (model specific)
- Documentation package

Processor options

The RD450 supports up to two Intel Xeon E5-2600 v3 series of processors. The following table lists the supported processor options. When two processors are installed, they must be identical.

Table 2. Processor options (TB = Turbo Boost, VT = Virtualization Technology, HT = Hyper-Threading Technology)

Part number	Description	Memory speed	TB	VT	HT
4XG0F28860	Lenovo ThinkServer RD450 Intel Xeon E5-2603 v3 (6C, 85W, 1.6GHz) Processor	1600 MHz	N	Y	N
4XG0F28859	Lenovo ThinkServer RD450 Intel Xeon E5-2609 v3 (6C, 85W, 1.9GHz) Processor	1600 MHz	N	Y	N
4XG0F28858	Lenovo ThinkServer RD450 Intel Xeon E5-2620 v3 (6C, 85W, 2.4GHz) Processor	1866 MHz	Y	Y	Y
4XG0F28864	Lenovo ThinkServer RD450 Intel Xeon E5-2623 v3 (4C, 105W, 3.0GHz) Processor	1866 MHz	Y	Y	Y
4XG0F28857	Lenovo ThinkServer RD450 Intel Xeon E5-2630 v3 (8C, 85W, 2.4GHz) Processor	1866 MHz	Y	Y	Y
4XG0F28862	Lenovo ThinkServer RD450 Intel Xeon E5-2630L v3 (8C, 55W, 1.8GHz) Processor	1866 MHz	Y	Y	Y
4XG0F28856	Lenovo ThinkServer RD450 Intel Xeon E5-2640 v3 (8C, 90W, 2.6GHz) Processor	1866 MHz	Y	Y	Y
4XG0F28855	Lenovo ThinkServer RD450 Intel Xeon E5-2650 v3 (10C, 105W, 2.3GHz) Processor	2133 MHz	Y	Y	Y
4XG0F28861	Lenovo ThinkServer RD450 Intel Xeon E5-2650L v3 (12C, 65W, 1.8GHz) Processor	2133 MHz	Y	Y	Y
4XG0F28854	Lenovo ThinkServer RD450 Intel Xeon E5-2660 v3 (10C, 105W, 2.6GHz) Processor	2133 MHz	Y	Y	Y

Xeon E5-2600 v3 improves on the older generation of processors in the following ways:

- Maximum RD450 core count is increased from 10 to 12 cores per processor from the RD440.
- Single thread count is increased from 20 to 24.
- Maximum last level per-processor cache is increased from 25 MB to 30 MB.
- Intel Quick Path Interconnect speed increases from 8.0 GT/s to 9.6 GT/s.
- Supports DDR4 memory at up to 2133 MT/s.
- Supports Trusted Execution Technology (TX).
- Supports Advanced Encryption Standard Instruction Set.

Memory options

The ThinkServer RD450 supports DDR4 memory. DDR4 memory offers many benefits over older generation DDR3 memory. DDR4 operates at a lower voltage than DDR3L (1.2V vs. 1.5V) and as a result, offers significant power savings. In addition, DDR4 memory has higher memory transfer speeds of up to 2133 MT/s, depending on the memory configuration.

Lenovo offers Registered DIMMs (RDIMM) and Load Reduced DIMMs (LR-DIMM) that use a buffer to reduce memory bus loading, which enables greater memory capacities to be achieved.

The following table lists the DDR4 memory options and ordering information.

2400 MHz memory support: the RD450 with Intel Xeon E5-2600 v3 processors supports both 2133 MHz and 2400 MHz memory options, however the 2400 MHz memory DIMMs will operate at speeds up to 2133 MHz.

Table 3. Memory Options

Part number	Description	Maximum supported*
2400 MHz memory options		
4X70G88318	Lenovo ThinkServer 8GB DDR4-2400MHz (1Rx4) RDIMM	8 / 16
4X70G88319	Lenovo ThinkServer 16GB DDR4-2400MHz (2Rx4) RDIMM	8 / 16
4X70G88320	Lenovo ThinkServer 32GB DDR4-2400MHz (2Rx4) RDIMM	8 / 16
4X70G88321	Lenovo ThinkServer 64GB DDR4-2400MHz (4Rx4) LRDIMM	8 / 16
2133 MHz memory options		
4X70F28588	Lenovo ThinkServer 4GB DDR4-2133MHz (1Rx8) RDIMM	8 / 16
4X70F28589	Lenovo ThinkServer 8GB DDR4-2133MHz (1Rx4) RDIMM	8 / 16
4X70F28590	Lenovo ThinkServer 16GB DDR4-2133MHz (2Rx4) RDIMM	8 / 16
4X70G88311	Lenovo ThinkServer 32GB DDR4-2133MHz (2Rx4) RDIMM	8 / 16
4X70F28591	Lenovo ThinkServer 32GB DDR4-2133MHz (4Rx4) LRDIMM	8 / 16

* Maximum supported with 1 processor / 2 processors installed

The server supports up to 8 DIMMs when one processor is installed and up to 16 DIMMs when two processors are installed. Each processor has four memory channels, and there are two DIMMs supported per channel. The server supports up to 1024 GB of memory at speeds up to 2133 MHz when fully populated. The actual memory speed in the system is determined as the lowest of the memory speed that is supported by the specific CPU or the maximum operating speeds for the memory configuration that is based on the number of DIMMs per channel.

ThinkServer engineering tested and validated system designs that support memory speeds beyond Intel's original plan, which provides benefits for workloads that require memory speed and density. Lenovo ThinkServer memory is fully supported up to the rated speeds that are listed in the following table.

Table 4. Memory maximums

DIMMs per channel	RDIMM		LR-DIMM	
	Memory bus speed	Maximum capacity	Memory bus speed	Maximum capacity
1 DPC	2133 MHz	256 GB (8x 32 GB)	2133 MHz	512 GB (8x 64 GB)
2 DPC	2133 MHz	512 GB (16x 32 GB)	2133 MHz	1024 GB (16x 64 GB)

Protection against data loss is provided through the following memory RAS features: ECC, Patrol and Demand Scrubbing, Sparing, Mirroring, and Lockstep Mode.

Configuration Guidelines

Memory can be configured to meet various needs and workloads subject to the following general rules:

- Mixing memory type (RDIMM, LRDIMM) is not supported.
- Mixing memory speeds (2400 MHz and 2133 MHz) is supported. 2400 MHz memory will operate at most at 2133 MHz.
- DIMM capacities and rank can be mixed.

When you are populating for the various RAS modes the following rules apply:

- If memory mirroring or lockstep is used, DIMMs must be installed in pairs (minimum of one pair per each CPU), and both DIMMs in a pair must be identical in type, size, and rank.
- If memory sparing is used, one rank of a DIMM in each populated channel is reserved as spare memory; therefore, Single Rank DIMMs cannot be used. DIMMs in a pair must be identical in type, size, and rank.

Memory Optimization

The memory subsystem can be optimized for various factors, including performance, capacity, or power consumption. Refer to the following guidelines when you are selecting memory options:

- Guidelines for maximum memory performance:
 - Use all available memory channels (four per processor, eight total per system).
 - Use identical DIMM populations in size and speed across channels.
 - Populate both processors with equal amounts of memory.
 - Use the same number of ranks that are populated per channel.
 - Have at least two ranks available on each channel.
- Guidelines for lowest memory power consumption:
 - Use fewer, higher capacity DIMMs. For example, a 8x 16 GB DIMM configuration often has lower power requirements than that of a 16x 8 GB DIMM configuration.
 - Populating more DIMMs per channel and the use of less channels (opposite of the previous guidance) reduces overall system power, but at the cost of significant performance reduction.

The following table provides guidelines for selecting memory configurations that are based on performance or capacity. For example, to achieve optimal 2133 MHz performance at a specific capacity, populate up to 16 DIMMs (up to 8 per CPU). To achieve the maximum memory capacity with the highest performance, populate up to 16 sockets with LRDIMMs.

Table 5. Memory configuration guidelines

Desired system capacity	Number of processors	Number of DIMMs and size	Number of channels used	Recommended DIMM type	Operating frequency	Comments
4GB	1 CPU	1x 4 GB	1 channel	RDIMM	2133 MHz	Minimum configuration for 1 CPU
8GB	1 CPU	1x 8 GB	1 channel	RDIMM	2133 MHz	Cost optimized
16GB	1 CPU	2x 8 GB	2 channel	RDIMM	2133 MHz	Cost optimized
32GB	1 CPU	8x 4 GB	4 channels	RDIMM	2133 MHz	Best throughput with one CPU
64GB	1 CPU	8x 8 GB	4 channels	RDIMM	2133 MHz	
128GB	1 CPU	8x 16GB	4 channels	RDIMM	2133 MHz	
256GB	1 CPU	8x 32 GB	4 channels	RDIMM	2133 MHz	
256GB	1 CPU	8x 32 GB	4 channels	RDIMM LRDIMM	1866 MHz	Highest 1 CPU capacity
32GB	2 CPU	8x 4 GB	4 channels	RDIMM	2133 MHz	Cost optimized
64GB	2 CPU	16x 4 GB	8 channels	RDIMM	2133 MHz	Best throughput with two CPUs
128GB	2 CPU	16x 8 GB	8 channels	RDIMM	2133 MHz	
192GB	2 CPU	8x 8 GB + 8x 16 GB	8 channels	RDIMM	2133 MHz	
256GB	2 CPU	16x 16 GB	8 channels	RDIMM	2133 MHz	
512GB	2 CPU	16x 32 GB	8 channels	RDIMM	2133 MHz	Highest capacity at best throughput & latency
1024GB	2 CPU	16x 64 GB	8 channels	LRDIMM	2133 MHz	Highest capacity at best throughput & price

Internal storage

The RD450 supports chassis configurations with either 2.5-inch drive bays or 3.5-inch drive bays. Some configurations also support an optical drive or both an optical drive and an internal LTO6 tape drive. The five available drive configurations are shown in the following figure (the 3rd diagram indicates two of the five configurations).

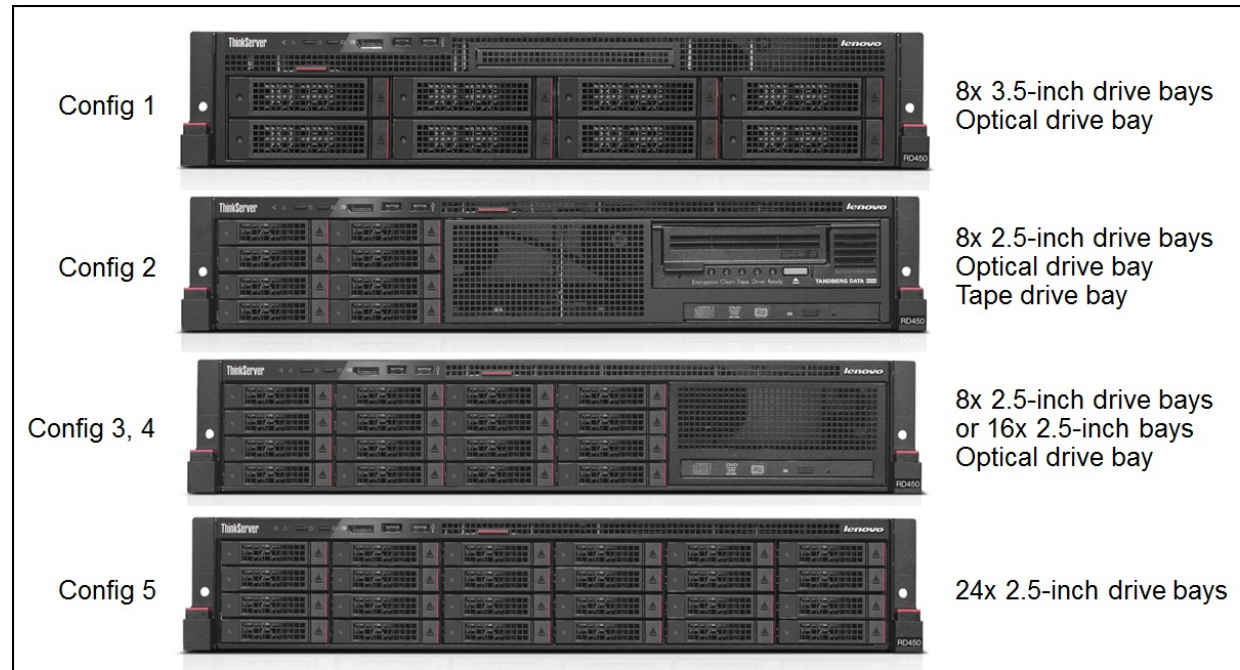


Figure 6. Available drive bay configurations

There are three backplanes available for the RD450:

- 8x 3.5-inch drive backplane
- 8x 2.5-inch drive backplane
- 16x 2.5-inch drive backplane

The following table shows the specifics of each of the five drive bay configurations.

Table 6. Backplanes and drive support

Config (Figure 6)	Number of available drive bays	Backplanes required	Supports Optical drive	Supports Tape drive
Config 1	8x 3.5-inch hot-swap drives	One 8x3.5 backplane	Yes	No
Config 2	8x 2.5-inch hot-swap drives + Tape	One 8x2.5 backplane	Yes	Yes*
Config 3	8x 2.5-inch hot-swap drives	One 8x2.5 backplane	Yes	No
Config 4	16x 2.5-inch hot-swap drives	Two 8x2.5 backplane	Yes	No
Config 5	24x 2.5-inch hot-swap drives	One 8x2.5 backplane + One 16x2.5 backplane	No	No

* The use of a tape drive also requires the AnyRAID 720ix controller be installed

The 16x2.5 and 24x2.5 bay configurations can start with just one backplane and the second backplane can be added later, using the options listed in the following table.

Table 7. Backplane options

Part Number	Description
4XF0G45894	Front 2.5-inch backplane kit (8 drive)
4XF0G45895	Front 2.5-inch backplane kit (16-drive)

The server also supports an optional SD Card module which installs into a dedicated slot on the system board and supports two SDHC cards. See the [SD Card storage options](#) section for information.

SD cards can be configured redundantly by using the operating system. The SD cards are enabled via a USB port from the system board Platform Controller Hub (PCH) and do not require a RAID controller.

Controllers for internal storage

The RD450 supports one RAID controller for all internal drives. Controller options are listed in the following table. The maximum supported column indicates which slots each adapter is supported in. For slot locations see the [I/O expansion options](#) section.

Table 8. Supported RAID controllers

Part number	Description	Maximum supported
Configurations with 2.5-inch drive bays		
None	Lenovo ThinkServer RAID 110i AnyRAID Adapter	1
4XC0G88837	Lenovo ThinkServer RAID 510i AnyRAID Adapter	1
4XC0G88838	Lenovo ThinkServer RAID 720i AnyRAID Adapter	1
4XC0G88839	Lenovo ThinkServer RAID 720ix AnyRAID Adapter with Expander	1
Configurations with 3.5-inch drive bays		
None	Lenovo ThinkServer RAID 110i	1
4XC0G88834	Lenovo ThinkServer Gen5 RAID 500 PCIe Adapter	1 (slot 1)
4XB0G45758	Lenovo ThinkServer RD350,RD450 RAID 500 PCIe Adapter	1 (slot 1)
4XC0G88836	Lenovo ThinkServer Gen 5 RAID 710 PCIe Adapter	1 (slot 1)

Models with 2.5-inch drives support an AnyRAID adapter, which is installed on a dedicated slot on the drive backplane. Supported controllers are as follows:

- AnyRAID 110i offers a low-cost solution for light workloads with limited users. It supports 6 GB SATA drives with RAID 0/1/10 with optional RAID 5. The AnyRAID 110i is a pass-through card that routes the embedded controller in the Intel C610 PCH to the backplane. Supports SATA drives only. RAID support only with 6 drives; remaining 2 drives (if installed) must be configured as single drives (AHCI mode).
- AnyRAID 510i is an IOC-based RAID card that offers an affordable hardware controller that delivers performance and reliability. It supports 6 GB SAS & SATA drives and RAID 0/1/10 with optional RAID 5/50. Maximum 8 drives.
- AnyRAID 720i is a RoC-based 12Gb SAS/SATA controller that offers advanced RAID configurations, protection, and software. It supports RAID 0/1/5/6/10/50/60 with optional 1 GB cache (without flash), or 1 GB, 2 GB or 4 GB cache each with CacheVault (flash), CacheCade, and FastPath support. Maximum 8 drives.
- AnyRAID 720ix is similar to the 720i but also includes a SAS Expander to support up to 24 drives. It is a 12 GB SAS/SATA controller with support for RAID 0/1/5/6/10/50/60. Cache is required, either 1

GB cache (without flash), or 1 GB, 2GB or 4GB cache each with CacheVault (flash), CacheCade, and FastPath support.

Note: If the server configuration includes an internal LTO6 tape drive, the AnyRAID 720ix is required.

Models with 3.5-inch drives support either an embedded controller or a PCIe RAID adapter. Supported controllers are as follows:

- Embedded RAID 110i controller in the Intel C610 PCH routed via cable to the backplane. Supports SATA drives only. RAID support only with 6 drives; remaining 2 drives (if installed) must be configured as single drives (AHCI mode).
- RAID 500 adapter supporting RAID 0/1/10 with optional RAID 5/50
- RAID 710 adapter supporting RAID 0/1/5/6/10/50/60 with 1 GB cache standard. Optional CacheVault and CacheCade support.

The following table summarizes the features and specifications of RAID controllers for use with 2.5-inch drive bay configurations.

Table 9. RAID controller features and specifications summary - 2.5-inch drive configurations

Feature	AnyRAID 110i	AnyRAID 510i	AnyRAID 720i	AnyRAID 720ix
Part number	None	4XC0G88837	4XC0G88838	4XC0G88839
Form factor	AnyRAID (passthru)	AnyRAID	AnyRAID	AnyRAID
Controller chip	Intel PCH	LSI SAS2008	LSI SAS3108	LSI SAS3108
Host interface	Not applicable	PCIe 2.0 x8	PCIe 3.0 x8	PCIe 3.0 x8
Port interface	6 Gbps SATA	6 Gbps SAS	12 Gbps SAS	12 Gbps SAS
Drive interface	SATA	SAS, SATA	SAS, SATA	SAS, SATA
Includes SAS expander	No	No	No	Yes
Drive type	HDD, SSD	HDD, SSD	HDD, SSD	HDD, SSD
Number of drives	8*	8	8	24
RAID levels	0/1/10, Optional 5 (4XB0F28690)	0/1/10, Optional 5/50 (4XB0F28692)	0/1/10/5/50, Optional 6/60 with cache upgrade	0/1/10/5/50/6/60
JBOD mode	Yes	Yes	Yes (without cache)	Yes (with 1GB no-backup cache)
Cache (some with CacheVault flash-backed cache)	None	None	Optional: 1 GB flash-backed (4XB0F28696) 2 GB flash-backed (4XB0F28697) 4 GB flash-backed (4XB0F28698) 1 GB (no backup) (4XB0F28695)	Required: 1 GB flash-backed (4XB0F28696) 2 GB flash-backed (4XB0F28697) 4 GB flash-backed (4XB0F28698) 1 GB (no backup) (4XB0F28695)
FastPath	No	No	Yes (with flash backup)	Yes (with flash backup)

Feature	AnyRAID 110i	AnyRAID 510i	AnyRAID 720i	AnyRAID 720ix
CacheCade 2.0	No	No	Yes (with flash backup)	Yes (with flash backup)
RD450 internal tape drive support	No	No	No	Yes

* Up to 6 drives can be configured in a RAID array, and the remaining two drives operate in JBOD mode.

The following table summarizes the features and specifications of RAID controllers for use with 3.5-inch drive bay configurations.

Table 10. RAID controller features and specifications summary - 3.5-inch drive configurations

Feature	RAID 110i	RAID 500	RAID 710
Part number	None	4XC0G88834 4XB0G45758	4XC0G88836
Form factor	Cable from system board	PCIe	PCIe
Connectors	None	2x Mini-SAS SFF8087	2x Mini-SAS SFF8087
Controller chip	Intel PCH	LSI SAS2008	LSI SAS2208
Based on	None	LSI MegaRAID SAS 9240-8i	LSI MegaRAID SAS 9270-8i
Host interface	Not applicable	PCIe 2.0 x8	PCIe 3.0 x8
Port interface	6 Gbps SATA	6 Gbps SAS	6 Gbps SAS
Drive interface	SATA	SAS, SATA	SAS, SATA
Includes SAS expander	No	No	No
Drive type	HDD, SSD	HDD, SSD	HDD, SSD
Number of drives	8*	8	8
RAID levels	0/1/10, Optional 5 (4XB0F28690)	0/1/10, Optional 5/50 (4XC0G88835)	0/1/10/5/50/6/60
JBOD mode	Yes	Yes	No
Cache	None	None	1 GB
Flash-backed cache (CacheVault)	No	No	Optional (4X50G88110 or 4XB0G45761)
FastPath	No	No	No
CacheCade 2.0	No	No	Optional (4XB0F28702)

* Up to 6 drives can be configured in a RAID array, and the remaining two drives operate in JBOD mode.

The following table summarizes the available RAID controller upgrades for the controllers supported in the RD450.

Table 11. RAID controller upgrades

Part number	Description
AnyRAID 110i and RAID 110i upgrade	
4XB0F28690	Lenovo ThinkServer RAID 110i RAID 5 Upgrade
AnyRAID 510i upgrade	
4XB0F28692	Lenovo ThinkServer RAID 510i RAID 5 Upgrade
AnyRAID 720i and 720ix upgrades	
4XB0F28695	Lenovo ThinkServer RAID 720i 1GB Modular DRAM Upgrade
4XB0F28696	Lenovo ThinkServer RAID 720i 1GB Modular Flash and Supercapacitor Upgrade
4XB0F28697	Lenovo ThinkServer RAID 720i 2GB Modular Flash and Supercapacitor Upgrade
4XB0F28698	Lenovo ThinkServer RAID 720i 4GB Modular Flash and Supercapacitor Upgrade
RAID 500 upgrade	
4XC0G88835	Lenovo ThinkServer RAID 500 RAID 5 Upgrade
RAID 700 upgrades	
4XB0F28702	Lenovo ThinkServer RAID CacheCade Pro 2.0 Key
4XB0G45761	Lenovo ThinkServer CacheVault Data Protection Upgrade II
4X50G88110	Lenovo ThinkServer CacheVault Data Protection Upgrade III

Internal drive options

The following tables list the hard disk drive and solid-state drive options for the internal disk storage of the server.

- Table 12: [2.5-inch hot-swap 12 Gb SAS/SATA HDDs](#)
- Table 13: [2.5-inch hot-swap 6 Gb SAS/SATA HDDs](#)
- Table 14: [2.5-inch hot-swap 12 Gb SAS/SATA SSDs](#)
- Table 15: [3.5-inch hot-swap 12 Gb SAS/SATA HDDs](#)
- Table 16: [3.5-inch hot-swap 6 Gb SAS/SATA HDDs](#)
- Table 17: [3.5-inch hot-swap 12 Gb SAS/SATA SSDs](#)
- Table 18: [3.5-inch easy-swap 12 Gb SAS/SATA HDDs](#)
- Table 19: [3.5-inch easy-swap 6 Gb SAS/SATA HDDs](#)

Table 12. 2.5-inch hot-swap 12 Gb SAS/SATA HDDs

Part number	Description	Maximum supported
2.5-inch hot-swap HDDs - 12 Gb SAS 10K		
4XB0G88732	ThinkServer Gen 5 2.5" 300GB 10K Enterprise SAS 12Gbps Hot Swap Hard Drive	24
4XB0G88734	ThinkServer Gen 5 2.5" 600GB 10K Enterprise SAS 12Gbps Hot Swap Hard Drive	24
4XB0G88735	ThinkServer Gen 5 2.5" 900GB 10K Enterprise SAS 12Gbps Hot Swap Hard Drive	24
4XB0G88736	ThinkServer Gen 5 2.5" 1.2TB 10K Enterprise SAS 12Gbps Hot Swap Hard Drive	24
4XB0G88737	ThinkServer Gen 5 2.5" 1.8TB 10K Enterprise SAS 12Gbps Hot Swap Hard Drive	24
2.5-inch hot-swap HDDs - 12 Gb SAS 15K		
4XB0G88739	ThinkServer Gen 5 2.5" 300GB 15K Enterprise SAS 12Gbps Hot Swap Hard Drive	24
4XB0G88765	ThinkServer Gen 5 2.5" 600GB 15K Enterprise SAS 12Gbps Hot Swap Hard Drive	24

Table 13. 2.5-inch hot-swap 6 Gb SAS/SATA HDDs

Part number	Description	Maximum supported
2.5-inch hot-swap HDDs - 6 Gb NL SATA		
4XB0G45721	ThinkServer Gen 5 2.5" 1TB 7.2K Enterprise SATA 6Gbps Hot Swap Hard Drive	24
4XB0G88774	ThinkServer Gen 5 2.5" 2TB 7.2K Enterprise SATA 6Gbps Hot Swap HardDrive	24

Table 14. 2.5-inch hot-swap 12 Gb SAS/SATA SSDs

Part number	Description	Maximum supported
2.5-inch hot-swap SSDs - 12 Gb SAS - Enterprise Mainstream (3-5 DWPD)		
4XB0K12258	ThinkServer 2.5" 400GB PM1635 Enterprise Mainstream 12Gb SAS Hot Swap Solid State Drive	24
4XB0K12259	ThinkServer 2.5" 800GB PM1635 Enterprise Mainstream 12Gb SAS Hot Swap Solid State Drive	24
4XB0K12260	ThinkServer 2.5" 1.6TB PM1635 Enterprise Mainstream 12Gb SAS Hot Swap Solid State Drive	24

Table 15. 3.5-inch hot-swap 12 Gb SAS/SATA HDDs

Part number	Description	Maximum supported
3.5-inch hot-swap HDDs - 12 Gb SAS 15K		
4XB0G88740	ThinkServer Gen 5 3.5" 300GB 15K Enterprise SAS 12Gbps Hot Swap Hard Drive	8
4XB0G88746	ThinkServer Gen 5 3.5" 600GB 15K Enterprise SAS 12Gbps Hot Swap Hard Drive	8
3.5-inch hot-swap HDDs - 12 Gb SAS 10K		
4XB0G88733	ThinkServer Gen 5 3.5" 300GB 10K Enterprise SAS 12Gbps Hot Swap Hard Drive	8
4XB0G88761	ThinkServer Gen 5 3.5" 600GB 10K Enterprise SAS 12Gbps Hot Swap Hard Drive	8
4XB0G88762	ThinkServer Gen 5 3.5" 900GB 10K Enterprise SAS 12Gbps Hot Swap Hard Drive	8
4XB0G88763	ThinkServer Gen 5 3.5" 1.2TB 10K Enterprise SAS 12Gbps Hot Swap Hard Drive	8
4XB0G88738	ThinkServer Gen 5 3.5" 1.8TB 10K Enterprise SAS 12Gbps Hot Swap Hard Drive	8
3.5-inch hot-swap HDDs - 12 Gb NL SAS		
4XB0G88730	ThinkServer Gen 5 3.5" 2TB 7.2K Enterprise SAS 12Gbps Hot Swap Hard Drive (512e)	8
4XB0G88731	ThinkServer Gen 5 3.5" 4TB 7.2K Enterprise SAS 12Gbps Hot Swap Hard Drive (512e)	8
4XB0G88715	ThinkServer Gen 5 3.5" 6TB 7.2K Enterprise SAS 12Gbps HS HDD (512e)	8
4XB0K12254	ThinkServer Gen 5 3.5" 8TB 7.2K Enterprise SAS 12Gbps Hot Swap Hard Drive (512e)	8
4XB0K12312	ThinkServer Gen 5 3.5" 10TB 7.2K Enterprise SAS 12Gbps HS 512e HDD	8
4XB0K12270	ThinkServer Gen5 3.5" 1TB 7.2K Enterprise SAS 12Gbps HS HDD (512n)	8
4XB0K12278	ThinkServer Gen 5 3.5" 2TB 7.2K Enterprise SAS 12Gbps HS HDD (512n)	8
4XB0K12279	ThinkServer Gen 5 3.5" 4TB 7.2K Enterprise SAS 12Gbps HS HDD (512n)	8

Table 16. 3.5-inch hot-swap 6 Gb SAS/SATA HDDs

Part number	Description	Maximum supported
3.5-inch hot-swap HDDs - 6 Gb NL SATA		
4XB0F28712	ThinkServer Gen 5 3.5" 1TB 7.2K Enterprise SATA 6Gbps Hot Swap Hard Drive	8
4XB0F28713	ThinkServer Gen 5 3.5" 2TB 7.2K Enterprise SATA 6Gbps Hot Swap Hard Drive	8
4XB0G45715	ThinkServer Gen 5 3.5" 4TB 7.2K Enterprise SATA 6Gbps Hot Swap Hard Drive	8
4XB0G88713	ThinkServer Gen 5 3.5" 6TB 7.2K Enterprise SATA 6Gbps HS HDD	8
4XB0K12255	ThinkServer Gen 5 3.5" 8TB 7.2K Enterprise SATA 6Gbps HS HDD	8
4XB0K12313	ThinkServer Gen 5 3.5" 10TB 7.2K Enterprise SATA 6Gbps HS 512e HDD	8
4XB0N68532	ThinkServer Gen 5 3.5" 12TB 7.2K Enterprise SATA 6Gbps Hot Swap 512e HDD	8

Table 17. 3.5-inch hot-swap 12 Gb SAS/SATA SSDs

Part number	Description	Maximum supported
3.5-inch hot-swap SSDs - 12 Gb SAS - Enterprise Mainstream (3-5 DWPD)		
4XB0K12261	ThinkServer 3.5" 400GB PM1635 Enterprise Mainstream 12Gb SAS Hot Swap Solid State Drive	8
4XB0K12262	ThinkServer 3.5" 800GB PM1635 Enterprise Mainstream 12Gb SAS HS SSD	8
4XB0K12263	ThinkServer 3.5" 1.6TB PM1635 Enterprise Mainstream 12Gb SAS Hot Swap Solid State Drive	8

Table 18. 3.5-inch easy-swap 12 Gb SAS/SATA HDDs

Part number	Description	Maximum supported
3.5-inch easy-swap HDDs - 12 Gb NL SAS		
4XB0K12290	ThinkServer Gen 5 3.5" 2TB 7.2K Enterprise SAS 12Gbps EasySwap Hard Drive	8
4XB0K12291	ThinkServer Gen 5 3.5" 4TB 7.2K Enterprise SAS 12Gbps EasySwap Hard Drive	8
4XB0K12292	ThinkServer Gen 5 3.5" 6TB 7.2K Enterprise SAS 12Gbps EasySwap Hard Drive	8

Table 19. 3.5-inch easy-swap 6 Gb SAS/SATA HDDs

Part number	Description	Maximum supported
3.5-inch easy-swap HDDs - 6 Gb NL SAS		
4XB0K12286	ThinkServer Gen 5 3.5" 1TB 7.2K Enterprise SAS 6Gbps EasySwap Hard Drive	8
3.5-inch easy-swap HDDs - 6 Gb NL SATA		
4XB0F28708	ThinkServer Gen 5 3.5" 1TB 7.2K Enterprise SATA 6Gbps Easy Swap Hard Drive	8
4XB0F28709	ThinkServer Gen 5 3.5" 2TB 7.2K Enterprise SATA 6Gbps Easy Swap Hard Drive	8
4XB0K12314	ThinkServer Gen 5 3.5" 10TB 7.2K Enterprise SATA 6Gbps EasySwap 512e HDD	8
4XB0N68534	ThinkServer Gen 5 3.5" 12TB 7.2K Enterprise SATA 6Gbps NHS 512e HDD	8

SD Card storage options

The RD450 also supports SD memory cards, which can be used to boot the operating system. The RD450 supports two SD memory cards via an optional module that is connected to USB ports on the system board. SD cards can be configured redundantly by using the operating system. The SD cards are enabled via a USB port from the system board Platform Controller Hub (PCH), and do not require a RAID controller.

Table 20. SD Card options

Part Number	Description	Maximum supported
4XF0G88933	ThinkServer SDHC Flash Assembly Module (supports 2 SDHC cards)	1
4X70F28592	ThinkServer 8GB SD Card	2
4X70F28593	ThinkServer 32GB SD Card	2

Internal backup units

The RD450 supports an internal LTO6 tape drive in configurations that support a maximum of eight 2.5-inch drive bays. See Configuration 2 in Figure 3 in the [Locations of key components and connectors](#) section.

To support a tape drive, the AnyRAID 720ix RAID controller must be used. The SAS connection for the tape drive is routed from the RAID controller.

The following table lists the part numbers for tape support.

Table 21. Internal LTO6 tape drive options

Part number	Description
4XF0G45866	Lenovo ThinkServer LTO-6 Linear Tape Drive Kit by Tandberg
4XB0F28689	2.5 TB LTO6 Tape Cartridge

The tape drive kit includes the necessary cables and mounting hardware to install the tape drive in the server.

Optical drives

The RD450 server supports the optical drive options listed in the following table.

Table 22. Optical drives

Part number	Description	Maximum supported
4XA0F28609	ThinkServer RD350,RD450 Slim SATA DVD-RW Optical Disk Drive	1
4XA0F28610	ThinkServer RD350,RD450 Slim SATA DVD-ROM Optical Disk Drive	1

I/O expansion options

The RD450 supports up to six slots, depending on the riser cards installed and the number of processors installed. The slots are numbered as follows:

1. PCIe 3.0 x8 (x16 mechanical) full-height half-length slot (riser 1)
2. PCIe 3.0 x8 (x16 mechanical) full-height half-length slot (riser 1)
3. PCIe 3.0 x8 (x16 mechanical) Low Profile slot (riser 2, requires CPU 2)
4. PCIe 3.0 x8 (x16 mechanical) Low Profile slot (riser 2, requires CPU 2)
5. PCIe 3.0 x8 (x16 mechanical) Low Profile slot (riser 2, requires CPU 2)
6. PCIe 3.0 x8 (x16 mechanical) Low Profile slot (requires CPU 2)

Slot 6 is not part of a riser and is connected directly to the system board

Note: Although Slot 5 electrically connects to CPU 1, the use of Slot 5 requires riser 2, and support for riser 2 requires CPU 2. As a result, the use of Slot 5 requires CPU 2.

The following figure shows the location of the slots, as seen from the rear of the server.

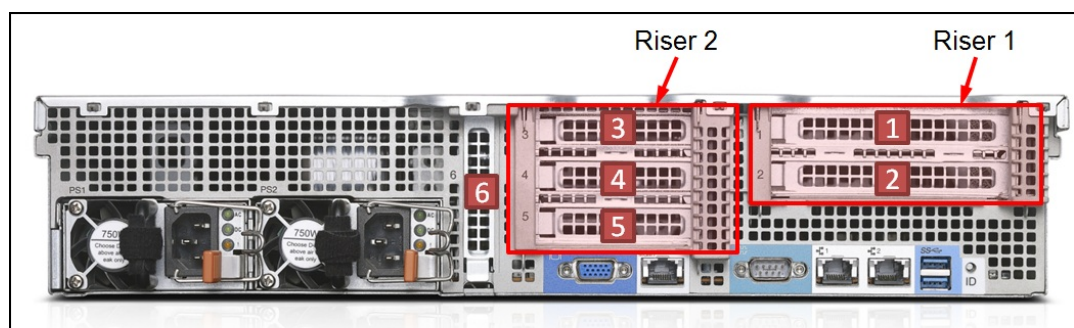


Figure 7. Slot numbering

The ordering information for the riser card is shown in the following table. Riser 1 and Riser 2 are the same part number.

Table 23. Riser card option

Part number	Description	Maximum supported
4XF0G45897	Lenovo ThinkServer RD450 x8/x8/x8 PCIe Riser Kit Can be used in either riser slot 1 or riser slot 2, however use in riser slot 2 requires second CPU	2

Network adapters

The RD450 supports two integrated Gigabit Ethernet ports controlled by a single integrated network interface controller (NIC):

- Based on the Intel i210 controller
- Two Gigabit Ethernet ports
- NIC Teaming (load balancing and failover)
- Port 1 supports NCSI to enable shared access to the management controller
- Supports Wake-on-LAN (WOL)

- Ethernet features:
 - Compliant with 1 Gb Ethernet IEEE 802.3, 802.3u, and 802.3ab PHY specifications
 - Integrated PHY for 10/100/1000 Mbps for multispeed, full, and half-duplex auto-negotiation
 - Automatic MDI crossover
 - IEEE 802.3x-compliant flow control support
 - IEEE 1588 protocol and 802.1AS time synchronization implementation
 - IEEE802.3az - Energy Efficient Ethernet (EEE)
 - IEEE 802.1q Virtual Local Area Network (VLAN) tagging support
- Stateless offload and performance features:
 - TCP, IP, and User Datagram Protocol (UDP) checksum offload
 - TCP segmentation offload (TCO)
 - Large Send Offload (LSO)
 - Receive Side Scaling (RSS) and Transmit Side Scaling (TSS)
 - Message Signal Interrupt (MSI) and Message Signal Interrupt Extension (MSI-X) support
 - Support for jumbo frames up to 9600 bytes

Note: iSCSI offload and iSCSI boot are not supported

The following table lists additional supported network adapters.

Table 24. Supported Ethernet adapters

Part number	Description	Maximum supported*
1 Gb Ethernet		
4XC0F28724	ThinkServer OCe14102-NX 10Gbps Dual Port Ethernet Adapter by Emulex	2 / 6 (All slots)
4XC0F28730	ThinkServer I350-T2 PCIe 1Gb 2 Port Base-T Ethernet Adapter by Intel	2 / 6 (All slots)
4XC0F28731	ThinkServer I350-T4 PCIe 1Gb 4 Port Base-T Ethernet Adapter by Intel	2 / 6 (All slots)
10 Gb Ethernet		
4XC0F28732	ThinkServer X540-T2 PCIe 10Gb 2 Port Base-T Ethernet Adapter by Intel	2 / 6 (All slots)
4XC0F28733	ThinkServer X520-SR2 PCIe 10Gb 2 Port SFP+ Ethernet Adapter by Intel	2 / 6 (All slots)
4XC0F28734	ThinkServer X520-DA2 PCIe 10Gb 2 Port SFP+ Ethernet Adapter by Intel	2 / 6 (All slots)
4XC0G88855	ThinkServer X550-T1 PCIe 10Gb 1 Port Base-T Ethernet Adapter by Intel	2 / 6 (All slots)
4XC0G88856	ThinkServer X550-T2 PCIe 10Gb 2 Port Base-T Ethernet Adapter by Intel	2 / 6 (All slots)
4XC0G88852	ThinkServer X710-DA2 PCIe 10Gb 2 port Ethernet Adapter by Intel	2 / 6 (All slots)
4XC0G88854	ThinkServer X710-DA4 PCIe 10Gb 4 port Ethernet Adapter by Intel	2 / 6 (All slots)
4XC0F28735	ThinkServer 10Gb Optical Module by Intel (for use with Intel SFP+ adapters)	2 per card
4XC0F28736	ThinkServer OCe14102-UX-L PCIe 10Gb 2 Port SFP+ Converged Network Adapter by Emulex	2 / 6 (All slots)
4XC0F28737	ThinkServer 10Gb Optical Module by Emulex (for use with 4XC0F28736)	2 per card
40 Gb Ethernet		
4XC0F28738	ThinkServer OCe14401-UX-L PCIe 40Gb 1 Port QSFP+ Converged Network Adapter by Emulex	2 / 6 (All slots)
4XC0F28739	ThinkServer 40Gb Optical Module by Emulex (for use with 4XC0F28738)	1 per card

* Maximum supported for 1 CPU / 2 CPU installed.

For more information, see the list of Product Guides in the Ethernet category:

<https://lenovopress.com/servers/options/ethernet>

SAS adapters for external storage

The following table lists the supported SAS HBAs and RAID adapters.

Table 25. Supported SAS HBAs and RAID adapters

Part number	Description	Max Supported (1 CPU / 2 CPU)
SAS HBAs		
4XB0G88727	ThinkServer 8885e PCIe 12Gb 8 port external SAS Adapter by PMC	2 / 6 (All slots)
4XB0F28703	ThinkServer 9300-8e PCIe 12Gb 8 Port External SAS Adapter by LSI	1 / 5 (All except slot 2)
RAID controllers for external storage		
4XB0F28699	ThinkServer 9286CV-8e PCIe 6Gb 8 Port External SAS RAID Adapter by LSI	2 / 6 (All slots)
Options for the 9286CV-8e controller		
4XB0F28702	ThinkServer RAID CacheCade Pro 2.0 Key	1 per card
4XB0G45761	ThinkServer CacheVault Data Protection Upgrade II	1 per card

The following table compares the features of the supported HBAs and external RAID adapters.

Table 26. Feature comparison

	9286CV-8e	9300-8e	8885e*
Adapter type	RAID controller	SAS HBA	SAS HBA
Part number	4XB0F28699	4XB0F28703	4XB0G88727
Form factor	Low profile	Low profile	Low profile
Controller chip	LSI SAS2208	LSI SAS3008	PMC PM8063
Host interface	PCIe 3.0 x8	PCIe 3.0 x8	PCIe 3.0 x8
Port interface	6 Gbps SAS	12 Gbps SAS	12 Gbps SAS
Number of external ports	8	8	8
External port connectors	2x Mini-SAS (SFF-8088)	2x Mini-SAS HD (SFF-8644)	2x Mini-SAS HD (SFF-8644)
Drive interface	SAS, SATA	SAS, SATA	SAS, SATA
Drive type	HDD, SSD	HDD, SSD	HDD, SSD
Maximum number of devices	240	1024	256
Maximum number of expansion units	8	8	8
RAID levels	0/1/10/5/50/6/60	None	None
JBOD mode	No	Yes	Yes
Cache	1 GB	None	1 GB
CacheVault cache protection	Optional (4XB0G45761)	None	None
FastPath	Included	None	None
CacheCade Pro 2.0	Optional (4XB0F28702)	None	None

* In addition to eight external ports, the ThinkServer 8885e adapter has eight internal ports.

Fibre Channel host bus adapters

The following table lists the supported Fibre Channel HBAs.

Table 27. Supported FC host bus adapters

Part number	Description	Max Supported (1 CPU / 2 CPU)
16 Gb Fibre Channel HBAs		
4XB0F28704	Lenovo ThinkServer LPe16002B-M8-L PCIe 8Gb 2 Port Fibre Channel Adapter by Emulex	2 / 6 (All slots)
4XB0F28705	Lenovo ThinkServer LPe16002B-M6-L PCIe 16Gb 2 Port Fibre Channel Adapter by Emulex	2 / 6 (All slots)
4XC0F28745	Lenovo ThinkServer QLE2672 PCIe 16Gb 2 Port Fibre Channel Adapter by QLogic	2 / 6 (All slots)
4XB0F28654	ThinkServer QLE2670 Single Port 16Gb Fibre Channel HBA by QLogic	2 / 6 (All slots)
4XB0F28653	ThinkServer LPe16000B Single Port 16Gb Fibre Channel HBA by Emulex	2 / 6 (All slots)
8 Gb Fibre Channel HBAs		
0C19476	ThinkServer LPe1250 Single Port 8Gb fibre Channel HBA by Emulex	2 / 6 (All slots)
0C19478	ThinkServer LPe12002 Dual Port 8Gb fibre Channel HBA by Emulex	2 / 6 (All slots)
0C19482	ThinkServer QLE2562 Dual Port 8Gb fibre Channel HBA by QLogic	2 / 6 (All slots)
4XB0F28649	ThinkServer QLE2560 Single Port 8Gb fibre Channel HBA by QLogic	2 / 6 (All slots)
4XB0F28652	ThinkServer LPe16000B Single Port 8Gb Fibre Channel HBA by Emulex	2 / 6 (All slots)

PCIe Flash Storage adapters

The RD450 supports the following PCIe Flash Storage adapters. For slot locations see the [I/O expansion options](#) section.

Table 28. PCIe Flash Storage adapters

Part number	Description	Max supported (1 CPU / 2 CPU)
4XB0G88747	LTS 1.6TB ioMemory SX350 Performance PCIe 2.0 SSD by Sandisk	0 / 2 (slot 1, 2)
4XB0G88748	LTS 3.2TB ioMemory SX350 Performance PCIe 2.0 SSD by Sandisk	0 / 2 (slot 1, 2)
4XB0F28661	Lenovo ThinkServer 1.6TB ioMemory SX300 Performance PCIe 2.0 Solid State Drive by FusionIO	0 / 2 (slot 1, 2)
4XB0F28662	Lenovo ThinkServer 3.2TB ioMemory SX300 Performance PCIe 2.0 Solid State Drive by FusionIO	0 / 2 (slot 1, 2)

GPU adapters

The RD450 currently does not support any GPU adapters.

Power supplies

The RD450 supports up to two redundant hot-swap AC power supplies. Power supplies are Energy Star 2.0 compliant and 80 PLUS certified. The server ships with power cords.

Power supplies that are available for the RD450 are highly efficient with Energy Star 80 Plus Platinum and Titanium supplies. Several power supply options are available and they can be selected to match the workload and configuration of the server for even greater efficiencies. All power supplies that are used in the RD450 are common across the ThinkServer next-generation server portfolio, which simplifies management across large installations.

Power supplies are auto-sensing and support both 110V and 220V AC power. In China only, the power supplies also support 240V DC. The power supplies feature a line-cord retention mechanism to prevent unintended disconnects.

The available power supply options for RD450, including their operating characteristics, efficiency ratings, and ordering information are listed in the following table

Table 29. Power supply options

Part number	Power rating	80 PLUS rating	Voltage range	Efficiency at rated load - 110V			Efficiency at rated load - 220V		
				20%	50%	100%	20%	50%	100%
4X20G87845	450 W	Platinum	100 - 240 AC	90%	92%	89%	90%	94%	91%
4X20F28579	550 W	Platinum	100-240 AC	90%	92%	89%	89%	94%	91%
4X20F28575	750 W	Platinum	100 - 240 AC	90%	92%	89%	90%	94%	91%
4X20F28576	750 W	Titanium	200 - 240 AC	No support			94%	96%	91%
4X20F28577	1100 W	Platinum	100 - 240 AC	90 %	92 %	89 %	90 %	94 %	91 %

Use the ThinkServer Power Planner to estimate power usage for a specific configuration:

<http://support.lenovo.com/us/en/downloads/ds101155>

Configuration rules:

- 1 or 2 powers supplies are supported.
- If two power supplies are installed, they must be identical
- If two power supplies are installed, they form a redundant pair
- Both active-active and active-passive forms of redundancy are supported and they are configurable through IPMI (command-line interface)

Power supply options do not ship with a power cable. Cables can be ordered if needed, as listed in the following table.

Table 30. Power cables

Part number	Description
4X90F92964	ThinkServer C13-C14 WW 250V 10A 1.8m Jumper Cord
4X90F92965	ThinkServer C13-NEMA_5-15P US 125V 10A 1.8m Power Cord
4X90F92966	ThinkServer C13-JIS_C8303 Japan 125V 7A 1.8m Power Cord
4X90F92970	ThinkServer C13-BS_1363A UK 250V 10A 1.8m Power Cord
4X90F92971	ThinkServer C13-DK_2.5A Denmark 250V 10A 1.8m Power Cord
4X90F92974	ThinkServer C13-CEE_7.7 Europe 250V 10A 1.8m Power Cord
4X90F92975	ThinkServer C13-CE123_50 Italy 250V 10A 1.8m Power Cord
4X90F92976	ThinkServer C13-NRB_14136 Brazil 250V 10A 1.8m Power Cord
4X90F92977	ThinkServer C13-IRAM_2073 LA 250V 10A 1.8m Power Cord
4X90F92981	ThinkServer C13-GB1002 PRC 250V 10A 1.8m Power Cord
4X90F92973	ThinkServer C13-SI_32 Israel 250V 10A 1.8m Power Cord
4X90F92978	ThinkServer C13-SABS_164 South Africa 250V 6A 1.8m Power Cord
39Y7938	IEC C13 to C20 jumper power cable 2.8m
46M2593	Japan 12A/125V C13 to JIS C-8303 2.8m line cord

Integrated virtualization

The RD450 offers an optional SD Card solution for operating systems. See the [SD Card storage options](#) section for information.

Systems management

A significant factor in the total cost of a server's ownership is the processes that are used for administering the system hardware, software, and support over the life of the server. Lenovo's ThinkServer system management offerings are based on industry standards, which enable integration into existing IT environments. Lenovo's tools emphasize provisioning and operational management, which is a large portion of the system cost. Optional upgrades provide more management capabilities to optimize performance and usage of the servers.

Deployment

Embedded within every Lenovo next-generation ThinkServer system, ThinkServer Deployment Manager is a tools suite that provides a complete set of provisioning capabilities from a single interface. ThinkServer Deployment Manager automates many of the tasks that are associated with server provisioning, including hardware configuration, operating system deployment, device driver (for operating system installation), firmware updates, and server cloning. Because ThinkServer Deployment Manager is integrated into the UEFI pre-boot environment, the tools operate independently of the server and are available regardless of system's operational state. Formatting a system drive or reinstalling the operating system does not remove the tools, and there are no CDs or DVDs to retrieve or store, which affects user experience or productivity.

Remote Systems Management

ThinkServer System Manager (TSM) is Lenovo's integrated systems management technology is standard on all next-generation ThinkServer systems. TSM operates independently of the server. It provides hardware-based, out-of-band remote access and management to ThinkServer systems, regardless of the server's power state or the condition of the operating system.

TSM is a fully featured management solution that is built on open industry standards that can help reduce related IT expenses by increasing a server administrator's productivity. TSM provides important health and status information to systems administrators. It also enables administrators to remotely perform most functions that otherwise require a visit to the server.

TSM can be used as part of any server systems management infrastructure and is well-suited for customers who are deploying servers in remote branches, limited-access data centers, and where one-on-one remote-control capability is required. Lenovo's design advancements address key system management concerns. In particular, TSM is a low-cost solution that supports heterogeneous environments, provides full remote management capability, and supports remote deployment.

TSM offers the following choices in management Ethernet connections that are configurable in BIOS or the TSM:

- Shared:
 - Port zero on any Ethernet AnyFabric mezzanine card is supported
 - VLANs supported to provide separation between in-band network and TSM
 - 10 Mbps maximum TSM bandwidth on 1 GbE mezzanine cards
 - 100 Mbps maximum TSM bandwidth on 10 GbE mezzanine cards
- Dedicated:
 - Uses separate network port
 - Provides complete physical separation between Mezzanine 0 and TSM
 - 1 Gbps maximum TSM bandwidth

TSM provides the following key features:

- Remote server management through the following industry standard interfaces:
 - Secure HTML5 web browser GUI that is suitable for today's mobile devices and tablets
 - IPMI 2.0
 - DCMI 1.0
 - WS-MAN
 - SMASH-CLP
 - SNMP v3 (Gets only)
- A PowerShell CLI provides increased flexibility and scripting capabilities
- Automatic out-of-band notification and alerts from:
 - SNMP Traps
 - SMTP (email)
 - CIM indications
- Configurable via web and PowerShell CLI, IPMI, WS-Man, and SMASH-CLI interfaces

ThinkServer System Manager Premium, which is available as an optional hardware upgrade key, enables the following advanced features:

- A remote console that provides complete remote control of the server. A video viewer enables graphical console, keyboard, and mouse redirection of the server.
- Remote media capability that enables the attachment of local CD-ROMs, DVD-ROMs, USB mass storage devices, ISO images, and IMG images (which are created from local folders) to the remote server.
- Support for power monitoring and management with the separately available ThinkServer Energy Manager tool. Energy Manager is a stand-alone, web-based, power management console that enables you to observe, plan, and manage server power usage to decrease power and cooling needs, which helps to lower your total cost of ownership. Energy Manager uses TSM to capture real-time power and temperature data from the ThinkServer system, which analyzes the data to optimize server power consumption and workload placement and provides controls to limit the maximum server power that is used.

The following table lists ThinkServer System Manager Premium ordering information.

Table 31. ThinkServer System Manager Premium

Description	Part number	Maximum supported
Lenovo ThinkServer System Manager Premium Module	4XF0G45867	1

ThinkServer Energy Manager

Lenovo ThinkServer Energy Manager (TEM) provides power management for servers, which enables server density and data center capacity to be increased through use of power capping.

TEM is an agent-less, web-based console that tracks and analyzes real-time power usage and thermal data for servers and other supported devices in the data center. With this data, administrators can plan and manage server power and cooling. By using built-in intelligence, TEM identifies power usage trends, ideal power settings, and cooling analysis so that you can develop power-saving usage policies that adjust server power caps that are based on server utilization, business conditions, and power usage trends. When a user-defined power or temperature threshold is reached, an alert can be generated to inform you of the event. An emergency feature can automatically help maintain business continuity; when power outages or temperature events occur, TEM can dynamically cap power to shed load and distribute remaining power to servers that are prioritizing business-critical workloads.

With the ability to monitor, analyze, and control the power and cooling of Lenovo and non-Lenovo servers, TEM enables you to take control of power management and reduce operational costs.

A single TEM license is included with all next-generation servers with TSM Premium. Licenses are available for next-generation servers without TSM, selected fourth generation ThinkServer systems, and certain third-party servers via Node License Packs, as shown in the following table. Users of Lenovo Smart Grid can upgrade to TEM at no charge.

Table 32. ThinkServer System Manager Premium

Part number	Description	Maximum supported
4L40E51621	Lenovo ThinkServer Energy Manager Node License	1 node
4L40E51622	Lenovo ThinkServer Energy Manager Node License Pack	5 nodes
4L40E51623	Lenovo ThinkServer Energy Manager Node License Pack	50 nodes

ThinkServer Partner Pack for VMware vCenter

The Lenovo Partner Pack for vSphere vCenter Server provides detailed system information about Lenovo ThinkServer hosts in a VMware virtualized environment, including extended inventory and status information about processors, memory, fans, temperature sensors, and more. It also enables actions, such as starting a remote console or the Think Server Management Module (TMM) interface.

The Partner Pack integrates into vCenter by using the open plug-in architecture and allows “one pane of glass” management for the virtualized environment, so administrators can continue to use familiar tools.

Unlike options from other server providers, the Lenovo Partner Pack integrates into vCenter and does not require the installation of extra consoles or software.

ThinkServer Partner Pack for Microsoft System Center Operations Manager

Microsoft System Center Operations Manager (SCOM) is part of the Microsoft Systems Center suite and provides the operational management functions, such as health monitoring, performance data collection, and administrator-initiated or automated actions.

Implemented as a Management Pack for SCOM, the Partner Pack is integrated into SCOM by using the native Management Pack interface, which allows IT administrators to manage ThinkServer systems by using familiar tools and “one pane of glass” management.

The Lenovo Partner Pack for SCOM automatically discovers and provides detailed system information about the Lenovo ThinkServer managed servers, including component inventory and component and sensor status. The Partner Pack also enables actions, such as restarting or powering off the ThinkServer, accessing the Remote Desktop Console via RDP, and accessing the TMM interface.

The Partner Pack uses “In-Band” management to manage ThinkServer systems that are running Microsoft Windows Operating Systems with the System Center Agent installed.

Unlike options from other server providers, the Lenovo Partner Pack integrates into SCOM and does not require the installation of extra consoles or software.

Operating system support

The server supports the following operating systems:

- Citrix XenServer 6.5
- Citrix XenServer 6.5.1
- Microsoft Windows SBS 2011 Essentials
- Microsoft Windows SBS 2011 Premium Add-on
- Microsoft Windows SBS 2011 Standard
- Microsoft Windows Server 2008 R2 x64 with SP1
- Microsoft Windows Server 2012
- Microsoft Windows Server 2012 R2
- Microsoft Windows Server 2016
- Microsoft Windows Server, version 1709
- Red Hat Enterprise Linux 6.10 x64
- Red Hat Enterprise Linux 6.5 32-bit
- Red Hat Enterprise Linux 6.5 x64
- Red Hat Enterprise Linux 6.6 32-bit
- Red Hat Enterprise Linux 6.6 x64
- Red Hat Enterprise Linux 6.7 32-bit
- Red Hat Enterprise Linux 6.7 x64
- Red Hat Enterprise Linux 6.8 32-bit
- Red Hat Enterprise Linux 6.8 x64
- Red Hat Enterprise Linux 7.0
- Red Hat Enterprise Linux 7.1
- Red Hat Enterprise Linux 7.2
- Red Hat Enterprise Linux 7.3
- Red Hat Enterprise Linux 7.4
- Red Hat Enterprise Linux 7.5
- Red Hat Enterprise Linux 7.6
- Red Hat Enterprise Linux 7.7
- Red Hat Enterprise Linux 7.8
- Red Hat Enterprise Linux 7.9
- SUSE Linux Enterprise Server 11 x64 SP3
- SUSE Linux Enterprise Server 11 x64 SP4
- SUSE Linux Enterprise Server 11 x86 SP3
- SUSE Linux Enterprise Server 11 x86 SP4
- SUSE Linux Enterprise Server 12
- SUSE Linux Enterprise Server 12 SP1
- SUSE Linux Enterprise Server 12 SP2
- SUSE Linux Enterprise Server 12 SP3
- SUSE Linux Enterprise Server 12 SP4
- SUSE Linux Enterprise Server 12 Xen SP2
- SUSE Linux Enterprise Server 12 Xen SP3
- SUSE Linux Enterprise Server 12 Xen SP4
- VMware ESXi 5.1

- VMware ESXi 5.5 U2
- VMware ESXi 5.5 U3
- VMware ESXi 6.0
- VMware ESXi 6.0 U1
- VMware ESXi 6.0 U2
- VMware ESXi 6.0 U3
- VMware ESXi 6.5
- VMware ESXi 6.5 U1
- VMware ESXi 6.5 U2
- VMware ESXi 6.5 U3

Note: The use of embedded RAID (RAID 110i) is not supported by virtualization hypervisors, including VMware ESXi, Linux KVM, Xen, and Microsoft Hyper-V. AHCI mode (non-RAID) of the controller does support hypervisors, however.

For a complete list of supported, certified and tested operating systems, plus additional details and links to relevant web sites, see the Operating System Interoperability Guide:

<https://lenovopress.com/osig#servers=rd450-e5-v3>

Security

The RD450 supports the following security features.

Trusted Platform Module (TPM)

The RD450 provides an optional Trusted Platform Module (TPM) to securely store the passwords, certificates, and encryption keys that might be used to authenticate the platform. TPM is a hardware-based system security feature that supports Trusted Computing Group (TCG) 2.0 or 1.2 depending on the option selected. TPM supports Windows BitLocker Drive encryption, which is a Windows data protection feature. BitLocker uses the TPM to protect user data and to ensure that a Windows server was not tampered with.

The Trusted Platform Module ordering information is listed in the following table.

The table also lists the Trusted Cryptographic Module (TCM) which is the equivalent v1.2 component for use in China.

Table 33. Trusted Platform Module ordering information

Part number	Description	Maximum supported
4XF0G88938	Lenovo ThinkServer Trusted Platform Module v2.0	1
4XF0G45908	ThinkServer Trusted Platform Module II (not for use in China)	1
4XF0G45869	ThinkServer Gen 5 Trusted Cryptographic Module (China only)	1

Chassis intrusion switch

The intrusion switch informs you that the server cover is not properly installed or closed by creating an event in the system event log (SEL). The following figure shows where the switch is installed.

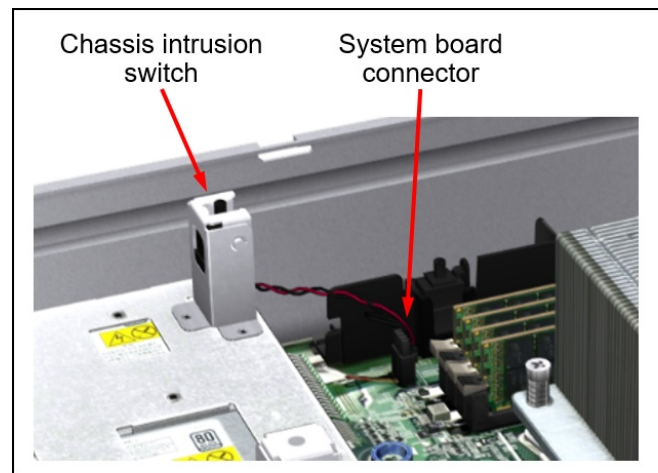


Figure 8. Chassis intrusion switch

Some models include the chassis switch and cable. For custom configurations, the SBB part number can be selected.

Table 34. Chassis intrusion switch ordering information

Part number	Description	Maximum supported
SBB 0G16686	Chassis Intrusion Cable for RD450	1

Rack installation

The RD450 supports sliding and static rails as listed in the following table. The rail systems are designed for toolless support, which enables ease of installation.

Table 35. Rack installation options

Part number	Description
4XF0G45872	Lenovo ThinkServer Gen 5 2U 4-Post Slide Rail Kit
4XF0G45873	Lenovo ThinkServer Gen 5 4-Post Static Rail Kit
4XF0G45875	Lenovo ThinkServer Gen 5 2U Cable Management Arm
4XF0G45876	Lenovo ThinkServer Gen 5 Cable Management Bar

For keyboards and KVM console options, see the [KVM console options](#) section.

The supported rail kits have the specifications listed in the following table.

Table 36. Rail kit specifications

Option name	Lenovo ThinkServer Gen 5 2U 4-Post Slide Rail Kit	Lenovo ThinkServer Gen 5 4-Post Static Rail Kit
Option part number	4XF0G45872	4XF0G45873
Supported servers	RD450 RD650	RD350 RD450 RD550 RD650
Rail type	Ball bearing slide rail (with stop latches), toolless installation	Friction rail
Supported rack type	Four-post Lenovo standard rack, complying with the IEC standard	Four-post Lenovo standard rack, complying with the IEC standard
Service on rack	Yes	No
Cable management arm (CMA) or cable management bracket (CMB) support	CMA	CMB
1U PDU support	Yes	Yes
0U PDU support	Limited support*	Limited support*
Supported mounting holes (square)	Unthread square hole: 9.5 mm x 9.5 mm (0.37 inches x 0.37 inches)	Unthread square hole: 9.5 mm x 9.5 mm (0.37 inches x 0.37 inches)
Supported mounting holes (round)	Unthread round hole: 7.1 mm (0.28 inches) in diameter	Unthread round hole: 7.1 mm (0.28 inches) in diameter
Thickness of mounting flanges	2 mm to 3.18 mm (0.08 to 0.125 inches)	2 mm to 3.18 mm (0.08 to 0.125 inches)
Distance between the front and rear mounting flanges	460 to 900 mm (18.11 to 35.43 inches)	610 to 900 mm (24 to 35.43 inches)
Rail length (measured when mounted on the rack, starting from the front surface of the front mounting flange to the rear most point of the rail)	840 mm (33.07 inches)	728.1 mm (28.66 inches)

* Notes on 0U PDU support:

- If you want to install the rail kit (option part number: 4XF0G45871, 4XF0G45872, or 4XF0G45873) and a 0U PDU into the same rack, the rack must meet the following height and depth requirements:
 - 42U or higher
 - At least 1200-mm (47.24-inch) deep if a CMA or CMB is to be installed
- For best performance, it is recommended that you install the rail kit (option part number:

4XF0G45871, 4XF0G45872, or 4XF0G45873) into a rack with a distance of 719 mm (28.3 inches) between the front and rear mounting flanges.

Physical, thermal and acoustic specifications

Dimensions and weight (approximate):

- Height: 87 mm (3.4 in)
- Width: 482 mm (19 in)
- Depth: 783 mm (30.8 in)
- Weight:
 - Minimum configuration: 16 kg (35.3 lb)
 - Maximum configuration: 27 kg (59.5 lb)

Thermal specifications are as follows:

- Operating ambient temperature: 10°C - 35°C (50°F - 95°F)
- Transit ambient temperature: -40°C - +70°C (-40°F - 158°F)
- Operating Humidity: 20 % - 80 % RH, non-condensing
- Transit humidity: 8 % - 90 % RH, non-condensing
- Operating altitude: 0 - 3048 m (0 - 10,000 ft)
- Transit altitude: 7620 m (25,000 ft)

Noise levels:

- Minimum configuration:
 - LWAd: 3.6 bels (Idle), 3.7 bels (Operating)
 - m : 24.8 dB (Idle), 25.2 dB (Operating)
- Maximum configuration:
 - LWAd: 5.6 bels (Idle), 5.6 bels (Operating)
 - m : 39.4 dB (Idle), 42.3 dB (Operating)

Warranty

The server has a three-year or one-year warranty (model dependent) with 24x7 standard call center support and 9x5 next business day onsite coverage. Lenovo offers services warranty maintenance upgrades and post-warranty maintenance agreements with a well-defined scope of services, including service hours, response time, and length of service coverage.

The Lenovo QuickPick tool helps locate compatible accessories and services and warranty information. Services offered may vary by geographic location. Access the tool via the following URL:
<http://lenovoquickpick.com>

The following table explains warranty service definitions in more detail.

Table 37. Warranty service definitions

Term	Description
On-site service	A service technician will go to the client's location for equipment service.
24x7x4 hour	A service technician is scheduled to arrive at the client's location within four hours after remote problem determination is completed. Lenovo provides service around the clock, every day, including Lenovo holidays.
24x7x8 hour	A service technician is scheduled to arrive at the client's location within eight hours after remote problem determination is completed. Lenovo provides service around the clock, every day, including Lenovo holidays.
9x5x4 hour	A service technician is scheduled to arrive at the client's location within four business hours after remote problem determination is completed. Lenovo provides service 8:00 am - 5:00 pm in the client's local time zone, Monday-Friday, excluding Lenovo holidays. For example, if a customer reports an incident at 3:00 pm on Friday, the technician will arrive by 10:00 am the following Monday.
9x5 next business day	A service technician is scheduled to arrive at the client's location on the business day after remote problem determination is completed. Lenovo provides service 8:00 am - 5:00 pm in the client's local time zone, Monday - Friday, excluding Lenovo holidays. Calls received after 4:00 pm local time require an extra business day for service dispatch.

The following Lenovo warranty service upgrades are available:

- Warranty and maintenance service upgrades:
 - Three, four, or five years of 9x5 or 24x7 service coverage
 - Onsite response time from next business day to 4 hour same-day
 - Warranty extension of up to 5 years
 - Post warranty extensions offered in 1-year increments
- Priority Technical Support
Lenovo's Priority Support Offering enhances our award-winning call center support to provide top priority queue assignment to specialized Lenovo technicians. Priority support accelerates call center troubleshooting to get your problems resolved quickly, and includes other value-added support for Lenovo provided software tools. Priority support can be purchased stand alone to match the base warranty of your system or in convenient bundles with our same-day response services.
- Keep Your Drive Multi-Drive
Lenovo's Keep Your Drive Multi-Drive service is a multi-drive hard drive retention offering that ensures your data is always under your control, regardless of the number of hard drives that are installed in your Lenovo server. In the unlikely event of a hard drive failure, you retain possession of your hard drive while Lenovo replaces the failed drive part. Your data stays safely on your premises, in your hands. Keep Your Drive Multi-Drive covers multiple drives and multiple failures with one service offering at one value price. This service can be purchased stand-alone to match the base warranty of your system or in convenient bundles with our same-day response services.

Regulatory compliance

The server conforms to the following regulations:

- Energy Star 2.0 (excluding the 450W power supply unit)
- FCC class A: USA FCC 47 CFR Part 15-Subpart B; ANSI C63.4
- ICES class A: Canada ICES-003 Issue 5
- CB
- UL/cTUVus
- Germany GS
- Russia EAC
- Argentina AR-S
- Mexico NOM
- EU CE: EN55022; EN55024; EN61000-3-2;EN61000-3-3;
- International: CISPR22; CISPR 24
- Brazil (voluntary)
- China CCC: GB 9254
- CECP
- CELP
- Green Guard

External drive enclosures

The server supports attachment to external drive enclosures using a RAID controller with external ports or a SAS host bus adapter. Adapters supported by the server are listed in the [SAS adapters for external storage](#) section.

The following table lists the 6 Gbps SAS external drive enclosures that are offered by Lenovo that can be used with the server for storage expansion.

Table 38. E1012 and E1024 external drive enclosure models

Part number	Description
64111B1	Lenovo Storage E1012 LFF Disk Expansion Single SAS IO Module, Rail Kit, 9x5 NBD
64111B2	Lenovo Storage E1012 LFF Disk Expansion Dual SAS IO Module, Rail Kit, 9x5 NBD
64111B3	Lenovo Storage E1024 SFF Disk Expansion Single SAS IO Module, Rail Kit, 9x5 NBD
64111B4	Lenovo Storage E1024 SFF Disk Expansion Dual SAS IO Module, Rail Kit, 9x5 NBD

For details about supported drives and cables for the Lenovo Storage E1012 and E1024, see the Lenovo Press Product Guide:

<http://lenovopress.com/lp0043>

The following table lists the 12 Gbps SAS external drive enclosures offered by Lenovo that can be used with the server for storage expansion.

Note: Information provided in this section is for ordering reference purposes only. For the operating system and adapter support details, refer to the interoperability matrix for a particular storage enclosure that can be found on the Lenovo Data Center Support web site:

<http://datacentersupport.lenovo.com>

Table 39. External drive enclosures

Description	Part number		
	Worldwide	Japan	PRC
Lenovo Storage D1212 LFF Disk Expansion with Dual SAS IO Modules	4587A11	4587A1J	4587A1C
Lenovo Storage D1224 SFF Disk Expansion with Dual SAS IO Modules	4587A31	4587A3J	4587A3C
Lenovo Storage D3284 4TB x 84 HD Expansion Enclosure	641311F		
Lenovo Storage D3284 6TB x 84 HD Expansion Enclosure	641312F		
Lenovo Storage D3284 8TB x 84 HD Expansion Enclosure	641313F		
Lenovo Storage D3284 10TB x 84 HD Expansion Enclosure	641314F		

For details about supported drives, adapters, and cables, see the following Lenovo Press Product Guides:

- Lenovo Storage D1212 and D1224
<http://lenovopress.com/lp0512>
- Lenovo Storage D3284
<http://lenovopress.com/lp0513>

External storage systems

Lenovo offers the ThinkSystem DE Series and ThinkSystem DM Series external storage systems for high-performance storage. See the DE Series and DM Series product guides for specific controller models, expansion enclosures and configuration options:

- ThinkSystem DE Series Storage
<https://lenovopress.com/storage/thinksystem/de-series#rt=product-guide>
- ThinkSystem DM Series Storage
<https://lenovopress.com/storage/thinksystem/dm-series#rt=product-guide>
- ThinkSystem DG Series Storage
<https://lenovopress.com/storage/thinksystem/dg-series#rt=product-guide>

External backup units

The following table lists the external backup options that are offered by Lenovo.

Table 40. External backup options

Part number	Description
External RDX USB drives	
4T27A10725	ThinkSystem RDX External USB 3.0 Dock
External SAS tape backup drives	
6160S7E	IBM TS2270 Tape Drive Model H7S
6160S8E	IBM TS2280 Tape Drive Model H8S
6160S9E	IBM TS2290 Tape Drive Model H9S
External SAS tape backup autoloaders	
6171S7R	IBM TS2900 Tape Autoloader w/LTO7 HH SAS
6171S8R	IBM TS2900 Tape Autoloader w/LTO8 HH SAS
6171S9R	IBM TS2900 Tape Autoloader w/LTO9 HH SAS
External tape backup libraries	
6741A1F	IBM TS4300 3U Tape Library-Base Unit
6741A3F	IBM TS4300 3U Tape Library-Expansion Unit
Full High 8 Gb Fibre Channel for TS4300	
01KP938	LTO 7 FH Fibre Channel Drive
01KP954	LTO 8 FH Fibre Channel Drive
02JH837	LTO 9 FH Fibre Channel Drive
Half High 8 Gb Fibre Channel for TS4300	
01KP936	LTO 7 HH Fibre Channel Drive
01KP952	LTO 8 HH Fibre Channel Drive
02JH835	LTO 9 HH Fibre Channel Drive
Half High 6 Gb SAS for TS4300	
01KP937	LTO 7 HH SAS Drive
01KP953	LTO 8 HH SAS Drive
02JH836	LTO 9 HH SAS Drive

For more information, see the list of Product Guides in the Backup units category:

<https://lenovopress.com/servers/options/backup>

Top-of-rack Ethernet switches

The following table lists the Ethernet LAN switches that are offered by Lenovo.

Table 41. Ethernet LAN switches

Part number	Description
1 Gb Ethernet Rack switches	
7Y810011WW	Lenovo ThinkSystem NE0152T RackSwitch (Rear to Front)
7Z320011WW	Lenovo ThinkSystem NE0152TO RackSwitch (Rear to Front, ONIE)
7159BAX	Lenovo RackSwitch G7028 (Rear to Front)
7159CAX	Lenovo RackSwitch G7052 (Rear to Front)
7159G52	Lenovo RackSwitch G8052 (Rear to Front)
7165H1X	Juniper EX2300-C PoE Switch
7165H2X	Juniper EX2300-24p PoE Switch
1 Gb Ethernet Campus switches	
7Z340011WW	Lenovo CE0128TB Switch (3-Year Warranty)
7Z360011WW	Lenovo CE0128TB Switch (Limited Lifetime Warranty)
7Z340012WW	Lenovo CE0128PB Switch (3-Year Warranty)
7Z360012WW	Lenovo CE0128PB Switch (Limited Lifetime Warranty)
7Z350021WW	Lenovo CE0152TB Switch (3-Year Warranty)
7Z370021WW	Lenovo CE0152TB Switch (Limited Lifetime Warranty)
7Z350022WW	Lenovo CE0152PB Switch (3-Year Warranty)
7Z370022WW	Lenovo CE0152PB Switch (Limited Lifetime Warranty)
10 Gb Ethernet switches	
7159A1X	Lenovo ThinkSystem NE1032 RackSwitch (Rear to Front)
7159B1X	Lenovo ThinkSystem NE1032T RackSwitch (Rear to Front)
7Z330011WW	Lenovo ThinkSystem NE1064TO RackSwitch (Rear to Front, ONIE)
7159C1X	Lenovo ThinkSystem NE1072T RackSwitch (Rear to Front)
7159CRW	Lenovo RackSwitch G8272 (Rear to Front)
7159GR6	Lenovo RackSwitch G8296 (Rear to Front)
7159BR6	Lenovo RackSwitch G8124E (Rear to Front)
25 Gb Ethernet switches	
7159E1X	Lenovo ThinkSystem NE2572 RackSwitch (Rear to Front)
7Z210021WW	Lenovo ThinkSystem NE2572O RackSwitch (Rear to Front, ONIE)
7Z330021WW	Lenovo ThinkSystem NE2580O RackSwitch (Rear to Front, ONIE)
100 Gb Ethernet switches	
7159D1X	Lenovo ThinkSystem NE10032 RackSwitch (Rear to Front)
7Z210011WW	Lenovo ThinkSystem NE10032O RackSwitch (Rear to Front, ONIE)

For more information, see the list of Product Guides in the following switch categories:

- 1 Gb Ethernet switches: <http://lenovopress.com/networking/tor/1gb?rt=product-guide>
- 10 Gb Ethernet switches: <http://lenovopress.com/networking/tor/10gb?rt=product-guide>
- 25 Gb Ethernet switches: <http://lenovopress.com/networking/tor/25gb?rt=product-guide>
- 40 Gb Ethernet switches: <http://lenovopress.com/networking/tor/40gb?rt=product-guide>
- 100 Gb Ethernet switches: <https://lenovopress.com/networking/tor/100Gb?rt=product-guide>

Fibre Channel SAN switches

Lenovo offers the ThinkSystem DB Series of Fibre Channel SAN switches for high-performance storage expansion. See the DB Series product guides for models and configuration options:

- ThinkSystem DB Series SAN Switches:
<https://lenovopress.com/storage/switches/rack#rt=product-guide>

Uninterruptible power supply units

The following table lists the uninterruptible power supply (UPS) units that are offered by Lenovo.

Table 42. Uninterruptible power supply units

Part number	Description
55941AX	RT1.5kVA 2U Rack or Tower UPS (100-125VAC)
55941KX	RT1.5kVA 2U Rack or Tower UPS (200-240VAC)
55942AX	RT2.2kVA 2U Rack or Tower UPS (100-125VAC)
55942KX	RT2.2kVA 2U Rack or Tower UPS (200-240VAC)
55943AX	RT3kVA 2U Rack or Tower UPS (100-125VAC)
55943KX	RT3kVA 2U Rack or Tower UPS (200-240VAC)
55945KX	RT5kVA 3U Rack or Tower UPS (200-240VAC)
55946KX	RT6kVA 3U Rack or Tower UPS (200-240VAC)
55948KX	RT8kVA 6U Rack or Tower UPS (200-240VAC)
55949KX	RT11kVA 6U Rack or Tower UPS (200-240VAC)
55948PX	RT8kVA 6U 3:1 Phase Rack or Tower UPS (380-415VAC)
55949PX	RT11kVA 6U 3:1 Phase Rack or Tower UPS (380-415VAC)
55943KT†	ThinkSystem RT3kVA 2U Standard UPS (200-230VAC) (2x C13 10A, 2x GB 10A, 1x C19 16A outlets)
55943LT†	ThinkSystem RT3kVA 2U Long Backup UPS (200-230VAC) (2x C13 10A, 2x GB 10A, 1x C19 16A outlets)
55946KT†	ThinkSystem RT6kVA 5U UPS (200-230VAC) (2x C13 10A outlets, 1x Terminal Block output)
5594XKT†	ThinkSystem RT10kVA 5U UPS (200-230VAC) (2x C13 10A outlets, 1x Terminal Block output)

† Only available in China and the Asia Pacific market.

For more information, see the list of Product Guides in the UPS category:

<https://lenovopress.com/servers/options/ups>

Power distribution units

The following table lists the power distribution units (PDUs) that are offered by Lenovo.

Table 43. Power distribution units

Part number	Feature code	Description	ANZ	ASEAN	Brazil	EET	MEA	RUCIS	WE	HTK	INDIA	JAPAN	LA	NA	PRC
0U Basic PDUs															
00YJ776	ATZY	0U 36 C13/6 C19 24A 1 Phase PDU	N	Y	Y	N	N	N	N	N	N	Y	Y	Y	N
00YJ779	ATZX	0U 21 C13/12 C19 48A 3 Phase PDU	N	N	Y	N	N	N	Y	N	N	Y	Y	Y	N

Part number	Feature code	Description	ANZ	ASEAN	Brazil	EET	MEA	RUCIS	WE	HTK	INDIA	JAPAN	LA	NA	PRC
00YJ777	ATZZ	0U 36 C13/6 C19 32A 1 Phase PDU	Y	Y	N	Y	Y	Y	Y	Y	Y	N	N	Y	Y
00YJ778	AU00	0U 21 C13/12 C19 32A 3 Phase PDU	Y	Y	N	Y	Y	Y	Y	Y	Y	N	N	Y	Y
0U Switched and Monitored PDUs															
00YJ783	AU04	0U 12 C13/12 C19 Switched and Monitored 48A 3 Phase PDU	N	N	Y	N	N	N	Y	N	N	Y	Y	Y	N
00YJ781	AU03	0U 20 C13/4 C19 Switched and Monitored 24A 1 Phase PDU	N	N	Y	N	Y	N	Y	N	N	Y	Y	Y	N
00YJ782	AU02	0U 18 C13/6 C19 Switched and Monitored 32A 3 Phase PDU	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	N	Y
00YJ780	AU01	0U 20 C13/4 C19 Switched and Monitored 32A 1 Phase PDU	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	N	Y
1U Switched and Monitored PDUs															
4PU7A81117	BNDV	1U 18 C19/C13 switched and monitored 48A 3P WYE PDU - ETL	N	N	N	N	N	N	N	N	N	N	N	Y	N
4PU7A77467	BLC4	1U 18 C19/C13 Switched and Monitored 80A 3P Delta PDU	N	N	N	N	N	N	N	N	N	Y	N	Y	N
4PU7A77469	BLC6	1U 12 C19/C13 switched and monitored 60A 3P Delta PDU	N	N	N	N	N	N	N	N	N	N	N	Y	N
4PU7A77468	BLC5	1U 12 C19/C13 switched and monitored 32A 3P WYE PDU	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y
4PU7A81118	BNDW	1U 18 C19/C13 switched and monitored 48A 3P WYE PDU - CE	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	N	Y
46M4002	5896	1U 9 C19/3 C13 Switched and Monitored DPI PDU	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
46M4004	5894	1U 12 C13 Switched and Monitored DPI PDU	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
46M4003	5897	1U 9 C19/3 C13 Switched and Monitored 60A 3 Phase PDU	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
46M4005	5895	1U 12 C13 Switched and Monitored 60A 3 Phase PDU	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
1U Ultra Density Enterprise PDUs (9x IEC 320 C13 + 3x IEC 320 C19 outlets)															
71763NU	6051	Ultra Density Enterprise C19/C13 PDU 60A/208V/3PH	N	N	Y	N	N	N	N	N	N	Y	Y	Y	N
71762NX	6091	Ultra Density Enterprise C19/C13 PDU Module	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
1U C13 Enterprise PDUs (12x IEC 320 C13 outlets)															
39M2816	6030	DPI C13 Enterprise PDU Plus Module (WW)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
39Y8941	6010	DPI C13 Enterprise PDU Module (WW)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
1U C19 Enterprise PDUs (6x IEC 320 C19 outlets)															
39Y8948	6060	DPI C19 Enterprise PDU Module (WW)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
39Y8923	6061	DPI Three-phase 60A/208V C19 Enterprise PDU (US)	N	N	Y	N	N	N	Y	N	N	N	Y	Y	N
1U Front-end PDUs (3x IEC 320 C19 outlets)															

Part number	Feature code	Description	ANZ	ASEAN	Brazil	EET	MEA	RUCIS	WE	HTK	INDIA	JAPAN	LA	NA	PRC
39Y8938	6002	DPI Single-phase 30A/120V Front-end PDU (US)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
39Y8939	6003	DPI Single-phase 30A/208V Front-end PDU (US)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
39Y8934	6005	DPI Single-phase 32A/230V Front-end PDU (International)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
39Y8940	6004	DPI Single-phase 60A/208V Front-end PDU (US)	Y	N	Y	Y	Y	Y	Y	N	N	Y	Y	Y	N
39Y8935	6006	DPI Single-phase 63A/230V Front-end PDU (International)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
1U NEMA PDUs (6x NEMA 5-15R outlets)															
39Y8905	5900	DPI 100-127V NEMA PDU	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Line cords for 1U PDUs that ship without a line cord															
40K9611	6504	4.3m, 32A/380-415V, EPDU/IEC 309 3P+N+G 3ph wye (non-US) Line Cord	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
40K9612	6502	4.3m, 32A/230V, EPDU to IEC 309 P+N+G (non-US) Line Cord	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
40K9613	6503	4.3m, 63A/230V, EPDU to IEC 309 P+N+G (non-US) Line Cord	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
40K9614	6500	4.3m, 30A/208V, EPDU to NEMA L6-30P (US) Line Cord	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
40K9615	6501	4.3m, 60A/208V, EPDU to IEC 309 2P+G (US) Line Cord	N	N	Y	N	N	N	Y	N	N	Y	Y	Y	N
40K9617	6505	4.3m, 32A/230V, Souriau UTG Female to AS/NZ 3112 (Aus/NZ) Line Cord	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
40K9618	6506	4.3m, 32A/250V, Souriau UTG Female to KSC 8305 (S. Korea) Line Cord	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

For more information, see the Lenovo Press documents in the PDU category:
<https://lenovopress.com/servers/options/pdu>

Rack cabinets

The server supports the rack cabinets listed in the following table.

Table 44. Rack cabinets

Part number	Description
201886X	11U Office Enablement Kit
93072RX	25U Standard Rack
93072PX	25U Static S2 Standard Rack
93634EX	42U 1100mm Dynamic Expansion Rack
93634PX	42U 1100mm Dynamic Rack
93604EX	42U 1200mm Deep Dynamic Expansion Rack
93604PX	42U 1200mm Deep Dynamic Rack
93614EX	42U 1200mm Deep Static Expansion Rack
93614PX	42U 1200mm Deep Static Rack
93084EX	42U Enterprise Expansion Rack
93084PX	42U Enterprise Rack
93074RX	42U Standard Rack
93074XX	42U Standard Rack Extension
93624EX	47U 1200mm Deep Static Expansion Rack
93624PX	47U 1200mm Deep Static Rack
93634BX	PureFlex® System 42U Expansion Rack
93634DX	PureFlex System 42U Expansion Rack
93634AX	PureFlex System 42U Rack
93634CX	PureFlex System 42U Rack

For more information, see the list of Product Guides in the Rack cabinets category:

<https://lenovopress.com/servers/options/racks>

KVM console options

The following table lists the supported KVM consoles, keyboards, and KVM switches.

Table 45. Console keyboards

Part number	Description
Consoles	
17238BX	1U 18.5" Standard Console (without keyboard)
Console keyboards	
00MW310	Lenovo UltraNav Keyboard USB - US Eng
46W6713	Keyboard w/ Int. Pointing Device USB - Arabic 253 RoHS v2
46W6714	Keyboard w/ Int. Pointing Device USB - Belg/UK 120 RoHS v2
46W6715	Keyboard w/ Int. Pointing Device USB - Chinese/US 467 RoHS v2
46W6716	Keyboard w/ Int. Pointing Device USB - Czech 489 RoHS v2
46W6717	Keyboard w/ Int. Pointing Device USB - Danish 159 RoHS v2
46W6718	Keyboard w/ Int. Pointing Device USB - Dutch 143 RoHS v2

Part number	Description
46W6719	Keyboard w/ Int. Pointing Device USB - French 189 RoHS v2
46W6720	Keyboard w/ Int. Pointing Device USB - Fr/Canada 445 RoHS v2
46W6721	Keyboard w/ Int. Pointing Device USB - German 129 RoHS v2
46W6722	Keyboard w/ Int. Pointing Device USB - Greek 219 RoHS v2
46W6723	Keyboard w/ Int. Pointing Device USB - Hebrew 212 RoHS v2
46W6724	Keyboard w/ Int. Pointing Device USB - Hungarian 208 RoHS v2
46W6725	Keyboard w/ Int. Pointing Device USB - Italian 141 RoHS v2
46W6726	Keyboard w/ Int. Pointing Device USB - Japanese 194 RoHS v2
46W6727	Keyboard w/ Int. Pointing Device USB - Korean 413 RoHS v2
46W6728	Keyboard w/ Int. Pointing Device USB - LA Span 171 RoHS v2
46W6729	Keyboard w/ Int. Pointing Device USB - Norwegian 155 RoHS v2
46W6730	Keyboard w/ Int. Pointing Device USB - Polish 214 RoHS v2
46W6731	Keyboard w/ Int. Pointing Device USB - Portuguese 163 RoHS v2
46W6732	Keyboard w/ Int. Pointing Device USB - Russian 441 RoHS v2
46W6733	Keyboard w/ Int. Pointing Device USB - Slovak 245 RoHS v2
46W6734	Keyboard w/ Int. Pointing Device USB - Spanish 172 RoHS v2
46W6735	Keyboard w/ Int. Pointing Device USB - Swed/Finn 153 RoHS v2
46W6736	Keyboard w/ Int. Pointing Device USB - Swiss F/G 150 RoHS v2
46W6737	Keyboard w/ Int. Pointing Device USB - Thai 191 RoHS v2
46W6738	Keyboard w/ Int. Pointing Device USB - Turkish 179 RoHS v2
46W6739	Keyboard w/ Int. Pointing Device USB - UK Eng 166 RoHS v2
46W6740	Keyboard w/ Int. Pointing Device USB - US Euro 103P RoHS v2
46W6741	Keyboard w/ Int. Pointing Device USB - Slovenian 234 RoHS v2
Console switches	
1754D2X	Global 4x2x32 Console Manager (GCM32)
1754D1X	Global 2x2x16 Console Manager (GCM16)
1754A2X	Local 2x16 Console Manager (LCM16)
1754A1X	Local 1x8 Console Manager (LCM8)
Console switch cables	
43V6147	Single Cable USB Conversion Option (UCO)
39M2895	USB Conversion Option (4 Pack UCO)
46M5383	Virtual Media Conversion Option Gen2 (VCO2)
46M5382	Serial Conversion Option (SCO)

For more information, see the list of Product Guides in the KVM Switches and Consoles category:
<http://lenovopress.com/servers/options/kvm>

Lenovo Financial Services

Lenovo Financial Services reinforces Lenovo's commitment to deliver pioneering products and services that are recognized for their quality, excellence, and trustworthiness. Lenovo Financial Services offers financing solutions and services that complement your technology solution anywhere in the world.

We are dedicated to delivering a positive finance experience for customers like you who want to maximize your purchase power by obtaining the technology you need today, protect against technology obsolescence, and preserve your capital for other uses.

We work with businesses, non-profit organizations, governments and educational institutions to finance their entire technology solution. We focus on making it easy to do business with us. Our highly experienced team of finance professionals operates in a work culture that emphasizes the importance of providing outstanding customer service. Our systems, processes and flexible policies support our goal of providing customers with a positive experience.

We finance your entire solution. Unlike others, we allow you to bundle everything you need from hardware and software to service contracts, installation costs, training fees, and sales tax. If you decide weeks or months later to add to your solution, we can consolidate everything into a single invoice.

Our Premier Client services provide large accounts with special handling services to ensure these complex transactions are serviced properly. As a premier client, you have a dedicated finance specialist who manages your account through its life, from first invoice through asset return or purchase. This specialist develops an in-depth understanding of your invoice and payment requirements. For you, this dedication provides a high-quality, easy, and positive financing experience.

For your region-specific offers, please ask your Lenovo sales representative or your technology provider about the use of Lenovo Financial Services. For more information, see the following Lenovo website:

<https://www.lenovo.com/us/en/landingpage/lenovo-financial-services/>

Related publications and links

For more information, see these resources:

- ThinkServer RD450 product page
<http://shop.lenovo.com/us/en/systems/servers/racks/thinkserver/rd450/>
- ThinkServer RD450 User Guide and Hardware Maintenance Manual
https://download.lenovo.com/ibmdl/pub/pc/pccbbs/thinkservers/rd450_ug_hmm_en.pdf
- Lenovo Quick Pick
<http://www.lenovoquickpick.com/usa/system/thinkserver/rd-series/rd450>
- Lenovo Think Option Compatibility Matrix (OCM):
<http://www.lenovo.com/accessoriesguide>
- Lenovo Support for the RD450
<http://support.lenovo.com/us/en/products/servers/thinkserver-rack-servers/thinkserver-rd450>
- ThinkServer Power Planner
<http://support.lenovo.com/us/en/downloads/ds101155>
- Lenovo PSREF - Product Specifications Reference
http://psref.lenovo.com/Product/ThinkServer_RD450

Related product families

Product families related to this document are the following:

- [2-Socket Rack Servers](#)

Notices

Lenovo may not offer the products, services, or features discussed in this document in all countries. Consult your local Lenovo representative for information on the products and services currently available in your area. Any reference to a Lenovo product, program, or service is not intended to state or imply that only that Lenovo product, program, or service may be used. Any functionally equivalent product, program, or service that does not infringe any Lenovo intellectual property right may be used instead. However, it is the user's responsibility to evaluate and verify the operation of any other product, program, or service. Lenovo may have patents or pending patent applications covering subject matter described in this document. The furnishing of this document does not give you any license to these patents. You can send license inquiries, in writing, to:

Lenovo (United States), Inc.
8001 Development Drive
Morrisville, NC 27560
U.S.A.
Attention: Lenovo Director of Licensing

LENOVO PROVIDES THIS PUBLICATION "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Some jurisdictions do not allow disclaimer of express or implied warranties in certain transactions, therefore, this statement may not apply to you.

This information could include technical inaccuracies or typographical errors. Changes are periodically made to the information herein; these changes will be incorporated in new editions of the publication. Lenovo may make improvements and/or changes in the product(s) and/or the program(s) described in this publication at any time without notice.

The products described in this document are not intended for use in implantation or other life support applications where malfunction may result in injury or death to persons. The information contained in this document does not affect or change Lenovo product specifications or warranties. Nothing in this document shall operate as an express or implied license or indemnity under the intellectual property rights of Lenovo or third parties. All information contained in this document was obtained in specific environments and is presented as an illustration. The result obtained in other operating environments may vary. Lenovo may use or distribute any of the information you supply in any way it believes appropriate without incurring any obligation to you.

Any references in this publication to non-Lenovo Web sites are provided for convenience only and do not in any manner serve as an endorsement of those Web sites. The materials at those Web sites are not part of the materials for this Lenovo product, and use of those Web sites is at your own risk. Any performance data contained herein was determined in a controlled environment. Therefore, the result obtained in other operating environments may vary significantly. Some measurements may have been made on development-level systems and there is no guarantee that these measurements will be the same on generally available systems. Furthermore, some measurements may have been estimated through extrapolation. Actual results may vary. Users of this document should verify the applicable data for their specific environment.

© Copyright Lenovo 2024. All rights reserved.

This document, TIPS1283, was created or updated on February 3, 2018.

Send us your comments in one of the following ways:

- Use the online Contact us review form found at:
<https://lenovopress.lenovo.com/TIPS1283>
- Send your comments in an e-mail to:
comments@lenovopress.com

This document is available online at <https://lenovopress.lenovo.com/TIPS1283>.

Trademarks

Lenovo and the Lenovo logo are trademarks or registered trademarks of Lenovo in the United States, other countries, or both. A current list of Lenovo trademarks is available on the Web at <https://www.lenovo.com/us/en/legal/copytrade/>.

The following terms are trademarks of Lenovo in the United States, other countries, or both:

Lenovo®
AnyFabric®
AnyRAID®
Lenovo Services
RackSwitch
System x®
ThinkServer®
ThinkSystem®
UltraNav®

The following terms are trademarks of other companies:

Intel® and Xeon® are trademarks of Intel Corporation or its subsidiaries.

Linux® is the trademark of Linus Torvalds in the U.S. and other countries.

Microsoft®, BitLocker®, Hyper-V®, PowerShell, Windows Server®, and Windows® are trademarks of Microsoft Corporation in the United States, other countries, or both.

Other company, product, or service names may be trademarks or service marks of others.