

Memory Configurator

Lenovo ThinkStation P3 Tower, P3 Tiny, P3 Ultra



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Overview

The ThinkStation P3 Intel Raptor Lake (RPL) and Raptor Lake Refresh (RPL-R) platform is the latest desktop workstation replacement for the ThinkStation P360 Intel Alder Lake-S platform.

The purpose of this document is to highlight the major differences between the different memory platform architectures from the previous platforms and help guide users to optimally configure their memory configuration in the ThinkStation P3 platform.

Support for RPL-R CPUs may require a BIOS update, depending on the system's current BIOS revision. Please update the system to at least the following versions or newer for RPL-R support:

- P3 Tower – S0IKT61A
- P3 Ultra – S0JKT19A
- P3 Tiny – M4WKT48A

Section 1 – P3 Tower Memory Architectural Design

The ThinkStation P3 Tower platform utilizes DDR5 memory with bus speeds up to 4400MHz, depending on the system processor and number of DIMMs per channel. This platform offers a dual memory channel design based on Intel RPL and RPL-R processors. There is a total of four memory DIMM slots, allowing the P3 to take full advantage of supporting a two DIMM per channel design.

Figure 1 - P3 Tower Motherboard Layout

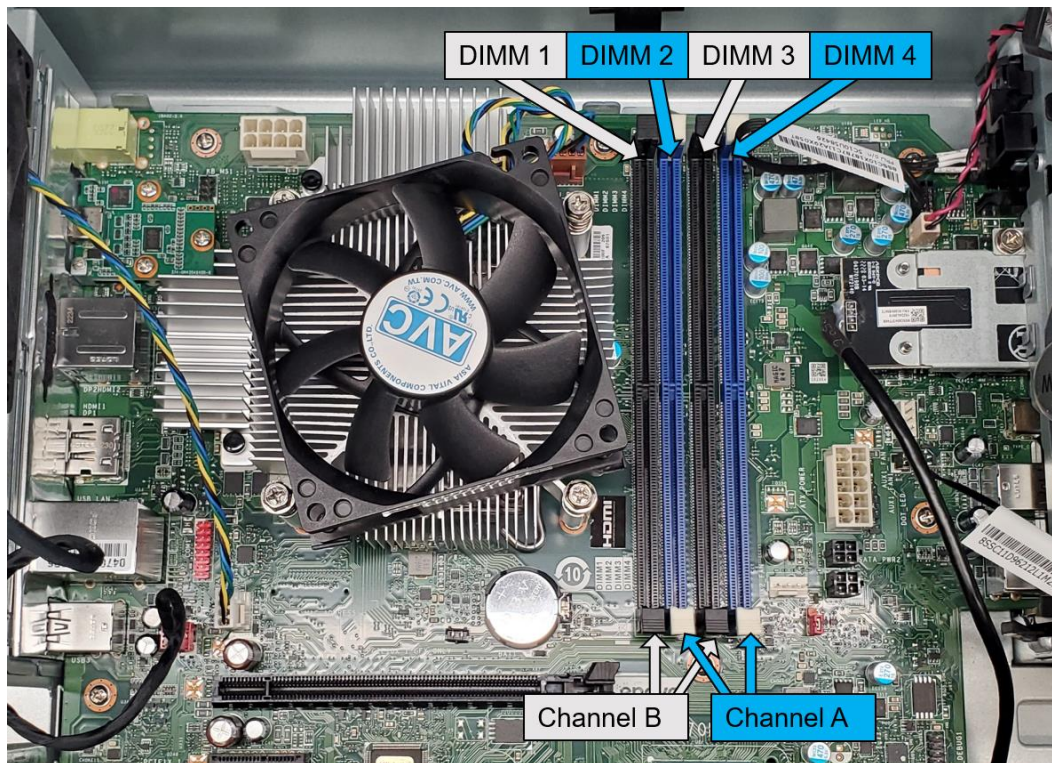
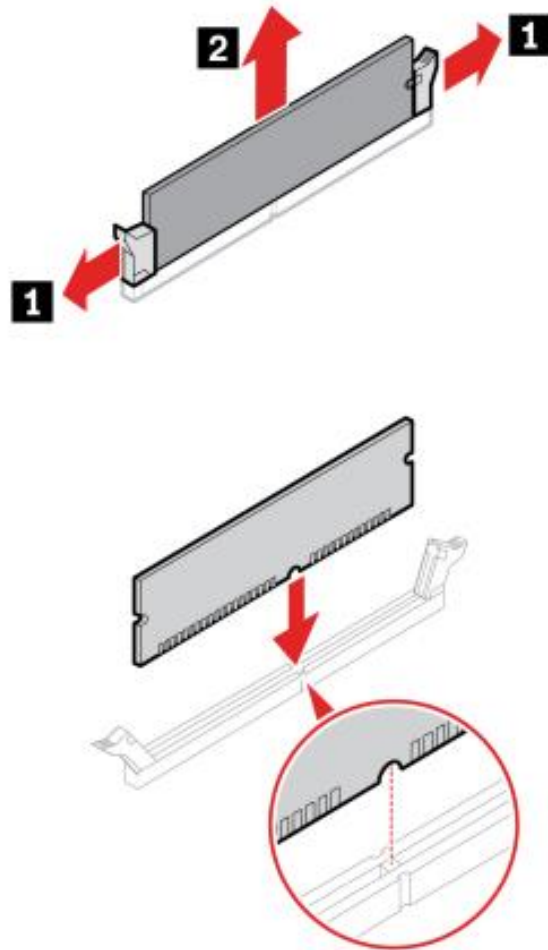


Figure 2 - P3 Tower Memory Install and Removal



Section 2 – P3 Tower Memory Configurations

Below are guidelines on how to optimally configure memory for best overall performance and bandwidth for the ThinkStation P3 Tower platform.

- P3 Tower utilizes a two DIMMs per channel (2DPC) configuration. Install DIMM slots in multiples of two to fully take advantage of both memory channels.
- Unregistered Dual In-Line Memory Modules (UDIMMs) only are supported in the P3 Tower platform.
- DIMM slots should be filled in the order listed in *Figure 3*.
- Maximum frequency is partially dependent on the ranks of DIMMs installed in the system. Due to the 2DPC design, maximum speed is limited to 4400MHz (See *Figure 4*).
- Refer to [Section 7](#) for other considerations.

Figure 3 - P3 Tower Slot Fill Order Recommendations

# of DIMMs	DIMM slots used
1 DIMM	DIMM slot 2
2 DIMMs	DIMM slot 2, DIMM slot 4
3 DIMMs	<u>Unsupported</u> ¹
4 DIMMs	DIMM slot 2, DIMM slot 4, DIMM slot 1, DIMM slot 3

Figure 4 – 1R (single rank) and 2R (dual rank) Memory Installation and Maximum Frequency

Slot 1	Slot 2	Slot 3	Slot 4	Actual Speed
	1R			4400 MHz
	1R		1R	4400 MHz
1R	1R	1R	1R	4000 MHz
	2R			4400 MHz
	2R		2R	4400 MHz
2R	2R	2R	2R	3600 MHz

¹ Lenovo does not support or recommend this number of DIMM quantity as it results in an unbalanced memory configuration across the dual channels.

Section 3 – P3 Tiny Memory Architectural Design

The ThinkStation P3 Tiny platform utilizes DDR5 memory with bus speeds up to 5600MHz, depending on the system processor, and number of DIMMs per channel. This platform offers two memory channels based on Intel RPL and RPL-R processors. There is a total of two memory DIMM slots, allowing the P3 Tiny to take advantage of supporting a single DIMM per channel design.

Figure 5 - P3 Tiny Motherboard Layout

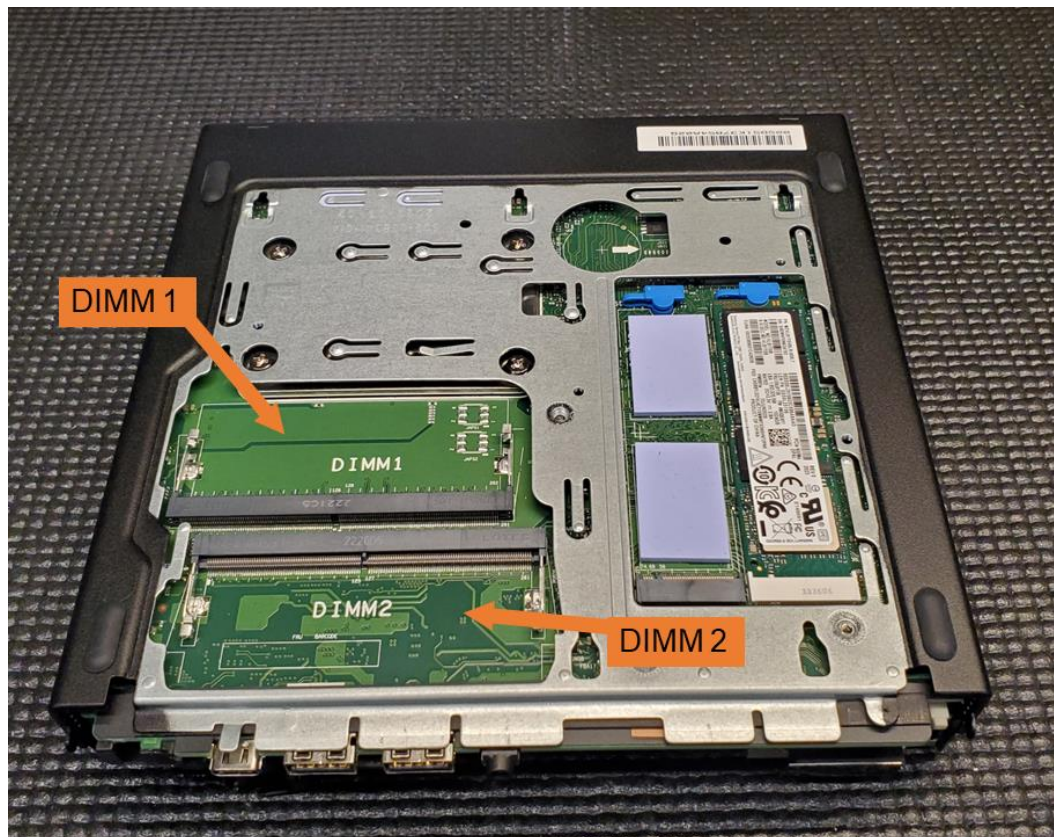
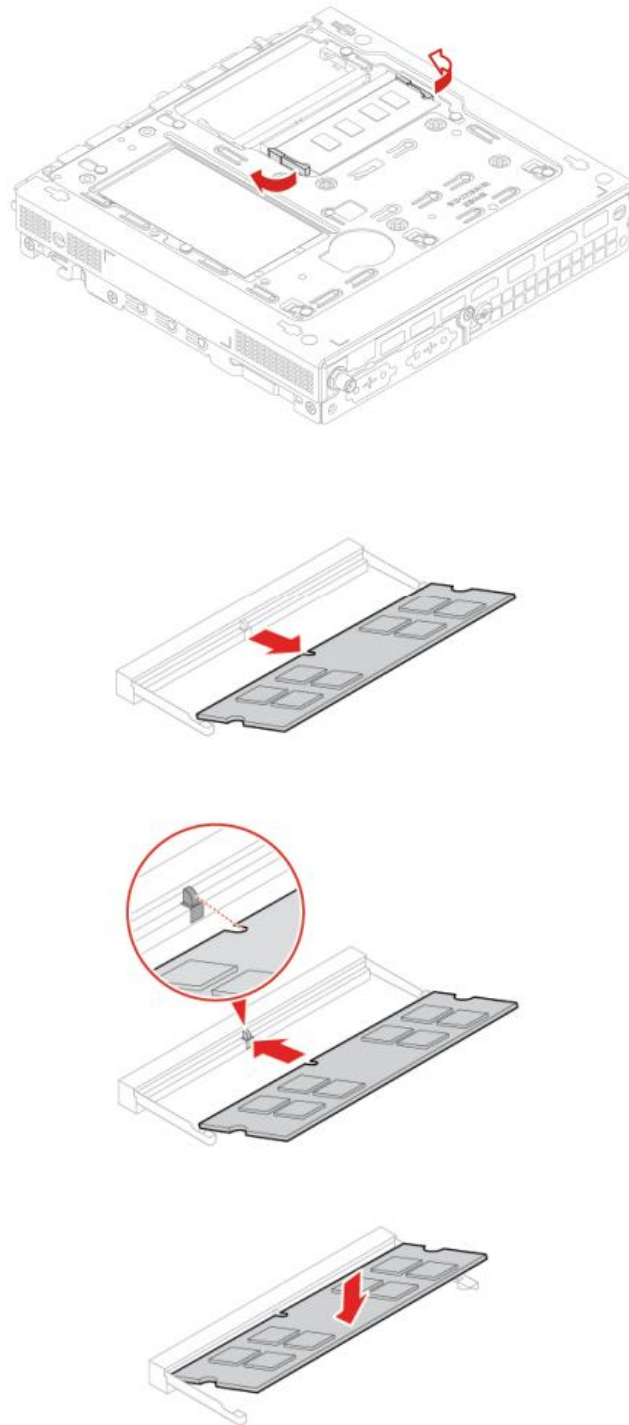


Figure 6 - P3 Tiny Memory Install and Removal



Section 4 – P3 Tiny Memory Configurations

The following recommended guidelines will help obtain the best overall memory bandwidth from the P3 Tiny system:

- P3 Tiny utilizes one DIMM per channel (DPC) to allow for full maximum memory bandwidth performance. Max memory speed will be dependent on CPU SKU and the maximum rated speed of the DIMMs installed.
- DIMM slots should be filled in the order listed in *Figure 7*.
- **Non-ECC** Small Outline Dual In-Line Memory Modules (SODIMMs) only are supported in the P3 Tiny platform.
- Memory speed dependent on CPU and DIMM capabilities.
- Refer to [Section 7](#) for other considerations.

Figure 7 - P3 Tiny Slot Fill Order Recommendations

# of DIMMs	DIMM slots used
1 DIMM	DIMM slot 1
2 DIMMs	DIMM slot 1, DIMM slot 2

Section 5 – P3 Ultra Memory Architectural Design

The ThinkStation P3 Ultra is Lenovo's latest small form factor workstation platform, utilizing DDR5 memory with bus speeds up to 4000MHz, depending on the system processor and number of DIMMs per channel. This platform offers a dual memory channel design based on Intel RPL and RPL-R processors. There is a total of four memory DIMM slots, allowing the P3 Ultra to take advantage of supporting a dual DIMM per channel design.

Figure 8 - P3 Ultra Motherboard Layout (CPU side)

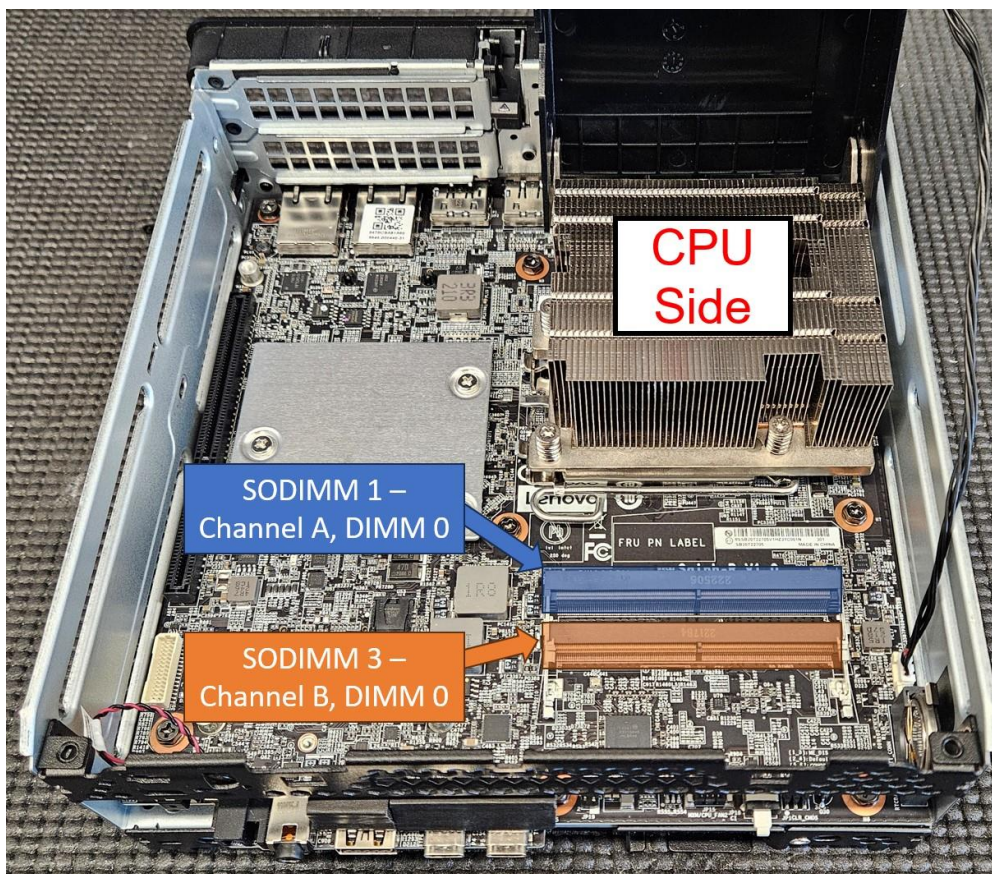


Figure 9 - P3 Ultra Motherboard Layout (SSD side)

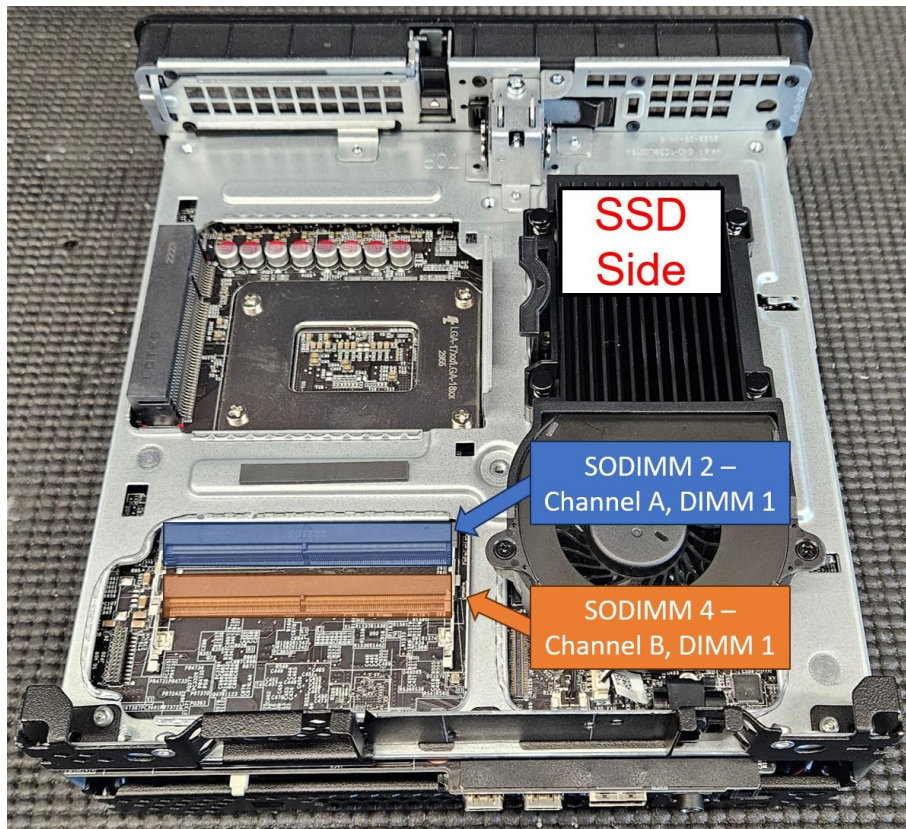
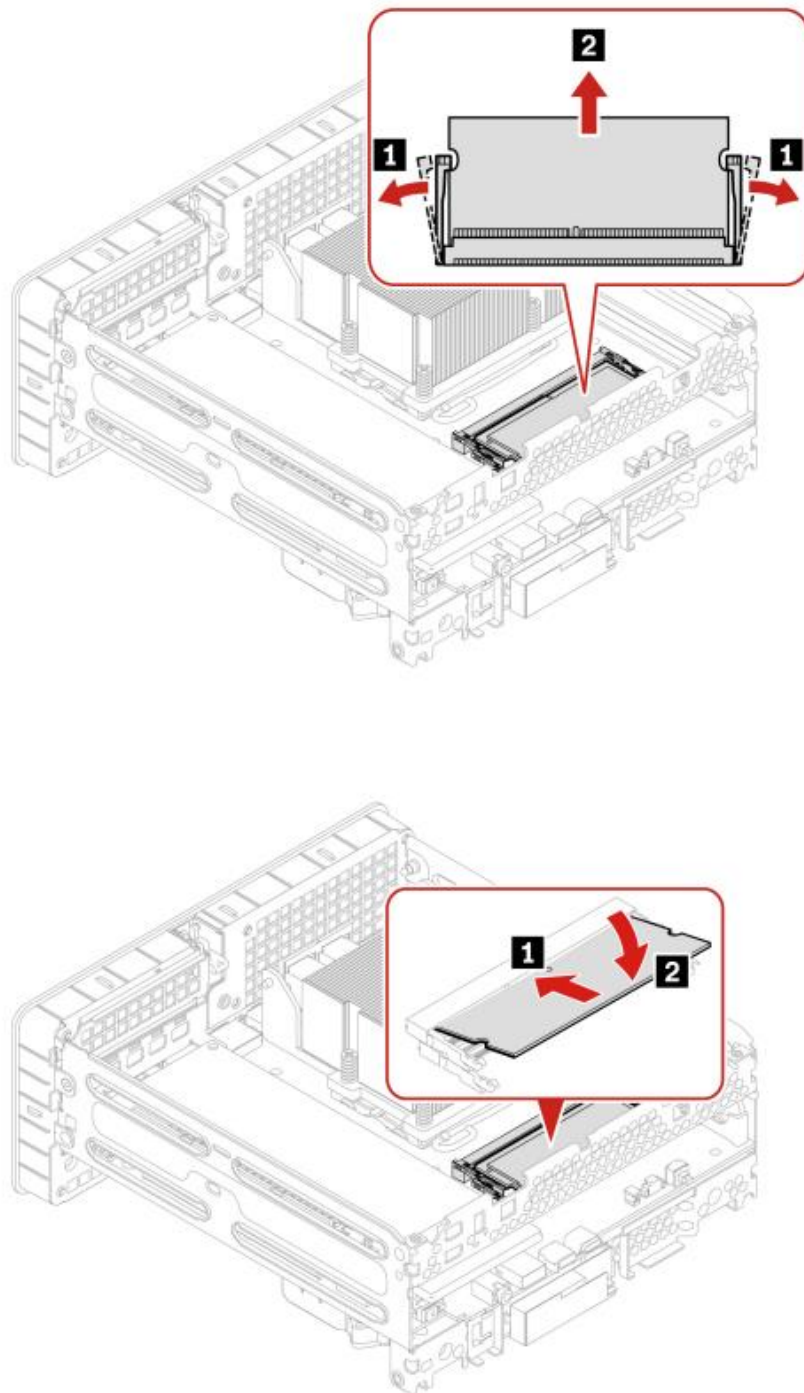


Figure 10 - P3 Ultra Memory Install & Removal Instructions



Section 6 – P3 Ultra Memory Configurations

Below are guidelines on how to optimally configure memory for best overall performance and bandwidth for the ThinkStation P3 Ultra platform.

- P3 Ultra utilizes a two DIMMs per channel (2DPC) configuration. Install DIMM slots in multiples of two to fully take advantage of both memory channels.
- DIMM slots should be filled in the order listed in *Figure 11*.
- Maximum frequency is partially dependent on the ranks of DIMMs installed in the system (See *Figure 12*).
- Small Outline Dual In-Line Memory Modules (SODIMMs) only are supported in the P3 Ultra platform.
- Refer to [Section 7](#) for other considerations.

Figure 11 - P3 Ultra Slot Fill Order Recommendations

# of DIMMs	DIMM slots used
1 DIMM	DIMM slot 2
2 DIMMs	DIMM slot 2, DIMM slot 4
3 DIMMs	<u>Unsupported</u> ²
4 DIMMs	DIMM slot 2, DIMM slot 4, DIMM slot 1, DIMM slot 3

Figure 12 – 1R (single rank) and 2R (dual rank) Memory Installation and Maximum Frequency

Slot 1	Slot 3	Slot 2	Slot 4	Actual Speed
		1R		4000 MHz
		1R	1R	4000 MHz
1R	1R	1R	1R	4000 MHz
		2R		4000 MHz
		2R	2R	4000 MHz
2R	2R	2R	2R	3600 MHz

² Lenovo does not support or recommend this number of DIMM quantity as it results in an unbalanced memory configuration across the dual channels.

Section 7 – Considerations

The following is a list of situations a user should consider in order to optimally configure memory for the best overall system performance. The configuration guidelines below apply generally to the P3 Tower, P3 Ultra, and P3 Tiny.

- Mixing ECC and non-ECC memory is not supported.
- Lenovo does not support installing three (3) DIMMs resulting in an unbalanced memory channel configuration.
- Lenovo recommends using the same capacity, rank, and brand within the same channel.
- Lenovo does not support mixing different memory DIMM capacities or mixing single rank (1R) and dual rank (2R) memory DIMMs.

Platform-specific limitations:

P3 Tower

- Intel Core i5-14400, i3-14100, i5-13400, and i3-13100 do not support ECC memory.
- If an Nvidia ConnectX-6 25G Adapter is installed, maximum supported number of DIMMs is two.
- Registered DIMMs (RDIMMs) & Load-Reduced DIMMs (LRDIMMs) are not supported.

P3 Ultra

- Intel Core i5-14400T, i3-14100, i5-13400T, and i3-13100 do not support ECC memory.

P3 Tiny

- Supports only non-ECC memory.
- Per Intel specifications, some CPU SKUs are limited to 4800MHz speeds.
- If Intel Core 14th Gen (RPL-R) CPU is installed in the system, only 5600MHz memory is supported.

Revision History

Version	Date	Author	Changes/Updates
v1.0	5/25/23	Chris C	Initial Release
v1.1	4/19/23	Chris C	Updated for 14 th Gen CPUs