Spec Sheet

Cisco UCS C220/C240/ B200 M6 Memory Guide

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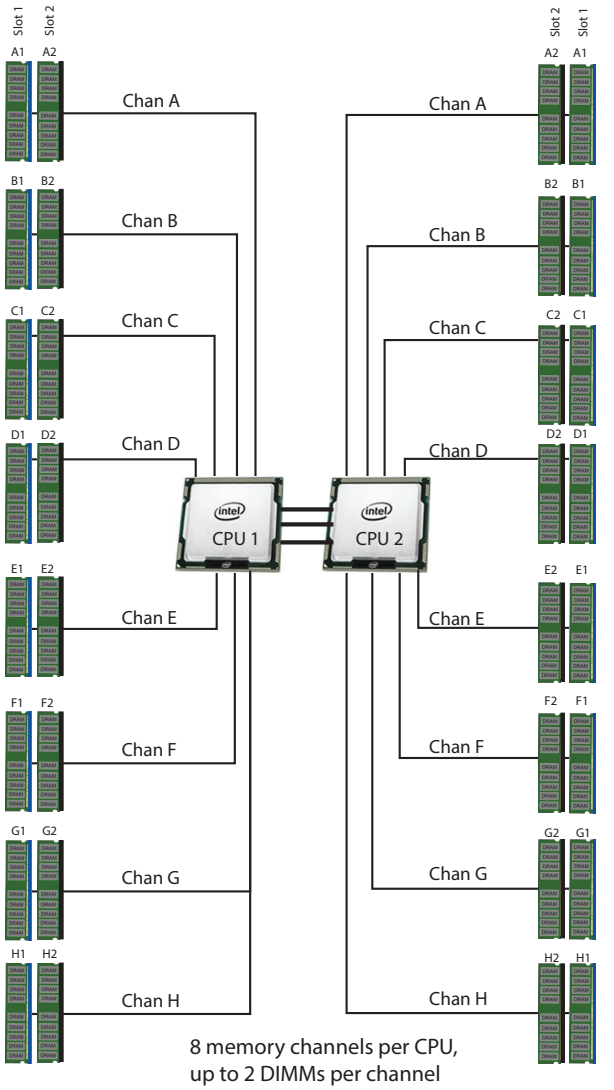
Memory Organization

The standard memory features are:

- Clock speed: 3200 MHz
- Ranks per DIMM: 1, 2, 4, or 8
- Operational voltage: 1.2 V
- Registered ECC DDR4 DIMMS (RDIMMs), Load-reduced DIMMs (LRDIMMs), or Intel® Optane™ Persistent Memory (PMem).

Memory is organized with eight memory channels per CPU, with up to two DIMMs per channel, as shown in ***Figure 1***.

Figure 1 C220, C240, B200 M6 Memory Organization



8 memory channels per CPU,
up to 2 DIMMs per channel

32 DIMMS total (16 DIMMs per CPU)
8 TB maximum memory (with 256 GB DIMMs)

Memory Devices (DIMMs and PMem)

The available memory devices are listed in *Table 1*.

Table 1 Available DDR4 DIMMs and PMem

Product ID (PID)	PID Description	Voltage	Ranks /DIMM
3200-MHz DIMMS			
UCS-MR-X16G1RW	16 GB RDIMM SRx4 3200 (8Gb)	1.2 V	1
UCS-MR-X32G1RW	32 GB RDIMM SRx4 3200 (16Gb)	1.2 V	1
UCS-MR-X32G2RW	32 GB RDIMM DRx4 3200 (8Gb)	1.2 V	2
UCS-MR-X64G2RW	64 GB RDIMM DRx4 3200 (16Gb)	1.2 V	2
UCS-ML-128G4RW	128 GB LRDIMM QRx4 3200 (16Gb) (non-3DS)	1.2 V	4
UCS-ML-256G8RW[1,2,3]	256 GB LRDIMM 8Rx4 3200 (16Gb) (3DS)	1.2 V	8
Intel® Optane™ Persistent Memory (PMem)			
UCS-MP-128GS-B0	Intel® Optane™ DC Persistent Memory, 128GB, 3200 MHz		
UCS-MP-256GS-B0	Intel® Optane™ DC Persistent Memory, 256 GB, 3200 MHz		
UCS-MP-512GS-B0	Intel® Optane™ DC Persistent Memory, 512 GB, 3200 MHz		
Intel® Optane™ Persistent Memory (PMem) Operational Modes			
UCS-DCPMM-AD	App Direct Mode		
UCS-DCPMM-MM	Memory Mode		
Memory Mirroring Option			
N01-MMIRROR	Memory mirroring option		

Notes:

1. 256 GB DIMM is available on all C240M6 server models, with the exclusion of C240M6 LFF model.
2. 256 GB DIMMs cannot be combined with GPU cards, and the ambient temperature shall be limited to a maximum of 28ºC.
3. Review the C240M6 specsheet for additional 256GB DIMM usage condition.



NOTE: All 3rd Generation Intel® Xeon® Scalable Processors (Ice Lake) support PMem products, except 4309Y, 4310, 4310T, and 4316 processors.

DIMM Guidelines

- System speed is dependent on the CPU DIMM speed support. Refer to *Table 1 on page 4* for DIMM speeds.
- The servers support the following memory reliability, availability, and serviceability (RAS) BIOS options (only one option can be chosen):
  - Adaptive Double Device Data Correction (ADDDC) (default)
  - Maximum performance
  - Full mirroring
  - Partial mirroring
- DIMM Count Rules:
  - Allowed DIMM count for 1-CPU:
    - Minimum DIMM count = 1; Maximum DIMM count = 16
    - 1, 2, 4, 6, 8, 12, or 16 DIMMs allowed
    - 3, 5, 7, 9, 10, 11, 13, 14, 15 DIMMs not allowed.
  - Allowed DIMM count for 2-CPUs
    - Minimum DIMM count = 2; Maximum DIMM count = 32
    - 2, 4, 8, 12, 16, 24, or 32 DIMMs allowed
    - 6, 10, 14, 18, 20, 22, 26, 28, 30 DIMMs not allowed.
- Mixing Rules:
  - Mixing different types of DIMM (RDIMM with any type of LRDIMM or 3DS LRDIMM with non-3DS LRDIMM) is not supported within a server.
  - Mixing RDIMM with RDIMM types is allowed if they are mixed in same quantities, in a balanced configuration.
  - Mixing 16 GB, 32 GB, and 64 GB RDIMMs is supported.
  - 128 GB and 256 GB LRDIMMs[1,2] cannot be mixed with other RDIMMs
  - 128 GB non-3DS LRDIMMs cannot be mixed with 256 GB 3DS LRDIMMs[1,2]
  - Single-rank DIMMs can be mixed with dual-rank DIMMs in the same channel
  - Allowed mixing must be in numbered “pairs” (for example, 8x32 GB and 8x64 GB). Such pairs as 10x32 GB and 6x64 GB are not allowed.
  - RDIMMs of different sizes can be mixed within a channel. When mixing RDIMMs of different densities (sizes), populate DIMMs with the highest density first. For example, if you have to mix 32 GB RDIMMs with 16 GB RDIMMs, then populate the 32 GB DIMMs in blue slots (or slot 1) and then 16 GB DIMMs in black slots (or slot 2).
  - Do not mix DIMM types (size, speed, ranks) in a system that uses PMem. In these cases, all DIMMs must be the same type and size.

Notes

1. 256GB DIMM is available on C240M6 servers only, with the exclusion of C240M6 LFF model.
2. Review the C240M6 specsheet for additional 256GB DIMM usage condition.

- RDIMMs of different ranks can be mixed within a channel. When mixing RDIMMs with different ranks, populate RDIMMs with the higher rank first. For example, when mixing dual-rank RDIMMs with single-rank RDIMMs populate the dual-rank RDIMMs in blue slots first and then single-rank RDIMMs in black slots.

Observe the DIMM mixing rules shown in *Table 2*

Table 2 DIMM Rules for C220, C240, B200 M6 Servers

DIMM Parameter	DIMMs in the Same Channel	DIMM in the Same Slot[1]
DIMM Capacity RDIMM = 16, 32, 64 GB LRDIMM = 128, 256 GB[2,3]	DIMMs in the same channel (for example, A1 and A2) can have different capacities.	For best performance, DIMMs in the same slot (for example, A1, B1, C1, D1, E1, F1) should have the same capacity.
DIMM Speed 3200-MHz	DIMMs will run at the lowest speed of the CPU installed	DIMMs will run at the lowest speed of the CPU installed
DIMM Type RDIMMs, or LRDIMMs	Do not mix LRDIMMs with RDIMMs in a channel	Do not mix LRDIMMs with RDIMMs in a slot

Notes:

1. Although different DIMM capacities can exist in the same slot, this will result in less than optimal performance. For optimal performance, all DIMMs in the same slot should be identical.
2. 256GB DIMM is available on C240M6 servers only, with the exclusion of C240M6 LFF model.
3. Review the C240M6 spec sheet for additional 256GB DIMM usage condition.

- Population Rules
  - Each channel has two memory slots (for example, channel A = slots A1 and A2).
    - A channel can operate with one or two DIMMs installed.
    - If a channel has only one DIMM, populate slot 1 first (the blue slot).
  - When both CPUs are installed, populate the memory slots of each CPU identically. Fill the blue slots (slot 1) in the memory channels first according to the recommended DIMM populations in *Table 3*. The table gives the DIMM populations for both mirrored and non-mirrored configurations.

Table 3 C220, C240, B200 M6 DIMM Population Order

#DIMMs per CPU	Populate CPU1 Slot		Populate CPU2 Slot	
	Blue Slots	Black slots	Blue slots	Black slots
DIMM Configuration Without Memory Mirroring				
1	(A1)	-	(A1)	-
2	(A1, E1)	-	(A1, E1)	-
4	(A1, C1); (E1, G1)	-	(A1, C1); (E1, G1)	-
6	(A1, C1); (D1, E1); (G1, H1)	-	(A1, C1); (D1, E1); (G1, H1)	-
8	(A1, B1); (C1, D1); (E1, F1); (G1,H1)	-	(A1, B1); (C1, D1); (E1, F1); (G1,H1)	-
12	(A1, C1); (D1, E1); (G1, H1)	(A2, C2); (D2, E2); (G2, H2)	(A1, C1); (D1, E1); (G1, H1)	(A2, C2); (D2, E2); (G2, H2)

Table 3 C220, C240, B200 M6 DIMM Population Order

16	(A1, B1); (C1, D1); (E1, F1); (G1, H1)	(A2, B2); (C2, D2); (E2, F2); (G2, H2)	(A1, B1); (C1, D1); (E1, F1); (G1, H1)	(A2, B2); (C2, D2); (E2, F2); (G2, H2)
DIMM Configuration With Memory Mirroring[1]				
8	(A1, B1); (C1, D1); (E1, F1); (G1,H1)		(A1, B1); (C1, D1); (E1, F1); (G1,H1)	
16	(A1, B1); (C1, D1); (E1, F1); (G1, H1); (A2, B2); (C2, D2); (E2, F2); (G2, H2)		(A1, B1); (C1, D1); (E1, F1); (G1, H1); (A2, B2); (C2, D2); (E2, F2); (G2, H2)	

Notes:

1. Memory mirroring reduces the amount of memory available by 50 percent because only one of the two populated channels provides data. When memory mirroring is enabled, you must install DIMMs in even numbers of channels.

- Memory Limitations
  - The maximum combined memory allowed in the 16 DIMM slots controlled by any one CPU is 6 TB (for 8 x 512 GB PMem and 8 x 256 GB DIMMs[1,2]).
  - The maximum combined memory allowed in the 32 DIMM slots controlled by two CPUs is 12 TB (for 16 x 512 GB PMem and 16 x 256 GB DIMMs[1,2]).
  - NVIDIA M-Series GPUs can support only less than 1 TB memory in the server.
  - NVIDIA P/V/A-Series GPUs can support 1 TB or more memory in the server.
  - AMD FirePro S7150 X2 GPUs can support only less than 1 TB memory in the server.
- For best performance, observe the following:
  - For optimum performance, populate at least one DIMM per memory channel per CPU. When one DIMM is used, it must be populated in DIMM slot 1 (blue slot farthest away from the CPU) of a given channel.
  - For populations of 1 DIMM per channel (DPC) and 2DPC, all supported DIMMs on Cisco UCS M6 servers run at their labeled speed provided the processor supports that speed.
  - When populating DIMM slots for optimal performance, multiples of 16 DIMMs are best because there are 8 memory channels per CPU socket and 2-CPUs must be populated.
  - At the same memory speed, 2 DPC may perform slightly better than 1 DPC for RDIMMs (workload dependent).
  - For optimum performance, use dual rank RDIMMs preferably, then single rank RDIMMs, and lastly LRDIMMs. Larger size LRDIMMs provide large capacity memory configurations but the performance of these DIMMs is lower than standard RDIMMs.
  - For small to medium memory capacities, whenever possible, install dual rank RDIMMs for optimal performance. Dual rank RDIMMs perform better than single rank RDIMMs. Single rank DIMMs limit the performance of memory-intensive workloads in 1 DIMM per channel configurations.

Notes

1. 256GB DIMM is available on C240M6 servers only, with the exclusion of C240M6 LFF model.
2. Review the C240M6 specsheet for additional 256GB DIMM usage condition.

  - 256 GB RDIMMs should be used for the largest memory capacity requirement. These DIMMs provide the maximum memory size supported for 2-socket UCS M6 servers.

- DIMMs for both CPUs must always be configured identically
- All DIMMs must be DDR4 DIMMs that support ECC. Non-buffered UDIMMs and non-ECC DIMMs are not supported.
- Cisco memory from previous generation servers (DDR3 and DDR4) is not supported with the UCS C220/C240/B200 M6 servers.



NOTE: System performance is optimized when the DIMM type and quantity are equal for both CPUs, and when all channels are filled equally across the CPUs in the server.

Table 5 shows the Cisco-supported all-DIMM configurations. These configurations are a subset of the Intel-supported configurations.

Table 4 3rd Gen Intel® Xeon® Scalable Processors (Ice Lake) All DIMM Physical Configuration

DIMM + PMem Count	CPU 1 or CPU 2															
	ICX: IMC2				ICX: IMC3				ICX: IMC1				ICX: IMC0			
	Chan 0 (F)		Chan 1 (E)		Chan 0 (H)		Chan 1 (G)		Chan 0 (C)		Chan 1 (D)		Chan 0 (A)		Chan 1 (B)	
	Slot 1	Slot 2	Slot 1	Slot 2	Slot 1	Slot 2	Slot 1	Slot 2	Slot 2	Slot 1	Slot 2	Slot 1	Slot 2	Slot 1	Slot 2	Slot 1
1 + 0														DIMM		
2 + 0			DIMM											DIMM		
4 + 0			DIMM				DIMM			DIMM				DIMM		
6 + 0			DIMM		DIMM		DIMM			DIMM		DIMM		DIMM		
8 + 0	DIMM		DIMM		DIMM		DIMM			DIMM		DIMM		DIMM		DIMM
12 + 0			DIMM	DIMM	DIMM	DIMM	DIMM	DIMM	DIMM	DIMM	DIMM	DIMM	DIMM	DIMM		
16 + 0	DIMM	DIMM	DIMM	DIMM	DIMM	DIMM	DIMM	DIMM	DIMM	DIMM	DIMM	DIMM	DIMM	DIMM	DIMM	DIMM

PMem Guidelines

- All installed PMem must be the same size. Mixing PMem of different capacities is not supported.
- When PMem are installed, all DIMMs installed must be identical (same speed, size and ranks).
- PMem and DIMMs must be populated as shown in *Table 5*.



NOTE: In *Table 5*, all DIMMs must be identical to each other and all PMem must also be identical to each other. The table shows the Cisco-supported configurations (it is a subset of the Intel-supported configurations).

Table 5 3rd Gen Intel® Xeon® Scalable Processors (Ice Lake) DIMM and PMem[1] Physical Configuration

DIMM + PMem Count	CPU 1 or CPU 2															
	ICX: IMC2				ICX: IMC3				ICX: IMC1				ICX: IMC0			
	Chan 0 (F)		Chan 1 (E)		Chan 0 (H		Chan 1 (G)		Chan 0 (C)		Chan 1 (D)		Chan 0 (A)		Chan 1 (B)	
	Slot 1	Slot 2	Slot 1	Slot 2	Slot 1	Slot 2	Slot 1	Slot 2	Slot 2	Slot 1	Slot 2	Slot 1	Slot 2	Slot 1	Slot 2	Slot 1
4 + 4[2]	PMem		DIMM		PMem		DIMM			DIMM		PMem		DIMM		PMem
8 + 1[3]	DIMM		DIMM		DIMM		DIMM			DIMM		DIMM	PMem	DIMM		DIMM
8 + 4[4]	DIMM		DIMM	PMem	DIMM		DIMM	PMem	PMem	DIMM		DIMM	PMem	DIMM		DIMM
8 + 8[5]	DIMM	PMem	DIMM	PMem	DIMM	PMem	DIMM	PMem	PMem	DIMM	PMem	DIMM	PMem	DIMM	PMem	DIMM
NOTE: AD = App Direct Mode, MM = Memory Mode																

Notes:

1. All systems must be fully populated with two CPUs when using PMem at this time.
2. AD, MM
3. AD
4. AD, MM
5. AD, MM

- Two CPUs must be installed when using PMem.For each memory channel with both a PMem and a DIMM installed, the PMem is installed in channel slot 2 (black slot closest to the CPU) and the DIMM is installed in channel slot 1 (blue slot farthest from CPU).
- To maximize performance, balance all memory channels
- For best memory performance, use identical DIMM and PMem types within a server (same speed, size and ranks).
- In configurations with PMem installed, memory mirroring is supported, with two restrictions:
  - Mirroring is only enabled on the DIMMs installed in the server; the PMem themselves do not support mirroring.
  - Only App Direct mode is supported. Memory mirroring cannot be enabled when PMem are in Memory Mode.

- Memory sparing is not supported with PMem installed.

Memory Modes

The Ice Lake CPUs support two memory modes:

- App Direct Mode
- Memory Mode

App Direct Mode

PMem operates as a solid-state disk storage device. Data is saved and is non-volatile. Both DCPMM and DIMM capacities count towards the CPU capacity limit.

For example, if App Direct mode is configured and the DIMM sockets for a CPU are populated with 8 x 256 GB DRAMs (2 TB total DRAM) and 8 x 512 GB PMem (4 TB total PMem), then 6 TB total counts towards the CPU capacity limit.

Memory Mode

PMem operates as a 100% memory module. Data is volatile and DRAM acts as a cache for PMem. Only the PMem capacity counts towards the CPU capacity limit. This is the factory default mode.

For example, if Memory mode is configured and the DIMM sockets for a CPU are populated with 8 x 256 GB DRAMs[1,2] (2 TB total DRAM) and 8 x 512 GB PMem (4 TB total PMem), then only 4 TB total (the PMem memory) counts towards the CPU capacity limit. All of the DRAM capacity (2 TB) is used as cache and does not factor into CPU capacity. The supported Intel DRAM:PMem ratios for Memory Mode are 1:4, 1:8, and 1:16.

Notes

1. 256GB DIMM is available on C240M6 servers only, with the exclusion of C240M6 LFF model.
2. Review the C240M6 specsheet for additional 256GB DIMM usage condition.

Intel CPU Support

For 3rd Generation Intel® Xeon® Scalable Processors (Ice Lake):

- DRAMs and PMem are supported
- Each CPU has 16 DIMM sockets and supports the following maximum memory capacities:
  - 4 TB using 16 x 256 GB DRAMs[1,2], or
  - 6 TB using 8 x 256 GB DRAMs[1,2] and 8 x 512 GB Persistent Memory Modules (PMem)

Only the following mixed DRAM/PMem memory configurations are supported per CPU socket:

- 4 DRAMs and 4 PMem, or
- 8 DRAMs and 4 PMem, or
- 8 DRAMs and 1 PMem, or
- 8 DRAMs and 8 PMem

The available DRAM capacities are 16 GB, 32 GB, 64 GB, 128 GB, or 256 GB[1,2].

The available PMem capacities are 128 GB, 256 GB, or 512 GB.



NOTE: All 3rd Generation Intel® Xeon® Scalable Processors (Ice Lake) support PMem products, except 4309Y, 4310, 4310T, and 4316 processors.

Notes

1. 256GB DIMM is available on C240M6 servers only, with the exclusion of C240M6 LFF model.
2. Review the C240M6 specsheet for additional 256GB DIMM usage condition.

Physical Layout

Each CPU has eight memory channels:

- CPU1 has channels A, B, C, D, E, F, G and H
- CPU2 has channels A, B, C, D, E, F, G and H

Each memory channel has two slots: slot 1 and slot 2. The blue-colored slots are for slot 1 and the black slots for slot 2.

As an example, slots A1, B1, C1, D1, E1, F1, G1, and H1 belong to slot 1, while A2, B2, C2, D2, E2, F2, G2 and H2 belong to slot 2.

Figure 2 and *Figure 3* show how slots and channels are physically laid out on the motherboards for the servers. Each CPU has channels A, B, C, D, E, F, G, and H. The slot 1 (blue) slots are always located farther away from a CPU than the corresponding slot 2 (black) slots. Slot 1 slots (blue) are populated before slot 2 slots (black).

Figure 2 Physical Layout of C220/C240 M6 CPU Memory Channels and Slots

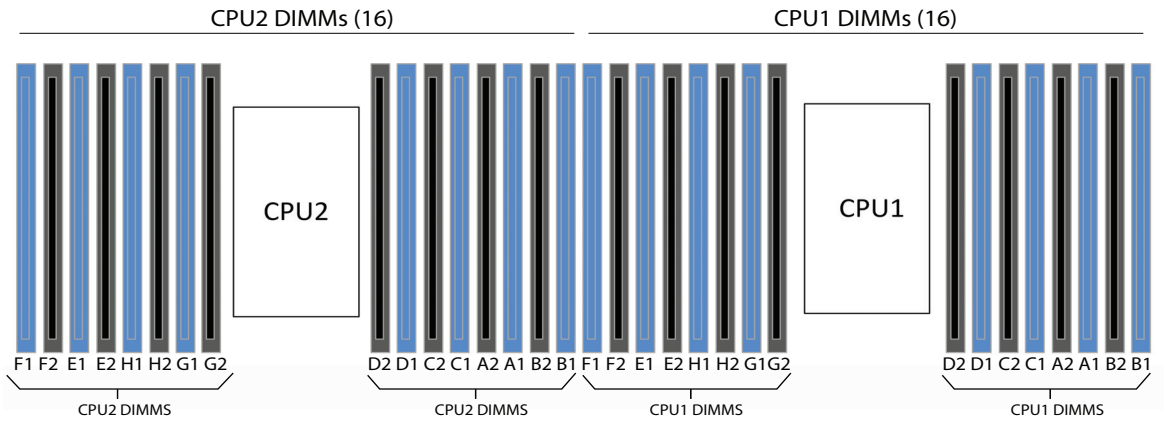
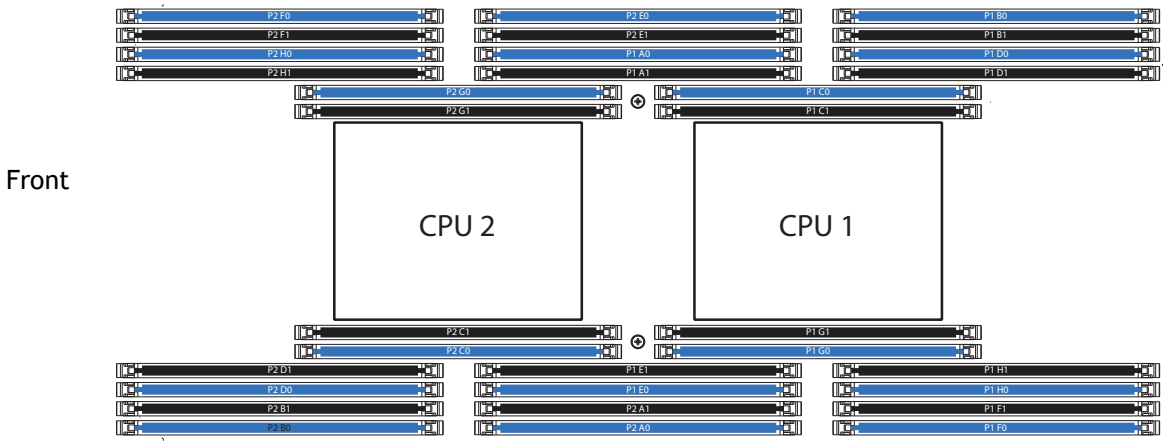


Figure 3 Physical Layout of B200 M6 CPU Memory Channels and Slots



Recommended DIMM Configurations For Best Performance

This section explains the recommended DIMM population order rules for best performance. *Table 6* shows the recommended configurations for 3rd Gen Intel® Xeon® Scalable Processors (Ice Lake). The rows highlighted in yellow indicate configurations with optimum performance.

Table 6 Recommended Memory Configurations for 3rd Gen Intel® Xeon® Scalable Processors (Ice Lake) For Best Performance

Total System Memory Size	CPU-1		CPU-2		DIMM Type	Total DIMMs in the system
	Blue Slots	Black Slots	Blue Slots	Black Slots		
	Bank 1	Bank 2	Bank 1	Bank 2		
	(A1,B1,C1,D1, E1, F1,G1,H1)	(A2, B2, C2, D2, E2, F2,G2,H2)	(A1,B1,C1,D1, E1, F1,G1,H1)	(A2, B2, C2, D2, E2, F2,G2,H2)		
256 GB	8x16 GB	-	8x16 GB	-	R	16
512 GB	8x16 GB	8x16 GB	8x16 GB	8x16 GB	R	32
512 GB	8x32 GB	-	8x32 GB	-	R	16
768 GB	8x32 GB	8x16 GB	8x32 GB	8x16 GB	R	32
1024 GB	8x32 GB	8x32 GB	8x32 GB	8x32 GB	R	32
1024 GB	8x64 GB	-	8x64 GB	-	R	16
1280 GB	8x64 GB	8x16 GB	8x64 GB	8x16 GB	R	32
1536 GB	8x64 GB	8x32 GB	8x64 GB	8x32 GB	R	32
2048 GB	8x64 GB	8x64 GB	8x64 GB	8x64 GB	R	32
2048 GB	8x128 GB	-	8x128 GB	-	LR	16
4096 GB	8x128 GB	8x128 GB	8x128 GB	8x128 GB	LR	32
4096 GB[1,2]	8x256 GB	-	8x256 GB	-	LR	16
8192 GB[1,2]	8x256 GB	8x256 GB	8x256 GB	8x256 GB	LR	32

Notes:

1. 256GB DIMM is available on C240M6 servers only, with the exclusion of C240M6 LFF model.
2. Review the C240M6 specsheet for additional 256GB DIMM usage condition.

NOTE:

- This ***Table 6*** lists only best recommended memory configurations based on memory performance data.
- Yellow Highlighted Cells represent Sweet Spot configurations for achieving optimum performance in a system.
- These memory configurations will yield the best performance since the memory is populated equally for both the CPUs across all the eight memory channels.
- The recommendations of ***Table 6*** are based on memory performance measurements, done for a C240 M6 configured with two 3rd Generation Intel Xeon Scalable 8380 processors.
- 32GB dual rank and 64GB dual rank RDIMMs provide the highest memory bandwidth at 1 DPC and 2 DPC.
- Among all mixing configurations, 8x32 GB + 8x64 GB mix per CPU (1536 GB total system capacity for 2-sockets) provides the highest memory bandwidth.
- 128 GB LRDIMMs with up to 4096 GB total system capacity for 2-Sockets, and 256 GB[1,2] LRDIMMs with up to 8192 GB total system capacity for 2-Sockets provide the largest memory capacities. Note: these LRDIMMs cannot be mixed with any RDIMMs;

Notes:

1. 256GB DIMM is available on C240M6 servers only, with the exclusion of C240M6 LFF model.
2. Review the C240M6 specsheet for additional 256GB DIMM usage condition.

Supported DIMM Configurations

Table 7 below show some (not all) of the alternative DIMM configurations for configurations with 1, 2, 4, 6, 8, 12, and 16 DIMMs per CPU. The only DIMM mixing allowed is:

- 16 GB and 32 GB RDIMMS
- 16 GB and 64 GB RDIMMs
- 32 GB and 64 GB RDIMMs

DIMM mixing configurations are shown at the end of *Table 7*.

Table 7 Supported Memory Configurations for 3rd Gen Intel® Xeon® Scalable Processors (Ice Lake)

Total System Memory Size	CPU-1		CPU-2		DIMM Type	Total DIMMs in the system
	Blue Slots	Black Slots	Blue Slots	Black Slots		
	Bank 1	Bank2	Bank 1	Bank 2		
	(A1,B1,C1,D1, E1, F1, G1, H1)	(A2, B2, C2, D2 E2, F2, G2, H2)	(A1,B1,C1,D1, E1, F1, G1, H1)	(A2, B2, C2, D2 E2, F2, G2, H2)		
16 GB RDIMMs						
32 GB	1x16 GB	-	1x16 GB	-	R	2
64 GB	2x16 GB	-	2x16 GB	-	R	4
128 GB	4x16 GB	-	4x16 GB	-	R	8
192 GB	6x16 GB	-	6x16 GB	-	R	12
256 GB	8x16 GB	-	8x16 GB	-	R	16
384 GB	6x16GB	6x16 GB	6x16 GB	6x16 GB	R	24
512 GB	8x16 GB	8x16 GB	8x16 GB	8x16 GB	R	32
32 GB RDIMMs						
64 GB	1x32 GB	-	1x32 GB	-	R	2
128 GB	2x32 GB	-	2x32 GB	-	R	4
256 GB	4x32 GB	-	4x32 GB	-	R	8
384 GB	6x32 GB	-	6x32 GB	-	R	12
512 GB	8x32 GB	-	8x32 GB	-	R	16
768 GB	6x32 GB	6x32 GB	6x32 GB	6x32 GB	R	24
1024 GB	8x32 GB	8x32 GB	8x32 GB	8x32 GB	R	32

Table 7 Supported Memory Configurations for 3rd Gen Intel® Xeon® Scalable Processors (Ice Lake)

Total System Memory Size	CPU-1		CPU-2		DIMM Type	Total DIMMs in the system
	Blue Slots	Black Slots	Blue Slots	Black Slots		
	Bank 1	Bank2	Bank 1	Bank 2		
	(A1,B1,C1,D1, E1, F1, G1, H1)	(A2, B2, C2, D2 E2, F2, G2, H2)	(A1,B1,C1,D1, E1, F1, G1, H1)	(A2, B2, C2, D2 E2, F2, G2, H2)		
64 GB RDIMMs						
128 GB	1x64 GB	-	1x64 GB	-	R	2
256 GB	2x64 GB	-	2x64 GB	-	R	4
512 GB	4x64 GB	-	4x64 GB	-	R	8
768 GB	6x64 GB	-	6x64 GB	-	R	12
1024 GB	8x64 GB	-	8x64 GB	-	R	16
1536 GB	6x64 GB	6x64 GB	6x64 GB	6x64 GB	R	24
2048 GB	8x64 GB	8x64 GB	8x64 GB	8x64 GB	R	32
128 GB LRDIMMs						
256 GB	1x128 GB	-	1x128 GB	-	LR	2
512 GB	2x128 GB	-	2x128 GB	-	LR	4
1024 GB	4x128 GB	-	4x128 GB	-	LR	8
1536 GB	6x128 GB	-	6x128 GB	-	LR	12
2048 GB	8x128 GB	-	8x128 GB	-	LR	16
3072 GB	6x128 GB	6x128 GB	6x128 GB	6x128 GB	LR	24
4096 GB	8x128 GB	8x128 GB	8x128 GB	8x128 GB	LR	32
256 GB LRDIMMs[1,2]						
512 GB	1x256 GB	-	1x256 GB	-	LR	2
1024 GB	2x256 GB	-	2x256 GB	-	LR	4
2048 GB	4x256 GB	-	4x256 GB	-	LR	8
3072 GB	6x256 GB	-	6x256 GB	-	LR	12
4096 GB	8x256 GB	-	8x256 GB	-	LR	16
6144 GB[1,2]	6x256 GB	6x256 GB	6x256 GB	6x256 GB	LR	24
8192 GB[1,2]	8x256 GB	8x256 GB	8x256 GB	8x256 GB	LR	32

Table 7 Supported Memory Configurations for 3rd Gen Intel® Xeon® Scalable Processors (Ice Lake)

Total System Memory Size	CPU-1		CPU-2		DIMM Type	Total DIMMs in the system
	Blue Slots	Black Slots	Blue Slots	Black Slots		
	Bank 1	Bank2	Bank 1	Bank 2		
	(A1,B1,C1,D1, E1, F1, G1, H1)	(A2, B2, C2, D2 E2, F2, G2, H2)	(A1,B1,C1,D1, E1, F1, G1, H1)	(A2, B2, C2, D2 E2, F2, G2, H2)		
16GB RDIMMs + 32GB RDIMMs						
576 GB	6x16 GB	6x32 GB	6x16 GB	6x32 GB	R	24
768 GB	8x16 GB	8x32 GB	8x16 GB	8x32 GB	R	32
16GB RDIMMs + 64GB RDIMMs						
960 GB	6x16 GB	6x64 GB	6x16 GB	6x64 GB	R	24
1280 GB	8x16 GB	8x64 GB	8x16 GB	8x64 GB	R	32
32GB RDIMMs + 64GB RDIMMs						
1152 GB	6x32 GB	6x64 GB	6x32 GB	6x64 GB	R	24
1536 GB	8x32 GB	8x64 GB	8x32 GB	8x64 GB	R	32

Notes:

1. 256GB DIMM is available on C240M6 servers only, with the exclusion of C240M6 LFF model.
2. Review the C240M6 spec sheet for additional 256GB DIMM usage condition.

NOTE: 1-CPU configuration, with identical mix of DIMMs as 2-CPUs shown on *Table 7* above, is possible but not recommended for performance reason.

Allowed Memory Configurations

This following material describes the configurable memory capacities using DRAMS only or mixes of DRAMs and PMem for 3rd Gen Intel® Xeon® Scalable Processors (Ice Lake) used in C220/C240/B200 M6 servers.

DRAM-Only Configurations for 3rd Gen Intel® Xeon® Scalable Processors (Ice Lake)

Table 8 shows the possible configurations for 3rd Gen Intel® Xeon® Scalable Processors (Ice Lake) populated with all DIMMs.

Table 8 All DRAM Memory Allowed Configurations (per CPU)

Number of DIMMs per CPU	Capacity Per DIMM (GB)				
	16	32	64	128	256[1,2]
	Total Capacity per CPU (GB)				
1	16	32	64	128	256
2	32	64	128	256	512
4	64	128	256	512	1024
6	96	192	384	768	1536
8	128	256	512	1024	2048
12	192	384	768	1536	3072
16	256[1,2]	512	1024	2048	4096

Notes:

1. 256GB DIMM is available on C240M6 servers only, with the exclusion of C240M6 LFF model.
2. Review the C240M6 specsheet for additional 256GB DIMM usage condition.

Mixed DRAM/PMem Configurations for 3rd Gen Intel® Xeon® Scalable Processors (Ice Lake)

When PMem are selected, there are several allowable combinations of DRAMs and PMem per CPU as shown in *Table 5 on page 10* and *Table 9*:

Table 9 Mixed DIMM/PMem Allowed Configurations (per CPU)

Number of DRAMs per CPU	Number of PMem per CPU
4	4
8	4
8[1]	1[1]
8	8

Notes:

1. The 8:1 DRAM:PMem ratio is valid for App Direct mode only.

Selection of PMem also requires that all CPUs be fully populated. The rules of mixed DIMM and PMem configurations are as follows.

- Only the number of DIMMs and PMem allowed per CPU are as shown in *Table 9*.
- All PMem must be equal in size
- All DIMMs must be equal in size and type
- For the App Direct Mode, both DCPMM and DIMM capacities count towards the CPU capacity limit
- For the Memory Mode only the PMem capacity counts towards the CPU capacity limit. DIMMs are used for cache only and do not counts toward the CPU capacity limit.

Table 10 through *Table 13* show all the possible combinations of DRAMs and PMem possible in each of the four supported DRAM/PMem 2-CPU mixed configurations.

2-CPU Configuration	
DRAM	PMem
8	8

Table 10 2-CPU Mixed Configuration: (8xDRAMs + 8xPMem)

CPU1						CPU2						Total System (2-CPUs) Memory Capacity[1]		
DRAM N#	DRAM Capacity [2,3]	Total DRAM Capacity	PMem N#	PMem Capacity	Total PMem Capacity	DRAM N#	DRAM Capacity [2,3]	Total DRAM Capacity	PMem N#	PMem Capacity	Total PMem Capacity	DRAM: PMem Ratio	Memory Mode	App Direct Mode
PMem Capacity: 128GB						PMem Capacity: 128GB						PMem Capacity: 128GB		
4	16 GB	64 GB	4	128 GB	512 GB	4	16 GB	64 GB	4	128 GB	512 GB	1:8	1024 GB	1152 GB
4	32 GB	128 GB	4	128 GB	512 GB	4	32 GB	128 GB	4	128 GB	512 GB	1:4	1024 GB	1280 GB
4	64 GB	256 GB	4	128 GB	512 GB	4	64 GB	256 GB	4	128 GB	512 GB	1:2	N/A	1536 GB
4	128 GB	512 GB	4	128 GB	512 GB	4	128 GB	512 GB	4	128 GB	512 GB	1:1	N/A	2048 GB
4	256 GB	1024 GB	4	128 GB	512 GB	4	256 GB	1024 GB	4	128 GB	512 GB	2:1	N/A	3072 GB
PMem Capacity: 256GB						PMem Capacity: 256GB						PMem Capacity: 256GB		
4	16 GB	64 GB	4	256 GB	1024 GB	4	16 GB	64 GB	4	256 GB	1024 GB	1:16	2048 GB	2176 GB
4	32 GB	128 GB	4	256 GB	1024 GB	4	32 GB	128 GB	4	256 GB	1024 GB	1:8	2048 GB	2304 GB
4	64 GB	256 GB	4	256 GB	1024 GB	4	64 GB	256 GB	4	256 GB	1024 GB	1:4	2048 GB	2560 GB
4	128 GB	512 GB	4	256 GB	1024 GB	4	128 GB	512 GB	4	256 GB	1024 GB	1:2	N/A	3072 GB
4	256 GB	1024 GB	4	256 GB	1024 GB	4	256 GB	1024 GB	4	256 GB	1024 GB	1:1	N/A	4096 GB
PMem Capacity: 512GB						PMem Capacity: 512GB						PMem Capacity: 512GB		
4	16 GB	64 GB	4	512 GB	2048 GB	4	16 GB	64 GB	4	512 GB	2048 GB	1:32	N/A	4224 GB
4	32 GB	128 GB	4	512 GB	2048 GB	4	32 GB	128 GB	4	512 GB	2048 GB	1:16	4096 GB	4352 GB
4	64 GB	256 GB	4	512 GB	2048 GB	4	64 GB	256 GB	4	512 GB	2048 GB	1:8	4096 GB	4608 GB
4	128 GB	512 GB	4	512 GB	2048 GB	4	128 GB	512 GB	4	512 GB	2048 GB	1:4	4096 GB	5120 GB
4	256 GB	1024 GB	4	512 GB	2048 GB	4	256 GB	1024 GB	4	512 GB	2048 GB	1:2	N/A	6144 GB

Notes:

1. Red cells represent the unsupported configurations and ratio for Memory Mode.
2. 256GB DIMM is available on C240M6 servers only, with the exclusion of C240M6 LFF model.
3. Review the C240M6 specsheet for additional 256GB DIMM usage condition.

2-CPU Configuration	
DRAM	PMem
16	8

Table 11 2-CPU Mixed Configuration: (16xDRAMs + 8xPMem)

CPU1						CPU2						Total System (2-CPUs) Memory Capacity[1]		
DRAM N#	DRAM Capacity [2,3]	Total DRAM Capacity	PMem N#	PMem Capacity	Total PMem Capacity	DRAM N#	DRAM Capacity [2,3]	Total DRAM Capacity	PMem N#	PMem Capacity	Total PMem Capacity	DRAM: PMem Ratio	Memory Mode	App Direct Mode
PMem Capacity: 128GB						PMem Capacity: 128GB						PMem Capacity: 128GB		
8	16 GB	128 GB	4	128 GB	512 GB	8	16 GB	128 GB	4	128 GB	512 GB	1:4	1024 GB	1280 GB
8	32 GB	256 GB	4	128 GB	512 GB	8	32 GB	256 GB	4	128 GB	512 GB	1:2	N/A	1536 GB
8	64 GB	512 GB	4	128 GB	512 GB	8	64 GB	512 GB	4	128 GB	512 GB	1:1	N/A	2048 GB
8	128 GB	1024 GB	4	128 GB	512 GB	8	128 GB	1024 GB	4	128 GB	512 GB	2:1	N/A	3072 GB
8	256 GB	2048 GB	4	128 GB	512 GB	8	256 GB	2048 GB	4	128 GB	512 GB	4:1	N/A	5120 GB
PMem Capacity: 256GB						PMem Capacity: 256GB						PMem Capacity: 256GB		
8	16 GB	128 GB	4	256 GB	1024 GB	8	16 GB	128 GB	4	256 GB	1024 GB	1:8	2048 GB	2304 GB
8	32 GB	256 GB	4	256 GB	1024 GB	8	32 GB	256 GB	4	256 GB	1024 GB	1:4	2048 GB	2560 GB
8	64 GB	512 GB	4	256 GB	1024 GB	8	64 GB	512 GB	4	256 GB	1024 GB	1:2	N/A	3072 GB
8	128 GB	1024 GB	4	256 GB	1024 GB	8	128 GB	1024 GB	4	256 GB	1024 GB	1:1	N/A	4096 GB
8	256 GB	2048 GB	4	256 GB	1024 GB	8	256 GB	2048 GB	4	256 GB	1024 GB	2:1	N/A	6144 GB
PMem Capacity: 512GB						PMem Capacity: 512GB						PMem Capacity: 512GB		
8	16 GB	128 GB	4	512 GB	2048 GB	8	16 GB	128 GB	4	512 GB	2048 GB	1:16	4096 GB	4352 GB
8	32 GB	256 GB	4	512 GB	2048 GB	8	32 GB	256 GB	4	512 GB	2048 GB	1:8	4096 GB	4608 GB
8	64 GB	512 GB	4	512 GB	2048 GB	8	64 GB	512 GB	4	512 GB	2048 GB	1:4	4096 GB	5120 GB
8	128 GB	1024 GB	4	512 GB	2048 GB	8	128 GB	1024 GB	4	512 GB	2048 GB	1:2	N/A	6144 GB
8	256 GB	2048 GB	4	512 GB	2048 GB	8	256 GB	2048 GB	4	512 GB	2048 GB	1:1	N/A	8192 GB

Notes:

1. Red cells represent the unsupported configurations and ratio for Memory Mode.
2. 256GB DIMM is available on C240M6 servers only, with the exclusion of C240M6 LFF model.
3. Review the C240M6 specsheet for additional 256GB DIMM usage condition.

2-CPU Configuration	
DRAM	PMem
16	2

Table 12 2-CPU Mixed Configuration: (16xDRAMs + 2xPMem)

CPU1						CPU2						Total System (2-CPUs) Memory Capacity[1]		
DRAM N#	DRAM Capacity [2,3]	Total DRAM Capacity	PMem N#	PMem Capacity	Total PMem Capacity	DRAM N#	DRAM Capacity [2,3]	Total DRAM Capacity	PMem N#	PMem Capacity	Total PMem Capacity	DRAM: PMem Ratio	Memory Mode	App Direct Mode
PMem Capacity: 128GB						**PMem Capacity: 128GB**						**PMem Capacity: 128GB**		
8	16 GB	128 GB	1	128 GB	128 GB	8	16 GB	128 GB	1	128 GB	128 GB	N/A	N/A	512 GB
8	32 GB	256 GB	1	128 GB	128 GB	8	32 GB	256 GB	1	128 GB	128 GB	N/A	N/A	768 GB
8	64 GB	512 GB	1	128 GB	128 GB	8	64 GB	512 GB	1	128 GB	128 GB	N/A	N/A	1280 GB
8	128 GB	1024 GB	1	128 GB	128 GB	8	128 GB	1024 GB	1	128 GB	128 GB	N/A	N/A	2304 GB
8	256 GB	2048 GB	1	128 GB	128 GB	8	256 GB	2048 GB	1	128 GB	128 GB	N/A	N/A	4352 GB
PMem Capacity: 256GB						**PMem Capacity: 256GB**						**PMem Capacity: 256GB**		
8	16 GB	128 GB	1	256 GB	256 GB	8	16 GB	128 GB	1	256 GB	256 GB	N/A	N/A	768 GB
8	32 GB	256 GB	1	256 GB	256 GB	8	32 GB	256 GB	1	256 GB	256 GB	N/A	N/A	1024 GB
8	64 GB	512 GB	1	256 GB	256 GB	8	64 GB	512 GB	1	256 GB	256 GB	N/A	N/A	1536 GB
8	128 GB	1024 GB	1	256 GB	256 GB	8	128 GB	1024 GB	1	256 GB	256 GB	N/A	N/A	2560 GB
8	256 GB	2048 GB	1	256 GB	256 GB	8	256 GB	2048 GB	1	256 GB	256 GB	N/A	N/A	4608 GB
PMem Capacity: 512GB						**PMem Capacity: 512GB**						**PMem Capacity: 512GB**		
8	16 GB	128 GB	1	512 GB	512 GB	8	16 GB	128 GB	1	512 GB	512 GB	N/A	N/A	1280 GB
8	32 GB	256 GB	1	512 GB	512 GB	8	32 GB	256 GB	1	512 GB	512 GB	N/A	N/A	1536 GB
8	64 GB	512 GB	1	512 GB	512 GB	8	64 GB	512 GB	1	512 GB	512 GB	N/A	N/A	2048 GB
8	128 GB	1024 GB	1	512 GB	512 GB	8	128 GB	1024 GB	1	512 GB	512 GB	N/A	N/A	3072 GB
8	256 GB	2048 GB	1	512 GB	512 GB	8	256 GB	2048 GB	1	512 GB	512 GB	N/A	N/A	5120 GB

Notes:

1. Red cells represent the unsupported configurations and ratio for Memory Mode.
2. 256GB DIMM is available on C240M6 servers only, with the exclusion of C240M6 LFF model.
3. Review the C240M6 specsheet for additional 256GB DIMM usage condition.

2-CPU Configuration	
DRAM	PMem
16	16

Table 13 2-CPU Mixed Configuration: (16xDRAMs + 16xPMem)

CPU1						CPU2						Total System (2-CPUs) Memory Capacity[1]		
DRAM N#	DRAM Capacity [2,3]	Total DRAM Capacity	PMem N#	PMem Capacity	Total PMem Capacity	DRAM N#	DRAM Capacity [2,3]	Total DRAM Capacity	PMem N#	PMem Capacity	Total PMem Capacity	DRAM: PMem Ratio	Memory Mode	App Direct Mode
PMem Capacity: 128GB						PMem Capacity: 128GB						PMem Capacity: 128GB		
8	16 GB	128 GB	8	128 GB	1024 GB	8	16 GB	128 GB	8	128 GB	1024 GB	1:8	2048 GB	2304 GB
8	32 GB	256 GB	8	128 GB	1024 GB	8	32 GB	256 GB	8	128 GB	1024 GB	1:4	2048 GB	2560 GB
8	64 GB	512 GB	8	128 GB	1024 GB	8	64 GB	512 GB	8	128 GB	1024 GB	1:2	N/A	3072 GB
8	128 GB	1024 GB	8	128 GB	1024 GB	8	128 GB	1024 GB	8	128 GB	1024 GB	1:1	N/A	4096 GB
8	256 GB	2048 GB	8	128 GB	1024 GB	8	256 GB	2048 GB	8	128 GB	1024 GB	2:1	N/A	6144 GB
PMem Capacity: 256GB						PMem Capacity: 256GB						PMem Capacity: 256GB		
8	16 GB	128 GB	8	256 GB	2048 GB	8	16 GB	128 GB	8	256 GB	2048 GB	1:16	4096 GB	4352 GB
8	32 GB	256 GB	8	256 GB	2048 GB	8	32 GB	256 GB	8	256 GB	2048 GB	1:8	4096 GB	4608 GB
8	64 GB	512 GB	8	256 GB	2048 GB	8	64 GB	512 GB	8	256 GB	2048 GB	1:4	4096 GB	5120 GB
8	128 GB	1024 GB	8	256 GB	2048 GB	8	128 GB	1024 GB	8	256 GB	2048 GB	1:2	N/A	6144 GB
8	256 GB	2048 GB	8	256 GB	2048 GB	8	256 GB	2048 GB	8	256 GB	2048 GB	1:1	N/A	8192 GB
PMem Capacity: 512GB						PMem Capacity: 512GB						PMem Capacity: 512GB		
8	16 GB	128 GB	8	512 GB	4096 GB	8	16 GB	128 GB	8	512 GB	4096 GB	1:32	N/A	8448 GB
8	32 GB	256 GB	8	512 GB	4096 GB	8	32 GB	256 GB	8	512 GB	4096 GB	1:16	8192 GB	8704 GB
8	64 GB	512 GB	8	512 GB	4096 GB	8	64 GB	512 GB	8	512 GB	4096 GB	1:8	8192 GB	9216 GB
8	128 GB	1024 GB	8	512 GB	4096 GB	8	128 GB	1024 GB	8	512 GB	4096 GB	1:4	8192 GB	10240 GB
8	256 GB	2048 GB	8	512 GB	4096 GB	8	256 GB	2048 GB	8	512 GB	4096 GB	1:2	N/A	12288 GB

Notes:

1. Red cells represent the unsupported configurations and ratio for Memory Mode.
2. 256GB DIMM is available on C240M6 servers only, with the exclusion of C240M6 LFF model.
3. Review the C240M6 specsheet for additional 256GB DIMM usage condition.



NOTE: All 3rd Generation Intel® Xeon® Scalable Processors (Ice Lake) support PMem products, except 4309Y, 4310, 4310T, and 4316 processors.

Installing a DIMM or DIMM Blank

To install a DIMM or a DIMM blank into a slot on the blade server, follow these steps.

Procedure

Step 1 Open both DIMM connector latches.

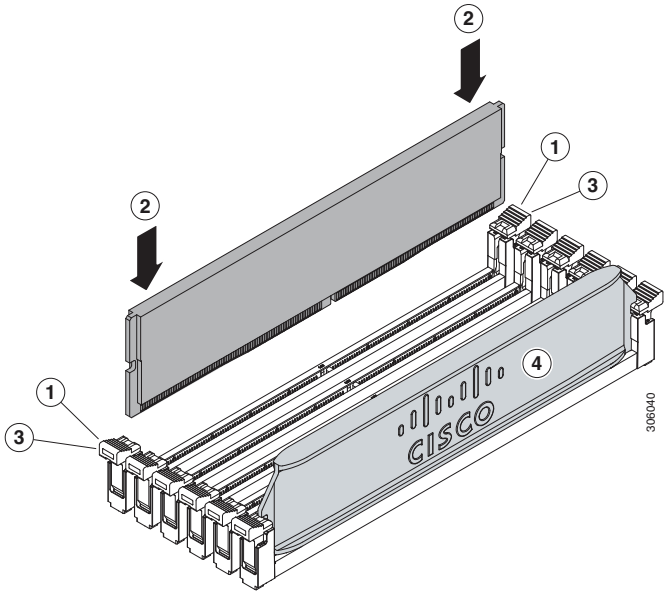
Step 2 Press evenly on both ends of the DIMM until it clicks into place in its slot

Note: Ensure that the notch in the DIMM aligns with the slot. If the notch is misaligned, it is possible to damage the DIMM, the slot, or both.

Step 3 Press the DIMM connector latches inward slightly to seat them fully.

Step 4 Populate all slots with a DIMM or DIMM blank. A slot cannot be empty.

Figure 4 Installing Memory



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