Cisco UCS/UCSX M7 Memory Guide

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Introduction

The M7 Memory guide provides the detailed specifications of the M7 memory DIMMs including:

- Memory DIMMs features,
- Cisco PID's description,
- Memory DIMMs guidelines, mixing rules and populations,
- All M7 supported DIMM configurations

The M7 Memory Guide document applies to the following Cisco M7 generation servers:

- M7 C220/C240 Racks servers
- M7 X-series X210c/X410c Compute nodes

CHAPTER 1 MEMORY ORGANIZATION CAPABILITIES AND FEATURE

The *Table 1* below describes the main memory DIMM features supported on Cisco UCS/UCSX M7 servers.

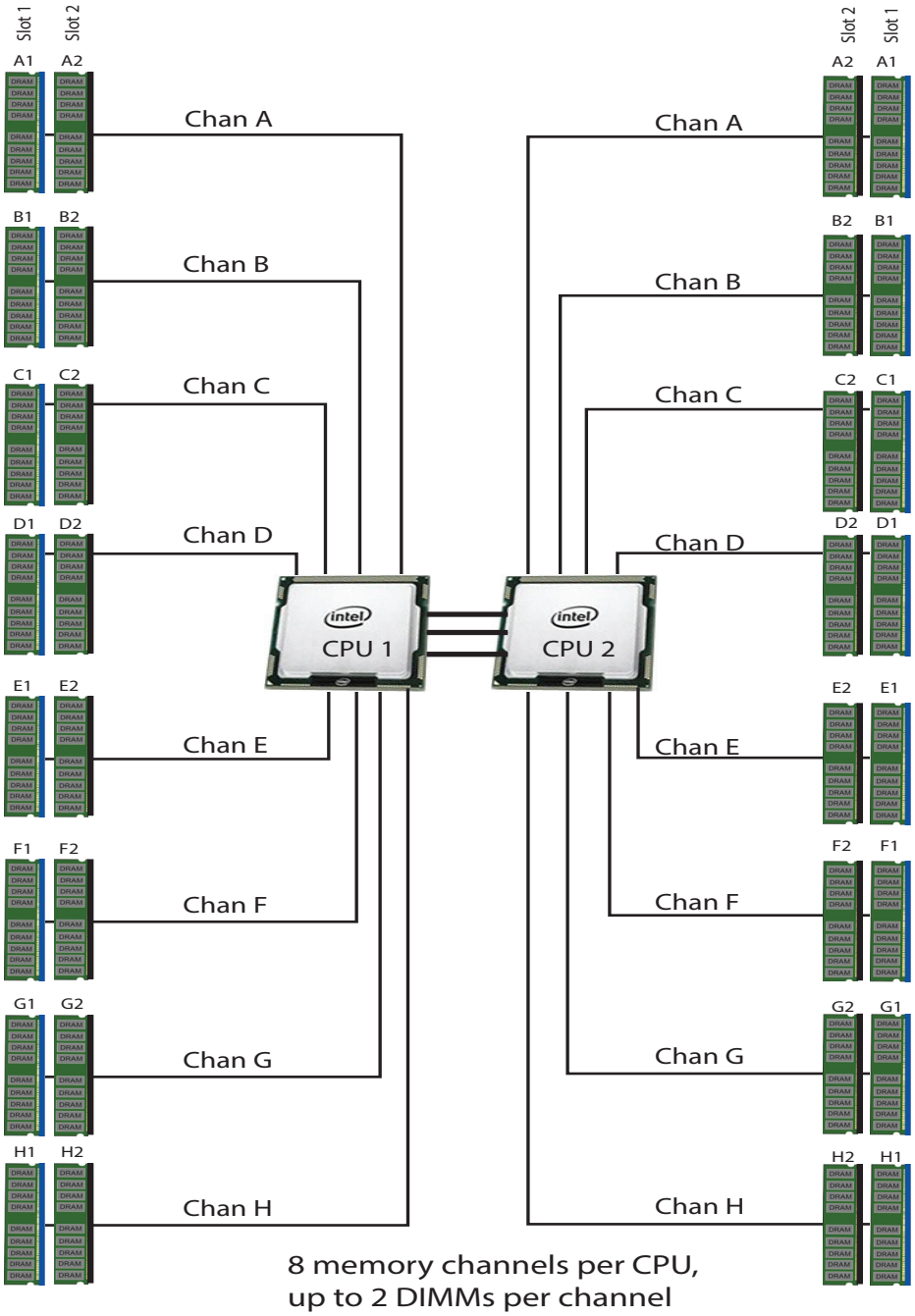
Table 1 Main Memory Features

M7 Memory DIMM server technologies	C220 M7	C240 M7	X210c M7	X410c M7
CPU Sockets	**1S or 2S**	**1S or 2S**	**1S or 2S**	**4S**
DDR5 memory clock speed	Up to 4800MT/s 1DPC; Up to 4400MT/S 2DPC			
Operational voltage	1.1 Volts			
DRAM fab density	16Gb			
DRAM DIMM Type	RDIMM (Registered DDR5 DIMM with on die ECC)			
Memory DIMM organization	Eight memory DIMM channels per CPU; up to 2 DIMMs per channel			
Maximum number of DRAM DIMM per server	32 (2-Socket)			64 (4-Socket)
DRAM DIMM Densities and Ranks	16GB 1Rx8, 32GB 1Rx4, 64GB 2Rx4, 128GB 4Rx4			
	N/A	256GB 8Rx4		
Maximum DRAM DIMMs System capacity	4TB (32x128GB)	8TB (32x256GB)		16TB (64x256GB[1])

Notes:

1. 256GB DIMMs available post first customer ship (FCS) for the X410c M7.

Figure 1 2-socket memory organization



CHAPTER 2 MEMORY OPTIONS

The available memory devices for UCS and X-series M7 are listed in *Table 2*.
The memory PID decoder for M7 Memory PIDs are shown in *Table 3*

NOTE:

- 256GB DIMMs are available on all C240 M7 server models, X210c M7 and X410C M7 compute nodes. They are not supported on C220 M7.
- Review the appropriate platform spec sheets for additional 256GB DIMM usage conditions.

CAUTION:

- On C240 M7, 256GB DIMMs cannot be combined with GPU cards and the ambient temperature shall be limited to a maximum of 28°C.
- On X210c M7, when populating 256GB DIMMs, the ambient temperature shall be limited to a maximum of 32°C.
- On X410c M7, when populating 256GB DIMMs, the ambient temperature shall be limited to a maximum of 32°C.

Table 2 Memory Options for UCS and UCSX M7

M7 Memory DIMM Densities & Cisco PIDs	C220 M7	C240 M7	X210c M7	X410c M7
	DDR5-4800MT/s Cisco PID list			
16GB	UCS-MRX16G1RE1		UCSX-MRX16G1RE1	
32GB	UCS-MRX32G1RE1		UCSX-MRX32G1RE1	
64GB	UCS-MRX64G2RE1		UCSX-MRX64G2RE1	
128GB	UCS-MR128G4RE1		UCSX-MR128G4RE1	
256GB	N/A	UCS-MR256G8RE1	UCSX-MR256G8RE1[1]	

Notes:

1. 256GB DIMMs available post first customer ship (FCS) for the X410c M7.

Table 3 Memory PID Decoder

Identifier#1	Identifier#2	Identifier#3	Identifier#4	Identifier#5	Identifier#6	Identifier#7
Cisco Product Family	**Memory DIMM Type**	**DIMM Capacity (GB)**	**DIMM Org. (Rank)**	**DDR Generation & DRAM Density**	**DIMM Speed (Mega Transfers per second)**	**Option/Spare DIMM**
		X16G	**1R:** Single-Rank			
UCS		X32G	**2R:** Dual-rank			
UCSX	**MR:** RDIMM	X64G	**4R:** Quad-rank	**E:** DDR5/16Gb	**1:** 4800 MT/s	**Blank:** Option
		128G	**8R:** Octa-rank			=: Spare
		256G				

CHAPTER 3 DRAM GUIDELINES

GOLDEN RULE: Memory on every CPU socket shall be configured identically. Therefore, the memory configuration of CPU-1 will be identical to CPU-2 for a 2-Socket system and identical to CPU-3 and CPU-4 for a 4-socket system. Unbalanced populations are unsupported.

- DIMM Count Rules:
  - Allowed DIMM count for 1-CPU:
    - Minimum DIMM count = 1; Maximum DIMM count = 16
    - 1, 2, 4, 6, 8, 12[1], 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[1], or 32 DIMMs allowed
    - 6, 10, 14, 18, 20, 22, 26, 28, 30 DIMMs not allowed.
  - Allowed DIMM count for 4-CPU:
    - Minimum DIMM count = 4; Maximum DIMM count = 64
    - 4, 8, 16, 24, 32, 48[1], or 64 DIMMs allowed
    - 12, 20, 28, 36, 40, 44, 52, 56, 60 DIMMs not allowed.

NOTE(1): 12 DIMMs count for 1-CPU, 24 DIMMs count for 2-CPU, and 48 DIMMs count for 4-CPU configurations are only allowed when all DIMMs have the same density.

- DIMM Population Rules:
  - Each channel has two memory slots (for example, channel A = slots A1 and A2). See golden rule above.
    - 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 4***.

Table 4 M7 DIMM Population Order per socket

#DIMMs per CPU	Population of DIMM slots per socket[1]	
	Slot 1 (Blue)	Slot 2 (Black)
1	A1	-
2	A1, G1	-
4	A1, C1, E1, G1	-
6	A1, C1, D1, E1, F1, G1	-
8	A1, B1, C1, D1, E1, F1, G1, H1	-
12[2]	A1, B1, C1, D1, E1, F1, G1, H1	A2, C2, E2, G2
16	A1, B1, C1, D1, E1, F1, G1, H1	A2, B2, C2, D2, E2, F2, G2, H2

Notes:

1. See DIMM Mixing Rules for allowed combinations across slots 1 and 2.
2. Only valid when DIMMs in blue and black slots are the same density.

- DIMM Mixing Rules:
  - Higher rank DIMMs shall be populated on Slot 1.
  - Mixing different DIMM densities in the same slot across channels is not supported. All populated slots of the same color must have the same DIMM density.
  - The DIMM mixing rules matrix is described in the ***Table 5***, below.

Table 5 Supported DIMM mixing and population across 2 slots in each channel

Channel Mixing		DIMM Slot 2 (Black)				
DIMM Slot 1 (Blue)		16GB	32GB	64GB	128GB	256GB[3]
		1Rx8	1Rx4	2Rx4	4Rx4	8Rx4
16GB	1Rx8	Yes[1]	No	No	No	No
32GB	1Rx4	No	Yes[1]	No	No	No
64GB	2Rx4	No	Yes[2]	Yes[1]	No	No
128GB	4Rx4	No	No	No	Yes[1]	No
256GB[3]	8Rx4	No	No	No	Yes[2]	Yes[1]

Notes:

1. Only 6 or 8 channels are allowed (for 2, 4, or 8 DIMMs you would just populate 1 DPC on 2, 4, or 8 channels)
2. When mixing two different DIMM densities, all 8 channels per CPU must be populated. Use of fewer than 8 channels (16 slots per CPU) is not supported.
3. 256GB DIMMs available post first customer ship (FCS) for the X410c M7.

- Memory Limitations:
  - Memory on every CPU socket shall be configured identically. See golden rule from page 7.
  - Refer to ***Table 4*** and ***Table 5*** for DIMM population and DIMM mixing rules.
  - Cisco memory from previous generation servers (DDR3 and DDR4) is not supported with the M7 servers.
- For best performance, observe the following:
  - For optimum performance, populate at least one DIMM per memory channel per CPU. When one DIMM per channel is used, it must be populated in DIMM slot 1 (blue slot farthest away from the CPU) of a given channel.
  - The maximum 2 DPC speed is 4400 MT/s, refer to ***Table 6*** for the details.

Table 6 DDR5-4800 DIMM 1DPC and 2DPC max speed matrix

CPU max speed/ DIMM max speed	DDR5 DIMM 1DPC	DDR5 DIMM 2DPC
CPU 4000 MT/s	4000 MT/s	4000 MT/s
CPU 4400 MT/s	4400 MT/s	4400 MT/s
CPU 4800 MT/s	4800 MT/s	4400 MT/s

CHAPTER 4 SUPPORTED DRAM DIMM CONFIGURATIONS

- *Table 7* below shows the supported DIMM configurations with 1, 2, 4, 6, 8, 12, and 16 DIMMs per CPU.
- The rows highlighted in yellow are recommended for the best performance at a given capacity (Performance measurement is Work In Progress).
- The only DIMM mixing configurations allowed are:
  - 32GB and 64GB RDIMMs
  - 128GB RDIMMs and 256GB[1] RDIMMs

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

Table 7 Supported Memory Configurations for 4th Gen Intel® Xeon® Scalable Processors (Sapphire Rapids)

Total system capacity			Capacity Per CPU (GB)		Total DIMMs Per CPU
1-CPU	2-CPU	4-CPU	Blue Slots A1 to H1	Black Slots A2 to H2	
16GB RDIMMs					
16GB	32GB	64GB	1x16GB	-	1
32GB	64GB	128GB	2x16GB	-	2
64GB	128GB	256GB	4x16GB	-	4
96GB	192GB	384GB	6x16GB	-	6
128GB	256GB	512GB	8x16GB	-	8
192GB	384GB	768GB	6x16GB	6x16GB	12
256GB	512GB	1024GB	8x16GB	8x16GB	16
32GB RDIMMs					
32GB	64GB	128GB	1x32GB	-	1
64GB	128GB	256GB	2x32GB	-	2
128GB	256GB	512GB	4x32GB	-	4
192GB	384GB	768GB	6x32GB	-	6
256GB	512GB	1024GB	8x32GB	-	8
384GB	768GB	1536GB	6x32GB	6x32GB	12
512GB	1024GB	2048GB	8x32GB	8x32GB	16

Table 7 Supported Memory Configurations for 4th Gen Intel® Xeon® Scalable Processors (Sapphire Rapids)

Total system capacity			Capacity Per CPU (GB)		Total DIMMs Per CPU
1-CPU	2-CPU	4-CPU	Blue Slots A1 to H1	Black Slots A2 to H2	
64GB RDIMMs					
64GB	128GB	256GB	1x64GB	-	1
128GB	256GB	512GB	2x64GB	-	2
256GB	512GB	1024GB	4x64GB	-	4
384GB	768GB	1536GB	6x64GB	-	6
512GB	1024GB	2048GB	8x64GB	-	8
768GB	1536GB	3072GB	6x64GB	6x64GB	12
1024GB	2048GB	4096GB	8x64GB	8x64GB	16
128GB RDIMMs					
128GB	256GB	512GB	1x128GB	-	1
256GB	512GB	1024GB	2x128GB	-	2
512GB	1024GB	2048GB	4x128GB	-	4
768GB	1536GB	3072GB	6x128GB	-	6
1024GB	2048GB	4096GB	8x128GB	-	8
1536GB	3072GB	6144GB	6x128GB	6x128GB	12
2048GB	4096GB	8192GB	8x128GB	8x128GB	16
256GB RDIMMs[1]					
256GB	512GB	1024GB	1x256GB	-	1
512GB	1024GB	2048GB	2x256GB	-	2
1024GB	2048GB	4096GB	4x256GB	-	4
1536GB	3072GB	6144GB	6x256GB	-	6
2048GB	4096GB	8192GB	8x256GB	-	8
3072GB	6144GB	12288GB	6x256GB	6x256GB	12
4096GB	8192GB	16384GB	8x256GB	8x256GB	16

Table 7 Supported Memory Configurations for 4th Gen Intel® Xeon® Scalable Processors (Sapphire Rapids)

Total system capacity			Capacity Per CPU (GB)		Total DIMMs Per CPU
1-CPU	2-CPU	4-CPU	Blue Slots A1 to H1	Black Slots A2 to H2	
32GB RDIMMs + 64GB RDIMMs					
768GB	1536GB	3072GB	8x32GB	8x64GB	16
128GB RDIMMs + 256GB[1] RDIMMs					
3072GB	6144GB	12288GB	8x128GB	8x256GB	16

Notes:

1. 256GB DIMMs available post first customer ship (FCS) for the X410c M7.

NOTE:

- 256GB DIMMs are available on all C240 M7 server models, X210c M7 and X410C M7 compute nodes. They are not supported on C220 M7.
- Review the appropriate platform spec sheets for additional 256GB DIMM usage conditions.

CHAPTER 5 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.

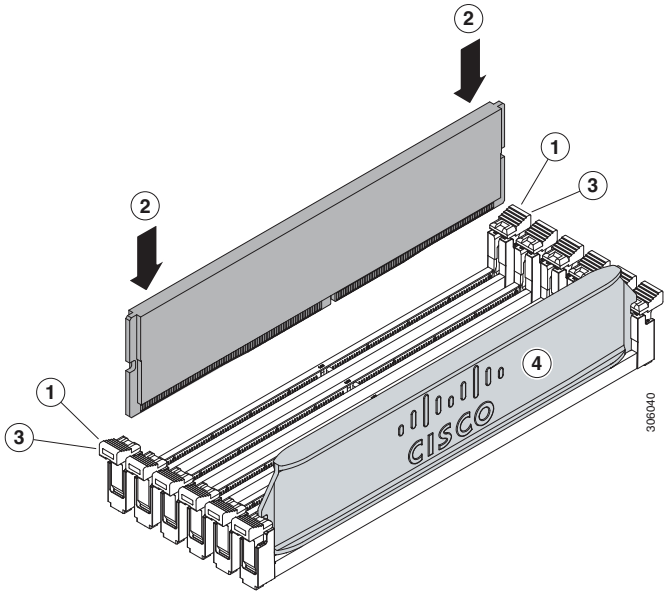
Step 2 Press evenly on both ends of the DIMM until it clicks into place in its slot

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 2 Installing Memory



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