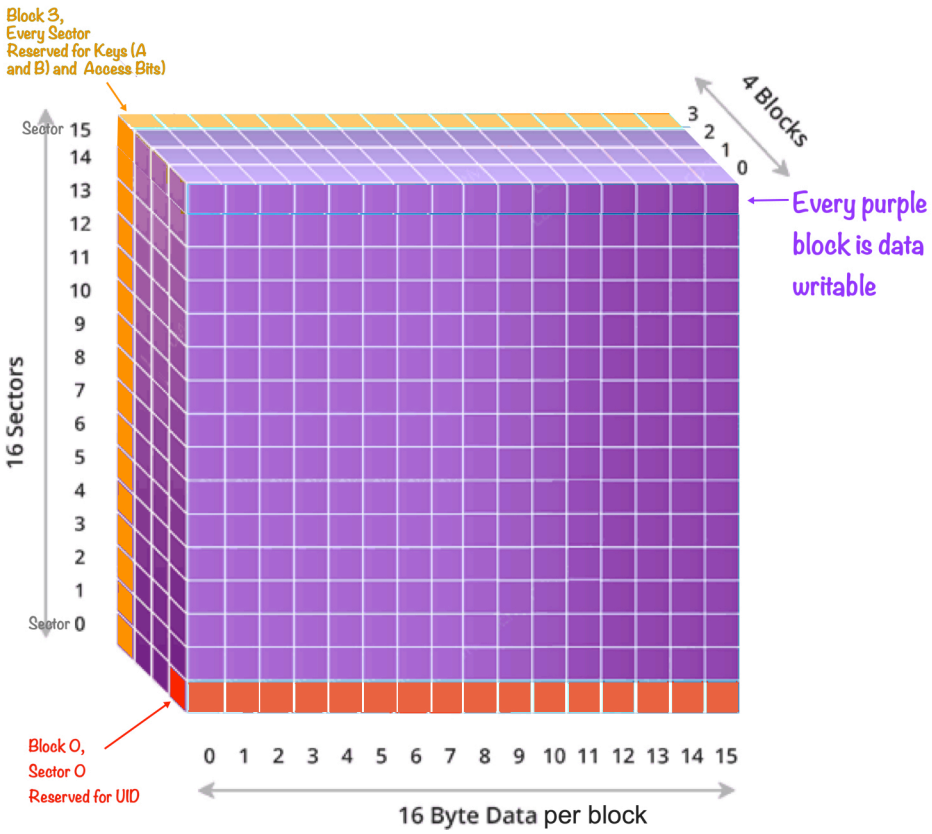
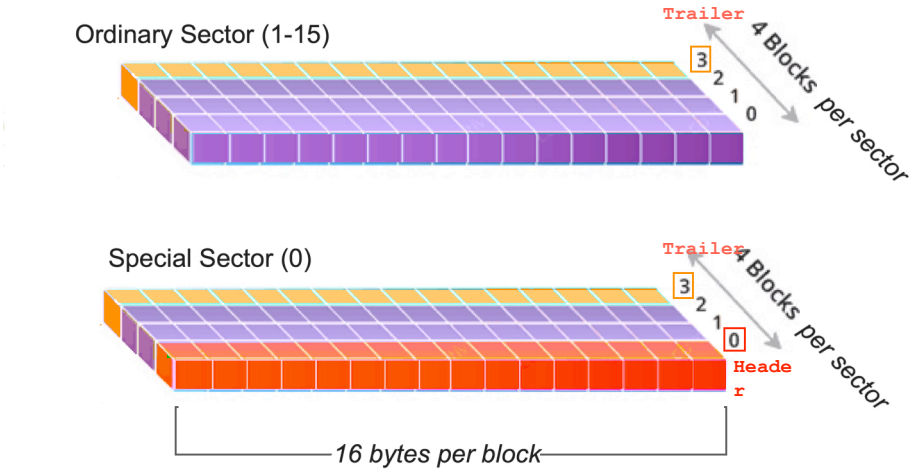
MIFARE RFID Card (PICC) Memory Map

1) 3D Respresentation of Entire Memory (1KB)



2) 3D Respresentation of a memory sector: made up of 4 blocks, whereby each block has 16 bytes



3) Tabular Memory Map Representation

Access Bits: 4 bytes

Key A: 6 bytes

Key B: 6 bytes

Sector	Block	0 1 2 3 4 5	6 7 8 9	10 11 12 13 14 15	AccessBits
15	63	00 00 00 00 00 00	FF 07 80 69	FF FF FF FF FF FF	[0 0 1]
	62	00 00 00 00 00 00	00 00 00 00	00 00 00 00 00 00	[0 0 0]
	61	00 00 00 00 00 00	00 00 00 00	00 00 00 00 00 00	[0 0 0]
	60	00 00 00 00 00 00	00 00 00 00	00 00 00 00 00 00	[0 0 0]
14	59	00 00 00 00 00 00	FF 07 80 69	FF FF FF FF FF FF	[0 0 1]
	58	00 00 00 00 00 00	00 00 00 00	00 00 00 00 00 00	[0 0 0]
	57	00 00 00 00 00 00	00 00 00 00	00 00 00 00 00 00	[0 0 0]
	56	00 00 00 00 00 00	00 00 00 00	00 00 00 00 00 00	[0 0 0]
13	55	00 00 00 00 00 00	FF 07 80 69	FF FF FF FF FF FF	[0 0 1]
	54	00 00 00 00 00 00	00 00 00 00	00 00 00 00 00 00	[0 0 0]
	53	00 00 00 00 00 00	00 00 00 00	00 00 00 00 00 00	[0 0 0]
	52	00 00 00 00 00 00	00 00 00 00	00 00 00 00 00 00	[0 0 0]
12	51	00 00 00 00 00 00	FF 07 80 69	FF FF FF FF FF FF	[0 0 1]
	50	00 00 00 00 00 00	00 00 00 00	00 00 00 00 00 00	[0 0 0]
	49	00 00 00 00 00 00	00 00 00 00	00 00 00 00 00 00	[0 0 0]
	48	00 00 00 00 00 00	00 00 00 00	00 00 00 00 00 00	[0 0 0]
11	47	00 00 00 00 00 00	FF 07 80 69	FF FF FF FF FF FF	[0 0 1]
	46	00 00 00 00 00 00	00 00 00 00	00 00 00 00 00 00	[0 0 0]
	45	00 00 00 00 00 00	00 00 00 00	00 00 00 00 00 00	[0 0 0]
	44	00 00 00 00 00 00	00 00 00 00	00 00 00 00 00 00	[0 0 0]
10	43	00 00 00 00 00 00	FF 07 80 69	FF FF FF FF FF FF	[0 0 1]
	42	00 00 00 00 00 00	00 00 00 00	00 00 00 00 00 00	[0 0 0]
	41	00 00 00 00 00 00	00 00 00 00	00 00 00 00 00 00	[0 0 0]
	40	00 00 00 00 00 00	00 00 00 00	00 00 00 00 00 00	[0 0 0]
9	39	00 00 00 00 00 00	FF 07 80 69	FF FF FF FF FF FF	[0 0 1]
	38	00 00 00 00 00 00	00 00 00 00	00 00 00 00 00 00	[0 0 0]
	37	00 00 00 00 00 00	00 00 00 00	00 00 00 00 00 00	[0 0 0]
	36	00 00 00 00 00 00	00 00 00 00	00 00 00 00 00 00	[0 0 0]
8	35	00 00 00 00 00 00	FF 07 80 69	FF FF FF FF FF FF	[0 0 1]
	34	00 00 00 00 00 00	00 00 00 00	00 00 00 00 00 00	[0 0 0]
	33	00 00 00 00 00 00	00 00 00 00	00 00 00 00 00 00	[0 0 0]
	32	00 00 00 00 00 00	00 00 00 00	00 00 00 00 00 00	[0 0 0]
7	31	00 00 00 00 00 00	FF 07 80 69	FF FF FF FF FF FF	[0 0 1]
	30	00 00 00 00 00 00	00 00 00 00	00 00 00 00 00 00	[0 0 0]
	29	00 00 00 00 00 00	00 00 00 00	00 00 00 00 00 00	[0 0 0]
	28	00 00 00 00 00 00	00 00 00 00	00 00 00 00 00 00	[0 0 0]
6	27	00 00 00 00 00 00	FF 07 80 69	FF FF FF FF FF FF	[0 0 1]
	26	00 00 00 00 00 00	00 00 00 00	00 00 00 00 00 00	[0 0 0]
	25	00 00 00 00 00 00	00 00 00 00	00 00 00 00 00 00	[0 0 0]
	24	00 00 00 00 00 00	00 00 00 00	00 00 00 00 00 00	[0 0 0]
5	23	00 00 00 00 00 00	FF 07 80 69	FF FF FF FF FF FF	[0 0 1]
	22	00 00 00 00 00 00	00 00 00 00	00 00 00 00 00 00	[0 0 0]
	21	00 00 00 00 00 00	00 00 00 00	00 00 00 00 00 00	[0 0 0]
	20	00 00 00 00 00 00	00 00 00 00	00 00 00 00 00 00	[0 0 0]
4	19	00 00 00 00 00 00	FF 07 80 69	FF FF FF FF FF FF	[0 0 1]
	18	00 00 00 00 00 00	00 00 00 00	00 00 00 00 00 00	[0 0 0]
	17	00 00 00 00 00 00	00 00 00 00	00 00 00 00 00 00	[0 0 0]
	16	00 00 00 00 00 00	00 00 00 00	00 00 00 00 00 00	[0 0 0]
3	15	00 00 00 00 00 00	FF 07 80 69	FF FF FF FF FF FF	[0 0 1]
	14	00 00 00 00 00 00	00 00 00 00	00 00 00 00 00 00	[0 0 0]
	13	00 00 00 00 00 00	00 00 00 00	00 00 00 00 00 00	[0 0 0]
	12	00 00 00 00 00 00	00 00 00 00	00 00 00 00 00 00	[0 0 0]
2	11	00 00 00 00 00 00	FF 07 80 69	FF FF FF FF FF FF	[0 0 1]
	10	00 00 00 00 00 00	00 00 00 00	00 00 00 00 00 00	[0 0 0]
	9	00 00 00 00 00 00	00 00 00 00	00 00 00 00 00 00	[0 0 0]
	8	00 00 00 00 00 00	00 00 00 00	00 00 00 00 00 00	[0 0 0]
1	7	00 00 00 00 00 00	FF 07 80 69	FF FF FF FF FF FF	[0 0 1]
	6	00 00 00 00 00 00	00 00 00 00	00 00 00 00 00 00	[0 0 0]
	5	00 00 00 00 00 00	00 00 00 00	00 00 00 00 00 00	[0 0 0]
	4	4D 75 73 69 6D 65 6E 74	61 20 0D 0A	20 20 20 20	[0 0 0]
0	3	00 00 00 00 00 00	FF 07 80 69	FF FF FF FF FF FF	[0 0 1]
	2	00 00 00 00 00 00	00 00 00 00	00 00 00 00 00 00	[0 0 0]
	1	00 00 00 00 00 00	00 00 00 00	00 00 00 00 00 00	[0 0 0]
	0	23 28 74 F5 8A 08 04 00	62 63 64 65	66 67 68 69	[0 0 0]

Every Block 3, Every Sector: Trailer: Key A, Key B, and Acess Bits

Block 0, Sector 0: Header: UID
A block has 16 bytes

4) Calculation of Actual Writable Memory

Note: Not all of 1KB memory is usable for storing data!

While a MIFARE Classic 1KB card is marketed as having 1KB (1024 bytes) of memory, not all of this memory is usable for storing data. A significant portion is reserved for keys, access control, and special-purpose blocks like the UID.

Let's recalculate the writable memory.

Memory Structure Recap

A MIFARE Classic 1KB card has:
- 16 sectors
- 4 blocks per sector
- 16 bytes per block

Thus:

16 sectors x 4 blocks/sector x 16 bytes/block = 1024 bytes total memory

Reserved Memory
1. Sector Trailers (1 block per sector):
- Each sector has 1 trailer block (Block 3).
- The trailer stores Key A, Key B, and AccessBits.
- 16 bytes per trailer × 16 sectors = 256 bytes reserved.

2. Sector 0, Block 0 (UID and manufacturer data):
- Permanently reserved for the card's UID and manufacturer data.
- 16 bytes reserved.

Total Reserved Memory= Memory reserved for UID + Memory reserved for trailers
= 256 bytes + 16 bytes
= 272 bytes

Writable Memory = Total Memory - Reserved Memory
= 1024 bytes - 272 bytes
= 752 bytes

Verification:

Writable Memory

1. Sector 0: Blocks 1 and 2 are writable.
Therefore, 2 blocks × 16 bytes/block = 32 bytes writable.

2. Sectors 1–15: Each sector has 3 writable blocks (Blocks 0, 1, and 2).
Therefore, 15 sectors × 3 blocks/sector × 16 bytes/block = 720 bytes writable.

Total Writable Memory = Writable memory in Sector 0 + Writable memory in Sectors 1–15

Total Writable Memory = 32 bytes + 720 bytes = 752 bytes

Thus, the writable data capacity of a MIFARE Classic 1KB card is 752 bytes.