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BioStar 1, MIFARE Class

How to configure MIFARE card memory layout

Understanding the memory structure of MIFARE Classic cards

The MIFARE Classic card is a memory storage device. The memory is divided into sectors, which are also divided into blocks of 16 bytes.

The MIFARE Classic 1K card has 16 sectors, each of which are divided into four blocks. If we do the math, we can figure out how the memory structure would be like: 16 bytes (1 block) * 4 blocks * 16 sectors = 1024 bytes.

[Figure 1. MIFARE 1K card memory structure]

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Block (1 block = 16bytes)	0	4	8	12	16	20	24	28	32	36	40	44	48	52	56	60
	1	5	9	13	17	21	25	29	33	37	41	45	49	53	57	61
	2	6	10	14	18	22	26	30	34	38	42	46	50	54	58	62
	3	7	11	15	19	23	27	31	35	39	43	47	51	55	59	63

CSN CIS Data Site Key

The MIFARE Classic 4K card has 40 sectors, 32 of which are divided into four blocks and the remaining 8 are divided into 16 blocks. 16 bytes (1 block) * 4 blocks * 32 sectors + 16 bytes (1 block) * 16 blocks * 8 sectors = 4096 bytes. The memory structure is as follows:

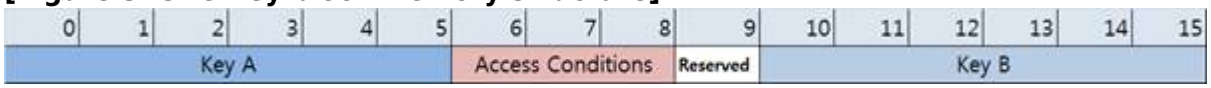
[Figure 2. MIFARE 4K card memory structure]

Sector	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Block (1block = 16byte)	0	4	8	12	16	20	24	28	32	36	40	44	48	52	56	60	
	1	5	9	13	17	21	25	29	33	37	41	45	49	53	57	61	
	2	6	10	14	18	22	26	30	34	38	42	46	50	54	58	62	
	3	7	11	15	19	23	27	31	35	39	43	47	51	55	59	63	1K
Sector	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
Block	64	68	72	76	80	84	88	92	96	100	104	108	112	116	120	124	
	65	69	73	77	81	85	89	93	97	101	105	109	113	117	121	125	
	66	70	74	78	82	86	90	94	98	102	106	110	114	118	122	126	
	67	71	75	79	83	87	91	95	99	103	107	111	115	119	123	127	2K
Sector	32	33	34	35	36	37	38	39									
Block	128	144	160	176	192	208	224	240									
	129	145	161	177	193	209	225	241									
	130	146	162	178	194	210	226	242									
	131	147	163	179	195	211	227	243									
	132	148	164	180	196	212	228	244									
	133	149	165	181	197	213	229	245									
	134	150	166	182	198	214	230	246									
	135	151	167	183	199	215	231	247									
	136	152	168	184	200	216	232	248									
	137	153	169	185	201	217	233	249									
	138	154	170	186	202	218	234	250									
	139	155	171	187	203	219	235	251									
	140	156	172	188	204	220	236	252									
	141	157	173	189	205	221	237	253									
	142	158	174	190	206	222	238	254									
	143	159	175	191	207	223	239	255									4K

The number on the blocks indicates its index. Each sector is protected by the site key written in the

last block of the sector. For example, block 3 contains the site key for sector 1 and block 7 for sector 2. The last block in each sector also contains access conditions information such as “write”, “read” and “read & write”. The following figure demonstrates how the last block consists of:

[Figure 3. Site Key block memory structure]

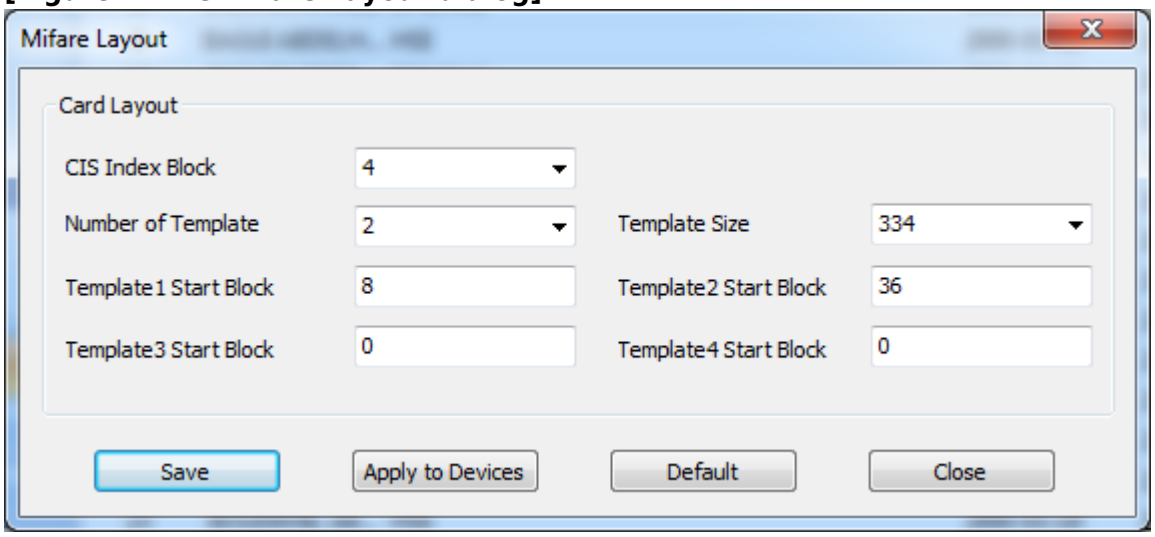


Manipulating the MIFARE card layout

BioStar Client allows you to manipulate the MIFARE layout. More specifically, you can specify how many fingerprint templates you want to store in which blocks.

1. Go to **Option** > **Mifare Card** > **Mifare Layout** and this brings up the **Mifare Layout** dialog.

[Figure 4. The Mifare Layout dialog]

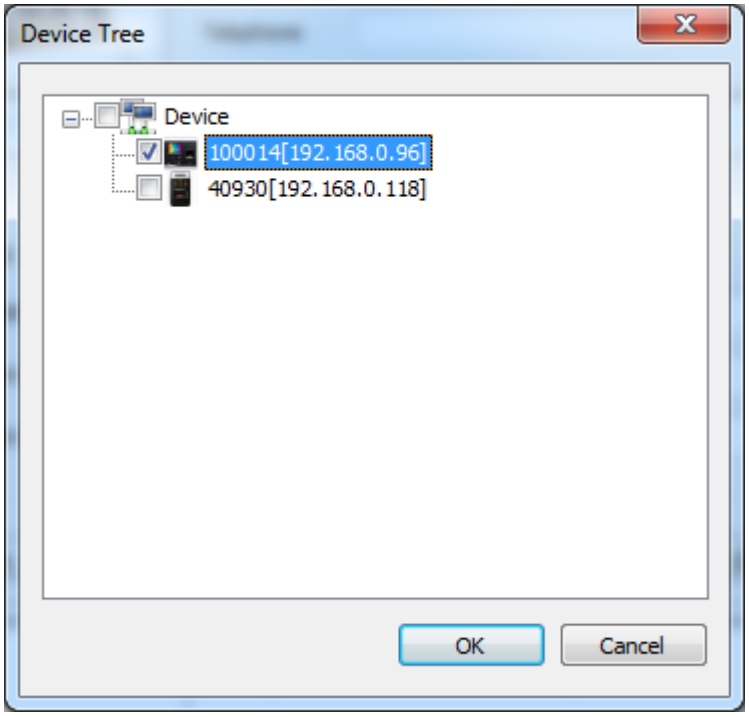


2. Fill out the fields on the dialog.

- **CIS Index Block**: You can specify where you want to store card information in this field. It only accepts 4, 8, 12 and 16. CIS stands for Card Information Sector. The card information sector contains additional user information such as card number, user ID, user name, access group and so on. As we can guess from its name (Card Information Sector), it takes up one sector (three data blocks).
- **Number of Template**: You can specify how many fingerprint / face templates you want to store. You can store up to two fingerprint templates in a MIFARE Classic 1K card. We can store templates in data blocks only. For example, if you want to store two fingerprint templates, the total number of bytes requires is 668 (334 * 2). As shown in the figure 1, templates are stored in the data blocks only. So, you need 21 blocks to store two templates, because dividing 334 by 16 equals 20.875. This means that if the starting block for Template 1 is 8, the starting block for Template 2 should be 36. Remember that we cannot store templates in the site key blocks (the last block of each sector).
- **Template Size**: The default value is 334 bytes. It can vary depending on the template type.
- **Template 1-4 Start Block**: You can specify the starting block for each template.

3. After specifying all the values, click **Apply to Devices** to transfer the settings to the devices.

4. Select the devices to which you want to transfer the settings and click **OK**.



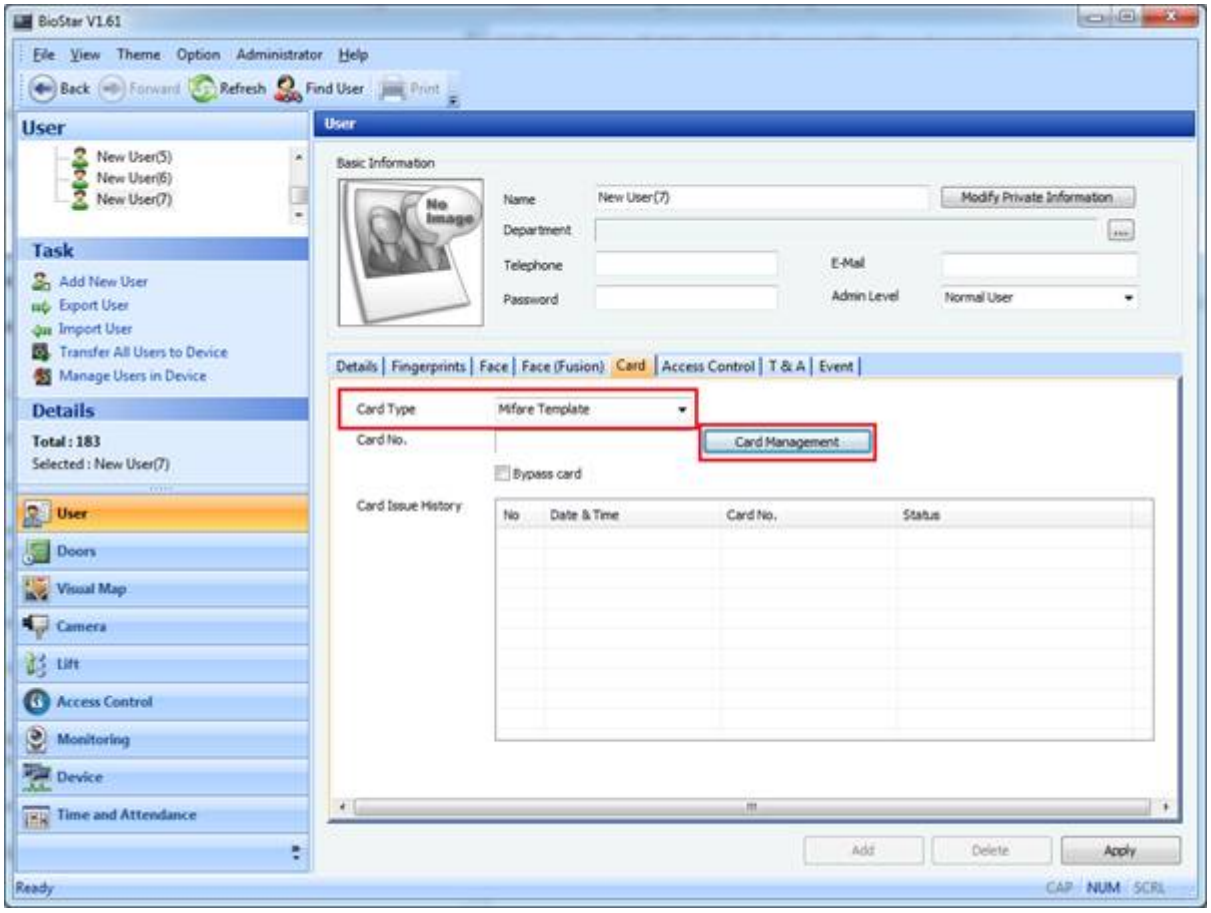
5. Click **Save** if you want to save the settings you've configured.

6. Click **Close** to close the **Mifare Layout** dialog.

Writing templates into a MIFARE card

The procedure to write templates into a MIFARE card is different from storing card serial number in a user. The templates are not stored in a user but in a MIFARE card itself.

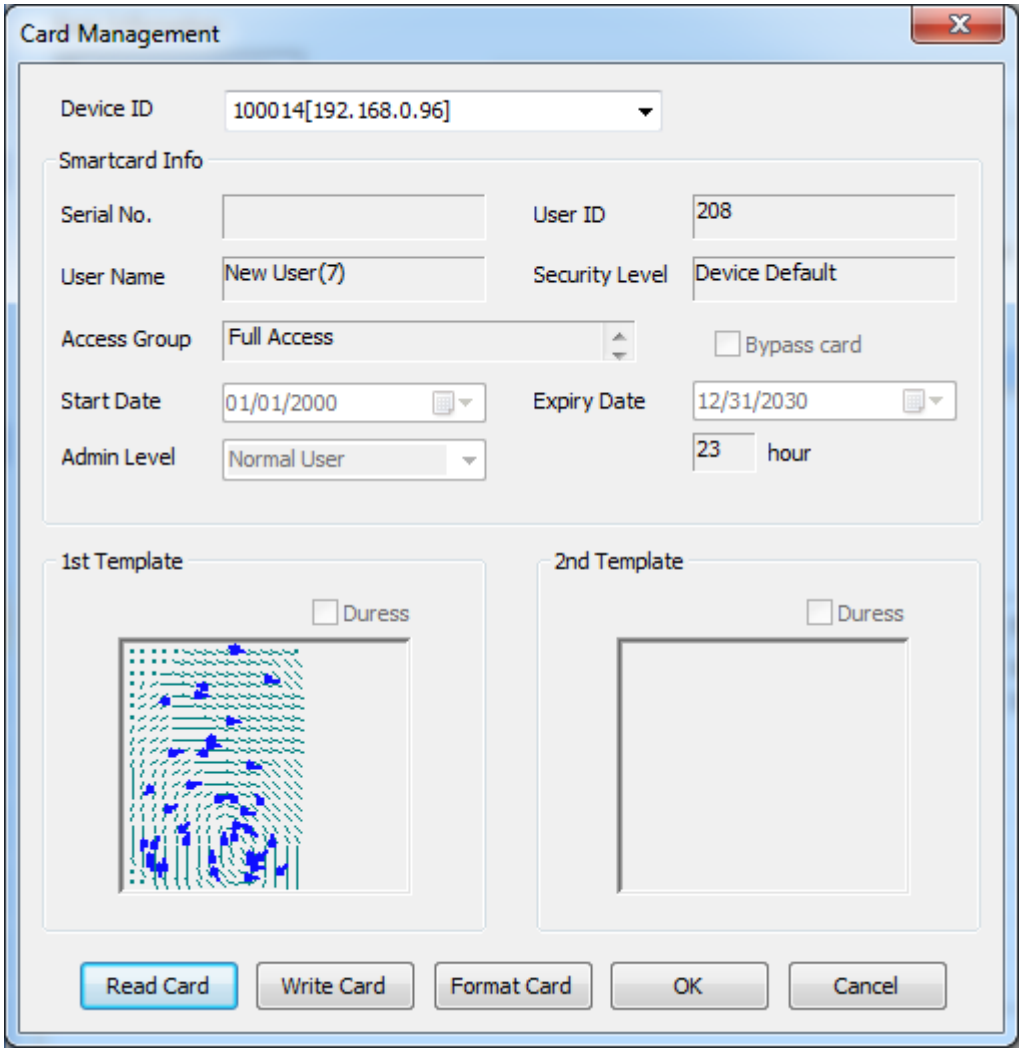
1. Go to the **Card** tab of the **User** page.



2. Set **Card Type** to **Mifare Template** and click **Card Management**.

3. The information under the **Smartcard Info** section is stored in the card information sector that you specified on the **Mifare Layout** dialog.

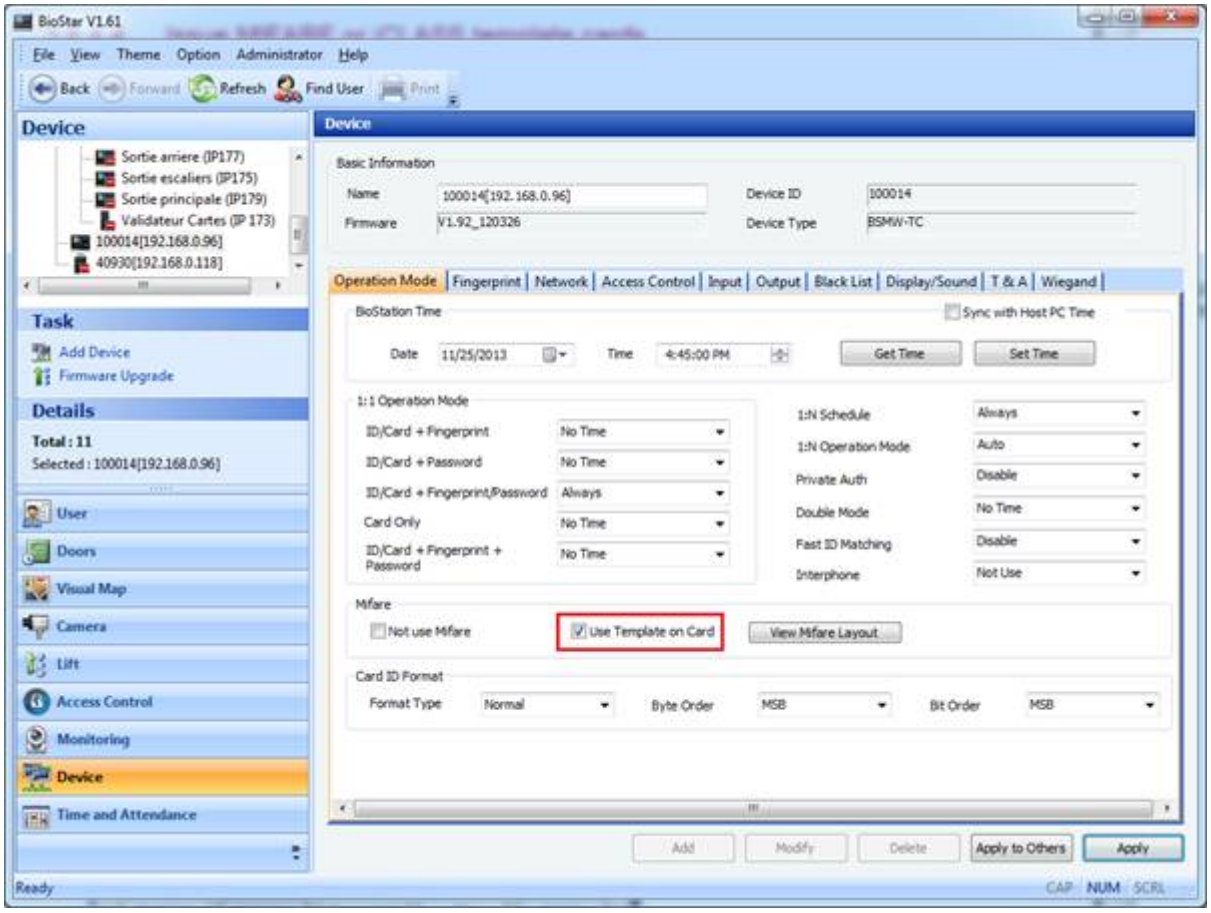
4. Click **Write Card** and place the card on the reader.



5. Click **OK** to close the dialog.

6. It's time to test if the templates are properly written into the card.

7. Make sure that the card reading mode is set to **Use Template on Card**.



8. Place the card on the reader and verify yourself using the finger you have used for the template.