eMMC Flash Memories

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Programming eMMC on Elnec Device Programmers

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eMMC Flash Memories

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an_elnec_emmc, version 1.06

1. eMMC Partitions

The memory configuration initially consists of the User Area, two Boot Areas and RPMB Area partition. The sizes and attributes of Boot Areas and RPMB Area are defined by the memory manufacturer. The sizes and attributes of General Purpose Area Partitions 1-4(GP0-GP3) and Enhanced User Data Area can be programmed by the host setting the corresponding values in the Extended CSD registers.

Extended CSD bytes for configuring the parameters of General Purpose Area Partitions and Enhanced User Data Area:

GP_SIZES_MULT_GP0 - the size for Partition 1 area
GP_SIZES_MULT_GP1 - the size for Partition 2 area
GP_SIZES_MULT_GP2 - the size for Partition 3 area
GP_SIZES_MULT_GP3 - the size for Partition 4 area
ENH_SIZE_MULT - the size for Enhanced User Data area (pSLC)
ENH_START_ADDR - the device start address for Enhanced User Area
PARTITIONS_ATTRIBUTE - enhanced attribute (pSLC/MLC) for Partition1-3, Enhanced User Area
EXT_ PARTITIONS_ATTRIBUTE - extended attribute for Partition 1-4
PARTITION_SETTING_COMPLETED - mandatory for setting successfully completed

1.1. Example of configuration setting for Partitions 1-4 (MLC mode)

Requirements eMMC device configuration:

PARTITION 1(GP0) size = 1000000h (MLC)
PARTITION 2(GP1) size = 2000000h (MLC)
PARTITION 3(GP2) size = 6000000h (MLC)
PARTITION 4(GP3) size = 0000000h (MLC)
Enhanced UserArea size = 00h (none)
Enhanced UserArea Device Start/offset = 00h (none)

HC_WP_GRP_SIZE = (**value from the vendor datasheet**)
HC_ERASE_GRP_SIZE = (**value from the vendor datasheet**)
GP_SIZE_MULT_GPx = Partition size / (HC_WP_GRP_SIZE x HC_ERASE_GRP_SIZE x 80000h)

Example settings of Extended CSD register in the PG4UW/device:

GP_SIZE_MULT_GP0 [145-143] = 02h
GP_SIZE_MULT_GP1 [148-146] = 04h
GP_SIZE_MULT_GP2 [148-146] = 0Ch
GP_SIZE_MULT_GP3 [151-149] = 00h
ENH_SIZE_MULT [142:140] = 0000h (none)
ENH_START_ADDR [139:136] = 0000h (none)
PARTITIONS_ATTRIBUTE [156] = 00h (MLC mode setting)
PARTITIONS_SETTING_COMPLETE [155] = 01h (mandatory for configuration)

1.2. Example of configuration setting for UserArea (pSLC mode)

Requirements eMMC device configuration:

```
PARTITION 1(GP0) size = 00h (none)
PARTITION 2(GP1) size = 00h (none)
PARTITION 3(GP2) size = 00h (none)
PARTITION 4(GP3) size = 00h (none)
Enhanced UserArea size = configure device to Full pSLC mode
```

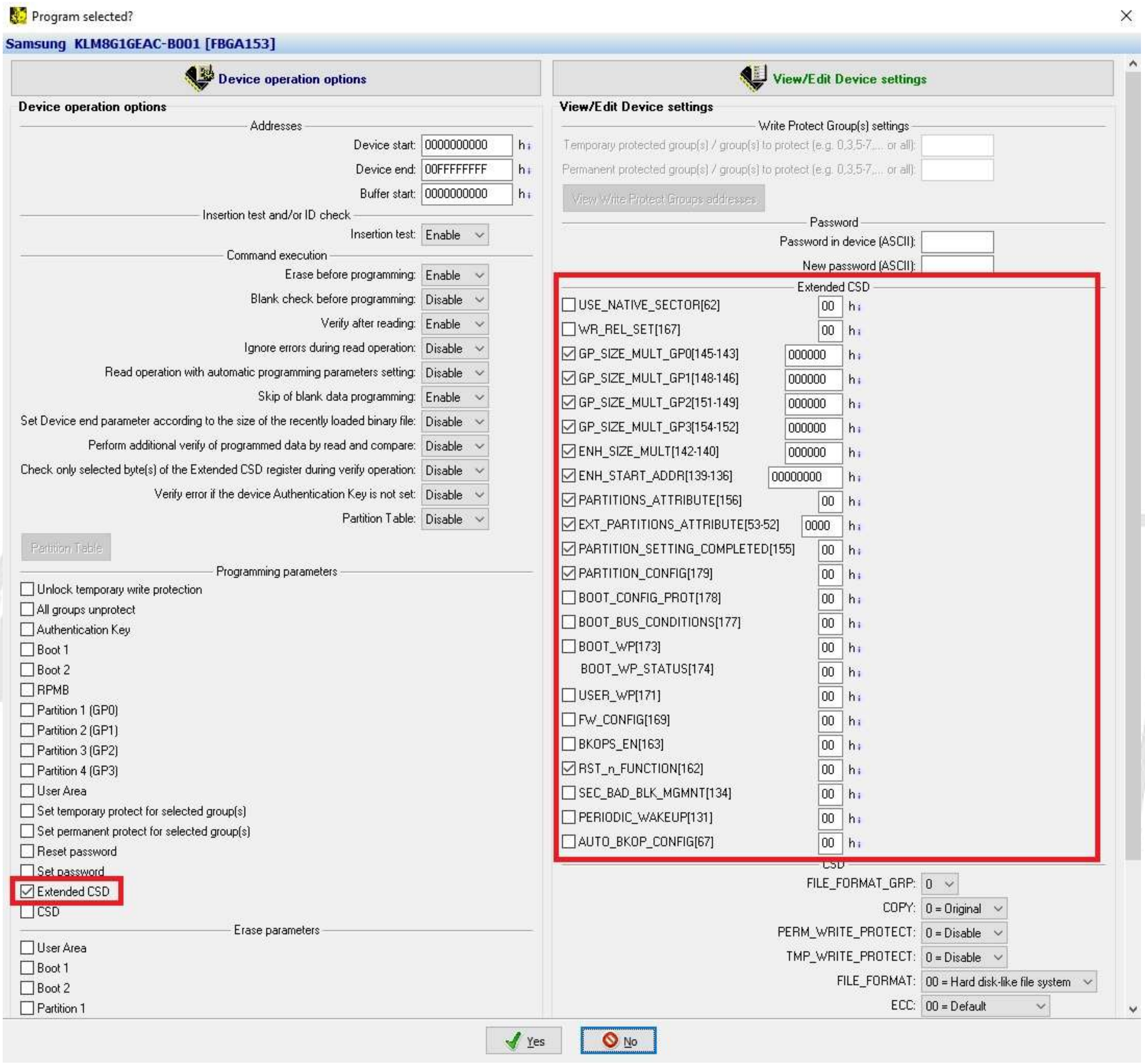
MAX_ENH_SIZE_MULT = **value from the vendor data sheet**

Example settings of Extended CSD register in the PG4UW/device:

```
GP_SIZE_MULT_GP0 [145-143] = 0000h
GP_SIZE_MULT_GP1 [148-146] = 0000h
GP_SIZE_MULT_GP2 [148-146] = 0000h
GP_SIZE_MULT_GP3 [151-149] = 0000h
ENH_SIZE_MULT [142:140] = MAX_ENH_SIZE_MULT
ENH_START_ADDR [139:136] = 0000h
PARTITIONS_ATTRIBUTE [156] = 01h (UserArea pSLC mode setting)
PARTITIONS_SETTING_COMPLETE [155] = 01h (mandatory for configuration)
```

2. Program Extended CSD register

To enable programming the Extended CSD register, open Device operation options (ALT+O) window and use check box “Extended CSD”, see figure 1. Setting this option is mandatory to allow programming selected bytes of Extended CSD register. For setting the individual bytes of Extended CSD register use the checkboxes in View/Edit Device settings (ALT+S) window, section "Extended CSD". During the "Program" operation only selected bytes of the Extended CSD register are programmed and verified. During operation of "Verify" all bytes of the Extended CSD register are verified.



Program selected?

Samsung KLM8G1GEAC-B001 [FBGA153]

Device operation options

Addresses
Device start: 0000000000 h
Device end: 00FFFFFFFF h
Buffer start: 0000000000 h

Insertion test and/or ID check
Insertion test: Enable

Command execution
Erase before programming: Enable
Blank check before programming: Disable
Verify after reading: Enable
Ignore errors during read operation: Disable
Read operation with automatic programming parameters setting: Disable
Skip of blank data programming: Enable
Set Device end parameter according to the size of the recently loaded binary file: Disable
Perform additional verify of programmed data by read and compare: Disable
Check only selected byte(s) of the Extended CSD register during verify operation: Disable
Verify error if the device Authentication Key is not set: Disable
Partition Table: Disable

Programming parameters
□ Unlock temporary write protection
□ All groups unprotect
□ Authentication Key
□ Boot 1
□ Boot 2
□ RPMB
□ Partition 1 (GP0)
□ Partition 2 (GP1)
□ Partition 3 (GP2)
□ Partition 4 (GP3)
□ User Area
□ Set temporary protect for selected group(s)
□ Set permanent protect for selected group(s)
□ Reset password
□ Set password
☑ Extended CSD
□ CSD

Erase parameters
□ User Area
□ Boot 1
□ Boot 2
□ Partition 1

View/Edit Device settings

Write Protect Group(s) settings
Temporary protected group(s) / group(s) to protect (e.g. 0,3,5-7,... or all):
Permanent protected group(s) / group(s) to protect (e.g. 0,3,5-7,... or all):

Password
Password in device (ASCII):
New password (ASCII):

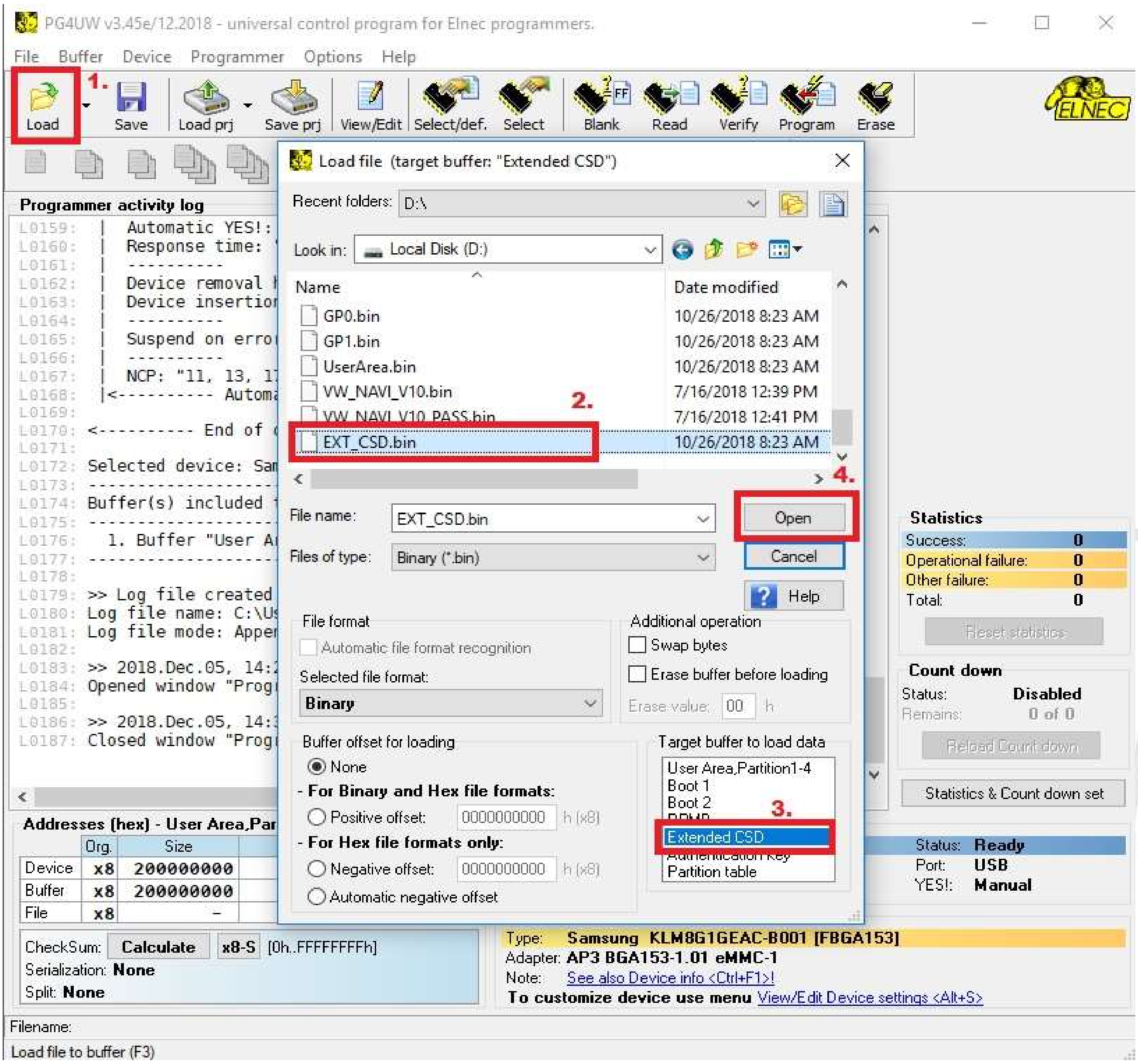
Extended CSD
□ USE_NATIVE_SECTOR[62] 00 h
□ WR_REL_SET[167] 00 h
☑ GP_SIZE_MULT_GP0[145-143] 000000 h
☑ GP_SIZE_MULT_GP1[148-146] 000000 h
☑ GP_SIZE_MULT_GP2[151-149] 000000 h
☑ GP_SIZE_MULT_GP3[154-152] 000000 h
☑ ENH_SIZE_MULT[142-140] 000000 h
☑ ENH_START_ADDR[139-136] 00000000 h
☑ PARTITIONS_ATTRIBUTE[156] 00 h
☑ EXT_PARTITIONS_ATTRIBUTE[53-52] 0000 h
☑ PARTITION_SETTING_COMPLETED[155] 00 h
☑ PARTITION_CONFIG[179] 00 h
□ BOOT_CONFIG_PROT[178] 00 h
□ BOOT_BUS_CONDITIONS[177] 00 h
□ BOOT_WP[173] 00 h
BOOT_WP_STATUS[174] 00 h
□ USER_WP[171] 00 h
□ FW_CONFIG[169] 00 h
□ BKOPS_EN[163] 00 h
☑ RST_n_FUNCTION[162] 00 h
□ SEC_BAD_BLK_MGMNT[134] 00 h
□ PERIODIC_WAKEUP[131] 00 h
□ AUTO_BKOP_CONFIG[67] 00 h

CSD
FILE_FORMAT_GRP: 0
COPY: 0 = Original
PERM_WRITE_PROTECT: 0 = Disable
TMP_WRITE_PROTECT: 0 = Disable
FILE_FORMAT: 00 = Hard disk-like file system
ECC: 00 = Default

Figure 1. Enabling program Extended CSD register

2.1. Loading input data for Extended CSD register

For the loading Extended CSD register values you can use two ways. First, the user can view and edit the individual bytes of Extended CSD register via the View/Edit Device settings (Alt+S) window, section "Extended CSD", see figure 1. The Second way is import the data from the file(*.bin) to the buffer called “Extended CSD”, see figure 2. Both ways are equivalent and the setting of individual bytes is mirrored between the “Extend CSD” buffer and View/Edit Device settings (Alt+S) window.



Programmer activity log

```
L0159: |  Automatic YES!:
L0160: |  Response time:
L0161: |  ----------
L0162: |  Device removal
L0163: |  Device insertion
L0164: |  ----------
L0165: |  Suspend on error
L0166: |  ----------
L0167: |  NCP: "11, 13, 1
L0168: |<---------- Automa
L0169:
L0170: <---------- End of
L0171:
L0172: Selected device: Sa
L0173: ------------------
L0174: Buffer(s) included
L0175: ------------------
L0176:   1. Buffer "User A
L0177: ------------------
L0178:
L0179: >> Log file created
L0180: Log file name: C:\U
L0181: Log file mode: Appe
L0182:
L0183: >> 2018.Dec.05, 14:
L0184: Opened window "Prog
L0185:
L0186: >> 2018.Dec.05, 14:
L0187: Closed window "Prog
```

Name	Date modified
GP0.bin	10/26/2018 8:23 AM
GP1.bin	10/26/2018 8:23 AM
UserArea.bin	10/26/2018 8:23 AM
VW_NAVI_V10.bin	7/16/2018 12:39 PM
VW_NAVI_V10_PASS.bin	7/16/2018 12:41 PM
EXT_CSD.bin	10/26/2018 8:23 AM

File name: EXT_CSD.bin

Files of type: Binary (*.bin)

File format

☐ Automatic file format recognition

Selected file format: Binary

Additional operation

☐ Swap bytes

☐ Erase buffer before loading

Erase value: 00 h

Buffer offset for loading

● None

- For Binary and Hex file formats:

○ Positive offset: 0000000000 h (x8)

- For Hex file formats only:

○ Negative offset: 0000000000 h (x8)

○ Automatic negative offset

Target buffer to load data

User Area,Partition1-4
Boot 1
Boot 2
RPMB
Extended CSD
Authentication key
Partition table

Addresses (hex) - User Area,Par

	Org.	Size
Device	x8	200000000
Buffer	x8	200000000
File	x8	-

CheckSum: Calculate x8-S [0h..FFFFFFFFh]

Serialization: None

Split: None

Statistics	
Success:	0
Operational failure:	0
Other failure:	0
Total:	0

Count down

Status: Disabled

Remains: 0 of 0

Status: Ready

Port: USB

YES!: Manual

Type: Samsung KLM8G1GEAC-B001 [FBGA153]

Adapter: AP3 BGA153-1.01 eMMC-1

Note: See also Device info <Ctrl+F1>!

To customize device use menu View/Edit Device settings <Alt+S>

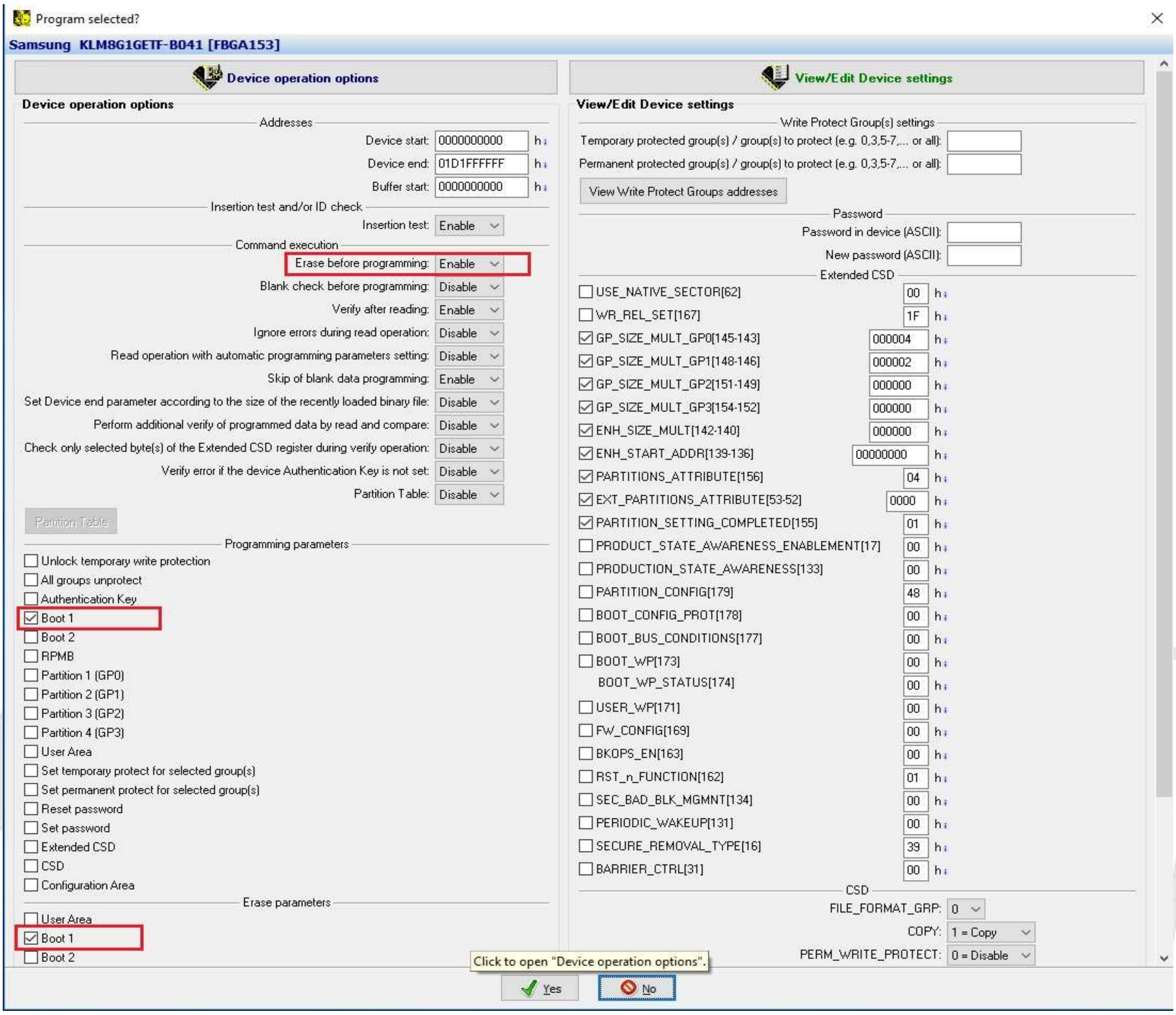
Filename:

Load file to buffer (F3)

Figure 2. Load input file for Extended CSD register

3. Program Boot 1(or Boot 2)

To enable programming of Boot 1 (Boot 2) area, open the Device operation options (ALT+O) window and use check box “Boot 1”, see figure 3.



Program selected?

Samsung KLM8G1GETF-B041 [FBGA153]

Device operation options

Addresses

Device start: 0000000000 h

Device end: 01D1FFFFFF h

Buffer start: 0000000000 h

Insertion test and/or ID check

Insertion test: Enable

Command execution

Erase before programming: Enable

Blank check before programming: Disable

Verify after reading: Enable

Ignore errors during read operation: Disable

Read operation with automatic programming parameters setting: Disable

Skip of blank data programming: Enable

Set Device end parameter according to the size of the recently loaded binary file: Disable

Perform additional verify of programmed data by read and compare: Disable

Check only selected byte(s) of the Extended CSD register during verify operation: Disable

Verify error if the device Authentication Key is not set: Disable

Partition Table: Disable

Programming parameters

- □ Unlock temporary write protection
- □ All groups unprotect
- □ Authentication Key
- ☑ Boot 1
- □ Boot 2
- □ RPMB
- □ Partition 1 (GP0)
- □ Partition 2 (GP1)
- □ Partition 3 (GP2)
- □ Partition 4 (GP3)
- □ User Area
- □ Set temporary protect for selected group(s)
- □ Set permanent protect for selected group(s)
- □ Reset password
- □ Set password
- □ Extended CSD
- □ CSD
- □ Configuration Area

Erase parameters

- □ User Area
- ☑ Boot 1
- □ Boot 2

View/Edit Device settings

Write Protect Group(s) settings

Temporary protected group(s) / group(s) to protect (e.g. 0,3,5-7,... or all):

Permanent protected group(s) / group(s) to protect (e.g. 0,3,5-7,... or all):

Password

Password in device (ASCII):

New password (ASCII):

Extended CSD

- □ USE_NATIVE_SECTOR[62] 00 h
- □ WR_REL_SET[167] 1F h
- ☑ GP_SIZE_MULT_GP0[145-143] 000004 h
- ☑ GP_SIZE_MULT_GP1[148-146] 000002 h
- ☑ GP_SIZE_MULT_GP2[151-149] 000000 h
- ☑ GP_SIZE_MULT_GP3[154-152] 000000 h
- ☑ ENH_SIZE_MULT[142-140] 000000 h
- ☑ ENH_START_ADDR[139-136] 00000000 h
- ☑ PARTITIONS_ATTRIBUTE[156] 04 h
- ☑ EXT_PARTITIONS_ATTRIBUTE[53-52] 0000 h
- ☑ PARTITION_SETTING_COMPLETED[155] 01 h
- □ PRODUCT_STATE_AWARENESS_ENABLEMENT[17] 00 h
- □ PRODUCTION_STATE_AWARENESS[133] 00 h
- □ PARTITION_CONFIG[179] 48 h
- □ BOOT_CONFIG_PROT[178] 00 h
- □ BOOT_BUS_CONDITIONS[177] 00 h
- □ BOOT_WP[173] 00 h
- BOOT_WP_STATUS[174] 00 h
- □ USER_WP[171] 00 h
- □ FW_CONFIG[169] 00 h
- □ BKOPS_EN[163] 00 h
- □ RST_n_FUNCTION[162] 01 h
- □ SEC_BAD_BLK_MGMNT[134] 00 h
- □ PERIODIC_WAKEUP[131] 00 h
- □ SECURE_REMOVAL_TYPE[16] 39 h
- □ BARRIER_CTRL[31] 00 h

CSD

FILE_FORMAT_GRP: 0

COPY: 1 = Copy

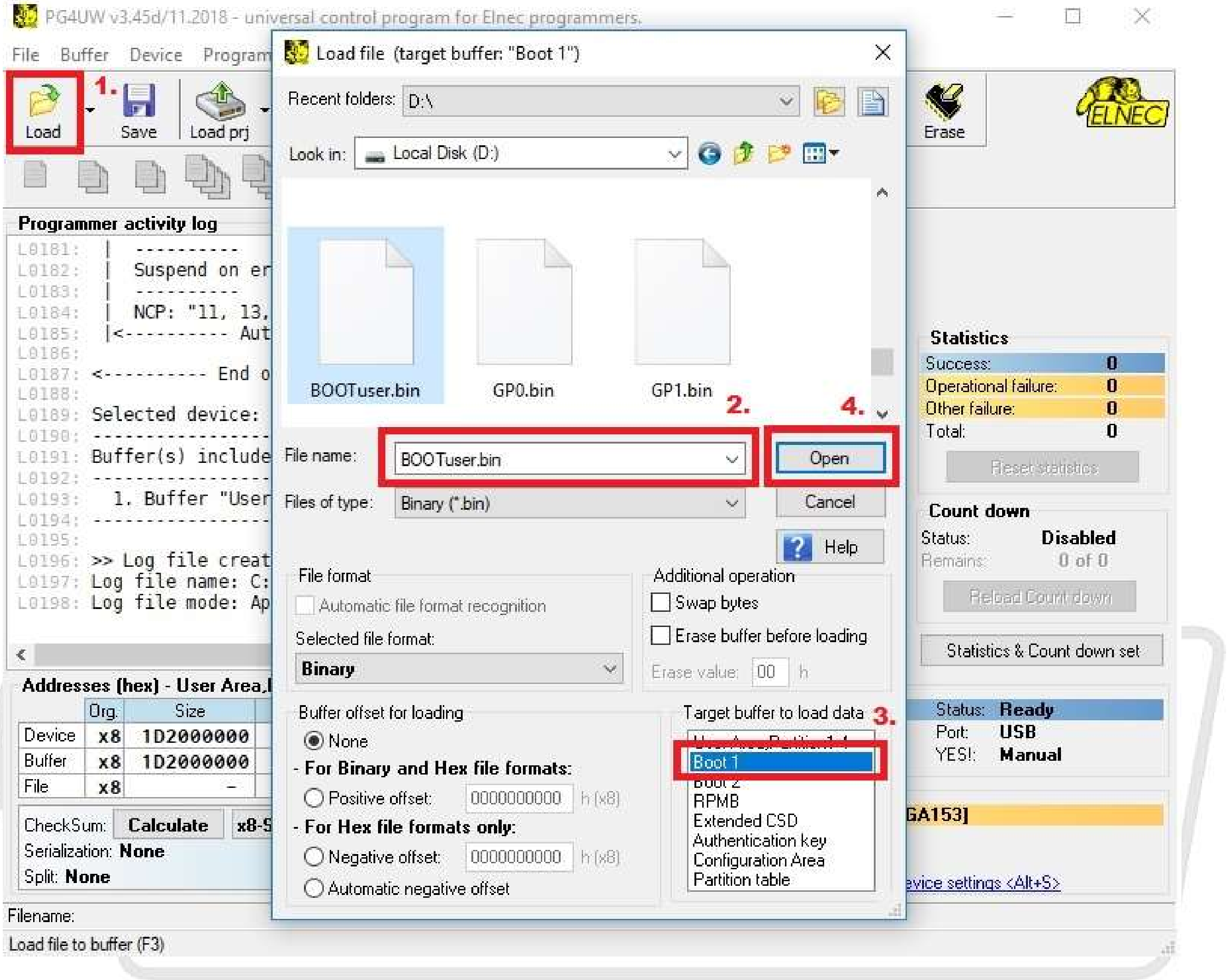
PERM_WRITE_PROTECT: 0 = Disable

Click to open "Device operation options".

Figure 3. Enabling program Boot 1 area

3.1. Loading input data for Boot 1(or Boot 2)

The data for the Boot 1 (Boot 2) area must be stored in a separate *.bin file. For loading Boot 1 (Boot 2) data open the “Load file” window, select the appropriate target buffer to Boot 1 (Boot 2) and open *.bin file, see figure 4. The loaded data can be viewed in View/Edit Buffer window, Boot 1 (Boot 2) buffer tab.



PG4UW v3.45d/11.2018 - universal control program for Elnec programmers.
File
Buffer
Device
Program
Load
Save
Load prj
Erase
1.
2.
3.
4.
Load file (target buffer: "Boot 1")
Open
Cancel
Help
Reset statistics
Reload Count down
Statistics & Count down set
Calculate

Programmer activity log

```
L0181:  |  ----------
L0182:  |  Suspend on er
L0183:  |  ----------
L0184:  |  NCP: "11, 13,
L0185:  |<---------- Aut
L0186:
L0187: <---------- End o
L0188:
L0189: Selected device:
L0190: ---------------
L0191: Buffer(s) include
L0192: ---------------
L0193:   1. Buffer "User
L0194: ---------------
L0195:
L0196: >> Log file creat
L0197: Log file name: C:
L0198: Log file mode: Ap
```

Addresses (hex) - User Area,I

	Org.	Size
Device	x8	1D2000000
Buffer	x8	1D2000000
File	x8	-

CheckSum: Calculate x8-S
Serialization: None
Split: None

Filename:
Load file to buffer (F3)

Recent folders: D:\
Look in: Local Disk (D:)
BOOTuser.bin GP0.bin GP1.bin
File name: BOOTuser.bin
Files of type: Binary (*.bin)

File format
□ Automatic file format recognition
Selected file format: Binary

Additional operation
□ Swap bytes
□ Erase buffer before loading
Erase value: 00 h

Buffer offset for loading
● None
- For Binary and Hex file formats:
○ Positive offset: 0000000000 h (x8)
- For Hex file formats only:
○ Negative offset: 0000000000 h (x8)
○ Automatic negative offset

Target buffer to load data
User Area, Partition 1-4
Boot 1
Boot 2
RPMB
Extended CSD
Authentication key
Configuration Area
Partition table

Statistics
Success: 0
Operational failure: 0
Other failure: 0
Total: 0

Count down
Status: Disabled
Remains: 0 of 0

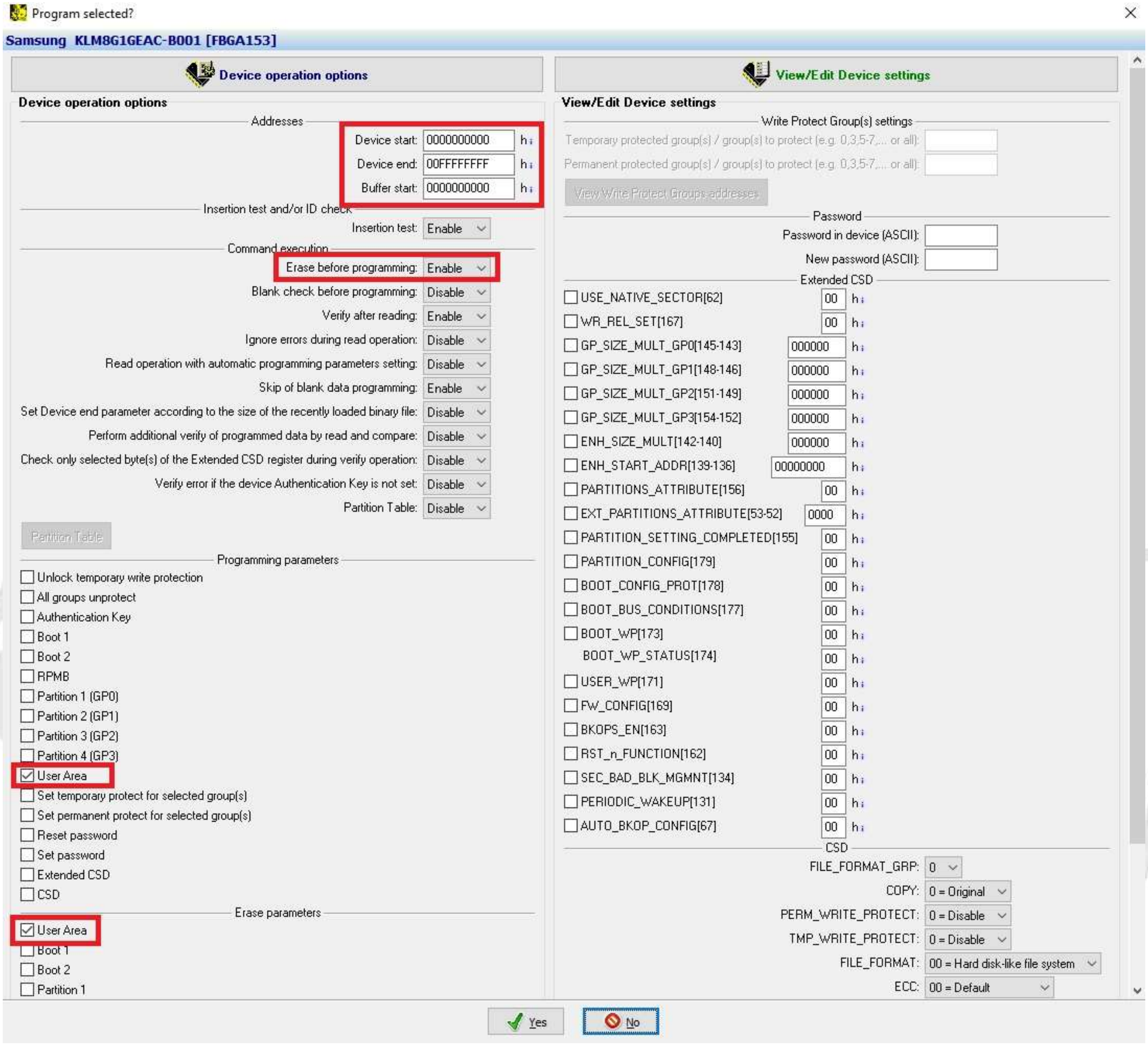
Status: Ready
Port: USB
YES!: Manual

GA153]
evice settings <Alt+S>

Figure 4. Load input file for BOOT 1 area

4. Program User Area

To enable programming of the User Area, open the Device operation options (ALT+O) window and tick the "User Area" check box. If the status of Command execution option "Partition table" is disable then address range for the User Area can be set in the Operation options window, section "Addresses", see figure 5. If the option "Partition table" is enabled then the address range of User Area is defined by the Partition table.



Program selected?

Samsung KLM8G1GEAC-B001 [FBGA153]

Device operation options

Device operation options

Addresses

Device start: 0000000000 h

Device end: 00FFFFFFFF h

Buffer start: 0000000000 h

Insertion test and/or ID check

Insertion test: Enable

Command execution

Erase before programming: Enable

Blank check before programming: Disable

Verify after reading: Enable

Ignore errors during read operation: Disable

Read operation with automatic programming parameters setting: Disable

Skip of blank data programming: Enable

Set Device end parameter according to the size of the recently loaded binary file: Disable

Perform additional verify of programmed data by read and compare: Disable

Check only selected byte(s) of the Extended CSD register during verify operation: Disable

Verify error if the device Authentication Key is not set: Disable

Partition Table: Disable

Partition Table

Programming parameters

- □ Unlock temporary write protection
- □ All groups unprotect
- □ Authentication Key
- □ Boot 1
- □ Boot 2
- □ RPMB
- □ Partition 1 (GP0)
- □ Partition 2 (GP1)
- □ Partition 3 (GP2)
- □ Partition 4 (GP3)
- ☑ User Area
- □ Set temporary protect for selected group(s)
- □ Set permanent protect for selected group(s)
- □ Reset password
- □ Set password
- □ Extended CSD
- □ CSD

Erase parameters

- ☑ User Area
- □ Boot 1
- □ Boot 2
- □ Partition 1

View/Edit Device settings

View/Edit Device settings

Write Protect Group(s) settings

Temporary protected group(s) / group(s) to protect (e.g. 0,3,5-7,... or all):

Permanent protected group(s) / group(s) to protect (e.g. 0,3,5-7,... or all):

View Write Protect Groups addresses

Password

Password in device (ASCII):

New password (ASCII):

Extended CSD

- □ USE_NATIVE_SECTOR[62] 00 h
- □ WR_REL_SET[167] 00 h
- □ GP_SIZE_MULT_GP0[145-143] 000000 h
- □ GP_SIZE_MULT_GP1[148-146] 000000 h
- □ GP_SIZE_MULT_GP2[151-149] 000000 h
- □ GP_SIZE_MULT_GP3[154-152] 000000 h
- □ ENH_SIZE_MULT[142-140] 000000 h
- □ ENH_START_ADDR[139-136] 00000000 h
- □ PARTITIONS_ATTRIBUTE[156] 00 h
- □ EXT_PARTITIONS_ATTRIBUTE[53-52] 0000 h
- □ PARTITION_SETTING_COMPLETED[155] 00 h
- □ PARTITION_CONFIG[179] 00 h
- □ BOOT_CONFIG_PROT[178] 00 h
- □ BOOT_BUS_CONDITIONS[177] 00 h
- □ BOOT_WP[173] 00 h
- BOOT_WP_STATUS[174] 00 h
- □ USER_WP[171] 00 h
- □ FW_CONFIG[169] 00 h
- □ BKOPS_EN[163] 00 h
- □ RST_n_FUNCTION[162] 00 h
- □ SEC_BAD_BLK_MGMNT[134] 00 h
- □ PERIODIC_WAKEUP[131] 00 h
- □ AUTO_BKOP_CONFIG[67] 00 h

CSD

FILE_FORMAT_GRP: 0

COPY: 0 = Original

PERM_WRITE_PROTECT: 0 = Disable

TMP_WRITE_PROTECT: 0 = Disable

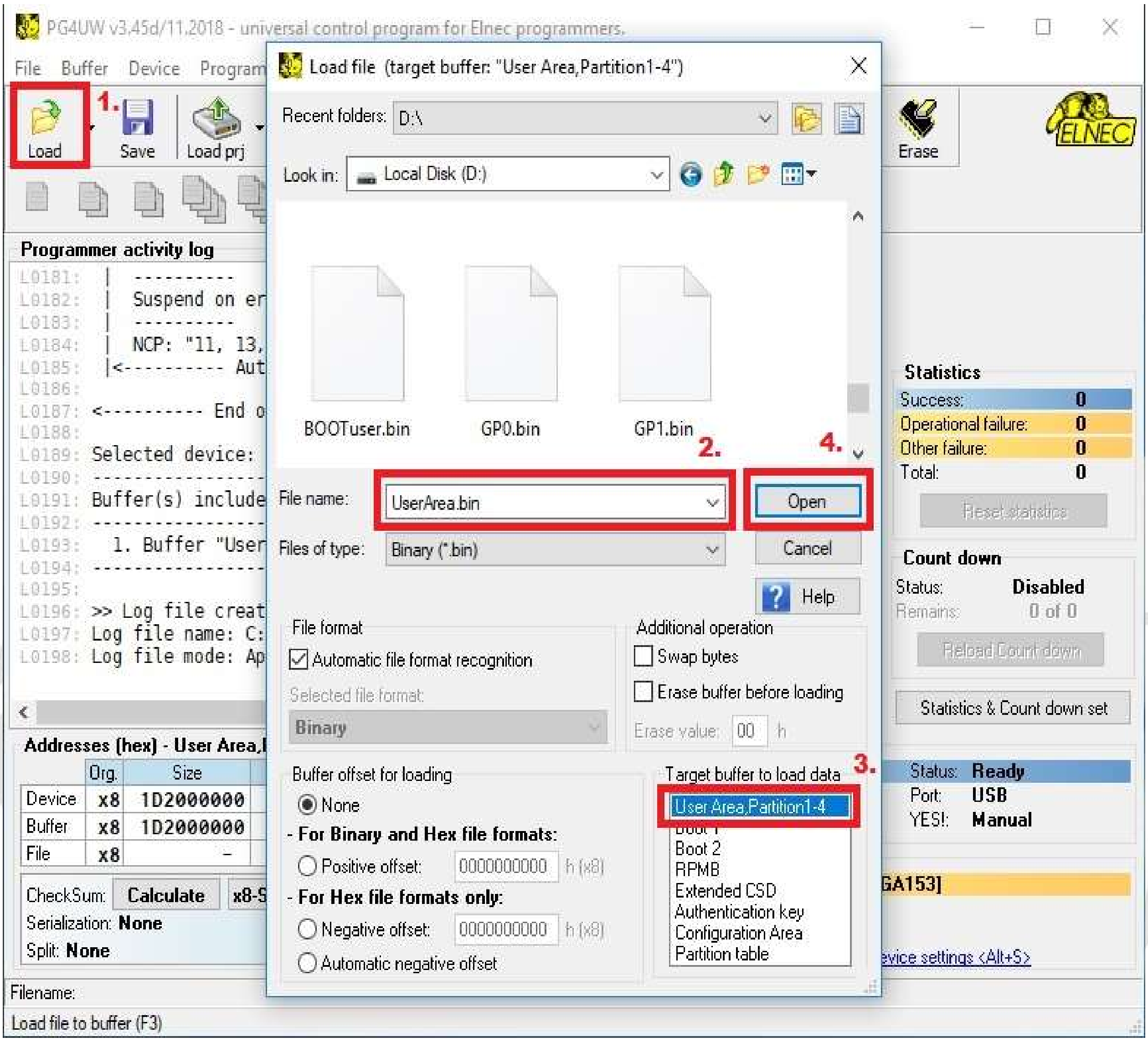
FILE_FORMAT: 00 = Hard disk-like file system

ECC: 00 = Default

Figure 5. Enabling program User Area

4.1. Loading input data for User Area

The data for the User Area area must be stored in a separate *.bin file. For loading data of the User Area, open "Load file" window, select the appropriate target buffer to User Area, Partition1-4 and open *.bin file, see figure 6. The loaded data can be viewed in View/Edit Buffer window, "User Area,Partition1-4" buffer tab.



Load file (target buffer: "User Area,Partition1-4")

Recent folders: D:\

Look in: Local Disk (D:)

File name: UserArea.bin

Files of type: Binary (*.bin)

File format
☑ Automatic file format recognition
Selected file format: Binary

Additional operation
□ Swap bytes
□ Erase buffer before loading
Erase value: 00 h

Buffer offset for loading
● None
- For Binary and Hex file formats:
○ Positive offset: 0000000000 h (x8)
- For Hex file formats only:
○ Negative offset: 0000000000 h (x8)
○ Automatic negative offset

Target buffer to load data
User Area,Partition1-4
Boot 1
Boot 2
RPMB
Extended CSD
Authentication key
Configuration Area
Partition table

Programmer activity log

```
L0181:  |  ----------
L0182:  |  Suspend on er
L0183:  |  ----------
L0184:  |  NCP: "11, 13,
L0185:  |<---------- Aut
L0186:
L0187: <---------- End o
L0188:
L0189: Selected device:
L0190: ----------------
L0191: Buffer(s) include
L0192: ----------------
L0193:   1. Buffer "User
L0194: ----------------
L0195:
L0196: >> Log file creat
L0197: Log file name: C:
L0198: Log file mode: Ap
```

Addresses (hex) - User Area,I

	Org.	Size
Device	x8	1D2000000
Buffer	x8	1D2000000
File	x8	-

CheckSum: Calculate x8-S
Serialization: None
Split: None

Filename:

Load file to buffer (F3)

Statistics

Success:	0
Operational failure:	0
Other failure:	0
Total:	0

Count down
Status: Disabled
Remains: 0 of 0

Status: Ready
Port: USB
YES!: Manual

GA153]

evice settings <Alt+S>

Figure 6. Load input file for User Area

4.2. Loading input data for Enhanced User Area

The "Enhanced User Data Area" occupy address range within the "User data area" (there is no obligatory address gap between the "Enhanced User Data Area" and the rest of the "User data area").The start address(sector address) of the "Enhanced User Data Area" is defined by the ENH_START_ADDR[139-136] location in the Extended CSD register (see Alt+S window)

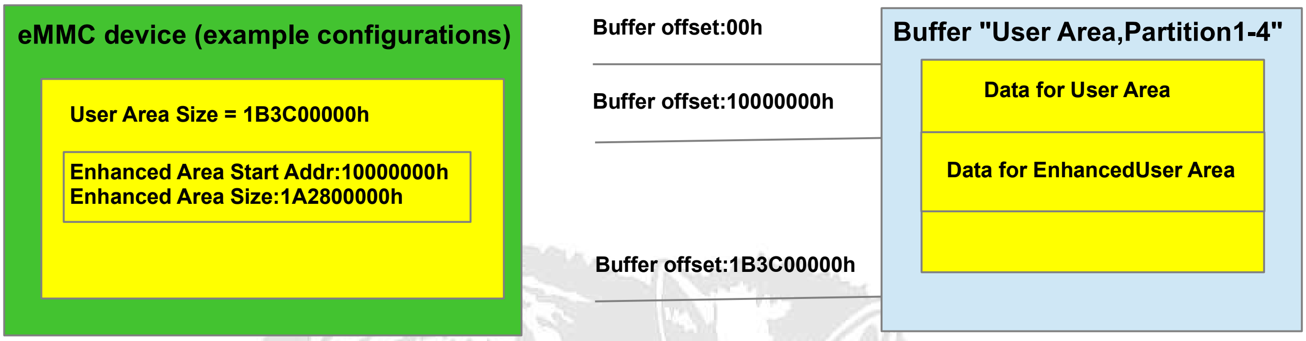
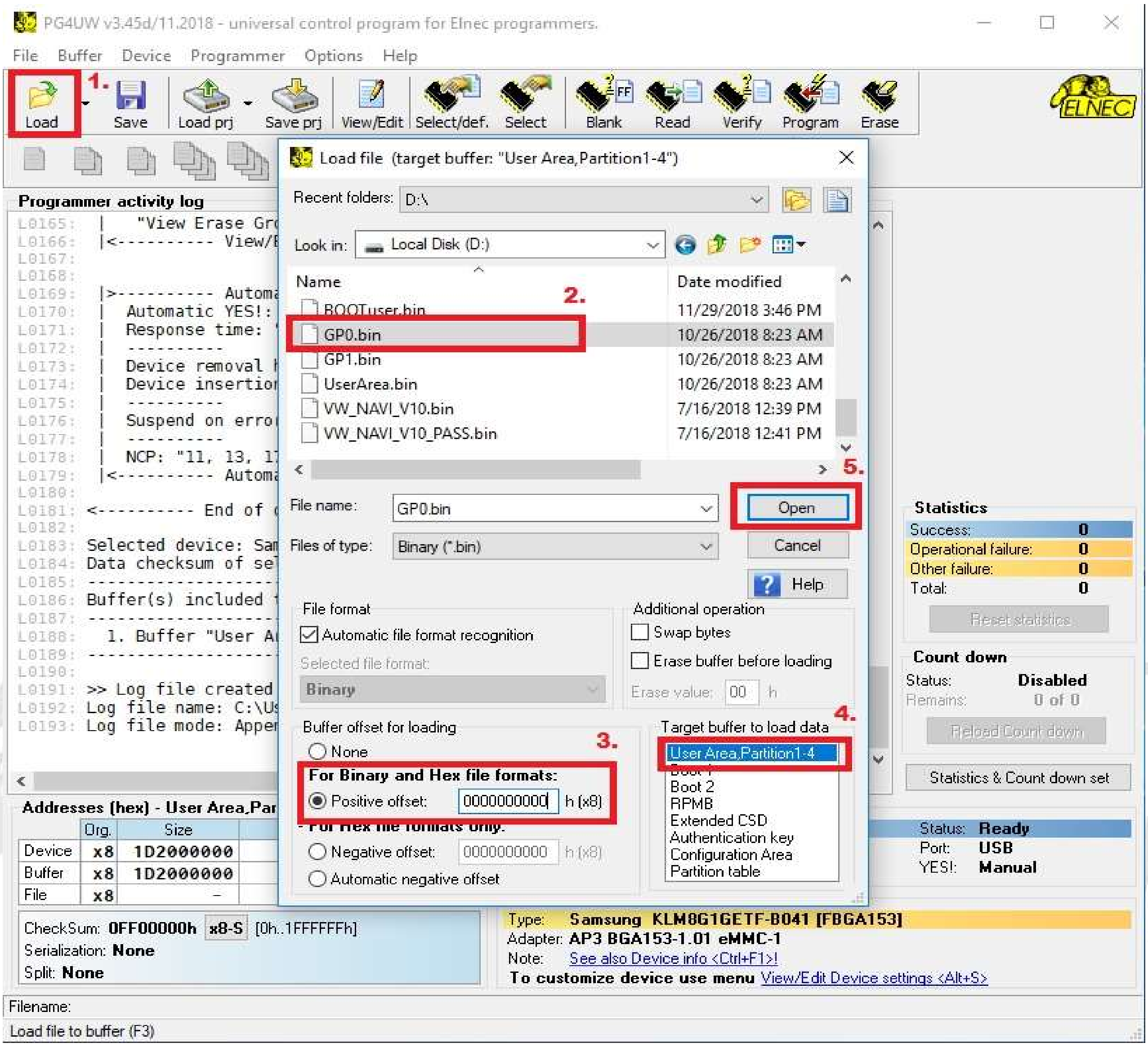

eMMC device (example configurations)
User Area Size = 1B3C00000h
Enhanced Area Start Addr:10000000h
Enhanced Area Size:1A2800000h
Buffer offset:00h
Buffer offset:10000000h
Buffer offset:1B3C00000h
Buffer "User Area,Partition1-4"
Data for User Area
Data for EnhancedUser Area

Figure 7.Example configuration or Enhanced User Area

Note: The "Enhanced User Data Area" start address is in byte units,
i.e. start address(in bytes) = ENH_START_ADDR[139-136] x SECTOR_SIZE(200h).

For loading data to the Enhanced User Area, open Load file window, set buffer offset, choose the “User Area,Partition1-4” target buffer and open specified *.bin file (see figure 8). It is necessary to enter the correct **positive offset** and then load the *.bin file. The loaded data can be viewed in View/Edit Buffer window, “User Area,Partition1-4” buffer tab.



Programmer activity log

```
L0165:  |   "View Erase Gr
L0166:  |<---------- View/
L0167:
L0168:
L0169:  |>---------- Automa
L0170:  |  Automatic YES!:
L0171:  |  Response time:
L0172:  |  ----------
L0173:  |  Device removal
L0174:  |  Device insertion
L0175:  |  ----------
L0176:  |  Suspend on erro
L0177:  |  ----------
L0178:  |  NCP: "11, 13, 1
L0179:  |<---------- Automa
L0180:
L0181: <---------- End of
L0182:
L0183: Selected device: Sam
L0184: Data checksum of se
L0185: -------------------
L0186: Buffer(s) included
L0187: -------------------
L0188:   1. Buffer "User A
L0189: -------------------
L0190:
L0191: >> Log file created
L0192: Log file name: C:\U
L0193: Log file mode: Appen
```

Load file (target buffer: "User Area,Partition1-4")

Recent folders: D:\

Look in: Local Disk (D:)

Name	Date modified
BOOTuser.bin	11/29/2018 3:46 PM
GP0.bin	10/26/2018 8:23 AM
GP1.bin	10/26/2018 8:23 AM
UserArea.bin	10/26/2018 8:23 AM
VW_NAVI_V10.bin	7/16/2018 12:39 PM
VW_NAVI_V10_PASS.bin	7/16/2018 12:41 PM

File name: GP0.bin

Files of type: Binary (*.bin)

File format
☑ Automatic file format recognition
Selected file format: Binary

Additional operation
□ Swap bytes
□ Erase buffer before loading
Erase value: 00 h

Buffer offset for loading
○ None
For Binary and Hex file formats:
● Positive offset: 0000000000 h (x8)
For Hex file formats only:
○ Negative offset: 0000000000 h (x8)
○ Automatic negative offset

Target buffer to load data
User Area,Partition1-4
Boot 1
Boot 2
RPMB
Extended CSD
Authentication key
Configuration Area
Partition table

Statistics
Success: 0
Operational failure: 0
Other failure: 0
Total: 0

Count down
Status: Disabled
Remains: 0 of 0

Status: Ready
Port: USB
YES!: Manual

Addresses (hex) - User Area,Par

	Org.	Size
Device	x8	1D2000000
Buffer	x8	1D2000000
File	x8	–

CheckSum: 0FF00000h x8-S [0h..1FFFFFFFh]
Serialization: None
Split: None

Type: Samsung KLM8G1GETF-B041 [FBGA153]
Adapter: AP3 BGA153-1.01 eMMC-1
Note: See also Device info <Ctrl+F1>!
To customize device use menu View/Edit Device settings <Alt+S>

Filename:
Load file to buffer (F3)

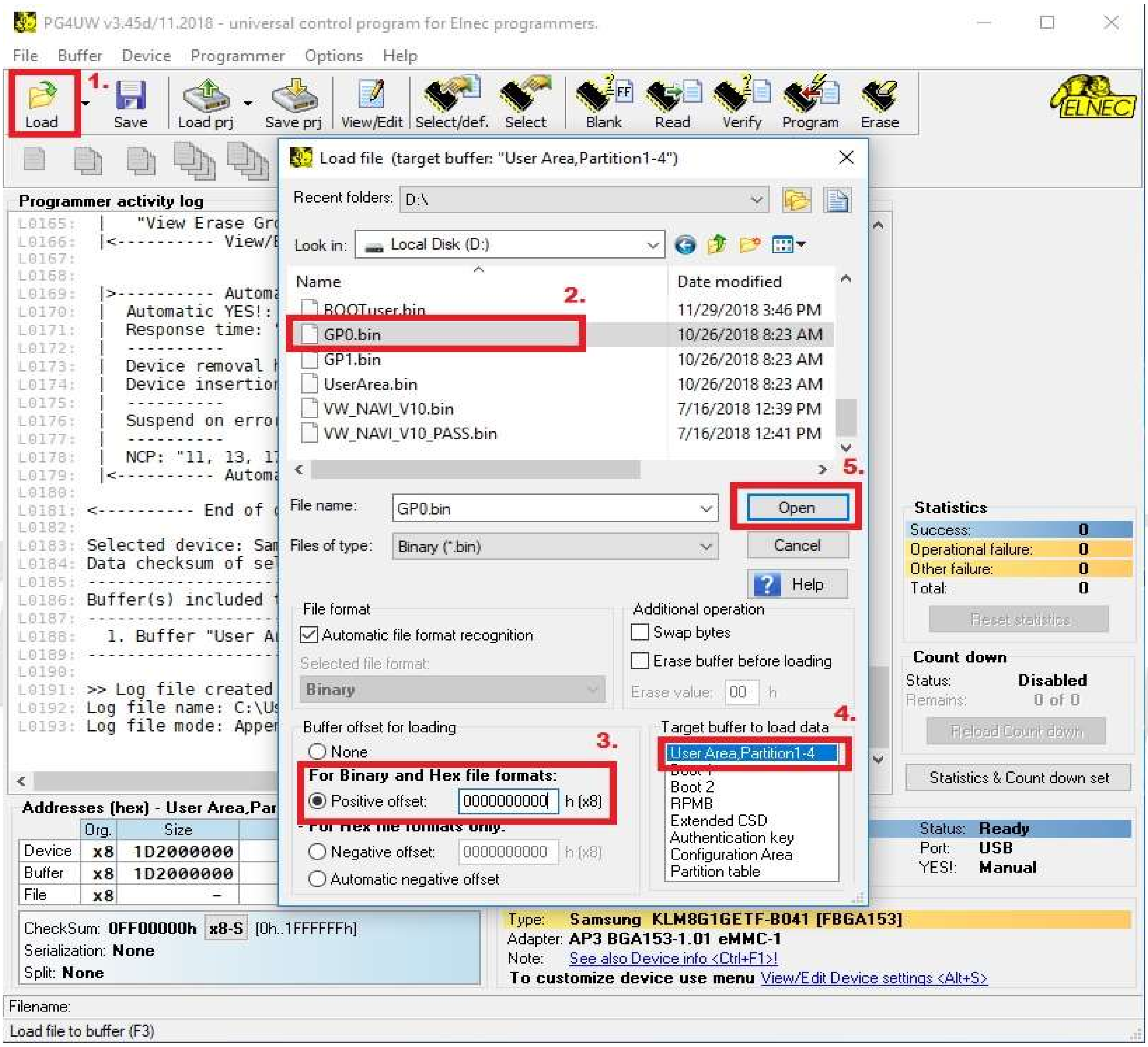
Figure 8.Load input file for Enhanced User Area

Note: When load the *bin file for “Enhanced User Data Area” use positive offset for start address in bytes, i.e. ENH_START_ADDR[139-136] x SECTOR_SIZE(200h).

5. Program Partition 1-4

To enable programming of Partition 1-4, open the Device operation options (ALT+O) window and tick the "Partition 1-4" check box.

Data for the Partition 1-4 must be loaded in the "User Area,Partition1-4" buffer. For loading data to the Partition 1-4, open Load file window, set buffer offset, choose the "User Area,Partition1-4" target buffer and open specified *.bin file(see figure 9). It is necessary to enter the correct **positive offset** and then load the *.bin file. The loaded data can be viewed in View/Edit Buffer window, "User Area,Partition1-4" buffer tab.


PG4UW v3.45d/11.2018 - universal control program for Elnec programmers.
File Buffer Device Programmer Options Help
Load
Save
Load prj
Save prj
View/Edit
Select/def.
Select
Blank
Read
Verify
Program
Erase
1.
2.
3.
4.
5.
Open
Cancel
Help
Reset statistics
Reload Count down
Statistics & Count down set

Load file (target buffer: "User Area,Partition1-4")

Recent folders: D:\

Look in: Local Disk (D:)

Name	Date modified
BOOTuser.bin	11/29/2018 3:46 PM
GP0.bin	10/26/2018 8:23 AM
GP1.bin	10/26/2018 8:23 AM
UserArea.bin	10/26/2018 8:23 AM
VW_NAVI_V10.bin	7/16/2018 12:39 PM
VW_NAVI_V10_PASS.bin	7/16/2018 12:41 PM

File name: GP0.bin

Files of type: Binary (*.bin)

File format
☑ Automatic file format recognition
Selected file format: Binary

Additional operation
☐ Swap bytes
☐ Erase buffer before loading
Erase value: 00 h

Buffer offset for loading
○ None
For Binary and Hex file formats:
● Positive offset: 0000000000 h (x8)
For Hex file formats only:
○ Negative offset: 0000000000 h (x8)
○ Automatic negative offset

Target buffer to load data
User Area,Partition1-4
Boot 1
Boot 2
RPMB
Extended CSD
Authentication key
Configuration Area
Partition table

Programmer activity log

```
L0165:  |   "View Erase Gr
L0166:  |<---------- View/E
L0167:
L0168:
L0169:  |>---------- Automa
L0170:  |   Automatic YES!:
L0171:  |   Response time:
L0172:  |   ----------
L0173:  |   Device removal
L0174:  |   Device insertio
L0175:  |   ----------
L0176:  |   Suspend on erro
L0177:  |   ----------
L0178:  |   NCP: "11, 13, 1
L0179:  |<---------- Automa
L0180:
L0181: <---------- End of
L0182:
L0183: Selected device: Sa
L0184: Data checksum of se
L0185: -------------------
L0186: Buffer(s) included
L0187: -------------------
L0188:   1. Buffer "User A
L0189: -------------------
L0190:
L0191: >> Log file created
L0192: Log file name: C:\U
L0193: Log file mode: Appe
```

Addresses (hex) - User Area,Par

	Org.	Size
Device	x8	1D2000000
Buffer	x8	1D2000000
File	x8	-

CheckSum: 0FF00000h x8-S [0h..1FFFFFFh]
Serialization: None
Split: None

Statistics

Success:	0
Operational failure:	0
Other failure:	0
Total:	0

Count down
Status: Disabled
Remains: 0 of 0

Status: Ready
Port: USB
YES!: Manual

Type: Samsung KLM8G1GETF-B041 [FBGA153]
Adapter: AP3 BGA153-1.01 eMMC-1
Note: See also Device info <Ctrl+F1>!
To customize device use menu View/Edit Device settings <Alt+S>

Filename:
Load file to buffer (F3)

Figure 9. Load input file for Partition 1-4

Note: Positive offset = for more information see section 5.1, 5.2

5.1 Buffer map in case of disabled "Partition table" option

If the "Partition table" option (Device operation options windows(Alt+O), section Command execution) is disabled then is not possible to edit the Partition1-4 buffer map. SW will automatically change the buffer map in accordance with setting in the Extended CSD register(View/edit Device settings window Alt+S, section Extend CSD). Address ranges of the data for Partitions1-4(buffer "User Area, Partition1-4") are showing in the programmer activity log window during Read operation or suring programming these partitions. The loaded data for the Partition 1-4 must be placed in the "User Area,Partition1-4" buffer in accordance with example case in figure 10.

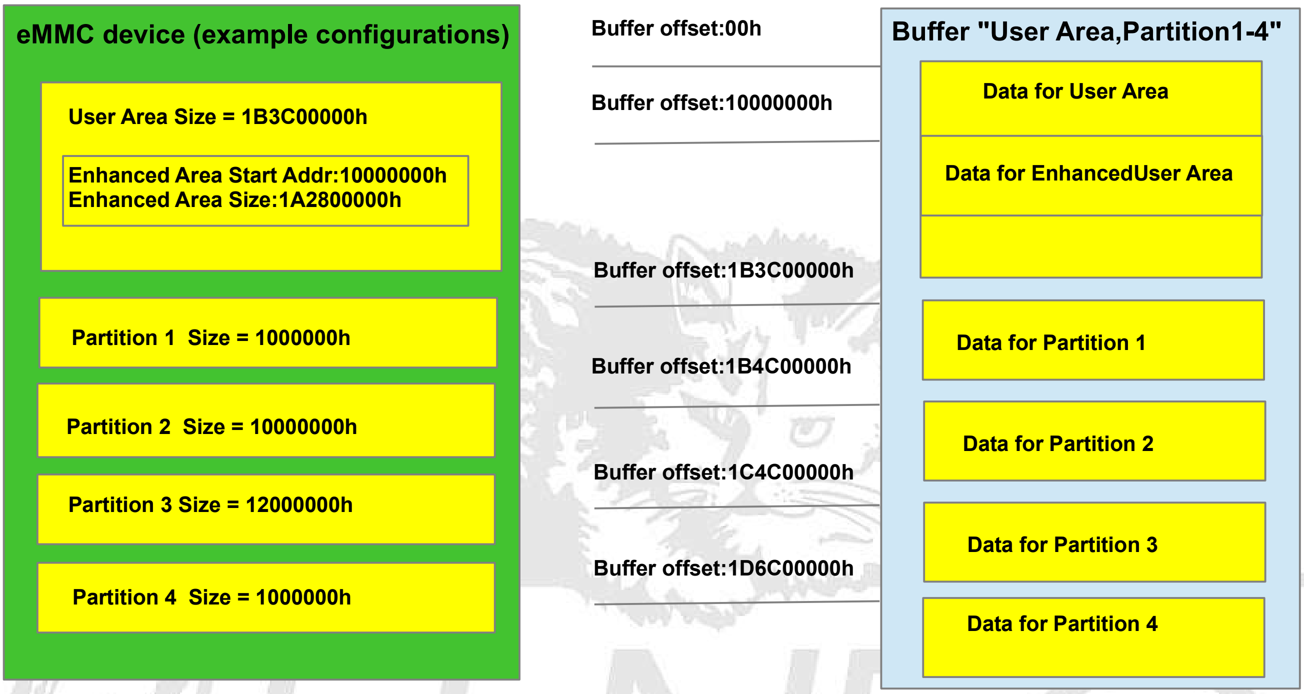

eMMC device (example configurations)
User Area Size = 1B3C00000h
Enhanced Area Start Addr:10000000h
Enhanced Area Size:1A2800000h
Partition 1 Size = 1000000h
Partition 2 Size = 10000000h
Partition 3 Size = 12000000h
Partition 4 Size = 1000000h
Buffer offset:00h
Buffer offset:10000000h
Buffer offset:1B3C00000h
Buffer offset:1B4C00000h
Buffer offset:1C4C00000h
Buffer offset:1D6C00000h
Buffer "User Area,Partition1-4"
Data for User Area
Data for EnhancedUser Area
Data for Partition 1
Data for Partition 2
Data for Partition 3
Data for Partition 4

Figure 10. Example of "User Area,Partition1-4" buffer map when Partition table = DISABLE

5.1.1 Example of loading several *.bin files when the option "Partition table" is disabled

UserArea default size = 37A400000h

eMMC device configuration:
Enhanced UserArea start address = 10000000h
Enhanced UserArea Size = 1A2800000h(pSLC)
Partition1/GP0 size = 1000000h(pMLC)
Partition2/GP1 size = 10000000h(pMLC)
Partition3/GP2 size = 12000000h(pMLC)
Partition4/GP3 size = 1000000h(pMLC)
UserArea size = 37A400000h-1A2800000h-1000000h-10000000h-12000000h-1000000h
= **1B3C00000h**

Programming files and destination:
1.DTIW381.bin to UserArea address 1 = 10000000h
2.TT_D_De.bin to UserArea address 2 = 10011000h
3.FSOS_Ex.bin to UserArea address 3 = 14011000h
4.DIW3870.bin to GP0 address = 00h
5.SC60401.bin to GP1 address = 00h
6.DIW3871.bin to GP3 address = 00h

Calculation of the buffer offset for loading files:
1.DTIW381.bin
Buffer **offset1** = UserArea address 1 = **10000000h**
2.TT_D_De.bin
Buffer **offset2** = UserArea address 2 = **10011000h**
3.FSOS_Ex.bin
Buffer **offset3** = UserArea address 3 = **14011000h**
4.DIW3870.bin
Buffer **offset4** = UserArea size + GP0 address
= 1B3C00000h + 00h
= 1B3C00000h
5.SC60401.bin
Buffer **offset5** = UserArea size + GP0 size + GP1 address
= 1B3C00000h + 1000000h + 00h
= 1B4C00000h
6.DIW3871.bin
Buffer **offset6** = UserArea size + GP0 size + GP1 size + GP2 size+ GP3 address
= 1B3C00000h + 1000000h + 10000000h + 12000000h + 00h
= 1D6C00000h

Loading files sequence:
1.Clear buffer "User Area,Partition1-4"
2.Open Load file window, choose the "User Area,Partition1-4" target buffer, set positive buffer **offset1** = **10000000h** and then load the **DTIW381.bin** file.
3.Open Load file window, choose the "User Area,Partition1-4" target buffer, set positive buffer **offset2** = **10011000h** and then load the **TT_D_De.bin** file.
4.Open Load file window, choose the "User Area,Partition1-4" target buffer, set positive buffer **offset3** = **14011000h** and then load the **FSOS_Ex.bin** file
5.Open Load file window, choose the "User Area,Partition1-4" target buffer, set positive buffer **offset4** = **1B3C00000h** and then load the **DIW3870.bin** file.
6.Open Load file window, choose the "User Area,Partition1-4" target buffer, set positive buffer **offset5** = **1B4C00000h** and then load the **SC60401.bin** file.
7.Open Load file window, choose the "User Area,Partition1-4" target buffer, set positive buffer **offset6** = **1D6C00000h** and then load the **DIW3871.bin** file.
8.Save project

5.2 Buffer map in case of enabled "Partition table" option

If the option "Partition table" is enabled then the address ranges(buffer map) for Partition1-4 can be viewed and edited in the Partition Table window(see section 5.3 Partition table). The user load appropriate *bin files to the “User Area, Partition 1-4” buffer and fill the records in the Partition table window. The loaded *.bin files must be 512-byte sector aligned. For more information see section “5.2.1 Partition table”.

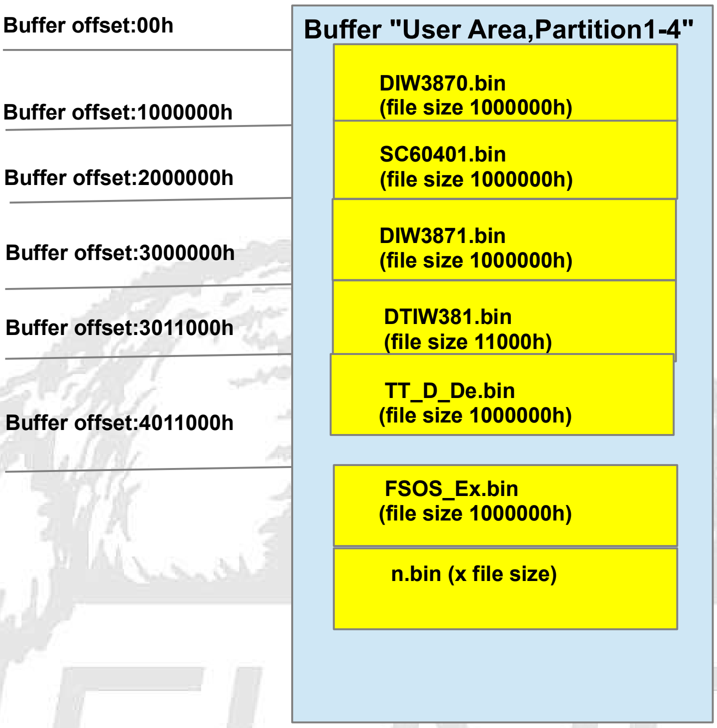


Figure 11. Example of "User Area,Partition1-4" buffer map when Partition table = ENABLE

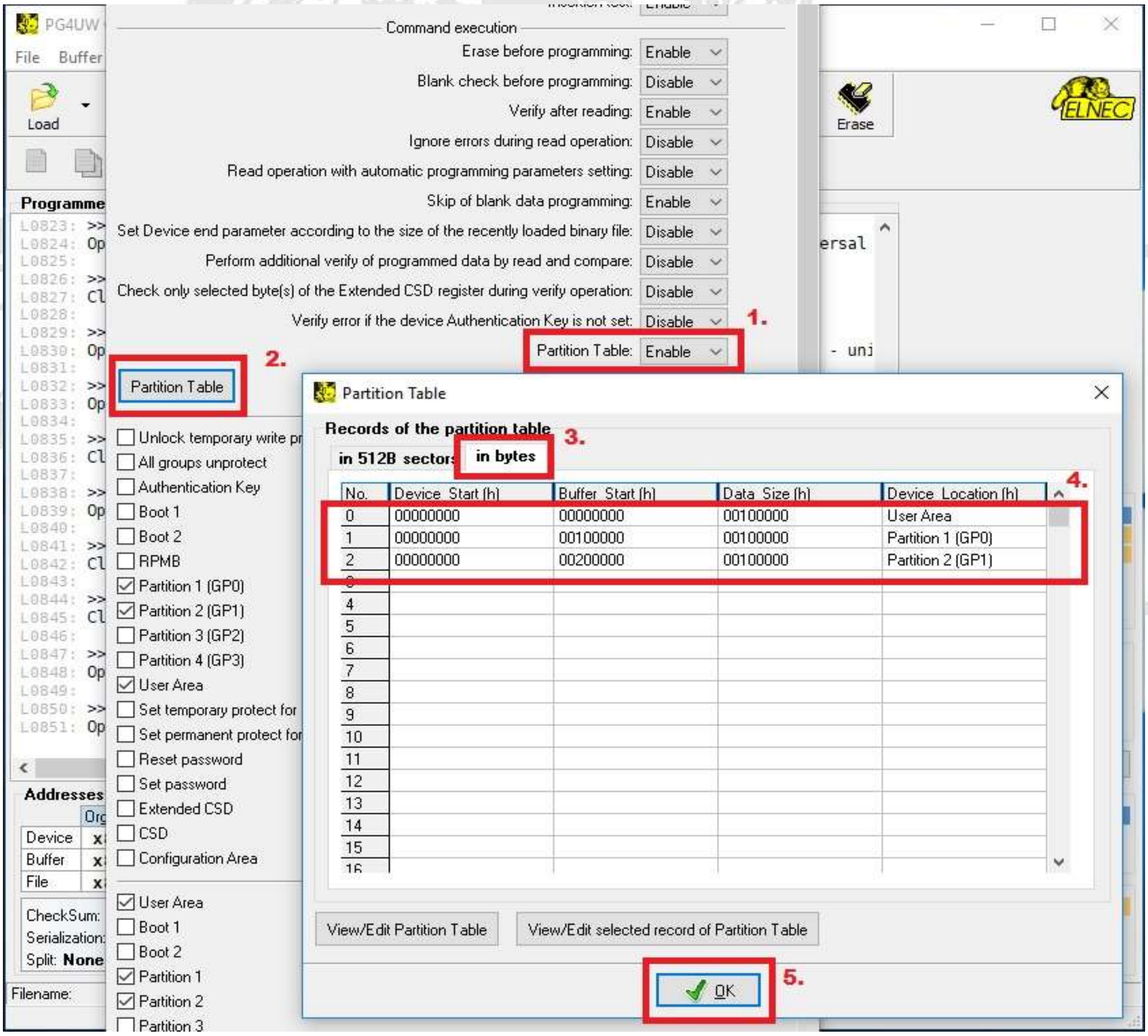
Note: Loading the *.bin files without filling the Partition table records cause the omit of processing(skipping the operation of program/read/etc) “User Area, Partition 1-4” areas.

5.2.1 Partition table

Partition table records allow user to define address ranges for User Area and Partition 1-4. Each partition record is specified by four items Device_Start_Sec, Buffer_Start_Sec, Data_Size_Sec and Device_Location (4 bytes/32bits in size for each item). Every partition record have size of 16bytes. The data in the buffer "Partition Table" is stored using Little Endian byte order. The user can view and edit the individual records of Partition table using the "Partition table" window, see figure 12.

Partition table item meaning:

Device_Start_Sec – indicates start of the sector location for partition within the device.
Buffer_Start_Sec – indicates start of the sector location for partition within the buffer "User Area".
Data_Size_Sec – indicates the number of bytes for processing within the specified partition record
Device_Location – indicates the location of specified partition record. The lowest byte indicate wich physical partition it belongs to. The higher 3 bytes are not used.



Command execution

- Erase before programming: Enable
- Blank check before programming: Disable
- Verify after reading: Enable
- Ignore errors during read operation: Disable
- Read operation with automatic programming parameters setting: Disable
- Skip of blank data programming: Enable
- Set Device end parameter according to the size of the recently loaded binary file: Disable
- Perform additional verify of programmed data by read and compare: Disable
- Check only selected byte(s) of the Extended CSD register during verify operation: Disable
- Verify error if the device Authentication Key is not set: Disable
- 1. Partition Table: Enable

2. Partition Table

- □ Unlock temporary write pr
- □ All groups unprotect
- □ Authentication Key
- □ Boot 1
- □ Boot 2
- □ RPMB
- ☑ Partition 1 (GP0)
- ☑ Partition 2 (GP1)
- □ Partition 3 (GP2)
- □ Partition 4 (GP3)
- ☑ User Area
- □ Set temporary protect for
- □ Set permanent protect for
- □ Reset password
- □ Set password
- □ Extended CSD
- □ CSD
- □ Configuration Area

- ☑ User Area
- □ Boot 1
- □ Boot 2
- ☑ Partition 1
- ☑ Partition 2
- □ Partition 3

Partition Table

Records of the partition table

in 512B sectors | 3. in bytes

4.

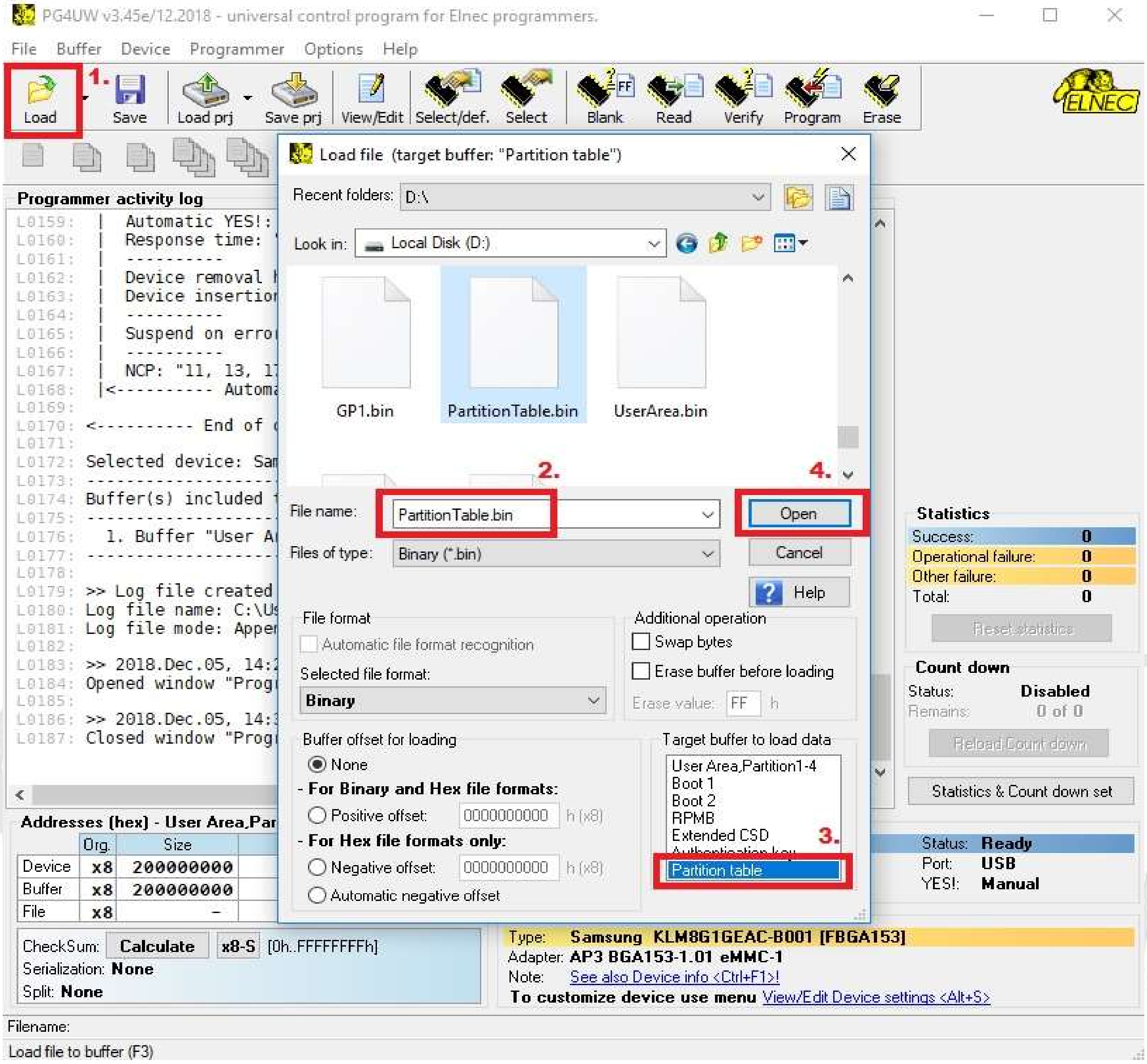
No.	Device Start (h)	Buffer Start (h)	Data Size (h)	Device Location (h)
0	00000000	00000000	00100000	User Area
1	00000000	00100000	00100000	Partition 1 (GP0)
2	00000000	00200000	00100000	Partition 2 (GP1)
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				

View/Edit Partition Table | View/Edit selected record of Partition Table

5. OK

Figure 12. Partition table

The second way for import the data is loading the data from the file(*.bin) to the buffer called "Partition table", see figure 13. The loaded data can be viewed in View/Edit Buffer window, "Partition table" buffer tab. Both ways are equivalent and the settings of individual records are mirrored between the "Partition table" buffer and the Partition table window


PG4UW v3.45e/12.2018 - universal control program for Elnec programmers.
File Buffer Device Programmer Options Help
1.
Load
Save
Load prj
Save prj
View/Edit
Select/def.
Select
Blank
Read
Verify
Program
Erase
Load file (target buffer: "Partition table")
2.
3.
4.
Open
Cancel
Help
Reset statistics
Reload Count down
Statistics & Count down set
Calculate

Programmer activity log

```
L0159:  |   Automatic YES!:
L0160:  |   Response time:
L0161:  |   ----------
L0162:  |   Device removal
L0163:  |   Device insertion
L0164:  |   ----------
L0165:  |   Suspend on erro
L0166:  |   ----------
L0167:  |   NCP: "11, 13, 1
L0168:  |<---------- Automa
L0169:
L0170: <---------- End of
L0171:
L0172: Selected device: Sa
L0173: --------------------
L0174: Buffer(s) included
L0175: --------------------
L0176:   1. Buffer "User A
L0177: --------------------
L0178:
L0179: >> Log file created
L0180: Log file name: C:\U
L0181: Log file mode: Appe
L0182:
L0183: >> 2018.Dec.05, 14:
L0184: Opened window "Prog
L0185:
L0186: >> 2018.Dec.05, 14:
L0187: Closed window "Prog
```

Recent folders: D:\

Look in: Local Disk (D:)

GP1.bin PartitionTable.bin UserArea.bin

File name: PartitionTable.bin

Files of type: Binary (*.bin)

File format
□ Automatic file format recognition
Selected file format: Binary

Additional operation
□ Swap bytes
□ Erase buffer before loading
Erase value: FF h

Buffer offset for loading
● None
- For Binary and Hex file formats:
○ Positive offset: 0000000000 h (x8)
- For Hex file formats only:
○ Negative offset: 0000000000 h (x8)
○ Automatic negative offset

Target buffer to load data
User Area,Partition1-4
Boot 1
Boot 2
RPMB
Extended CSD
Authentication key
Partition table

Addresses (hex) - User Area,Par

	Org.	Size
Device	x8	200000000
Buffer	x8	200000000
File	x8	-

CheckSum: Calculate x8-S [0h..FFFFFFFFh]
Serialization: None
Split: None

Statistics

Success:	0
Operational failure:	0
Other failure:	0
Total:	0

Count down
Status: Disabled
Remains: 0 of 0

Status: Ready
Port: USB
YES!: Manual

Type: Samsung KLM8G1GEAC-B001 [FBGA153]
Adapter: AP3 BGA153-1.01 eMMC-1
Note: See also Device info <Ctrl+F1>!
To customize device use menu View/Edit Device settings <Alt+S>

Filename:
Load file to buffer (F3)

Figure 13. Load input file for Partition table

5.2.2 Example of loading several *.bin files when the option "Partition table" is enabled

```
UserArea default size = 37A400000h
```

<u>eMMC device configuration:</u>

```
Enhanced UserArea start address = 10000000h
Enhanced UserArea Size  = 1A2800000h(pSLC)
Partition1/GP0 size =  1000000h(pMLC)
Partition2/GP1 size = 10000000h(pMLC)
Partition3/GP2 size = 12000000h(pMLC)
Partition4/GP3 size =  1000000h(pMLC)
UserArea Size = 37A400000h-1A2800000h-1000000h-10000000h-12000000h-1000000h
              = 1B3C00000h
```

<u>Programming files and destination:</u>

```
1.DIW3870.bin(file size 1000000h) to GP0 address = 00h
2.SC60401.bin(file size 1000000h) to GP1 address = 00h
3.DIW3871.bin(file size 1000000h) to GP3 address = 00h
4.DTIW381.bin(file size 11000h)   to UserArea address 1 = 10000000h
5.TT_D_De.bin(file size 1000000h) to UserArea address 2 = 10011000h
6.FSOS_Ex.bin(file size 1000000h) to UserArea address 3 = 14011000h
```

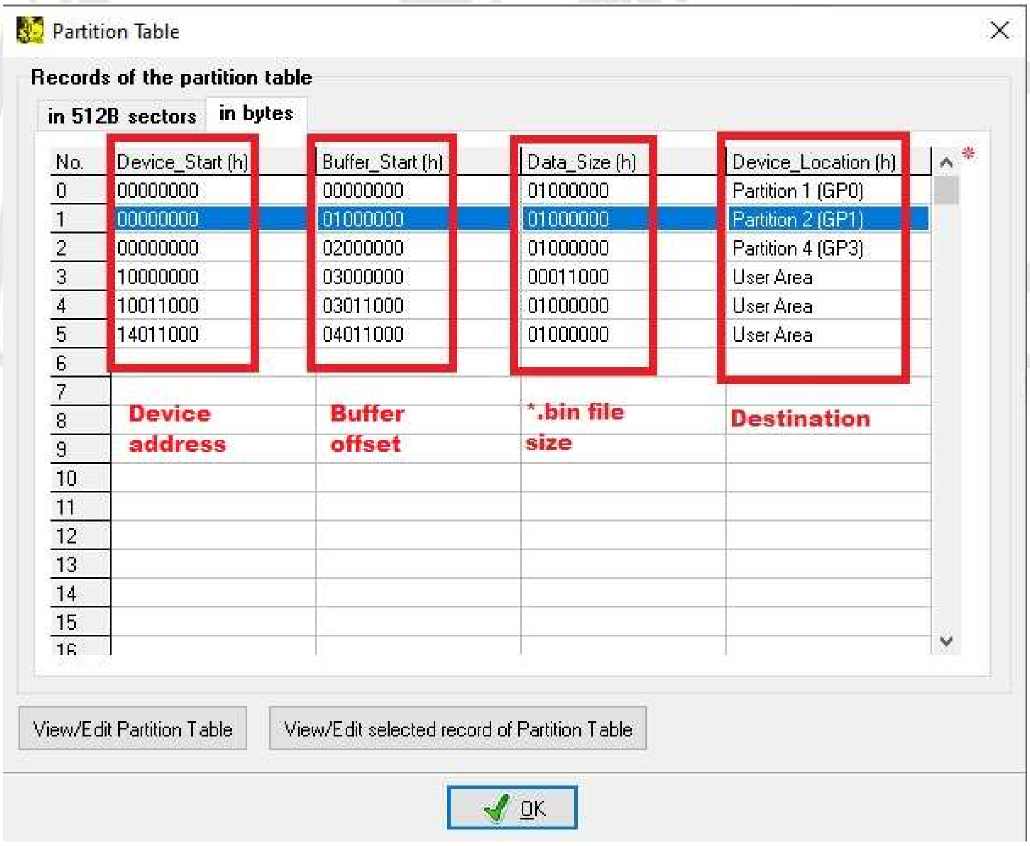
<u>Calculation of the buffer offset for loading files:</u>

```
1.DIW3870.bin: Buffer offset1 = 00h
2.SC60401.bin: Buffer offset2 = (DIW3870.bin) size = 1000000h
3.DIW3871.bin:
  Buffer offset3  = (DIW3870.bin+SC60401.bin) size
                  = 1000000h+1000000h
                  = 2000000h
4.DTIW381.bin:
  Buffer offset4  = (DIW3870.bin+SC60401.bin+DIW3871.bin) size
                  = 1000000h+1000000h+1000000h
                  = 3000000h
5.TT_D_De.bin:
  Buffer offset5  = (DIW3870.bin+SC60401.bin+DIW3871.bin+DTIW381.bin) size
                  = 1000000h+1000000h+1000000h+11000h
                  = 3011000h
6.FSOS_Ex.bin:
  Buffer offset6  = (DIW3870.bin+SC60401.bin+DIW3871.bin+DTIW381.bin+TT_D_De.bin) size
                  = 1000000h+1000000h+1000000h+11000h+1000000h
                  = 4011000h
```

<u>Loading files sequence:</u>

1. Clear buffer “User Area,Partition1-4”
2. Open Load file window, choose the “User Area,Partition1-4” target buffer, set positive buffer **offset1** = **00h** and then load the **DIW3870.bin** file.
3. Open Load file window, choose the “User Area,Partition1-4” target buffer, set positive buffer **offset2** = **1000000h** and then load the **SC60401.bin** file.
4. Open Load file window, choose the “User Area,Partition1-4” target buffer, set positive buffer **offset3** = **2000000h** and then load the **DIW3871.bin** file.
5. Open Load file window, choose the “User Area,Partition1-4” target buffer, set positive buffer **offset4** = **3000000h** and then load the **DTIW381.bin** file.
6. Open Load file window, choose the “User Area,Partition1-4” target buffer, set positive buffer **offset5** = **3011000h** and then load the **TT_D_De.bin** file.
7. Open Load file window, choose the “User Area,Partition1-4” target buffer, set positive buffer **offset6** = **4011000h** and then load the **FSOS_Ex.bin** file
8. Define partition table.(see figure 14)
9. Save project

```
Settings of the Partion table (in bytes):
Record 0: Device_start(h)     = GP0 address = 00h
          Buffer_start(h)     = DIW3870.bin buffer offset1 = 00h
          Data_size(h)        = (DIW3870.bin)size = 1000000h
          Device_Location(h)  = Partition1/GP0 = 03h

Record 1: Device_start(h)     = GP1 address = 00h
          Buffer_start(h)     = SC60401.bin buffer offset2 = 1000000h
          Data_size(h)        = (SC60401 .bin)size = 1000000h
          Device_Location(h)  = Partition2/GP1 = 04h

Record 2: Device_start(h)     = GP3 address = 00h
          Buffer_start(h)     = DIW3871.bin buffer offset3 = 2000000h
          Data_size(h)        = (DIW3871 .bin)size = 1000000h
          Device_Location(h)  = Partition4/GP3 = 06h

Record 3: Device_start(h)     = UserArea address 1 = 10000000h
          Buffer_start(h)     = DTIW381.bin buffer offset4 = 3000000h
          Data_size(h)        = (DTIW381.bin)size = 11000h
          Device_Location(h)  = User Area  = 00h

Record 4: Device_start(h)     = UserArea address 2 = 10011000h
          Buffer_start(h)     = TT_D_De.bin buffer offset5 = 3011000h
          Data_size(h)        = (TT_D_De .bin)size = 1000000h
          Device_Location(h)  = User Area = 00h

Record 5: Device_start(h)     = UserArea address 3 = 14011000h
          Buffer_start(h)     = FSOS_Ex.bin buffer offset6 = 4011000h
          Data_size(h)        = (FSOS_Ex.bin)size = 1000000h
          Device_Location(h)  = User Area = 00h
```



Partition Table

Records of the partition table

in 512B sectors | in bytes

No.	Device_Start (h)	Buffer_Start (h)	Data_Size (h)	Device_Location (h)
0	00000000	00000000	01000000	Partition 1 (GP0)
1	00000000	01000000	01000000	Partition 2 (GP1)
2	00000000	02000000	01000000	Partition 4 (GP3)
3	10000000	03000000	00011000	User Area
4	10011000	03011000	01000000	User Area
5	14011000	04011000	01000000	User Area
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				

Device address
Buffer offset
*.bin file size
Destination
View/Edit Partition Table
View/Edit selected record of Partition Table
OK

Figure 14. Example of partition table

6. Creating of copies from a Master device

The device settings option "Read operation with automatic programming parameters setting" analyze and set a whole group of device programming parameters(device end address, Extended CSD register, etc) based on the values readed from a Master device settings.

Working procedure:

1. Insert Master device to adapter ZIF socket

2. Enable the option "Read operation with automatic programming parameters setting"

3. Perform operation "READ"

4. Insert Blank device to adapter ZIF socket

5. Perform operation "Program"

6. Perform operation "Verify"

7. Save project

For working with a locked Master device it is necessary to enter the correct password to
Device settings, section "Password", item "Password in device". For working with a Master device that contains "Authentication Key", it is necessary to enter the correct "Authentication Key" to the buffer. Settings "Production State Awareness" must be set manually by the user.

7. Erase operation

The PG4UW defines the address of the ranges using the ERASE_GROUP_START(CMD35), ERASE_GROUP_END(CMD36) commands and finally it starts the erase process by issuing the ERASE (CMD38) command with argument bits set to zero. The PG4UW performs the Discard operation before the Erase operation automatically for the devices eMMC version 4.5 or newer. The Trim operation is not supported.

8. Production State Awareness (PSA)

The PG4UW supports two methods to manage the device PSA: auto mode and manual mode. It is necessary to enter the correct PSA registers values and set the device addresses range option(i.e. User Area start, User Area end or Partition table). The option "Skip of blank data programming" must be disabled in the Device operation options. Please Erase device before programming or enable option "Erase before programming" in Device operation options.

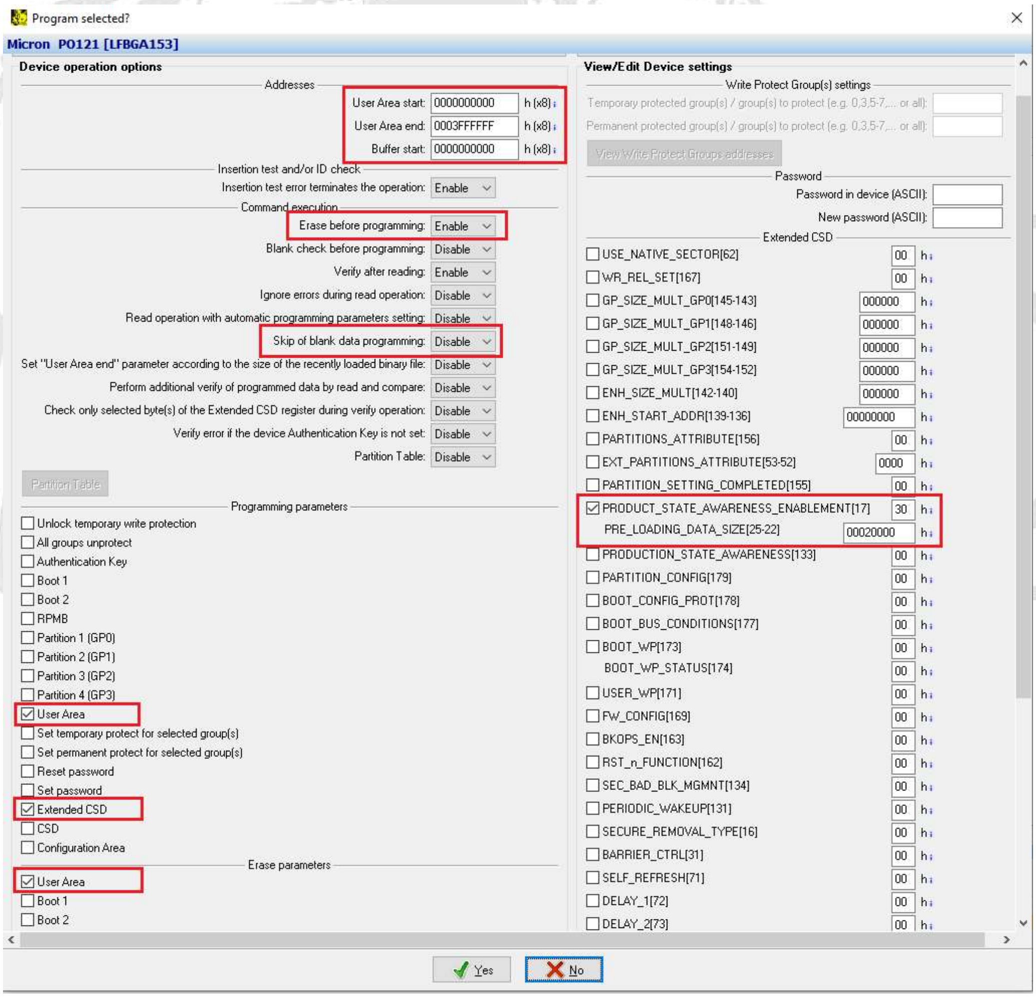
8.1. Auto mode setting

Select programming the PRODUCT_STATE_AWARENESS_ENABLEMENT register and set the value to **30h**. The PG4UW sets register PRODUCT_STATE_AWARENESS to the 03h value automatically before the program data operation therefore it is not necessary to do this manually. The PRE_LOADING_DATA_SIZE register field value must be set to an appropriate image size, i.e. to the amount of programmed data to all normal partitions. Data written in BOOT, RPMB, Enhanced GPP and Enhanced User Area partitions must not be included when calculating the PRE_LOADING_DATA_SIZE register field value to set. Set the device addresses range option (User Area start, User Area end or Partition table) according to the register PRE_LOADING_DATA_SIZE (see section 8.1.1.)

8.1.1. Example of configuration settings for Auto mode

1. Set PRODUCT_STATE_AWARENESS_ENABLEMENT[17] = 30h (70h for Micron eMMC TLC (Pearl))
2. Set PRE_LOADING_DATA_SIZE [25:22] = 20000h (see Note)
3. Set User Area start = 0h
4. Set User Area end = 3FFFFFFh (see Note)
5. Load the *.bin file (file size <= 4000000h)

Note: (User Area end – User Area start) = ((PRE_LOADING_DATA_SIZE x SECTOR_SIZE) – 1)
=> (3FFFFFFh – 0h) = ((20000h x 200h) – 1) => 3FFFFFFh = 3FFFFFFh



Micron P0121 [LFBGA153]

Device operation options

Addresses

User Area start: 0000000000 h (x8)
User Area end: 0003FFFFFF h (x8)
Buffer start: 0000000000 h (x8)

Insertion test and/or ID check

Insertion test error terminates the operation: Enable

Command execution

Erase before programming: Enable
Blank check before programming: Disable
Verify after reading: Enable
Ignore errors during read operation: Disable
Read operation with automatic programming parameters setting: Disable
Skip of blank data programming: Disable
Set "User Area end" parameter according to the size of the recently loaded binary file: Disable
Perform additional verify of programmed data by read and compare: Disable
Check only selected byte(s) of the Extended CSD register during verify operation: Disable
Verify error if the device Authentication Key is not set: Disable
Partition Table: Disable

Partition Table

Programming parameters

- ☐ Unlock temporary write protection
- ☐ All groups unprotect
- ☐ Authentication Key
- ☐ Boot 1
- ☐ Boot 2
- ☐ RPMB
- ☐ Partition 1 (GP0)
- ☐ Partition 2 (GP1)
- ☐ Partition 3 (GP2)
- ☐ Partition 4 (GP3)
- ☑ User Area
- ☐ Set temporary protect for selected group(s)
- ☐ Set permanent protect for selected group(s)
- ☐ Reset password
- ☐ Set password
- ☑ Extended CSD
- ☐ CSD
- ☐ Configuration Area

Erase parameters

- ☑ User Area
- ☐ Boot 1
- ☐ Boot 2

View/Edit Device settings

Write Protect Group(s) settings

Temporary protected group(s) / group(s) to protect (e.g. 0,3,5-7,... or all):
Permanent protected group(s) / group(s) to protect (e.g. 0,3,5-7,... or all):

View Write Protect Groups addresses

Password

Password in device (ASCII):
New password (ASCII):

Extended CSD

☐ USE_NATIVE_SECTOR[62]	00	h
☐ WR_REL_SET[167]	00	h
☐ GP_SIZE_MULT_GP0[145-143]	000000	h
☐ GP_SIZE_MULT_GP1[148-146]	000000	h
☐ GP_SIZE_MULT_GP2[151-149]	000000	h
☐ GP_SIZE_MULT_GP3[154-152]	000000	h
☐ ENH_SIZE_MULT[142-140]	000000	h
☐ ENH_START_ADDR[139-136]	00000000	h
☐ PARTITIONS_ATTRIBUTE[156]	00	h
☐ EXT_PARTITIONS_ATTRIBUTE[53-52]	0000	h
☐ PARTITION_SETTING_COMPLETED[155]	00	h
☑ PRODUCT_STATE_AWARENESS_ENABLEMENT[17]	30	h
PRE_LOADING_DATA_SIZE[25-22]	00020000	h
☐ PRODUCTION_STATE_AWARENESS[133]	00	h
☐ PARTITION_CONFIG[179]	00	h
☐ BOOT_CONFIG_PROT[178]	00	h
☐ BOOT_BUS_CONDITIONS[177]	00	h
☐ BOOT_WP[173]	00	h
BOOT_WP_STATUS[174]	00	h
☐ USER_WP[171]	00	h
☐ FW_CONFIG[169]	00	h
☐ BKOPS_EN[163]	00	h
☐ RST_n_FUNCTION[162]	00	h
☐ SEC_BAD_BLK_MGMNT[134]	00	h
☐ PERIODIC_WAKEUP[131]	00	h
☐ SECURE_REMOVAL_TYPE[16]	00	h
☐ BARRIER_CTRL[31]	00	h
☐ SELF_REFRESH[71]	00	h
☐ DELAY_1[72]	00	h
☐ DELAY_2[73]	00	h

Figure 15. Example of configuration settings for Auto mode

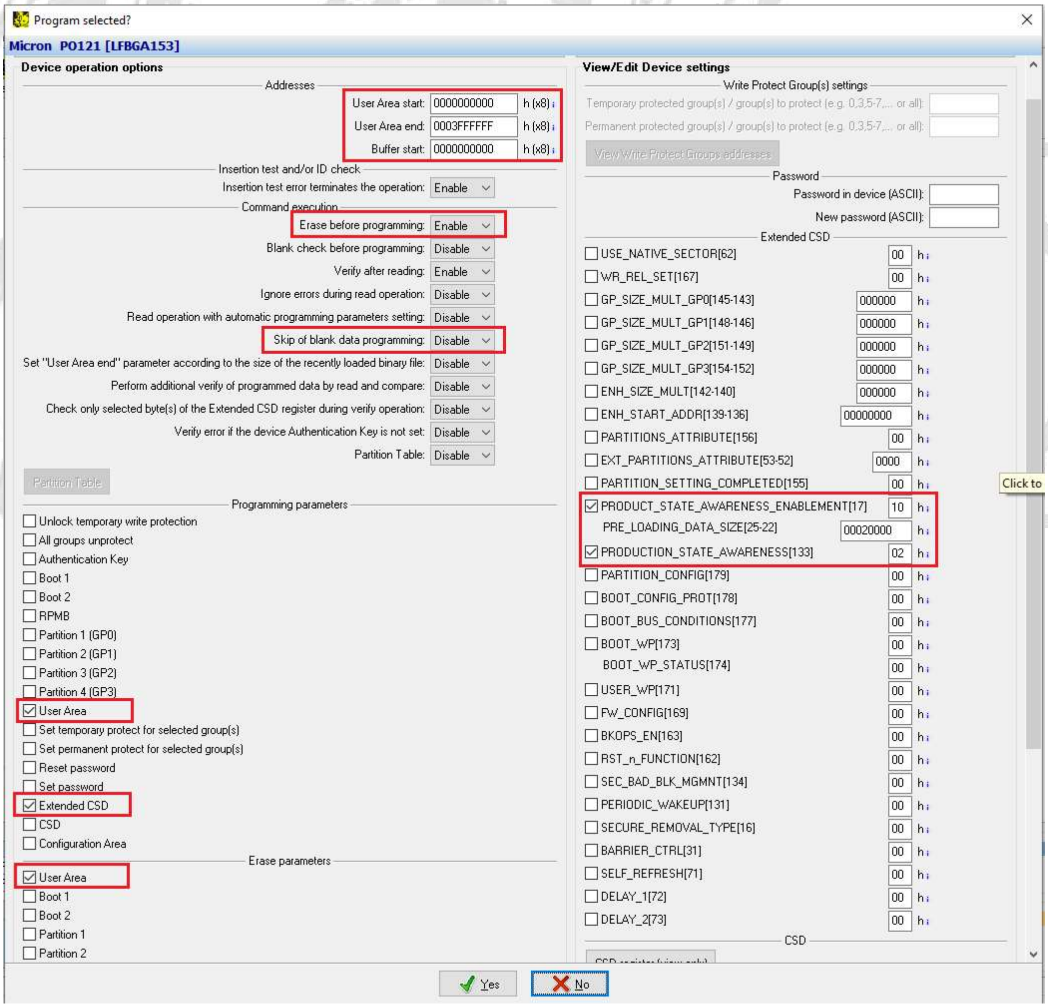
8.2. Manual mode setting

Select programming the PRODUCT_STATE_AWARENESS_ENABLEMENT register and set the value to **10h**. Select programming the PRODUCT_STATE_AWARENESS register and set the value to 02h. The PG4UW sets register PRODUCT_STATE_AWARENESS to the 01h value automatically before the program data operation therefore it is not necessary to do this manually. The PRE_LOADING_DATA_SIZE register field value must be set to an appropriate image size, i.e. to the amount of programmed data to all normal partitions. Data written in BOOT, RPMB, Enhanced GPP and Enhanced User Area partitions must not be included when calculating the PRE_LOADING_DATA_SIZE register field value to set. Set the device addresses range option (User Area start, User Area end or Partition table) according to the register PRE_LOADING_DATA_SIZE. (see section 8.1.2.)

8.2.1. Example of configuration settings for Manual mode

1. Set PRODUCT_STATE_AWARENESS_ENABLEMENT[17] = 10h (50h for Micron eMMC TLC (Pearl))
2. Set PRE_LOADING_DATA_SIZE [25:22] = 20000h (see Note)
3. Set PRODUCT_STATE_AWARENESS[133] = 02h
4. Set User Area start = 0h
5. Set User Area end = 3FFFFFFh (see Note)
6. Load the *.bin file (file size <= 4000000h)

Note: (User Area end – User Area start) = ((PRE_LOADING_DATA_SIZE x SECTOR_SIZE) – 1)
=> (3FFFFFFh – 0h) = ((20000h x 200h) – 1) => 3FFFFFFh = 3FFFFFFh



Program selected?

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Device operation options

Addresses
User Area start: 0000000000 h (x8)
User Area end: 0003FFFFFF h (x8)
Buffer start: 0000000000 h (x8)

Insertion test and/or ID check
Insertion test error terminates the operation: Enable

Command execution
Erase before programming: Enable
Blank check before programming: Disable
Verify after reading: Enable
Ignore errors during read operation: Disable
Read operation with automatic programming parameters setting: Disable
Skip of blank data programming: Disable
Set "User Area end" parameter according to the size of the recently loaded binary file: Disable
Perform additional verify of programmed data by read and compare: Disable
Check only selected byte(s) of the Extended CSD register during verify operation: Disable
Verify error if the device Authentication Key is not set: Disable
Partition Table: Disable

Partition Table

Programming parameters
□ Unlock temporary write protection
□ All groups unprotect
□ Authentication Key
□ Boot 1
□ Boot 2
□ RPMB
□ Partition 1 (GP0)
□ Partition 2 (GP1)
□ Partition 3 (GP2)
□ Partition 4 (GP3)
☑ User Area
□ Set temporary protect for selected group(s)
□ Set permanent protect for selected group(s)
□ Reset password
□ Set password
☑ Extended CSD
□ CSD
□ Configuration Area

Erase parameters
☑ User Area
□ Boot 1
□ Boot 2
□ Partition 1
□ Partition 2

View/Edit Device settings

Write Protect Group(s) settings
Temporary protected group(s) / group(s) to protect (e.g. 0,3,5-7,... or all):
Permanent protected group(s) / group(s) to protect (e.g. 0,3,5-7,... or all):
View Write Protect Groups addresses

Password
Password in device (ASCII):
New password (ASCII):

Extended CSD
□ USE_NATIVE_SECTOR[62] 00 h
□ WR_REL_SET[167] 00 h
□ GP_SIZE_MULT_GP0[145-143] 000000 h
□ GP_SIZE_MULT_GP1[148-146] 000000 h
□ GP_SIZE_MULT_GP2[151-149] 000000 h
□ GP_SIZE_MULT_GP3[154-152] 000000 h
□ ENH_SIZE_MULT[142-140] 000000 h
□ ENH_START_ADDR[139-136] 00000000 h
□ PARTITIONS_ATTRIBUTE[156] 00 h
□ EXT_PARTITIONS_ATTRIBUTE[53-52] 0000 h
□ PARTITION_SETTING_COMPLETED[155] 00 h
☑ PRODUCT_STATE_AWARENESS_ENABLEMENT[17] 10 h
PRE_LOADING_DATA_SIZE[25-22] 00020000 h
☑ PRODUCTION_STATE_AWARENESS[133] 02 h
□ PARTITION_CONFIG[179] 00 h
□ BOOT_CONFIG_PROT[178] 00 h
□ BOOT_BUS_CONDITIONS[177] 00 h
□ BOOT_WP[173] 00 h
BOOT_WP_STATUS[174] 00 h
□ USER_WP[171] 00 h
□ FW_CONFIG[169] 00 h
□ BKOPS_EN[163] 00 h
□ RST_n_FUNCTION[162] 00 h
□ SEC_BAD_BLK_MGMNT[134] 00 h
□ PERIODIC_WAKEUP[131] 00 h
□ SECURE_REMOVAL_TYPE[16] 00 h
□ BARRIER_CTRL[31] 00 h
□ SELF_REFRESH[71] 00 h
□ DELAY_1[72] 00 h
□ DELAY_2[73] 00 h

CSD

Figure 16. Example of configuration settings for Manual mode

Revision history:

V1.00 - December 5, 2018	- Initial version
V1.01 - January 15, 2020	- added “Creating of copies from a Master device”
V1.02 - July 15, 2020	- added example
V1.03 - July 20, 2021	- added section 1.1 - updated section 5.1
V1.04 - January 11, 2022	- changed section 1.1 - added section 1.2
V1.05 - May 25, 2023	- added section 7
V1.06 - August 10, 2023	- added section 8