Turbo Writer Tool User Guide

V2.01.007

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Support Chips:
W55FA

Support Platforms:
Windows

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1. Introduction

1.1. ISP Introduction

W55FA series have two boot flows – one is Normal mode; the other is Recovery mode. If user wants to do ISP (In System Programming) through USB, the system should be set to Recovery mode.

The boot flow descriptions are as follows

- **FA91**
  - Normal mode boot flow
    - ✓ NAND boot → SD card boot → USB boot → SPI boot
  - Recovery mode boot flow (Must Remove the SD card)
    - ✓ SD card boot → USB boot → SPI boot → NAND boot
- **FA93**
  - Normal mode boot flow
    - ✓ SD card 0 boot → NAND boot → SPI boot → SD card 1 boot → USB boot
  - Recovery mode boot flow
    - ✓ USB boot
- **FA95**
  - Normal mode boot flow
    - ✓ SD card 0 boot → SPI boot (GPA[15:12]/NAND) → NAND CS 0 boot→ NAND CS1 boot → SPI boot (GPD[15:12]) → SD card 1 boot → SD card 2 boot → USB boot
  - Recovery mode boot flow
    - ✓ USB boot
- **FA92**
  - Normal mode boot flow
    - ✓ SD card 0 boot → NAND CS 0 boot→ NAND CS1 boot → SD card 1 boot → SD card 2 boot → USB boot
  - Recovery mode boot flow
    - ✓ USB boot

1.2. Turbo Writer Introduction

Turbo Writer can program the images into specific flash or download to SDRAM and run. This document will tell user how to program the Linux kernel into W55FA demo board NAND flash and SD Card by Turbo Writer. Here we describe the files within the Turbo Writer folder.

- **[Turbo Writer Version History – ChangeLog.txt]**

  All Turbo Writer tool and Turbo Writer firmware change history is listed in this file.

- **[Turbo Writer program – Turbowriter.exe]**

Turbo Writer PC Tool execution file.

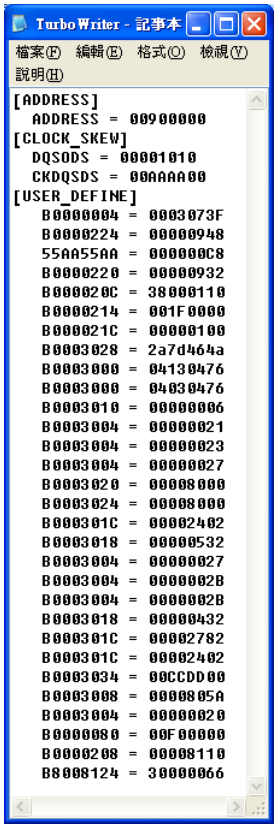
- **[Turbo Writer extra support NAND ID – NAND ID.ini]**

  User can add new NAND ID that Turbo Writer doesn't support without modifying Turbo Writer firmware.
  Ex. If user wants to add H27UAG8T2A to Turbo Writer NAND list without modifying Turbo Writer firmware, he can add the following information into NAND ID.ini.

[1stID]	[2ndID]	[3rdID]	[4thID]	[5thID]	[Page per Block]	[Block per Flash]
AD	D5	94	25	44	128	1024

- **[Turbo Writer Configuration for W55FA series Boot Code Header – TurboWriter.ini]**

  IBR supports some user-defined items in Boot code header about boot code executing address, DRAM clock skew setting, Register writing function (FA95/FA92 only), and delay function (FA95/FA92 only). After confirming the flash content is for booting, IBR will do corresponding operation according to the boot code header before reading boot code to destination address. Using FA95/FA92 boot code header, user can change clock setting, dram setting, engine clock, and so on. The file TurboWriter.ini is for NAND, SD, SPI flash and SPI flash raw data.



- [ADDRESS] Boot code execution address (FA93/FA95/FA92)
  It can be modified if necessary. Generally, it is the execution address of Loader (SD/NAND/SPI). FA93 has 3 kinds of N3290X, for N32905 (32MB DRAM), the execution address is 0x900000. For N32903 (8MB DRAM), the execution address is 0x700000. For N32901 (2MB SDRAM), the execution address is 0x180000. The execution address of FA95 is 0x900000.
- [CLOCK_SKEW] DQSODS /CKDQSDS values (FA93 only)
- [USER_DEFINE] Register writing / delay function (FA95/FA92 only)

  Register writing function Format:

  Address = Value

  Ex. Set REG_CKDQSDS to 0x00CCDD00
  B0003034 = 00CCDD00

  Delay function Format:

  55AA55AA = Delay time (micro second)

  Ex. Set Delay 1 second
  55AA55AA = 000F4240

- Left figure is an example to change PLL setting to 300MHz and initialize DRAM again

[Note1] FA92 DRAM initialization and detection are removed from IBR. So if Boot code execution address is DRAM, user needs to add DRAM initialization to the USER_DEFINE field to initialize DRAM.

- **[Turbo Writer Firmware - .bin]**

Turbo Writer is connected to Turbo writer firmware which loaded from PC to W55FA series by USB boot. When Turbo Writer connects to USB boot, Turbo Writer will send the corresponding binary file (VA91/FA95/FA95/FA92 Turbo writer firmware) to W55FA series and connects to Turbo writer firmware according to USB boot PID. If USB port is full speed, then user should backup the file FA9X_musb.bin, rename the file FA9X_musb_FullSpeed.bin into FA9X_musb.bin to work.

- ✧ VA91→ musb.bin
- ✧ FA93 → FA93_musb.bin/FA93_musb_FullSpeed.bin
- ✧ FA95 → FA95_musb.bin/FA95_musb_FullSpeed.bin
- ✧ FA92 → FA92_musb.bin/FA92_musb_FullSpeed.bin

Turbo writer firmware binary file includes

- ✧ Turbo Writer firmware marker : 0x2054564E
- ✧ Turbo Writer firmware executing address : 0x000F00000
- ✧ Turbo Writer firmware size : 0xE3C4
- ✧ Turbo Writer firmware version : 0x11102801 → 2011/10/28 V1
- ✧ Turbo Writer firmware code starts from offset 0x20.

```
00000000h: 4E 56 54 20 00 00 F0 00 C4 E3 00 00 01 28 10 11 ; NVT ..?瀰...(..
00000010h: 18 F0 9F E5 18 F0 9F E5 18 F0 9F E5 18 F0 9F E5 ; .????????
00000020h: 18 F0 9F E5 18 F0 9F E5 18 F0 9F E5 18 F0 9F E5 ; .????????
```

- **[Turbo Writer Firmware version]**

Turbo Writer firmware version is located at Turbo writer firmware binary file and it can be seen from Turbo Writer Tool as follows.

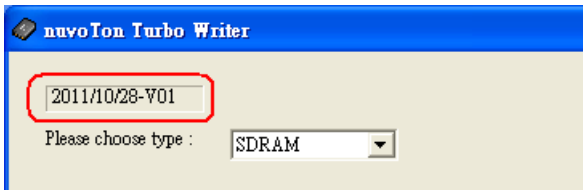


Figure 1 Turbo Writer Firmware version

[Note2] The Turbo Writer Firmware version for FA93 has another meaning about DRAM size. For example

The version number 2011/10/28-V01 → the DRAM size is 2MB.
The version number 2011/10/28-V03 → the DRAM size is 8MB.
The version number 2011/10/28-V05 → the DRAM size is 32MB.

- **[Turbo Writer Tool version]**

Turbo Writer PC tool version can be seen from Turbo Writer Tool as follows.

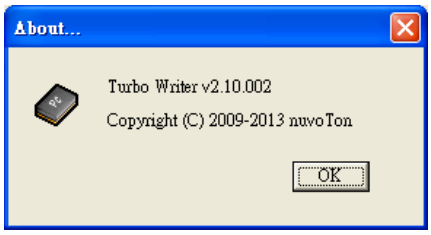


Figure 2 Turbo Writer Tool version

1.3. SDRAM

Turbo Writer SDRAM mode can download the Linux kernel and then execute it. The Linux kernel file is **ConProg.bin**.

- ConProg.bin –
  - Browse the file "ConProg.bin"
  - Set the buffer address: **0x0**
    - ✓ Linux runs at 0x0.
  - Select the Option: **Download and run**
  - Press the button "Download and run".

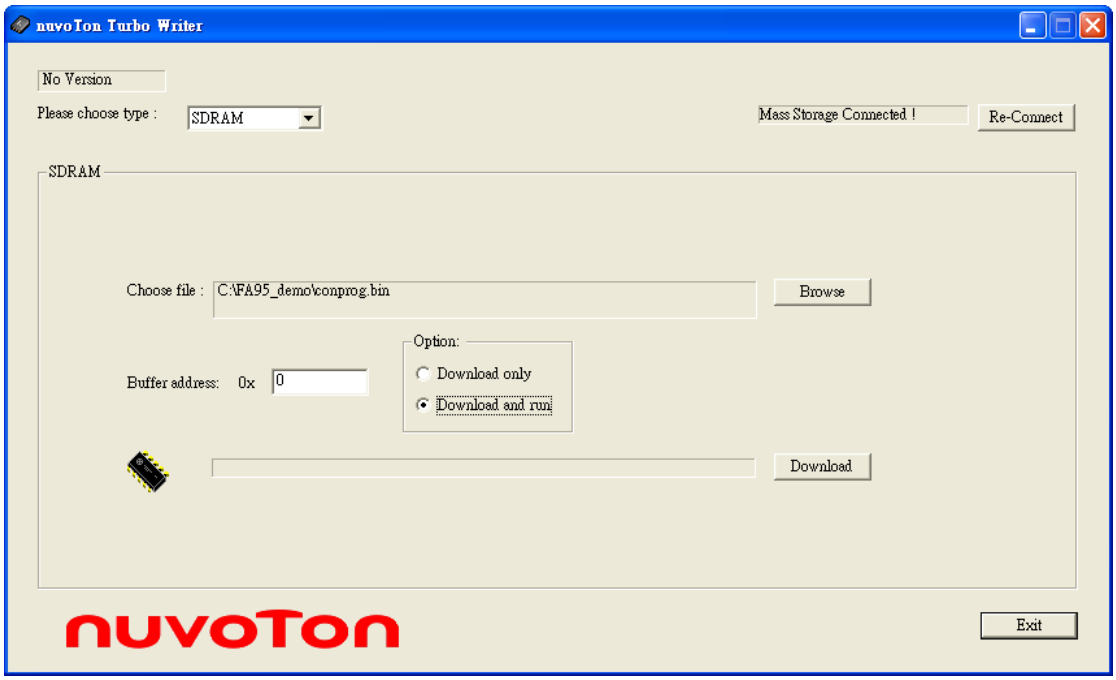


Figure 3 Download ConProg.bin to SDRAM and Run

1.4. Preliminary Definition

Image Type

Turbo Writer defines five image types. The detailed descriptions are as follows.

- **System image**
  - Required image – ID is 0x03
  - Nand/ SD/SPI Loader
  - Loaded and Executed by Internal Boot Code (IBR)
  - Execution address is defined in TurboWriter.ini, FA93 has 3 kinds of N3290X, for N32905 (32MB DRAM), the execution address is 0x900000. For N32903 (8MB DRAM), the execution address is 0x700000. For N32901 (2MB SDRAM), the execution address is 0x180000. The execution address of FA95 is 0x900000.

  Other images are loaded by Nand/ SD/SPI Loader
- **Execute image**
  - Optional image – ID is 0x01
  - NvtLoader for SD/Nand/SPI
  - Loader will load image to execution address and run it.
- **Logo image**
  - Optional image – ID is 0x04
  - Logo binary file for display
- **Data image**
  - Optional image – ID is 0x00
  - Data image for user
- **RomFS**
  - Optional image – ID is 0x02
  - Linux RomFS

Example

In the following sections, we use FA95 demo flow to describe how to use Turbo Writer. Here, we use three image types.

- **System image**
  - NAND/ SD/SPI Loader
    - **NANDLoader_0120.bin**
    - **SDLoader_0119.bin**
    - **SpiLoader_GWTFM9563B.bin**
  - Execution address is 0x900000
  - TurboWriter.ini
    - **[USER_DEFINE] can't be set, if not necessary**
    - **Ex. With [USER_DEFINE]**

```
[Address]
    Address = 00900000                  → Nand/ SD/SPI Loader executing address
[CLOCK_SKEW]
    DQSODS = 00001010                   → Not use in FA95/FA92
    CKDQSDS = 00AAAA00                  → Not use in FA95/FA92
[USER_DEFINE]
    B0003034 = 00CCDD00                 → Set CKDQSDS to 0x00CCDD00
```

- Ex. Without [USER_DEFINE]

```
[Address]
    Address = 00900000                  → Nand/ SD/SPI Loader executing address
[CLOCK_SKEW]
    DQSODS = 00001010                   → Not use in FA95/FA92
    CKDQSDS = 00AAAA00                  → Not use in FA95/FA92
[USER_DEFINE]
```

- **Execute image**
  - NvtLoader for NAND/SD/SPI
    - **NVT_NAND_GW9563_0120.bin for NAND**
    - **NVT_SDU0_GW9563_0120.bin for SD**
    - **Conprog.bin for SPI**
  - Execution address
    - **For N32905 (32 MB SDRAM), 0x800000 for NAND/SD. For N32903 (8 MB SDRAM), 0x600000 for NAND/SD. For N32901(2 MB SDRAM), 0x40000 for NAND/SD.**
    - **0x000000 for SPI**
- **Logo image**
  - Logo binary file for display
    - **NuvotonLogo_480x272.bin**
  - Display buffer address is 0x500000

Our demo Booting flow from IBR to Linux is as follows.

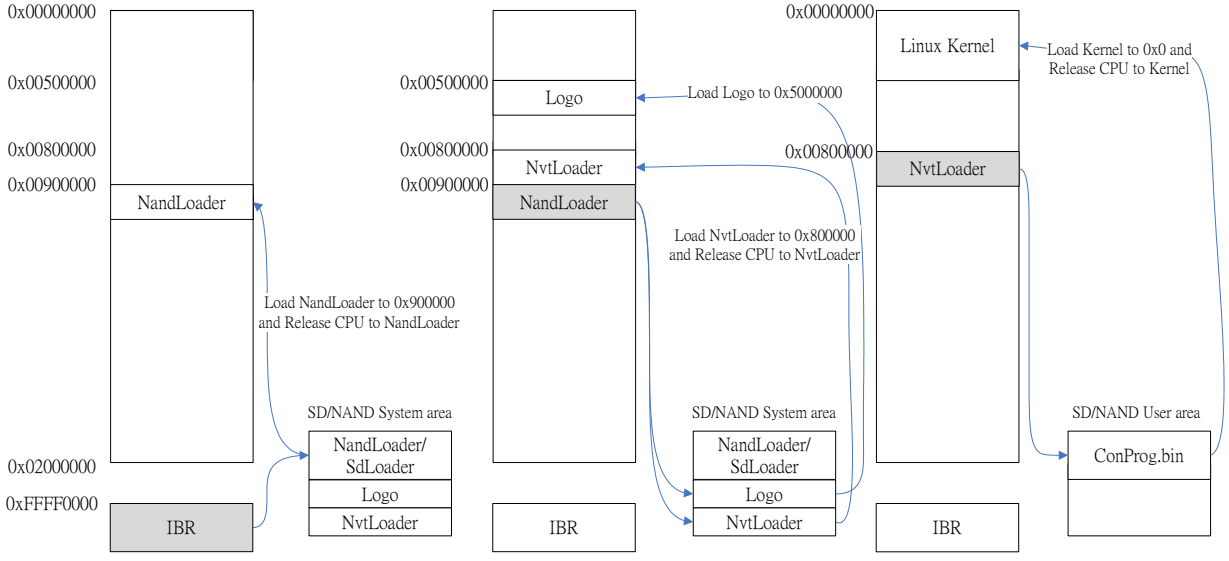


Figure 4 Demo booting flow for NAND

1.5. NAND Flash

Turbo Writer for NAND flash is as follows.

- NAND Loader –
  - Choose the type "NAND"
  - Set Image type "System Image"
  - Browse the file "NANDLoader_0120.bin"
  - Press the button "Burn"

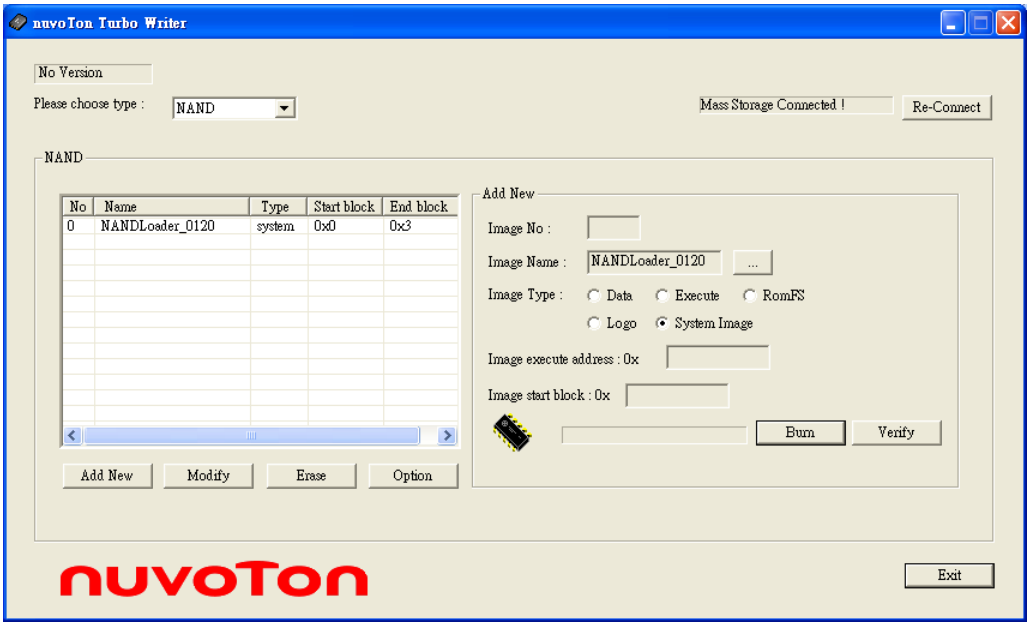


Figure 5 System image – NAND Loader

- Logo –
  - Set Image type "Logo"
  - Image number "1"
  - Browse the file "NuvotonLogo_480x272.bin"
  - Set the image execute address: **0x500000**
  - Set the start block number: **0x4**
    - ✓ Because the burned NAND Loader occupies block 0~3, so we could select block 4 to burn the logo file.
  - Press the button "Burn"

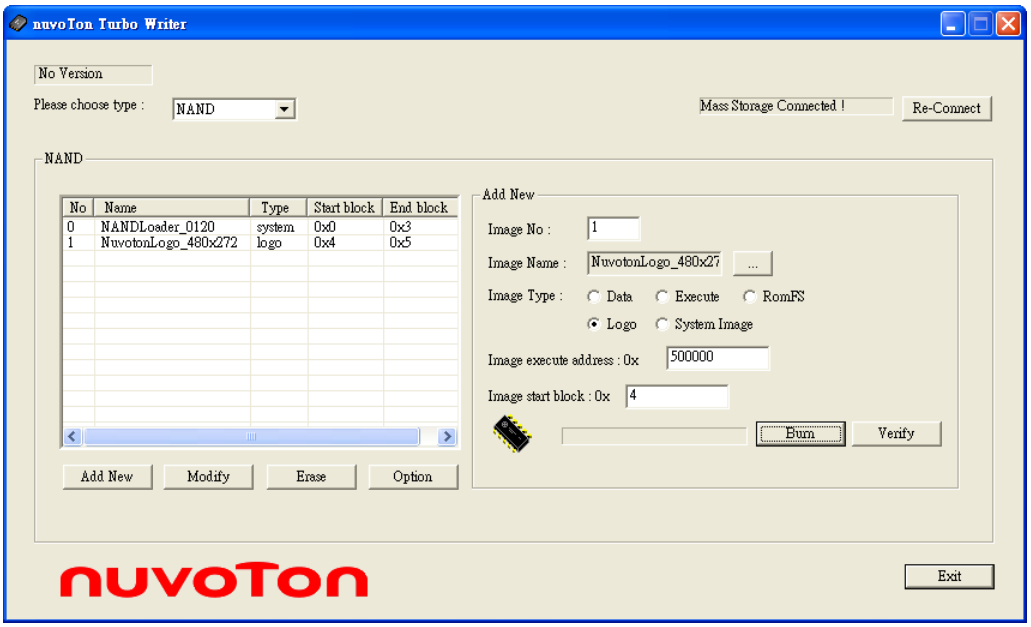


Figure 6 Logo image

- NVT Loader–
  - ✧ Image number "2"
  - ✧ Set Image type "Execute"
  - ✧ Browse the file "NVT_NAND_GW9563_0120.bin"
  - ✧ Set the executed address: **0x800000**
  - ✧ Set the start block number: **0x6.**
    - ✓ Because the burned NAND Loader and logo occupied block 0~5, so we could select block 6 to burn execute image
  - ✧ Press the button "Burn"

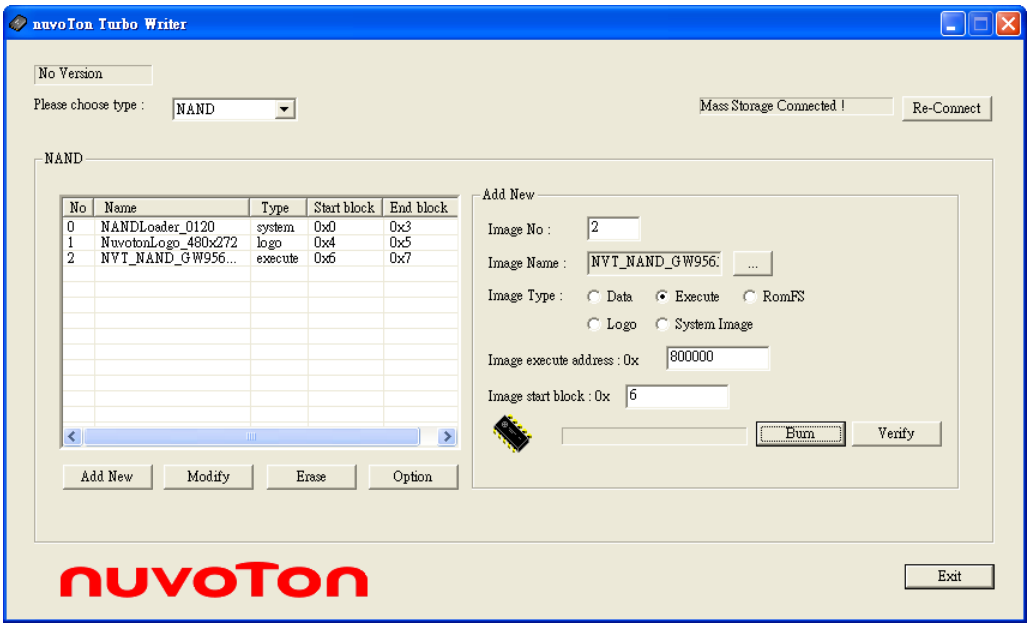


Figure 7 Execute image - NvtLoader

- Option button –

  User clicks down the button option, UI will show as follows. It includes the information of total size, user could set the system reserved area size, and presses the button of apply to take effect.

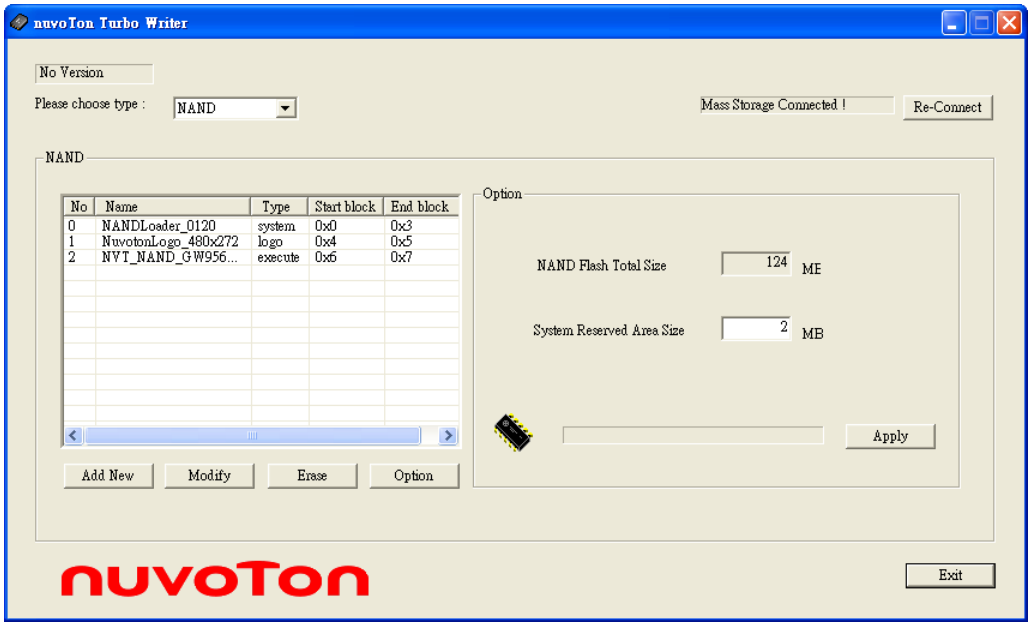
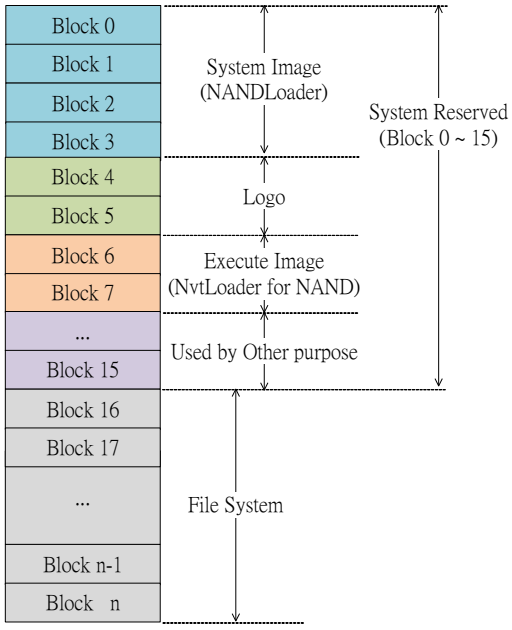


Figure 8 Reserved System Area Size

- Flash memory map after above step –



+Figure 9 NAND flash memory map

- Erase button –
  - System Reserved Area Size
    - ✓ User clicks down the button option, UI will show as follows. It includes the information of total size, user could set the system reserved area size, and presses the button of apply to take effect.

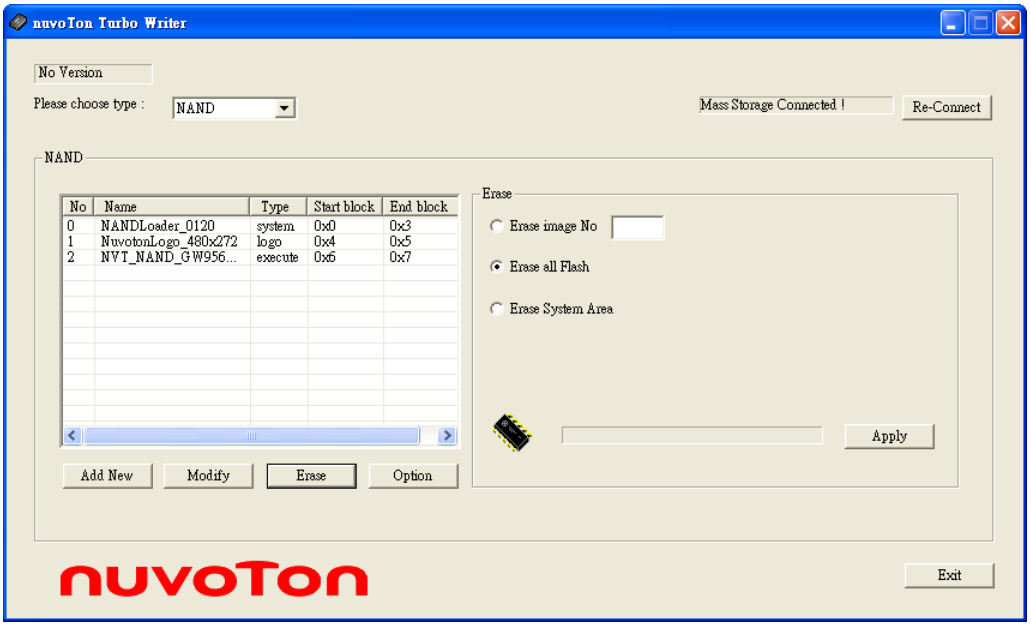


Figure 10 Erase

- Modify button –

  User clicks down the button of Modify, UI will show two options including Image No, and Image Type. User could set Image No., modify its Image Type, and click down the button of Apply to take effect.

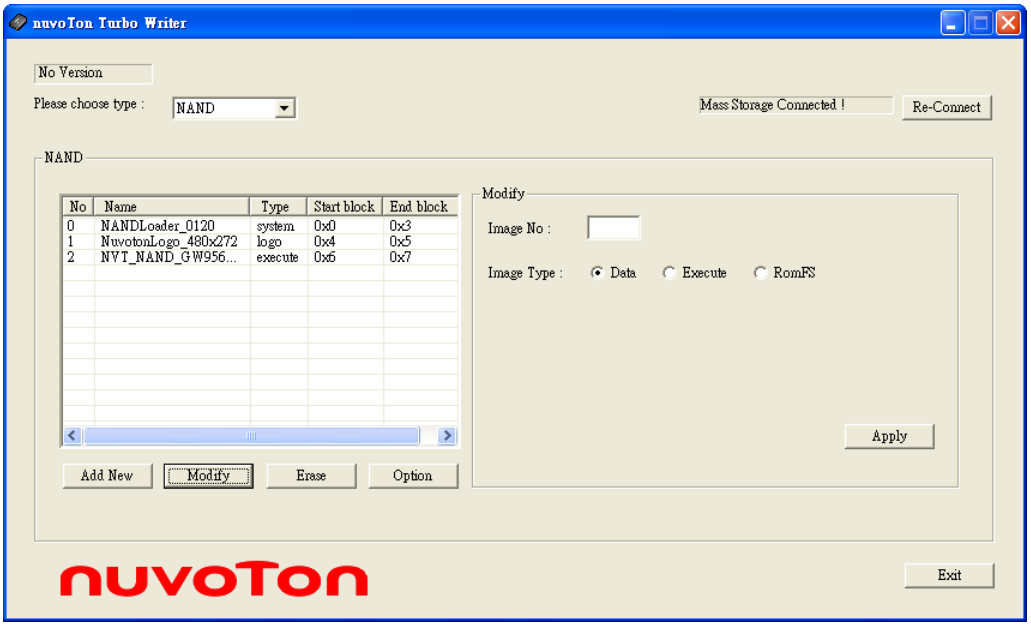


Figure 11 Modify image type

1.6. SD Card

Turbo Writer for SD Card is as follows.

- SD Loader –
  - Insert SD Card
  - Choose the type "SD"
  - Set Image type "System Image"
  - Browse the file "SDLoader_0119.bin"
  - Press the button "Burn"

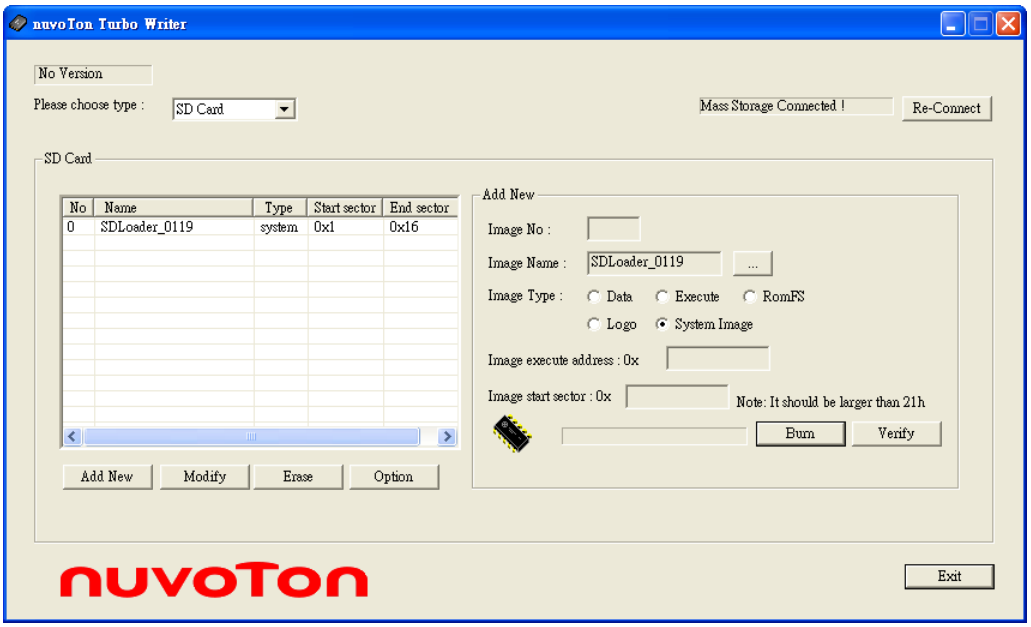


Figure 12 System image – SD Loader

- Logo –
  - Set Image type "Logo"
  - Image number "1"
  - Browse the file "NuvotonLogo_480x272.bin"
  - Set the image execute address: **0x500000**
  - Set the start block number: **0x22**
  - Press the button "Burn"

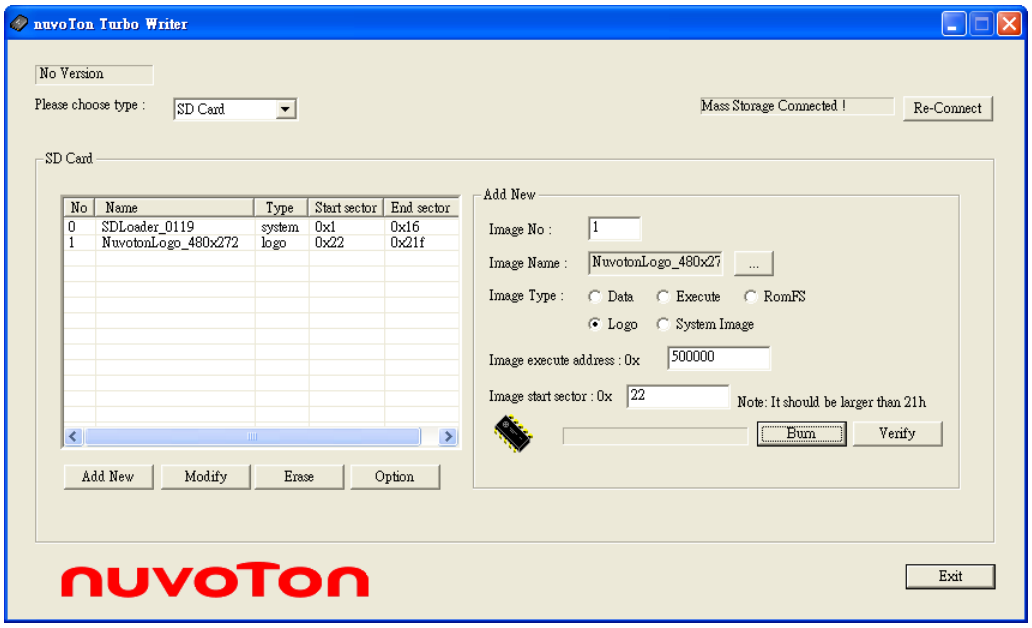


Figure 13 Logo image

- NVT Loader–
  - Image number "2"
  - Set Image type "Execute"
  - Browse the file "NVT_SDU0_GW9563_0120.bin"
  - Set the executed address: **0x800000**
  - Set the start block number: **0x220.**
  - Press the button "Burn"

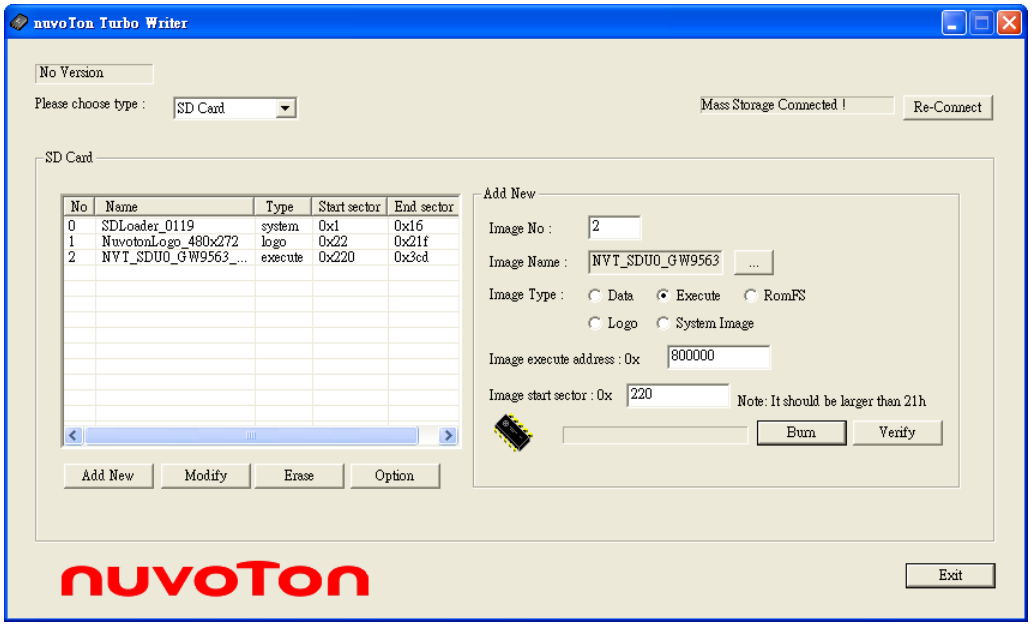


Figure 14 Execute image - NvtLoader

- Option button –
  - User clicks down the button option, UI will show as follows.
    - ✓ System reserved area size
    - ✓ Enable SD Format
      - ◆ Turbo Writer formats SD card as one partition disk
      - ◆ If NvtLoader wants to formats SD card as multi- partition disk, user can uncheck this check box
    - ✓ SD Port
      - ◆ User can select the SD port that he wants to control.

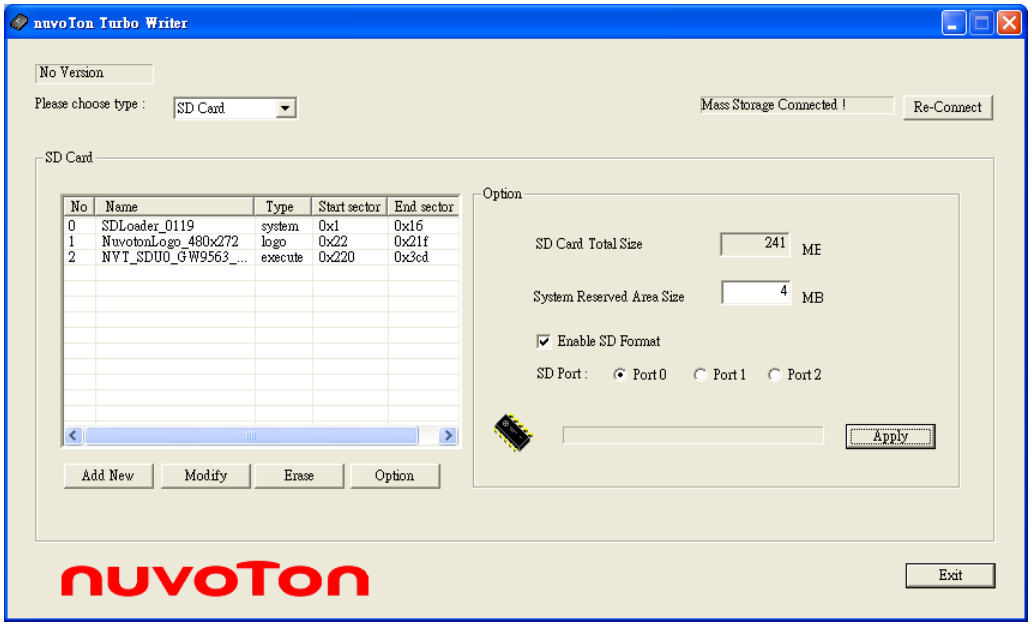


Figure 15 Option for SD

- Flash memory map after above step –

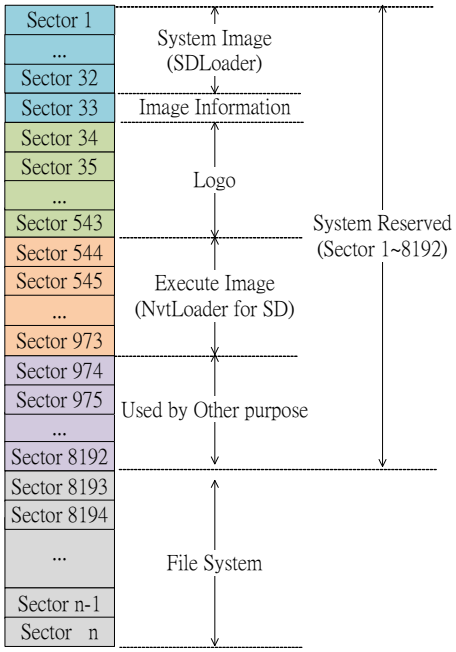


Figure 16 SD Card memory map

- Erase button –

User clicks down the button of Erase, UI will show two options including Erase image No and Erase all Flash. User should select the one of two options, and click down the button of Apply to take effect.

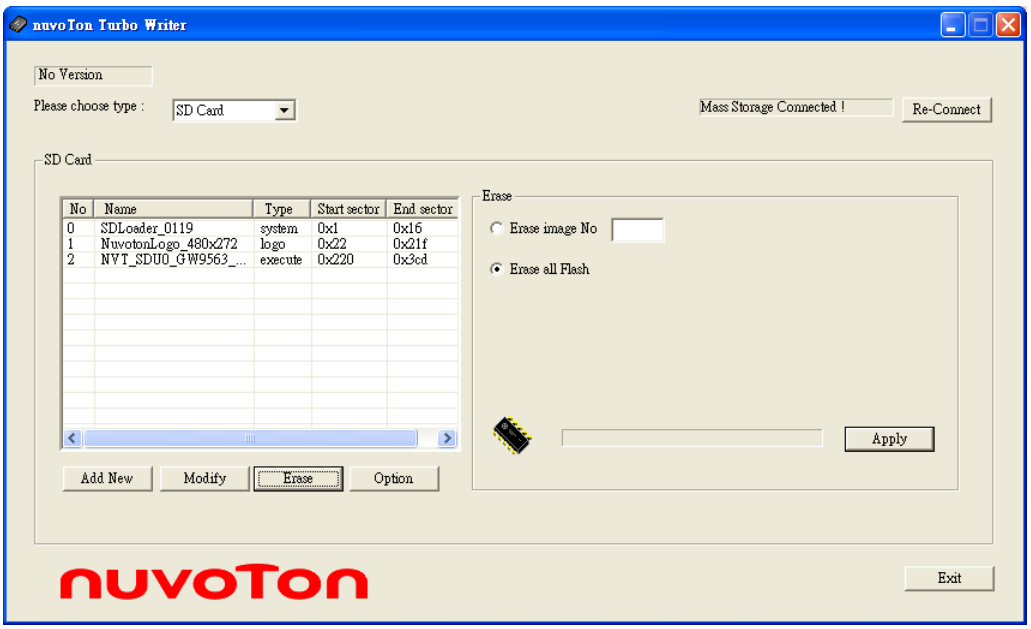


Figure 17 Erase

- Modify button –

User clicks down the button of Modify, UI will show two options including Image No, and Image Type. User could set Image No., modify its Image Type, and click down the button of Apply to take effect.

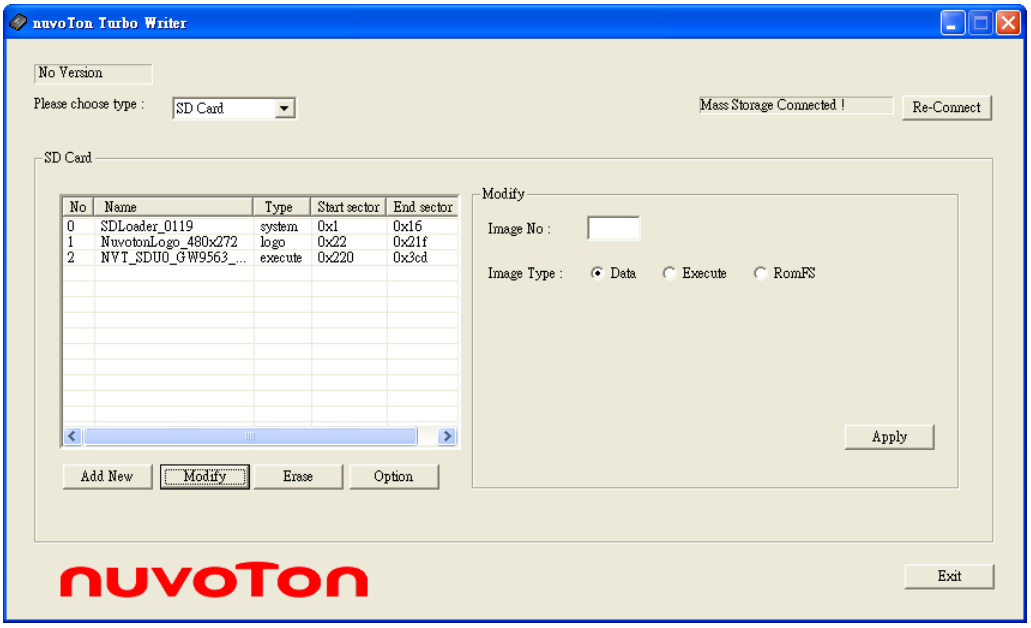


Figure 18 Modify image type

1.7. SPI Flash

Turbo Writer for SPI Flash is as follows.

- SPI Loader –
  - ✧ Choose the type “SPI”
  - ✧ Set Image type “System Image”
  - ✧ Browse the file “SpiLoader.bin”
  - ✧ Press the button “Burn”

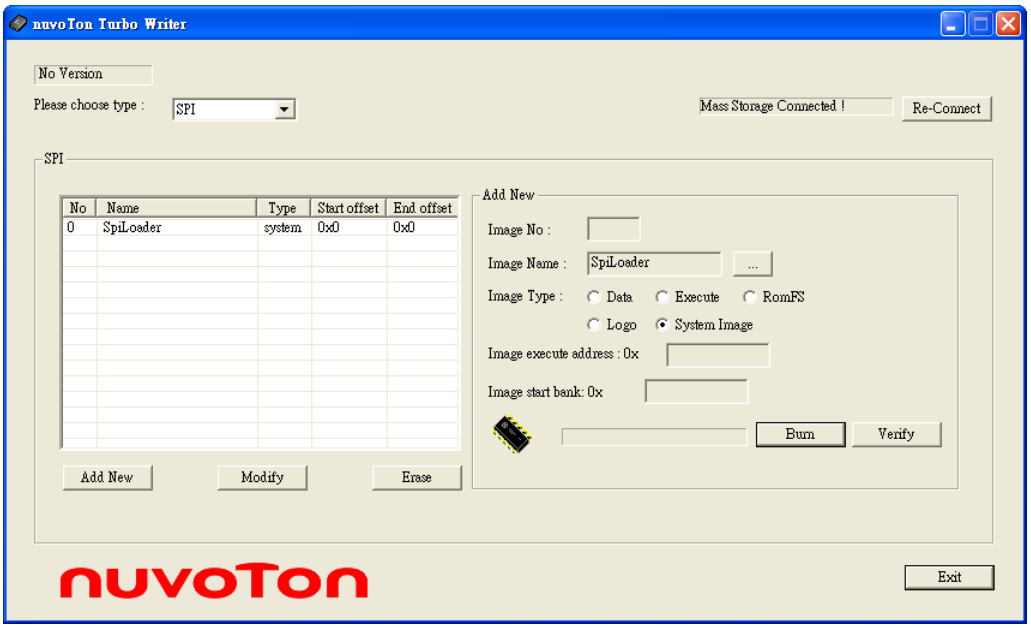


Figure 19 System image – SPI Loader

- Logo –
  - Set Image type "Logo"
  - Image number "1"
  - Browse the file "NuvotonLogo_480x272.bin"
  - Set the image execute address: **0x500000**
  - Set the start block number: **0x1**
  - Press the button "Burn"

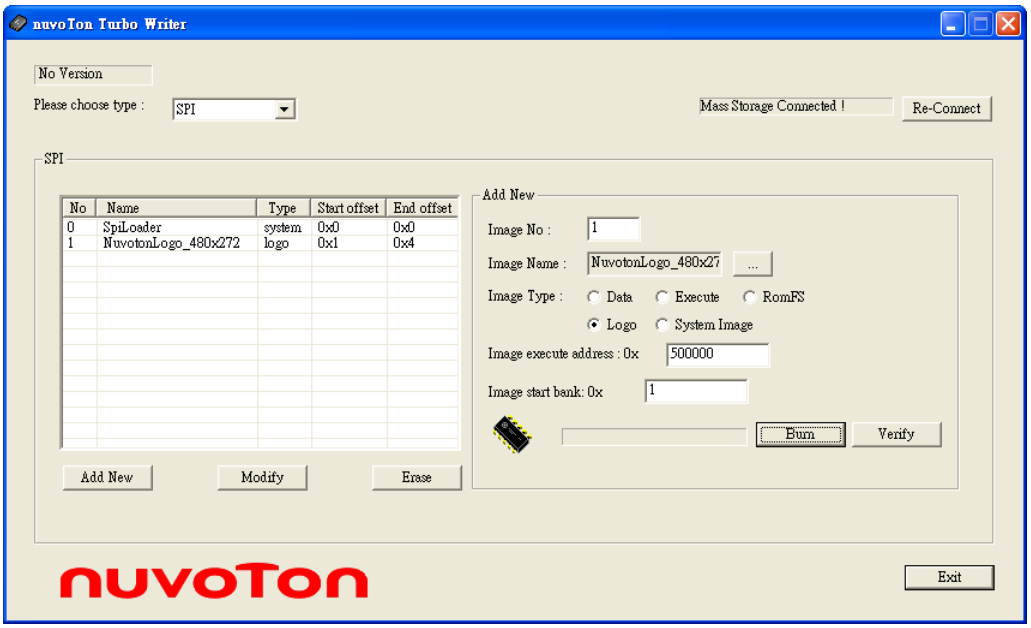


Figure 20 Logo image

- Linux Kernel Image–
  - Image number "2"
  - Set Image type "Execute"

- ✧ Browse the file “conprog.bin”
- ✧ Set the executed address: **0x0**
- ✧ Set the start block number: **0x5.**
- ✧ Press the button “Burn”

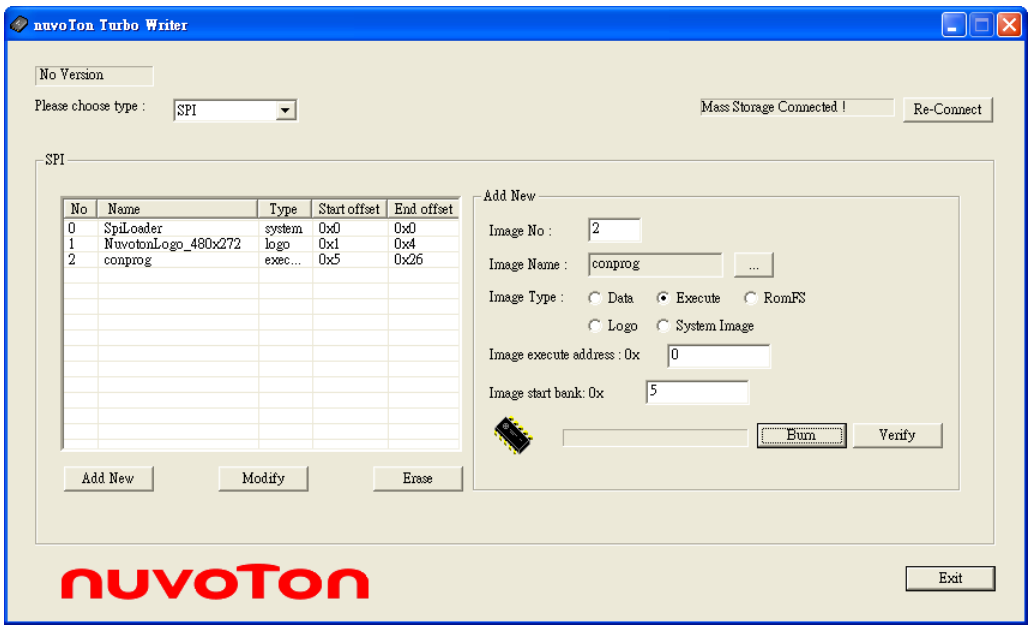


Figure 21 Execute image – Linux Kernel

- Flash memory map after above step –

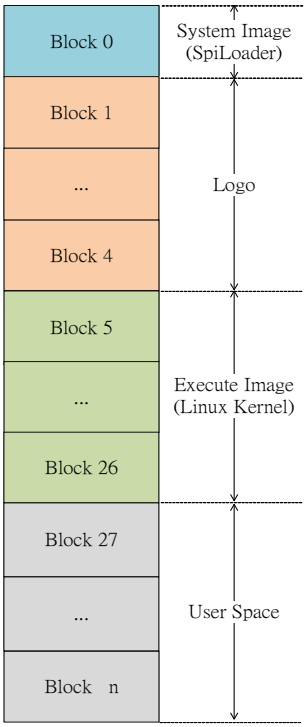


Figure 22 SPI Card memory map

- Erase button –
  - User clicks down the button option, UI will show as follows.
    - ✓ SPI Flash size
    - ✓ Two options including Erase image No and Erase all Flash.
      - ◆ Select one of two options, click down the button of Apply to take effect.

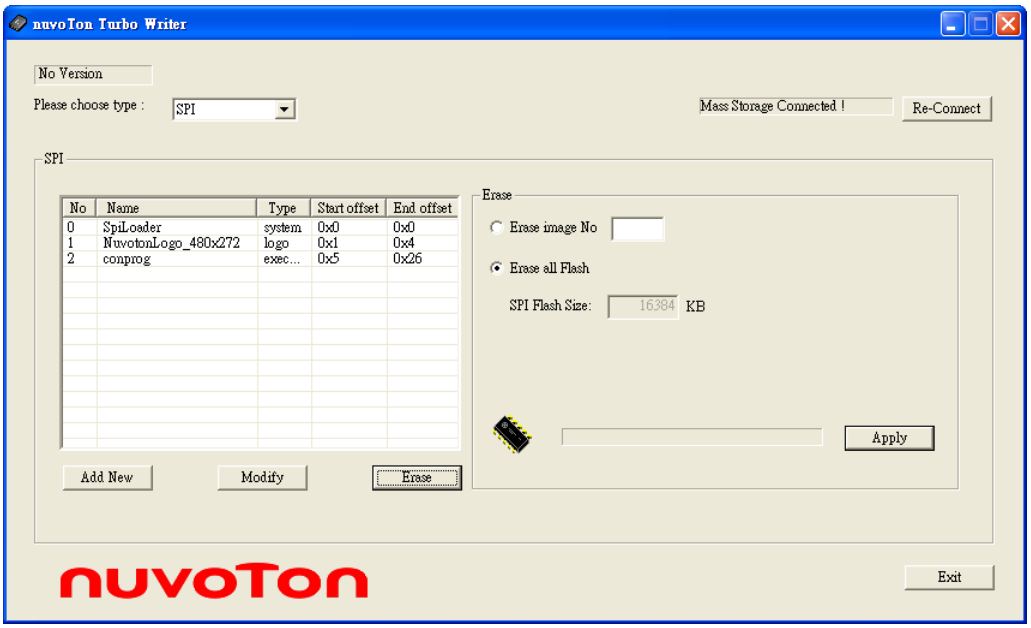


Figure 23 Erase

- Modify button –

  User clicks down the button of Modify, UI will show two options including Image No, and Image Type. User could set Image No., modify its Image Type, and click down the button of Apply to take effect.

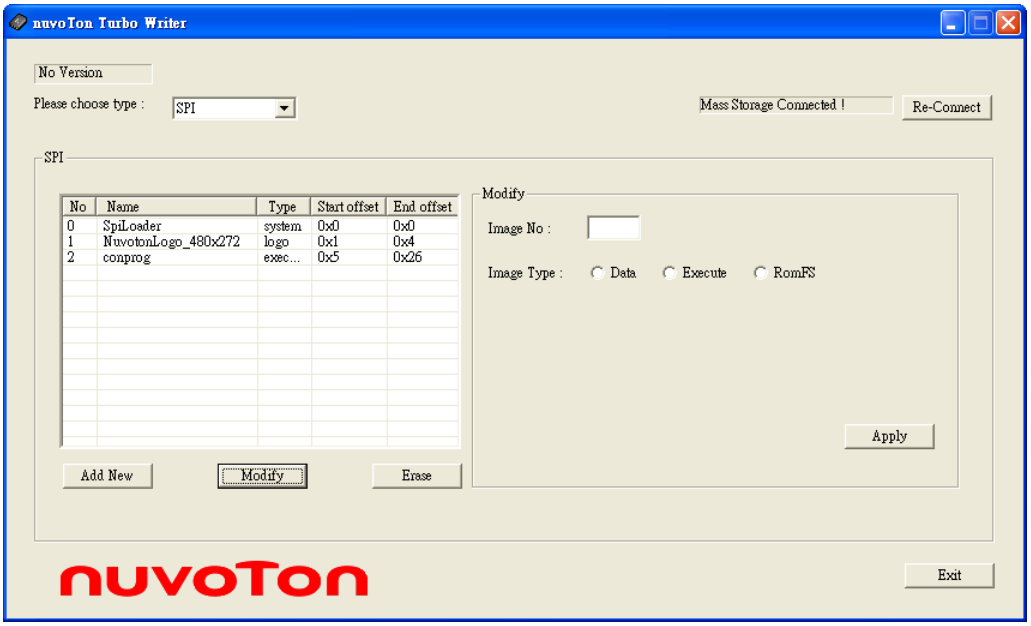


Figure 24 Modify image type

1.8. SPI Flash – Raw Data

SPI (Raw Data) displays the SPI flash and supports Image burn, data read back from SPI flash, Make Rom function. The SPI (Raw Data) interface is as follows.

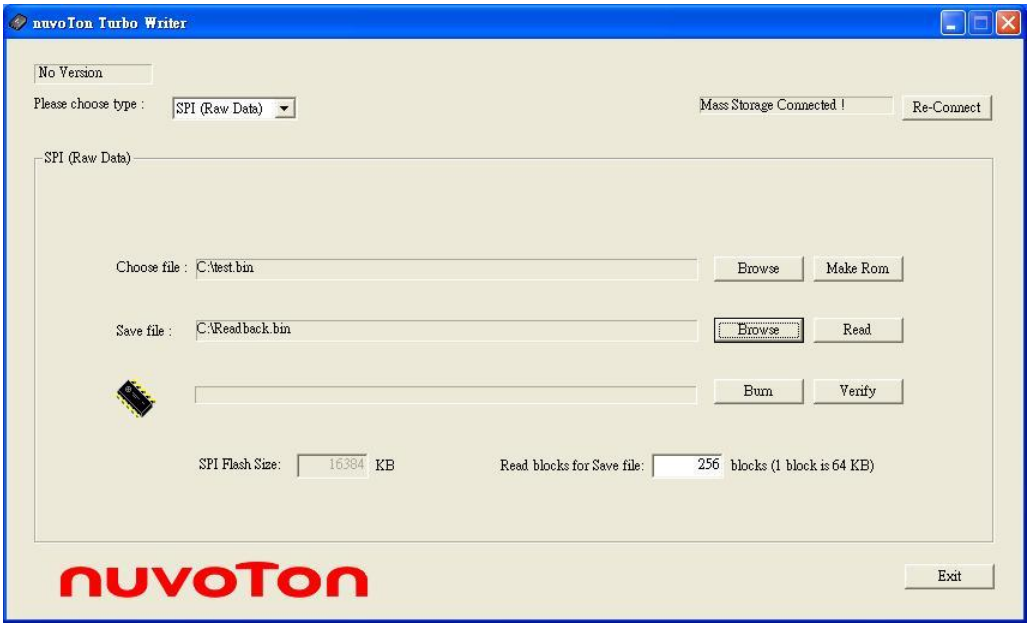


Figure 25 SPI(Raw) Mode

- Burn button –
  - ✧ User can use the binary file made by "Make Rom" or any other images
    - ✓ Turbowriter will burn the specified file. Using the button "Make Rom", it will add FA93/FA95 Boot code header automatically, and export the specified file.

- Verify button –
  - ✧ User can verify the binary file just burn into SPI flash (Read back and compare)

- Read button –
  - ✧ Read Back size
    - ✓ Minimum Read back unit: 64KB
    - ✓ Maximum read back block number will be the read back default value.

Turbo Writer supports SPI MKROM utility for user to build a packed image. This image includes SpiLoader_ GWTFM9563B.bin, NuvotonLogo_480x272.bin and Linux kernel – ConProg.bin.

SpiLoader.bin –

- **Set Image type "System Image"**
- **Browse the file "SpiLoader_GWTFM9563B.bin"**

NuvotonLogo_480x272.bin –

- **Set Image type "Logo"**
- **Image number "1"**
- **Browse the file "NuvotonLogo_480x272.bin"**

- **Set the executed address: 0x500000**
- **Set the start block number: 0x1**

ConProg.bin –

- **Image number "2"**
- **Set Image type "Execute"**
- **Browse the file "ConProg.bin"**
- **Set the executed address: 0x0**
- **Set the start block number: 0x4**

➢ Make Rom –
  ✧ User can add / Modify / Remove image to / from Image list
  ✧ User press "Make" to create binary file **with FA93/FA95 Boot code header**.
    ✓ When user press "Make", it will show a window to set the path and file name for the binary file.

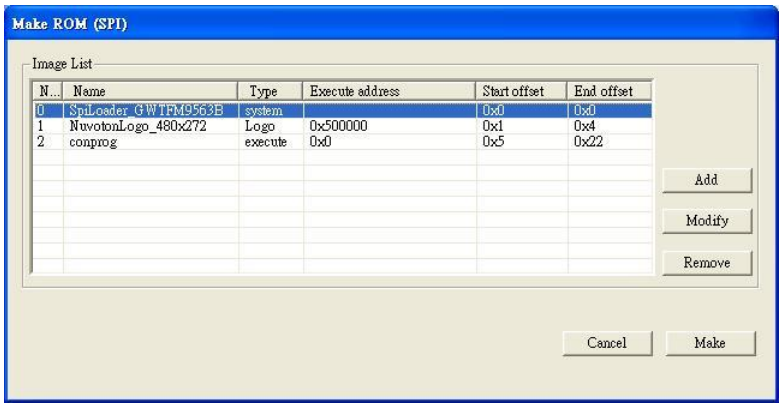


Figure 26 MKROM utility map

  ✧ User can set Image No, Image Name, Image Type, Image execute address, and Image start block

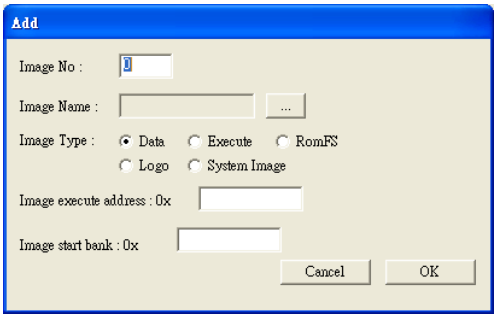


Figure 27 Add image in MKROM utility

2. Revision History

Version	Date	Description
V2.01.007	Mar. 26, 2013	● Add description for FA92 ● Add FA93 Firmware number description about DRAM size (N32901U1DN / N32903U1DN / N32905U1DN)
V2.01.006	May. 29, 2012	● Add description for SPI (Raw Data) ■ Make ROM ■ Read back Data from SPI flash
V2.01.005	Feb. 23, 2012	● Add description for FA95 ● Modify description for new version UI ● Add description for new function ■ SD format ■ SD Port ■ SPI Flash Size
V2.01.004	Nov. 4, 2010	● Change the file name of firmware for FA93. Its name is FA93_musb.bin
V2.01.003	Oct. 25, 2010	● 16 bytes file name for FA91, and 32 bytes for FA93.
V2.01.002	Oct. 19, 2010	● Reduce the checking time for the file TurboWriter.ini,
V2.01.001	Sep. 30, 2010	● Support 32 bytes file name for FA93 later
V2.00.001	Sep. 20, 2010	● Modify for W55FA series, ● Support header of boot loader image.
V1.2	May, 2010	● Add NVT Loader for NAND
V1.1	May, 2009	● Add SPI and SPI (raw data) mode
V1.0	Apr, 2009	● Created

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