UM2109
User manual

BlueNRG-1 ST-LINK Utility software description

Introduction

The BlueNRG-1 ST-LINK Utility software facilitates fast in-system programming of the BlueNRG-1, BlueNRG-2 microcontroller family in development environments via ST-LINK and ST-LINK/V2 tools. This user manual describes the software functions of the BlueNRG-1 ST-LINK Utility and thanks to it, user is encouraged to download the ST-LINK/V2 in-circuit debugger/programmer user manual (UM1075), which provides more information about the ST-LINK tools.

The document content is valid both for the BlueNRG-1 and BlueNRG-2 devices. Any reference to the BlueNRG-1 device is also valid for the BlueNRG-2 device. Any specific difference is highlighted whenever it is needed.

Contents

1 Getting started

This section describes the requirements and procedures to install the BlueNRG-1 ST-LINK Utility software.

1.1 System requirements

The BlueNRG-1 ST-LINK Utility software requires:

- PC with USB port and Intel® Pentium® processor running a 32-bit version of one of the following Microsoft® operating systems:
  - Windows® XP
  - Windows® 7
  - Windows® 10
- 256 Mbytes of RAM
- 30 Mbytes of hard disk available space

1.2 Hardware requirements

The BlueNRG-1 ST-LINK Utility is designed to work with:

- BlueNRG-1, BlueNRG-2
- ST-LINK or ST-LINK/V2 or ST-LINK/V2-ISOL in-circuit debugger/programmer probe

In this document, ST-LINK/V2 refers to ST-LINK/V2 and ST-LINK/V2-ISOL, which are functionally equivalent.

1.3 Installing the BlueNRG-1 ST-LINK Utility

Follow these steps and the on-screen instructions to install the BlueNRG-1 ST-LINK Utility.

1. Download the compressed BlueNRG-1 ST-LINK Utility software from the ST website
2. Extract the contents of the .zip file into a temporary directory
3. Double-click the extracted executable, to initiate the installation, and follow the on-screen prompts to install the BlueNRG-1 ST-LINK Utility in the development environment. Documentation for the Utility is located in the subdirectory \\Docs where the BlueNRG-1 ST-LINK Utility is installed

1.4 Uninstalling the BlueNRG-1 ST-LINK Utility

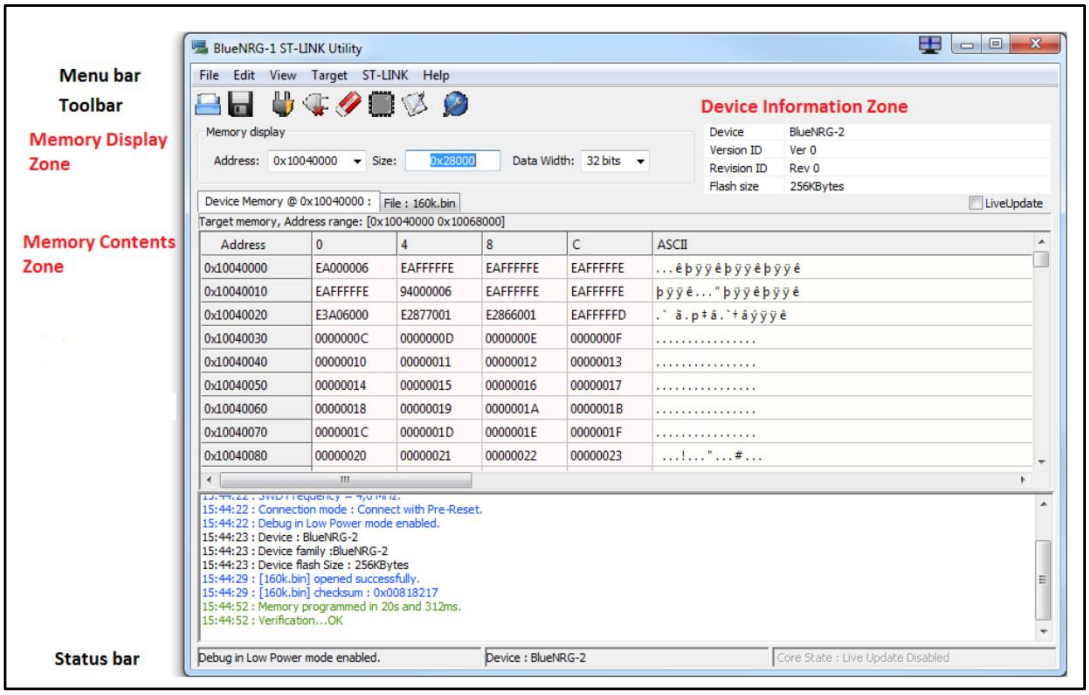
Follow steps below to uninstall the BlueNRG-1 ST-LINK Utility.

1. Select **Start | Settings | Control Panel**
2. Double-click on **Add or Remove Programs**
3. Select **BlueNRG-1_2 ST-LINK Utility**
4. Click on the **Remove** button

2 BlueNRG-1 ST-LINK Utility user interface

2.1 Main window

Figure 1: BlueNRG-1 ST-LINK Utility user interface main window



The main window is composed of three zones and three bars, as illustrated in *Figure 1: "BlueNRG-1 ST-LINK Utility user interface main window"*:

- Memory display zone
- Device information zone
- Memory content zone
  - **LiveUpdate** checkbox updates memory data in real time (this feature is described in detail in *Section 3.3: "Memory display and modification"*)
- Menu bar: uses the menu bar to access the following BlueNRG-1 ST-LINK Utility functions:
  - **File** menu
  - **Edit** menu
  - **View** menu
  - **Target** menu
  - **Help** menu

These menus are described in detail in *Section 2.2: "Menu bar"*

- Toolbar: it provides a quick access to a set of functionalities
- Status bar displays:
  - Connection status and debug interface
  - Device
  - Core state (active only when LiveUpdate feature is active and memory grid is selected)

The BlueNRG-1 ST-LINK Utility user interface also provides additional forms and descriptive pop-up error messages.

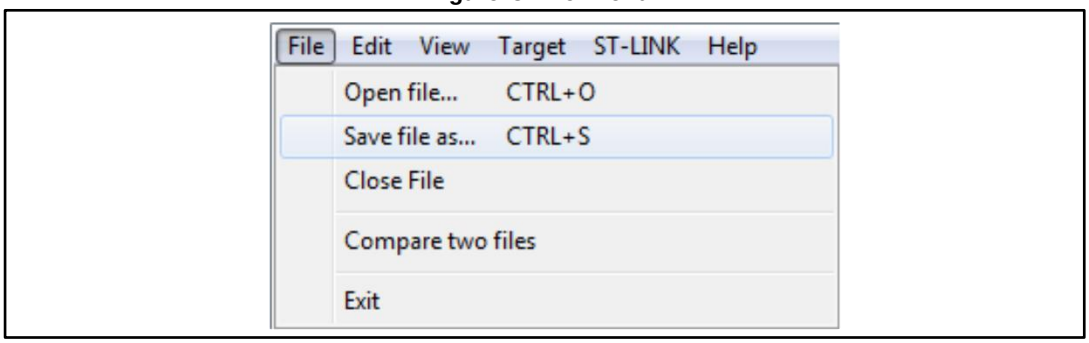
2.2 Menu bar

The *Figure 2: "Menu bar"* allows users to explore the BlueNRG-1 ST-LINK Utility software features.

Figure 2: Menu bar

2.2.1 File menu

Figure 3: File menu



Open file... opens a binary, Intel Hex or Motorola S-record.

Save file as... saves the content of the memory panel into a binary, Intel Hex or Motorola S-record.

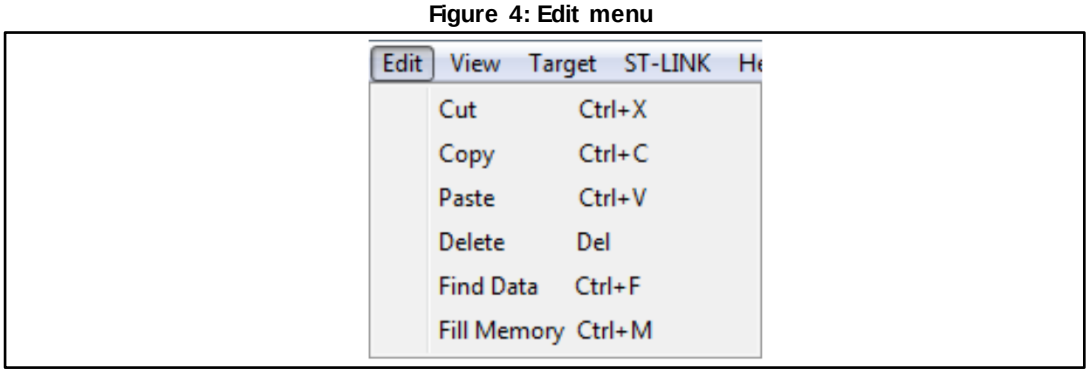
Close File closes the loaded file.

Compare two files compares two binary, hex, or srec files. The difference is colored in red in the file panel. If a file contains a section with an address range that is unavailable in the other file, this section is colored in violet.

Exit closes the BlueNRG-1 ST-LINK Utility program.

2.2.2 Edit menu

Figure 4: Edit menu



Cut cuts the selected cells on file or memory grid

Copy copies selected cells on file or memory grid

Paste pastes the copied cells in the selected position in file or memory grid

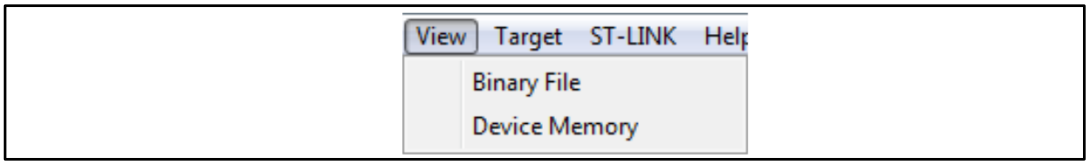
Delete deletes the selected cells on file or memory grid

Find Data finds data in binary or Hex format in file or memory grid

Fill Memory fills file or memory grid with the chosen data starting from the chosen address

2.2.3 View menu

Figure 5: View menu



Binary file displays the content of the loaded binary file

Device memory displays the content of the device memory

External memory displays the content of the external memory

2.2.4 Target menu

Figure 6: Target menu

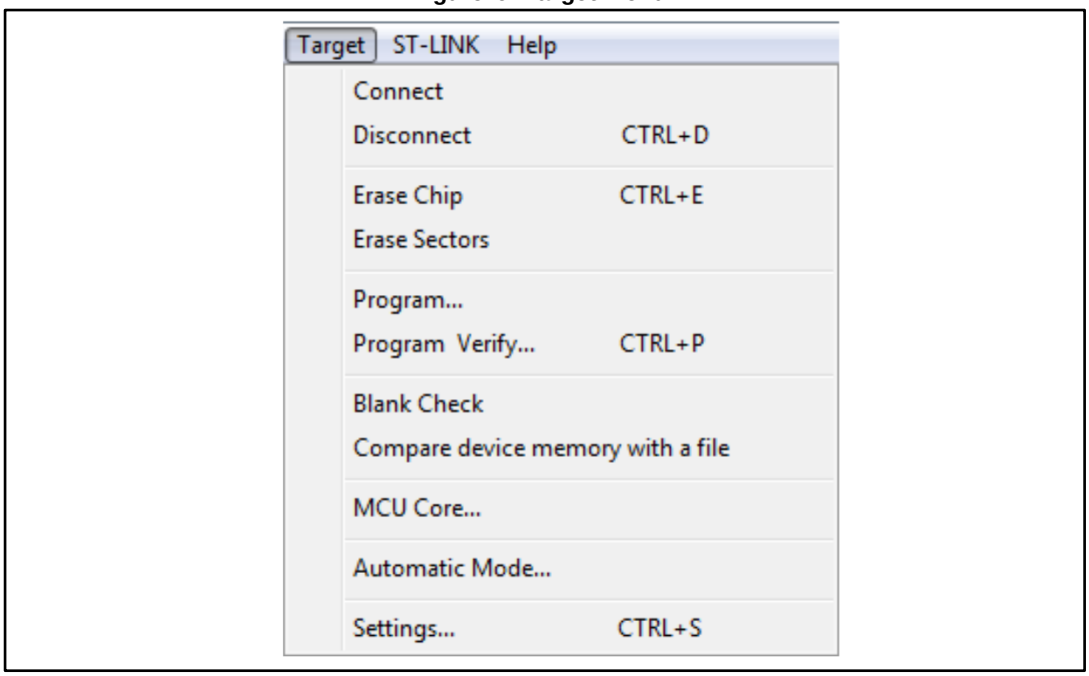


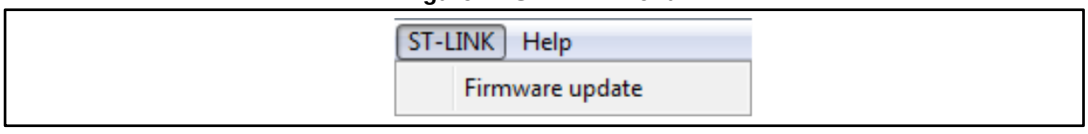
Table 1: Target menu table

Target functions	Notes
Connect	Connects to the target device and displays the device type, the device ID and Flash memory size in the device information zone
Disconnect	Disconnects from the target device
Erase chip	Performs a Flash memory mass erase and then displays the Flash memory content in the memory panel
Erase sectors	Selects the erase sectors dialog window to erase (see *Section 3.4:" Flash memory erase"* for more details)
Program	Loads a binary, Intel Hex or Motorola S-record file into the device memory (Flash or RAM) by selecting a binary, Intel Hex or Motorola S-record file, then enter the start address (where to put the file in the device) in the program dialog window and click on program button
Program and verify	Loads a binary, Intel Hex or Motorola S-record file into the device memory (Flash or RAM) then performs a verification of the programmed data
Blank check	Verifies that the BlueNRG-1, BlueNRG-2 Flash memory is blank. If the Flash memory is not blank, the first address with data is highlighted in a prompt message
Compare device memory with file	Compares the MCU device memory content with a binary, hex, or srec file. The difference is colored in red in the file panel
MCU core	Opens the MCU core dialog window (see *Section 3.6:"MCU core functions"* for more details)
Automatic mode	Opens the automatic mode dialog window (see *Section 3.7:"Automatic mode functions"* for more details)
Settings	The settings dialog box allows ST-LINK probes to be selected and its connection settings to be defined. The ST-LINK probes list contains the serial numbers of all probes connected to the computer. If during the settings dialog box is shown and some probes are added or removed the "Refresh" button allows the update of the ST-LINK probes list. When you select one probe, you can read the firmware version and the connected target (depending on the connection settings). After that the reset type can be selected: The “Connect with Pre-Reset” option allows you to connect to the target before executing any instruction. This is useful in many cases such as when the target contains a code that disables the SWD pins The “HotPlug” option allows you to connect to the target without halt or reset. This is useful to update RAM addresses or IP registers while application is being run

When an ST-LINK/v2 or ST-LINK/V2-1 probe is used with another application, the serial number is not displayed and the probe cannot be used in the current instance of ST-LINK Utility.

2.2.5 ST-LINK menu

Figure 7: ST-LINK menu



Firmware update displays the version of ST-LINK and ST-LINK/V2 firmware and updates it to the latest available version.

ST-LINK: V1J13S0

ST-LINK/V2: V2J23S4

ST-LINK/V2-1: V2J21M5

2.2.6 Help menu

Help menu provides the following feature:

About... displays BlueNRG-1 ST-LINK Utility software version and copyright information.

2.3 Toolbar

The BlueNRG-1 ST-LINK Utility software toolbar offers a row of boxes controlling several functions of the software as a quick access.

Figure 8: Toolbar menu

The toolbar icons are dedicated to (from the left to the right):

- Open file
- Save file
- Connect to device
- Disconnect from device
- Full chip erase (mass erase)
- Show core panel
- Show program and verify panel
- Show settings panel

3 BlueNRG-1 ST-LINK Utility features

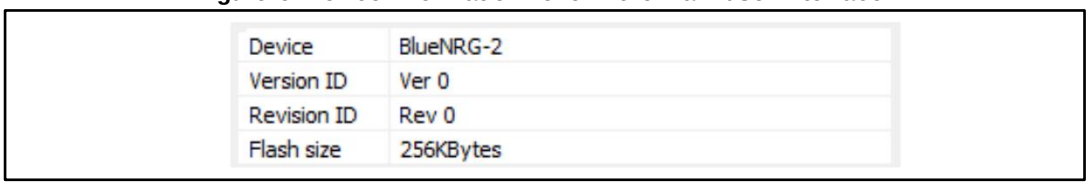
This section provides a detailed description about how to use BlueNRG-1 ST-LINK Utility features:

- Device information
- Settings
- Memory display and modification
- Flash memory erase
- Device programming
- MCU core functions
- Automatic mode functions

3.1 Device information

The device information zone displays information as shown in *Figure 9: "Device information zone in the main user interface"*.

Figure 9: Device information zone in the main user interface



Device: family of the connected BlueNRG-1 device. Each device type includes many devices with different characteristics such as Flash memory size, RAM size and peripherals.

Version ID: the version ID of the connected MCU device

Revision ID: the revision ID of the connected MCU device

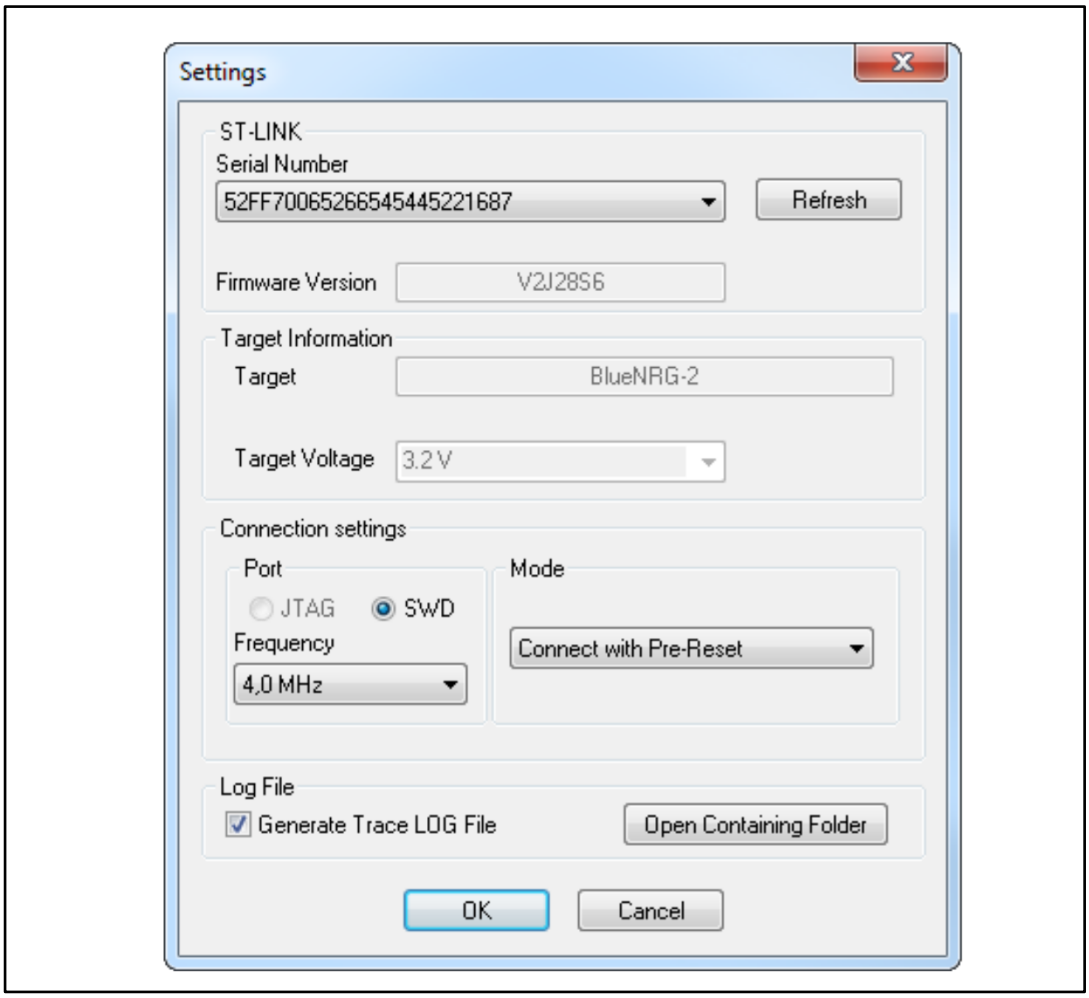
Flash size: size of the on-chip Flash memory

The BlueNRG-2 device version ID 0 means version ID 1.

3.2 Settings

The "settings" panel dialog box shown in *Figure 10: "Settings dialog box"* displays useful information on the connected ST-LINK probes and BlueNRG-1, BlueNRG-2 target, and allows the connection settings to be configured.

Figure 10: Settings dialog box



The user can choose one of the connected ST-LINK probes to use, based on its serial number or on the connected target which is displayed in the BlueNRG-1, BlueNRG-2 target information section.

When ST-LINK/V2 or ST-LINK/V2-ISOL is used, the target voltage is measured and displayed in the BlueNRG-1, BlueNRG-2 target information section.

Available connection settings:

- Frequency (for SWD connection only)
- Mode:
  - Normal
  - Hot plug
  - Connect with pre-reset
- Enable/disable trace LOG file generation

JTAG port is not available with the BlueNRG-1 and BlueNRG-2.

3.3 Memory display and modification

In addition to the device information zone, the main window contains 2 other zones:

- Memory display
- Memory data

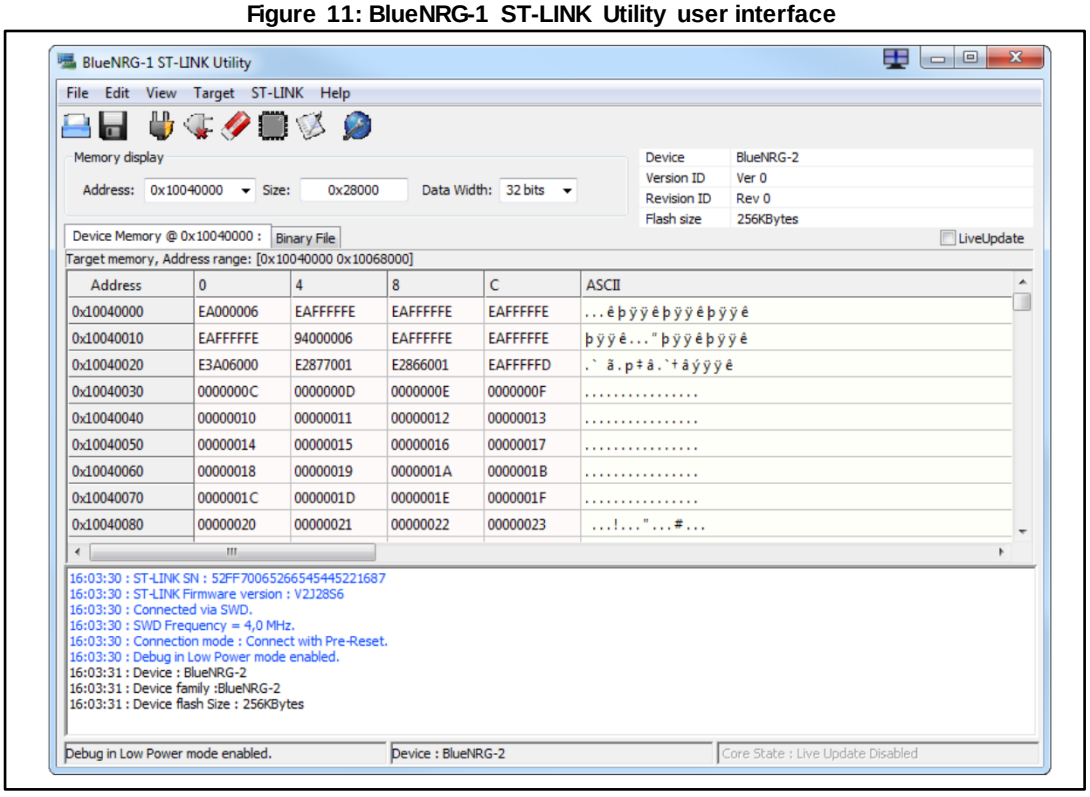
Memory display zone contains three edit boxes:

- Address (memory start address from which you want to read)
- Size (amount of data to read)
- Data width (width of the displayed data, 8-bit, 16-bit or 32-bit)

Memory data zone displays the data read from a file or the memory content of a connected device. The content of the file can be modified before downloading.

- To use this zone to display the content of a binary, Intel Hex or Motorola S-record file, go to **File | Open file...**
- To use this zone to read and display memory content of a connected device, enter the memory start address, data size and the data width in the memory display zone and then press **Enter**
- After reading data, each value can be modified merely by double-clicking on the concerned cell as illustrated by *Figure 11: "BlueNRG-1 ST-LINK Utility user interface"*. You can also save the device memory content into a binary, Intel Hex or Motorola S-record file using the menu **File | Save file** as...
- When LiveUpdate feature is used, the device memory grid is updated in real time and the data modified are colored in red

Figure 11: BlueNRG-1 ST-LINK Utility user interface

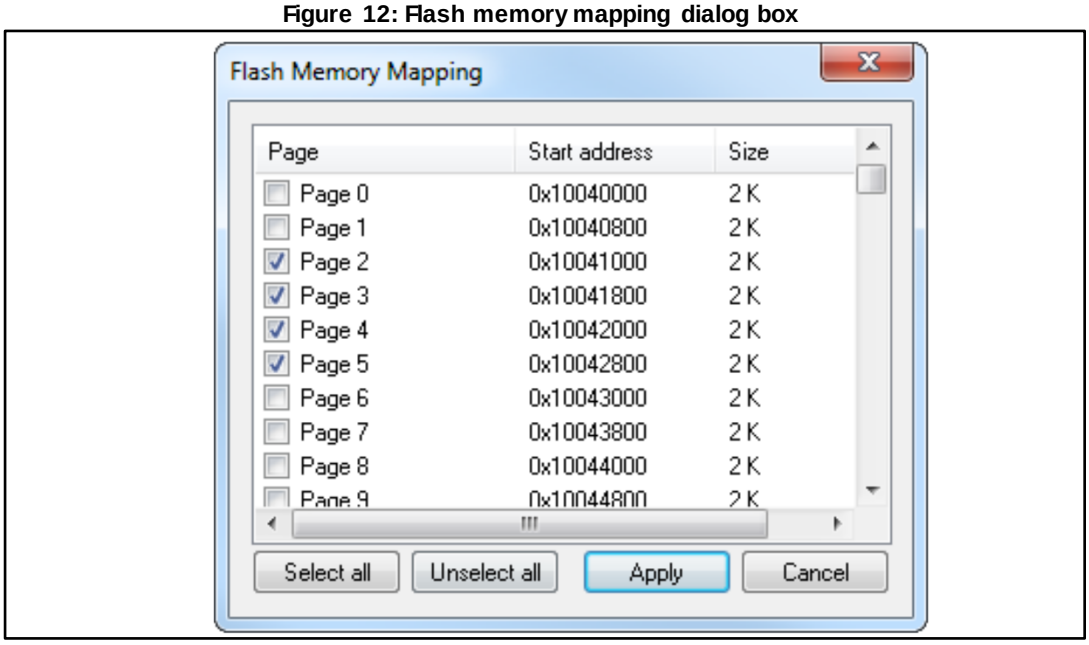


3.4 Flash memory erase

There are two types of Flash memory erase:

- Flash mass erase: erases all Flash memory sectors of the connected device by clicking on the menu **Target | Erase Chip**
- Flash sector erase: erases the selected sector(s) of the Flash memory. To select sector(s), go to **Target | Erase Sectors...** which then displays the **Flash Memory** mapping dialog box where you select the sector(s) to erase as shown below:
  - **Select all** button selects all the Flash memory pages
  - **Deselect all** button deselects all selected pages
  - **Cancel** button discards the erase operation even if some pages are selected
  - **Apply** button erases all the selected pages

Figure 12: Flash memory mapping dialog box

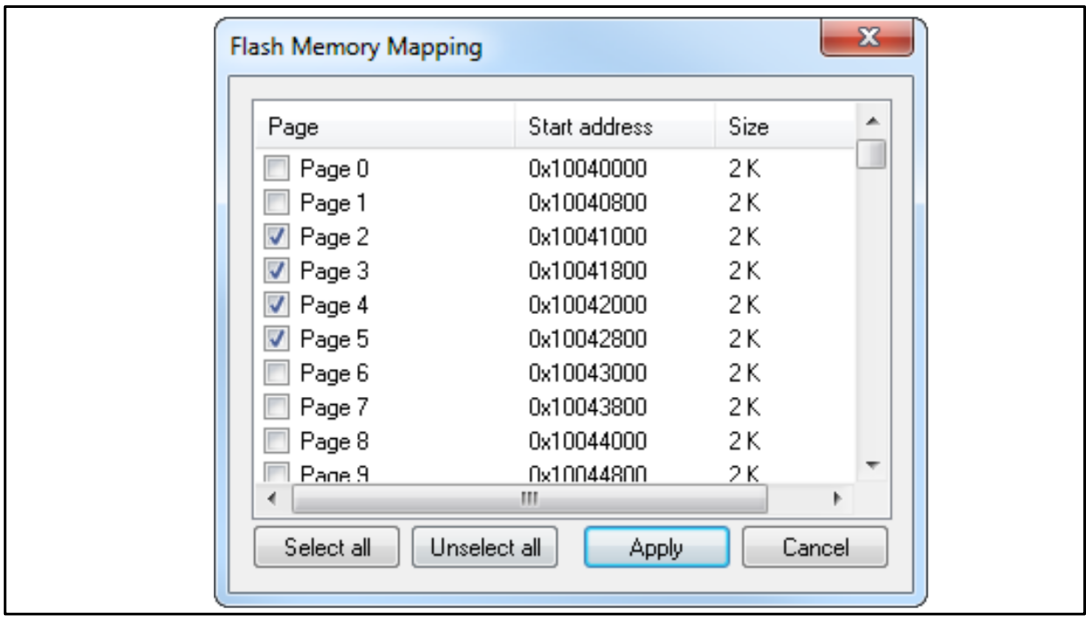


3.5 Device programming

The BlueNRG-1 ST-LINK Utility can download binary, Hex, or srec files into Flash or RAM by following steps below:

1: Click on **Target | Program...** (or **Target | Program & Verify...** if you want to verify the written data) to open the open file dialog box, as shown in open file dialog box. If a binary file is already opened, go to step 3

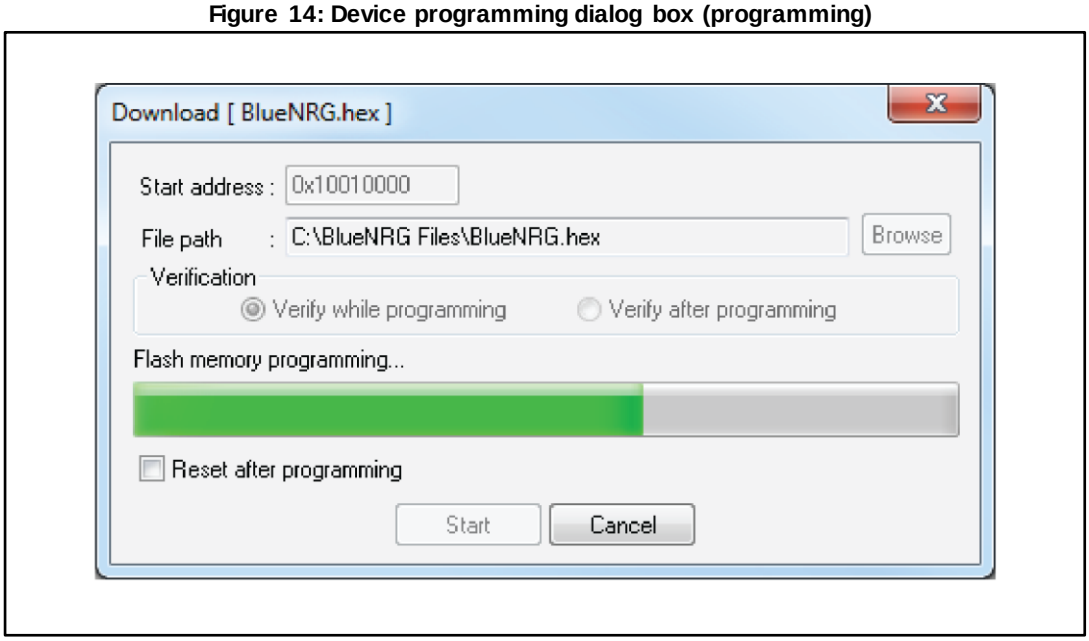
Figure 13: Open file dialog box



2: Select a binary, Intel Hex or Motorola S-record file and click on the open button

3: Specify the address from which to start programming as shown in the figure below: "Device programming dialog box (programming)", it may be a Flash or RAM address

Figure 14: Device programming dialog box (programming)



4: Choose a verification method by selecting one of the two radio buttons:

- Verify during programming means fast on-chip verification method, which compares the program buffer content (portion of file) with the Flash memory content
- Verify after programming means slow but reliable verification method, which reads the programmed memory zone after the program operation ends and compares it with the file content

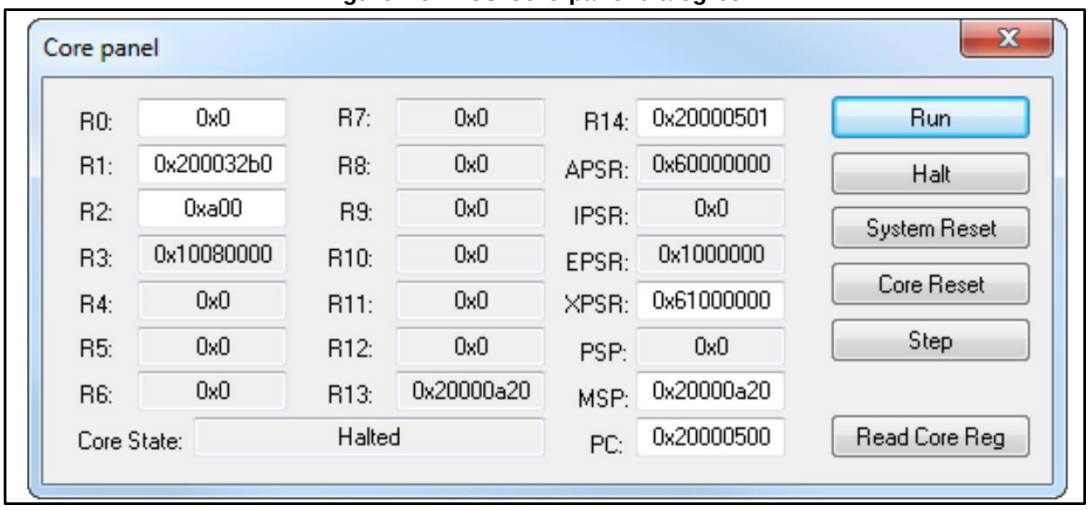
5: At last, click on the start button to start programming:

- If you select **Target | Program & Verify**... in the first step, a check is done during the programming operation
- If the reset after programming box is checked, an MCU reset is issued

3.6 MCU core functions

- The **Core panel** dialog box shown in *Figure 15: "MCU Core panel dialog box"*, displays the Cortex core register values. It also allows the following actions to be carried out on the MCU, using the buttons on the right:
- **Run**: runs the core
- **Halt**: halts the core
- **System Reset**: sends a system reset request
- **Core Reset**: resets the core
- **Step**: executes only one step core instruction
- **Read Core Reg**: updates the core register values

Figure 15: MCU Core panel dialog box

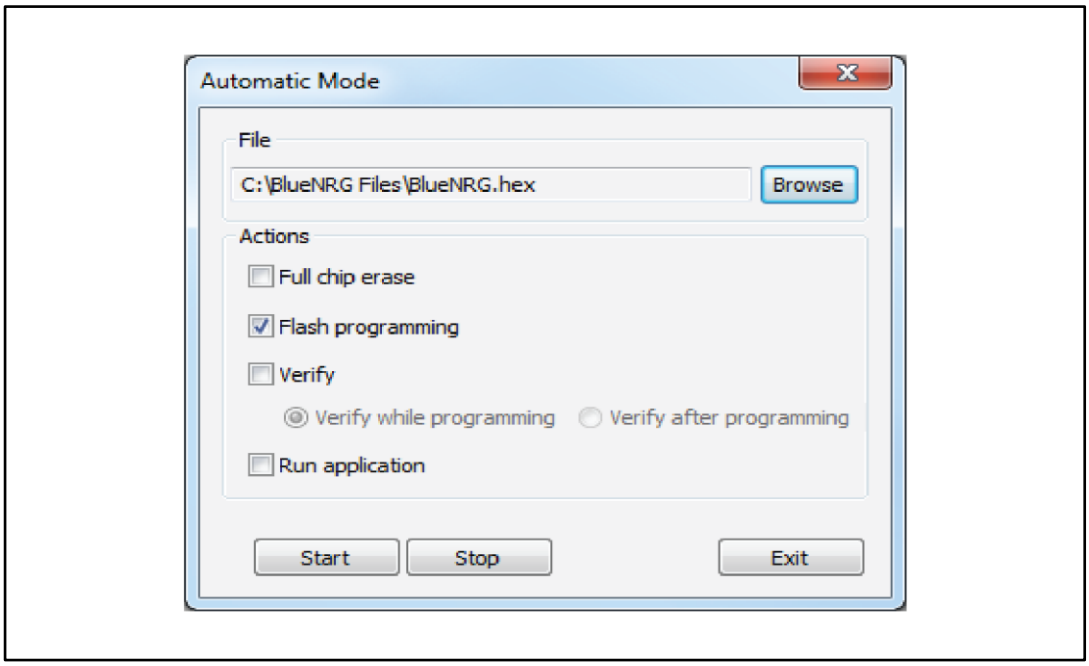


3.7 Automatic mode functions

The **Automatic Mode** dialog box shown in *Figure 16: "Automatic mode"* allows programing and configuring BlueNRG-1, BlueNRG-2 devices in the loop. It allows the following actions to be carried out on the BlueNRG-1, BlueNRG-2 devices:

- Full chip erase
- Flash programming
- Verify
  - Verify while programming
  - Verify after programming
- Run application: clicking on the **Start** button, the selected actions are executed on the connected BlueNRG-1, BlueNRG-2 devices and the same actions can be repeated after disconnecting the current device and connecting the new device.

Figure 16: Automatic mode



4 BlueNRG-1 ST-LINK Utility command line interface (CLI)

4.1 Command line usage

The following sections describe how to use the BlueNRG-1 ST-LINK Utility from the command line.

The BlueNRG-1 ST-LINK Utility command line interface is located at the following address: [Install_Directory]\\BlueNRG-1_2 ST-Link Utility x.x.x\\ST-LINK_Utility\BlueNRG-1_ST-LINK_CLI.exe.

4.1.1 Connection and memory manipulation commands

The list of commands as follows:

Table 2: -c

Description	Syntax
Select SWD communication protocol	-c [ID=<id>/SN=<sn>] [SWD] [UR/HOTPLUG] [LPM] [ID=<id>]: ID of ST-LINK [0..9] to use when multiple probes are connected to the host [SN=<sn>]: serial number of the chosen ST-LINK probe [UR]: connect to target with pre-reset [HOTPLUG]: connect to target without halt or reset [LPM]: activate debug in low power mode Example1: -c ID=1 SWD UR LPM Example2: -c SN=55FF6C064882485358622187 SWD UR LPM

Table 3: -List

Description	Syntax
Lists the corresponding firmware version and the unique serial number (SN) of every ST-LINK probe connected to the computer	-List

Table 4: -r8

Description	Syntax
Reads <NumBytes> memory	-r8 <Address> <NumBytes> Example: -r8 0x20000000 0x100

Table 5: -w8

Description	Syntax
Writes 8-bit data to the specified memory address	-w8 <Address> <data> Example: -w8 0x20000000 0xAA

Table 6: -w32

Description	Syntax
Writes 32-bit data to the specified memory address	-w32 <Address> <data> Example: -w32 0x08000000 0xAABBCCDD

4.1.2 Core commands

The list of core commands as follows:

Table 7: -Rst

Description	Syntax
Resets the system	-Rst

Table 8: -HardRst

Description	Syntax
Hardware reset	-HardRst [<LOW/HIGH] [LOW] held reset pin low [HIGH] held reset pin high

Table 9: -Run

Description	Syntax
Sets the program counter and stack pointer as defined at user application and performs a run operation. This is useful if the user application is loaded with an offset (e.g. 0x10013000). If the address is not specified, 0x10010000 is used	-Run [<Address>] Example: -Run 0x10013000

Table 10: –Halt

Description	Syntax
Halts the core	-Halt

Table 11: –Step

Description	Syntax
Executes step core instruction	-Step

Table 12: –SetBP

Description	Syntax
Sets the software or hardware breakpoint at a specific address. If an address is not specified, 0x10040000 is used	-SetBP [<Address>] Example: -SetBP 0x10043000

Table 13: –ClrBP

Description	Syntax
Clears all hardware breakpoints, if any	-ClrBP

Table 14: –CoreReg

Description	Syntax
Reads the core registers	-CoreReg

Table 15: –SCore

Description	Syntax
Detects the core status	-Score

4.1.3 Flash commands

Table 16: -ME

Description	Syntax
Executes a full chip erase operation	-ME

Table 17: -SE

Description	Syntax
Erases Flash sector(s)	-SE <Start_Sector> [<End_Sector>] Example: 1) -SE 0 => Erase sector 0; 2) -SE 2 12 => erases sectors from 2 to 12

Table 18: -P

Description	Syntax
Load binary, Intel Hex or Motorola S-record file into device memory without verification. For hex and srec format, the address is relevant	-P <File_Path> [<Address>] Example: 1) -P C:\\file.srec -P C:\\file.bin 0x10012000; 2) -P C:\\file.hex

Table 19: -V

Description	Syntax
Verifies that the programming operation has been performed successfully	-V [while_programming/after_programming] Example: -P *C:\\file.srec* -V "after_programming"

4.1.4 Miscellaneous commands

Table 20: -CmpFile

Description	Syntax
Compares a binary, Intel Hex or Motorola S-record file with the device memory and displays the address of the 1st different value	-CmpFile <File_Path> [<Address>] Example1: -CmpFile "c:\\application.bin" 0x10040000

Table 21: -Dump

Description	Syntax
Reads target memory and saves it in a file	-Dump<Address> <Memory_Size> <File_Path>

Table 22: -Log

Description	Syntax
Enables Trace LOG file generation. The log file is generated under %userprofile%\\STMicroelectronics\\BlueNRG-1_2 ST-LINK Utility	

Table 23: -Q

Description	Syntax
Enables quiet mode. No progress bar displayed	-Q

Table 24: -TVolt

Description	Syntax
Displays target voltage	-TVolt

4.1.5 ST-LINK_CLI return codes

In case of error while ST-LINK_CLI commands are being executed, the return code (Errorlevel) is greater than 0. The following table summarizes the ST-LINK_CLI return codes:

Table 25: Table 1 ST-LINK_CLI return codes

Return code	Commands	Error
1	All	Command argument error
2	All	Connection problem
3	All	Command not available for the connected target
4	-w8, -w32	Error occurred while writing data to the specified memory address
5	-r8, -r32	Cannot read memory from the specified memory address
6	-rst, -HardRst	Cannot reset MCU
7	-Run	Failed to run application
-Halt	-Halt	Failed to halt the core

Return code	Commands	Error
9	-Sleep	Failed to perform a single instruction step
10	-SetBP	Failed to set/clear a breakpoint
11	-ME, -SE	Unable to erase one or more Flash sectors
12	-P, -V	Flash programming/verification error

5 Revision history

Table 26: Document revision history

Date	Revision	Changes
23-Jan-2017	1	Initial release.
08-Sep-2017	2	Added reference to the BlueNRG-2 device and the whole document has been updated accordingly.

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