# RSL10 Stand-Alone Flash Loader Manual

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# CHAPTER 1

# Introduction

## 1.1 PURPOSE

This manual provides the information that you need to use the stand-alone flash loader. It describes the operations that the flash loader can perform, and explains how to configure the flash loader to connect to an RSL10 radio IC.

The stand-alone flash loader is used to program, erase and read flash memory in RSL10.

## 1.2 INTENDED AUDIENCE

This manual is aimed at software development professionals who are responsible for developing and/or maintaining applications based on RSL10.

This manual assumes that a reader will have some familiarity with embedded software development.

## 1.3 CONVENTIONS

In general, numbers are presented in decimal notation. In cases where hexadecimal notation is more convenient, these numbers are identified by the prefix “0x”. For example, the decimal number 123456 can also be represented as 0x1E240.

The following special fonts are used in this manual to signify particular types of information:

`monospace font`
: Commands and their options, file and path names, error messages, code samples and code snippets.

**`mono bold`**
: A placeholder that represents where you would specify the appropriate information. For example, you would replace **`filename`** with the actual name of the file.

***bold***
: Used for menu names and menu items.

## 1.4 FURTHER READING

For more information that will help you to use the RSL10 radio IC, refer to the following documents:

- *RSL10 Getting Started Guide*
- *RSL10 Hardware Reference Manual*
- *RSL10 Firmware Reference Manual*
- *RSL10 Evaluation and Development Board Manual*
- *J-Link/J-Trace User Guide* (document UM08001-R41) available from the SEGGER website: www.segger.com

# CHAPTER 2

# Flash Loader Overview

## 2.1 Introduction

The stand-alone flash loader can perform the following operations to an RSL10 radio IC:

- Program the contents of a data file to flash memory.
- Verify that the contents of a file match the contents of flash memory.
- Erase regions of flash memory.
- Verify that regions of flash memory are erased.
- Read the contents of flash memory and save them to a data file.

When programming data from or saving data to a file, the stand-alone flash loader supports the following data file formats:

- Intel Hex
- Motorola S-record

The stand-alone flash loader communicates with the RSL10 JTAG debug port using a Segger or IAR Systems® J-Link™ for Arm® processors. This setup is illustrated in Figure 1.

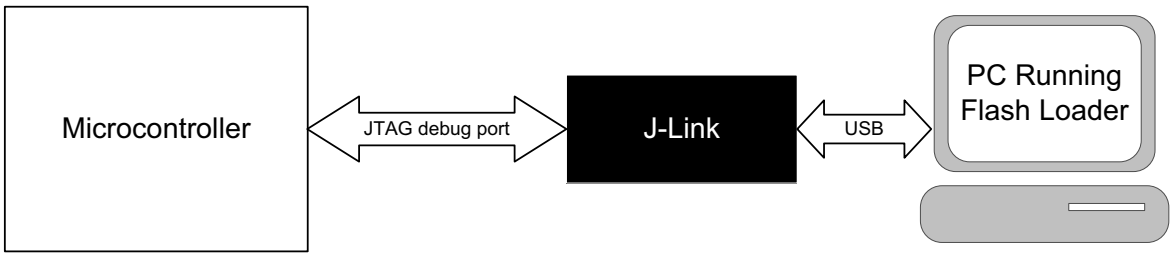



**Figure 1. How the Stand-Alone Flash Loader Communicates with the Radio IC**

The RSL10 radio IC contains multiple sections, all of which can be managed by the stand-alone flash loader. See the *RSL10 Hardware Reference Manual* for more information about the sections.

## 2.2 Flash Loader Operations and Options

The stand-alone flash loader can perform a variety of operations, and supports the grouping of certain operations. Chapter 3, “Flash Loader User Interface” on page 8 describes the operations and options available from the graphical user interface, and Chapter 4, “Command-Line Usage” on page 11 describes the ones available from the command line.

*Program flash memory*

This operation reads the contents of a data file and writes the data to flash memory. Optionally, the flash loader can:

- Erase all of flash memory before programming.
- Verify that the contents of the data file were correctly written to flash memory by reading back the flash contents and comparing it with the file contents.

*Verify flash memory against a file*

This operation reads the contents of a data file, then reads the corresponding contents of flash memory and compares the data. The flash loader reports if there are differences.

*Erase flash memory*

This operation erases sections of flash memory. By default, this operation erases all of flash memory. This operation can also erase one or more user-specified regions of flash memory.

*Verify erased*

This operation verifies that sections of the flash memory are erased. By default, this operation verifies that all of flash memory is erased. This operation can also verify that one or more user-specified regions of flash memory is erased.

*Read flash memory*

This operation reads sections of flash memory and saves the data in a data file. By default, this operation reads all of flash memory. This operation can also read one or more user-specified regions of flash memory.

The stand-alone flash loader has several global options:

*Device options* These options control how the stand-alone flash loader communicates with the RSL10 radio IC. See Section 2.3, “Supported Flash Loader Hardware” for information on these options.

*JTAG speed* This option determines the JTAG clock speed that the stand-alone flash loader uses when communicating with the RSL10 radio IC.

*Reset device* This operation determines whether the stand-alone flash loader should reset the RSL10 radio IC after completing the requested operation.

Table 1 maps the tasks you want to accomplish to specific information about the steps, using either the graphical user interface or the command line interface.

**Table 1. Mapping Tasks to User Interfaces**

| Task | Graphical User Interface | Command Line Interface |
|---|---|---|
| Program flash memory | Section 3.1, “The Program Page” on page 8 | Section 4.1, “The Program Command” on page 12 |
| Verify flash memory against a file | Section 3.1, “The Program Page” on page 8 | Section 4.3, “The Verify Command” on page 13 |
| Erase flash memory | Section 3.1, “The Program Page” on page 8 | Section 4.2, “The Erase Command” on page 12 |
| Verify erased flash memory | Section 3.2, “The Tools Page” on page 9 | Section 4.3, “The Verify Command” on page 13 |
| Read flash memory | Section 3.2, “The Tools Page” on page 9 | Section 4.4, “The Read Command” on page 13 |
| Set device options | Section 3.3, “The Options Page” on page 9 | Table 4 on page 12 |
| Determine JTAG speed | Section 3.3, “The Options Page” on page 9 | Table 4 on page 12 |
| Reset the device | Section 3.3, “The Options Page” on page 9 | Table 4 on page 12 |

### 2.2.1 Flash Regions

When the flash loader is performing operations on user-specified regions of flash memory, a standard format is used to specify one or more ranges of addresses in flash memory.

```
start-end,start-end,...,start-end
```

Each **start** and **end** address is a decimal or C-formatted hexadecimal address. Both the **start** and **end** addresses are included in the range. You must specify at least one range, but there is no limit to the number of ranges that you can include.

For example:

- `0x00040000-0x0007FFFF`
- `0-127,256-1023,196-199`

For more information about using the flash regions, see Section 3.2, “The Tools Page” on page 9, Section 4.2, “The Erase Command” on page 12, and Section 4.4, “The Read Command” on page 13.

## 2.3 Supported Flash Loader Hardware

### 2.3.1 SEGGER or IAR Systems J-Link for Arm Processors

The Segger J-Link Arm Emulator for Arm® Cortex®-M3 cores, also sold as the IAR Systems J-Link for Arm Processors, is a small Arm JTAG hardware debug probe. It connects via USB to the PC host running Windows®, and supports JTAG communication clock speeds up to 12 MHz. The J-Link device connects to the target using a standard 20-pin JTAG cable. This flash loader requires J-Link version 8.0 or higher.

The stand-alone flash loader can connect to a J-Link device in one of two ways:

- J-Link devices can be connected directly to the computer via USB. Each J-Link device is assigned a serial number. You can optionally enter this number in the flash loader GUI. If multiple J-Link devices are connected and no serial number is provided, a J-Link window will pop up and request the device selection. If the flash loader is unable to connect to the J-Link device via USB, it fails with an error. The flash loader does not attempt to default to a connected device.
- The stand-alone flash loader can also connect over a network to a J-Link device connected to another computer. On the remote computer to which the J-Link device is connected, you must run the *jlinktcpipserver.exe* program. In this case, you must provide the hostname of the remote computer and the TCP/IP port number (usually 19020) to the flash loader to use the remote J-Link device. See the *J-Link/ J-Trace User Guide* (document UM08001-R41) from Segger for more information.

## 2.4 Trouble-Shooting

Table 2 provides a brief guide to fixing the most common errors that might occur when you use the stand-alone flash loader. It is not a comprehensive guide to all possible problems. If you try these solutions and they don’t work, contact your ON Semiconductor customer support representative.

**Table 2. Common Errors and Their Solutions**

| Description of Error | Possible Causes | Possible Solutions |
|---|---|---|
| No emulators connected to the USB window. Asks for IP address. | You have not connected the J-Link emulator, or the J-link drivers are not properly installed. | Connect the J-link emulator, make sure the drivers are properly installed. Make sure the version of J-link DLL is greater than 4.7x. |
| Connect Failed | The J-Link is physically connected, but the device is not connected or not communicating with it. | Some ways of checking the connection and communication are:<br>• Use the NOP command on the Tools page of the graphical user interface to check the connection and communication.<br>• Use J-Link Commander, which is provided by Segger in their tools, to check that the J-Link and the device can communicate. For more information, see the online help in the J-Link Commander interface. |
| Erase Failed | The address specified for the erasure is not valid. | Verify that the address specified for erasure can be erased and that the location is valid. |
| Program Failed | The address specified for the program is not valid.<br>The area specified from the address is too small for the size of the program. | Verify that the address specified for loading the program is valid, and that the area to be programmed has adequate space for the program. |
| Verify Failed | There was a problem during programming and the flash loader could not verify the contents of flash. | Check that the file being used for the comparison is the same as what should be in flash memory. For more information about verifying flash memory, see Section 3.1, “The Program Page” on page 8 or Section 4.3, “The Verify Command” on page 13. |

# CHAPTER 3

# Flash Loader User Interface

To start the stand-alone flash loader from a short-cut, use the Windows Start menu and choose **ON Semiconductor > RSL10 Flash Loader > RSL10 Flash Loader**.

When you run the stand-alone flash loader with no command-line options, it operates in graphical mode. In this mode, the flash loader displays the graphical user interface shown in Figure 2. The user interface consists of three pages:

- The **Program** page allows you to program and verify the contents of flash memory.
- The **Tools** page allows you to erase and read the contents of flash memory.
- The **Options** page allows you to control how the flash loader accesses the RSL10 radio IC.

For a list of all the tasks you can do with this application, and where to find the corresponding graphical user interface or command line interface steps, see Table 1 on page 5.

## 3.1 The Program Page

Use the controls on the **Program** page (Figure 2) to program and verify the contents of flash memory.

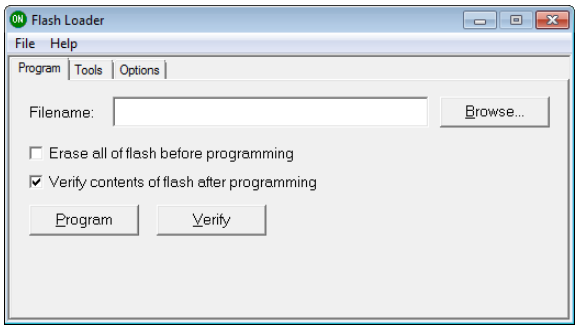



**Figure 2. The Stand-Alone Flash Loader Program Page**

For all operations on this page, first enter a filename or click **Browse...** to select a file. The rest of the controls are:

*Program button*
Copies the contents of the file to flash memory.

*Verify button*
Verifies that the contents of flash memory match the contents of the file.

*Erase all of flash before programming*
Erases the main section of flash memory. By default, the flash loader only erases blocks of flash memory that are overwritten with data in the file.

*Verify contents of flash after programming*
To program and verify the flash memory in one operation, check this box.

### 3.2 THE TOOLS PAGE

Use the controls on the **Tools** page (Figure 3) of the flash loader to perform various operations on regions of flash memory.

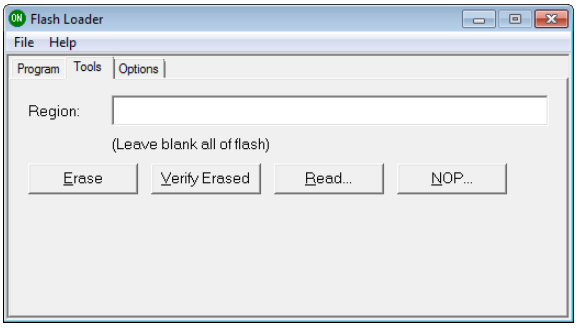



**Figure 3. The Stand-Alone Flash Loader Tools Page**

For all operations on this page, first enter a region in the **Region** field. If you leave this field blank, the operation applies to all of flash memory. For information on the format of a region, see Section 2.2.1, “Flash Regions” on page 6.

The controls on this page are applied to the entry in the **Region** field:

*Erase button* Erases the region of flash memory.

*Verify Erased button* Verifies that the region of flash memory is erased.

*Read... button* Reads the contents of the region of flash memory and saves the data. When you press the **Read...** button, the flash loader prompts you to select a file for saving the data.

*NOP... button* Sends a null command to the flash memory to ensure that connectivity is as expected.

### 3.3 THE OPTIONS PAGE

Use the controls on the **Options** page (Figure 4) to control how the flash loader accesses the RSL10 radio IC.

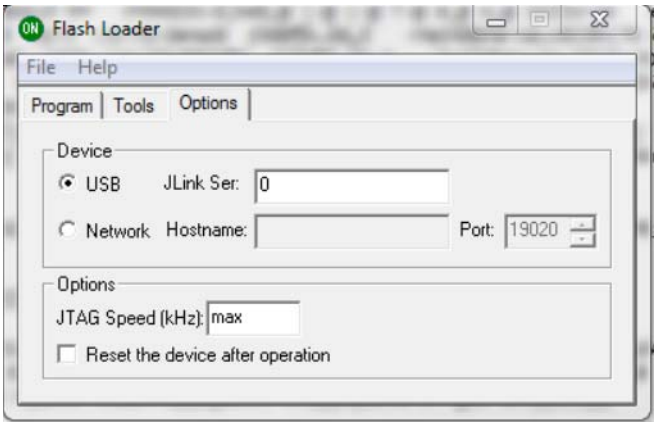



**Figure 4. The Stand-Alone Flash Loader Options Page**

In the **Device** section of the page, you can select either a **USB** or **Network** J-Link device:

- For a USB J-Link device, select the J-Link device serial number.
- For a network J-Link device, enter the **Hostname** and **Port** of the computer running the *jlinktcpipserver.exe* program.

In the **Options** section, you can:

- Change the **JTAG Speed**. Enter **max** to use the maximum JTAG Speed supported by the J-Link device, or a number to specify the speed in kHz.
- Check the **Reset the device after operation** box to have the flash loader reset the connected RSL10 radio IC after completing any operation.

### 3.4 The Progress Dialog

The stand-alone flash loader displays the progress dialog box shown in Figure 5 when performing any operation that communicates with the RSL10 radio IC. The dialog shows the current operation at the top, the overall progress in a progress bar, and various progress and status messages in the large text box.

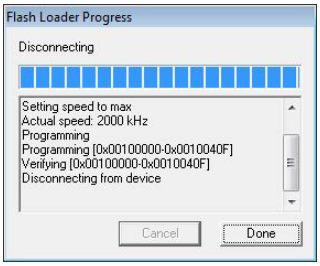



**Figure 5. The Progress Dialog**

Press **Cancel** at any time to stop the operation.

After the operation completes, or after you press **Cancel**, the dialog remains open so that you can inspect or copy the output of the operation. To copy, select the contents of the dialog and press Ctrl-C. Press **Done** to dismiss the progress dialog.

# CHAPTER 4

# Command-Line Usage

To start the stand-alone flash loader from a command line, execute *Flashloader.exe*. Its default location is *C:\Program Files\ON Semiconductor\RSL10 Flash Loader*. Add its folder to your system PATH environment variable to allow easy access to this command.

When you run the stand-alone flash loader from the Windows command processor (*CMD.EXE*) with command-line options, it operates in command-line mode. In this mode, the command-line options determine the operation to perform, and all progress and messages are displayed on the console.

Usage:

```
flashloader options command command-options
```

The **options** are global flash loader options. Possible global options are listed in Table 3.

**Table 3. Global Flash Loader Command-Line Options**

| Global Option | Description |
|---|---|
| `-h` | Display the usage message. |
| `-u` **serial_number** | Use the specified USB J-Link device. If no USB or network J-Link device is specified, the flash loader tries to connect to the J-Link device it finds. If it finds more than one J-Link device, you are prompted to select a device to use. If the flash loader finds no J-Link devices, the connection fails, and you are asked to connect on the network, which you can cancel. |
| `-n` **hostname:port** | Use the specified host and port to access a network J-Link device. |
| `-s` **speed** | Specify the maximum JTAG speed in kHz to communicate with the RSL10 radio IC, or specify the value `max` to use the maximum speed supported by the flash loader hardware. The actual JTAG speed might be slower. |
| `-r` | Reset the device after the operation finishes. |
| `-v` | Display verbose output. |

The **command** determines which flash loader operation to perform. Some commands allow **command-options** that control the behavior of the command. The commands are:

`program` Write the contents of a data file to flash memory.

`erase` Erase a region of flash memory.

`verify` Verify that the contents of flash memory match the contents of a data file, or verify that a region of flash memory is erased.

`read` Read a region of flash memory and save the data to a data file.

For a list of all the tasks you can do with this application, and where to find the corresponding graphical user interface or command line interface steps, see Table 1 on page 5.

### 4.1 The Program Command

Use the `flashloader program` command to write the contents of a data file to flash memory. By default, the `flashloader program` command only erases the regions of flash memory that are being written. The `flashloader program` command takes the options shown in Table 4.

**Table 4. Program Command Options**

| Program Command Option | Description |
|---|---|
| **`filename`** | The name of the data file to write to flash memory (required). |
| `-e` | Erase all of flash memory before programming. |
| `-v` | Verify the contents of flash memory after programming. |

Some examples of the `flashloader program` command:

- To write the contents of *blinky.hex* to the main section of flash memory:

  ```
  flashloader program blinky.hex
  ```

- To write the contents of *blinky.srec* to flash memory using a remote J-Link device on a machine named `jlinkserver` port `19020`:

  ```
  flashloader -n jlinkserver:19020 program blinky.srec -i
  ```

- To erase all of flash memory, write the contents of *blinky.hex* to the flash memory, verify that the contents of flash memory match the file, then reset the device:

  ```
  flashloader -r program blinky.hex -e -v
  ```

### 4.2 The Erase Command

Use the `flashloader erase` command to erase a region of flash memory. By default, the `flashloader erase` command erases all of flash memory. The `flashloader erase` command takes the options shown in Table 5.

**Table 5. Erase Command Options**

| Erase Command Option | Description |
|---|---|
| **`region`** | Override the default behavior to erase one or more ranges of flash memory. |

Some examples of the `flashloader erase` command:

- To erase all of flash memory:

  ```
  flashloader erase
  ```

- To erase two blocks of flash memory, using local J-Link device number 2:

  ```
  flashloader -u 2 erase 0x00040000-0x0003FFFF,0x00070000-0x0007FFFF
  ```

### 4.3 THE VERIFY COMMAND

Use the `flashloader verify` command to perform two similar operations:

1. Verify that a region of flash memory is erased.
2. Verify that the contents of flash memory match the contents of a data file.

By default, the `flashloader verify` command verifies that all of flash memory is erased. The `flashloader verify` command takes the options shown in Table 6. You can only specify a **`region`** or **`filename`** option, but not both.

**Table 6. Verify Command Options**

| Verify Command Option | Description |
|---|---|
| **`region`** | Override the default behavior to verify that one or more regions of flash memory are erased. |
| **`filename`** | Override the default behavior to verify that the contents of flash memory match the contents of a data file. |

Some examples of the `flashloader verify` command:

- To verify that the entire main section of flash memory is erased, then reset the device:

```
flashloader -r verify
```

- To verify that the contents of flash memory match the contents of *blinky.srec*:

```
flashloader verify blinky.srec
```

### 4.4 THE READ COMMAND

Use the `read` command to read a region of flash memory and write the data to a data file. By default, the `read` command reads all of flash memory. The `read` command takes the options shown in Table 7.

**Table 7. Read Command Options**

| Read Command Option | Description |
|---|---|
| **`region`** | Override the default behavior to read one or more regions of flash memory. |
| **`filename`** | The name of the data file to write the contents of flash memory to (required and must be the last parameter on the command line). |

Some examples of the `flashloader read` command:

- To read all of flash memory and save it to *allflash.hex*:

```
flashloader read allflash.hex
```

- To read the contents of two blocks of flash memory and save it to *myflash.srec*, then reset the device:

```
flashloader -r read 0x00040000-0x00041000,0x00070000-0x0007FFFF myflash.srec
```

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