

Universal Flash Loader

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Manual versions

This manual describes the Universal Flash Loader Configurator.

For further information on topics or routines not yet specified, please contact us.

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2.56	i	200331	MF	Added PIC16 AutoCfg information
2.56	c	200331	MF	Added dsPIC33 connection information, added ATmega AutoCfg information
2.56	a	200303	MF	Added PIC12 connection information
2.54		200115	MF	Update ATmega device information
2.48	a	190809	MF	Added ATxmega device connection via JTAG
2.44	g	190627	MF	Added connection for I2C devices
2.44	f	190524	MF	Added corrected pin description for RH850 connection
2.44	c	190524	MF	Added ATxmega devices
2.44	b	190520	MF	corrected pin description for RX64M
2.44		190517	MF	Added RH850 and RX64M devices
2.42	a	190503	MF	Added ATtiny devices
2.42		190429	MF	Added PIC16 devices
2.52	b	190429	MF	Added PIC16C devices

About this document

Assumptions

This document assumes that you already have a solid knowledge of the following:

- The software tools used for building your application (assembler, linker, C compiler).
- The C programming language.
- The target processor.
- DOS command line.

If you feel that your knowledge of C is not sufficient, we recommend *The C Programming Language* by Kernighan and Richie (ISBN 0--13--1103628), which describes the standard in C programming and, in newer editions, also covers the ANSI C standard.

How to use this manual

This manual explains all the functions and macros that the product offers. It assumes you have a working knowledge of the C language. Knowledge of assembly programming is not required.

Typographic conventions for syntax

This manual uses the following typographic conventions:

Style	Used for
Body	Body text.
Keyword	Text that you enter at the command prompt or that appears on the display (that is system functions, file- or pathnames).
Parameter	Parameters in API functions.
Sample	Sample code in program examples.
Sample comment	Comments in program examples.
Reference	Reference to chapters, sections, tables and figures or other documents.
GUIElement	Buttons, dialog boxes, menu names, menu commands.
Emphasis	Very important sections.

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Chapter 1

Introduction

This chapter provides a short overview about the Universal Flash Loader and its features.

1.1 Universal Flash Loader overview

The Universal Flash Loader is a technique which enables the Flasher to support new devices and interfaces which were not in scope at the time of development of the Flasher hardware. This feature allows SEGGER to enhance the Flasher with new features quickly.

1.1.1 The Features

The Universal Flash Loader supports the following features:

- Erase a device,
- Program a device,
- Verify a device,
- Secure a device,
- Configure the device
- Configure the target interface. Not all features are available for all devices.

1.1.2 Supported Cores

Supported cores / devices	Supported target interfaces
AVR Mega	In circuit serial programming (ISP), JTAG
AVR Tiny	In circuit serial programming (ISP)
AVR XMega	PDI
I2C EEPROM	I2C
I2C FRAM	I2C
MSP430	JTAG
PIC12	In circuit serial high voltage programming (HVP via ICSP)
PIC16	In circuit serial low voltage programming (LVP via ICSP)
PIC18	JTAG
RH850	UART
RL78	
RX63N	UART
RX64N	UART
STM8	SWIM

1.1.3 Supported Interfaces

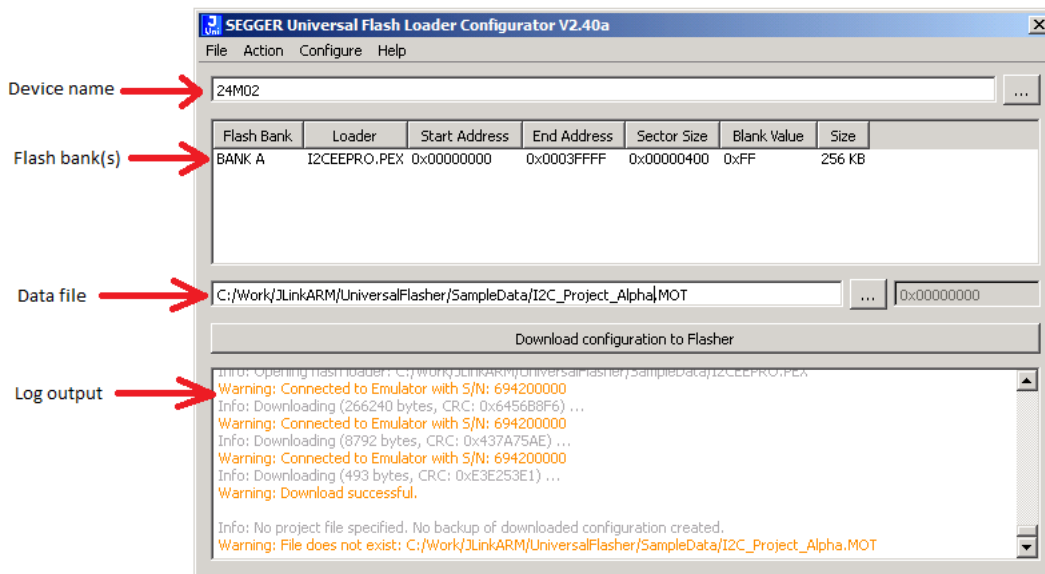
Interfaces	Devices
I2C	EEPROMs, FRAMs
ICSP	PIC16, PIC12
JTAG	PIC18, AVR Mega
PDI	AVR XMega
SWD	
SWIM	STM8
UART	RH850, RX63N, RX64N

Chapter 2

Universal Flash Loader Configurator

2.1 Overview

The Universal Flash Loader Configurator is the tool to set up the project files needed for programming devices supported by the Flasher devices using the SEGGER Universal Flasher Loader technology.

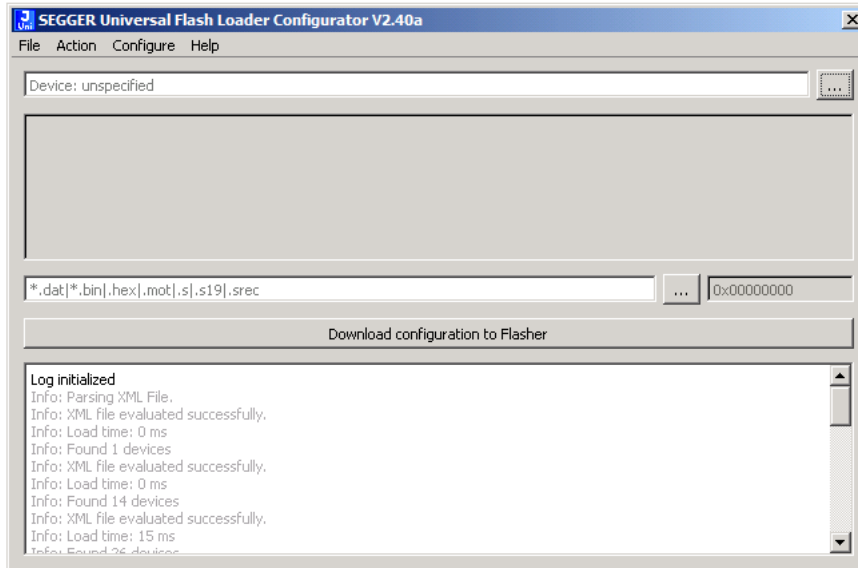


The picture shows the start up screen of the Universal Flash Loader Configurator and explains the main values on the screen.

2.2 Create a new project

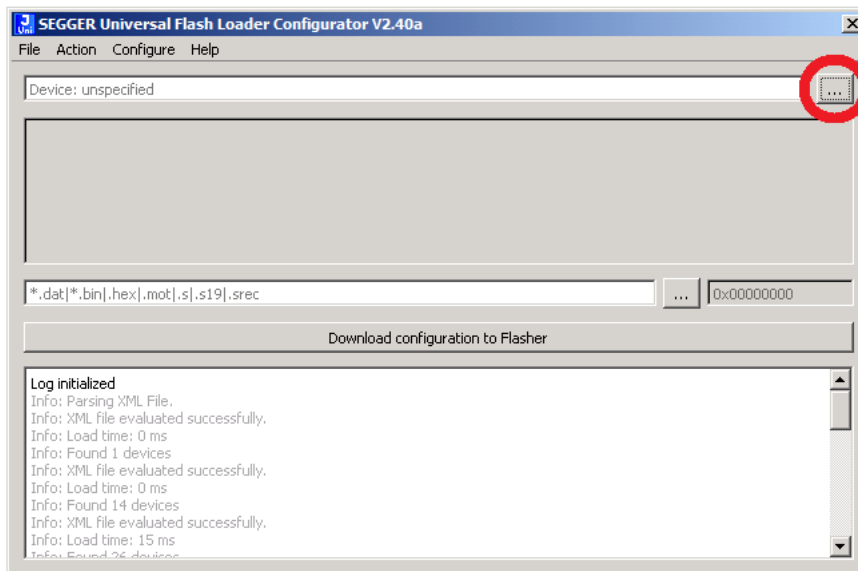
2.2.1 Startup

If you start the the Universal Flash Loader Configurator you can it starts with an empty and new project.

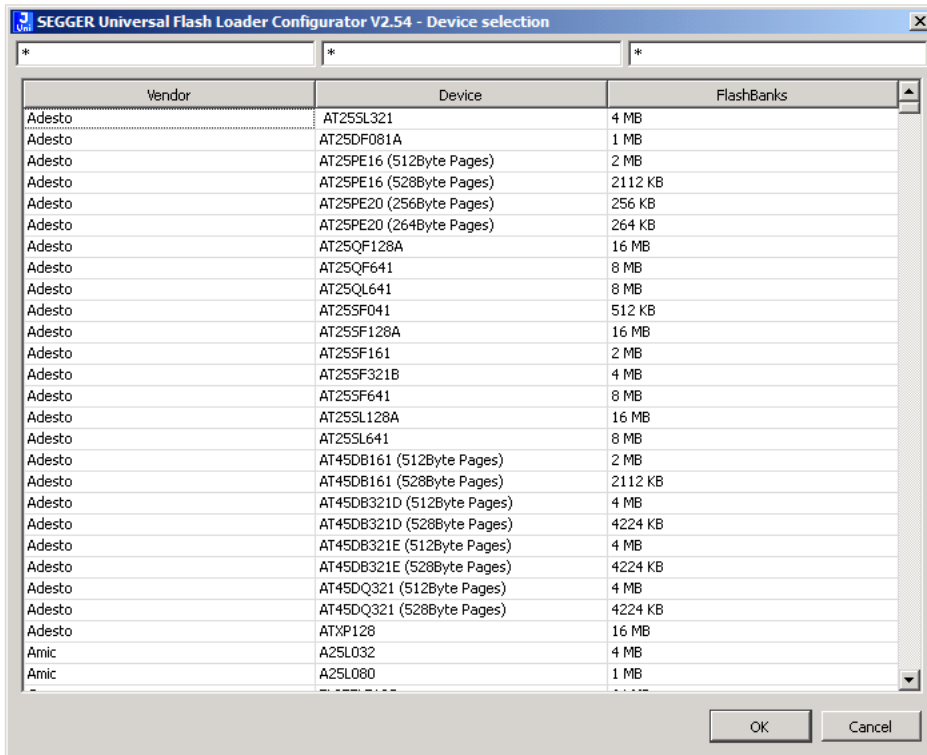


2.2.2 Device selection

The first step is the selection of the device, you want to program. Therefor you can chose the menu point **Configure** -> **Select Device** or you chose the button **...** marked in the next picture.



This will open the device selection dialog, which will list all currently supported devices sorted by manufacturer.



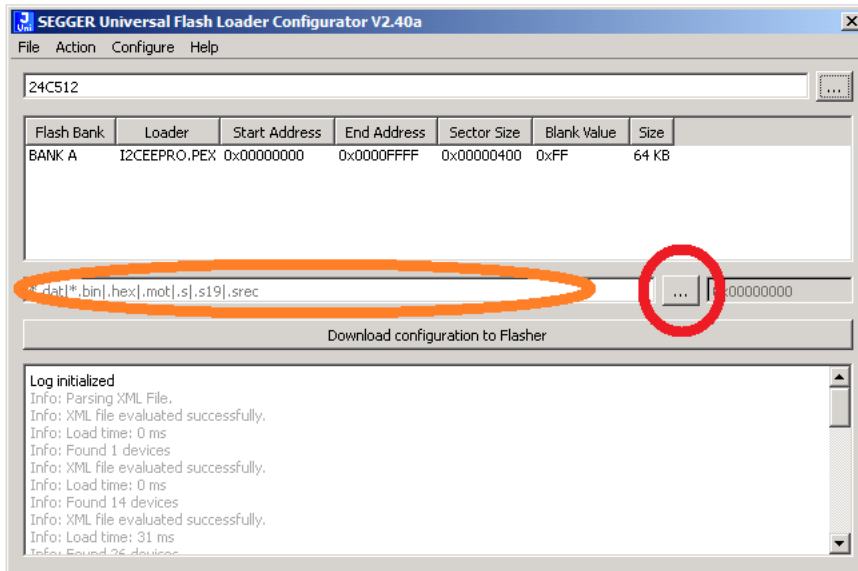
Mark your device in the list and click the button **OK**.

The three fields in top row allow you to search in the list e.g. list only all I2C FRAM devices:

2.2.3 Adding a data file

You have three options to add the data file to your project.

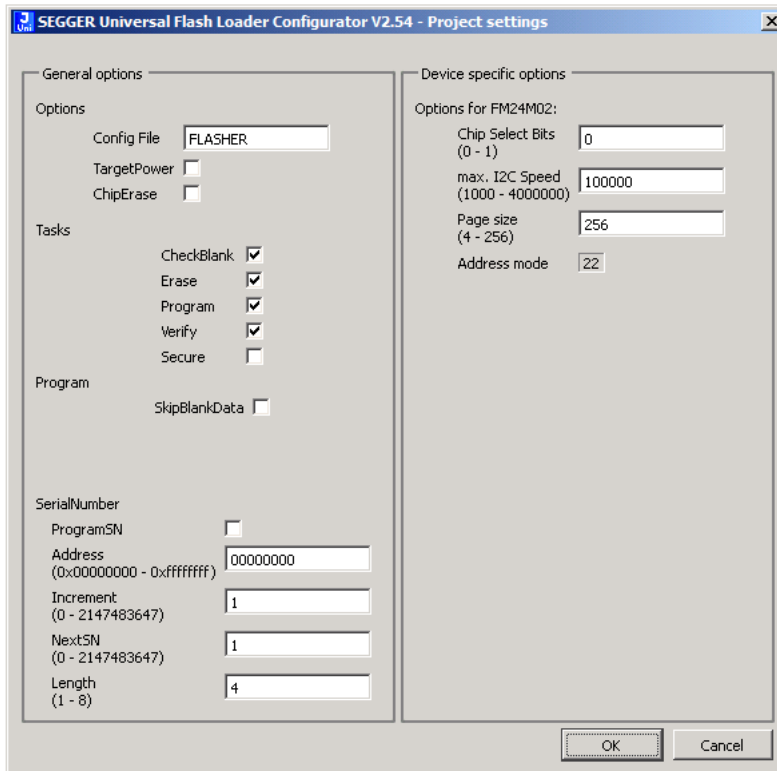
- You can add the data file by typing the full path and file name in to the input field (marked in orange in the next picture) or
- you can choose the menu point **Configure** -> **Open Data File** and browse in the opening to the data file or
- you can choose the button **...** marked red in the next picture and browse in the opening to the data file.



If you use a binary file the start address offset can be specified by the right field in the row.

2.2.4 Configure project settings

You can configure the project setup in the **Project settings** dialog. The next picture shows the dialog.



On the left half the common project options are listed. These are:

- Options,
- Tasks,
- Program and
- Serial number.

Each option has some sub points which can be activated or not by clicking on the check boxes.

2.2.4.1 Options

The project option **Options** allows you to activate the following properties:

- **Config File**, this field specifies the name used on the Flasher's file system for configuration file. The default name is "Flasher.UNI". The ".UNI" extension will be added automatically. Note: Only 8.3 file name format is supported.
- **Target Power**, if activated the Flasher will turn on the target power supply during the programming cycle.
- **Chip Erase**, if activated the Flasher will use the chip erase command for the device. We recommend to activate this option. For more than 95% of the devices a chip erase is executed much faster than single sector erase for the whole device.

2.2.4.2 Option Tasks

The project option **Tasks** defines which tasks will be executed during a programming cycle, e.g. by the command #auto to the Flasher. The steps:

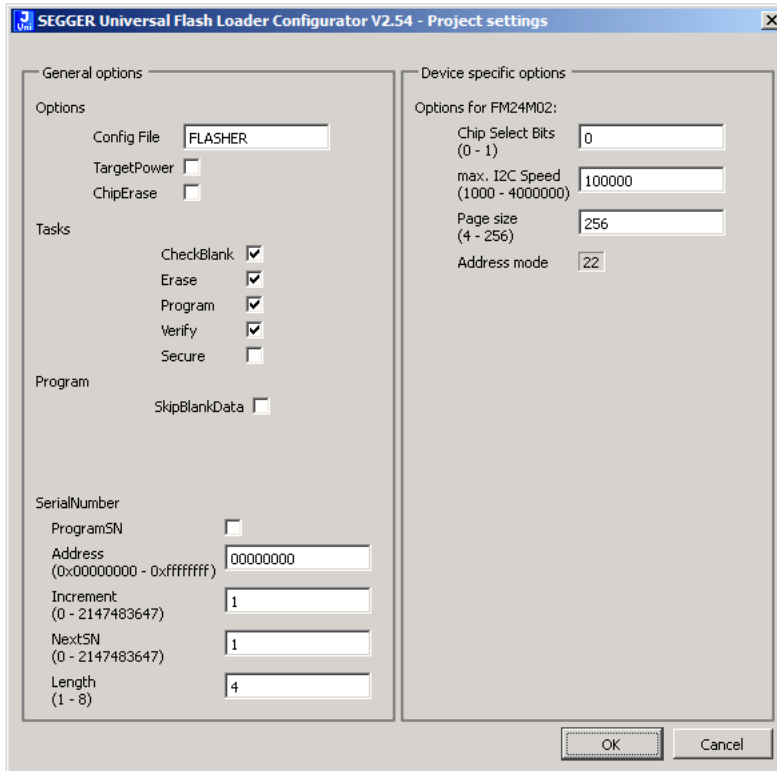
- Check Blank,
- Erase,
- Program,
- Verify and
- Secure can be added to the programming cycle. By default the steps Check Blank, Erase, Program and Verify are executed.

2.2.4.3 Option Program

The project option **Program** provides the possibility to skip blank data section. This option might be useful to reduce programming time, e.g. if you have a large flash device which will be filled only partly.

2.2.5 Configure device specifics

The most devices and projects require to set up some device specific values. These configuration can be made by the **Project settings** dialog which can be opened by the menu point **Configuration -> Project settings**.



The right half of the dialog lists all device specific options. Details are listed in the chapter *Device specific options* on page 24.

2.2.6 Save the project

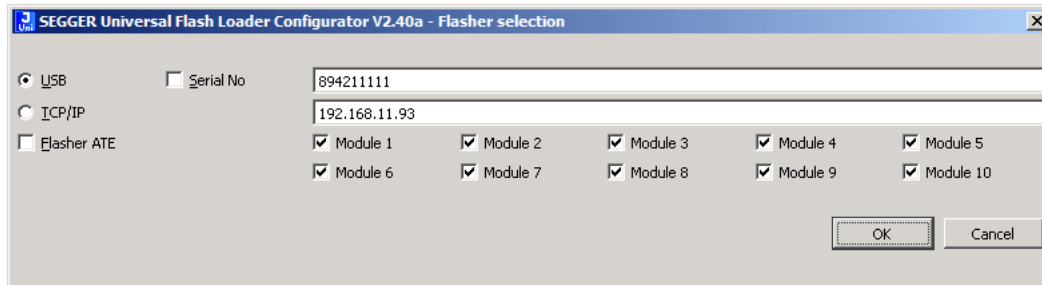
You can save the project using the menu point **File -> Save project as**. If you have already saved the project once you can save the last changes with the menu point **File -> Save project**.

2.2.7 Download files to the Flasher

The next step is transferring the file to the Flasher. Therefore you can chose:

- using the USB connection or
- using the IP connection or
- save the files to disk and copy them manually to the Flasher.

The preferred way can be setup in the Flasher selection dialog. This can be opened by the menu point **Configuration** -> **Select Flasher**.



In this dialog you can chose who the connected Flasher can be reached:

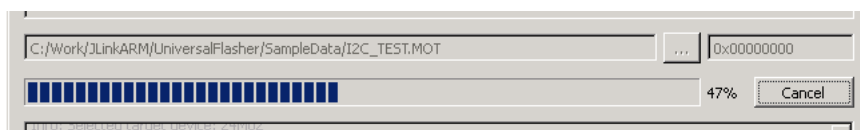
- **USB** connection or
- **TCP/IP** connection.

If the check box **Serial No** is activated the Universal Flash Loader Configurator will connect to the Flasher with the given serial number. If the check box is not activated the Universal Flash Loader Configurator will connect to USB device x, specified in the upper data field.

If you are using the TPC/IP connection and the check box **Serial No** is activated the Universal Flash Loader Configurator will try to find out the IP address by itself for the given serial number. If the check box is not activated the IP address given in the lower data field is used for the TCP/IP connection.

In addition if you want to deploy the project to a Flasher ATE you can chose all modules to which the data shall be copied. Therefore activate the check box **Flasher ATE** and check boxes **Module 1** to **Module 10** required for your setup.

You can start the download to the Flasher with the button **Download configuration to Flasher**. The button will change into a progress bar and show the current progress of the download.



2.3 Open a project

If you want to open a saved project you can do this with menu point **File -> Open Project**.

2.4 Save configuration files

The generated configuration files for a project can be saved to a hard drive e.g. to store them in a version administration tool. Therefore chose the menu point **File -> Save Flasher UNI file** which will save to project configuration file. And afterwards chose the menu point **File -> Save Flasher dat file** which will save the data file of the project. In sum you will get:

- Flasher.UNI (contains the project setup),
- Flasher.DAT (contains the project data programmed into the device's storage),
- a subfolder Flasher and
- a *.pex file, with the device flash loader, in the sub folder.

2.5 Generate test data

The menu point **File** -> **Generate test** offers the option to generate data for the whole chip for testing purpose.

2.6 Serial Number programming

The Universal Flash Loader can program individual serial numbers into the device. This option can be configured with the field in the left lower quarter of the project settings dialog. The options are:

- ProgramSN,
- Address,
- Increment,
- NextSN and
- Length.

ProgramSN

This checkbox activates or deactivates the serial number programming option.

Address

The address field defines the address in the devices where the serial number is stored.

Increment

The increment defines which value is added to the current serial number for the next serial number after a successful programming cycle.

NextSN

This values defines which serial number is programmed into the next device. If it is the first device you may also say it is the start serial number.

Length

The length defines how many bytes serial number has.

Chapter 3

Device specific options

3.1 I2C EEPROM devices

Option	Description	Value range (may be device dependent)
Chip Select Bits	used chip address bits in the address byte	0 .. 7 (depends on the device)
max. I2C speed	maximum speed for the I2C clock line in Hz	1000 ... 4000000
Page size	size of one page in the EEPROM	4 ... 256

Available address ranges

Option	Description	Address range
Bank A	data area	0x00000000 ... 0x0000FFFF

Note

Not all values are available for all devices.

Connecting the I2C device to the Flasher

Flasher Target Interface Pin	Description	Chip Signal
1 VTref	target I/O reference voltage	VDD
7 TMS	Data I/O	SDA
9 TCK	Clock	SCL
4,6,8,10,12,14,16,18,20 GND	Ground	GND

3.2 I2C FRAM devices

Option	Description	Value range (may be device dependent)
Chip Select Bits	used chip address bits in the address byte	0 .. 7 (depends on the device)
max. I2C speed	maximum speed for the I2C clock line in Hz	1000 ... 4000000
Page size	size of one page in the EEPROM	4 ... 256

Note

Not all values are available for all devices.

Available address ranges

Option	Description	Address range
Bank A	data area	0x00000000 ... 0x0000FFFF

Connecting the I2C device to the Flasher

Flasher Target Interface Pin	Description	Chip Signal
1 VTref	target I/O reference voltage	VDD
7 TMS	Data I/O	SDA
9 TCK	Clock	SCL
4,6,8,10,12,14,16,18,20 GND	Ground	GND

3.3 Microchip AVR Mega devices

Option	Description	Value range (may be device dependent)
ISP_SPEED	maximum speed for the ISP clock line in Hz	2000 ... 4000000
ISP_SPEED_FOR_FUSE	maximum speed for the ISP clock line in Hz during fuse byte programming for oscillator selection	2000 ... 4000000
CLOCK_SOURCE	selection for clock source during programming cycle (default: internal oscillator (div 8))	
FUSE_BYTE_LOW	value for the fuse byte low	0x00 ... 0xFF
FUSE_BYTE_HIGH	value for the fuse byte high	0x00 ... 0xFF
FUSE_BYTE_EXTENDED	value for the fuse byte extended	0x00 ... 0xFF
LOCKBITS	value for the lock bits	0x00 ... 0xFF

Note

Not all values are available for all devices.

Note

Sector erase is not available for all device. It is recommend to use the chip erase.

Note

The device variants with "AutoCfg" in the name use the Configuration and LOCKBITS area to program the fuses.

Available address ranges

Option	Description	Address range
Application	program data area	0x00000000 ... 0x0001FFFF
EEPROM	calibration/user/configuration data area	0xE0000000 ... 0xE0007FFF

Note

Not all areas are available for all devices.

Available address ranges for AutoCfg variants

Option	Description	Address range
Application	program data area	0x00000000 ... 0x0001FFFF
EEPROM	calibration/user/configuration data area	0x00810000 ... 0x00817FFF
FUSES	fuses settings area	0x00820000 ... 0x00820008
LOCKBITS	lock bits setting area	0x00830000 ... 0x00830001

Note

Not all areas are available for all devices.

Connecting the AVR Mega device to the Flasher using ISP

Flasher Target Interface Pin	Description	Chip Signal
1 VTref	target I/O reference voltage	VDD
5 TDI	MOSI	MOSI
9 TCK	Clock	SCK
13 TDO	MISO	MISO
15 #Reset	Reset	#Reset
4,6,8,10,12,14,16,18,20 GND	Ground	GND

Connecting the AVR Mega device to the Flasher using JTAG

Flasher Target Interface Pin	Description	Chip Signal
1 VTref	target I/O reference voltage	VDD
5 TDI	JTAG TDI	JTAG TDI
7 TMS	JTAG TMS	JTAG TMS
9 TCK	JTAG Clock	JTAG CLK
13 TDO	JTAG TDO	JTAG TDO
15 #Reset	Reset	#Reset
4,6,8,10,12,14,16,18,20 GND	Ground	GND

3.4 Microchip AVR Tiny devices

Option	Description	Value range (may be device dependent)
ISP_SPEED	maximum speed for the ISP clock line in Hz	2000 ... 4000000
FUSE_BYTE_LOW	value for the fuse byte low	0x00 ... 0xFF
FUSE_BYTE_HIGH	value for the fuse byte high	0x00 ... 0xFF
FUSE_BYTE_EXTENDED	value for the fuse byte extended	0x00 ... 0xFF
LOCKBITS	value for the lock bits	0x00 ... 0xFF

Note

Not all values are available for all devices.

Note

Sector erase is not available for all device. It is recommend to use the chip erase.

Available address ranges

Option	Description	Address range
Application	program data area	0x00000000 ... 0x0001FFFF
EEPROM	calibration/user/configuration data area	0xE0000000 ... 0xE0007FFF

Note

Not all areas are available for all devices.

Connecting the AVR tiny device to the Flasher

Flasher Target Interface Pin	Description	Chip Signal
1 VTref	target I/O reference voltage	VDD
5 TDI	MOSI	MOSI
9 TCK	Clock	SCK
13 TDO	MISO	MISO
15 #Reset	Reset	#Reset
4,6,8,10,12,14,16,18,20 GND	Ground	GND

3.5 Microchip AVR XMega

Option	Description	Value range (may be device dependent)
PDI speed	maximum speed for the PDI clock line in Hz	2000 ... 4000000
FUSE Bytes 1	value for the fuses byte 1	0x00 ... 0xFF
FUSE Bytes 2	value for the fuses byte 2	0x00 ... 0xFF
FUSE Bytes 3	value for the fuses byte 3	0x00 ... 0xFF
FUSE Bytes 4	value for the fuses byte 4	0x00 ... 0xFF
FUSE Bytes 5	value for the fuses byte 5	0x00 ... 0xFF

Note

Not all values are available for all devices.

Note

Sector erase is not available for all device. It is recommend to use the chip erase.

Option	Description	Address range
Application	program data area	0x00000000 ... 0x0001FFFF
Boot loader	boot loader program data area	0x00020000 ... 0x00021FFF
EEPROM	calibration/user/configuration data area	0x000C0000 ... 0x000C07FF
UserId	User Id data area	0x000E0400 ... 0x000E05FF

Note

Not all areas are available for all devices.

Connecting the AVR XMega device to the Flasher using PDI

Flasher Target Interface Pin	Description	Chip Signal
1 VTref	target I/O reference voltage	VDD
7 TMS	data I/O	PDI data
9 TCK	Reset / Clock	#Reset / PDI Clock
15 #Reset	Reset	#Reset
4,6,8,10,12,14,16,18,20 GND	Ground	GND

Connecting the AVR XMega device to the Flasher using JTAG

Flasher Target Interface Pin	Description	Chip Signal
1 VTref	target I/O reference voltage	VDD
5 TDI	JTAG TDI	JTAG TDI
7 TMS	JTAG TMS	JTAG TMS
9 TCK	JTAG Clock	JTAG CLK
13 TDO	JTAG TDO	JTAG TDO
15 #Reset	Reset	#Reset
4,6,8,10,12,14,16,18,20 GND	Ground	GND

3.6 Microchip PIC12 devices

Note

It is recommend to use the chip erase for these devices.

Option	Description	Value range (may be device dependent)
ICSP speed	maximum speed for the ICSP clock line in Hz	2000 ... 5000000
CONFIGURATION WORD 1	value for the configuration word 1	0x00 ... 0xFF
CONFIGURATION WORD 2	value for the configuration word 2	0x00 ... 0xFF

Note

Not all values are available for all devices.

Note

The device variants with "AutoCfg" in the name use the Configuration and LOCKBITS area to program the config words. The data need to be included in the input data file.

Available address ranges

Option	Description	Address range
Application	program data area	0x00000000 ... 0x000007FF
EEPROM	calibration/user/configuration data area	0x0001E000 ... 0x000100FF
UserId	User Id data area	0x00020000 ... 0x000207FF

Note

Not all areas are available for all devices.

Connecting the PIC12 device to the Flasher

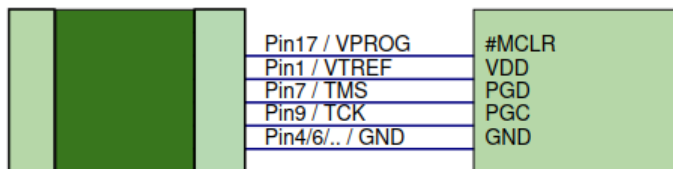
Flasher Target Interface Pin	Description	Chip Signal
1 VTref	target I/O reference voltage	VDD
7 TMS	Data I/O	DIO / PGD / RB7
9 TCK	Clock	CLK / PGC / RB6
17 PIN 17	Reset	#MCLR
4,6,8,10,12,14,16,18,20 GND	Ground	GND

Note

It is recommended to use SEGGER Programming Voltage adapter to feed in the high voltage on the MCLR pin of the chip.

SEGGER Programming Voltage Adapter

PIC12xxx Target



3.7 Microchip PIC16 devices

Note

It is recommend to use the chip erase for these devices.

Option	Description	Value range (may be device dependent)
ICSP speed	maximum speed for the ICSP clock line in Hz	2000 ... 5000000
CONFIGURATION WORD 1	value for the configuration word 1	0x00 ... 0xFF
CONFIGURATION WORD 2	value for the configuration word 2	0x00 ... 0xFF
CONFIGURATION WORD 3	value for the configuration word 3	0x00 ... 0xFF
CONFIGURATION WORD 4	value for the configuration word 4	0x00 ... 0xFF
CONFIGURATION WORD 5	value for the configuration word 5	0x00 ... 0xFF

Note

Not all values are available for all devices.

Note

The device variants with "AutoCfg" in the name use the Configuration and LOCKBITS area to program the config words. The data need to be included in the input data file.

Available address ranges

Option	Description	Address range
Application	program data area	0x00000000 ... 0x0000FFFF
EEPROM	calibration/user/configuration data area	0x0001E000 ... 0x0001FFFF
UserId	User Id data area	0x00020000 ... 0x000207FF

Note

Not all areas are available for all devices.

Connecting the PIC16 device to the Flasher

Flasher Target Interface Pin	Description	Chip Signal
1 VTref	target I/O reference voltage	VDD
7 TMS	Data I/O	DIO / PGD / RB7
9 TCK	Clock	CLK / PGC / RB6
15 #Reset	Reset	#MCLR
4,6,8,10,12,14,16,18,20 GND	Ground	GND

Connecting the PIC16C device to the Flasher

Flasher Target Interface Pin	Description	Chip Signal
1 VTref	target I/O reference voltage	VDD
7 TMS	Data I/O	DIO / PGD / RB7
9 TCK	Clock	CLK / PGC / RB6
17 PIN 17	switch signal for Vpp, need to switch externally from GND if PIN17 = 0V to Vpp=5V or 12V (depending on device) if PIN17=Vtref	#MCLR/Vpp
4,6,8,10,12,14,16,18,20 GND	Ground	GND

3.8 Microchip dsPIC33 devices

Option	Description	Value range (may be device dependent)
ICSP speed	maximum speed for the ICSP clock line in Hz	2000 ... 5000000

Available address ranges

Option	Description	Address range
User Program	program data area	0x00000000 ... 0x000AAFFF
Auxillary Program	auxillary program area	0x00FF8000 ... 0x00FFFFFF
Device Configuration	Configuration area	0x01F00000 ... 0x01F00027

Note

Not all areas are available for all devices.

Connecting the dsPIC33 device to the Flasher

Flasher Target Interface Pin	Description	Chip Signal
1 VTref	target I/O reference voltage	VDD
7 TMS	Data I/O	DIO / PGD / RB7
9 TCK	Clock	CLK / PGC / RB6
15 #Reset	Reset	#MCLR
4,6,8,10,12,14,16,18,20 GND	Ground	GND

3.9 Renesas RX64M devices

Option	Description	Value range (may be device dependent)
Baud rate	maximum speed for UART connection	9600 ... 2000000

Available address ranges

Option	Description	Address range
Data Flash	data area	0x00100000 ... 0x0010FFFF
Option Bytes	option bytes	0x00120040 ... 0x0012005F
User Boot	user bootloader program area	0xFF7F8000 ... 0xFF7FFFFFFF
Application	program area	0xFFE00000 ... 0xFFFFFFFF

Connecting the RX64M device to the Flasher

Flasher Target Interface Pin	Description	Chip Signal
1 VTref	target I/O reference voltage	VDD
5 TDI	RX Data from the target	FPDT
9 TCK	TX Data for the target	FPDR
15 #Reset	Reset	Reset
4,6,8,10,12,14,16,18,20 GND	Ground	GND

3.10 Renesas RH850 devices

Option	Description	Value range (may be device dependent)
Baud rate	maximum speed for UART connection	9600 ... 2000000

Available address ranges

Option	Description	Address range
Program Flash	program area	0x00000000 ... 0x00FFFFFF
User Boot	user bootloader program area	0x01000000 ... 0x01007FFF
Data Flash	data area	0xFF200000 ... 0xFF200000

Connecting the RH850 device to the Flasher

Flasher Target Interface Pin	Description	Chip Signal
1 VTref	target I/O reference voltage	VDD
5 TDI	RX Data from target	FPDT
9 TCK	TX Data to target	FPDR
13 power switch	pin to switch the VDD of the target (required for correct latching of the mode pins if not supplied by the Flasher)	
19 VSupply	output to switch the VDD of the target device	
4,6,8,10,12,14,16,18,20 GND	Ground	GND

Note

The FLMD0 and FLMD1 must be set accordingly. FLMD0 = Low, FLMD1 = High.

3.11 SPI Flashes for Direct Programming Mode

Option	Description	Value range (may be device dependent)
SPI Speed	maximum speed for SPI connection	10000 ... 20000000

Available address ranges

Option	Description	Address range
Memory	data area	0x00000000 ... 0xFFFFFFFF

Connecting the SPI Flash device to the Flasher

Flasher Target Interface Pin	Description	Chip Signal
1 VTref	target I/O reference voltage	VDD
5 TDI	TX Data to target	DI
7 TMS	Chip Select	#CS
9 TCK	SPI Clock	CLK
11 RTCK	Write protect	#WP
13 TDO	RX Data from target	DO
15 #Reset	Reset	#Reset
17 PIN17	Hold	#Hold
4,6,8,10,12,14,16,18,20 GND	Ground	GND

Chapter 4

Literature and references

This chapter lists documents, which we think may be useful to gain a deeper understanding of technical details.

Reference	Title	Comments
[Flasher]	Flasher User Guide	This document describes Flasher. It is publicly available from SEGGER (https://www.segger.com).
[Flasher ATE UM]	Flasher ATE User Guide	This document describes Flasher ATE. It is publicly available from SEGGER (https://www.segger.com/flasher-ate).
[Flasher ATE]	Flasher ATE Getting Started	Step by step guide to get the first project running with the Flasher ATE (https://www.segger.com/flasher-ate).