

# Easy Loader (eLoader)

## Manual

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Revision 1.4

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# 1 About this Document

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## 1.1 Purpose

This document describes installation and operation of AMFELTEC Corp. Easy Loader (eLoader) devices.

## 1.2 Feedback

AMFELTEC makes every effort to ensure that the information contained in this document is accurate and complete at time of release. Please contact AMFELTEC if you find any errors, inconsistencies or have trouble understanding any part of this document.

To provide your feedback, please send an email to [support@amfeltec.com](mailto:support@amfeltec.com)

Your comments or corrections are greatly valued in our effort for excellence and continued improvement.

## 1.3 Abbreviation

Abbreviation	Description
eLoader	EasyLoader USB device
Host application	EasyLoader Update application

## 1.4 Revision History

Rev. No.	Description	Rev. Date
1.1	Initial Release.	June 20, 2007
1.2	Add program serial flash functionality	Oct 19, 2007
1.3	Add support I2C devices	Nov 20, 2008
1.4	Add FPGA EPCSxxx configuration devices support.	Jan 10, 2009

## 2 General Description

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### 2.1 Introduction

The “eLoader” is designed to provide a flexible and cost effective programming/loading solution for electronic device manufacturers as well as for hardware design companies and their customers. It allows code upgrades on any JTAG/SPI/I2C compliant device like FPGA / CPLD / EEPROM / Flash as well as programming different microcontrollers during development, testing or production.

Initially the “eLoader” has to be connected to the host computer via USB port and loaded with the programming information. The Windows based software application provides a user-friendly interface to the “eLoader”.

During normal operation the “eLoader” doesn’t have to be connected to the host computer. It connects to the “debug” connector on the target board and automatically starts loading / programming the target device when power is turned on. The result of the operation is displayed on the two LEDs (red and green).



Figure 1: EasyLoader (USB)

## 2.2 How it works

“eLoader” can program/load specific device, group of the devices connected between each other via the same interface (JTAG/I2C) or multiple group of the devices (JTAG and I2C, JTAG and SPI).

Each target device requires a separate project to be created. The project describes the device in more detail with things such as interface type and the data file to be loaded. Designs containing multiple devices will have separate project files describing each device. A memory usage bar shows available “eLoader” resources, you’ll notice the bar move as more and more projects are added.

After the “eLoader” is configured, it can be disconnected from the host computer to run independently. All the configuration data is stored in non volatile memory internally on the “eLoader”.

The “eLoader” uses a standard 10 pin 2 row 0.1 inch pitch (see Appendix B) to connect to the target board via cable. Cables can be ordered from AMFELTEC Corp. or manufactured by the user. Power for “eLoader” device is taken from the target board so no extra cables are required.

When the “eLoader” receives power from target board, it will start to execute all projects in order starting with the first. The “eLoader” has two LEDs that show the current device status. Cycling RED-GREEN LEDs indicated success status after the target board has been programmed and verified. A blinking GREEN LED shows that the device in the process of doing programming or verification. A blinking RED LED shows that the program or verification task failed.



Figure 2: eLoader with target device

## **2.3 Application**

### **2.3.1 Board Assembly House**

The “eLoader” can be used in a board assembly house to program the programmable logic devices as they come off the assembly line. It's easy to use so minimal training is required for the personnel. After initial configuration, the device does not require a computer connection for normal operation. This can help completely avoid preprogramming parts, first article sign off and as a result significantly reduce production costs.

### **2.3.2 Update Firmware prior to Shipping**

Boards can be programmed just prior to shipping to the customer. This ensures that only the latest firmware will be used. This also adds further flexibility because a board can be programmed with different security/capability settings based on the particular customer order. No need to stock boards with 10 different CPLD/FPGA settings, instead program each board as the order comes in.

### **2.3.3 Remote Firmware Update**

Compact size and ease of use make it possible to simply ship the “eLoader” to customers. The eLoader starts working after power is turned on so it can be easily operated by anyone. No need to send an engineer overseas just to reprogram a customer’s device or ship device back to factory for update or for replacement.

### **2.3.4 Engineering**

Because “eLoader” doesn’t need computer for the normal operation it can be very useful portable programming/loading solution in case were debugging laboratory and engineering cubes are in the different places.

## 3 Installation

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This paragraph explains in detail the EasyLoader software installation steps. The software package includes EasyLoader Update application and device driver for USB devices

### 3.1 Software Installation

EasyLoader Update application provides communication between host computer and eLoader device. You will need to use it in order to update and verify contents of eLoader device.

The installation is simple. Execute *EasyLoaderUpdate.msi* file from CD. You can leave all default settings. The installation process will copy the necessary files onto your hard drive, update registers and create shortcut to executable file.

### 3.2 Device Driver Installation for eLoader (USB)

EasyLoader-USB device requires the installation of a device driver. Plug-in the eLoader-USB device into a USB port of your host computer.

- Found New Hardware Wizard dialog will show up
- Select Yes and click on Next
- Select *Install from a list of specific location* and click on Next
- Type full path to *EasyLoaderUsbDriverInstall* directory in CD and click on Next

Now, you can un-plug and plug-in back eLoader. The system should recognize it as *AMFELTEC Corp. EasyLoader USB device*.

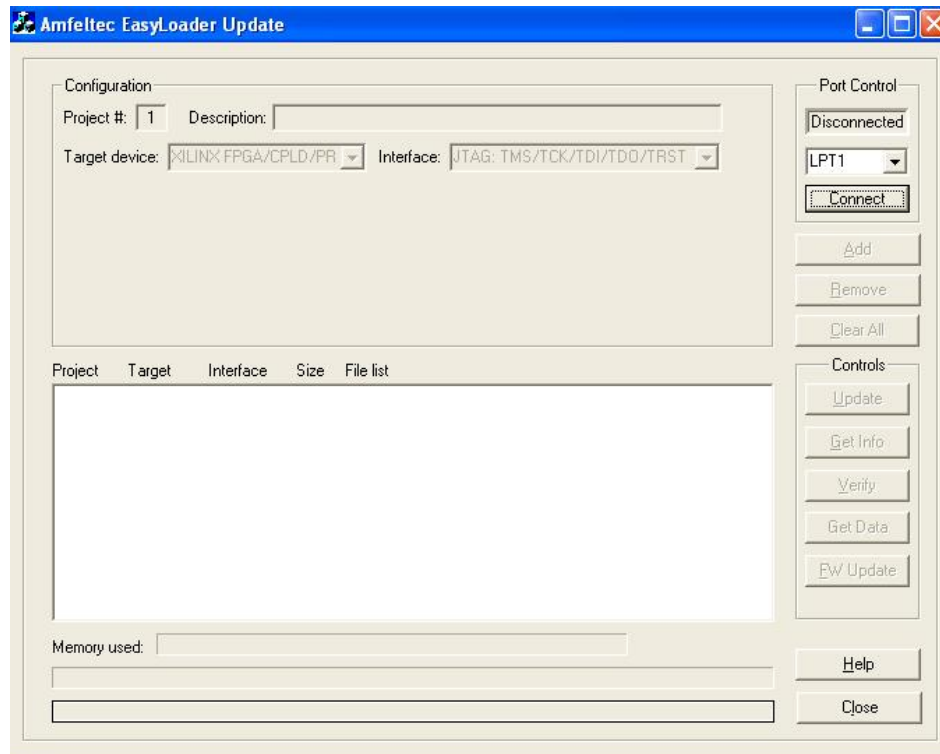
Host system recognizes eLoader device as a Serial device. You can detect the COM port number by opening Control Panel-System-Hardware-Device Manager. If installation succeeded, you will find eLoader device under *Ports (COM & LPT)* section (eLoader device must be plugged in). You will need to use the COM port number in host application (EasyLoader Update).

## 4 Configuration

This section explains the details of operation of the EasyLoader device with the host computer during configuration steps.

**NOTE:** During this step, please verify that DIP switch 4 is set to ON position!

### 4.1 Start EasyLoader Updater



In order to start the EasyLoader Update software, click on Start | Program | Amfeltec | EasyLoader | EasyLoader Update. The following dialog (**Error! Reference source not found.**) will show up:

Figure 3: EasyLoader main dialog

## 4.2 Establish connection with EasyLoader Device

Connect EasyLoader device to USB port of your host computer (the DIP switch 4 has to be in ON position). If your computer was started, you will see flashing GREEN LED on the EasyLoader device.

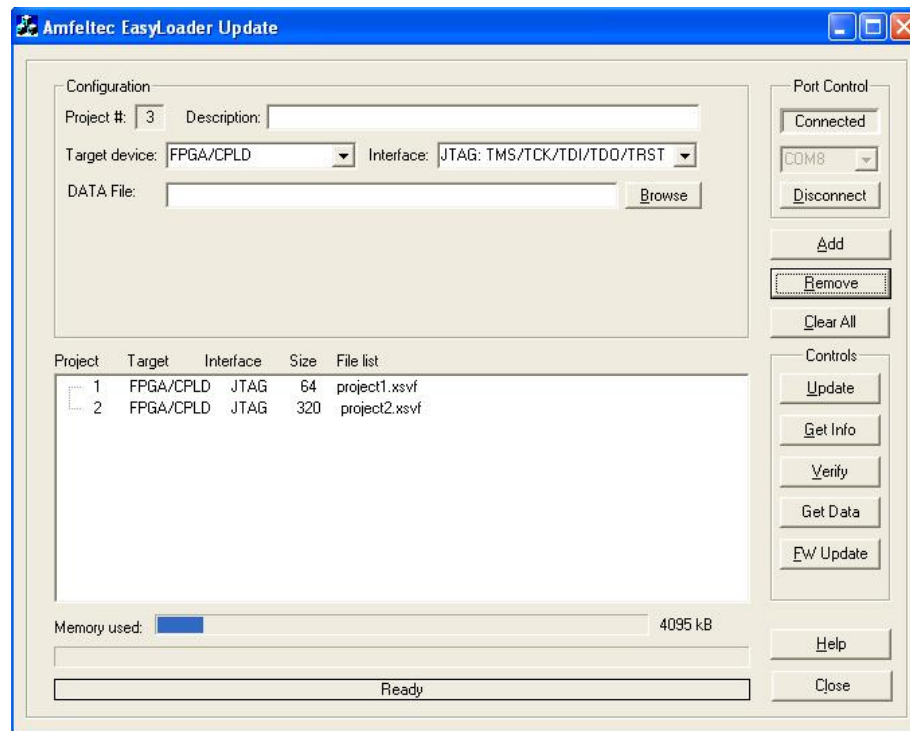


Figure 4: EasyLoader main dialog with sample project

The system recognizes EasyLoader as Serial device. From Port Control section, select port name (COM#) that connects to EasyLoader device. Press Connect button and EasyLoader Update software will try to establish a connection with the device. If connection succeeded, the connection status will change to Connected in Port Control section and software will ask you to read contents of the device now. If you select YES, the software will read and show you the contents (see sample contents in Figure 4). Otherwise, the project list will stay empty.

If connection failed to establish, the error message will show up. Please refer to Troubleshooting section for more details.

## 4.3 Project Contents Management

EasyLoader Update application uses term of *Project* to separate different target devices. Before you are going to create multiple projects, you need to understand where you can use single project and where you need to create multiple projects.

### 4.3.1 Add new Project (Add)

This option will allow you to create and add new projects to the “eLoader”. You will be required to provide different information depending on your target device and interface type (See Appendix A for more details).

- Select the target device and interface type. Depending on your selection, different dialog controls will become visible. Provide all necessary information and click on *Add Project*. The EasyLoader application will analyze the data and create the project. You will see it in a project window
- If you want to add another project, you can now select new target device, interface type and provide additional information. When done, click *Add*. The new project will be added after the previous project and application will update the memory used bar.

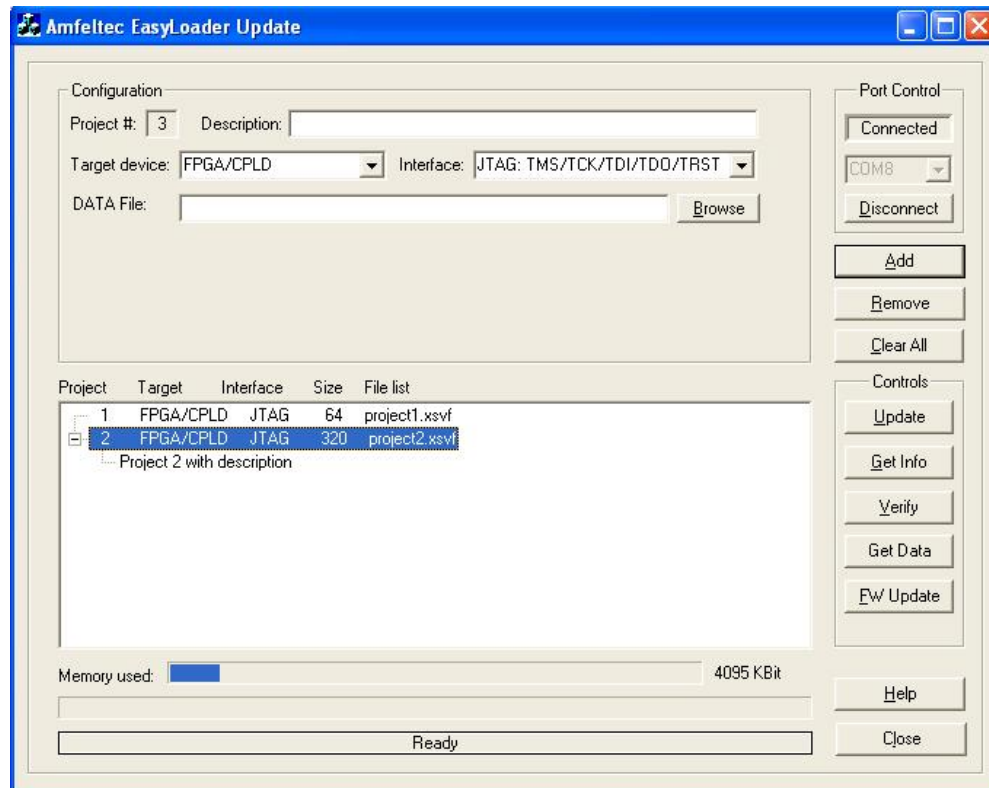


Figure 5: EasyLoader project with description

You can add as many projects as the EasyLoader's memory capacity will allow.

Your created project can include some extra information like project description. By default, the project details are hidden. In order to show the details, extend the project (**Error! Reference source not found.**). If you didn't provide extra information, the project will not have this option.

### 4.3.2 Remove Command (Remove)

This option will allow you to remove a project from the list.

If you decided to remove the project, select the project and click Remove button. The project will disappear from the list.

### 4.3.3 Clear All Command (Clear All)

Click on Clear All button in order to clear the project list (all project created before it, will be removed).

## 4.4 Update Command

When all projects are created and you are ready to update EasyLoader device with a new data, click on Update button. The application will start uploading new data. Copy all projects into the "eLoader". The progress bar will show the current status.

## 4.5 Get Info Command

This command reads the control information (without data) of all projects stored in EasyLoader device and displays it in the project window.

If you decided to add new project, simply add new project and click on update. The application will update EasyLoader device with a new project only.

## 4.6 Verify Command

This command compares the currently created projects with projects that are stored in the EasyLoader device.

You can use this command to verify the contents of you device.

## 4.7 Get Data Command

This command reads all the data of all projects stored in the EasyLoader device.

## 4.8 Firmware Update Command (FW Update)

EasyLoader device supports field upgrade firmware functionality. In order to check current firmware version, click left top corner of EasyLoader Update software and then click on *About EasyLoader*. The About windows will come up:



Figure 6: EasyLoader About dialog

This feature should be used only if AMFELTEC support team requests it. The new firmware file has extension \*.eld. Please do not modify name of firmware filename.

In order to upgrade firmware, please execute the following steps (we assume that EasyLoader device is connected to the host computer and connection status is *Connected* and DIP switch 4 is set to ON position):

1. Copy new firmware file received from Amfeltec Corp. into temporary directory.
2. Click on *FW Upgrade* button. Software will show the current firmware version and confirm that the operation. Click on YES, to continue.
3. The Open File dialog will ask you for a new firmware file. Select new firmware received from AMFELTEC Corp. and click on Open to start the firmware upgrade.
4. If the firmware upgrades succeeded, the windows with new firmware version will show up.

If the firmware upgrade failed, please refer to Troubleshooting section or contact Amfeltec Corp. tech. support!

## 5 Operation

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This section describes details during normal operation with target device.

**NOTE:** Please verify that the DIP switch 4 is set to OFF position. This position enables operation with target device.

### 5.1 Programming Target Device

When all necessary data is stored in the “eLoader”, you can then program the target device. “eLoader” doesn’t require separate power sources. It receives power from the target device.

After the “eLoader” is connected to the target device, applying power to the target device will initiate the programming sequence. Projects stored in the “eLoader” will be executed one after the other until all target devices are programmed.

Two led lights (red and green) will show the current status of the process. This is the complete list of available statuses:

Status	Description
Green LED is blinking and Red LED OFF	Program or verification task in progress
Green LED OFF and Red LED is blinking	Program or verification task failure.
Sequential Green-Red LEDs are blinking	Program and verification is complete.

### 5.2 Debugging

If any problem happened during programming target device, the “eLoader” supports mode that allows sending debug messages via mini-USB connector. For this purpose, you need to use a standard USB-A to mini-B cable to connect eLoader device to USB port on your host PC. Use following configuration for your HyperTerminal:

Baud rate	230400 bps
Data bits	8
Parity	None
Stop bits	1
Flow control	None

## Operation

The eLoader device supports 3 levels of debugging that can be enabled using main dip switch (position 1 and 2) located on top side.

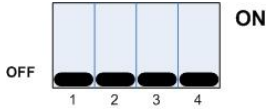
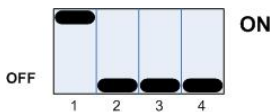

Debug Level	Description	Dip switch position
Level 0	Defines default debug level and prints only main information/header and status of each project	 OFF ON 1 2 3 4
Level 1	Includes extra debugging information like project header details.	 OFF ON 1 2 3 4
Level 2	Currently not used.	
Level 3	Includes full debug information. <b>WARNING:</b> Please use this option <b>ONLY</b> if you are advised by Amfeltec tech. support.	 OFF ON 1 2 3 4

Table 1: Debugging switch

## 6 Troubleshooting

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If any problem happened during operation with host PC, the error messages will be printed in a status bar. Please send the output as well as details about the project to AMFELTEC tech. support at [support@amfeltec.com](mailto:support@amfeltec.com).

### 6.1 Failed to establish connection

- Verify that eLoader device is connected. Please look Control Panel to verify that host computer recognize “eLoader” and check what port number assigned to it.
- Unplug eLoader device and plug it back. Check that green LED flashed 3 times
- Verify that DIP switch 4 is set to ON position during operation with the host PC

### 6.2 Failed to update firmware

- Verify that eLoader device is connected.
- Verify that firmware filename is original and didn't corrupted.

### 6.3 Failed to program target device

Try to enable different debug levels and verify the output. You can also capture this output and send it to AMFELTEC technical support team for verification ([support@amfeltec.com](mailto:support@amfeltec.com)).

## Appendix A. Target Devices and Interfaces

Depends of the type of “eLoader”, your selection of target device and interface you will need to provide following information to “eLoader”:

Parameter	Selection	Required data
Target Interface	XILINX FPGA/CPLG/PROM JTAG: TMS/TCK/TDI/TDO/TRST	<i>Data file:</i> File in XSVF format
Target Interface	FLASH/EEPROM I2C: SDA/SDC	<i>Data File:</i> File in specified format (Motorola S-Rec, HEX, binary). <i>I2C Cfg File:</i> I2C configuration file created by ELoaderConfig application (see Appendix C). <i>Verify Option:</i> Select check box for data verification.
Target Interface	FPGA Configuration Devices Altera EPCS1 Altera EPCS4 Altera EPCS16 Altera EPCS64 Altera EPCS128	<i>Data File:</i> File in .rbf or .rpd formats. <i>Verify Option:</i> Select check box for data verification

## Appendix B. 10-pin connector

The following figures show the pinout of 10-pin connector depending of selected target device and interface type.

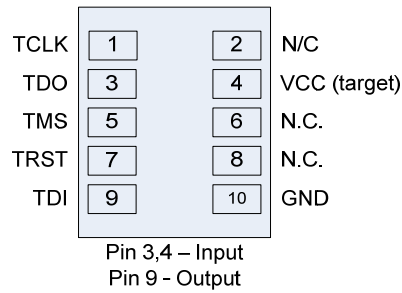


Figure 7: Pin-out for JTAG interface

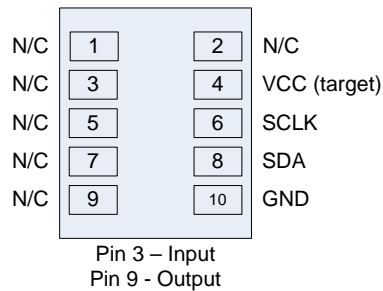


Figure 8: Pin-out for I2C interface

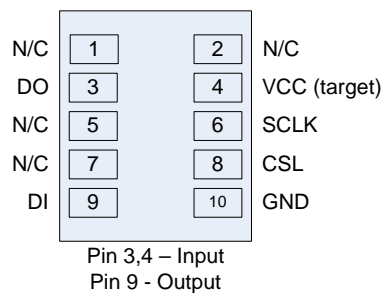


Figure 9: Pin-out for SPI interface

## Troubleshooting

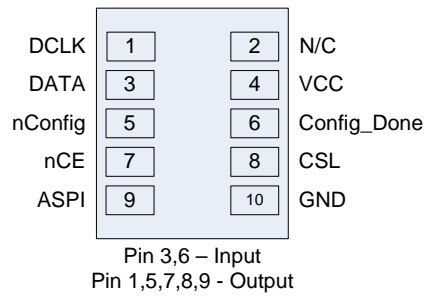


Figure 10: Pin-out for Altera FPGA/EPCSxxx devices

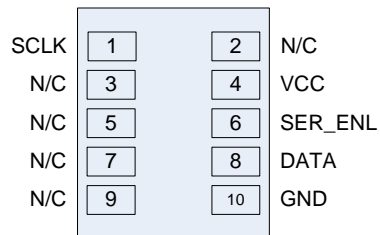


Figure 11: Pin-out for Atmel devices

Pinout 7 and 8, 7 and 9 can be combine together that will allow using one EasyLoader for target devices that has different interfaces (this option is supported by multiple projects).

## Appendix C. EasyLoader Configurator

EasyLoader configurator (*ELoaderConfig*) includes in an installation package. Execute ELoaderConfig (Figure 12).

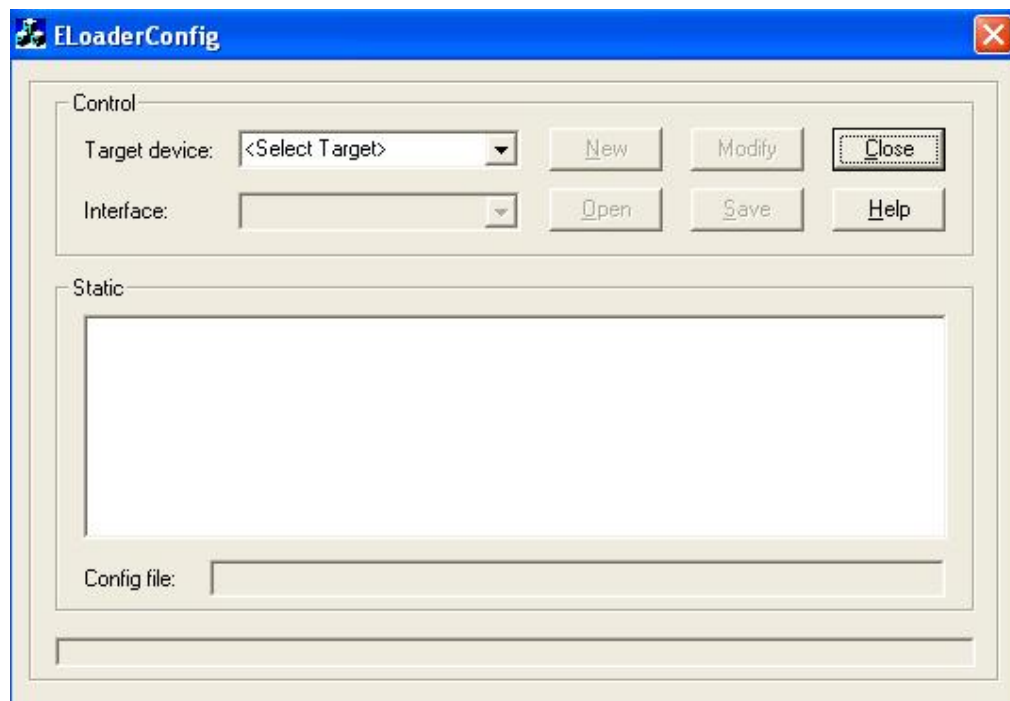


Figure 12: ELoaderConfig main dialog

Select *Target device* and *Interface type*. ELoaderConfig provides configuration only for the types that require special details of the target device.

The configuration program supports four commands: *New*, *Open*, *Modify* and *Save*.

The *New* command will open new dialog and ask you to answer all necessary questions about your target device. This information will be used later in order to properly program the target device.

The *Open* command will read previously created configuration file and will show it in a configuration window.

The *Modify* command will provide you options to modify the configuration parameters.

The *Save* command will save current configuration parameters into file.

### **I2C Configuration parameters**

The following list of parameter describe the required information about I2C target device that you need to provide in order properly program the device.

<b>I2C Parameter</b>	<b>Description</b>
Total flash memory size (Kbytes)	
Total flash address size (bits)	
Address bytes number (1/2/3)	
Flash page size (bytes)	
I2C control code (hex)	
I2C control code mask (hex)	
I2C control code shift (bits)	
I2C chip select (hex)	
I2C chip select mask (hex)	
I2C chip select shift (bits)	
I2C block address mask (hex)	
I2C block address shift (bits)	
I2C I/O noactive (hex)	
I2C not used byte value (hex)	
Clock frequency (kHz)	
Clock high time (tHigh) (ns)	
Clock low time (tLow) (ns)	
Start condition hold time (tHD_STA) (ns)	
Start condition setup time (tSU_STA) (ns)	
Data input hold time (tHD_DAT) (ns)	
Data input setup time (tSU_DAT) (ns)	
Stop condition setup time (tSU_STO) (ns)	
Bus free time (tBuf) (ns)	
Write cycle time (tWR) (ms)	