

ADQ Firmware Updater guide



TABLE 1: DOCUMENT HISTORY.

| Revision | Date | Description |
|----------|----------|---|
| A | 13-12-06 | Initial version (replaces earlier deprecated guide) |
| B | 14-11-26 | Addition of ADQUpdaterGUI section |
| C | 17-12-09 | Added note for ADQ7 |
| D | 19-06-28 | Updated for ADQ8 release |
| E | 22-01-12 | Editorial changes |

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2 INTRODUCTION TO ADQUPDATER

ADQUpdater (legacy version) is a command-line software tool that is used to upgrade firmware on ADQ digitizer products ADQ214, ADQ114, ADQ1600, ADQ412, SDR14, SDR14TX, and ADQ14. For other models please refer to 18-2059 “ADQUpdater_UsersGuide.pdf”.

On Windows, the ADQUpdater_legacy executable can be found in the SDK installation directory at:

Program Files/SP Devices/ADQUpdater/ADQUpdater_legacy.exe

On Linux systems, you can find the ADQUpdater_legacy package in the /packages folder of the SDK. Browse to your specific distribution and processor architecture, and install using the package manager of your distribution. The software can then be used via a terminal.

The executable will take as arguments a set of options and depending on the options used also numeric denominators for selecting target device and FPGA, and the path to a firmware file.

ADQUpdater_legacy has two modes of operation:

Default mode: Requires USB cable, can program digitizers that do not contain firmware

Partitioned mode: Can upload firmware via USB and PCIe, requires bootloader firmware on digitizer. The partitioned mode is described more fully in section 6.

3 COMMAND-LINE SYNTAX

The tool uses the following command-line syntax:

```
> ADQUpdater_legacy [OPTIONS] [<device number>:<fpga number>] [<filepath>]
```

The **device number** parameter indicates which digitizer you want to target in case you have multiple digitizers connected. The digitizers are 1-indexed. If you have multiple devices connected, use either of the list commands that are shown in the table below to figure out the number of the device you want to program.

The **FPGA number** parameter sets your target FPGA in case there are multiple FPGAs on the board.

For V5 products, the numbers are:

1 – Algorithm FPGA

2 – Communications FPGA

For V6 products, the sole FPGA is numbered:

1 – Main FPGA

Important note

The product lines which are not listed in this document section 1 have a different firmware updater program, called ADQUpdater. This application is located at:

Program Files/SP Devices/ADQUpdater/ADQUpdater.exe

It is not compatible with ADQUpdater_legacy or ADQUpdaterGUI.



4 COMMAND-LINE OPTIONS

| Option | Usage | Requires fpga/device number? | Requires firmware file path? |
|----------|---|------------------------------|------------------------------|
| e | Erase the target area of the FLASH firmware memory. This must be done when uploading new firmware. <i>NOTE: On V5 products this is handled automatically during upload and the “e” option is not required.</i> | Yes | |
| u | Uploads a .mcs firmware file to the FLASH memory. If used together with the “p” option, the firmware is uploaded to a specific partition. | Yes | Yes |
| v | Verify the uploaded firmware against a local firmware file. If used together with the “p” option, firmware from a specific partition is verified. | Yes | Yes |
| l | List available devices, without attempting to communicate with them. This mode will display device names and bus/slot information for the hardware USB/PCIe interface. The device-number command line argument to ADQUpdater should match the number of your target device in this list. | | |
| L | List available devices with extra information, by communicating with each board. Information such as FPGA type, serial number, firmware revisions, etc will be shown. This requires working firmware on each board. | | |
| p | Enables partitioned mode. Must be used together with one or more other options, such as “e” and/or “u” to perform a specific task in partitioned mode. The partitioned mode requires a bootloader to be present on the digitizer. Using this mode is faster than the normal mode, allows update via PCIe as well as USB, and is also fail-safe. More information on this mode is available in section 6. | | |
| o | Overwrite bootloader. This option may be used together with the partitioned mode option “p” and erase/upload options “eu” to overwrite the bootloader partition with new bootloader firmware. This is not fail-safe, and should normally not be required. | | |
| r | Display the revision of the updater tool | | |
| i | Identify the device by blinking the power led and print out currently running FPGA code (Bootloader or Firmware) and revision. | | |
| f | Force upload, overriding any warnings occurring during the .mcs file parsing or mismatch in information readout from the target digitizer. | | |
| t | A verification test that checks whether or not the digitizer has a bootloader partition. | Yes | |
| T | A verification test that checks whether or not the firmware on the board can be successfully booted and configured from the API. | Yes | |
| b | Reboot the current running fpga code on the device (similar to t and T option, but the device stays in the same partition it started from afterwards) | Yes | |

5 COMMON USE CASES

In all the use cases below, make sure you are not connected to the board via the C/C++-API, Matlab, ADCaptureLab or similar before running ADQUpdater_legacy.

5.1 Upgrade your current firmware

You have received a .mcs-file containing new firmware and would like to upgrade the firmware on your digitizer. Attach a USB cable to your device, open a command line prompt in the ADQUpdater folder, and use the following instructions:

```
> ADQUpdater_legacy l (list your devices)
```

You will see a list such as this:

| Dev# | VID | PID | HWIF | Name | Family | FPGAs |
|------|------|------|------|--------|--------|-------|
| 1 | 1D73 | 0014 | USB | ADQ412 | V6 | 1 |
| 2 | 1D73 | 001B | PCIE | SDR14 | V6 | 1 |

Note down the Dev# of the device you are interested in (here assumed to be #2).

```
> ADQUpdater_legacy eu 2:1 path/to/firmwarefile.mcs (erase the flash memory, and upload the firmware)
```

5.2 Install a bootloader

You have received a bootloader firmware file and you would like to start using the bootloader to upload firmware via PCI-express. Attach a USB cable to your device (you can leave the board inside the PCIe slot), open a command line prompt in the ADQUpdater folder, and use the following instructions:

```
> ADQUpdater_legacy l (list your devices)
```

If your device is connected via both PCIe and USB, you should see something similar to this:

| Dev# | VID | PID | HWIF | Name | Family | FPGAs |
|------|------|------|------|--------|--------|-------|
| 1 | 1D73 | 0014 | USB | ADQ412 | V6 | 1 |
| 2 | 1D73 | 0014 | PCIE | ADQ412 | V6 | 1 |

Note down the number of the USB entry for your unit (here #1).

```
> ADQUpdater_legacy eu 1:1 path/to/bootloader.mcs (erase the flash memory, and upload the bootloader)
```

Once the programming is done, you can de-attach the USB cable. You can now reboot your computer to re-enumerate the PCIe device. This step does not need to be re-done, the bootloader upload is intended as a one-time event.

5.3 Use the bootloader to upload firmware via PCIe

```
> ADQUpdater_legacy l (list your devices)
```

| Dev# | VID | PID | HWIF | Name | Family | FPGAs |
|------|------|------|------|--------|--------|-------|
| 1 | 1D73 | 0014 | PCie | ADQ412 | V6 | 1 |

```
> ADQUpdater_legacy t 1:1 (test to see that bootloader is working properly)
```

```
> ADQUpdater_legacy eup 1:1 path/to/firmwarefile.mcs (upload your firmware via the bootloader)
```

You do not need to reboot the computer after this, and can start using the new firmware immediately.

6 PARTITIONED MODE AND THE BOOTLOADER CONCEPT

The default mode of operation for ADQUpdater_legacy uses the on-board USB chip to program the FLASH memory. This is a fairly slow process, and also means that users with digitizers connected via PCIe/PXIe will have to attach a USB cable whenever firmware needs to be upgraded.

To deal with these issues, the partitioned mode and the bootloader concept were introduced to the ADQ digitizers. A bootloader is a slimmed down FPGA firmware, containing only the necessities for communicating via PCIe or USB, and for programming the FLASH firmware and reconfiguring the FPGA from a new FLASH address.

Due to the small size of the bootloader, the initial FPGA boot after power-on is, which means that the bootloader will also help with enumeration issues for PCI express, where the host computer in some systems boots too fast and attempts to enumerate the bus before the FPGA has initialized completely.

The programming syntax is the same in partitioned mode, but with the addition of the “p” option. If no bootloader is detected, the updater software will first attempt to reboot the FPGA from memory address 0, in case it is currently running the firmware partition. If no bootloader is detected even after the reboot, the upload will fail.

The updater preserves the enumeration info in the FPGA across firmware uploads, so there is no need to reboot the computer after doing a partitioned mode upload.

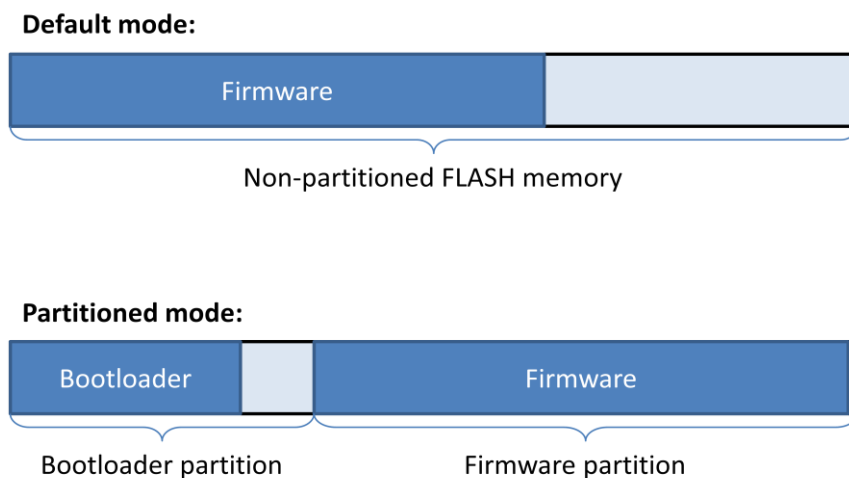


Fig 1. Comparison of FLASH memory usage for default and partitioned modes

In order to receive bootloader firmware for your digitizer, please contact SP Devices. The bootloader firmware must be uploaded once via USB-cable using the default ADQUpdater_legacy mode before the partitioned mode can be used. For a guide on using the bootloader, see sections 5.2 and 5.3.

7 COMPATIBLE SOFTWARE AND FIRMWARE REVISIONS

The ADQUpdater_legacy software contains all the features in this document as of the following SDK revisions:

- Windows: 12819
- Linux: 13178

When using bootloader mode, the actual firmware that is uploaded requires certain features in order to be able to reboot back to the bootloader partition. Therefore, it is only recommended to upload firmware with revisions higher than 11122 using the bootloader mode.

8 ADQUPDATERGUI (GRAPHICAL USER INTERFACE) [WINDOWS ONLY]

ADQUpdaterGUI has been replaced by ADQAssist from SDK version 56030. Please consult the ADQAssist User Guide instead.