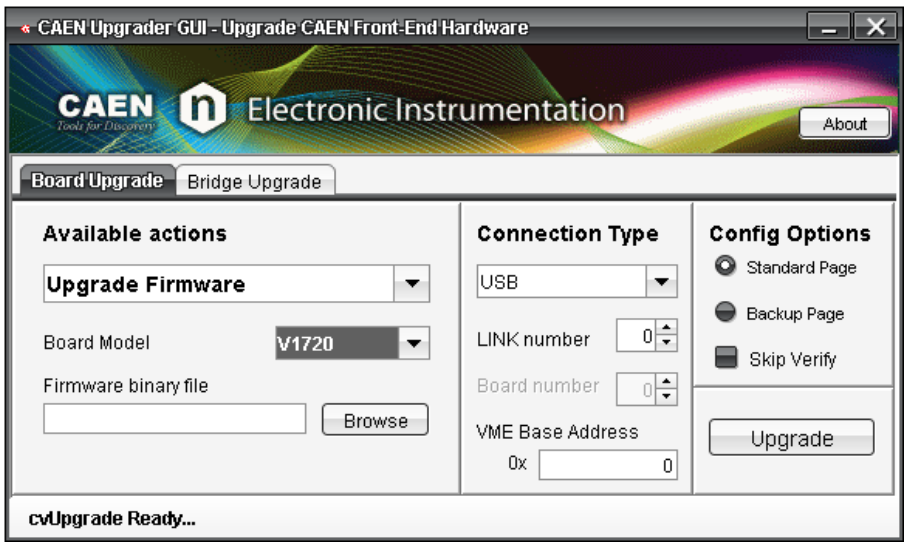
CAEN
Tools for Discovery

Electronic Instrumentation



GDGD2512

CAENUpgrader QuickStart Guide

Rev. 6 - 18 February 2013

Purpose of this Guide

This QuickStart Guide contains the basic information and examples that will let you use CAENUpgrader in few steps.

Change Document Record

Date	Revision	Changes
18 May 2011	00	Initial release.
19 July 2011	01	§UPGRADE PLL Modified: added note on PLL configuration file for DT/NIM boards
16 February 2012	02	§Reference Documents Extended. §System requirements & installation setup Modified. “Link number” parameter definition changed in §Appendix A.
06 June 2012	03	Updated §System requirements & installation setup
06 September 2012	04	Updated Chapter 3
03 December 2012	05	Updated §Firmware Upgrade
18 February 2013	06	Updated Chapter 1

Symbols, abbreviated terms and notation

DPP	Digital Pulse Processing
SBC	Single Board Computer

Reference Documents

[RD1] UM1934 - CAENComm User & Reference Manual

[RD2] AN2472 - CONET1 to CONET2 migration

[RD3] UM1935 - CAENDigitizer User & Reference Manual

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1 Introduction

This CAENUpgrader Quick Start Guide contains the basic information and guidelines for letting you use CAENUpgrader in few steps.

CAENUpgrader is a software composed of command line tools together with a Java Graphical User Interface (for Windows and Linux OS). It reunites all the functions included in cvUpgrade, CAENBridgeUpgrade and PLLConfig programs. In few easy steps you will be able to perform the following main functions on your board:

- upload different firmware versions
- verify the firmware upload success
- manage the PLL configuration upgrade
- get board information
- get the current firmware version
- manage the firmware license

and on your bridge:

- upload different firmware versions
- get the current firmware version

Here below the table of the supported boards and bridges:

Boards	Bridges
CAEN Digitizers (VME, VME64X, NIM, Desktop) and DT5780 (Digital MCA)	VME/VME64X-USB2.0 Bridges (V1718, VX1718)
VME /VME64X TDC family	VME/VME64X-PCI CONET Bridges (V2718, VX2718)
General Purpose VME Board (V1495)	PCI CONET Controller (A2818)
VME Power Supply Units (V65xx)	PCI Express CONET2 Controller (A3818)
TPC Readout System (SY2791)	A2719 Internal Controller for V2718

Tab. 1.1: List of the supported CAEN boards and Bridges

Note: If you have a VME64X board or bridge, any action supported in CAENUpgrader has to be performed referring to the correspondent VME model.

System requirements & installation setup

OS	OS version	CAEN Libraries required	Third-party software required
Windows	XP/Vista/7 32 and 64-bit	CAENComm CAENVMELib[1]	Java Java[2] Runtime Environment 6 or later. You can download from http://www.java.com
Linux	32 and 64-bit	CAENComm (1.02 or later) CAENVMELib (2.22 or later)	

[1] *CAEN libraries are locally installed by the CAENUpgrader Installer.*

[2] *Java is a registered trademark of Oracle, Inc.*

Tab. 1.2: Host PC requirements

CAENUpgrader stands on the third-party software listed in the **Tab. 1.2**. For the program installation do as follows:

- Go to CAENUpgrader web page:

  Home / Products / Firmware/Software / Software Tools / Configuration Tools / CAENUpgrader.
- Download the CAENUpgrader software package related to your OS in the "Download" tab.
- Uncompress the downloaded package.
- **For Windows users:** launch the CAENUpgrader Setup executable file, then follow the installer instructions. Note that this is a standalone version which installs locally all the required libraries (see **Tab. 1.2**) and doesn't need them to be installed apart by the user.
- **For Linux users:** before to install the CAENUpgrader, the installation of the CAEN required libraries is needed. Click on the red link above the CAENUpgrader package in order to download them.

Fig. 1.1: Additional CAEN libraries required by CAENUpgrader to be installed apart in Linux environment

Because of CAENComm is based on CAENVMElib, it is necessary to install CAENVMELib on your PC before installing the CAENComm. Now, install CAENUpgrader by following the installation instructions within the README file inside the package.

2 Board Connection

CAENComm library (see [RD1]) allows CAENUpgrader to access the target board via USB or via CAEN proprietary CONET optical link, using the following channels of communication:

- PC => USB => CAEN Front-end Modules with USB 2.0 interface:
  - CAEN Waveform digitizers with USB interface (NIM/Desktop form factors)
- PC => PCI (A2818) or PICe (A3818) => CONET => CAEN Modules with Optical link:
  - Waveform digitizers (VME, NIM/Desktop form factors)
  - SY2791 TPC Readout System
- PC => USB => V1718 => VME => CAEN Slave VME Modules:
  - CAEN VME waveform digitizer, CAEN VME TDCs V1190, V1290, General Purpose V1495, Power Supply Units V65xx
- PC => PCI (A2818) or PICe (A3818) => CONET => V2718 => VME => CAEN Slave VME Modules:
  - CAEN VME waveform digitizer, CAEN VME TDCs V1190, V1290, General Purpose V1495, Power Supply Units V65xx

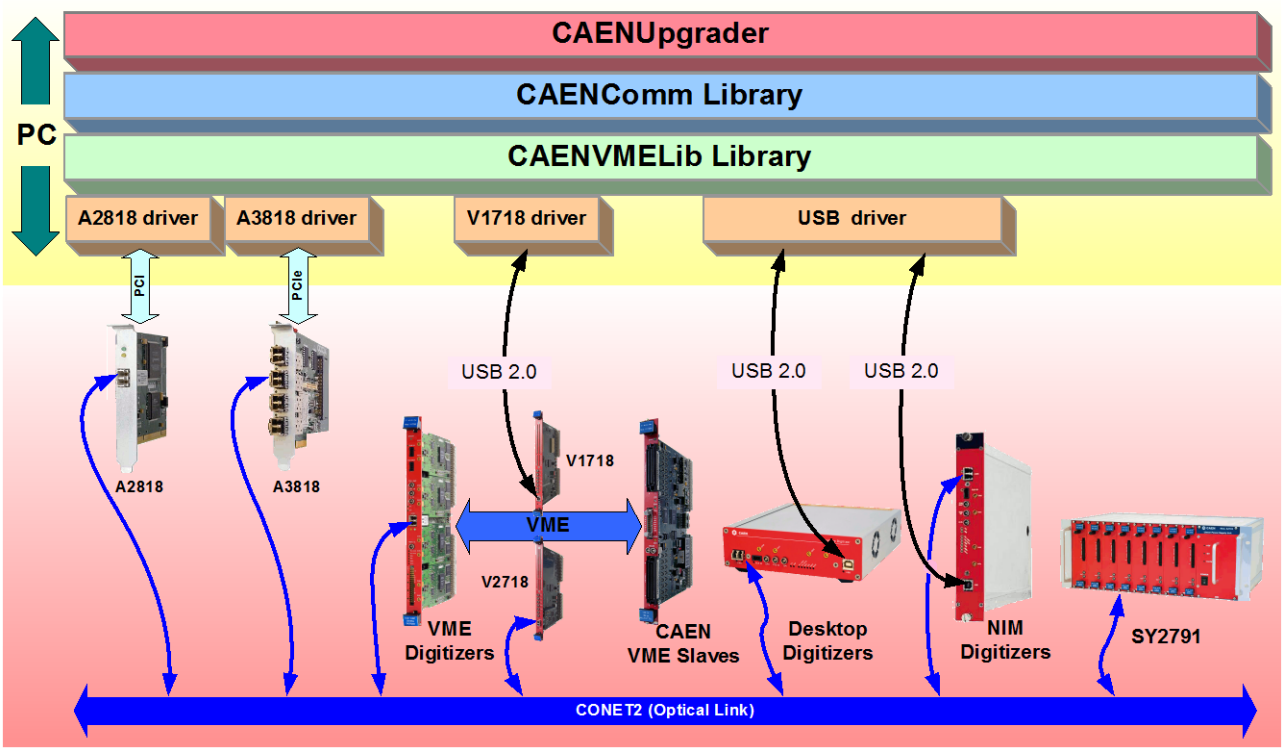


Fig. 2.1:PC-to-CAEN Board connection options

Note: In case of optical master and slave connection, be sure that they both are provided with the same CONET protocol version, in order to avoid system failures. CAEN makes two versions available, CONET1 and the new CONET2, which is not compatible with CONET1. Please refer to [RD2] reference and to the User Manual of your optical board or bridge for more detailed information.

Direct Link to the Module via USB

Desktop and NIM versions can be directly handled via USB as well, just connecting the digitizer to the host PC via the USB cable. The USB driver compliant to the architecture of your PC processor can be downloaded at the Digitizer web page.

Direct Link to the Module via Optical Link

Every CAEN Digitizer can be controlled directly via Optical Link; for this purpose a CAEN PCI or PCIe Controller (Mod. A2818 and A3818) is required, as shown in **Fig. 2.1**. See the web pages of A2818/A3818 for more info.

In this case, the slave unit must be connected to the featured master controller via the optical fibre cable (see the Ordering Options of the controller).

A2818 PCI Controller with Optical link (requiring just a host PC with a free PCI slot)	**A3818** PCIe Controller with Optical Link (requiring just a host PC with a free PCI slot)
	

Tab. 2.1:CAEN Optical Bridges

Link through a VME Bridges

VME Digitizer Boards can be controlled via VMEbus through a VME bridge (see **Fig. 2.1**).

Two CAEN bridges are available:

V1718 / VX1718 with USB interface (requiring just a host PC with a free USB port)	**V2718 / VX2718** with Optical Link (requiring Mod. A3818 or A2818 controller)
	

Tab. 2.2:CAEN VME Bridges

Note: If you want to use a VME bridge from another manufacturer or a SBC you have to provide a CAENComm-like library. Please refer to the Application Notes AN2472 [RD2].

3 Getting Started

This Section is intended to let you dial with the main features of CAENUpgrader step by step. For this purpose, **CAENUpgrader software** in **Windows** environment, the **DT5724 desktop digitizer board** with **USB** connection, the **V1731, V1751**and **VX1724 VME digitizer boards** have been selected as examples.

Fig. 3.1:CAEN DT5724,V1731,V1751 and VX1724 digitizers.

Next paragraphs highlight the main functions provided by CAENUpgrader after you have performed two basic actions:

- turn on the digitizer and connect it to the PC;
- launch the **CAENUpraderGUI.jar** file.

You will see a two-tab GUI interface with the only "**Available actions**" control box active, both for "**Board Upgrade**" and for "**Bridge Upgrade**" tab. This is the philosophy CAENUpgrader has been built on: different options will appear according to the action chosen in order not to confuse the user.

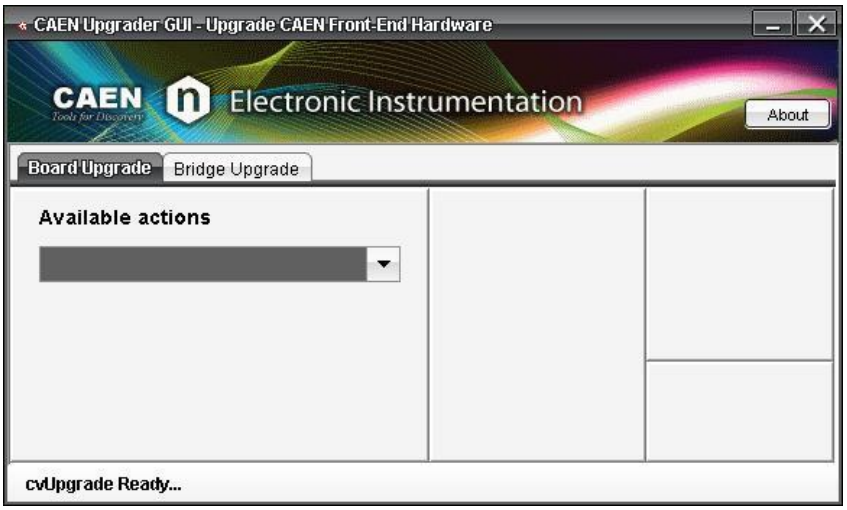


Fig. 3.2:CAENUpgrader's GUI main window

CAENUpgrader GUI Functions Overview

GET INFORMATION (only for boards)

This function allows a file to be generated on your computer containing all the main information related to your board that can be needed when a request for firmware license is performed by the user (see the proper section on this guide).

From the "**Board Upgrade" tab**, perform the following steps:

- Select the "**Get Information**" option in the "**Available actions**" scroll menu: the "**Board's Model"** box will appear right below.
- Select your board model in the "**Board's Model"** scroll menu; in our example we selected a **DT5724**.

This last action makes new commands appear. Let's focus on them from left to right:

- Browse your hard disk by the **"Browse"** button and set the "**Board Info output folder",** which means where to save the board info file on your computer. For the sake of simplicity, in this example we save it in the desktop folder.
- **"Connection Type**" control box will let you select the type of connection you are using (in our example, USB).
- **"LINK number"** allows for choosing between different boards/bridges linked to your computer, if you are using more than one connection link. In our example we leave this field set to **0**, which is the default value when there is only one link available.

It can be noticed that other two commands, "**Board number"** and "**VME BASE Address"** appear as shaded and not selectable, as they are not needed when using the DT5724 board through the USB connection. A detailed description of the connection parameters is given in the Appendix at the end of this guide.

- By clicking on the "**GetInfo**" button, a message will appear telling you that the board information file has been created. Follow the path you chose before and you will find a .dat file, in our example called "**BoardInfo-DT5724-xx.dat**", where xx is the serial number of the board.

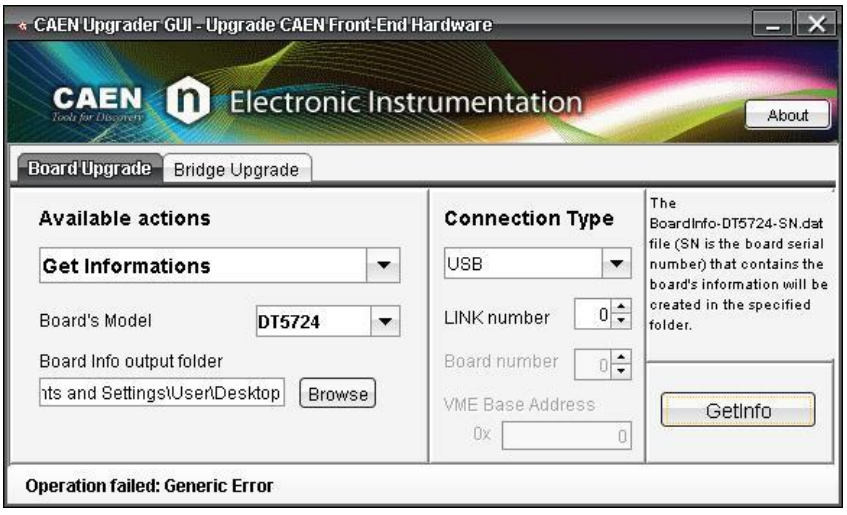


Fig. 3.3:CAENUpgrader's "Get Information" box

This example was intended to show you how CAENUpgrader works concerning the "**Get Board Information**" function. Next sections will describe the complete set of CAENUpgrader's functionalities.

GET FIRMWARE RELEASE (for digitizers and bridges)

By this function, it is possible to retrieve from the digitizer or the bridge the information about the current firmware release running on it.

- According to the target board, select "**Get Firmware Release**" in the "**Available actions**" scroll menu of CAENUpgrader's "**Board Upgrade**" or "**Bridge Upgrade**".
- Insert the target model in the appearing "**Board's Model**" or "**Bridge Model**" box. This action will make other commands be visible.
- Type the proper connection parameter settings. In the example, the V1751 is addressed by the A3818 PCIe Controller using the Optical Link, so Connection Type = OPTLINK.
- Press "**Get FW Rel**" button to retrieve the information.

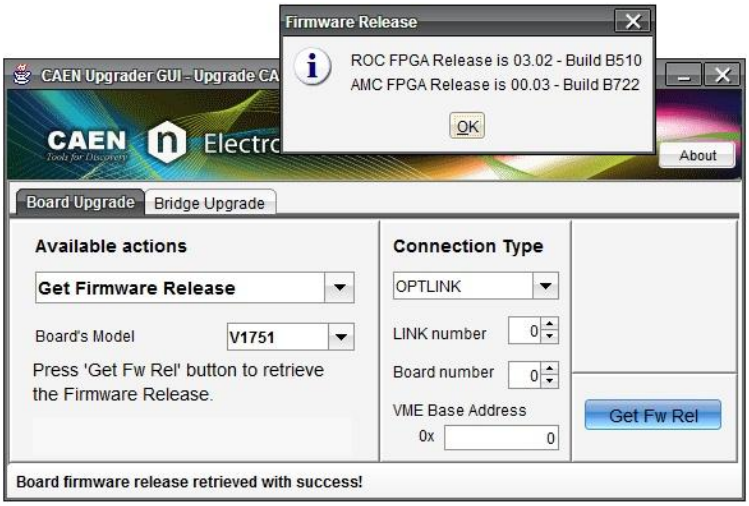


Fig. 3.4: CAENUpgrader's "Get Firmware Revision" box

FIRMWARE UPGRADE (for boards and bridges)

CAENUpgrader can manage the firmware upload on every CAEN board and bridge that may need it. For firmware has to be intended the standard firmware (related to boards and bridges) and CAEN's Digital Pulse Processing (DPP) firmware, specifically dedicated to different applications and running only on Digitizer boards. The programming file for a module can be downloaded at the module's web page. In particular, the DPP firmware is downloadable in a "trial" version, functionally fully opened, but the Digitizer can run the DPP algorithms for a limited time of 30 minutes, then a power cycle of the board is required for another 30-minute use.

CAEN makes two different programming file types available with **.rbf** and **.cfa** extensions.

Note: the exception is the PCIe Controller A3818, whose programming file has **.bin** extension. The upgrade firmware procedure of a A3818 through the CAENUpgrader tool is described in the A3818 User Manual

The **.rbf** file is a programming file used for standard firmware and for DPP firmware.

The new **.cfa** file, now available only for digitizers, is a sort of archive format file aggregating all the standard firmware files compatible with the same family of digitizers. This means, taking the x724 family as an example, that a single **.cfa** file is needed in order to upgrade the standard firmware either on a V1724 (VME), or on a DT5724 (Desktop), or on a N6724 (NIM) digitizer. The **.cfa** file features also heuristics, so that CAENUpgrader will inform the user when he is trying to upload a firmware not compatible with the target digitizer.

UPGRADING THE STANDARD FPGA

Let's see how to upgrade the standard firmware on the example board DT5724 using a **.rbf** file (the differences in using a **.cfa** file are shown in parenthesis):

- Select "**Upgrade Firmware**" in the "**Available actions**" scroll menu of CAENUpgrader's "**Board Upgrade**" tab and insert your board model in the appearing "**Board's Model"** box. This action will make other commands be visible.
- Click on the '"**Browse**" button, select the "***.rbf**" option in the 'File type' scroll menu of the 'Browse' window ("***.cfa**" is set by default) and seek on your hard disk the programming file previously downloaded. In the example, we used a **.rbf** file for a DT5724 board, which is the standard firmware version CONET2 compliant (in case of **.cfa** option, the file for the x724 digitizer family has to be used).

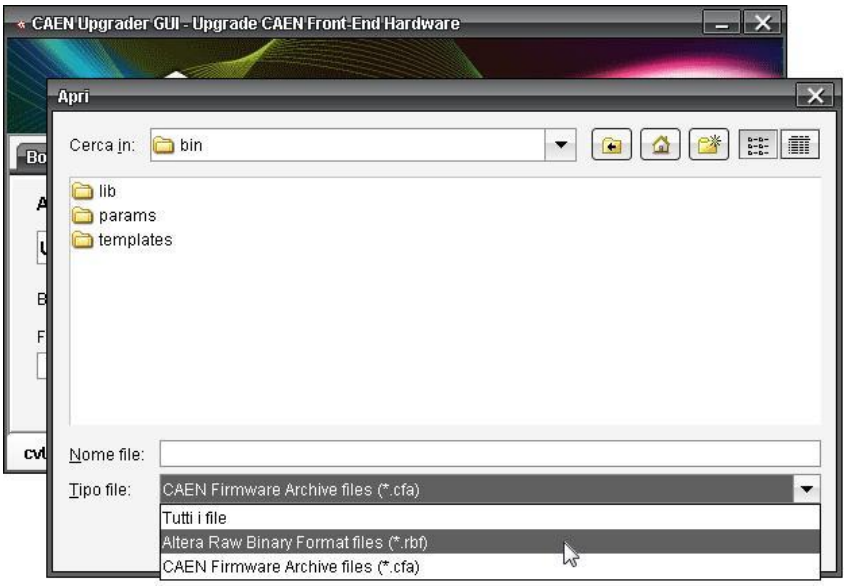


Fig. 3.5: Firmware file type selection in the 'Browse' window

- Select the **.rbf** file you have downloaded. In our example it is called: "**dt5724_n6724_rev_3.1_0.11.rbf**" ("**x724_standard_3.1_0.11.cfa**" in case of **.cfa** file).
- A pop-up window will warn you that CAENUpgrader can't check if the **.rbf** file you are using matches your target module. Press "**OK**" to continue.

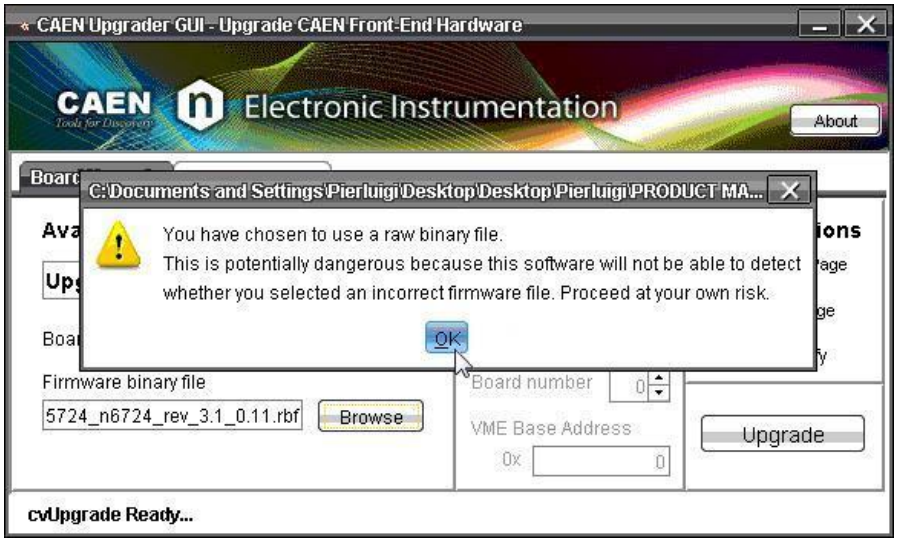


Fig. 3.6: Warning message uploading a .rbf file.

- Set Connection Type to USB.
- The "**Config Option**" menu at the top right of the GUI let you choose in which page of the board's memory the firmware will be saved. By selecting "**Standard Page**", the firmware will be saved in the section of the board memory that is loaded by default at the digitizer start-up. In our example this option has been chosen.

Note: It is strongly recommended to upgrade the firmware selecting always the "**Standard Page**" option. If any failure occurs during the upgrade, please contact support.nuclear@caen.it

- Click on the "**Upgrade**" button to upgrade the firmware. After few seconds a pop-up window with a successful upgrade message will appear (if you're uploading a **.cfa** file, in case of mismatch between the firmware and the target board, the software will show an error message).
- Power cycle the board to load and use the new firmware.

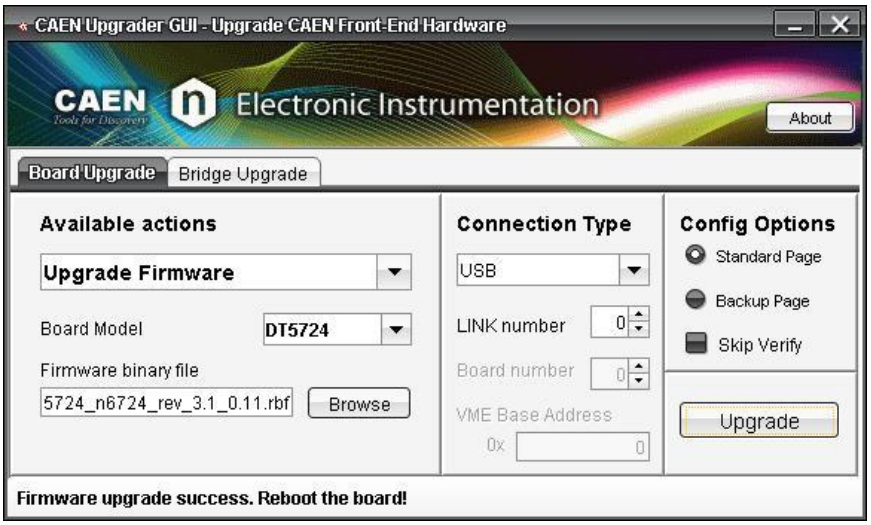


Fig. 3.7:CAENUpgrader's "Upgrade Firmware" box for CAEN boards

In particular, the procedure above described can be referred to also for the V1718 bridge (by selecting in this case the "**Upgrade Firmware**" action in the "**Available actions**" scroll menu of the "**Bridge Upgrade**" tab). Regarding other bridges like the A2818 and the V2718 (and so for its piggy back A2719), an example of firmware upgrade using CAENUpgrader is reported in [RD2].

UPGRADING BACKUP FPGA

CAENUpgrader allows for upgrading also the backup FPGA. The procedure is the same as for the standard page except for selecting the "**Backup Page**" option.

Please, refer to the "Firmware Upgrade" paragraph, within the User Manual of your board, for details about the use of the Backup FPGA.

VERIFY FIRMWARE UPGRADE (only for boards)

This function verifies that the firmware has been correctly loaded on your board:

- Select the "**Verify Board firmware"** option from the "**Available actions**" scroll box in the "**Board Upgrade**" tab
- Insert DT5724 as Board's Model.
- Browse through the "**Browse**" button for the binary file you have just loaded and click on the **"Verify"** button. The "**verification passed!**" message will appear.

STORE PRODUCT UNLOCK CODE (only for boards)

CAEN Company makes different Digital Pulse Processing firmware be available for those CAEN digitizers which support them. These DPPs are freely downloadable in a “trial” version, complete in terms of functionalities but operating only for 30 minutes per board power cycle.

If you want to unlock the firmware, you need to buy a license by sending to CAEN a formal purchase request specifying the product code of the DPP you want to buy (findable at the DPP web page).

Here follow a step-by-step example of the procedure you need to perform in order to have your DPP firmware unlocked for example on a **V1724** digitizer (supporting DPP TF):

- Once you bought a License, a License_ID code will be specifically generated by CAEN and sent you through an e-mail. This code is directly associated to the DPP product code you indicated in your request.
- If you haven’t the DPP firmware already uploaded on your board, in the e-mail you will found how to download the trial version. Then, refer to the **Upgrade Firmware** section of this guide for loading it on your board. On the contrary, jump to the step below.
- The e-mail will address you by an active link to the ’Web License’ page on CAEN website.

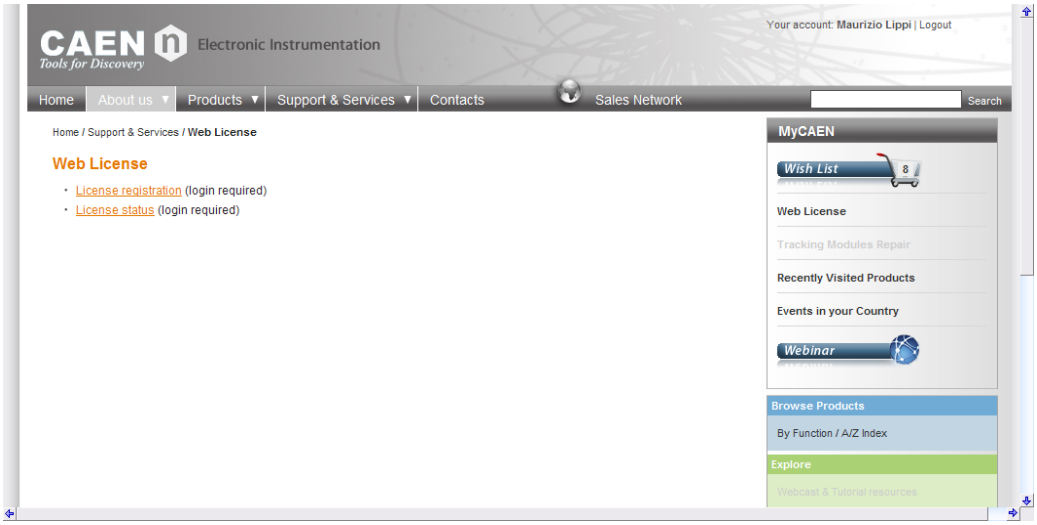


Fig. 3.8:‘Web License’ page on CAEN website

- Click on the ‘License registration’ link (**login required**) and select the module in your posses in three simple steps.

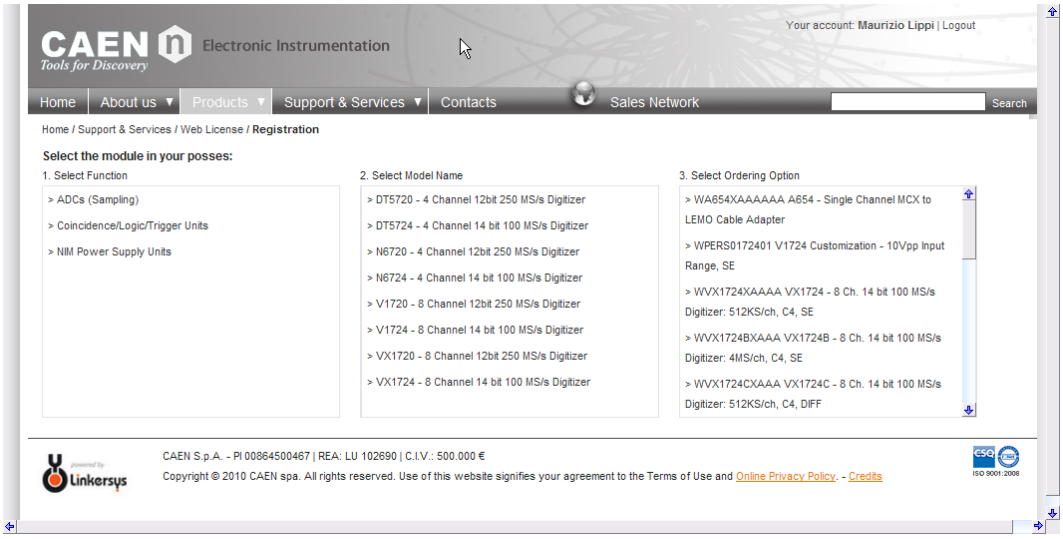


Fig. 3.9: Module detailed selection

- Submit the Activation Request after you’ve filled in the appearing Registration form with the given License_ID and the module Serial Number.

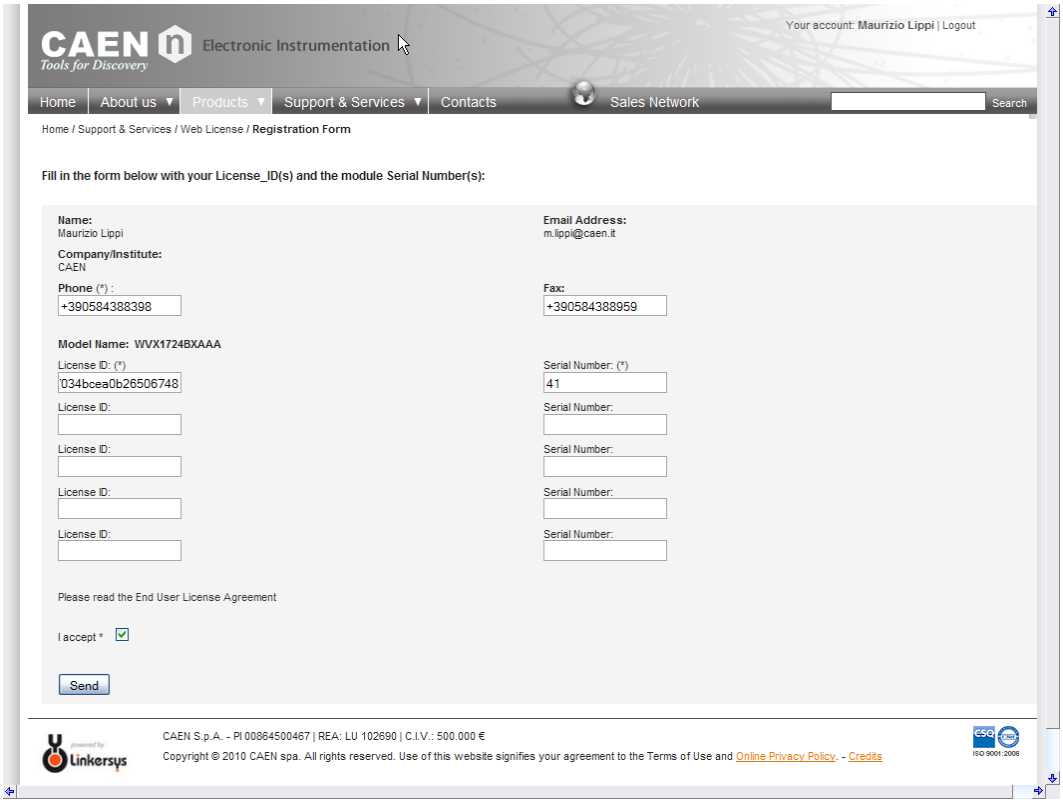


Fig. 3.10: Registration form

- From this moment you can monitor the status of your license in the 'License Status' webpage (**login required**).

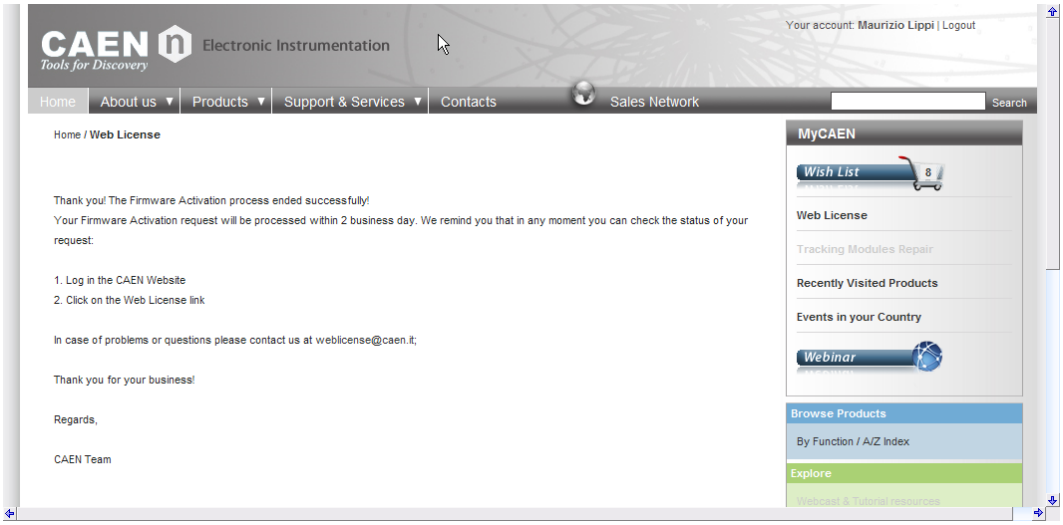


Fig. 3.11: Registration request's confirmation page

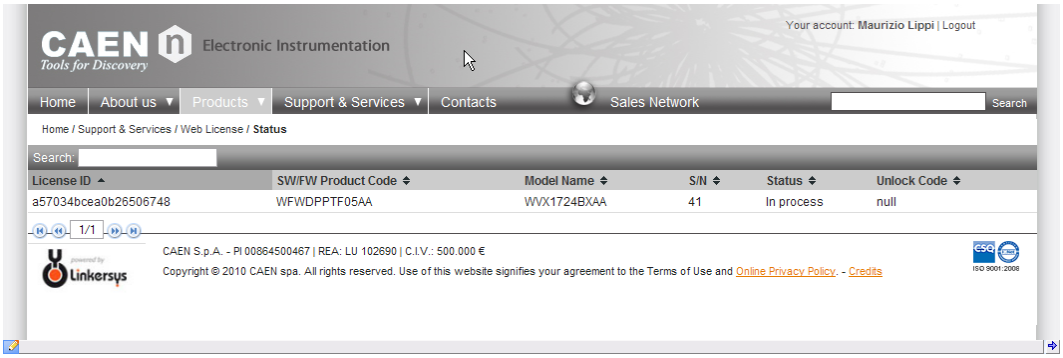


Fig. 3.12:'License Status' Web Page

- As soon as your request is processed, CAEN releases the Product_Unlock_Code. Its availability will be notified by email and on the website in the 'License Status' page.

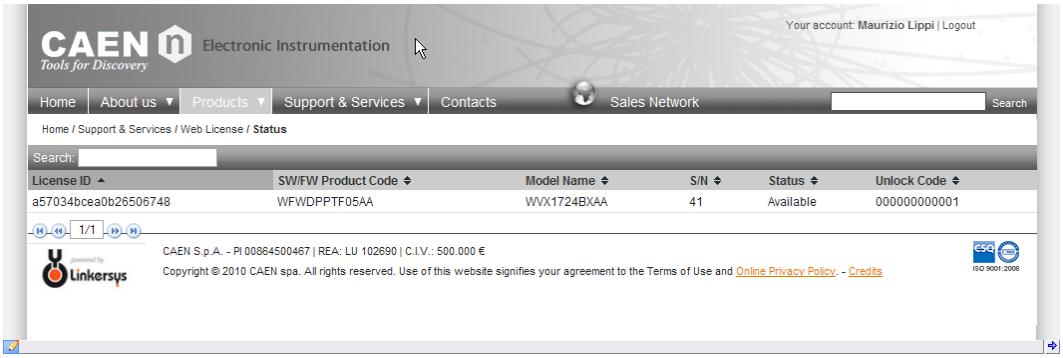


Fig. 3.13:Product Unlock Code availability at 'License Status' Web Page

Once the PUC is available, you can use it with CAENUpgrader to unlock the firmware on your module:

- Select the "**Store Product Unlock Code**" action in the "**Available actions**" scroll menu of CAENUpgrader's "**Board Upgrade**" tab.
- Insert your board model.
- Type the PUC, copied from the 'License status' webpage, in the "**Product Unlock Code value"** box.
- Select the proper connection type and click on the "**Store PUC**" button to unlock the firmware. A message will notify you about the outcome of the action.

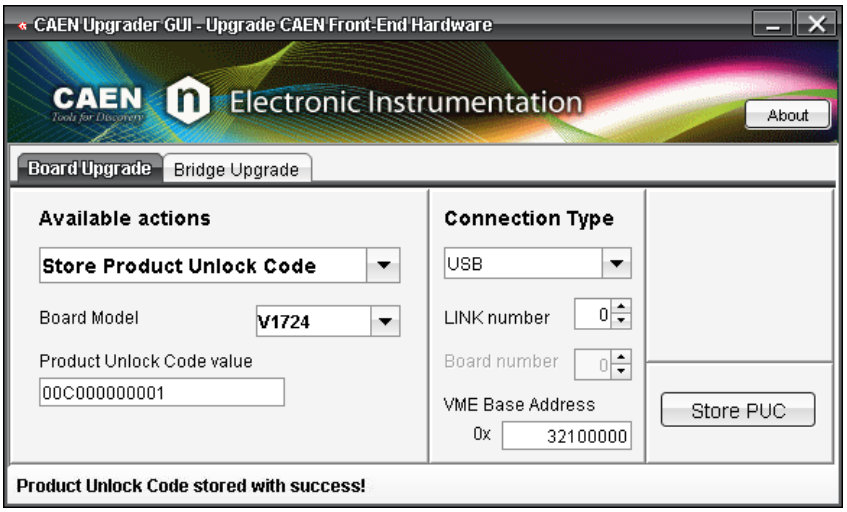


Fig. 3.14:CAENUpgrader's "Store Product Unlock Code" box

After a power cycle your firmware will be ready to use with no time restriction.

GET PRODUCT UNLOCK CODE (only for boards)

If you need to retrieve the Product Unlock Code of the DPP firmware on your board, you can do that by the "**Get Product Unlock Code**" action in the "**Board Upgrade**" tab. Set your board model and the proper connection type and click on the "**Get PUC**" button. The PUC will be displayed under the "**Board's Model**" box.

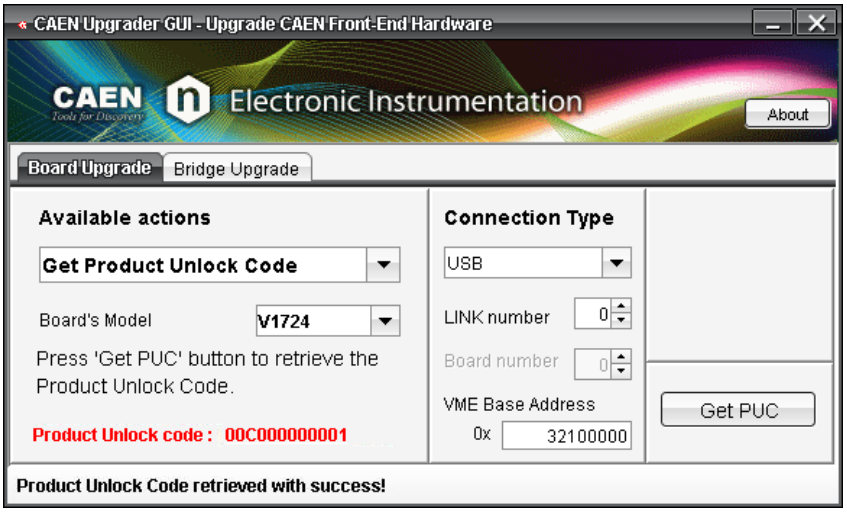


Fig. 3.15:CAENUpgrader's "Get Product Unlock Code" box

DELETE PRODUCT UNLOCK CODE (only for boards)

This command will delete the unlock code from your board, getting the uploaded DPP firmware back tot he 'trial' version. Select "**Delete Product Unlock Code**" action in the "**Board Upgrade**" tab. Set the proper connection type and click on the "**DeletePUC**" button.

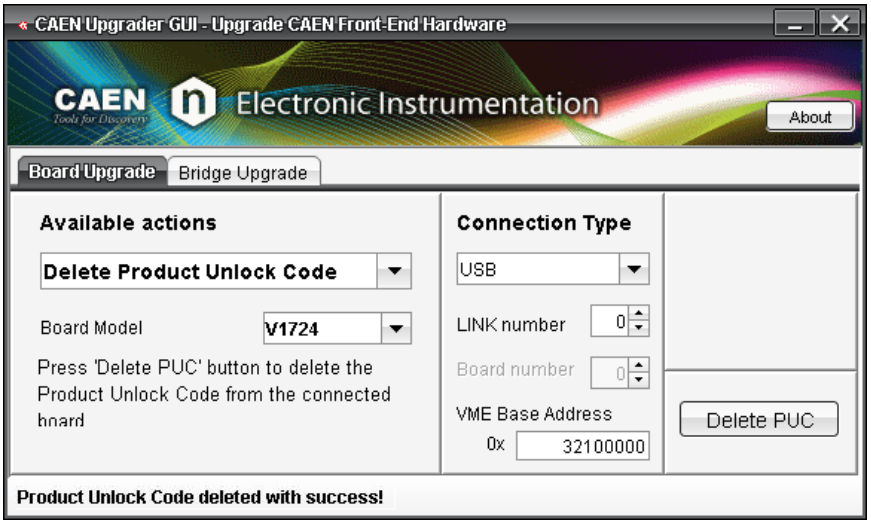


Fig. 3.16:CAENUpgrader's "Delete Product Unlock Code" box

UPGRADE PLL

CAENUpgrader's "**Upgrade PLL"** action allows you to upgrade the PLL configuration on CAEN Digitizers with customized settings.

- Select the "**Upgrade PLL**" action in the "**Available actions**" scroll menu of CAENUpgrader's "**Board Upgrade**" tab.
- Insert your board model in the "**Board's Model**" box. In the example we chose the V1731 board. New commands will appear.
- You can now use the "**Browse**" button to load a PLL configuration file (.rbf) already present on your computer, or you can generate the file by the PLL settings window opening up once you click on the "**New**" button (active only for supported board models).

Note: CAENUpgrader allows the User to create a new PLL Configuration file only for VME digitizers, whereas DT/NIM boards can only load files generated by CAEN. If you need the creation of a PLL configuration file, please contact CAEN Support: support.nuclear@caen.it

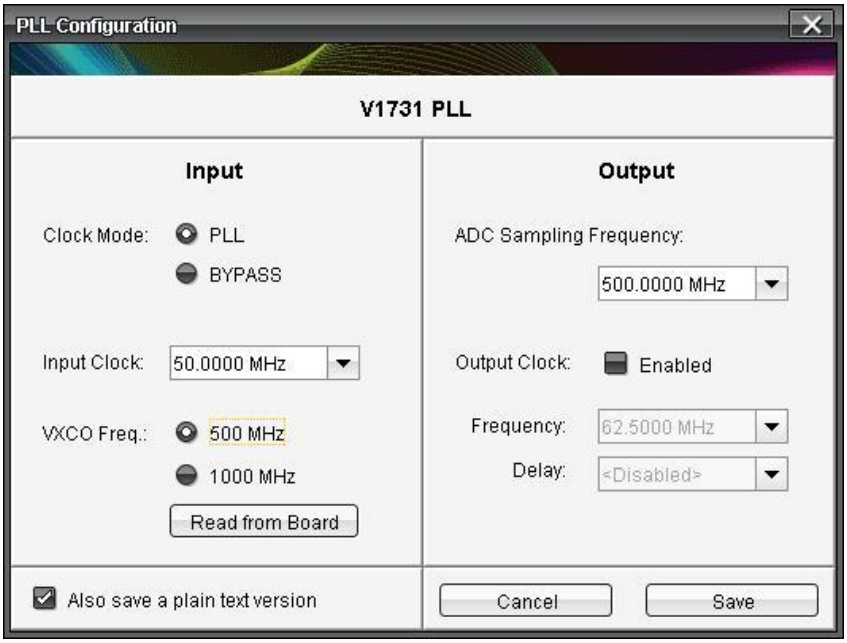


Fig. 3.17:CAENUpgrader's PLL settings window

- Once the PLL configuration has been set according to your purposes, you can save the configuration file on your computer by clicking on the "**Save**" button. Automatically the PLL settings window disappears and the file is loaded in the "**PLL upgrade file**" box.
- Select the connection type: as in the example the V1731 board is connected to the computer through the CAEN USB V1718 bridge, the USB connection has to be set; type in the appropriate box the VME Base Address of the target VME digitizer.

Note: Please refer to the User Manual of your digitizer for detailed information about the VME Base Address.

- Click on the "Upgrade" button to upload the new configuration on your board.
- Power cycle the board to make the changes be effective.

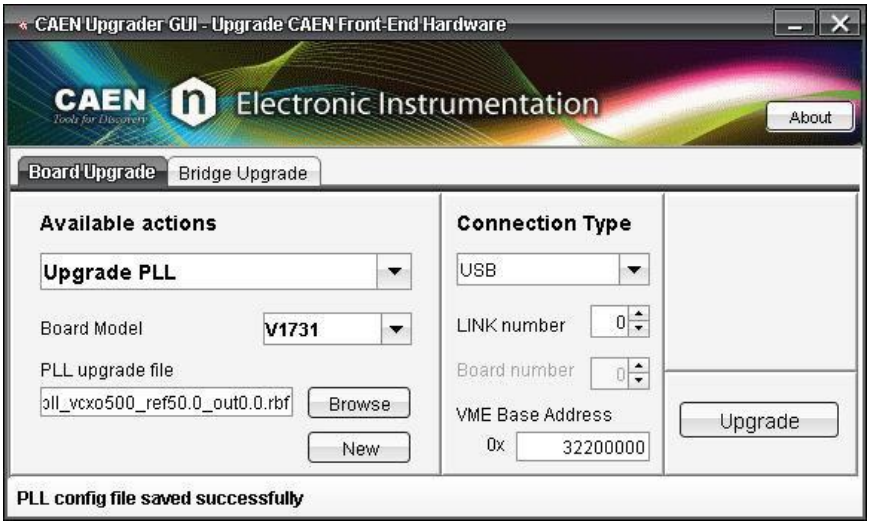


Fig. 3.18:CAENUpgrader's Upgrade PLL box

Troubleshooting

CAENUpgrader records any operation and its outcomes, chronologically starting from the program opening, in a log file (.txt). The file is readable at any moment when the program is open or after the program has been closed. File location depends on the OS version installed on your computer. The file is reset any time the program is reopened.

By clicking on the "**About**" button, at the top right of CAENupgrader GUI, a small window appears with the basic information about the program (SW version, developers, info & support contact) and the log file path.

Note: If the Operative System supports it, the Log path will be clickable.

If you're experiencing any problem you're not able to manage, due to errors occurring during the use of CAENUpgrader functions, you can contact CAEN support (support.computing@caen.it) attaching the session log file.

Fig. 3.19:CAENUpgrader's About window

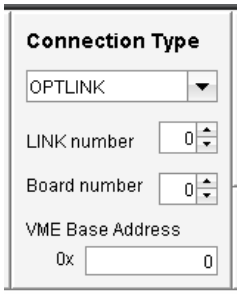
4 Appendix A

Connection Settings Description

CAENUpgrader's GUI provides the **"Connection Type"** box for setting the connection parameters needed to perform any software action on your target board or bridge.

These parameters are:

- Connection Type
- LINK number
- Board number
- VME Base Address



Connection Type: specifies the connection used for the target module. For target bridges, this parameter is fixed automatically once the module's model has been selected.

LINK number: in case of USB, the link numbers are assigned by the PC when you connect the cable to the device; it is 0 for the first device, 1 for the second and so on. There is not a fixed correspondence between the USB port and the link number. For the CONET, the link number indicates which link of A2818 or A3818 is used; Link index start from 0 (1st Optical link port in the 1st slot used). It is not known a priori which is the first slot used (it depends on the motherboard of the PC used.). **IMPORTANT NOTE:** if A2818 and A3818 are installed together, the A2818 have lower index assigned.

Board number: refers to the position of the target board or bridge in a CONET network. A CONET network consists in up to eight (8) nodes connected in a Daisy Chain, through the optical link, to a single Optical Controller (like the A2818).

VME Base Address: is an identification code to target a VME module. This code is fixed by the four rotary switches on the module itself (refer to the module's User Manual).

The following example is intended to show the setting of the connection parameters in three practical cases.

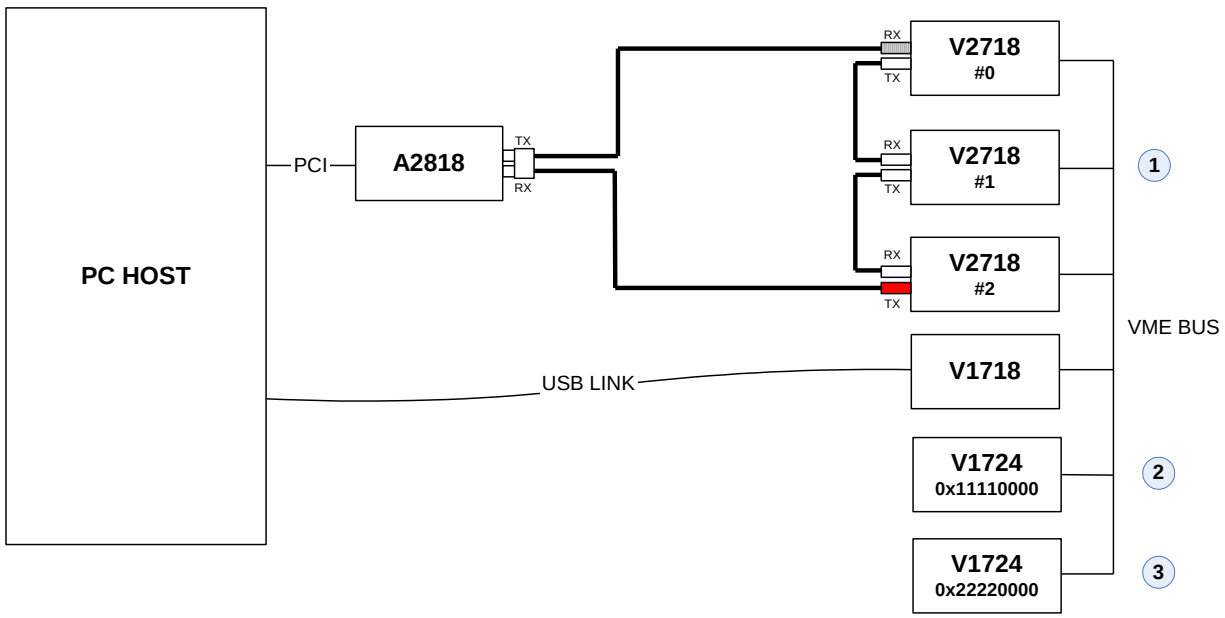
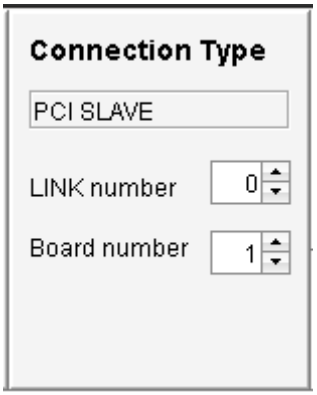
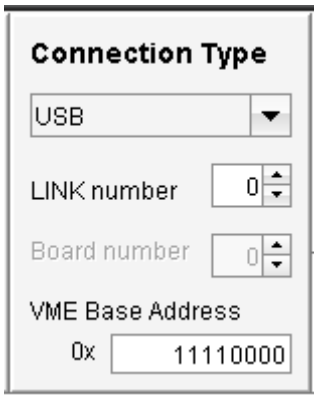


Fig. 4.1: Hardware System: PC with USB port, hosting a A2818; V2718 bridges in Daisy Chain, V1718 bridge and V1724 VME digitizers

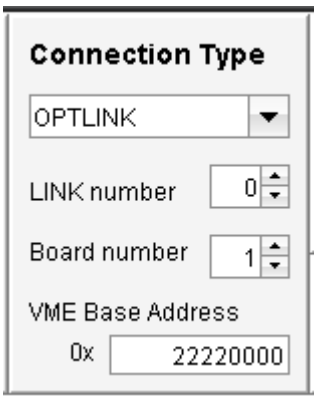
1. Target the second V2718 bridge in the CONET network through the Optical Link:

CONNECTION TYPE	LINK number	Board number	VME Base Address	
PCI SLAVE	**0**	**1**	**NOT REQUIRED**	

2. Target a VME Digitizer (V1724) through the USB link by means of a V1718 bridge:

CONNECTION TYPE	LINK number	Board number	VME Base Address	
USB	**0**	**NOT REQUIRED**	**0x11110000**	

3. Target the a VME Digitizer (V1724) through the Optical Link using the second V2718 bridge:

CONNECTION TYPE	LINK number	Board number	VME Base Address	
OPTLINK	**0**	**1**	**0x22220000**	

Note: Other useful examples about connection parameters can be found in [RD3].

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