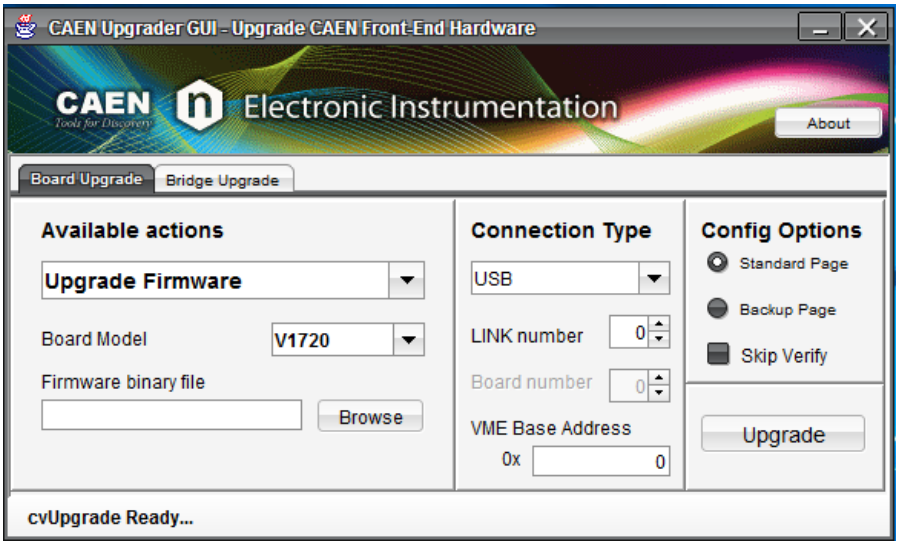
CAEN
Tools for Discovery

Electronic Instrumentation



GD2512

CAENUpgrader

Firmware Upgrade Tool for Front-end Boards Bridges & VME Power Supply

Rev. 10 - April 6th, 2021

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
May 18th, 2011	00	Initial release.
July 19th, 2011	01	Modified Sec. **Upgrade PLL**: added note on PLL configuration file for DT/NIM boards
February 16th, 2012	02	Extended Sec. **Reference Documents**. Modified Sec. **System Requirements and Installation Setup**. "Link number" parameter definition changed in Chap. **4**.
June 6th, 2012	03	Updated Sec. **System Requirements and Installation Setup**
September 6th, 2012	04	Updated Chap. **3**
December 3rd, 2012	05	Updated Sec. **All these options require the PID** of the A4818, which is the unique Product Identification number (>10000) in a label affixed to the adapter. Firmware Upgrade (boards and bridges)
February 18th, 2013	06	Updated Chap. **1**
May 18th, 2014	07	Updated Chap. **1**, Chap. **2**, Sec. **Get Firmware Release (digitizers and bridges)**, Sec. **All these options require the PID** of the A4818, which is the unique Product Identification number (>10000) in a label affixed to the adapter. Firmware Upgrade (boards and bridges), Sec. **Verify Firmware Upgrades (boards only)**, Sec. **Upgrade PLL**. Added Sec. **DeskBoot Utility**
November 7th, 2016	08	Updated Chap. **2**, Chap. **3**, Sec. **Upgrade PLL:** default configuration file for DT/NIM/WME boards, Sec. **V2495** Support
November 30th, 2020	09	General review. Added support to V3718 CAEN Bridge. Added Chap. **5**
April 6th, 2021	10	Added support to A4818 USB 3.0 to CONET adapter. Updated Chap. **4** and Chap. **5**

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

[RD4] GD2812 - DeskBoot QuickStart Guide

[RD5] UM5175 – V2495/VX2495 User Manual

https://www.caen.it/support-services/documentation-area/

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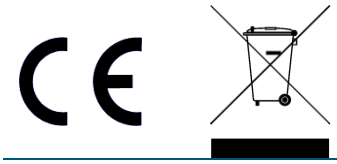
MADE IN ITALY: We remark that all our boards have been designed and assembled in Italy. In a challenging environment where a competitive edge is often obtained at the cost of lower wages and declining working conditions, we proudly acknowledge that all those who participated in the production and distribution process of our devices were reasonably paid and worked in a safe environment (while this is true for the boards marked "MADE IN ITALY", we cannot guarantee for third-party manufactures).



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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 licensing of pay firmware
- force the board reboot

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), x780/81 (Digital MCA), x790 and Programmable Logic Unit (V2495)	VME/VME64X-USB2.0 Bridges (V1718, VX1718, V3718, VX3718)
VME /VME64X TDC family	VME/VME64X-PCI CONET Bridges (V2718, VX2718, V3718, VX3718)
General Purpose VME Board (V1495)	PCI CONET Controller (A2818)
VME (V65xx) and desktop (DT55xx) Power Supply Units	PCI Express CONET2 Controller (A3818)
TPC Readout System (SY2791)	A2719 Internal Controller for V2718/VX2718
	USB 3.0 to CONET Adapter (A4818)

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 must be performed referring to the correspondent VME model.

System Requirements and Installation Setup

OS	OS version	CAEN Libraries required	Third-party software required
Windows	7/8/8.1/10 32 and 64-bit	CAENComm CAENVMELib[1]	Java Java[2] Runtime Environment v8 u40 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**.

Install the software by performing the following steps:

- Download the free installation packet for your operating system from the CAENUpgrader *Downloads* page on CAEN web site (**login required**).
- Uncompress the packet on your PC.
- **For Windows users:** launch the CAENUpgrader Setup executable file, then follow the installer instructions. The software is standalone as it installs locally all the required libraries (see **Tab. 1.2**), while the user must have installed the CAEN driver required by the wanted communication link.
- **For Linux users:** the required libraries must be installed first, starting from the CAENVMElib, then the CAENComm; finally, install the 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 series 1.0, Digital MCAs and x790 boards with USB interface (NIM/Desktop form factors)
- PC => USB => CAEN Front-end Modules with Mini-USB 2.0 interface:
  - Programmable Logic Units V2495/DT5495
- PC => PCI (A2818) or PICe (A3818) or USB3 (A4818) => CONET => CAEN Modules with Optical link:
  - Waveform digitizers series 1.0 (VME, NIM/Desktop form factors), Digital MCAs and x790 boards (Desktop/NIM)
  - SY2791 TPC Readout System
- PC => USB => V1718 or V3718 => VME => CAEN Slave VME Modules:
  - CAEN VME waveform digitizer series 1.0, CAEN VME TDCs V1190, V1290, General Purpose V1495, Power Supply Units V65xx, Programmable Logic Unit V2495/DT5495
- PC => PCI (A2818) or PICe (A3818) or USB3 (A4818) => CONET => V2718 or V3718 => VME => CAEN Slave VME Modules:
  - CAEN VME waveform digitizer series 1.0, CAEN VME TDCs V1190, V1290, General Purpose V1495, Power Supply Units V65xx

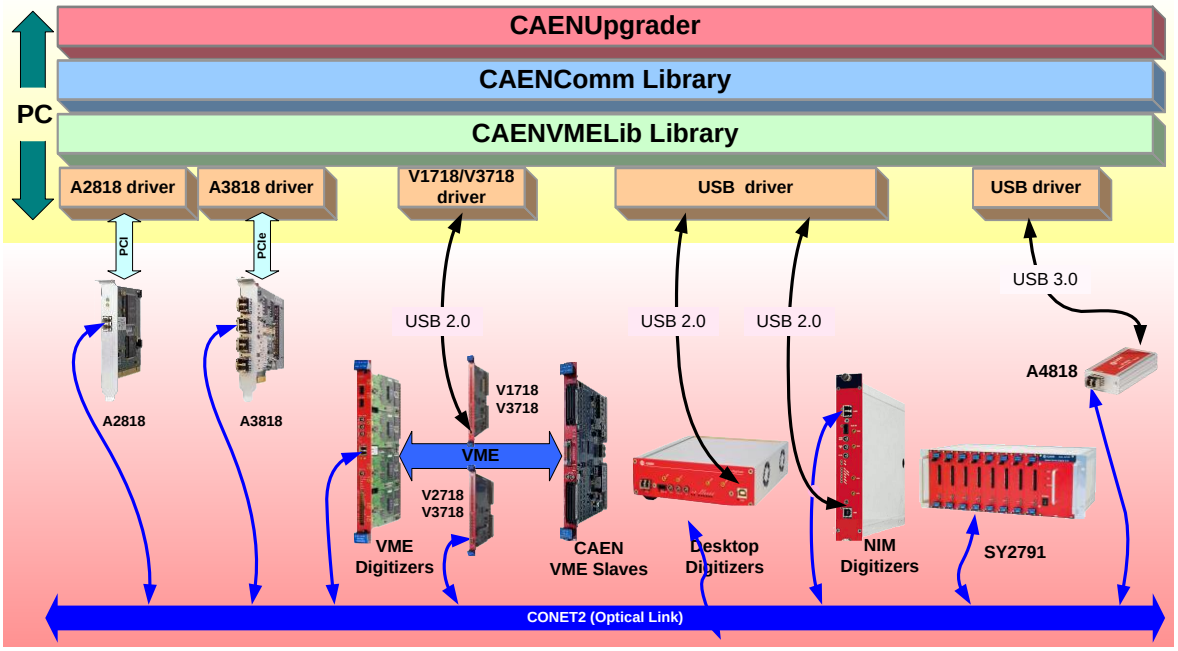


Fig. 2.1:PC-to-CAEN Board connection options

Note: In case of optical master and slave connection, be sure that they both are provided with the same CONET protocol version, 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.

Note: Please refer to **[RD5]** reference for more detailed information on Programmable Logic Unit V2495 connection.

Direct Link to the Module via USB

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

Direct Link to the Module via Optical Link

Every CAEN Digitizer (and so the Digital MCAs and the x790 boards) 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 Express slot)

Tab. 2.1:CAEN Optical Bridges

The A4818 adapter allows to directly connect a CAEN optical link slave just from the USB3 port of the PC.

A4818 Adapter from USB3 to Optical Link (requiring just a host PC with a USB3 port)

Tab. 2.2:CAEN A4818 Adapter

Link through a VME Bridges

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

CAEN provides the V3718/VX3718 Bridge as replacement of the old V1718/VX1718 and V2718/VX2718 ones:

V1718 / VX1718 with USB interface (requiring just a host PC with a free USB port) - **DISCONTINUED**	**V2718 / VX2718** with Optical Link (requiring Mod. A3818 or A2818 controller) - **DISCONTINUED**
V3718 / VX3718 with USB and Optical Link interfaces (requiring a host PC with a free USB port or Mod. A3818 or A2818 controller)	

Tab. 2.3:CAEN VME Bridges

Note: If you want to use a VME bridge from another manufacturer or an 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.

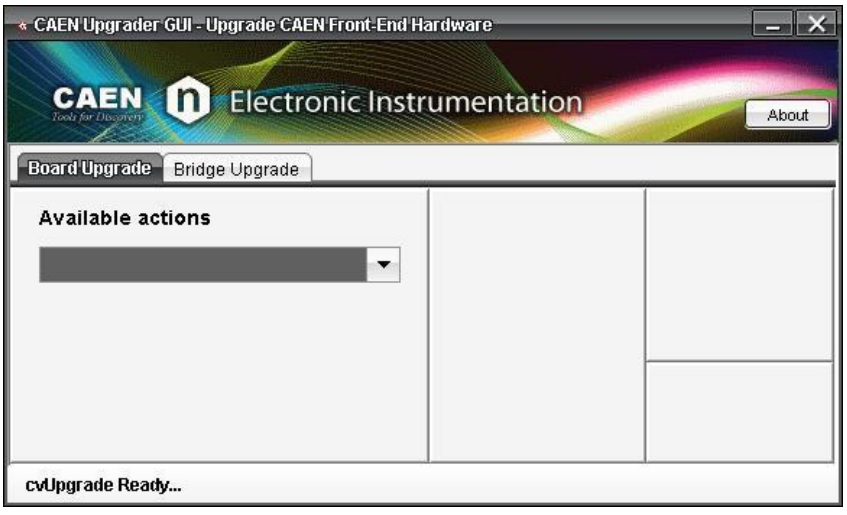


Fig. 3.2:CAENUpgrader's GUI main window

CAENUpgrader GUI Functions Overview

Get Information (boards only)

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-DT5725-xx.dat**", where xx is the serial number of the board.

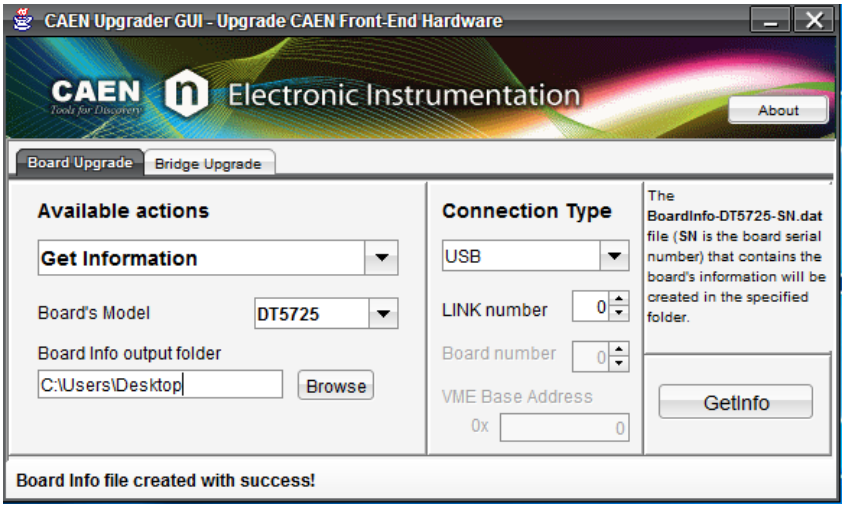


Fig. 3.3:CAENUpgrader's "Get Information" box

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 (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.

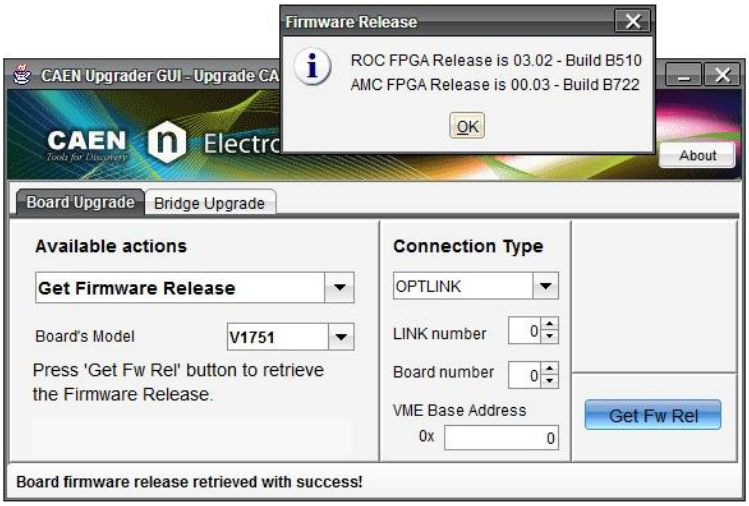


Fig. 3.4: CAENUpgrader's "Get Firmware Revision" box

When using the GET FW RELEASE action with a x780 (Dual Digital MCA) or a x790 module, two pop-up windows will appear giving information about the HV (power supply) firmware and the FPGA firmware release respectively. In case of the desktop power supply units DT55xx, a single window will report the revisions of the HV firmware and the motherboard FGPA (ROC).

With the V3718 bridge, select the "V1718" option to get the firmware release of the bridge via USB link, while the "V2718" option if via Optical Link.

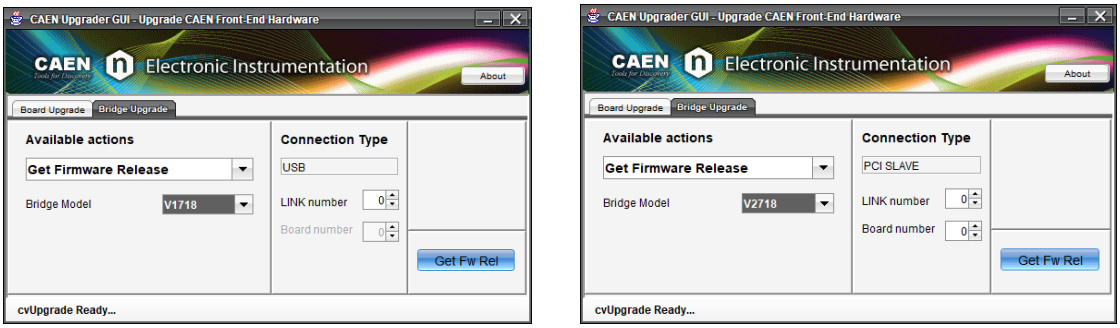


Fig. 3.5: "Get Firmware Release" options with the V3718 bridge

Select the "USB_A4818" in the "**Board Upgrade**" tab if you want to get the firmware release of a CAEN Optical Link slave board through the A4818 adapter.

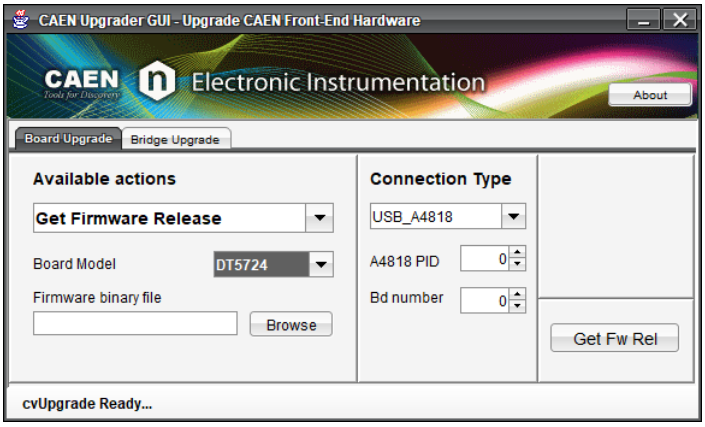


Fig. 3.6: "Get Firmware Release" option for CAEN optical link boards through the A4818 adapter

In case of direct link through the A4818 adapter, select the "USB_A4818_V2718" option to get the firmware of the V2718 or V3718, while select the "USB_A4818_A2719" option to get the one of the A2719 mezzanine of the V2718. These options require the PID of the A4818, which is the unique Product Identification number (>10000) in a label affixed to the adapter.

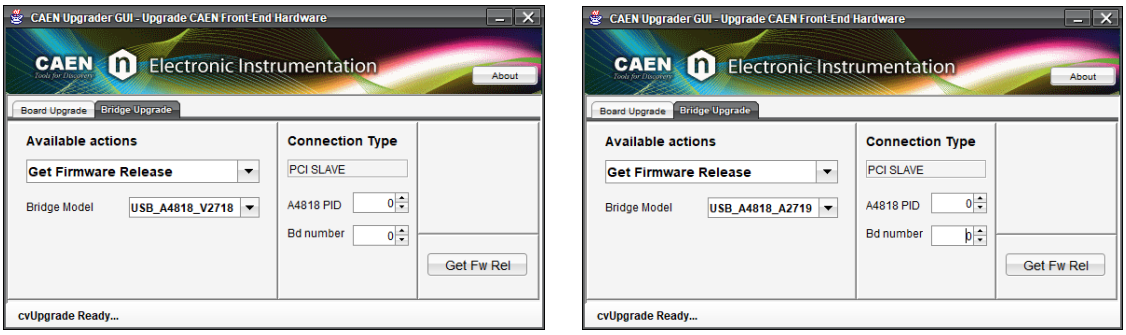


Fig. 3.7: "Get Firmware Release" options with the A4818 adapter

All these options require the PID of the A4818, which is the unique Product Identification number (>10000) in a label affixed to the adapter.

Firmware Upgrade (boards and bridges)

CAENUpgrader can manage the firmware upload on every CAEN board and bridge that may need it. In case of digitizers, the firmware must be intended as the default firmware (for the waveforms recording) or CAEN 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 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.

Note: the 30-minute time limitation does not apply to x780/81 and x790 boards, which are factory provided with full time operating DPP firmware.

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

Note: exceptions are the PCIe Controller A3818 and the V3718 Bridge, whose programming file has **.bin** extension, the HV firmware file for x780, x790 and DT55xx boards (see the example at the end of this paragraph) which is a **.hex** file, and the V2495 Main FPGA Application firmware, which is a **.rpd** file. 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 the digitizer default 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.

Note: concerning the **.rbf** files, if the firmware size exceeds the correct upgradable one, CAENUpgrader doesn't perform the upgrade and provides out a message to advise the user.

UPGRADING THE STANDARD FPGA

Let's see how to upgrade the default 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).

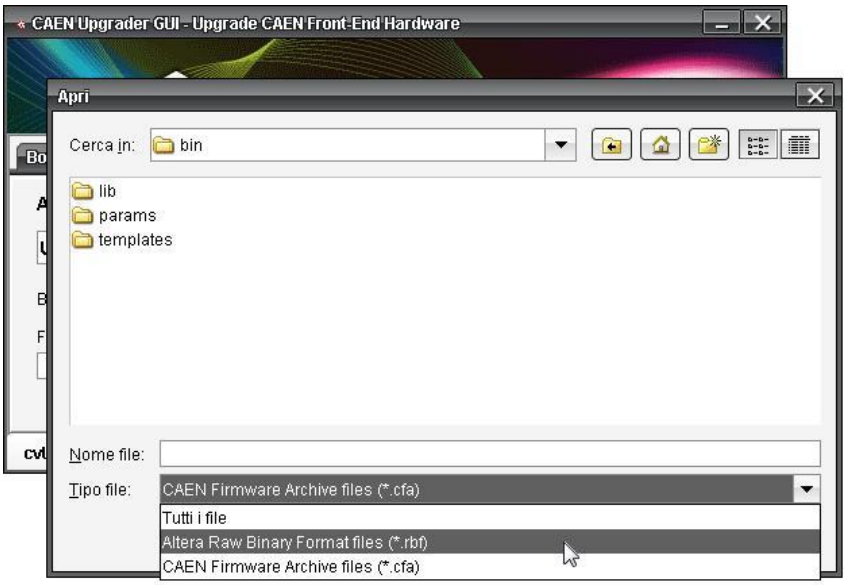


Fig. 3.8: Firmware file type selection in the 'Browse' window

- 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 cannot check if the **.rbf** file you are using matches your target module. Press "**OK**" to continue.

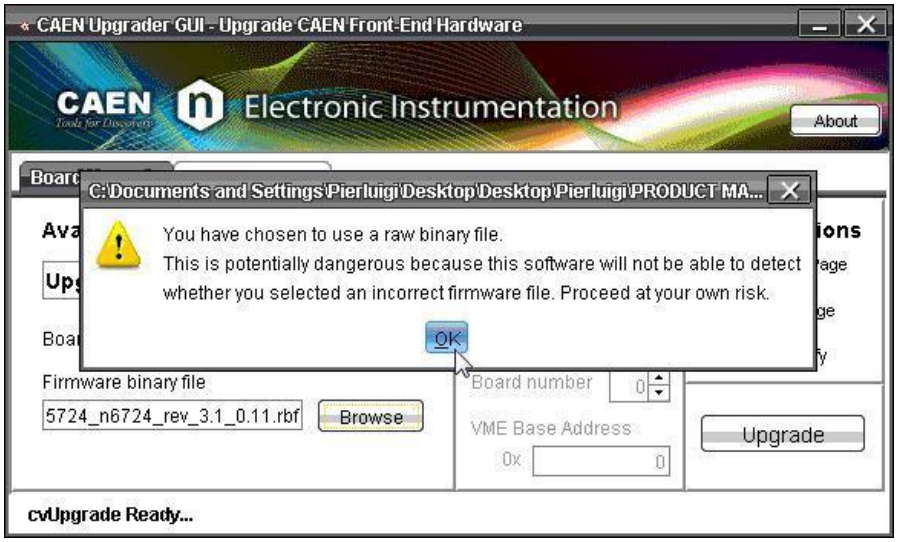


Fig. 3.9: Warning message uploading a .rbf file.

- 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 CAEN Support (Chap. **5**).

- 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.

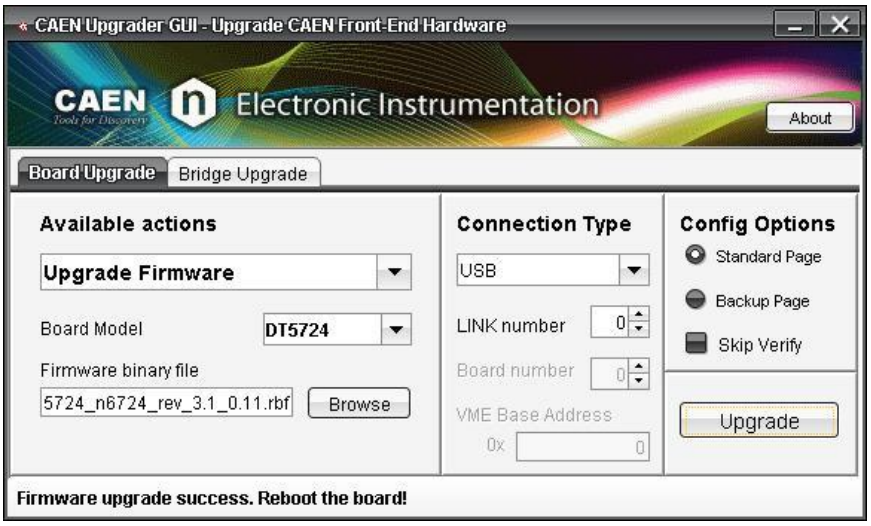


Fig. 3.10:CAENUpgrader's "Upgrade Firmware" box for CAEN boards

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 piggyback A2719), an example of firmware upgrade using CAENUpgrader is reported in **[RD2]**.

With the V3718 bridge, select the "V1718" option to upgrade the firmware of the bridge via USB link, while the "V2718" option if via Optical Link.

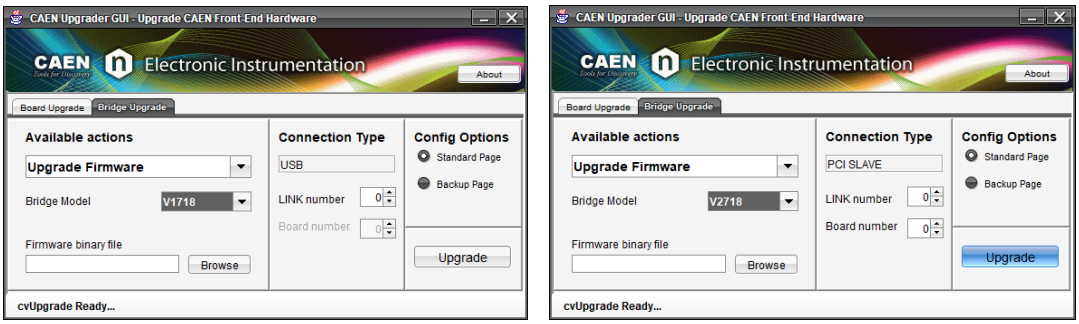


Fig. 3.11: "Upgrade Firmware" options for CAEN V3718 bridge

Select the "USB_A4818" in the "**Board Upgrade**" tab if you want to upgrade the firmware of a CAEN Optical Link slave bard through the A4818 adapter.

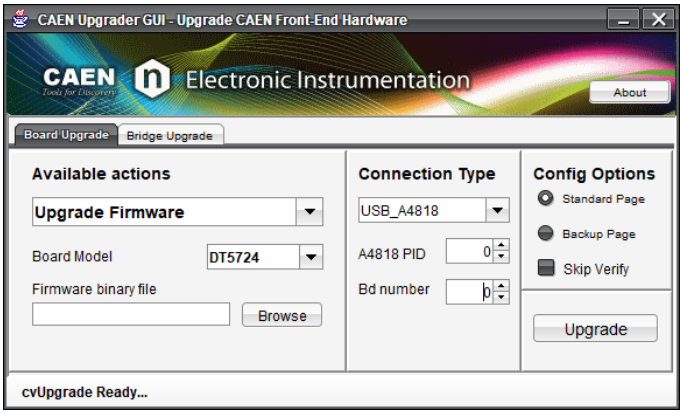


Fig. 3.12: "Upgrade Firmware" option for CAEN optical link boards through the A4818 adapter

In case of direct link through the A4818 adapter, select the “USB_A4818_V2718” option to upgrade the firmware of the V2718 or V3718, while select the “USB_A4818_A2719” option to upgrade the one of the A2719 mezzanine of the V2718.

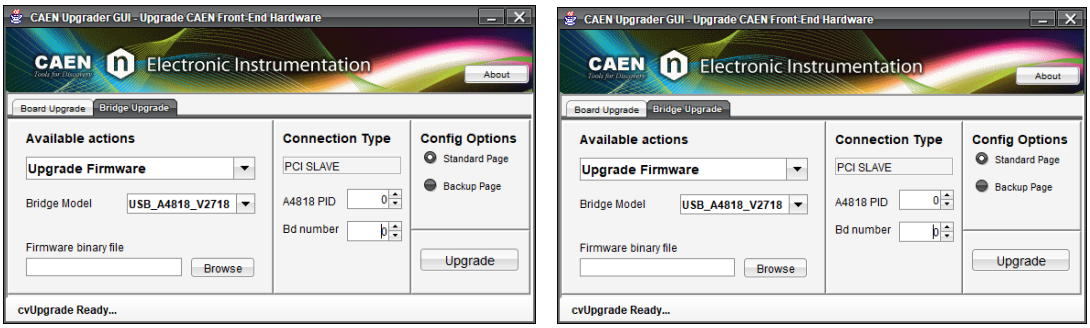


Fig. 3.13: “Upgrade Firmware” options for CAEN optical link bridges through CAEN A4818 adapter

All these options require the PID of the A4818, which is the unique Product Identification number (>10000) in a label affixed to the adapter.

UPGRADING BACKUP FPGA

CAENUpgrader allows for also upgrading 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.

UPGRADING HV firmware (x780, x790, DT55xx)

By selecting a x780 or x790 model in the relevant menu, the user can then choose to upgrade the HV firmware or the Readout firmware by checking the relevant option in the tab, as shown in **Fig. 3.14**

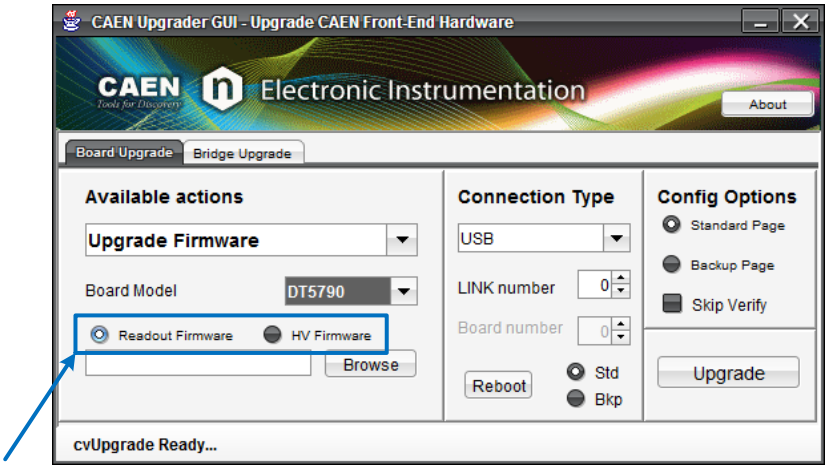


Fig. 3.14: Firmware options upgrading x780, x790 or DT55xx boards

Verify Firmware Upgrades (boards only)

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 an example) 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.

Note: The “Verify” function doesn’t apply to HV firmware (e.g. x780, x790, DT55xx).

Store Product Unlock Code (boards only)

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).

Note: The “Store Product Unlock code” function does not apply to x780, x781, x790 boards, which are delivered with factory licensed DPP firmware.

Here follows a step-by-step example of the procedure 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 have not 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.

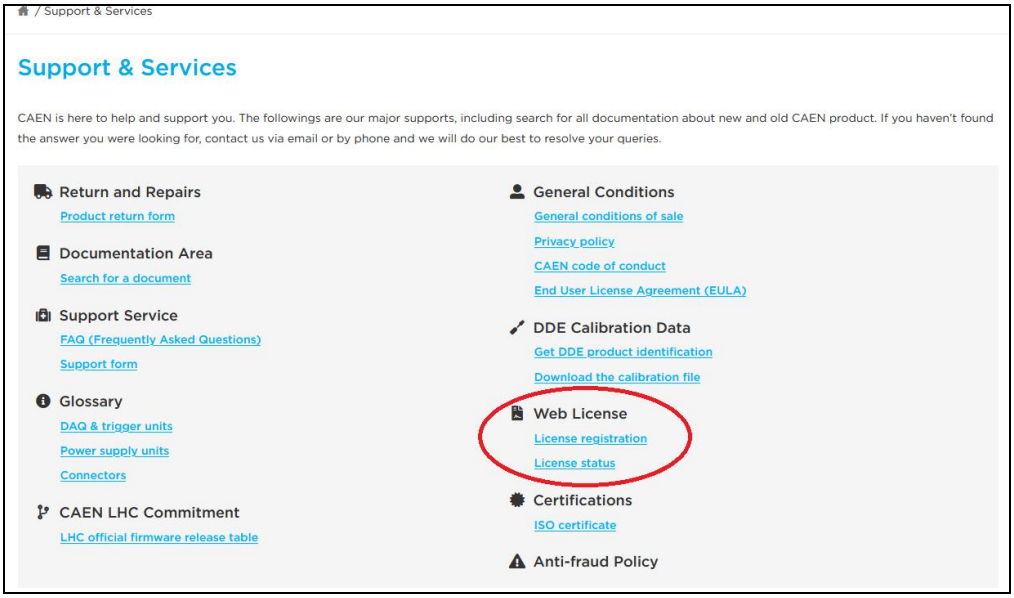


Fig. 3.15: The ”Web License” page on CAEN website

- Click on the ‘License registration’ link (**login required**) and select the module in your posses in three simple steps.
- Go on by filling in the Registration the given License_ID and the module Serial Number. If you have more than one license to request at once, here you can insert multiple license IDs and serial number.
- Press the button to send the request

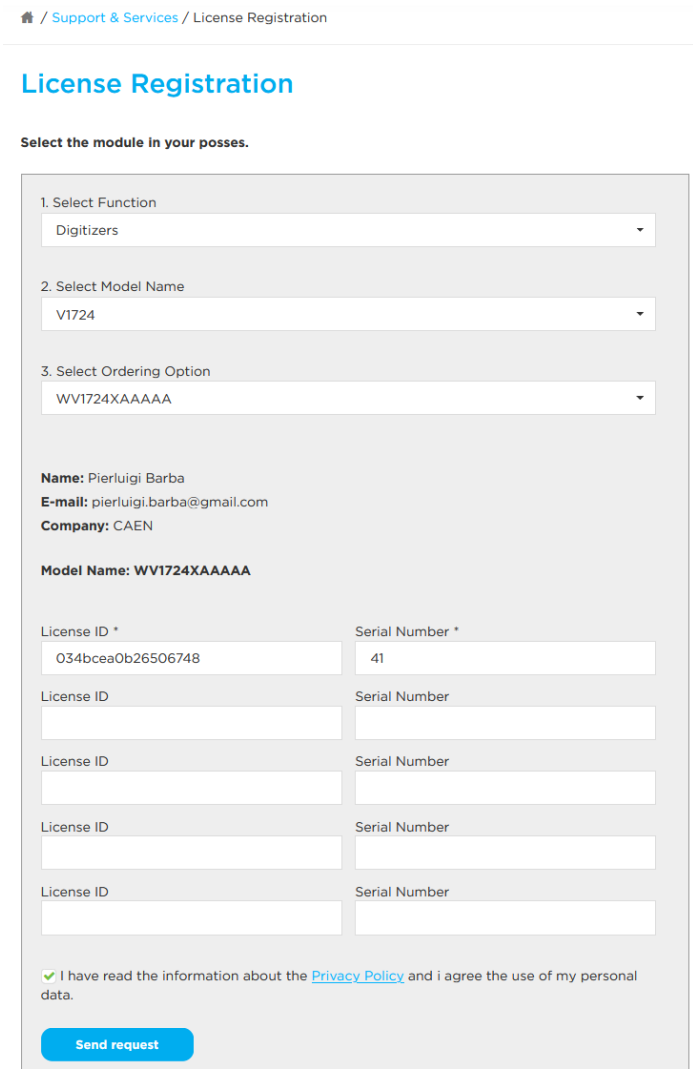


Fig. 3.16: The "License Registration" form

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

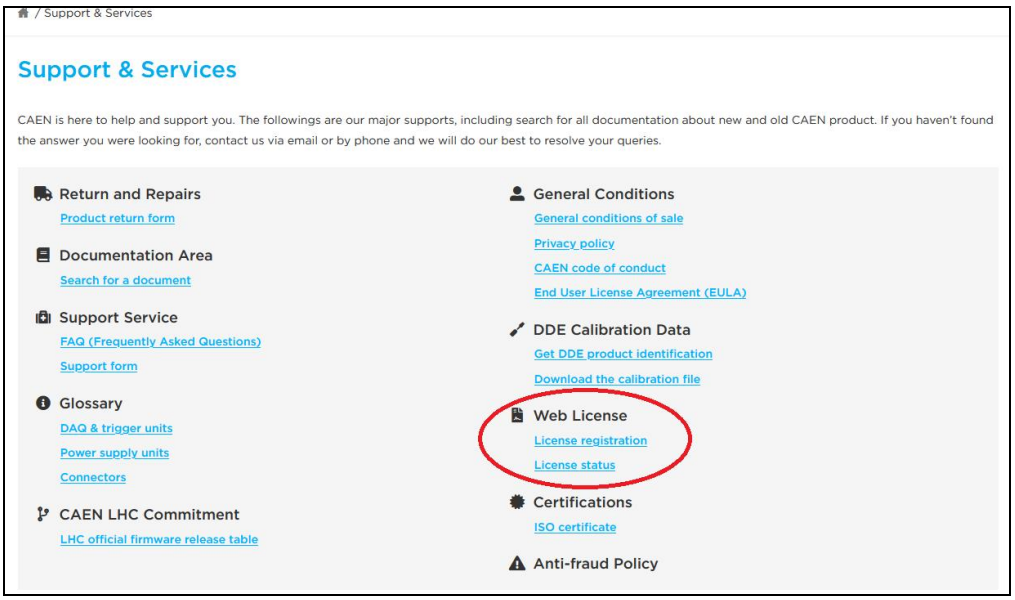


Fig. 3.17: The "License Status" Web Page

- 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.

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.

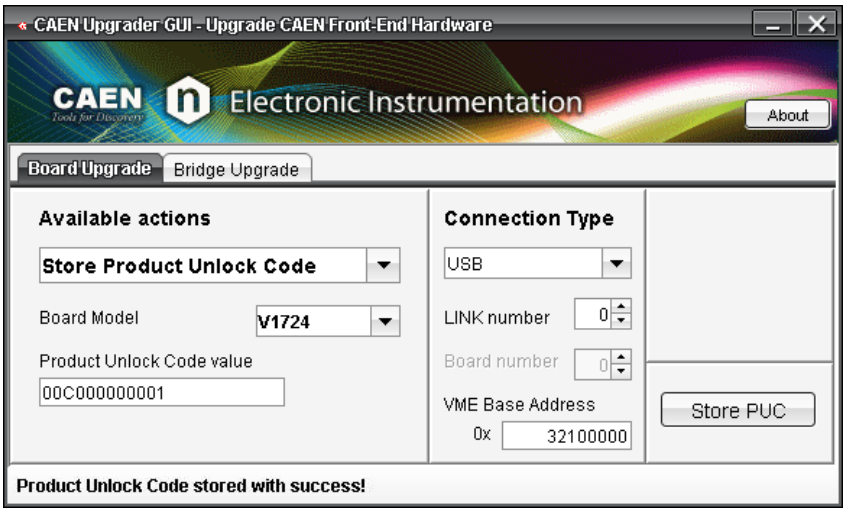


Fig. 3.18:CAENUpgrader's "Store Product Unlock Code" box

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

Get Product Unlock Code (boards only)

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.

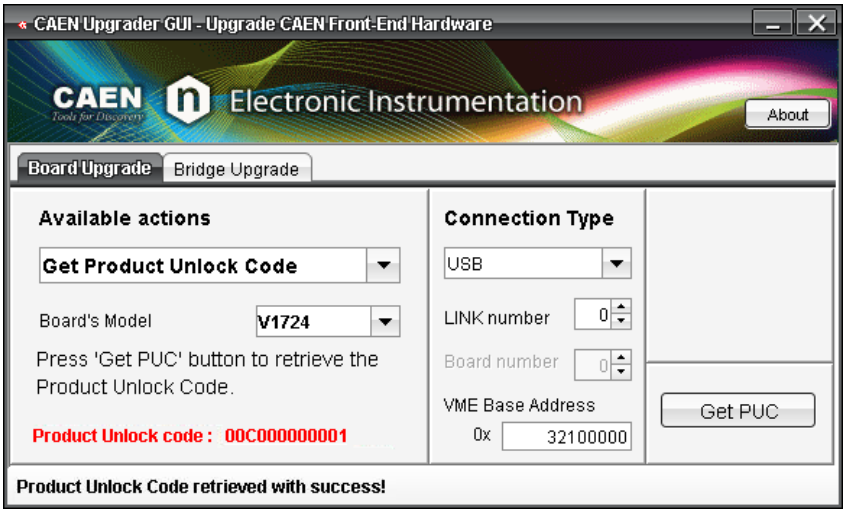


Fig. 3.19:CAENUpgrader's "Get Product Unlock Code" box

Note: The "Get Product Unlock code" function does not apply to x780, x781, x790 boards, which are delivered with factory licensed DPP firmware.

Delete Product Unlock Code (boards only)

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

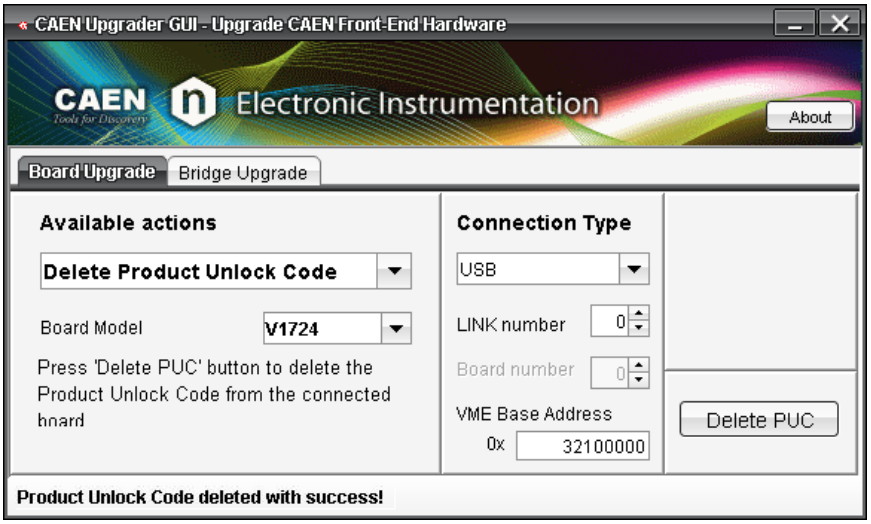


Fig. 3.20:CAENUpgrader's "Delete Product Unlock Code" box

Note: The "Delete Product Unlock code" function does not apply to x780, x781, x790 boards, which are delivered with factory licensed DPP firmware.

Upgrade PLL (digitizers only)

By this function it is possible to upgrade the internal PLL of the digitizers to:

1. Restore the PLL default configuration (50 MHz internal clock reference)
2. Latch the PLL to an external clock reference (different from 50MHz frequency)
3. Synchronize the clock in a multi-board system (Daisy-chain propagation of the clock signal)

CAENUpgrader stores a set of pre-defined programming files in the "bin/pll" subdirectory, which generally are intended for restoring the PLL default configuration and to synchronize the clocks in a system of multiple digitizers.

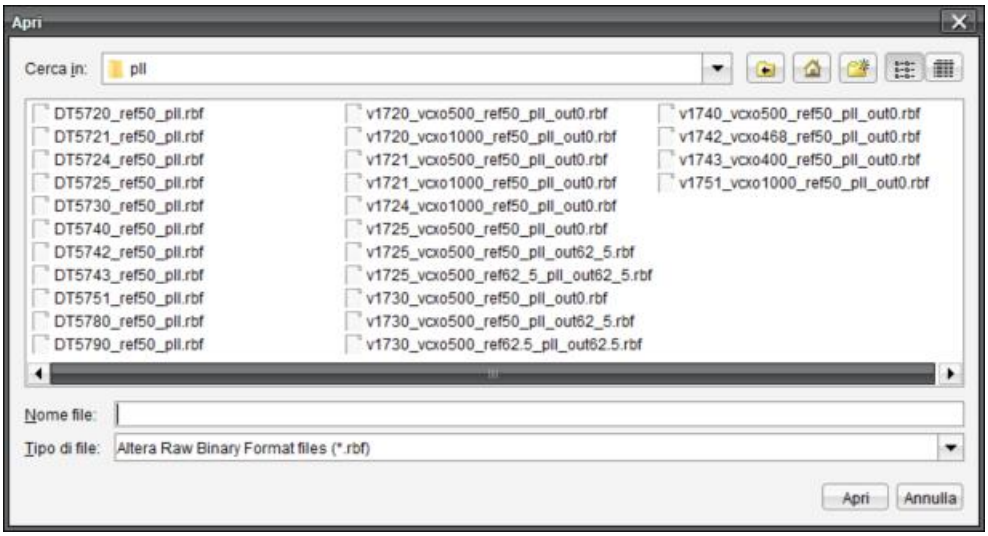


Fig. 3.21:CAENUpgrader's local repository of PLL programming files

Restore the PLL Default Configuration

The programming file of the PLL default configuration is stored in the "bin/pll" subdirectory of CAENUpgrader.

The programming file is identified as

<digitizer>_ref50_pll.rbf

where <digitizer> is the model of the digitizer (VME, NIM or Desktop version).

- Press the "Browse" button and point to the programming file related to the target digiitzer.
- 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: Default PLL Configuration files are provided for VME and DT/NIM digitizers (Desktop and NIM boards share the same file).

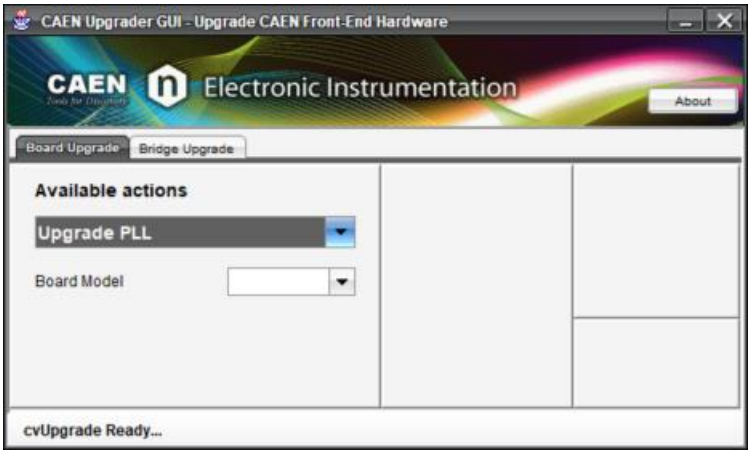
PLL Programming File Generation

There is a subset of VME CAEN digitizers for which the user can configure and generate the programming file by himself in the "PLL Configuration" GUI. The digitizers which are supported by the programming file generation are listed in **Tab. 3.1** below.

Digitizer	Description
V1720	8 Ch. 12 bit 250 MS/s Digitizer
V1721 (**Discontinued**)	8 Ch. 8 bit 500 MS/s Digitizer
V1724	VME Interface Registers
V1731 (**Discontinued**)	4/8 Ch. 8 bit 1000/500 MS/s Digitizer
V1740	64 Ch. 12 bit 62.5 MS/s Digitizer
V1751	4/8 Ch. 10 bit 2/1 GS/s Digitizer

Tab. 3.1: Digitizers supported by the "PLL Configuration" GUI

- Select the "**Upgrade PLL**" option in *Board Upgrade -> Available actions*



- Select the digitizer model in *Board Upgrade -> Board Model*

- Press the "New" button to open the "PLL Configuration" GUI

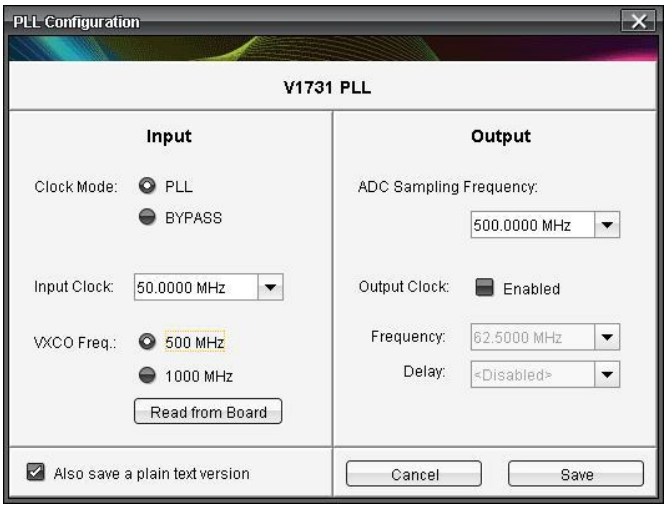


Fig. 3.22:CAENUpgrader's PLL settings window

- 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 V1720 board is connected to the computer through the CAEN USB V1718 bridge, the USB connection must 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.

Note: When upgrading the PLL with **.rbf** files, if the firmware size exceeds the correct upgradable one, CAENUpgrader will not perform the upgrade providing out a message to advise the user.

Note: For any need of programming files which are not in the CAENUpgrader local repository and related to digitizer families that are not supported by the "PLL Configuration", please contact CAEN for information (Chap. **5**).

DeskBoot Utility

Starting from the release 1.5 of CAENupgrader software, the DeskBoot utility has been integrated. DeskBoot applies only to desktop and NIM board and works only through USB link. It allows to force by software the board to reboot loading the FLASH Standard page copy of the firmware or the Backup page one.

DeskBoot detailed description can be found by consulting **[RD4]**. The software utility is also separately available for download on CAEN website (www.caen.it) at:

Home / Products / Firmware/Software / Digitizer Software / Configuration Tools / CAEN DeskBoot

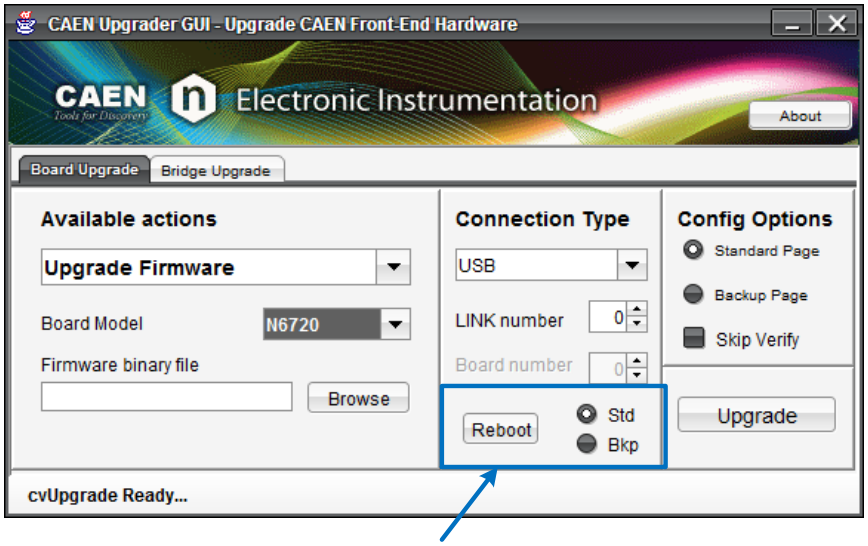


Fig. 3.23: DeskBoot utility integrated into CAENUpgrader tool

4 Select "Std" if you want the board to reboot from the Standard FLASH page firmware copy, or "Bkp" for the Backup one

5 Push the "Reboot" botton to perform the reboot.

The flash of the board's front panel LEDs, with NIM and PLL Lock ones finally ON, means the reboot was performed. A pop-up message is shown by the software to advise the user.

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 Operatiing System supports it, the Log path will be clickable.

If you're experiencing any problem that you are not able to manage, due to errors occurring in the use of CAENUpgrader functions, you can contact CAEN Support (Chap. **5**) attaching the session log file.

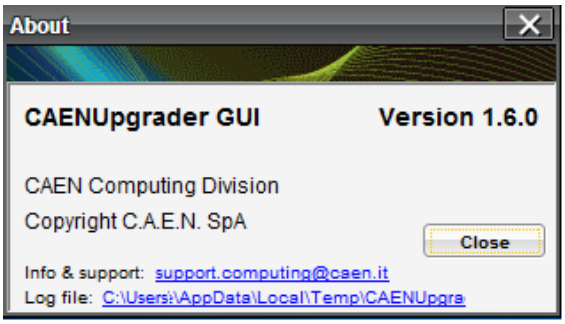


Fig. 3.24:CAENUpgrader's About window

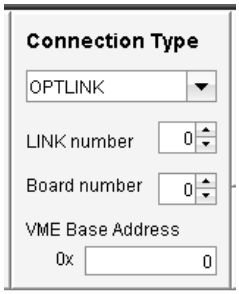
4 Appendix A

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 / A4818 PID
- 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 the first used slot is (it depends on the motherboard of the PC used.). **IMPORTANT NOTE:** if A2818 and A3818 are installed together, the A2818 have lower index assigned.

A4818 PID: this parameter replaces the LINK number when the A4818 USB3 to CONET adapter is used. The User must insert the PID number of its A4818 to complete the connection settings to the target board. The PID is a number (>10000) that is reported on a label affixed to the A4818 case.

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.

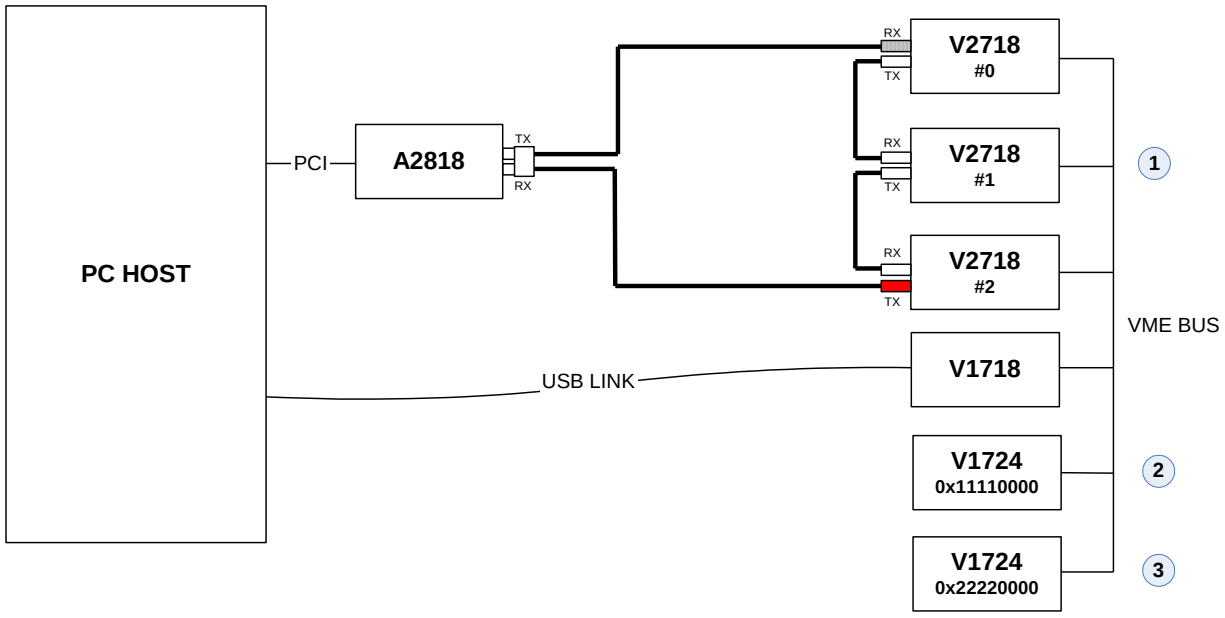
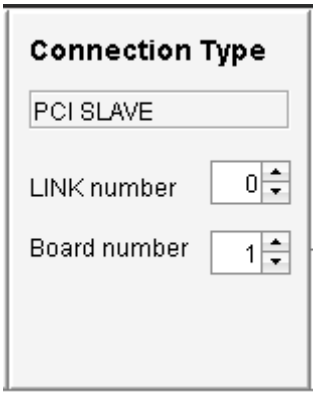
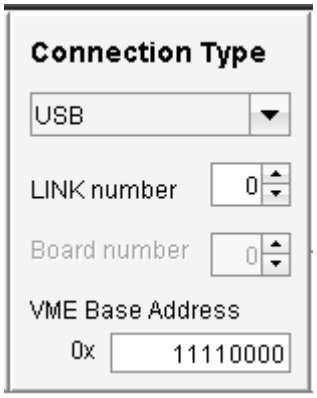


Fig. 4.1: Hardware System: PC with USB port, hosting a A2818; V2718 bridges in Daisy Chain, V1718 bridge and V1724 VME digitizers

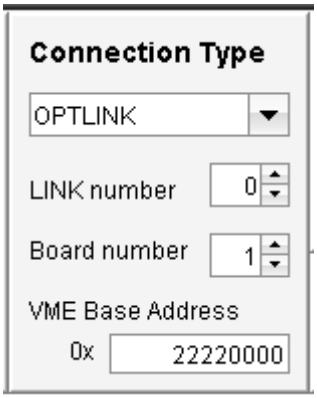
1. Target the second V2718 bridge in the CONET network through the Optical Link:

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

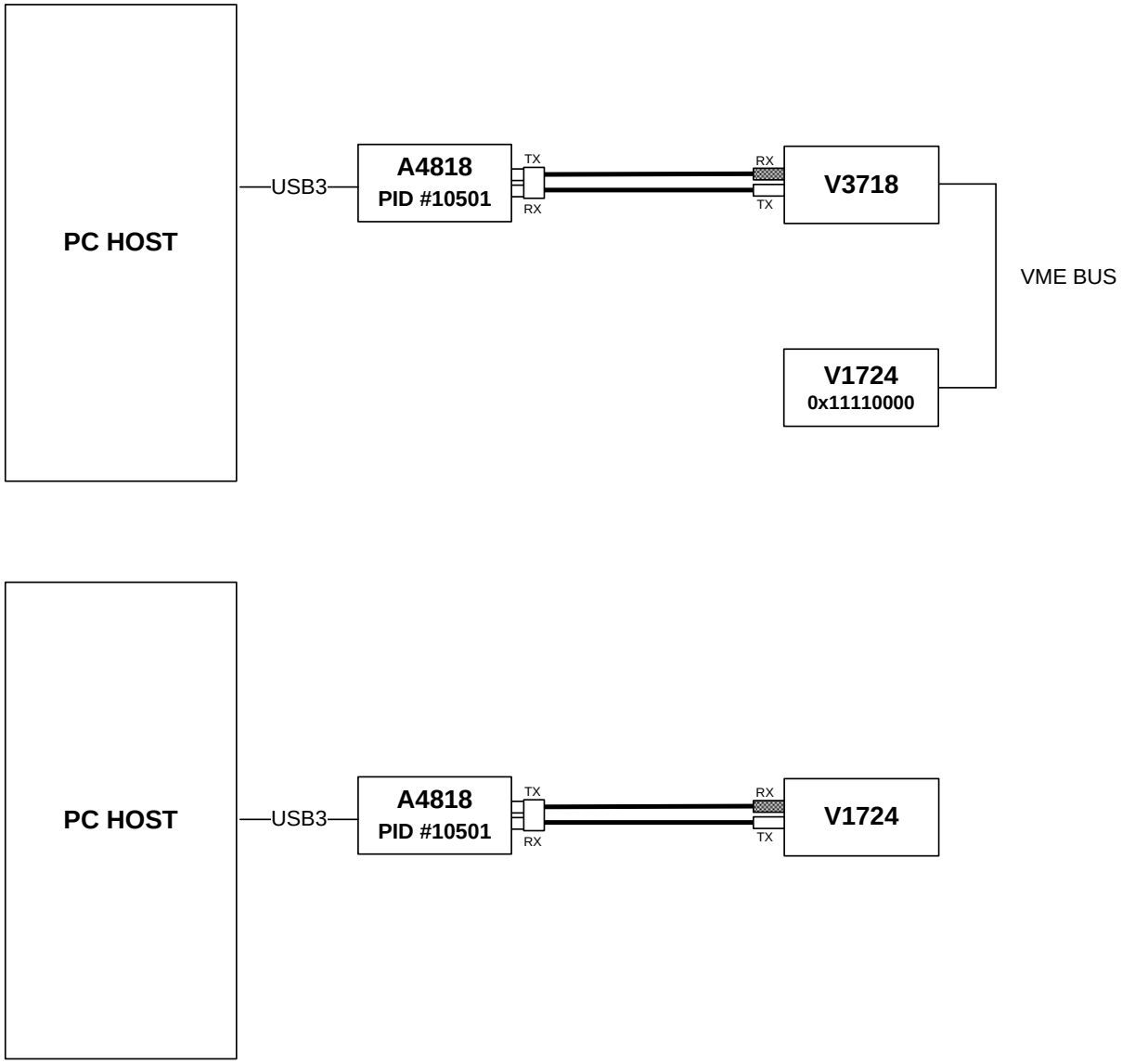
2. Target a VME Digitizer (V1724) through the USB link by means of a V1718 bridge:

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

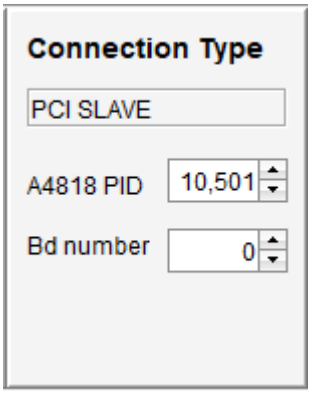
3. Target a VME Digitizer (V1724) through the Optical Link using the second V2718 bridge:

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

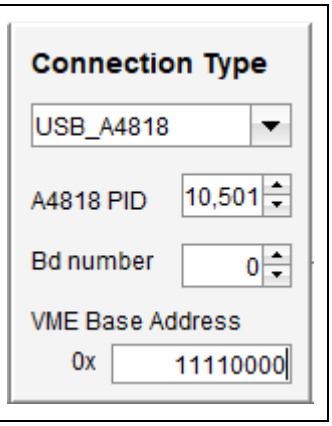
Another example shows the use of the A4818 adapter.



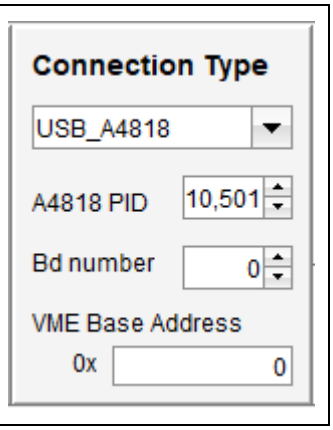
1. Target a VME Bridge (V3718) through the optical link using an A4818 adapter:

Bridge Model	CONNECTION TYPE	A4818 PID	Board number	
USB_A4818_V2718	**PCI SLAVE**	**10501**	**0**	

2. Target a VME Digitizer (V1724) through the VME bus using an A4818 adapter and a VME Bridge (V3718):

CONNECTION TYPE	A4818 PID	Board number	VME Base Address	
USB_A4818	**10501**	**0**	**11110000**	

3. Target a VME Digitizer (V1724) through an A4818 adapter:

CONNECTION TYPE	A4818 PID	Board number	VME Base Address	
USB_A4818	**10501**	**0**	**0**	

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

5 Technical Support

CAEN makes available the technical support of its specialists for requests concerning the software and hardware. Use the support form available at the following link:

https://www.caen.it/support-services/support-form/

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