CAEN
Tools for Discovery

Technical Information Manual

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A3818

PCI EXPRESS
OPTICAL LINK

NPO: 00102/08:A3818.MUTx/11

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Disclaimer

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 (this is true for the boards marked "MADE IN ITALY", while we cannot guarantee for third-party manufactures).

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1 Overview

Fig. 1.1: A3818C PCI Express Optical Link Controller

The Mod. A3818 is a PCI Express x8 card that can plug into both x8 and x16 PCI Express slots (V1.1 or V2.0) and allows to control up to 4 CONET2 independent networks.

CONET2 is an optical link based network (the communication path uses optical fiber cables as physical transmission line), with daisy chain capabilities (up to 8 nodes controlled by one link), and proprietary communication protocol.

Through the CONET2 it is possible to handle the VMEbus through the CAEN VMEbus Optical Link Bridges (such as the V2718) or to control directly CAEN modules with built-in optical link (such as the N67xx, DT57xx and V17xx digitizers).

IMPORTANT NOTE! CONET2 is not compatible with CONET1 network, an earlier optical link network (please read the Application Note “AN2472 - CONET1 to CONET2 migration” downloadable in the “Document Library” section of www.caen.it website).

The table below shows the A3818 orderable options.

Table 1.1: Available items

Code	Product	Description
WA3818AXAAAA	A3818A	PCIe 1 Optical Link
WA3818BXAAAA	A3818B	PCIe 2 Optical Link
WA3818CXAAAA	A3818C	PCIe 4 Optical Link

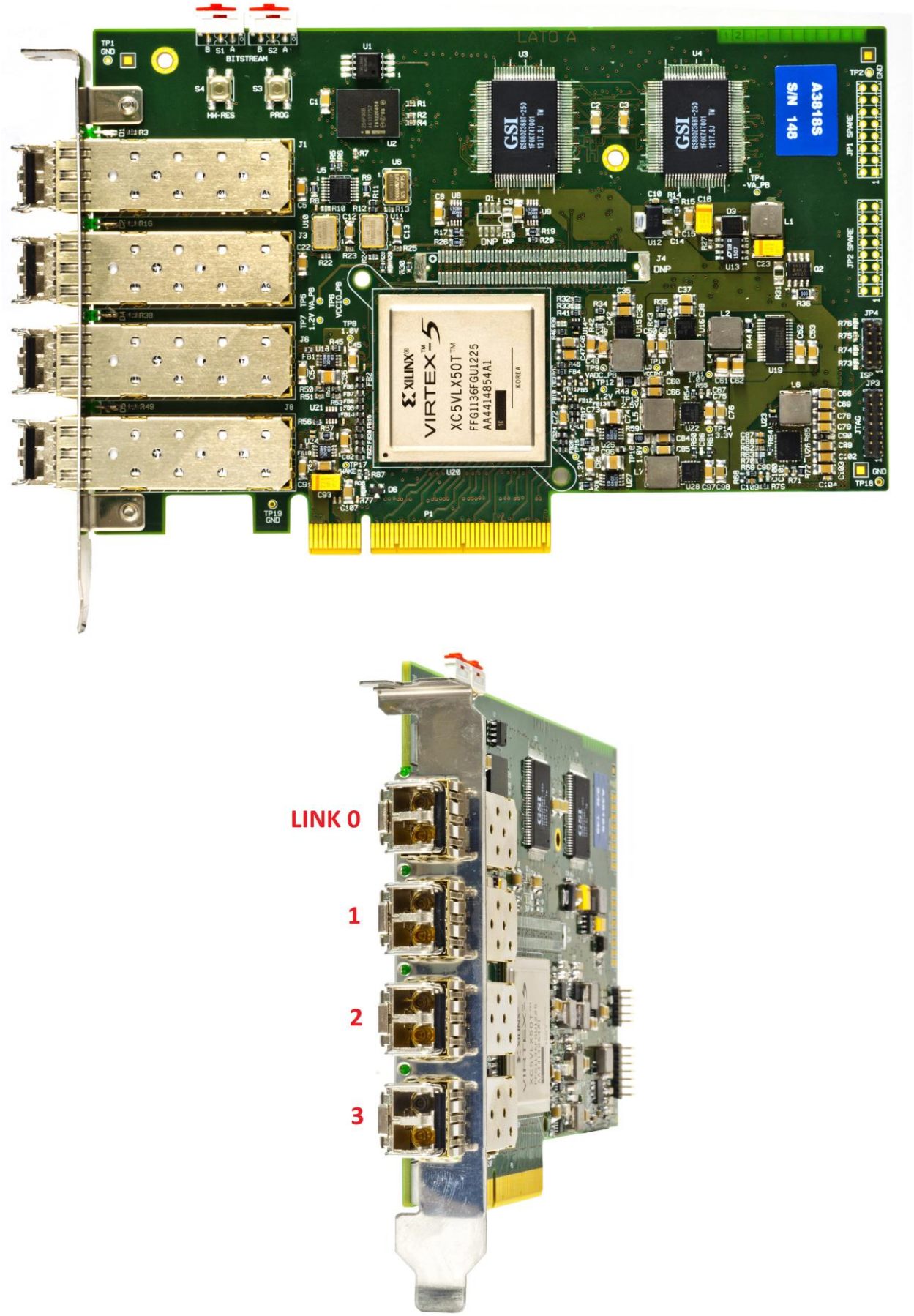


Fig. 1.2: Mod. A3818C – 4-link version of the PCIe Optical Link Controller

2 Technical Specifications

Table 2.1: A3818 Technical Specifications Table

ARCHITECTURE	PCI Express x8	
SLOT COMPATIBILITY	PCI Express x8, x16 (V1.1 or V2.0)	
PCI EXPRESS LANES	**Lane Capability** x8	**Compatibility** x1, x4 lanes slots
COMMUNICATION INTERFACE	Optical Link (CONET 2 CAEN proprietary protocol)	
NUM. OF OPTICAL LINKS	1 (mod. A3818A) 2 (mod. A3818B) 4 (mod. A3818C)	
NUM. OF BOARDS / LINK	Up to 8 boards can be controlled by a single CONET 2 link thanks to Daisy-chain capability	
TRANSFER RATE	Up to 80 MB/s	
MECHANICAL	**Form Factor** Half size	**Dimension** 106,65 x 167,65 mm (HxL) See **Fig. 2.1**
POWER RAILS	+12 V +3.3 V	
OPERATING SYSTEMS SUPPORTED	Windows® and Linux platforms	

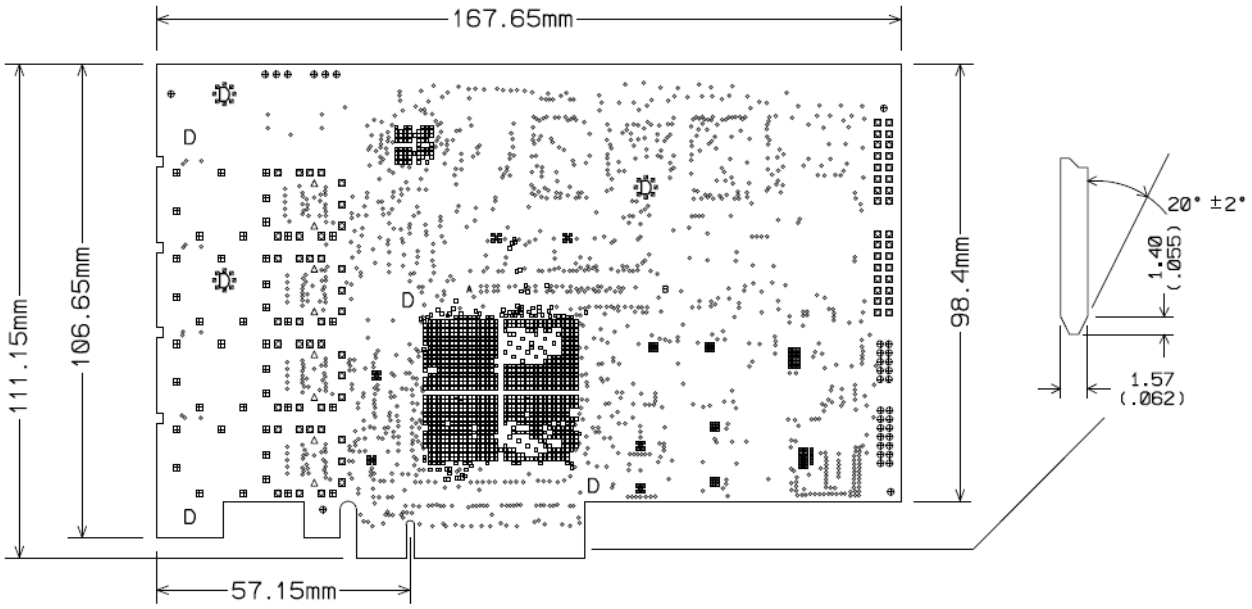


Fig. 2.1: A3818 Dimensional References

From Q3 2013, the PCB version in **Fig. 2.1** definitely substituted the old version (featuring 196,69 mm length). Both the PCB versions are declared to be full functionally interchangeable.

2.1 Transceiver Component

Fig. 2.2: The pluggable transceiver component of A3818

All A3818 types mount the Small Form Factor Pluggable (SFP) transceiver component shown in **Fig. 2.2**.

The PCIe Controller is delivered with its transceiver components already plugged in and mechanically tested.

IT IS STRONGLY RECOMMENDED NOT TO UNPLUG THE TRANSCEIVER COMPONENTS!

2.1.1 Troubleshooting

In case the transceiver results partially or totally unplugged for whatever reason, the procedure to plug it back in, restoring the full functionality of the optical communication, is to push the component along its guide, fixed on the board, until a click occurs to guarantee the proper plug (see **Fig. 2.3**).

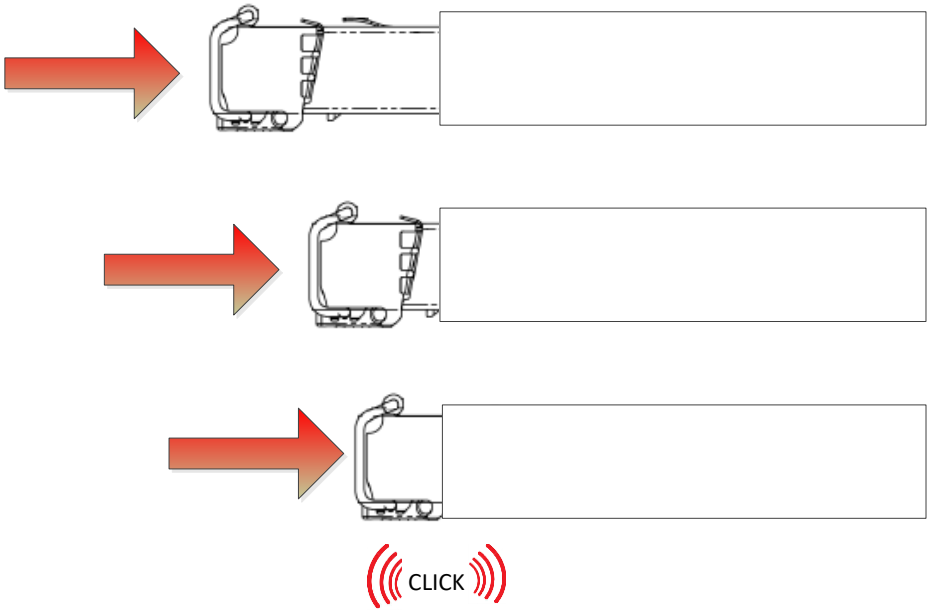


Fig. 2.3: Steps of the Optical Link transceiver plug-in procedure

The position of the adjustable front lever does not affect the plug-in procedure.

In case of any need of support, please contact CAEN as indicated in § **3.9**.

3 Configuration and Installation

3.1 System Requirements

The A3818 is provided with drivers for Linux and Windows OS, 32 and 64-bit.

THE A3818 MAY NOT BE SUPPORTED ON SOME DELL COMPUTERS. PLEASE CONTACT US FOR A LIST OF COMPATIBLE PCs THAT BEST FIT YOUR APPLICATION

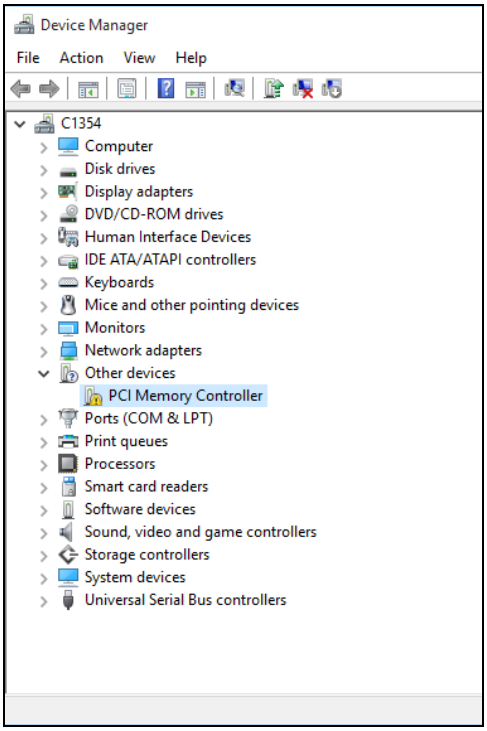
THE A3818 WINDOWS DRIVERS REL. 2.0.0 OR HIGHER WORK ONLY WITH CAENVMELib 3.0.0 OR HIGHER!

3.2 Installation

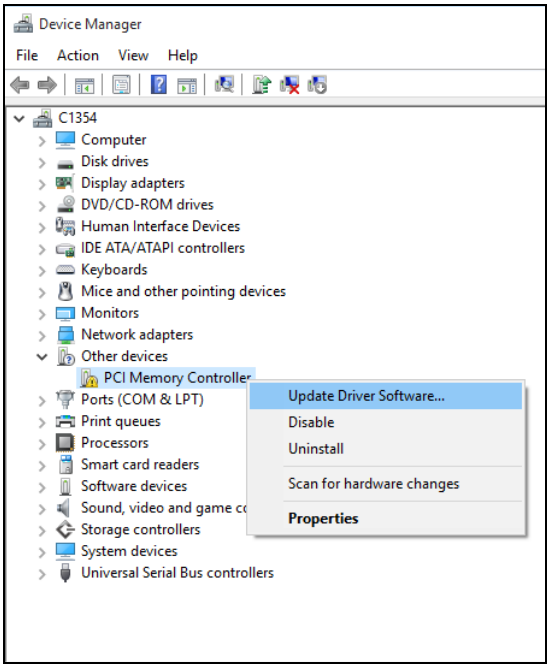
The following steps include the A3818 driver installation based on Windows 10 OS. In case of different Windows operating systems, the displayed dialogue boxes, indications or operations may slightly be different.

- Plug the A3818 into a free x8/x16 PCI Express slot (V1.1 or V2.0)
- Connect the optical fibres as described in § **3.5.1**
- Turn on the system
- Go to www.caen.it and browse:

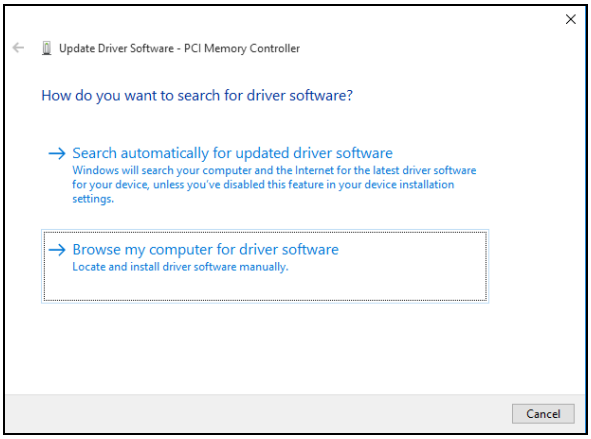
  Home / Products / Accessories / Optical Controllers / A3818
- Click on the “Software/Firmware” tab
- Download the driver package according to your OS
- Go to the Windows Device Manager and right click on the “PCI Memory Controller” item



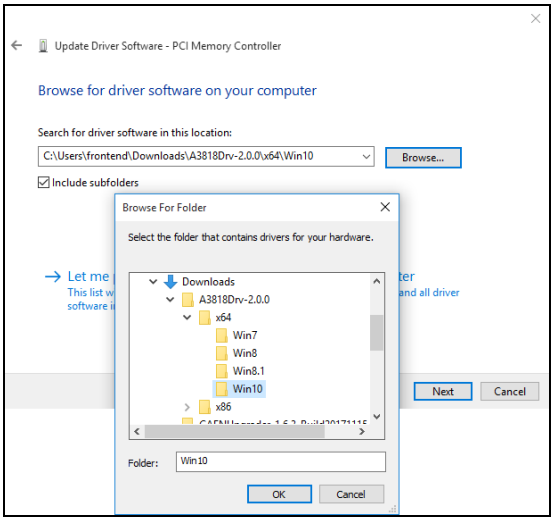
– Left click on “Update Driver Software”



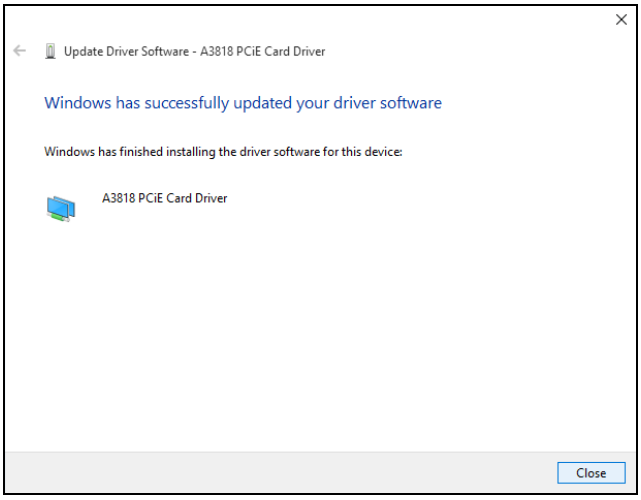
– Select “Browse my computer for driver software”



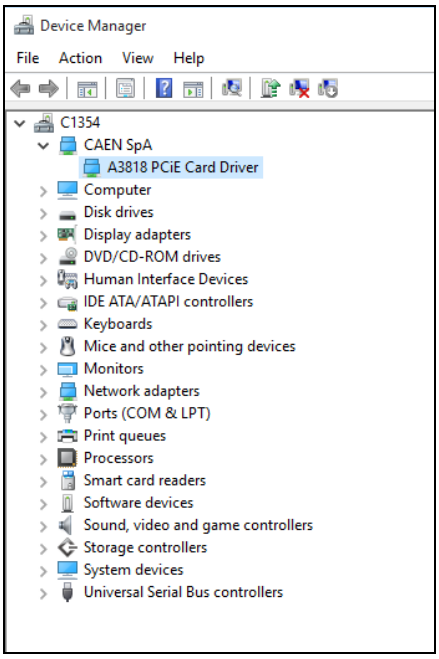
– Point to the proper driver subfolder on your PC according to your Windows system



- Wait until the installation process is completed



- Find the hardware properly detected in Windows Device Manager



- Download and install the latest version of CAENVMElib (3.0.0 or higher) from CAEN web site at:

  Home / Products / Firmware/Software / Digitizer Software / Software Libraries / CAENVMELib Library

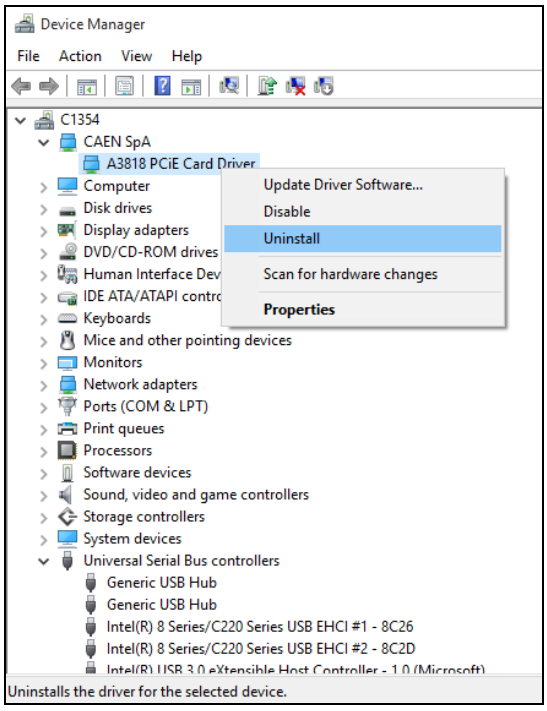
Now you can start working with the A3818 PCIe controller.

In case of any need of support, please contact CAEN as indicated in § **3.9**.

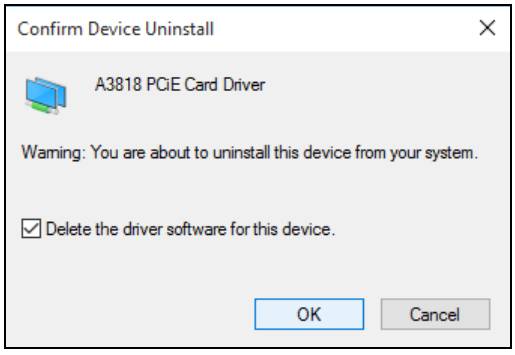
3.3 Uninstallation

To uninstall the A3818 from your PC:

- Go to the Windows Device Manager and right click on “A3818 PCiE Card Driver” item
- Left click on “Uninstall”



- Select “Delete the driver software for this device” and press “OK”



- Shut down your PC
- Unplug the optical fibre from your A3818
- Extract the A3818 from the PCIe slot with caution!

3.4 Components Location

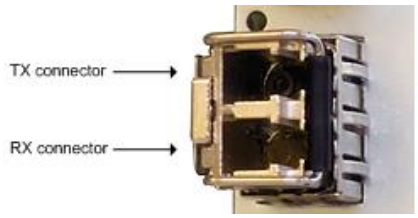


Fig. 3.1: Led and connector location

The A3818 has the following external components:

TX/RX: LC type connector (one per link); to be used with Multimode 62.5/125µm cable with LC connectors on both sides

Leds: green (one per link); data transfer, active ON

3.5 CONET2 Layout

Up to 8 Modules can be controlled by one CONET2 link; therefore, a controller with four links can handle up to 32 modules. For this purpose, various types of cables are available:

Table 3.1: CONET2 cables specifications

Code	Product	Description
WAI2730XAAAA	AI2730	Optical Fibre 30 m. simplex
WAI2720XAAAA	AI2720	Optical Fibre 20 m. simplex
WAI2705XAAAA	AI2705	Optical Fibre 5 m. simplex
WAI2703XAAAA	AI2703	Optical Fibre 30cm. simplex
WAY2730XAAAA	AY2730	Optical Fibre 30 m. duplex
WAY2720XAAAA	AY2720	Optical Fibre 20 m. duplex
WAY2705XAAAA	AY2705	Optical Fibre 5 m. duplex

3.5.1 Network Connection

- Connect the TX connector of the A3818 to the RX connector of the first Module of the CONET2 network, via the optical fiber cable, then connect the TX connector of the first Module of the network to the RX connector of the second Module (if existing) and so on, until the last module in the chain, whose TX connector must be connected to the A3818 RX connector; if only one Module is present, then its TX connector must be connected to the RX connector of the A3818. Link index starts from 0 (1st link in the 1st slot used, and so on, see picture below)
  - **Important note**: if also A2818s are installed, these ones have lower index number assigned
- Now the network is ready for operation.

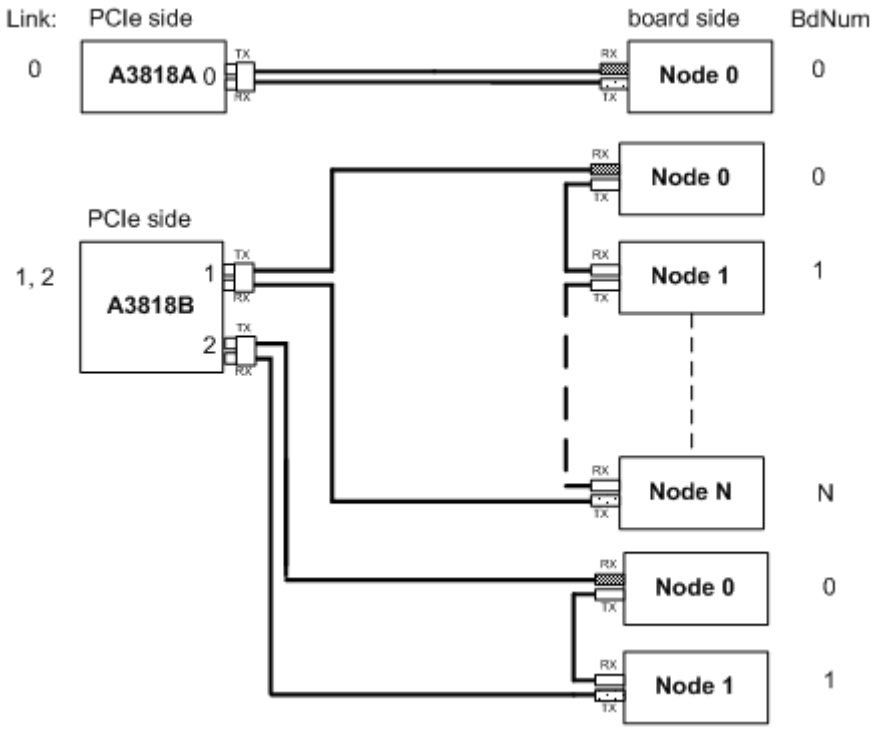


Fig. 3.2: Network scheme

3.6 Firmware Upgrade

It is possible to upgrade the A3818 firmware by writing the Flash. The firmware file is a binary file (.bin) whose name follows this general scheme:

a3818_revX.Y.BIN

where X.Y is the major/minor revision number of the Flash.

Firmware upgrades are downloadable on CAEN website (www.caen.it) at:

Home / Products / Modular Pulse Processing Electronics / PCI/PCIe / Optical Controllers / A3818

CAEN provides the CAENUpgrader software tool to upgrade the firmware. Installation package and documentation are available for download on caen website (www.caen.it) at:

Home / Products / Firmware/Software / Digitizer Software / Configuration Tools / CAENUpgrader

Important Note: the A3818 Windows driver rel. 2.0.0 (or higher) requires CAENUpgrader rel. 1.6.3 Build 20171215 (or higher)!

Important Note: the A3818 can store four firmware image files on four pages (from 0 to 3) of a BPI Flash; the "Config Options" tab of the CAENUpgrader tool allows to select the BPI Flash page where the new image is going to be saved.

The picture below shows the CAENUpgrader settings for the A3818 firmware upgrade (Flash page "0" selected by default).

- Select the Bridge Upgrade tab in the CAENUpgrader GUI;
- select the Upgrade Firmware option in the "Available Actions" menu;
- select A3818 as option in the "Bridge Model" menu;
- browse for the .bin firmware file to load, that you stored on your disk drive (use "all files" option);
- select PCI MASTER as option in the "Connection Type" menu;
- select the "LINK number" of the A3818 ("0" for a single A3818 mounted in the PC).

Note: the LINK number parameter is described in the CAENDigitizer User & Reference Manual available on CAEN website (www.caen.it) at:

Home / Products / Firmware/Software / Digitizer Software / Software Libraries / CAENDigitizer Library

- select the number of the "Flash page" to store the firmware in;
- click the "Upgrade" botton to perform the upgrade.

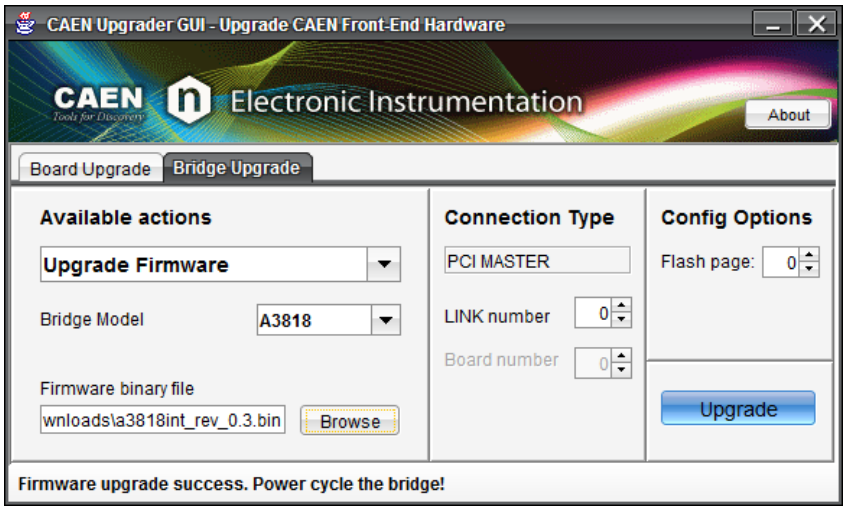


Fig. 3.3: CAENUpgrader tool

- Shut down the PC and then power it on to make the firmware change effective after the message given by the GUI (do not perform a system reset)

Switches S1 and S2 on the A3818 printed board allow to select the image to run:

S2 = A, S1 = A -> firmware on page 0
S2 = A, S1 = B -> firmware on page 1
S2 = B, S1 = A -> firmware on page 2
S2 = B, S1 = B -> firmware on page 3
S1 and S2 setting is meaningless during the firmware upgrade procedure described above.

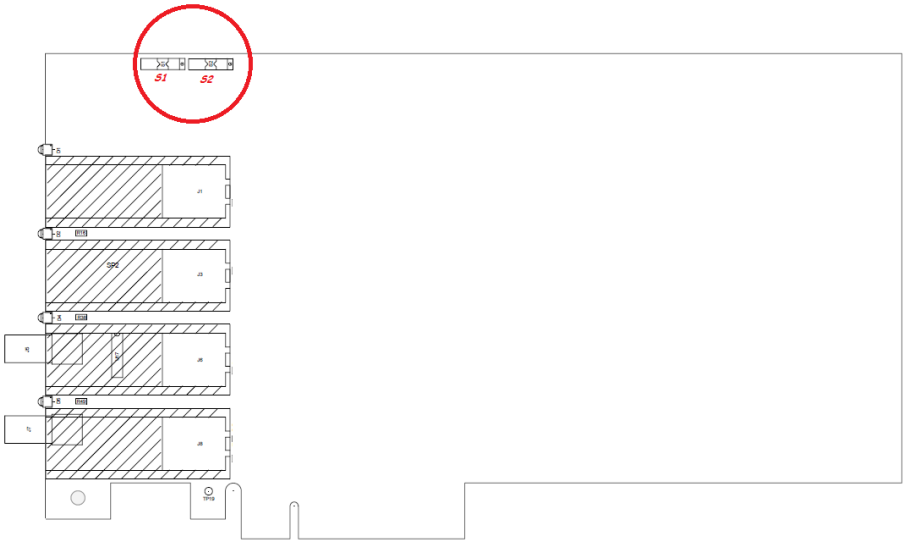


Fig. 3.4: S1, S2 switches location

By using the GET Firmware Release function in CAENUpgrader, it is also possible to read the version of the current firmware loaded on the Flash page selected by the switches above.

3.7 CAEN Modules Control

- VMEbus control through V2718 Bridge: refer to CAEN V2718 Bridge User's manual
- CAEN Digitizers control (all formats: VME, NIM and Desktop): refer to the CAENComm and CAENDigitizer libraries User's manual

3.8 CONET1-to-CONET2 Upgrade

CONET2 is not compatible with CONET1 network, therefore, in order to upgrade CONET1 compatible modules to CONET2 it is necessary to update the modules firmware by using the CAENUpgrader tool (see § **3.6**).

3.9 CAEN 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/