CAEN

Tools for Discovery

Register your device

Register your device to your **MyCAEN+** account and get access to our customer services, such as notification for new firmware or software upgrade, tracking service procedures or open a ticket for assistance. **MyCAEN+** accounts have a dedicated support service for their registered products. A set of basic information can be shared with the operator, speeding up the troubleshooting process and improving the efficiency of the support interactions.

MyCAEN+ dashboard is designed to offer you a direct access to all our after sales services. Registration is totally free, to create an account go to https://www.caen.it/become-mycaenplus-user and fill the registration form with your data.

1 create a MyCAEN+ account
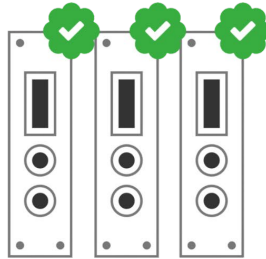
2 register your devices

3 get support and more!

https://www.caen.it/become-mycaenplus-user/
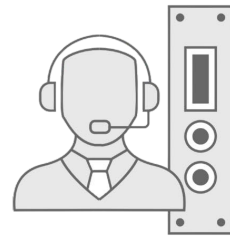
Purpose of this Manual

This document is the 803x Series 8-16 Ch. Programmable HV Power Supplies User's Manual; it contains information about the installation, the configuration and the use of the units.

Change Document Record

Date	Revision	Changes
30 May 2019	0	Preliminary Release
20 December 2019	1	Updated power requirements
21 July 2020	2	Updated Technical specifications table
28 January 2021	3	Updated power requirements, Technical specifications table
5 February 2021	4	Updated Technical specifications table
25 February 2021	5	Updated power requirements, Technical specifications table
23 March 2021	6	Updated Technical specifications table
7 May 2021	7	Updated Technical specifications table, External connections
12 May 2021	8	Updated Software tools
8 June 2022	9	Updated power requirements, Technical specifications table
19 December 2022	10	Updated with 8034H series data

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Limitation of Responsibility

If the warnings contained in this manual are not followed, CAEN will not be responsible for damage caused by improper use of the device. The manufacturer declines all responsibility for damage resulting from failure to comply with the instructions for use of the product. The equipment must be used as described in the user manual, with particular regard to the intended use, using only accessories as specified by the manufacturer. No modification or repair can be performed.

Disclaimer

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

Index

1. Safety Notices

N.B. Read carefully the "Precautions for Handling, Storage and Installation" document provided with the product before starting any operation.

The following HAZARD SYMBOLS may be reported on the unit:

⚠	Caution, refer to product manual
⚡	Caution, risk of electrical shock
⏚	Protective conductor terminal
⏚	Earth (Ground) Terminal
∿	Alternating Current
3∿	Three-Phase Alternating Current

The following symbol may be reported in the present manual:

⚠	General warning statement

The symbol could be followed by the following terms:

- **DANGER**: indicates a hazardous situation which, if not avoided, will result in serious injury or death.
- **WARNING**: indicates a hazardous situation which, if not avoided, could result in death or serious injury.
- **CAUTION**: indicates a situation or condition that, if not avoided, could cause physical injury or damage the product and / or its environment.

CAUTION: To avoid potential hazards

⚠ **USE THE PRODUCT ONLY AS SPECIFIED.**
ONLY QUALIFIED PERSONNEL SHOULD PERFORM SERVICE PROCEDURES

CAUTION: Avoid Electric Overload

TO AVOID ELECTRIC SHOCK OR FIRE HAZARD, DO NOT POWER A LOAD OUTSIDE OF ITS SPECIFIED RANGE

CAUTION: Avoid Electric Shock

TO AVOID INJURY OR LOSS OF LIFE, DO NOT CONNECT OR DISCONNECT CABLES WHILE THEY ARE CONNECTED TO A VOLTAGE SOURCE

CAUTION: Do Not Operate without Covers

TO AVOID ELECTRIC SHOCK OR FIRE HAZARD, DO NOT OPERATE THIS PRODUCT WITH COVERS OR PANELS REMOVED

CAUTION: Do Not Operate in Wet/Damp Conditions

TO AVOID ELECTRIC SHOCK, DO NOT OPERATE THIS PRODUCT IN WET OR DAMP CONDITIONS

CAUTION: Do Not Operate in an Explosive Atmosphere

TO AVOID INJURY OR FIRE HAZARD, DO NOT OPERATE THIS PRODUCT IN AN EXPLOSIVE ATMOSPHERE

THIS DEVICE SHOULD BE INSTALLED AND USED BY SKILLED TECHNICIAN ONLY OR UNDER HIS SUPERVISION

DO NOT OPERATE WITH SUSPECTED FAILURES.
IF YOU SUSPECT THIS PRODUCT TO BE DAMAGED, PLEASE CONTACT THE TECHNICAL SUPPORT

2. 803x Series Overview

The 803x power supply series provides 8 or 16 independent HV channels, whose control can take place either locally thanks to a 2.8" Touchscreen Graphic color LCD display or remotely, via USB 2.0 or Ethernet.

The units are available in three formats: double width NIM mechanics, 19" rack module and Desktop case.

NIM and Desktop versions feature 8 channels, the 19" rack units can house either 8 or 16 channels.

5 output ranges are available (100V/10mA, 500V/10mA, 4kV/3mA, 6kV/20µA and 6kV/1mA), with either positive or negative polarity; all units are provided also in "mixed" version, with half of the channels positive and half negative. 100V channels are delivered through BNC connectors, other versions feature SHV's.

The HV output RAMP-UP and RAMP-DOWN rates may be selected independently for each channel.

Safety features include:

- OVERVOLTAGE and UNDERVOLTAGE warning when the output voltage differs from the programmed value by more than 2% of set value (minimum 10V).

- Programmable VMAX protection limit via front panel trimmer; common to all channels

- Programmable IMAX protection limit via front panel trimmer; common to all channels

- OVERCURRENT detection: if a channel tries to draw a current larger than its programmed limit, it enters TRIP status, keeping the maximum allowed value for a programmable time (TRIP), before being switched off.

- Common Interlock logic for channels enable/disable and individual inputs signal for channel Kill function.

A complete set of Software Tools is available to control these units; the User can freely download low level libraries, LabVIEW driver and Graphical application software.

3. Technical specifications

Packaging

DT803x: Desktop package (340x110x255mm); Weight: ~5.2kg
N803x: Double width NIM mechanics. Weight ~2.6kg
R803x: 19" rack (h: 2U; d: 400mm). Weight: ~9kg (8 ch), 10.5kg (16 ch)

Power requirements

DT8031	DT8032	DT8033	DT8034	DT8034H
		8 Channels		
Voltage: 100 - 240V ~ Frequency 50/60Hz 0.8A rms max Fuse 2xT1A 6.3x32 250VAC	Voltage: 100 - 240V ~ Frequency 50/60Hz 1.6A rms max Fuse 2xT2A 6.3x32 250VAC	Voltage: 100 - 240V ~ Frequency 50/60Hz 1.6A rms max Fuse 2xT2A 6.3x32 250VAC	Voltage: 100 - 240V ~ Frequency 50/60Hz 1.6A rms max Fuse 2xT2A 6.3x32 250VAC	Voltage: 100 - 240V ~ Frequency 50/60Hz 1.6A rms max Fuse 2xT2A 6.3x32 250VAC

R8031	R8032	R8033	R8034	R8034H
		8 Channels		
Voltage: 100 - 240V ~ Frequency 50/60Hz 0.8A rms max Fuse 2xT1A 6.3x32 250VAC	Voltage: 100 - 240V ~ Frequency 50/60Hz 1.6A rms max Fuse 2xT2A 6.3x32 250VAC	Voltage: 100 - 240V ~ Frequency 50/60Hz 1.6A rms max Fuse 2 xT2A 6.3x32 250VAC	Voltage: 100 - 240V ~ Frequency 50/60Hz 1.6A rms max Fuse 2xT2A 6.3x32 250VAC	Voltage: 100 - 240V ~ Frequency 50/60Hz 1.6A rms max Fuse 2xT2A 6.3x32 250VAC

R8031D	R8032D	R8033D	R8034D	R8034HD
		16 Channels		
Voltage: 100 - 240V ~ Frequency 50/60Hz 1.6A rms max Fuse 2xT2A 6.3x32 250VAC	Voltage: 100 - 240V ~ Frequency 50/60Hz 3A rms max Fuse 2xT4A 6.3x32 250VAC	Voltage: 100 - 240V ~ Frequency 50/60Hz 3A rms max Fuse 2xT4A 6.3x32 250VAC	Voltage: 100 - 240V ~ Frequency 50/60Hz 3A rms max Fuse 2xT4A 6.3x32 250VAC	Voltage: 100 - 240V ~ Frequency 50/60Hz 3A rms max Fuse 2xT4A 6.3x32 250VAC

	N8031	N8032	N8033	N8034	N8034H
			8 Channels		
+6V	2.5A	1A	1A	1A	T.B.D.
-6V	1.6A	500mA	200mA	200mA	T.B.D.
+12V	300mA	2.5A	3.4A	3.4A	T.B.D.
-12V	200mA	2.5A	3.4A	3.4A	T.B.D.

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Front panel
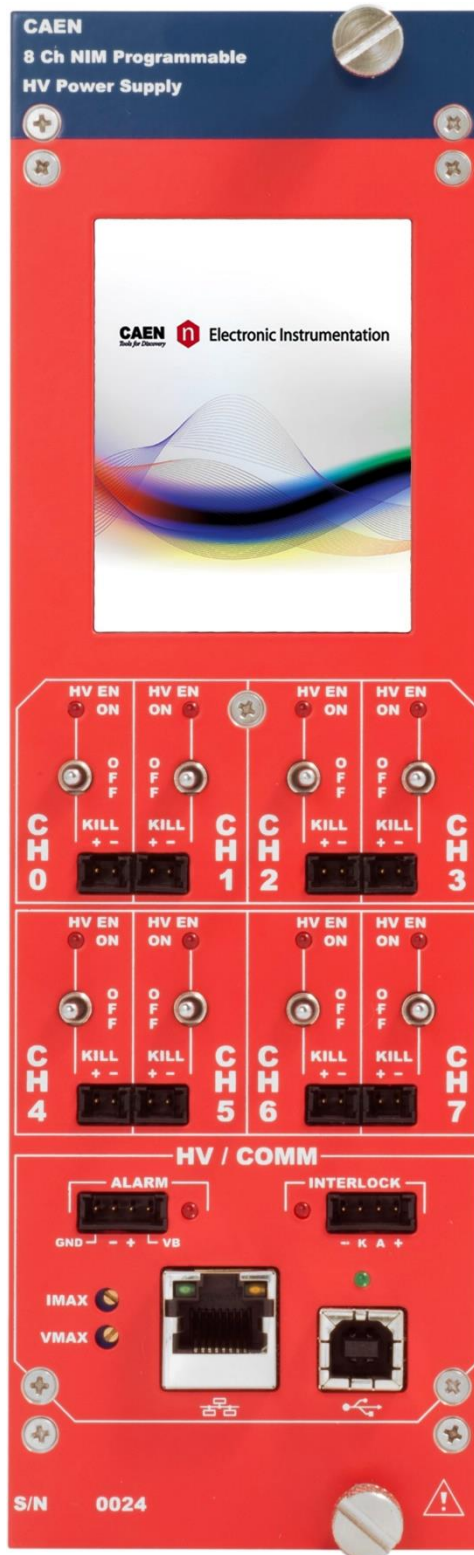
External connections

Local control section

2.8" LED Touch Screen   Parameter and Mode setting; Local settings monitoring

CAEN Electronic Instrumentation

Channel control section

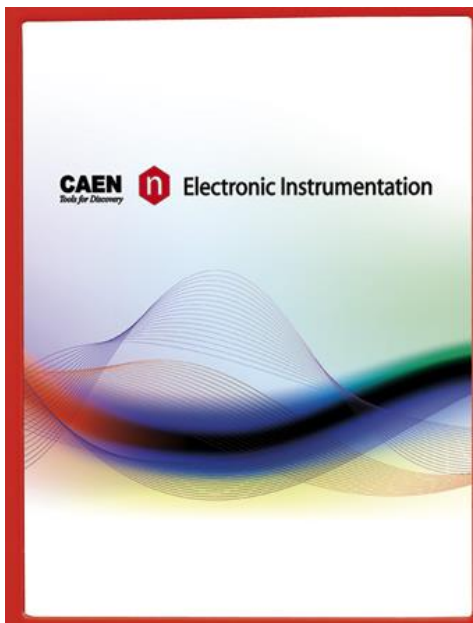| HV_EN/OFF/KILL	3 POS. SWITCH	*Channel Enable and turning OFF/KILL*
ON	RED LED	*HV On enabled*
REMOTE KILL	AMP 280370-2	The channel is KILLED either as the +/- contacts are open or as a +4÷6Vdc voltage is fed to "pin +", with "pin –" to GND (Channel turned off at fastest available rate)

HV Status control section

ALARM	RED LED AMP 280371-2.	Out	*Alarm status signalled (active LOW)*
INTERLOCK	RED LED AMP 280371-2	In	*Interlock signal*
VMAX	trimmer		it allows to adjust the hardware maximum voltage VMAX common to all the channels. Its value can be read out via software.
IMAX	trimmer		it allows to adjust the hardware maximum current IMAX common to all the channels. Its value can be read out via software.

Alarm signal
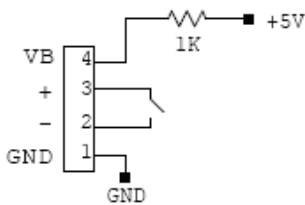
As an Alarm condition is detected, pins 2 and 3 (- and +) are closed; the contact can be used to switch an external device supplied by an external source, otherwise the VB and GND references can be used to provide a TTL compatible level on pin 2 and 3.

In the first case (externally supplied device) the maximum allowed ratings are:

Maximum voltage between + and -: 12V

Maximum sink current across + and -: 100mA

In the latter case, to produce a TTL compatible Alarm Out, pin 3 (+) must be connected with pin 4 (VB) and pin 1 (GND) with pin 2 (-); see the diagram:
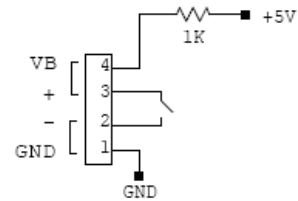
Interlock signal
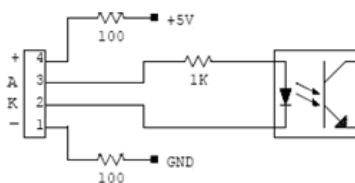
A schematic diagram of the Interlock input is shown in the figure on the left, where the diode is part of opto-coupler stage.
Interlock means that channels are hardware disabled. The following table explains the interlock operation:

CONFIGURATION ↓	INTERLOCK MODE →	UNDRIVEN	DRIVEN
leave contact open		INTERLOCK	ENABLED
voltage level (0÷1V, ~5mA current) between pin 2 (high) and pin 3 (low)		INTERLOCK	ENABLED
short circuit pin 1 with pin 2, and pin 3 with pin 4		ENABLED	INTERLOCK
voltage level (4÷6V, ~5mA current) between pin 2 (high) and pin 3 (low)		ENABLED	INTERLOCK

The front panel Interlock LED is ON when the INTERLOCK is active; as INTERLOCK is active, channels are <u>turned off</u> at the fastest available rate, regardless the RAMP DOWN setting. To reset the Interlock flag, all switches must be placed on KILL and then on OFF.

Remote communication control section
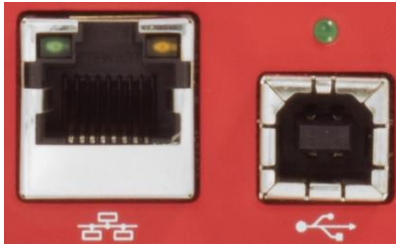
USB   B TYPE USB   USB2.0 compliant
ETH   10/100 Base-T female connector

HV Channel Output

Channel Output: **8031 series**: BNC RADIALL R141.557.000
Electrical: Impedance 50Ω; Operating temp. -65/+165°C; Frequency 0-4 GHz; VSWR 1.06+0.006 xF(GHz) Max; Insertion loss .025*√F(GHz) dB Max; RF leakage – (57 - F(GHz)) dB Max; Voltage rating 500Veff Max ; Dielectric withstanding voltage 1500Veff min; Insulation resistance 5000MΩ min;
Mechanical: Center contact retention: Axial force – Mating end 18 N min; Axial force – Opposite end 18N min; Torque 2.8 N.cm min Recommended torque: Panel nut 250 N.cm; Mating life 500 Cycles min Weight 8.000 g

Channel Output: **8032-33-34-34H series**: SHV RADIALL R317580; Impedance: 50 Ohm; Frequency range: 0 –
2 GHz; VSWR: <1.20 + 0.3 F (GHz) – (plug and jack); Test voltage: 10kV DC – 1mn (unmated
connectors); Ratings: 12kV DC – 1mn (mated pairs); Current rating: 10 A

MON   AMP 280371-2; The test points allow to monitor the Channel Output Voltage, Current and Temperature.
V/I analog monitor output; range: 0 ÷ +5V; proportional to output voltage and current.
T: input for PT1000 temperature probe (8031 series only).

⚠️ WARNING! These connectors produce extremely hazardous high voltages at a potentially lethal current level; never connect or disconnect the HV OUT connector with the power ON/OFF switch ON; always switch power OFF and wait at least 30s before connecting or disconnecting HV cables.

AC Input (DT803x, R803x)

IEC 60 320 Socket with switch; to be connected to Mains 100 - 240 Vac (50 - 60 Hz) via provided power cord.
Two Fuses: 6.3x32 (8 channels: 1A; 16 channels: 2A); Retarded 250VAC

Technical specifications table[1]

Series	8031	8032	8033	8034	8034H
Polarity	Positive / Negative / Mixed[2] depending on purchased version; common ground				
Output connector	BNC	SHV			
Output Voltage	0÷100 V	0÷500 V	0÷4 kV	0÷6 kV	
Max. Output Current	10 mA	10mA	3 mA	1 mA	20 µA
Max. Output Power	1 W	5 W	6 W		0.12 W
Voltage Set Resolution	500µV	2mV	10mV	20mV	
Voltage Monitor Resolution	500µV	2mV	10mV	20mV	
ISet Resolution	50nA		10nA	5nA	100pA
IMon Resolution — High range	50nA		10nA	5nA	100pA
IMon Resolution — Low range	5nA		1nA	500pA	10pA
Ramp Up/Down	1÷50 V/s, 1 V/s step	1÷100 V/s, 1 V/s step	1÷500 V/s, 1 V/s step		
VMAX hardware	0÷100 V	0÷500 V	0÷4 kV	0÷6 kV	
VMAX hardware resolution	1 V			2V	
IMAX hardware	0÷10 mA		0÷3 mA	0÷1 mA	0÷20 µA
IMAX hardware resolution	10µA			1µA	20nA
Alarm output	Open collector, 100 mA maximum sink current				
Interlock input	LOW: <1V; current~5mA; HIGH: 4÷6 V				
Trip	Max. time an "overcurrent" can last (seconds). A channel in "overcurrent" works as a current generator; output voltage varies to keep the output current lower than the programmed value. "Overcurrent" lasting more than set value (1 to 9999) causes the channel to "trip". Output voltage will drop to zero either at the Ramp-down rate or at the fastest available rate, depending on Power Down setting; in both cases the channel is put in the off state. If trip= INFINITE, "overcurrent" lasts indefinitely. TRIP range: 0 ÷ 999.9s; 1000 s = Infinite. Step = 0.1 s				
Voltage Ripple — 10Hz ÷ 1kHz — Typ	3 mVpp	5 mVpp	4 mVpp		
Voltage Ripple — 10Hz ÷ 1kHz — Max	5 mVpp	7 mVpp	8 mVpp		
Voltage Ripple — 1kHz ÷ 20MHz — Typ	1 mVpp	3 mVpp	2 mVpp		
Voltage Ripple — 1kHz ÷ 20MHz — Max	3 mVpp	5 mVpp	5 mVpp		
Accuracy — Vmon vs. Vout	± 0.02% ± 20mV	± 0.02% ± 100mV	± 0.02% ± 1V		
Accuracy — Vset Vs. Vout	± 0.02% ± 20mV	± 0.02% ± 100mV	± 0.02% ± 1V		
Accuracy — Imon vs. Iout — High range	± 0.5% ± 50µA		± 0.2% ± 2µA	± 0.2% ± 1µA	± 0.2% ± 20nA
Accuracy — Imon vs. Iout — Low range	± 0.5% ± 5µA		± 0.2% ± 200nA	± 0.2% ± 100nA	± 0.2% ± 2nA
Accuracy — Iset vs. Iout — High range	± 0.5% ± 50µA		± 0.2% ± 2µA	± 0.2% ± 1µA	± 0.2% ± 20nA
Accuracy — Iset vs. Iout — Low range	± 0.5% ± 5µA		± 0.2% ± 200nA	± 0.2% ± 100nA	± 0.2% ± 2nA
Humidity range	0 ÷ 80% non condensing				
Operating temperature	0 ÷ 45°C				
Storage temperature	-10 ÷ 70°C				
Altitude	≤ 2000m above sea level				
Vout / Temperature coeff.	±10 ppm/°C typ	±50 ppm/°C typ			
Stability (24h; 1 hour warm up)	±0.01% / full scale	±0.02% / full scale	±0.01% / full scale	±0.01% / full scale	
Long Term stability (1 week; 1h warmup)	±0.02% / full scale	±0.04% / full scale	±0.02% / full scale	±0.02% / full scale	
Safety Standard – ROHS – Halogen free	RoHS compliant				
EMC qualification	CEI EN 61326				

[1] Validity range of specifications: 8031: 1% to 100%; 8032: 5% to 100%; 8033: 1% to 100%; 8034, 8034H: 5% to 100%
[2] *Mixed* boards have half of the channels with positive polarity and half with negative

4.   Operating modes

Hardware installation

Prior to shipment this unit was inspected and found free of mechanical or electrical defects. Upon unpacking of the unit, inspect for any damage, which may have occurred in transport. The inspection should confirm that there is no exterior damage to the unit, such as broken knobs or connectors, and that the panels are not scratched or cracked. Keep all packing material until the inspection has been completed. If damage is detected, file a claim with carrier immediately and notify CAEN. Before installing the unit, make sure you have read thoroughly the safety rules and installation requirements, then place the package content onto your bench; you shall find the following parts:

N803x, DT803x or R803x power supply unit

USB cable

10BASE-T Ethernet cable

Power cord (DT803x and R803x only)

N803x's are housed in a 2-unit NIM mechanics. The unit is an equipment for BUILDING-IN: install it in a NIM crate providing the required power supplies, with forced cooling air flow, then connect the HV Channel Output to the load

R803x's are housed in 19" rack package. The unit is an equipment for BUILDING-IN: install it in a 19" EIA compliant equipment rack. Use the front panel rack-mount brackets to install the unit in the rack, using standard screws; leave at least one rack unit of free space above and below the unit. Plug the power cord into the AC Input (see p.11) and then to the mains AC; connect the HV Channel Output to the load.

D803x's are housed in a Desktop package. The unit is an equipment for BUILDING-IN: use it on flat solid surfaces, such as a table or a desk. Plug the power cord into the AC Input (see p.11) and then to the mains AC; connect the HV Channel Output to the load.

Unit control can take place either locally, assisted by a 2.8" Touchscreen LCD or remotely, via USB, or Ethernet.

Unit Power ON

- N803x: after hardware installation (see above), turn on the NIM crate
- DT803x, R803x: after hardware installation (see above), turn on the module, via the rear panel ON/OFF switch

Local Control

At power ON the Display shows the Main Menu:

⬡ **CAEN**
Tools for Discovery
N8033 8 CH 4KV/3mA

CH0
CH1
CH2
CH3   GROUP
CH4
CH5
CH6
CH7
                    BOARD
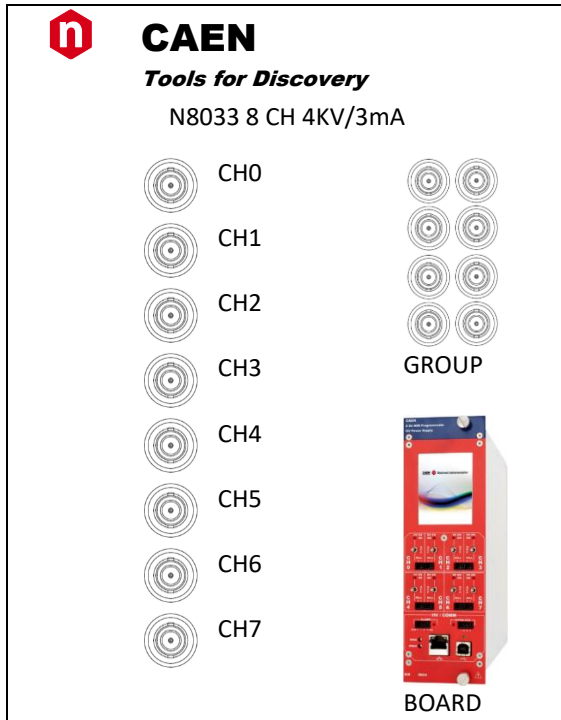
At this point the module is ready to be operated locally. Tap on:
- BOARD icon to access BOARD parameters
- CHx icon to access CHANNELS parameters
- GROUP icon to access CHANNEL GROUP parameters

BOARD Settings

Board Parameters	
Status	√
HVMax	
HIMax	
Interlock	Driven/Undriven
Control	Remote/Local
←	

General board parameters (CONTROL can be operated both in LOCAL and REMOTE mode; other settings are allowed in LOCAL mode only; monitor values are available also with remote control) include:

Parameter:	Type:	Function:
Status	Monitor	Module power supply status
HVMax	Monitor	Hardware Max Voltage settable via trimmer, see p.10
HIMax	Monitor	Hardware Max Current settable via trimmer, see p.10
INTERLOCK	Monitor/Set	Undriven / Driven OPERATION (see p.10)
CONTROL	Monitor/Set	REMOTE: the module is controlled remotely; local monitor is allowed; *LOCAL/REMOTE* switch is enabled
		LOCAL: the module is controlled locally; remote monitor is allowed

To set one parameter, set Control to "Local", then tap on the relevant name, and change and/or enter the desired value; confirm with "Enter". Tap the red arrow to go back to Main Menu.

🖧 Ethernet Configuration: "Network" Icon in the Board settings allows to access Ethernet configuration menu

<	Ethernet Menu	>
	IP Address	
	192.168.0.250	
	Mask	
	255.255.255.000	
	Gateway	
	0.0.0.0	
√		

This option allows to configure the Ethernet settings; once they are done, tap the flag button, but changes will only become effective at the next power ON. Tap the left arrow to go back.
The right arrow allows to access to DHCP settings:

	MAC Address	>
	00.12.5e.00.07.07	
	DHCP	
	Enabled	
√		

If a DHCP Server is available, then the module can be enabled or disabled as DHCP client; tap Flag button to save the new setting and go back to Main Menu: the DHCP server will automatically assign a new IP to the module at next Power On. Tap the right arrow to go back without changes.

Channel settings

These settings are performed on individual channels:

(±) CH1 MENU ←	
VMon	
IMon	
Status	
VSet	
ISet	
Chan	1/2

(±) CH1 MENU ←	
RampUp	
RampDown	
Trip	
PowerDown	
IMonRange	
Chan	2/3

(±) CH1 MENU ←	
VTC	*Dis/En*
KT	*V/°C*
T Step	
T Ref	
T Ext	
Chan	3/3

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N.B. parameters written in *italic* are available only on x8031 series.

For each channel the following parameters can be programmed and monitored either locally or remotely:

Parameter:	Function:	Unit:
(±)	Channel polarity	
Vmon	High Voltage Monitored value	Volt
Imon	Current Monitored value	µA
Status	ON/OFF; Ramp UP/DOWN; OVV; UNV; OVC; OVP; MAXV; TRIP; OVT; OFF; KILL; ILK; CAL_ERR	
Vset	High Voltage programmed value	Volt
Iset	Current Limit programmed value	µA
MaxV	Absolute maximum High Voltage level that the channel can reach (see p. 12)	V
Ramp-Up	Maximum High Voltage increase rate	V/s
Ramp-Down	Maximum High Voltage decrease rate	V/s
Power Down	Power Down mode after channel TRIP	KILL or RAMP
Trip	Max time "overcurrent" allowed to last (1000= ∞)	s
Imon Range	Current Monitor Zoom	H or L

Parameters available only with x8031 series:

VTC	*Enable Temperature compensation*	
KT	*Coefficient of Temperature compensation*	*V/°C*
T Ref	*Reference Temperature*	*°C*
T Step	*Programmed Interval of Temperature compensation*	*°C*
T Ext	*External Temperature*	*°C*

To set one parameter, tap on the relevant name, and change and/or enter the desired value through the "virtual keypad" (see below); confirm with "Enter". Tap the red arrow to go back to Main Menu.

1	2	3
4	5	6
7	8	9
.	0	Del
Enter		

Group Settings

This menu allows to extend settings to all the channels of the unit, and to monitor all of them.

GROUP MENU				←
Ch	0(-)	1(-)	2(-)	3(-)
VMon				
IMon				
Status				

	VSet		Zoom
	ISet		
Chan		Page	1/3

Options available:

Zoom: zoom on voltage and current monitor

Page: access to Channel 4 ÷ 7; 8 ÷ 11; 12 ÷ 15 (depending on number of channels present)

1/3: access to Group parameters:

GROUP MENU ←	
MaxV	
RampUp	
RampDown	
Trip	
RampDown	
PowerDown	
IMonRange	
Chan	2/3

GROUP MENU ←	
VTC	*Dis/En*
KT	*V/°C*
T Step	
T Ref	
T Ext	
Chan	3/3

For the Group of all channels, the following parameters can be programmed and monitored either locally or remotely:

Parameter:	Function:	Unit:
Vmon	High Voltage Monitored value single channels	Volt
Imon	Current Monitored value single channels	µA
Status	ON/OFF; Ramp UP/DOWN; OVV; UNV; OVC; OVP; MAXV; TRIP; OVT; OFF; KILL; ILK; CAL_ERR single channels	
Vset	High Voltage programmed value	Volt
Iset	Current Limit programmed value	µA
MaxV	Absolute maximum High Voltage level that the channel can reach	V
Ramp-Up	Maximum High Voltage increase rate	V/s
Ramp-Down	Maximum High Voltage decrease rate	V/s
Power Down	Power Down mode after channel TRIP	KILL or RAMP
Trip	Maximum time an "overcurrent" can last	s
Imon Range	Current Monitor Zoom	H or L

Parameters available only with x8031 series:

VTC	*Enable Temperature compensation*	
KT	*Coefficient of Temperature compensation*	*V/°C*
T Ref	*Reference Temperature*	*°C*
T Step	*Programmed Interval of Temperature compensation*	*°C*
T Ext	*External Temperature*	*°C*

To set one parameter, tap on the relevant name, and change and/or enter the desired value through the "virtual keypad"; confirm with "Enter". Tap the red arrow to go back to Main Menu.

CAEN Electronic Instrumentation

Status Icon

Three types of Icon in the display status area indicate:

√	OK status
!	WARNING status
!	ALARM status

Remote Control

Module control can take place remotely, via USB or Ethernet; an external PC is required (supported OS: Windows 7 or later; Linux kernel Rel. 2.4 or later). The connection can be performed via VT emulators (such as Tera Term), or via one of the available tools (see below). The 803x Power Supplies family is identified as **SMART HV** by the available software tools. Control option on the Touchscreen must be set to **REMOTE**.

Software tools

GECO2020

CAEN GECO2020 is a graphical application that allows to control the 803x Power Supplies (and all other CAEN Power Supplies). Once the unit is correctly installed, download and install the GECO2020 software package related to your OS; follow the instructions in the GECO2020 User manual and the unit will be ready to be operated. For more info, please visit www.caen.it (products>firmware/software section).

CAEN HV Wrapper

CAEN HV Wrapper is a library, available either as a set of ANSI C functions or LabVIEW™ VI's. Such set provides the software developer a unified software interface for the control of CAEN Power Supplies. This is a low-level application in which the writing of the Control SW is assigned to the user. It contains a generic software interface independent by the Power Supply models and by the communication path used to exchange data with them.

CAEN HV Wrapper is logically located between a higher-level application, such as GECO2020, and the lower layer software libraries. For more info, please visit www.caen.it (products>firmware/software section).

Power Supply Modules LabVIEW Instrument Driver

Power Supply Modules LabVIEW Instrument Driver is a set of VI'S, developed for LabVIEW 2017 and later releases (LabVIEW™ is a Trademark of National Instruments Corp.), that allow to configure and monitor all parameters of remotely controlled CAEN Programmable HV Power Supply modules. Host PC shall run LabVIEW 2017 or later releases and NI-VISA Run-Time Engine 17.

To install the Power Supply Modules LabVIEW Instrument Driver, go to CAEN web site in the "Software" area, download the Power Supply Modules LabVIEW Instrument Driver installation package and follow the Set Up instructions.

PC connection

USB installation

Install the unit, as explained at p. 13

Connect the Unit to the PC via the USB cable

Turn ON the unit via the rear panel (R803x and DT803x) or NIM bin (N803x) switch

Download and install the USB driver for your OS, available at the Unit page on the www.caen.it site[3]

Now the Unit is ready for operation, upon installation of one of the available software tools

Ethernet installation

Install the unit, as explained at p. 13

Connect the Ethernet port of the unit to the relevant port of the PC, using the 10BASE-T Ethernet cable

Turn ON the unit via the rear panel (R803x and DT803x) or NIM bin (N803x) switch

Now the unit is ready for operation, upon installation of one of the available software tools

---

[3] Linux OS Users: the Unit is automatically recognised by Kernel Linux 2.6.9 and higher; unit name is assigned to serial port with name /dev/ttyACM[x], where [x] is device number; for example 1st module connected is /dev/ttyACM0, 2nd module is /dev/ttyACM1 etc.

CAEN ⓝ Electronic Instrumentation

Module access via VT emulator

The connection can be performed via VT emulators; we suggest using Tera Term

(see https://ttssh2.osdn.jp/index.html.en)

USB
Launch the terminal emulator, select the serial communication link and set the virtual communication port associated to the module. Select USB connection and the used port number; set port as follows

> baud rate 9600
>
> Data bits: 8
>
> Parity: none
>
> stop bit: 1
>
> Flow control: none
>
> Launch communication
>
> Type caen then <enter>;

Ethernet
Launch the terminal emulator, select port number **1470**
Please note that line editing must be disabled prior to Ethernet access (EnableLineMode=off in the Teraterm.ini configuration file).
Default settings are:

IP address	192.168.0.250
Subnet mask	255.255.255.0
Gateway	0.0.0.0

Launch communication
Type caen then <enter>;

as the communication is established, the Terminal Board Menu will be displayed:

```
#####   #####   #####   #####   ##   #####   #####
##  ##   ##  ##   ##  ##   ##  ##   ###   ##  ##   ##  ##
#####   #####   ##  ##   ##       ##       ##  ##   #####
##  ##   ##  ##   ##  ##   ##       ##       ##  ##   ##
##  ##   #####   #####   #####   ####   #####   ##

C.A.E.N.  R8031DP 16 ch Pos 100V/10mA    V1.00   Snum 1

B O A R D   M E N U

Display/Modify channels
Format EEPROM
Ethernet Configuration




Quit


Select Item █
```

Ethernet Settings

N.B.: Ethernet settings can be updated ONLY with USB connection; type E on the Board menu: the following screen will open:

```
C.A.E.N.  R8031DP 16 ch Pos 100V/10mA    V1.00   Snum 1

Ethernet Configuration Menu

MACAddress      00   12   5e   00   06   07

IPAddress       010  105  253  012
Subnet Mask     255  255  000  000
Gateway         010  105  254  254


DHCP            Disabled








Save      Quit
```

Type S to save; the Ethernet Port is now ready to work with the new settings.

Format EEPROM

By typing F on Terminal Board Menu, it is possible to access the format EEPROM menu.

```
C.A.E.N.  DT8032M 8 Ch +/- 500V/10mA    V1.00   Snum 1


Format EEprom : are you sure ? [Y/N]
```

Channels settings

By typing D on Terminal Board Menu it is possible to access channels settings

To change one parameter: point the parameter with the "arrow keys", and type the desired value, confirm by pressing <Enter>; Power, ImRange and Power Down can be changed using the <Space> bar. P to move from page 1 to 2 and back.

```
C.A.E.N.  R8031DP 16 ch Pos 100V/10mA    V1.00   Snum 1

Page 0    HVmax 118   V           Board Status  OK
          HImax 11430 uA

         Pol   Vmon      Imon        Vset       Iset       Pw  Status

Ch00  +  000.0070  00000.00 uA   023.0000   05000.00 uA  Off
Ch01  +  000.0000  00000.00 uA   023.0000   05000.00 uA  Off
Ch02  +  000.0000  00000.00 uA   023.0000   05000.00 uA  Off
Ch03  +  000.0000  00000.00 uA   023.0000   05000.00 uA  Off
Ch04  +  000.0000  00000.00 uA   023.0000   05000.00 uA  Off
Ch05  +  000.0000  00000.00 uA   023.0000   05000.00 uA  Off
Ch06  +  000.0000  00000.00 uA   023.0000   05000.00 uA  Off
Ch07  +  000.0000  00000.00 uA   023.0000   05000.00 uA  Off




Next  Page  Group Mode   Intlk Mode[UNDRIVEN]  Reset Alarm   Quit
```

```
C.A.E.N.  R8031DP 16 ch Pos 100V/10mA    V1.00   Snum 1

Page 1


         Pol   Rup    Rdwn     Trip     Pdwn     ImRange

Ch00  +   50     50      Inf.     Rdwn     High
Ch01  +   50     50      Inf.     Rdwn     High
Ch02  +   50     50      Inf.     Rdwn     High
Ch03  +   50     50      Inf.     Rdwn     High
Ch04  +   50     50      Inf.     Rdwn     High
Ch05  +   50     50      Inf.     Rdwn     High
Ch06  +   50     50      Inf.     Rdwn     High
Ch07  +   50     50      Inf.     Rdwn     High




Next  Page  Group Mode   Intlk Mode[UNDRIVEN]  Reset Alarm   Quit
```

```
C.A.E.N.  R8031DP 16 ch Pos 100V/10mA    V1.00   Snum 1

Page 2


        Pol  VTC        KT          Temp Step   Temp Ref    Ext Temp

Ch00    +   Dis      00.000 V/C     0.5 C       -000.1 C    +105.8 C
Ch01    +   Dis      00.000 V/C     0.5 C       -000.1 C    +106.5 C
Ch02    +   Dis      00.000 V/C     0.5 C       -000.1 C    +104.8 C
Ch03    +   Dis      00.000 V/C     0.5 C       -000.1 C    +104.8 C
Ch04    +   Dis      00.000 V/C     0.5 C       -000.1 C    +104.8 C
Ch05    +   Dis      00.000 V/C     0.5 C       -000.1 C    +104.8 C
Ch06    +   Dis      00.000 V/C     0.5 C       -000.1 C    +104.8 C
Ch07    +   Dis      00.000 V/C     0.5 C       -000.1 C    +104.8 C




Next  Page  Group Mode   Intlk Mode[UNDRIVEN]  Reset Alarm  Quit
```

By typing:

G: accesses Group Mode (settings are extended to all channels)

Q: goes back to main menu

Voltage Temperature Compensation (VTC)

This option allows to adjust the output voltage, depending on the external temperature; it is available on x8031 series only.

The external temperature can be measured independently for each channel, by connecting a PT1000 probe between PIN "T" and "GND" of connector AMP 280371-2 (DT8031 and R8031 on front panel, N8031 on rear panel;).

On each channel, it is possible to set the Kt temperature coefficient and the Tstep compensation range.

As the compensation is enabled via the VTC parameter, Tref becomes equal to Text and the following formula regulates the output:

$$Vout = Vset + Kt * Tstep * [(Text-Tref) / Tstep]$$

[square brackets indicate the integer part of the ratio]

Example:

Vset = 50V
Tstep = 0.2°C
Kt = 0.5V/°C
Tref = 25°C

If Text becomes 25.1° → Vout = 50V
If Text becomes 25.2°C → Vout = 50.1V
If Text becomes 25.3°C → Vout = 50.1V
If Text becomes 25.5°C → Vout = 50.2V
If Text becomes 25.6°C → Vout = 50.3V
If Text becomes 25.8°C → Vout = 50.4V
If Text becomes 25.9°C → Vout = 50.4V
If Text becomes 26°C → Vout = 50.5V

The compensation is signed, in fact if temperature decreases, voltage is reduced (If Text becomes 24° → Vout = 49.5V)

By inverting Kt sign, if temperature increases, voltage is reduced, and vice-versa.

Notes:

If the probe is not installed, Text is considered >100°C; in this case no temperature compensation is performed.

Compensation is guaranteed in the -40 to +100°C range.

Compensation does not modify Vset parameter, that remains as programmed initially. If, after the compensation is done, the channel is turned off and then on, the voltage value returns to Vset (not compensated).

If the PT1000 probe is disconnected, VTC is disabled and Vout returns to Vset.

Tref is updated when:

VTC is enabled;

Vset is updated with VTC enabled;

Kt is updated, for example:

Vset = 50V   Tstep = 0.2°C   Kt = 1V/°C   Tref = 25°C

Given Text monitored at 26°C, due to the compensation, the output voltage is updated to 51V. At this point, if Kt is updated to 2V/°C, Tref is updated to 26°C (equal to Text) and Vout returns to 50V.

Kt: resolution 1mV/°C; maximum value +9.999V/°C; minimum value -9.999V/°C
Tstep: resolution 0.1°C; maximum value +2°C; minimum value +0.1°C
Tref e Text: resolution 0.1°C

CAEN ⬡ Electronic Instrumentation

Communication Protocol

Command interface

The command format is the following

$CMD:<attribute>[,CH:<chval>],PAR:<par_name>[,VAL:<par_val>]<CR><LF>

attribute = {"MON", "SET", "INFO"}

Each parameter, besides being associated to SET / MON parameter, is associated to a INFO command, that provides the information that describes it

chval = 0..N with N = number of channels

The value N is reserved for group commands.

'par_name' is the name of the parameter object of the command

Response to command

The response format is the following

#<header>:<result>[,VAL:<par_val>]<CR><LF>
header = {"CMD", "LOC", "VAL", "CH", "PAR"}
result = {"OK", "ERR"}

'VAL' field is optional and used only in response to a command of "MON" or "INFO" type; it is not used in response to a command of " SET" type

successful response to a command of " SET" type
#CMD:OK<CR><LF>

successful response to a command of "MON" type

#CMD:OK,VAL:<parval><CR><LF>
'parval' is the value of the monitored parameter
response to a command with attribute different from "MON", "SET", "INFO"
#CMD:ERR<CR><LF>

response to a SET command with the module in 'LOCAL' mode
#LOC:ERR<CR><LF>

response to a command of "SET" type with wrong 'VAL' field value
#VAL:ERR<CR><LF>

response to a command with wrong 'CH' field value
#CH:ERR<CR><LF>

response to a command with wrong ' PAR ' field value
#PAR:ERR<CR><LF>

Command "PARLIST"

The Command format is the following
$CMD:MON,PAR:PARLIST<CR><LF>

The module response is the list of board parameters:
#CMD:OK,VAL:<bdpar_list><CR><LF>

The board parameters are separated by ';'

Command "PARCHLIST"

The Command format is the following
$CMD:MON,CH:<ch>,PAR:PARCHLIST<CR><LF>

The module response is the list of channel parameters:
#CMD:OK,VAL:<chpar_list><CR><LF>

The channel parameters are separated by ';'

Parameter descriptor

Each parameter is associated with a descriptor, whose list is:

```
uint  TYPE          -> parameter type = {NUMERIC, ONOFF, CHSTATUS, BDSTATUS,  BINARY,
                       STRING,ENUM}
uint  ACC           -> parameter Access = {READ, WRITE, READ / WRITE}
uint  MIN           -> minimum value
uint  MAX           -> maximum value
uint  DEC           -> number of decimal digits
uint  RES           -> resolution
int   EXP           -> exponential of unit of measure
char UM[ ]          -> unit of measure
char ON_STATE[ ]    -> state on of boolean type
char OFF_STATE [ ]  -> state off of boolean type
```

```
// 'define' for parameter type described by data format
#define NUMERIC        0
#define ONOFF          1
#define CHSTATUS       2
#define BDSTATUS       3
#define BINARY         4
#define STRING         5
#define ENUM           6

#define READ           0
#define WRITE          1
#define READ_WRITE     2
```

INFO Commands

'INFO' attribute as response obtains the description of a board or channel parameter

The command :
$CMD:INFO,CH:<chan>,PAR:<ch_par><CR><LF>
Obtains the description of the channel parameter 'ch_par',

The command :
$CMD:INFO,PAR:<bd_par><CR><LF>
Obtains the description of the board parameter 'bd_par'

The response is:
#CMD:OK,VAL:<info_list><CR><LF>.

info_list is a string with the sequence of the values of the parameter descriptor, separated by ';' .

info_list = {par_type};{par_acc};{par_min};{par_max};{par_dec};{par_res};
            {par_exp};{par_um};{par_onstate};{par_offstate}

Board Parameters

BDNAME	Module name
BDNCH	Module Channels number
BDFREL	Firmware Release
BDSNUM	Module serial number

BDCLR	Clear alarm signal
BDILK	INTERLOCK status (YES/NO)
BDILKM	INTERLOCK mode (DRIVEN/UNDRIVEN)
BDCTR	Read out Control Mode (LOCAL/REMOTE)
BDALARM	Board Alarm status value
BDHVMAX	Hardware Vmax (set via trimmer)
BDHIMAX	Hardware Imax (set via trimmer)
BDSTATUS	

Channel Parameters

VSET	Channel set voltage value	
VMON	Channel monitor voltage value	
ISET	Channel set current value	
IMON	Channel monitor current value	
IMRANGE	IMON RANGE value	
RUP	RAMP UP	
RDWN	RAMP DOWN	
PDWN	POWER DOWN Mode	
STATUS	Bit 0 → ON 1 : ON 0 : OFF Bit 1 → RUP 1 : Channel Ramp UP Bit 2 → RDW 1 : Channel Ramp DOWN Bit 3 → OVC 1 : IMON >= ISET Bit 4 → OVV 1 : VMON > VSET + (2% of VSET) + 2V Bit 5 → UNV 1 : VMON < VSET – VSET - (2% of VSET) - 2V Bit 6 → TRIP 1 : Ch OFF via TRIP (Imon >= Iset during TRIP) Bit 7 → OVP 1 : Output Power > Max Bit 8 → TWN 1: Temperature Warning Bit 9 → OVT 1: TEMP > 65°C Bit 10 → KILL 1 : Ch in KILL via front panel and back panel Bit 11 → INTLK 1 : Ch in INTERLOCK via front panel and back panel Bit 12 -> ISDIS 1: Ch is disabled Bit 13 -> FAIL 1: Generic fail Bit 14 -> LOCK 1: Ch control switch on ON/EN and one of these conditions is TRUE: Bit 15 -> MAXV 1: VMON > HVMAX set via trimmer - Power On in local mode - Switch from remote to local	
TRIP	TRIP time value	
VTC	*Enable Temperature compensation*	
KT	*Coefficient of Temperature compensation*	*Only for x8031 series*
TREF	*Reference Temperature*	
TSTEP	*Programmed Interval of Temperature compensation*	
ETEMP	*External Temperature*	

EPICS Service

EPICS (Experimental Physics and Industrial Control System) is a set of software tools and applications which provide a software infrastructure for use in building distributed control systems, widely used to control experimental Physics and industrial electronics.

CAEN provides EPICS Input/Output Controller (IOC) for NIM-Desktop HV Power Supplies units, that allows access to a Process Variable using the Channel Access Protocol. Process Variable is a named piece of data associated with the module (e.g. status, readback, setpoint, parameter).

Client software (EPICS Channel Access Client), which requests access to a Process Variable, runs on the Host PC and is connected to the modules via either TCP/IP or USB.

The EPICS IOC is available for free download on www.caen.it website (Power Supply Software section)

More information about EPICS and a list of available client applications can be found at:
http://www.aps.anl.gov/epics/.

5.   Instructions for Cleaning

The equipment may be cleaned with isopropyl alcohol or deionized water and air dried. Clean the exterior of
the product only.
Do not apply cleaner directly to the items or allow liquids to enter or spill on the product.

Cleaning the Touchscreen

To clean the touchscreen (if present), wipe the screen with a towelette designed for cleaning monitors or with a clean cloth moistened with water.
Do not use sprays or aerosols directly on the screen; the liquid may seep into the housing and damage a component. Never use solvents or flammable liquids on the screen.

Cleaning the air vents

It is recommended to occasionally clean the air vents (if present) on all vented sides of the board. Lint, dust, and other foreign matter can block the vents and limit the airflow. Be sure to unplug the board before cleaning the air vents and follow the general cleaning safety precautions.

General cleaning safety precautions

CAEN recommends cleaning the device using the following precautions:
- Never use solvents or flammable solutions to clean the board.
- Never immerse any parts in water or cleaning solutions; apply any liquids to a clean cloth and then use the cloth on the component.
- Always unplug the board when cleaning with liquids or damp cloths.
- Always unplug the board before cleaning the air vents.
- Wear safety glasses equipped with side shields when cleaning the board

6. Device decommissioning

After its intended service, it is recommended to perform the following actions:

- Detach all the signal/input/output cable
- Wrap the device in its protective packaging
- Insert the device in its packaging (if present)

⚠️ **THE DEVICE SHALL BE STORED ONLY AT THE ENVIRONMENT CONDITIONS SPECIFIED IN THE MANUAL, OTHERWISE PERFORMANCES AND SAFETY WILL NOT BE GUARANTEED**

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