



User Manual UM2462

SY4527 - SY4527LC Power Supply Systems

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Purpose of this Manual

This document is the SY4527 - SY4527LC Power Supply Systems User's Manual; it contains information about the installation, the configuration and the use of the Power Supply System.

Change Document Record

Date	Revision	Changes
16 March 2012	0	Preliminary release
3 April 2012	1	Output Power notes
20 April 2012	2	Installation procedures
26 November 2012	3	Reboot procedures, new HiVoCS
27 February 2013	4	Firmware upgrade options
26 March 2013	5	Updated introduction
16 October 2013	6	Added SY4527LC specifications
28 November 2013	7	Details on TRIP function
13 December 2013	8	Updated power requirements
23 January 2014	9	Updated table 2 (packaging)

Symbols, abbreviated terms and notation

T.B.D.

Reference Document

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Disclaimer

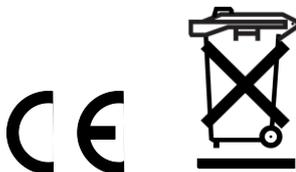
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Disposal of the Product *The product must never be dumped in the Municipal Waste. Please check your local regulations for disposal of electronics products.*

MADE IN ITALY : We stress the fact that all the boards are made in Italy because in this globalized world, where getting the lowest possible price for products sometimes translates into poor pay and working conditions for the people who make them, at least you know that who made your board was reasonably paid and worked in a safe environment. (this obviously applies only to the boards marked "MADE IN ITALY", we cannot attest to the manufacturing process of "third party" boards).



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1. Introduction



Fig. 1 – SY4527 Universal Multichannel Power Supply System

The SY4527 system is the fully equipped experiment version of a new line of power supply systems which represent CAEN's latest proposal in the matter of High Voltage and Low Voltage Power Supplying. This system outlines a completely new approach to power generation and distribution by allowing the housing, in the same mainframe, of a wide range of boards with different functions, such as High/Low Voltage boards, generic I/O boards (temperature, pressure monitors, etc.) and branch controllers, where the latter are used to control other remote generators and distributors. Modularity, flexibility and reliability are the key-points of its design, enabling this module to meet the requirements needed in a wide range of experimental conditions. The mainframe is housed in a 19"-wide, 8U-high euro-mechanics rack and hosts four main sections:

- the Board Section, with 16 slots to house power supply boards, distributors and branch controllers;
- the Fan Tray Section, housing 6 fans arranged on two rows, with programmable rotation speed regulation;
- the Power Supply Section, which consists of the Primary power supply and up to 3 "Booster" units;
- the CPU and Front Panel Section which includes all interface facilities.
- The CPU controller is available in 3 different versions: BASIC, ADVANCED and FULL.
 - The BASIC version provides all communication interfaces, RESET control, INTERLOCK control and status LEDs.
 - The ADVANCED version also provides the beam handshake management signals (CH-ON, GEN, VSEL, ISEL).
 - The FULL version provides the complete set of connectors, ENABLE control section, and fan speed control.

The User Software Interface features the usual friendliness of the previous CAEN systems which now also can optionally include a colour touchscreen LCD (two versions are available: 10.4" and 5.7"). Modularity has been one of the leading criteria in the design and development of the system: both the Power Supply Section and the Board Section are completely modular. The Power Supply Section allows different configurations with up to 4 power supply units per mainframe (up to 4.2kW), while the Board Section can house up to 16 boards able to perform different functions. The complete line of power supply boards and distributors that has been specially developed for SY1527 are fully compatible with the new mainframes. The minimum working system configuration consists of the Primary power supply, one CPU controller and one board. The system allows also to deal with power supply solutions composed by "branch controllers" (housed in the system mainframe) and on-detector "remote boards" (manufactured in order to be magnetic field and radiation tolerant). A sophisticated trip handling via software allows to control and correlate trip conditions on the channels of the crate. Live insertion and extraction of the boards, which reduces the down time of the global system and eases access to the computing core and peripherals of the system, complete the system flexibility.

Easy interfacing is another key-point of the SY4527 system. The Gigabit Ethernet interface (and the optional Wi-Fi interface) allows both an easy web access and the connection via OPC Server to a SCADA control system. Enhanced software programming features a unified command set independent from the interface used to communicate with the system. The Power Supply Section and Board Section can be externally synchronised via front panel connectors. Handy maintenance and upgrading, which constitute a major issue in the reliability of a system, are further guaranteed by the possibility of accessing and servicing the system via network facilities. A USB service port allows debugging, configuration and firmware upgrade.

- Two new powerful improvements have been carried out on the new backplane:
- A new 48V Power Bus distribution
- FLEXRAY Fast Serial Link



Fig. 2 – SY4527LC Universal Multichannel Power Supply System

The SY4527LC system is a simplified version of the SY4527 power supply system; it shares most of its features with its bigger brother, with the following exceptions:

- the Board Section has 10 slots to house power supply boards, distributors and branch controllers;
- the Power Supply Section hosts the 600 W non expandable power supply unit
- the CPU provides all communication interfaces, RESET control, INTERLOCK control and status LED
- colour touchscreen LCD for local control is not available

Table 1 – Available Items

Code	Item	Description	
WSY4527FLLXA	SY4527	Universal Multichannel Power Supply System - FULL 600W	
WSY4527ADVXA	SY4527	Universal Multichannel Power Supply System - ADVANCED 600W	
WSY4527BSCXA	SY4527	Universal Multichannel Power Supply System - BASIC 600W	
WSY4527PREXA	SY4527	SY4527 Premium - Includes SY4527 FULL, A4534, A4535, SW4536	
WSY4527LCXAA	SY4527LC	10 Slot LOW COST Universal Multichannel Power Supply System	
WA4528FLLXAA	A4528	SY4527/SY5527 CPU Module FULL	
WA4528ADVXAA	A4528	SY4527/SY5527 CPU Module ADVANCED	
WA4528BSCXAA	A4528	SY4527/SY5527 CPU Module BASIC	
WA4531XAAAA	A4531	SY4527/SY5527 Primary Power Supply 600W	
WA4532S600XA	A4532	SY4527/5527 Optional Single Power Supply Unit 600W	
WA4533D1200X	A4533	SY4527/5527 Optional Double Power Supply Unit 1200W	
WA4534XAAAA	A4534	10.4" LCD Touchscreen color Display Unit	
WA534XAAAA	A534	5.7" LCD Touchscreen color Display Unit	
WA4535XAAAA	A4535	SY4527/SY5527 Wi-Fi Dongle for Wireless connectivity	
WSW4536XAAAA	SW4536	SY4527/SY5527 Control software functionality enhancement activation code	

2. Safety and operation requirements

This section contains the fundamental safety rules for the installation and operation of the SY4527 system.

Read thoroughly this section before starting any procedure of installation or operation of the product.

General information

Review the following safety precautions to avoid injury and prevent damage to this product or any products connected to it. To avoid potential hazards, use the product only as specified.

Only qualified personnel should perform service procedures.

Injury Precautions

- Use Proper Power Cord and HV Cables
- To avoid fire hazard, use only the power cord and HV cables specified for this product.
- Avoid Electric Overload.
- To avoid electric shock or fire hazard, do not apply a voltage to a load that is outside the range specified for that load.
- Avoid Electric Shock.
- To avoid injury or loss of life, do not connect or disconnect cables while they are connected to a voltage source.
- Ground the Product.

This product is grounded through the grounding conductor of the power cord. To avoid electric shock, the grounding conductor must be connected to earth ground. Before making connections to any input or output terminals of the product, ensure that the product is properly grounded.

- Do Not Operate Without Covers.
- To avoid electric shock or fire hazard, do not operate this product with covers or panels removed.
- Do Not Operate in Wet/Damp Conditions.
- To avoid electric shock, do not operate this product in wet or damp conditions.
- Do Not Operate in an Explosive Atmosphere.
- To avoid injury or fire hazard, do not operate this product in an explosive atmosphere.
- Do not install the crates on top of each other.
- A minimum distance of 15cm is required between the top of a crate and any other object over it.

Product Damage Precautions

- Use Proper Power Source.
- Do not operate this product from a power source that applies more than the voltage specified.
- To prevent product overheating, do not obstruct cooling fans vents
- Do Not Operate With Suspected Failures.
- If you suspect there is damage to this product, have it inspected by qualified service personnel.

EC Certifications and Compliance

Use in conformity of the definition with fully equipped mainframe with fully closed slots by boards or dummy panels. Sufficient cooling and mains connection must be secured according to regulations. Signal lines length during all tests was less than 3 m. Admitted for powering by industrial mains only.

Terms in this Manual

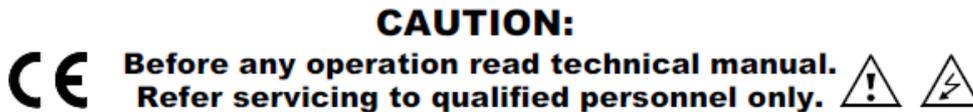
- **WARNING:** Warning statements identify conditions or practices that could result in injury or loss of life.
- **CAUTION:** Caution statements identify conditions or practices that could damage this product or other property.

Safety Terms and Symbols on the Product

These terms may appear on the product:

- **DANGER** indicates an injury hazard immediately accessible as you read the marking.
- **WARNING** indicates an injury hazard not immediately accessible as you read the marking.
- **CAUTION** indicates a hazard to property including the product.

The following label is printed on the back panel of the product:



These symbols mean:



General Operation Requirements

Before operation, check the following requirements:

Operating temperature:	5÷40°C (dry atmosphere)
Max. length of cables:	according to cable specifications

Power cords

The SY4527 system is provided with power cord, suitable to configuration requirements, as reported on the following back panel label:

VOLTAGE RANGE:	100 - 240 V ~
FREQUENCY:	50 - 60 Hz
INPUT CURRENT:	25A MAX

The SY4527LC system is provided with power cord, suitable to configuration requirements, as reported on the following panel label:

VOLTAGE RANGE:	100 - 240 V ~
FREQUENCY:	50 - 60 Hz
INPUT CURRENT:	15A MAX

3. Hardware installation

Installation

Before installing the system, make sure you have read thoroughly the safety rules and installation requirements.

All installation instructions are provided by the SY4527 Quickstart Guide.

4. Functional description

Technical specifications

Table 2 – SY4527 Technical specifications

Version	SY4527	SY4527LC
Packaging	19" 8U Euro-mechanics rack W: 19" (483 mm) H: 8U (355 mm) D: 747 mm (with handles) 667 mm (without handles)	19" 8U Euro-mechanics rack W: 19" (483 mm) H: 8U (355 mm) D: 556 mm (with handles) 489 mm (without handles)
Weight	Mainframe(*): 18 kg	Mainframe: 15 kg
Voltage range	100/240 Vac; 50/60 Hz	
Power Requirements	Max current	25 A; Fuse 10x38 25A Rapid 600V
	Max power	15A
		5500 W @ 220 Vac 2750 W @ 110 Vac
		1050 W @ 220 Vac 1020 W @ 110 Vac
Max. number of boards per crate	16	10
Max. number of Power Supply Units per crate	4 (1 Primary + 3 Optional)(**)	1
Primary Power Supply Unit Output Power	600 W with 220 Vac Mains; 550 W with 110 Vac Mains	
Optional Power Supply Unit Output Power	Single Version: 600 W (220 Vac Mains); 550 W (110 Vac Mains) Double Version: 1200 W (220 Vac Mains); 1100 W (110 Vac Mains)	n.a.
Maximum. Output Power	4200 W @ 220 Vac 1990 W @ 110 Vac	600 W @ 220 Vac 550 W @ 110 Vac
CPU	3 versions: BASIC, ADVANCED and FULL	See p.13
Display	10.4" Colour Touchscreen LCD (optional) with two USB 2.0 ports for event logging, configuration backup & restore	n.a.
Communication	Gigabit Ethernet, Wi-Fi (optional)	
Software	Graphical interface control software; OS Platforms: MS Windows, Linux HiVoCS tool	
Enhanced Software (optional)	Includes advanced features like Logging, Scripting, Alarm handling	
Additional features	OPC Server compatibility; FLEXRAY Fast Serial Link	
Operating temperature	From 5°C to +40°C	
Operating humidity	From 10% to +90% non-condensing	
Storage temperature	From -30°C to +80°C	
Storage humidity	From 5% to +90% non-condensing	

(*) One Primary Power Supply (Mod.A4531) and one CPU (Mod.A4528) are included; boards are not included.

(**) See Fig. 2

A4528 Output Power

The following chart shows the available typical output power depending on installed Power Supply Units and input power voltage line.

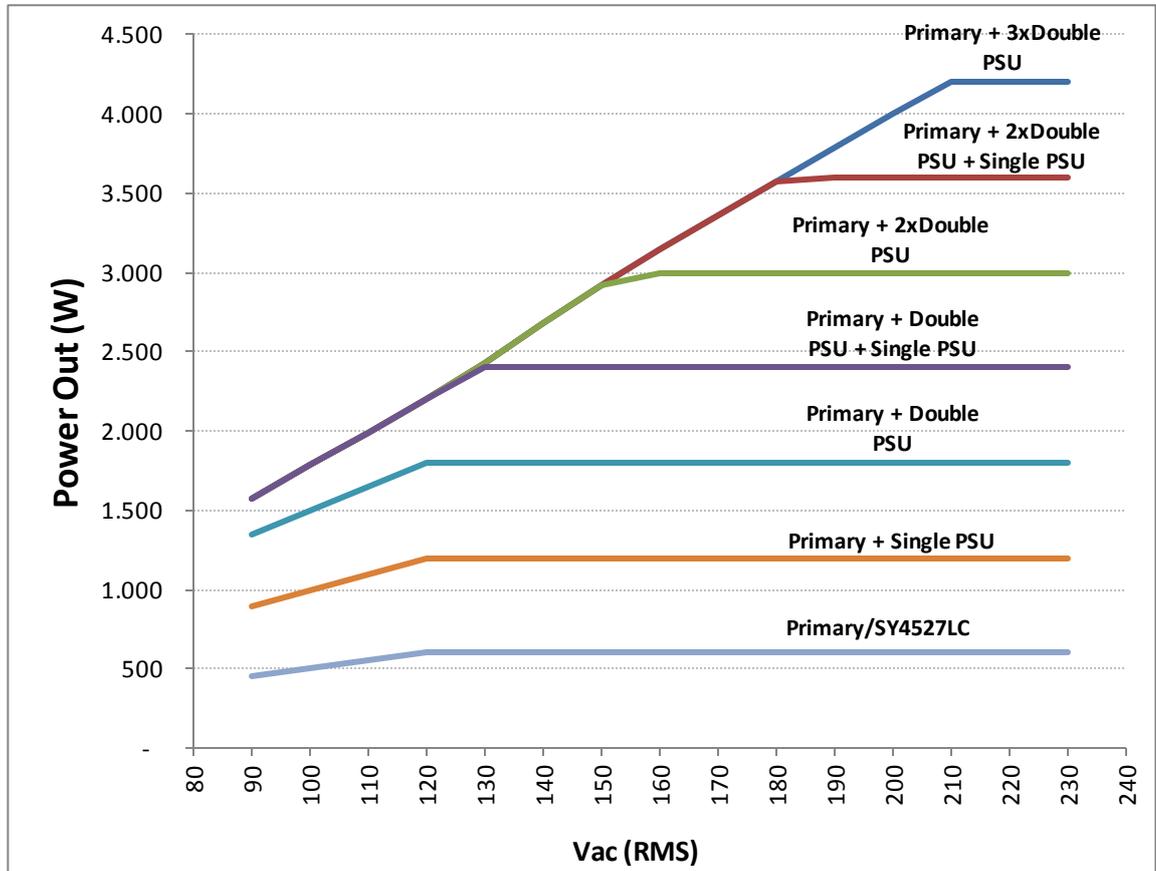


Fig. 3 – Maximum Output Power vs. Power Supply Units and power voltage line

A4528 CPU Section

The CPU Front Panel Section includes all interface facilities; it is available in 3 different versions: BASIC, ADVANCED and FULL: the BASIC version provides all the communication interfaces, the RESET control, the INTERLOCK control and status LEDs; the ADVANCED version also provides the beam handshake management connectors (CH-ON, GEN, VSEL, ISEL); the FULL version provides the complete set of panel connectors, the ENABLE control section, and the fan speed control. The CPU version installed on the SY4527LC shares the same features with the BASIC issue.

The tables below resume the front panel facilities of the 3 CPU versions.



Fig. 4 – A4528 CPU Full Version

Table 3 – CPU Front Panel I/O signals

Name	Direction	Electrical Specification	Function	CPU Version		
				Full	Advanced	Basic SY4527LC
CH-ON	Out	Std. NIM/TTL (selectable); 00-type LEMO connector.	at least one channel is ON	X	X	
GEN	Out	Std. NIM/TTL (selectable); 00-type LEMO connector.	GENERAL STATUS indication; corresponds to the logic combination (defined by the user) of OVC, UNV, OVV, TRIP	X	X	
CHK PASS	Out	Std. NIM/TTL (selectable); 00-type LEMO connector.	initial system check successful and system ready	X		
RSTFLAG	Out	Std. NIM/TTL (selectable); 00-type LEMO connector.	a RESET occurred according to user's settings (RESET FLAG window).	X		
OVV	Out	Std. NIM/TTL (selectable); 00-type LEMO connector.	at least one channel is in <i>Over Voltage</i>	X		
UNV	Out	Std. NIM/TTL (selectable); 00-type LEMO connector.	at least one channel is in <i>Under Voltage</i>	X		
OVC	Out	Std. NIM/TTL (selectable); 00-type LEMO connector.	at least one channel is in <i>Over Current</i> .	X		
TRIP	Out	Std. NIM/TTL (selectable); 00-type LEMO connector.	status of External Trip line 0 is HIGH (see p. 42)	X		
VSEL	In	Std. NIM/TTL (selectable); 00-type LEMO connector.	channel voltage selection	X	X	
ISEL	In	Std. NIM/TTL (selectable); 00-type LEMO connector.	channel current selection	X	X	
KILL	In	Std. NIM/TTL (selectable); 00-type LEMO connector.	KILL from the front panel: it turns all channels off	X		
HV SYNC MASTER	In	Bidirectional differential signal 2-pin LEMO connectors.	sync clock for the PWS Units (RS485 Std., 1.25 MHz).	X		
ENABLE	In	Std. NIM/TTL (selectable); 00-type LEMO connector.	remote enable.	X		
RESET	In	Std. NIM/TTL (selectable); 00-type LEMO connector.	RESET from the front panel. If the duration of the RESET signal is $> T_{RCPU}=100\pm 200$ ms, the CPU is reset; if it is $> T_{RCH}=T_{RCPU} + 900$ ms, also the boards are reset and the channels are turned off. Reset must be enabled via software (RESET FLAG window)	X	X	X
INTERLOCK	In	open/closed contact; 00-type LEMO connector.	INTERLOCK command: it turns all the channels off as it is open/dosed, according to the position of the relevant switch.	X	X	X
USB		USB A female connector, USB 2.0 compliant		X	X	X
SERVICE		USB B female connector, USB 2.0 compliant		X	X	X
ETH		10Base-T female connector, TTL signals (TCP/IP)		X	X	X

Table 4 – CPU Front Panel Displays

Name	Description	CPU Version		
		Full	Advanced	Basic SY4527LC
CH-ON	Red LED, lights up as at least one channel is ON	X	X	
GEN	Red LED, lights up as GENERAL STATUS signal, corresponding to a logic combination (defined by the user) of OVC, UNV, OVV, TRIP, is TRUE	X	X	
CHK PASS	Green LED, lights up as the initial system check has been performed successfully and the system is ready	X		
RSTFLAG	Red LED, lights up after a RESET	X		
OVV	Red LED, lights up as at least one channel is in <i>Over Voltage</i> condition	X		
UNV	Red LED, lights up as at least one channel is in <i>Under Voltage</i> condition	X		
OVC	Red LED, lights up as at least one channel is in <i>Over Current</i> condition	X		
TRIP	Red LED, lights up as status of External Trip line 0 is HIGH (see p. 42)	X		
TTL	Green LED, lights up as the relevant standard is selected	X	X	X
NIM	Green LED, lights up as the relevant standard is selected	X	X	X
VSEL	Green LED, lights up as the relevant connector for voltage selection is TRUE	X	X	
ISEL	Green LED, lights up as the relevant connector for current selection is TRUE	X	X	
KILL	Green LED, lights up as the system is in KILL condition	X		
HV SYNC MASTER	Red LED, lights up as the HV SYNC clock is internally generated	X		
ENABLE	Red LED, lights up, as either the <i>Local Enable</i> mode is selected or as the <i>Remote Enable</i> mode is selected and the proper REM EN signal is sent in	X		
RESET	Red/orange LED, lights up as a RESET occurs: it is initially red and then becomes orange, depending on the duration of the RESET signal	X	X	X
INTERLOCK	Green LED, lights up as the system is in INTERLOCK condition	X	X	X
OVER TEMP	Red LED, lights up as the <i>Over Temperature</i> condition occurs	X	X	X
FAN FAIL	Red LED, lights up as the <i>Fan Failure</i> condition occurs	X	X	X
PWR FAIL	Red LED, lights up as the <i>Power Failure</i> condition occurs	X	X	X
HI	Fan speed High	X		
MD	Fan speed Medium	X		
LO	Fan speed Low	X		

Table 5 – CPU Front Panel Switches

Name	Description	CPU Version		
		Full	Advanced	Basic SY4527LC
ENABLE	Allows, respectively, to enable the channels locally or to disable them or to allow their remote enable via the proper ENABLE input signal	X		
INTERLOCK	Select whether the INTERLOCK function is active when the contact is closed or open, respectively	X	X	X
RESET	“short” pressure; only the CPU is reset and the whole system resumes its operation from the beginning. All the channels which are ON remain ON, channels which are OFF remain OFF “long” pressure; also the boards are reset and the channels which are ON are dropped to zero at the maximum rate available and turned off. Reset must be enabled via software (RESET FLAG window)	X	X	X
FAN	Fan speed; 3 positions: High, Medium, Low	X		

A4531 Primary Power Supply Section (SY4527)

The **Power Supply Section** of the SY4527 system, consists of the Primary power supply and up to 3 power supply units; the Primary unit carries the system Power ON capability.

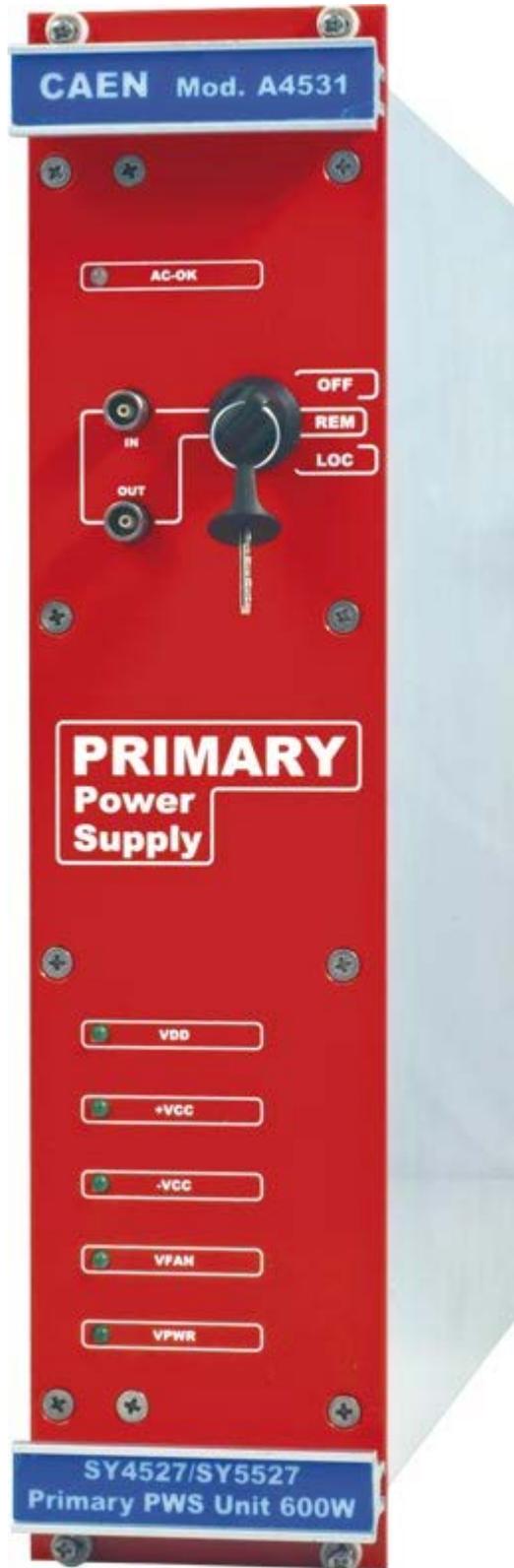


Fig. 5 – A4531 Primary Power Supply

Table 6 – Primary Power Supply Signals and Switches

Name	Description
REM/LOC/OFF key	Key to power on the system locally or to enable its remote power on
OUT	+8.5V level, refer. to the crate ground; to $\pm 10\%$; 00 LEMO connector. Remote power-on of the adjacent daisy-chained crate. N.B. Not compatible with SY527 System!
IN	+5 \div 12V, 10mA max., electric. insulated; 00 LEMO connector. Remote power-on of the system. N.B. Not compatible with SY527 System!

Table 7 – Primary Power Supply Displays

Name	Description
AC-OK	it indicates the presence of Mains power supply; if it is off it indicates that there is a fault
VDD	it indicates the presence of +5 V power supply; if it is off it indicates that there is a fault
+VCC	it indicates the presence of +12 V power supply; if it is off it indicates that there is a fault.
-VCC	it indicates the presence of -12 V power supply; if it is off it indicates that there is a fault
VFAN	it indicates the presence of Fan unit power supply; if it is off it indicates that there is a fault
VPWR	it indicates the presence of +48 V power supply; if it is off it indicates that there is a fault

Mainframe panel

The back panel of the SY4527 mainframe houses the AC input connectivity:

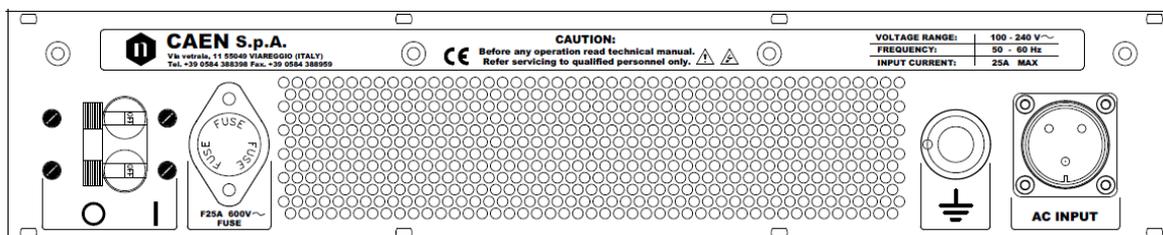


Fig. 6 – SY4527 back panel

The panel of the SY4527LC mainframe houses the AC input connectivity:

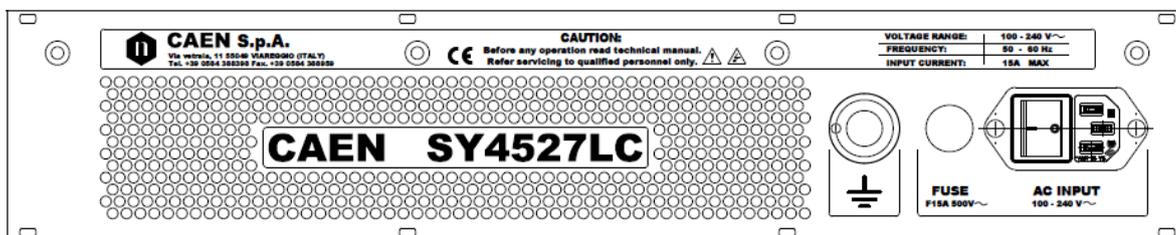
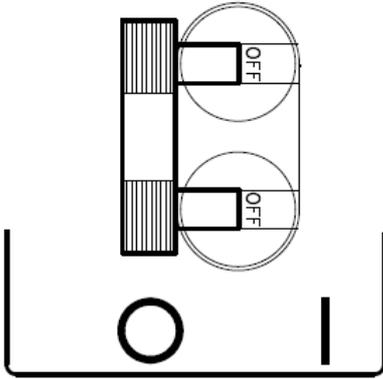


Fig. 7 – SY4527LC panel

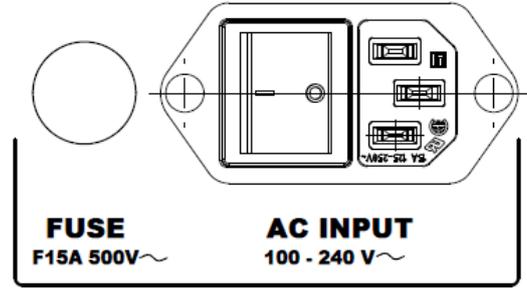
MAIN switch

SY4527



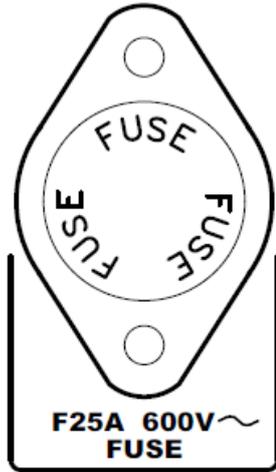
Carling 24A BA2-B0-42-624-B12-D type 2 pole circuit breaker

SY4527LC



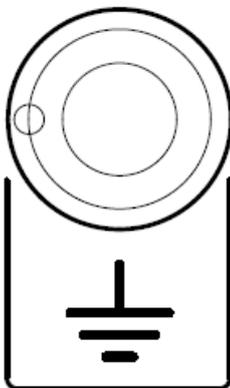
C14 Type Inlet (Fused) with Switch; F15A 500V Fuse

Fuse



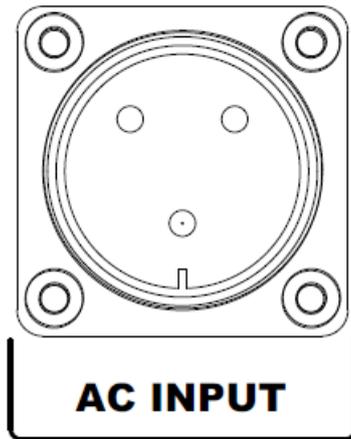
SY4527: Littell Fuse 10x38 25A Rapid 600V KLK25

Earth



L309-1 heavy current terminal; max ratings: 30A, -25÷+85 °C.

AC Input



SY4527: CA-COM-E-20-19 3-Pin Cannon Industrial

5. System and channel control

Organization

The CPU of the system handles readout or modification requests, coming from different sources (local or remote control), of all the parameters. The A4528 CPU also monitors the crate general parameters, such as Fan Speed, System Alarms and so on.

The current system status is stored in a permanent memory so that all this information is not lost at Power-Off.

The Channel Boards as well house a microcontroller with its permanent memory where it stores all the channels' parameters values. This feature allows easy upgrading and expansion of the system: new modules, or custom modules specially developed to fit the user's needs, can be added to the system without modifying the system CPU firmware.

The microcontroller has two main functions:

- control and monitoring of the channels of the board;
- communication with the system CPU.

The following sections contain an overview of the commands, parameters and alarms for the control and monitoring of the system and board channels.

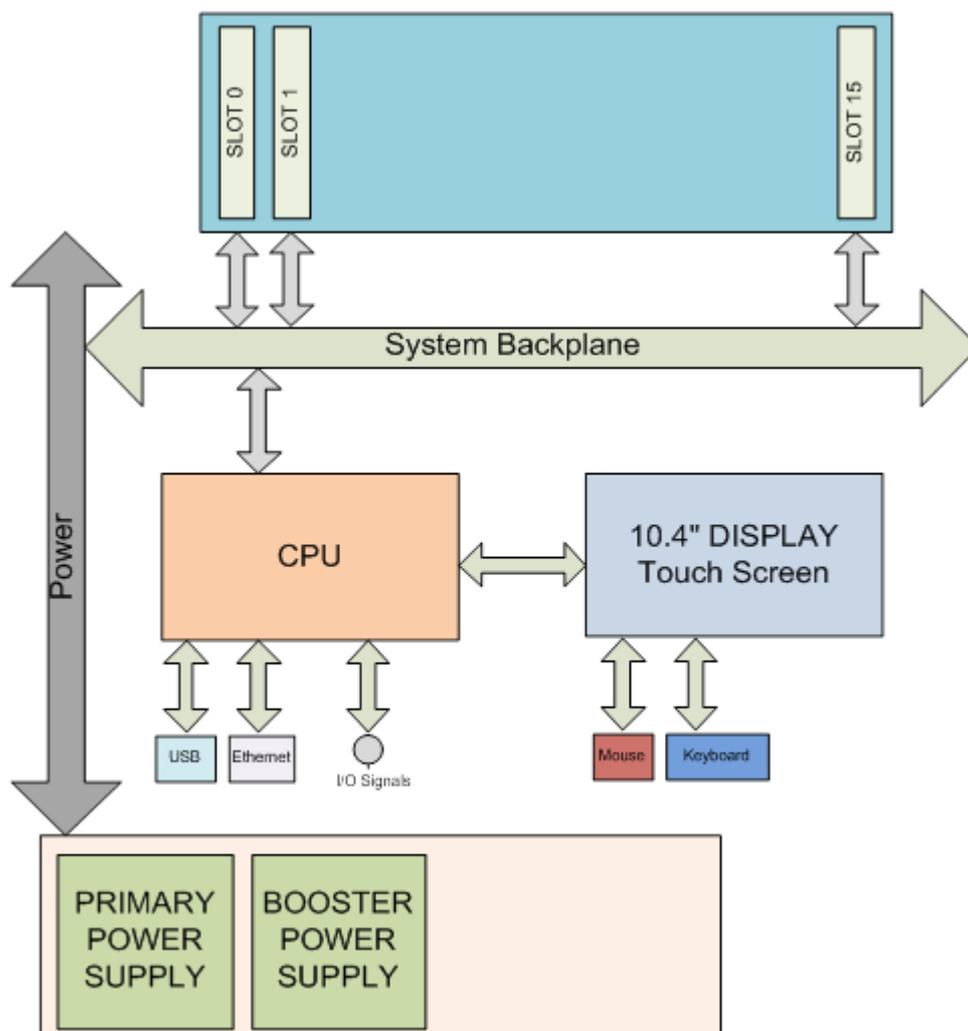


Fig. 8 – SY4527 System Block Diagram

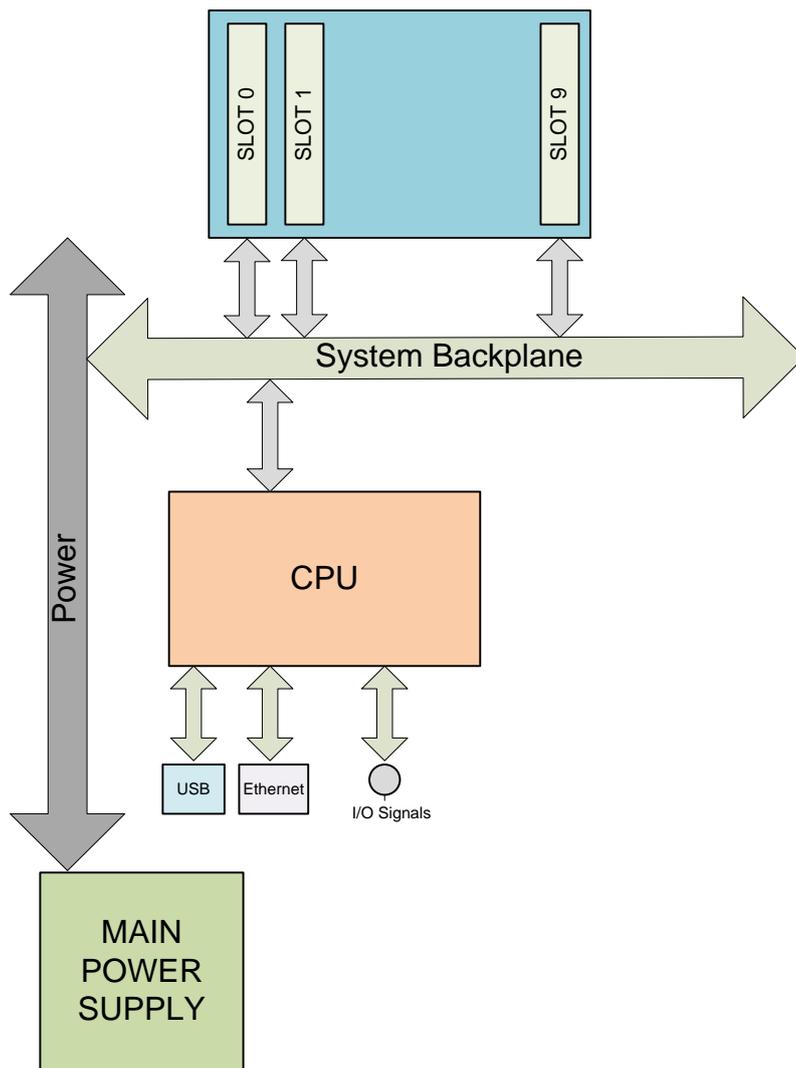
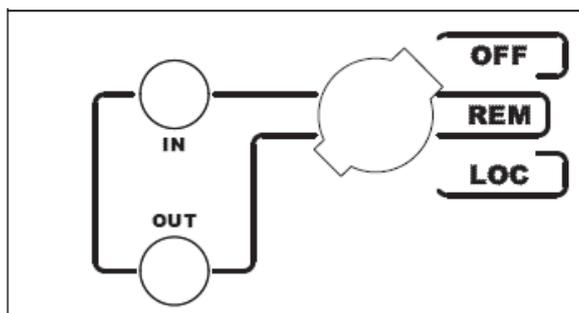


Fig. 9 – SY4527LC System Block Diagram

LOCAL/REMOTE Power-On (SY4527)



The system can be powered on either locally or remotely. The **POWER-ON** key, located on the front panel of the A4531 Primary Power Supply, has three different positions:

Up position (OFF): the system is turned off;

Down position (LOCAL): the system is turned on locally;

Central position (REMOTE): the system is enabled to be turned on remotely: the remote power ON of the system will occur by sending a proper REMOTE IN input signal through the relevant connector.

The REMOTE IN input signal must be a $+5 \div +12$ V input level (10 mA max.). As the REMOTE IN connector is supplied, the REMOTE OUT connector provides itself a +8.5 V voltage level (with a delay of some seconds; tolerance: $\pm 10\%$) that can be used to power on another crate remotely (N.B. Not compatible with SY527 Systems). This feature allows

to power on many crates with a single signal. The AC-OK yellow LED lights up as the system is powered on, either locally or remotely. N.B. The system can be turned on only if the MAIN switch on the rear panel is in the position 1.

System control

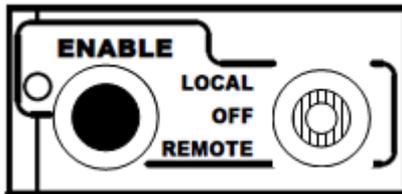
Several commands are available to control the system. These commands are shared to all channels and can be sent to the system in different ways, depending on their type. The simplest way to forward a command to the system is to send a proper input signal through the relevant connector on the A4528 CPU front panel; however, some commands feature a hardware input, such as a button or a switch, depending on the front panel command input availability on the featured A4528 CPU (Full, Advanced or Basic; SY4527LC CPU has the same I/O capabilities of the A4528 BASIC). It is always possible to send the commands via software.

The following sections describe the available commands. Unless differently specified, all input signals mentioned below are referred to a common ground (COMMON GROUND) and are insulated up to 150 V with respect to the ground of the crate (CRATE GROUND).

NIM / TTL standard selection

It is possible to select, via software, the standard for almost all the control inputs and output signals; the standard selection is signalled by the corresponding green LED lit up (default: NIM).

LOCAL/REMOTE Channel Enable



The channel outputs can be enabled either locally or remotely.

A three-position lever switch (**LOCAL ENABLE / REMOTE ENABLE / OFF switch**) allows for the selection of the enable mode:

Central position (OFF): the channel outputs are disabled;

Upper position (LOCAL ENABLE): the channel outputs are enabled locally (**LOCAL ENABLE** red LED on);

Lower position (REMOTE ENABLE): the channel outputs can be enabled remotely: the remote enable of the channel outputs will occur by sending a proper **ENABLE input signal** through the relevant connector (the **REMOTE ENABLE** red LED is lit up as the ENABLE signal is TRUE).

As the channels are enabled either locally or remotely, the output voltages of the channels which are ON increase up to the programmed value (VOSET or V1SET, according to the level of the VSEL input) with the rate determined by the Ramp-Up parameter. The channels which are OFF will remain OFF.

If the channels are disabled via the switch (**OFF** position), the output voltages of the channels which are ON drop to 0 at the rate determined by the Ramp-Down parameters. If then they are enabled again, they restore the previous state bringing the output voltage to the programmed value at the rate determined by the Ramp-Up parameters.

VSEL command



Two Voltage values can be programmed for each channel: VOSET and V1SET. They are selected by the status of the **VSEL input signal**, according to the following:

VSEL input signal	Selected Output voltage	VSEL green LED
VSEL False	VOSET	LED OFF
VSEL True	V1SET	LED ON

When channels are switched from V0SET to V1SET or vice versa, the output voltage drifts from one value to the other at the rate programmed for each channel (Ramp-Up or Ramp-Down parameter).

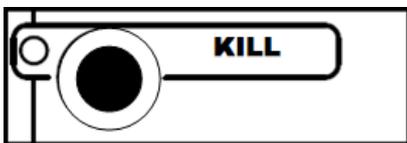
ISEL command



Two current limit values can be programmed for each channel: I0SET and I1SET. They are selected by the status of the **ISEL input signal**, according to the following:

ISEL input signal	Selected Current limit	ISEL green LED
ISEL False	I0SET	LED OFF
ISEL True	I1SET	LED ON

KILL command

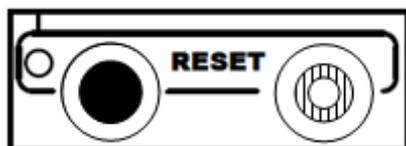


The **KILL input signal**, sent through the relevant connector, allows to switch all the channels off at the maximum rate available, regardless of the Ramp-Down or other parameters.

The relevant green LED will be lit up as the KILL signal is True.

The KILL command can be also forwarded via software.

RESET command



The RESET command allows via the RESET input signal or the RESET push-button to reset the system CPU and, optionally, to reset the boards and to turn all the channels off. The action of the RESET command depends on the duration of the signal or of the press action:

RESET Signal: 100÷200 ms; only the CPU is reset and the whole system resumes its operation from the beginning. All the channels which are ON remain ON, channels which are OFF remain OFF
 >1000 ms; also the boards are reset and the channels which are ON are dropped to zero at the maximum rate available and turned off

RESET push-button: "short" pressure; only the CPU is reset and the whole system resumes its operation from the beginning. All the channels which are ON remain ON, channels which are OFF remain OFF

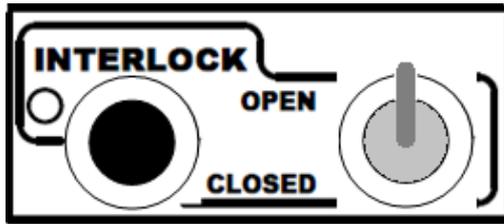
"long" pressure; also the boards are reset and the channels which are ON are dropped to zero at the maximum rate available and turned off

After the RESET, the system will react so as to Power-On: if the Power-On option is enabled, each channel will be restored in the same condition it was before the RESET at the correct rate. If it is disabled, all the channels will be off, independently from the condition in which they were before the RESET.

N.B.: please note that any type of reset command must be enabled via software in the RESET FLAG window by tagging the relevant reset condition.

The occurrence of RESET is also signalled by RST FLAG output signal, according to the software user's settings.

INTERLOCK command



The INTERLOCK command allows to switch off simultaneously all the channels, similarly to the KILL command.

The INTERLOCK command can be activated via the INTERLOCK input which acts as an open/closed contact. The selection of the contact position (open or closed) which will cause the INTERLOCK command is performed via the two-position INTERLOCK switch:

Upper position (OPEN): the channels are switched off as the INTERLOCK contact is open (the ground connection in the INTERLOCK input is removed);

Lower position (CLOSED): the channels are switched off as the INTERLOCK contact is closed (the INTERLOCK input is grounded).

The INTERLOCK condition of the system is signalled by the INTERLOCK green LED lit up.

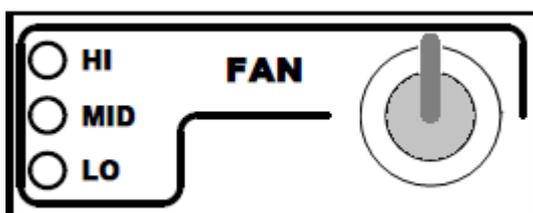
In order to turn the channels on again, the user must remove the INTERLOCK condition. Any attempt to turn the channels on without removing the INTERLOCK condition will result unsuccessful.

HV SYNC



HVSYNC is the synchronisation clock for the Power Supply Units (RS485 standard, 1.25 MHz). It can work either as MASTER (MASTER red LED on), i.e. the synchronisation clock is internally generated and the HVSYNC connector works as output, or as SLAVE (red LED off), i.e. the synchronisation clock is externally generated and sent through the HV SYNC connector which works as input.

FAN

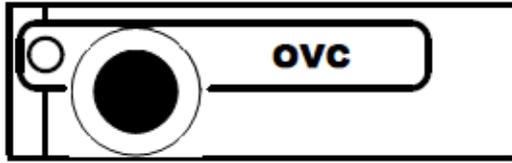


Three position switch; it allows to select Fan speed: High, Medium or Low. The red LEDs light up as the relevant speed is selected.

System status monitoring

Several output signals and alarms are available to monitor the system status, as described in the following subsections. Please note that all output signals mentioned below, unless differently specified, are referred to a common ground (COMMON GROUND) and are insulated up to 150 V with respect to the ground of the crate (CRATE GROUND).

Over Current



The Over Current condition (OVC) occurs when at least one channel is in Over Current condition, i.e. at least one channel has reached the current limit. The Over Current condition is signalled by the OVC output signal True and the relevant red LED on. The system detects this condition as a fault and reacts according to the setting of the TRIP parameter, namely:

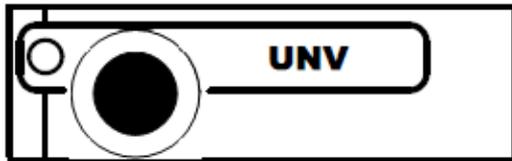
1) $TRIP = 1000$ (constant CURRENT mode)

If the Board has programmable current hardware protections, the output voltage is varied to keep the current below the programmed limit (I0SET or I1SET, according to the ISEL signal level). The channel behaves like a current generator. If the Board has fixed current hardware protections, the output current is permitted to exceed the ISET value; the channel behaves like a current generator only if the maximum current value is reached.

2) $0 < TRIP < 1000$ (TRIP mode)

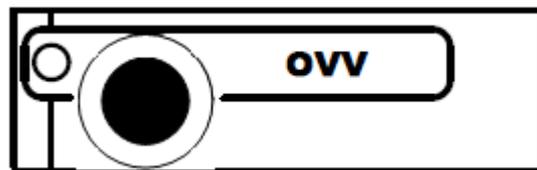
In this case, the channel behaves as in the constant CURRENT mode for a time equal to the finite value set as TRIP parameter, and then it is switched off according to the selected Power-Down option (KILL/RAMP). If the Kill option is selected, the channel will be switched off at the maximum rate available. If Ramp option is selected, the voltage will drop to zero at a rate determined by the value of the Ramp parameter programmed for that channel.

Under Voltage



The **Under Voltage** condition (UNV) occurs when at least one channel is in Under Voltage condition, i.e. when the actual value of the channel output voltage is lower than the programmed value. The Under Voltage condition is signalled by the UNV output signal True and the relevant red LED on.

Over Voltage



The Over Voltage condition occurs when at least one channel is in Over Voltage condition, i.e. when the actual value of the channel output voltage is higher than the programmed value. The Over Voltage condition is signalled by the OVV output signal True and the relevant red LED on.

Trip



The TRIP output signal is asserted True (and the relevant red LED is lit up) as the status of External Trip line 0 is HIGH (see p. 42); therefore the TRIP condition occurs as at least one channel, latched on External Trip line 0, has tripped and has been switched off due to an Over Current condition. To recover from this state, it is sufficient to turn the tripped channel On again or to execute a clear alarm command via software.

Reset flag



RST FLAG (RESET FLAG) output signal is TRUE (and relevant red LED on) after a RESET occurred, according to the user's settings. The type of reset which asserts RST FLAG TRUE can actually be selected via software.

Check passed

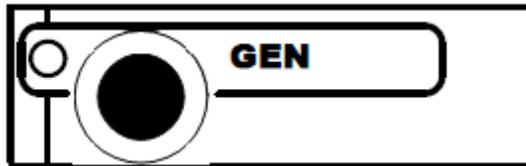


CHK PASS (CHECK PASSED) output signal is True (and the relevant green LED on) when the initial check of the system is successful and the system is ready.

At normal operation, this signal is True and the relevant green LED is ON.

This output signal becomes false either as the Fan failure LED is lit up or as the Power failure LED is lit up. As the condition which caused the CHECK PASSED being FALSE is remove, the CHECK PASSED signal becomes true again.

GEN



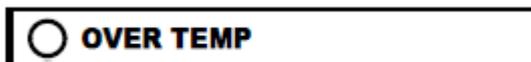
GEN (GENERAL STATUS) output signal is True (and relevant red LED on) according to a logic combination of OVC, UNV, OVV and TRIP (status of External Trip line 0 is HIGH see also p.42). The logic combination of these conditions is defined by the user via software.

CH-ON



CH-ON (CHANNEL ON) output signal is True (and the relevant red LED on) as at least one board channel is ON (i.e. the channels are enabled and the POWER parameter of that channel is set to ON).

Over Temperature



Over Temperature condition occurs when there is at least one board at a temperature out of the range $T_{MIN} \div T_{MAX}$, where T_{MIN} and T_{MAX} are two parameters depending on the board type. As the Over Temperature condition is reached, the relevant front panel LED lights up.

Fan Failure



Fan Failure condition occurs when at least one of the fans of the system has stopped or is turning below 20% of normal speed.

As the Fan Failure condition is reached, the relevant front panel LED lights up.

Pwr Failure



Power Failure condition occurs when there is a fault in the voltage supplies at the +12 V, -12 V or +48 V level.

As the Power Failure condition is reached, the relevant front panel LED lights up.

6. Operating modes

The System can be operated in one of the following ways:

- Standalone operation
- Remote operation via host computer by using TCP/IP protocol (OPC Server and CAEN HV Wrapper Library).

Standalone operation

Standalone Operation is intended as the interactive control and monitoring of one SY4527 system by using one of these devices:

SY4527

- optional 10.4" LCD Touchscreen (A4534)
- A4534 + external keyboard and/or mouse (via USB port)
- external PC (via Gigabit Ethernet)
- external Tablet PC (via A4535 Wi-Fi dongle, connected to the USB port)

SY4527LC

- external PC (via Gigabit Ethernet)
- external Tablet PC (via A4535 Wi-Fi dongle, connected to the USB port)

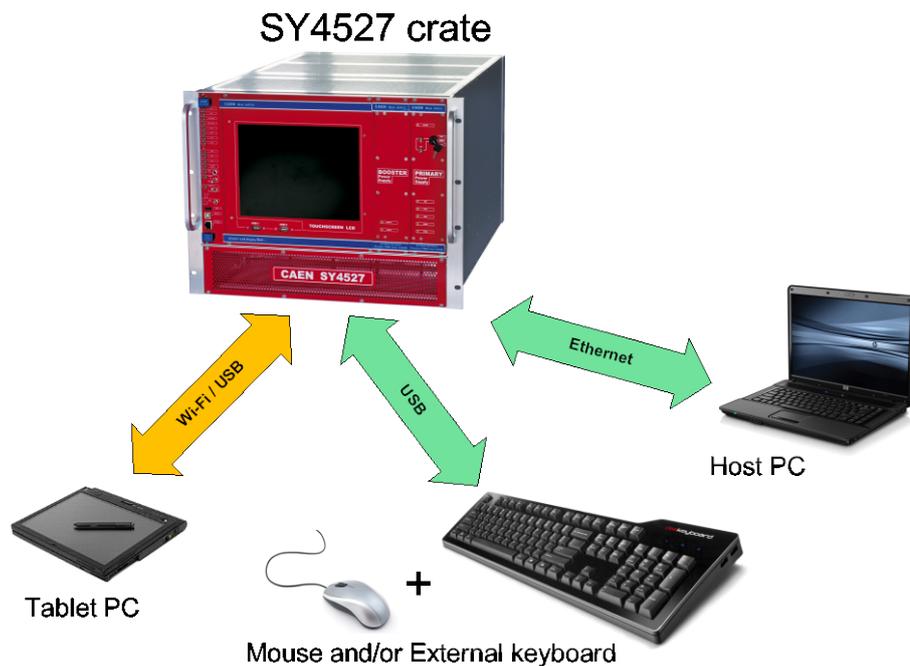


Fig. 10 – Standalone Operation with A4534 Touchscreen

Software Version

Description of the *User Interface Software* running on the SY4527 system refers to the:

Software Version x.yy.zz

A variation in the last two figures (.zz) of the software version refers to a debug operation; a variation in the two figures placed in the middle (.yy) refers to a feature upgrading of the software version; a variation in the first figure (x.) refers to a radical change of the software version.

Remote operation via Host Computer

A newly released suite of applications guarantees CAEN power supplies' inter-operability between virtually all available computing environments and communication protocols.

OPC is an open interface based on the OLE/COM (now ActiveX) and DCOM technology; OPC offers "Plug&Play" connectivity between disparate control applications and hardware devices. The introduction of the OPC interface has caused the number of driver developments which hardware manufacturers implement for their components to be reduced to only one: the OPC server. On the other hand, OPC client applications (from any vendor) can communicate with the OPC server to exchange data and control commands in a standard way. Each device property is accessed via an OPC item. An OPC server creates OPC items on behalf of an OPC client. The client's OPC items are organized in OPC groups with a hierarchical structure.

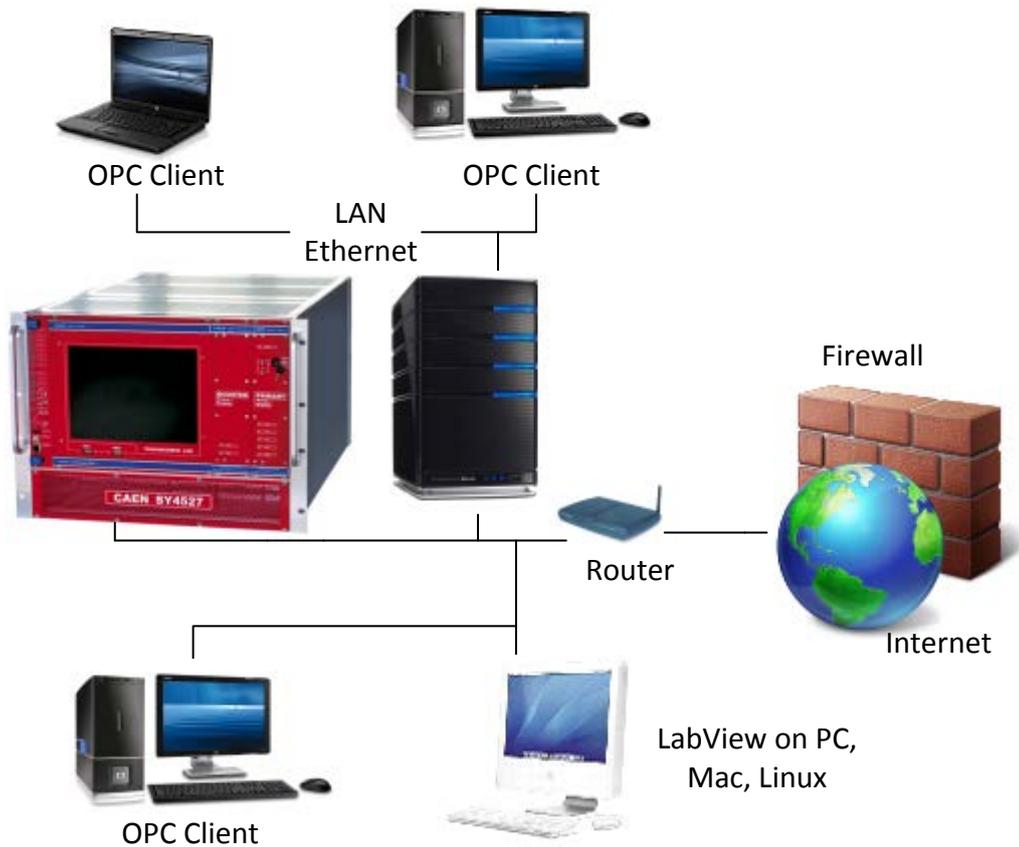


Fig. 11 – Remote Operation via Host Computer

CAEN, in close collaboration with CERN (IT-CO group) has developed an **OPC server** which allows powerful, flexible and yet simple control of its power supply systems through TCP/IP by any OPC compliant client application. For further details please refer to the *OPC Server for CAEN Power Supplies User's Manual* available at www.caen.it site.

A C library (CAENHVWrapper) providing the software developer a unified software interface for the control of all the CAEN Power Supply Systems is also available.

7. System Power-On

The Power-ON of the system can be performed either locally or remotely, as described in the following subsections.

Preliminary check

Before powering the system, check this:

SY4527

- 1) Choose one of the set up's described in Operating modes
- 2) The Primary Power Supply and the Booster Power Supply Units (if present) are inserted correctly in their relevant housings and fixed with the relevant screws;
- 3) The boards, after the required hardware settings, are plugged into the slots and fixed properly;
- 4) The power cord connects the crate to the mains correctly; see AC Input, p.19
- 5) Cabling has been performed according to the chosen hardware set-up;
- 6) Safety instructions, installation requirements and operation requirements have been complied.

SY4527LC

- 1) Choose one of the set up's described in Operating modes
- 2) The boards, after the required hardware settings, are plugged into the slots and fixed properly;
- 3) The power cord connects the crate to the mains correctly; see AC Input, p.19
- 4) Cabling has been performed according to the chosen hardware set-up;
- 5) Safety instructions, installation requirements and operation requirements have been complied.

Local Power-On

To power-On the system locally follow this procedure:

SY4527

Set to ON (position 1) the back panel

MAIN switch

Turn the Power-On key, located on the panel of the A4531 Primary Power Supply, in the right position (ON LOCAL): the AC OK LED (yellow), located on the front panel of the A4531, lights up and the fan tray unit starts to work.

Following these operations, the following LEDs will be lit up on the front panels of the Primary Power Supply: AC-OK, VDD, +VCC, -VCC, VFAN, VPWR (see also A4531 Primary Power Supply Section).

After the initial check of the system, it is possible to access the system through the HiVoCS.

SY4527LC

Set to ON the Main Switch.

After the initial check of the system, it is possible to access the system through the HiVoCS.

The system has a default address is 192.168.0.1 and the DHCP server configured to assign IP addresses on the network 192.168.0.0/255.255.255

Remote Power-On (SY4527)

To power-On the system remotely follow this procedure:

- Set to ON (position 1) the back panel MAIN switch, p.18.
- Turn the Power-On key, on the front panel of the Primary Power Supply, in the left position (ON REMOTE), p.21;
- Send a proper signal through the REMOTE IN input connector on the front panel of the Primary Power Supply: the OK LED (yellow), located on the front panel of the Primary Power Supply, will light up and the fan tray unit starts to work.
- Following these operations, the following LEDs will be lit up on the front panels of the Primary Power Supply: AC-OK, VDD, +VCC, -VCC, VFAN, VPWR (see also A4531 Primary Power Supply Section).
- After the initial check of the system, it is possible to access the system through the HiVoCS.

The system has a default address is 192.168.0.1 and the DHCP server configured to assign IP addresses on the network 192.168.0.0/255.255.255.

Configuration

To configure the system, if the A4534 LCD Touchscreen color Display is not installed, connect it to your local network or use a Ethernet cable and connect it directly to your PC Ethernet port (see also SY4527 Quickstart Guide). Wait until the PC has received an IP address after which you can connect to the HiVoCS and configure the network you want, by following the instructions in DHCP Server chapter of this manual (p.38).

open a web browser and type: <http://192.168.0.1> and enter user id and password.

The system default is:

User ID: admin Password: admin

You should change your password as soon as possible to prevent other people from altering system settings without your consent.

If case of forgotten IP address of the system or the admin username and password, in order to restore the default setting, connect an USB keyboard to the USB connector of the CPU panel and use key combination CTRL+ALT+DEL; the system will produce a "buzz" sound, after the last buzz, wait for about 15 sec, then reboot the system, default settings will be restored.

8. HiVoCS

The HiVoCS is the web tool that allows to manage the SY4527 Connection status and system/board upgrade.

System Log-in

First of all, launch the web browser, then type the Power Supply System IP address into the address bar; the following log-in window will open:

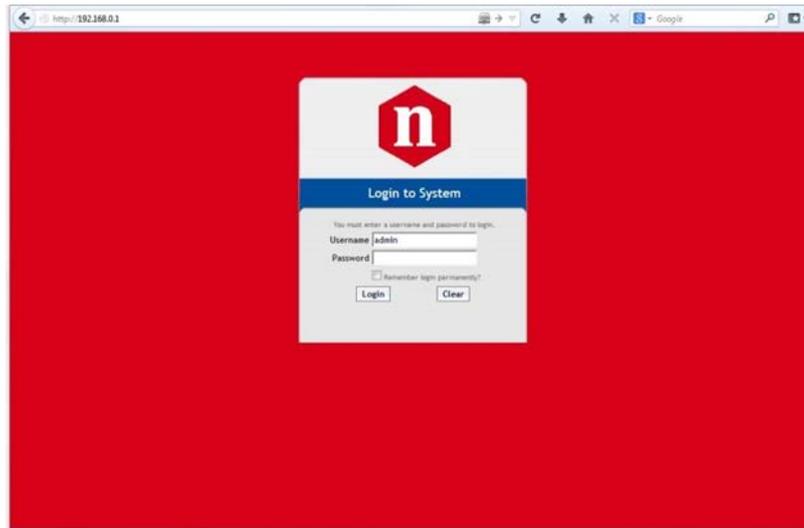


Fig. 12 – HiVoCS Log in window

Three access levels are foreseen: admin, user, guest

factory setting allows to access the System under the following profile:

User ID	Password	Level
admin	admin	Admin

The Admin level allows to access all the settings of the system, of the boards and of the channels; moreover it allows to upgrade the system software and the board firmware. Moreover the Admin level allows to:

- Create new lower level (User and Guest) users (up to 15 users);
- Remove lower level users;
- Change the admin password;
- Execute the Format command, which restores the factory-set users, with the related passwords (and deletes all the other ones).

Two lower level are foreseen:

“User” level can turn on/off the channels and change their own passwords, but cannot perform any setting.

“Guest” level can only monitor the system configuration and channel status and change their own passwords.

Once logged as “admin”, the next window will show, in the upper toolbar, two thumbnails:

- Upgrade
- Main Menu

Main Menu

By selecting “Main Menu” the configurator will offer the following options:

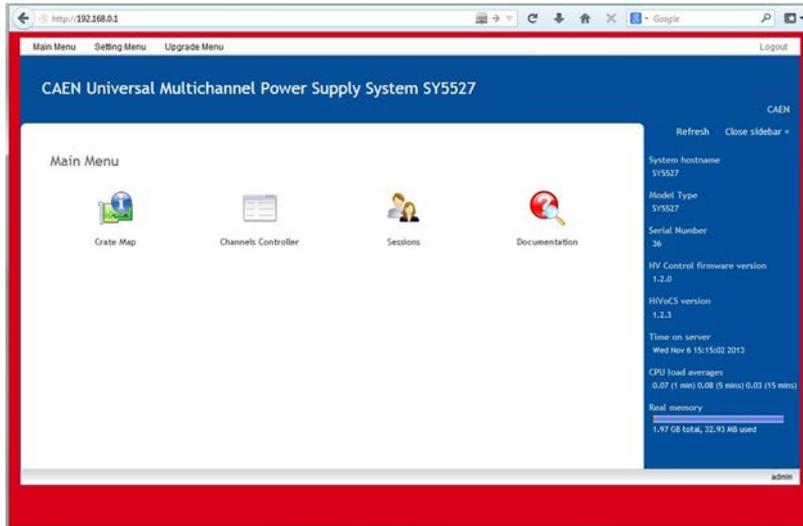


Fig. 13 – HiVoCS Main menu

The side bar shows the System features (type, version, s/n, etc.)

Crate Map

Crate Map is entered from the Main menu and opens the Crate Map Window showing what types of boards are inserted into the crate and in which slot they are plugged into.

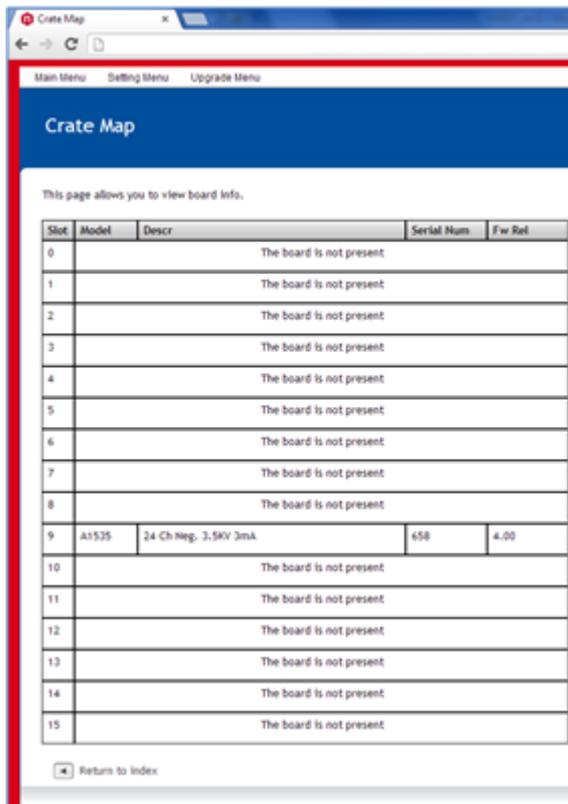


Fig. 14 – HiVoCS Crate Map

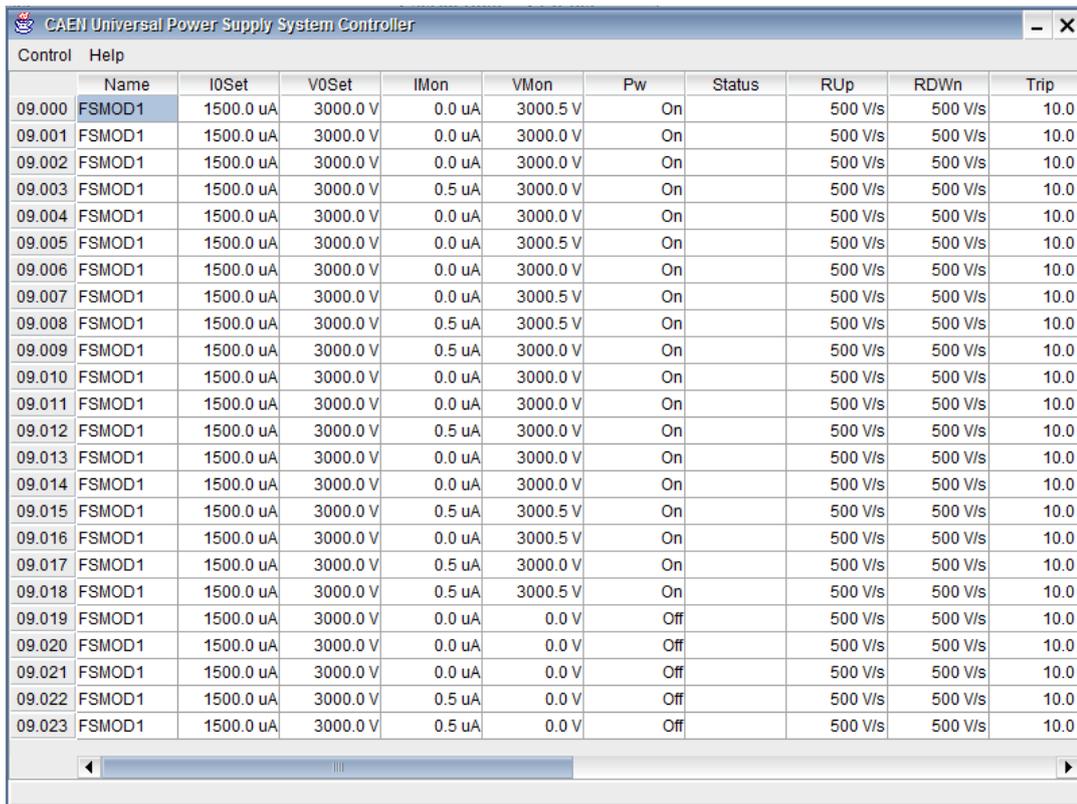
Channels Controller

From this page it is possible launch the CAEN HVPSS ChannelsController to manage channels.

CAEN HVPSS ChannelsController requires Java Web Start software to be installed on your computer. Java Web Start is included in the Java Runtime Environment (JRE) since release of Java 5.0. This means that when you install Java, you get Java Web Start installed automatically. For more information visit the website <http://www.java.com/>

If your browser does not support Java Web Start, you can also download the indicated zip file. Or a de Java Runtime Environment (JRE) downloaded from the website <http://www.java.com/> is required.

When launched the CAEN HVPSS ChannelsController will look like this:



	Name	I0Set	V0Set	IMon	VMon	Pw	Status	RUp	RDWn	Trip
09.000	FSMOD1	1500.0 uA	3000.0 V	0.0 uA	3000.5 V	On		500 V/s	500 V/s	10.0
09.001	FSMOD1	1500.0 uA	3000.0 V	0.0 uA	3000.0 V	On		500 V/s	500 V/s	10.0
09.002	FSMOD1	1500.0 uA	3000.0 V	0.0 uA	3000.0 V	On		500 V/s	500 V/s	10.0
09.003	FSMOD1	1500.0 uA	3000.0 V	0.5 uA	3000.0 V	On		500 V/s	500 V/s	10.0
09.004	FSMOD1	1500.0 uA	3000.0 V	0.0 uA	3000.0 V	On		500 V/s	500 V/s	10.0
09.005	FSMOD1	1500.0 uA	3000.0 V	0.0 uA	3000.5 V	On		500 V/s	500 V/s	10.0
09.006	FSMOD1	1500.0 uA	3000.0 V	0.0 uA	3000.0 V	On		500 V/s	500 V/s	10.0
09.007	FSMOD1	1500.0 uA	3000.0 V	0.0 uA	3000.5 V	On		500 V/s	500 V/s	10.0
09.008	FSMOD1	1500.0 uA	3000.0 V	0.5 uA	3000.5 V	On		500 V/s	500 V/s	10.0
09.009	FSMOD1	1500.0 uA	3000.0 V	0.5 uA	3000.0 V	On		500 V/s	500 V/s	10.0
09.010	FSMOD1	1500.0 uA	3000.0 V	0.0 uA	3000.0 V	On		500 V/s	500 V/s	10.0
09.011	FSMOD1	1500.0 uA	3000.0 V	0.0 uA	3000.0 V	On		500 V/s	500 V/s	10.0
09.012	FSMOD1	1500.0 uA	3000.0 V	0.5 uA	3000.0 V	On		500 V/s	500 V/s	10.0
09.013	FSMOD1	1500.0 uA	3000.0 V	0.0 uA	3000.0 V	On		500 V/s	500 V/s	10.0
09.014	FSMOD1	1500.0 uA	3000.0 V	0.0 uA	3000.0 V	On		500 V/s	500 V/s	10.0
09.015	FSMOD1	1500.0 uA	3000.0 V	0.5 uA	3000.5 V	On		500 V/s	500 V/s	10.0
09.016	FSMOD1	1500.0 uA	3000.0 V	0.0 uA	3000.5 V	On		500 V/s	500 V/s	10.0
09.017	FSMOD1	1500.0 uA	3000.0 V	0.5 uA	3000.0 V	On		500 V/s	500 V/s	10.0
09.018	FSMOD1	1500.0 uA	3000.0 V	0.5 uA	3000.5 V	On		500 V/s	500 V/s	10.0
09.019	FSMOD1	1500.0 uA	3000.0 V	0.0 uA	0.0 V	Off		500 V/s	500 V/s	10.0
09.020	FSMOD1	1500.0 uA	3000.0 V	0.0 uA	0.0 V	Off		500 V/s	500 V/s	10.0
09.021	FSMOD1	1500.0 uA	3000.0 V	0.0 uA	0.0 V	Off		500 V/s	500 V/s	10.0
09.022	FSMOD1	1500.0 uA	3000.0 V	0.5 uA	0.0 V	Off		500 V/s	500 V/s	10.0
09.023	FSMOD1	1500.0 uA	3000.0 V	0.5 uA	0.0 V	Off		500 V/s	500 V/s	10.0

Fig. 15 – CAEN HVPSS Channels Controller

Parameters to set can be selected individually or by columns, by holding on left click. Please note that the displayed parameters are “re refreshed” every 500 msec, therefore when, for example, quickly scrolling the view selection, there is a <500 msec delay between the displayed parameters and their actual value; please allow a 500 msec interval in order to let the actual values to be shown.

“Control” thumbnail allows to select Cooling Fan Speed, or to perform

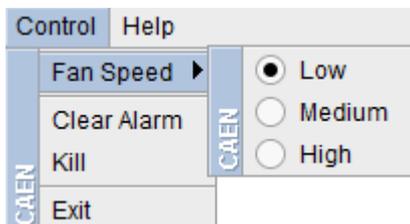


Fig. 16 – CAEN HVPSS Control options

- Fan speed allows also to set Hv Fan Speed (LO, MD, HI)
- Kill option turns all channels off
- Clear Alarm command allows to remove all the alarm conditions from the Channel Status
- Exit option allows to quit the program

Sessions

The Session option shows the parameters of the connected Users sessions.

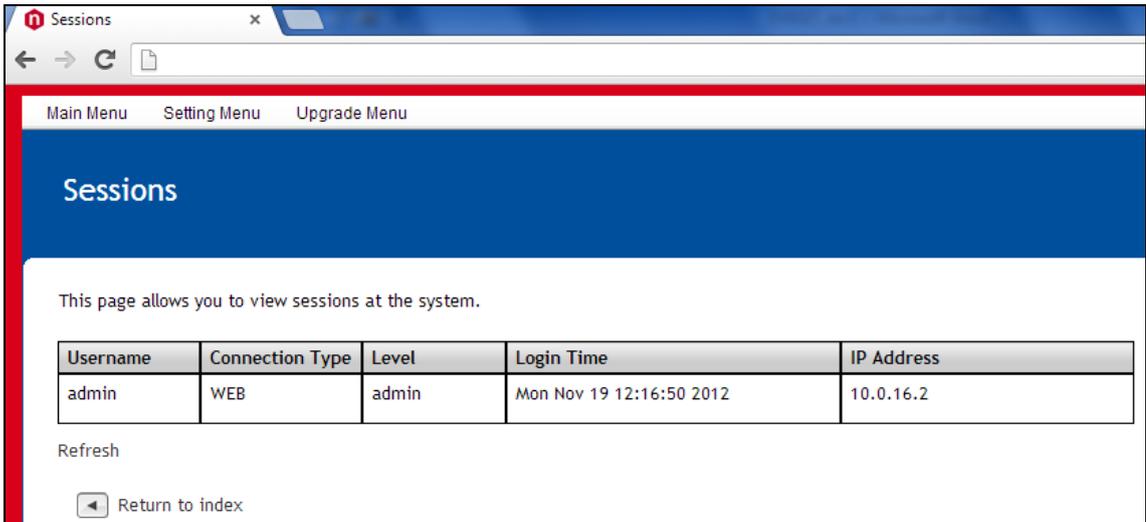


Fig. 17 – HiVoCS session parameters

Documentation

The documentation option allows to download the available technical manuals and guides.

Setting Menu

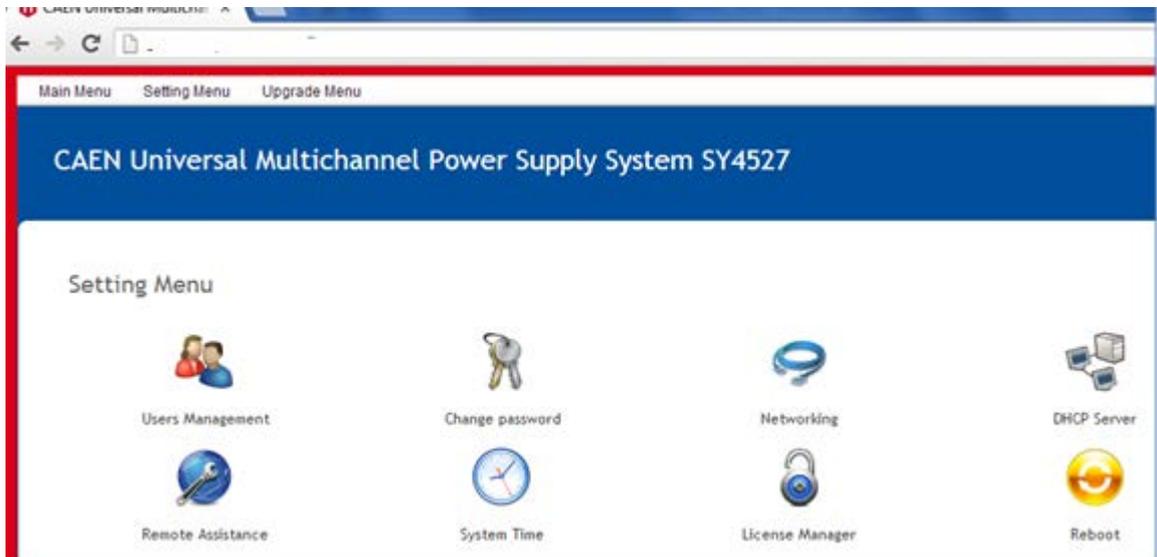


Fig. 18 – Setting Menu

The Setting Menu has the following options:

- Users Management
- Change password
- Networking
- DHCP Server
- Remote Assistance
- System Time
- License Manager
- Reboot

Users management

The User management option shows the parameters of the connected Users and allows to add new ones

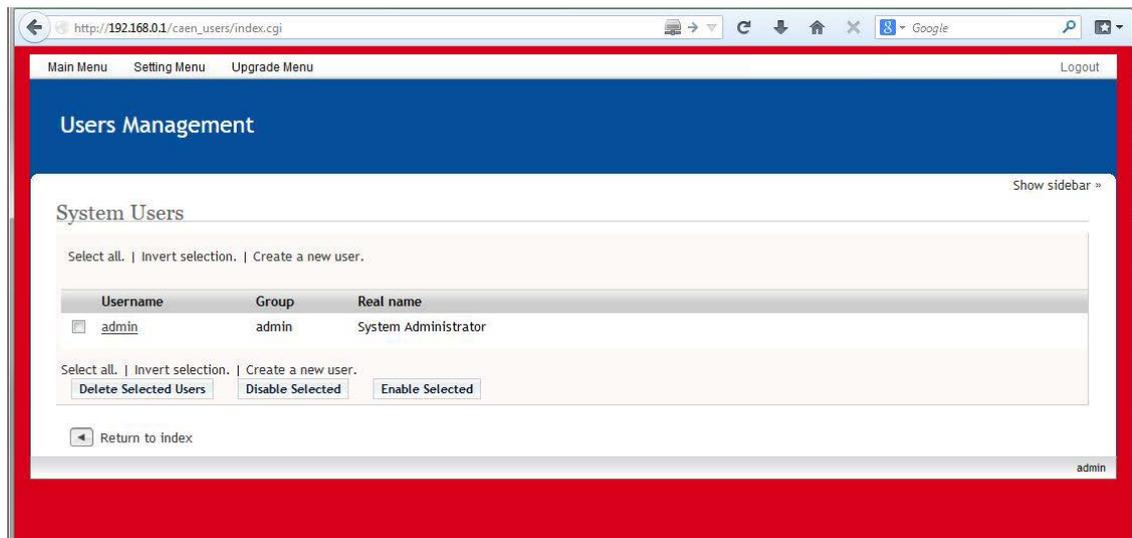
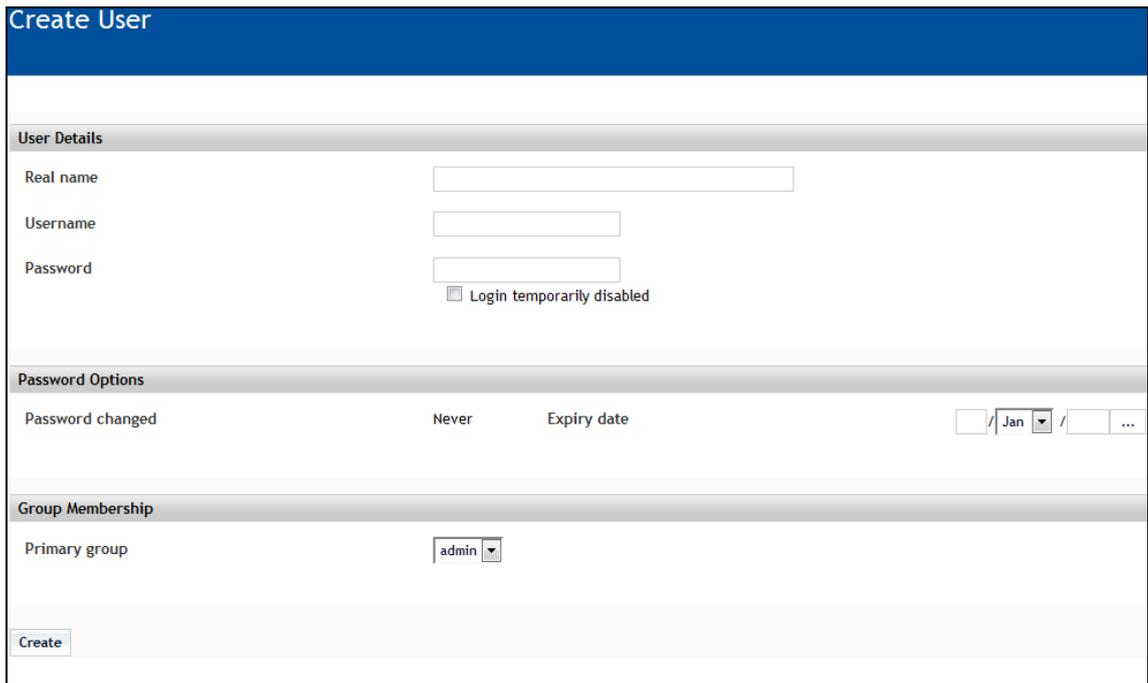


Fig. 19 – HiVoCS local user status

By clicking on "Create a new user", the following form is displayed:



The screenshot shows the "Create User" form with the following sections:

- User Details:**
 - Real name:
 - Username:
 - Password: Login temporarily disabled
- Password Options:**
 - Password changed: Never Expiry date: / Jan / ...
- Group Membership:**
 - Primary group:

A "Create" button is located at the bottom left of the form.

Fig. 20 – HiVoCS new user registration

Change password

Change password option will open a simple form box that allows to update the User's password.



Fig. 21 – HiVoCS Change password form

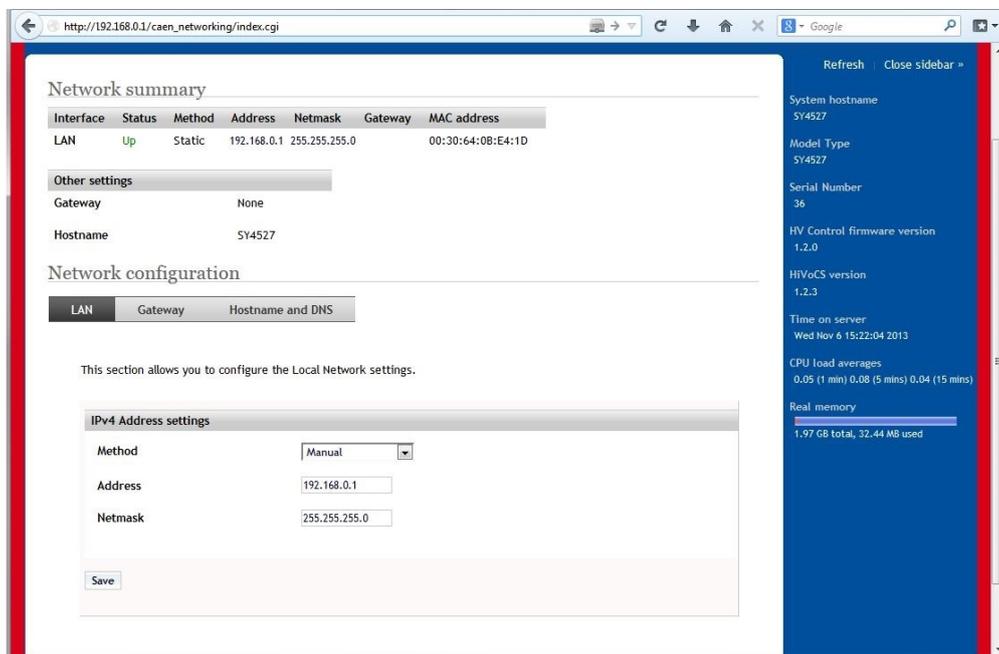
Networking

The Networking option allows to configure the SY4527 System for network connection.

The Ethernet connector provided with the system is a 10/100baseT connector and can be used to interface the SY4527 system to an Ethernet LAN. This allows the system control via an external standard PC connected to a TCP/IP network and running a web browser.

Before establishing a connection to a TCP/IP network, a specific IP Address, IP Net Mask must be assigned by the local Network Administrator to the SY4527 System.

If the User needs to connect to the SY4527 system from outside the local network, a Gateway address has to be specified in the TCP/IP settings.



Interface	Status	Method	Address	Netmask	Gateway	MAC address
LAN	Up	Static	192.168.0.1	255.255.255.0		00:30:64:0B:E4:1D

Other settings

Gateway: None
 Hostname: SY4527

Network configuration

LAN | Gateway | Hostname and DNS

This section allows you to configure the Local Network settings.

IPv4 Address settings

Method:
 Address:
 Netmask:

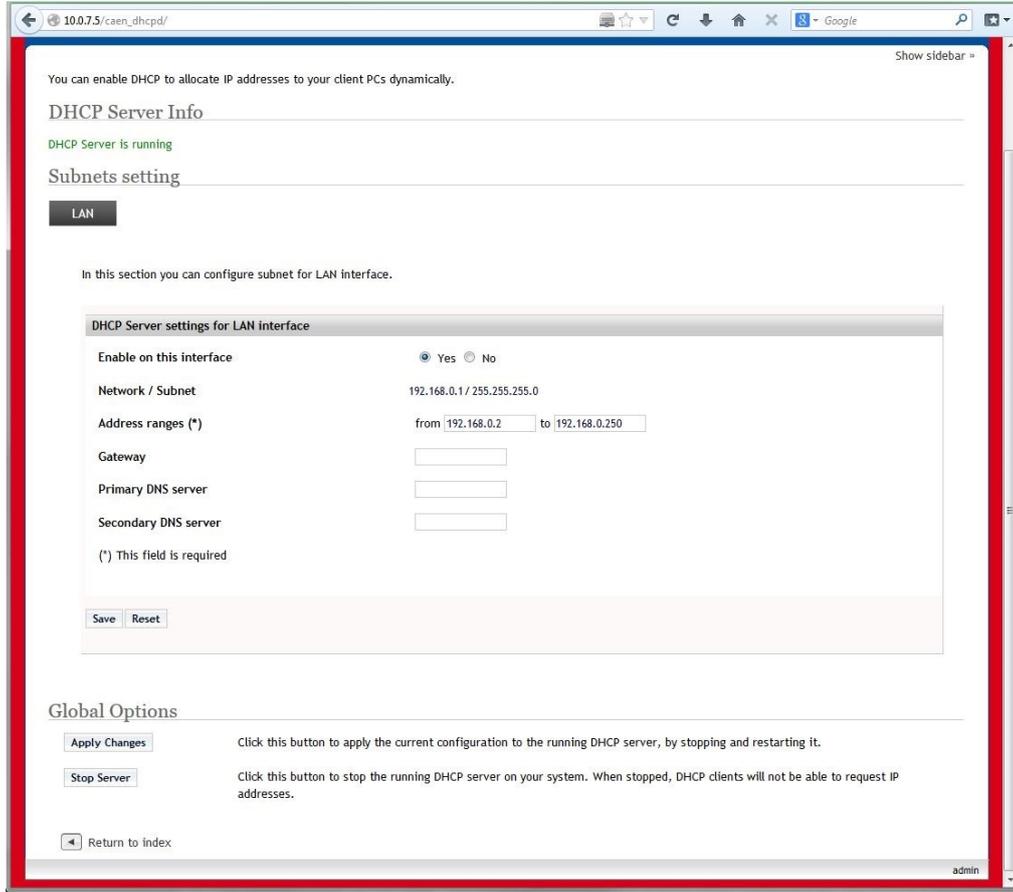
System Information (Right Sidebar):

- System hostname: SY4527
- Model Type: SY4527
- Serial Number: 36
- HV Control firmware version: 1.2.0
- HiVoCS version: 1.2.3
- Time on server: Wed Nov 6 15:22:04 2013
- CPU load averages: 0.05 (1 min) 0.08 (5 mins) 0.04 (15 mins)
- Real memory: 1.97 GB total, 32.44 MB used

Fig. 22 – HiVoCS network status

DHCP Server

DHCP Server allows to assign IP addresses to the Client's PC connected to the network, through the following form box:



You can enable DHCP to allocate IP addresses to your client PCs dynamically.

DHCP Server Info

DHCP Server is running

Subnets setting

LAN

In this section you can configure subnet for LAN interface.

DHCP Server settings for LAN interface

Enable on this interface Yes No

Network / Subnet 192.168.0.1/255.255.255.0

Address ranges (*) from 192.168.0.2 to 192.168.0.250

Gateway

Primary DNS server

Secondary DNS server

(*) This field is required

Global Options

Click this button to apply the current configuration to the running DHCP server, by stopping and restarting it.

Click this button to stop the running DHCP server on your system. When stopped, DHCP clients will not be able to request IP addresses.

admin

Fig. 23 – HiVoCS DHCP Server form

Remote Assistance

The Remote Assistance option allows to enable or disable the remote assistance. When Remote Assistance is enabled, CAEN personnel can access the system for remote maintenance intervention; in order to do this the system must also be connected to an externally accessible network.

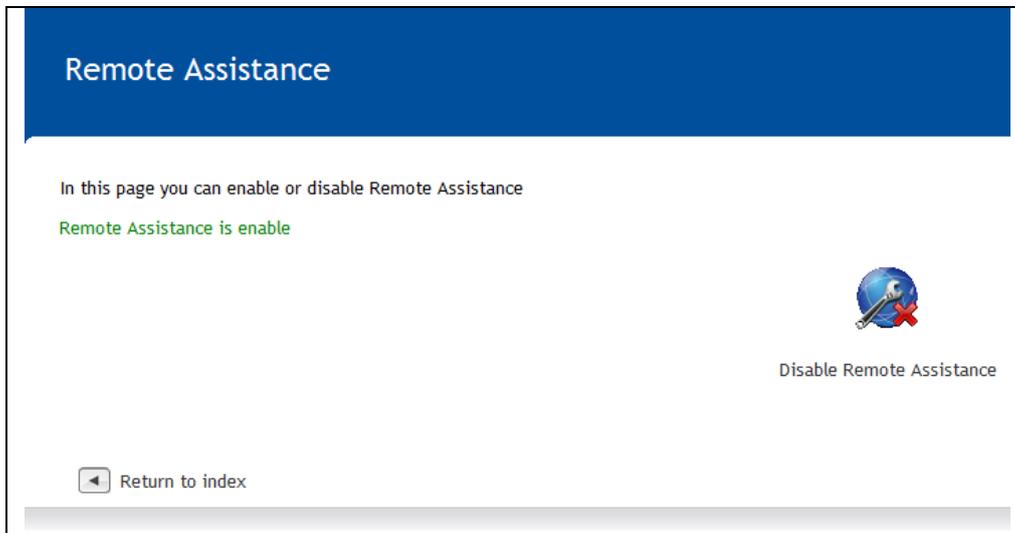


Fig. 24 – HiVoCS remote assistance

System time

The System time option allows to set the time and date of the SY4527

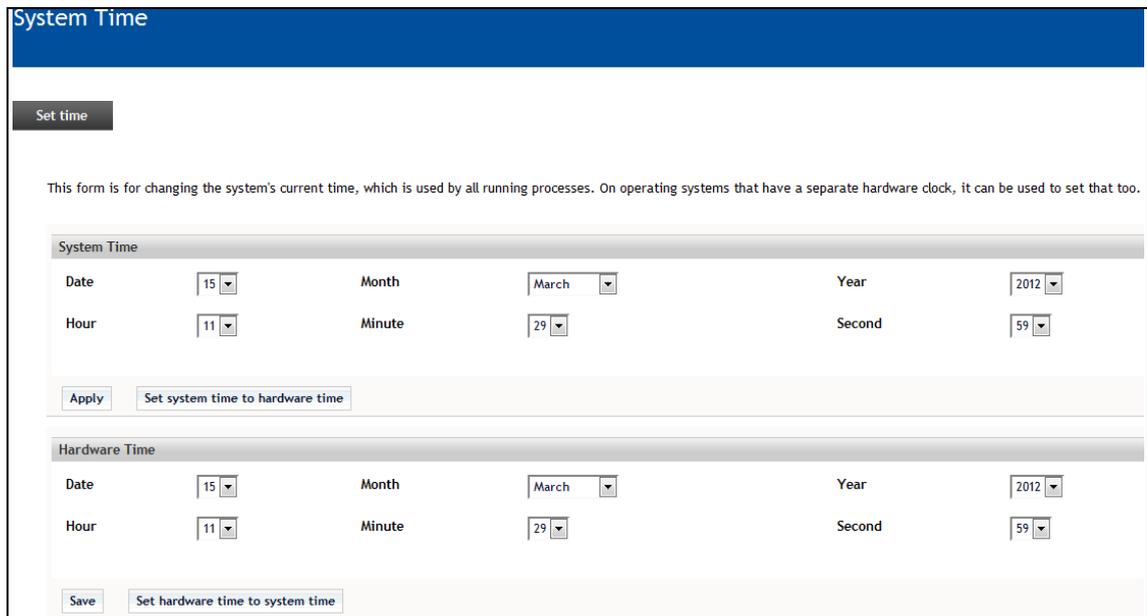


Fig. 25 – HiVoCS System time setting

License Manager

The License Manager has two options:

- System Add On allows to activate the optional “enhancement activation code”
 - CAEN HV Control Software functionality enhancement is available upon purchase. If you have purchased the “Control software functionality enhancement activation code” (ordering code WSW4536XAAA), prior to installation of the CAEN HV Control Software, you have to go to “Main menu” > License Manager, then type the “enhancement activation code” you received

into the “Insert key” field than select save. Install CAEN HV Control Software as described in the relevant manual and the “Advanced Features” will work!

- Wi Fi Add On allows to activate the optional A4535 Wi-Fi Dongle (see SY4527 Quick start guide)
 - The A4535 Wi-Fi Dongle allows the wireless control of the SY4527; in order to use it connect the A4535 into the USB port of the A4528 CPU and select License Manager > Wi-Fi Add-On; type the Activation Code provided with the A4535; at this point, the SY4527 will be listed in the wireless network of your PC (if this does not happen, then reboot both the System and PC) click on the SY4527 icon then perform the System Access.

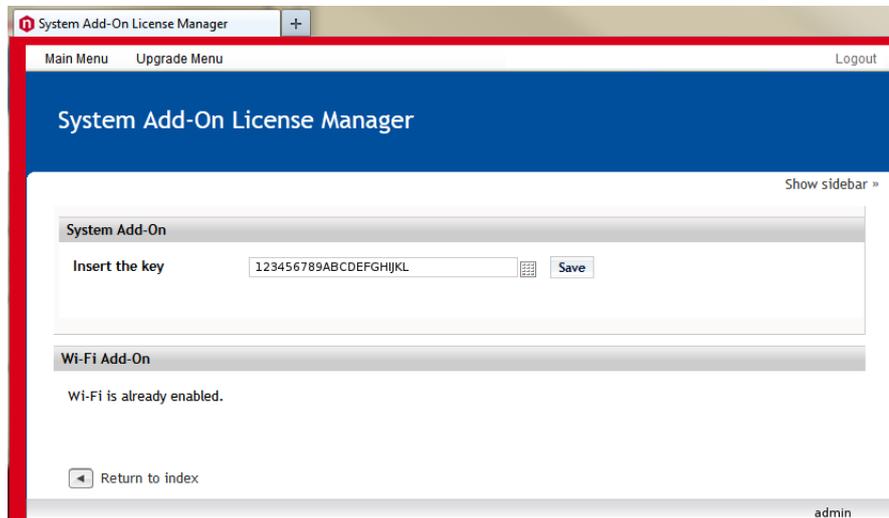


Fig. 26 – System Add On License Manager

System Reboot

This option allows to immediately reboot the system. All currently logged in users will be disconnected and all services will be re-started.

Upgrade menu

The Upgrade menu allows to update the firmware version of both the SY4527 system and the boards plugged into the system slots or into remote crates, handled via branch controllers.



Fig. 27 – HiVoCS Upgrade menu

- The System Interface Firmware Upgrade option allows to upgrade the system web tool (i.e. Add new features, bug-fix etc.)
- The HV Control Firmware Upgrade option allows to upgrade the firmware that handle the system activities (board control, channels control, OPC Server access etc.).
 - The CPU stores two locations for this firmware, named “STANDARD” and “BACK UP”; at Power On, a microcontroller reads the Flash Memory and programs the module with the firmware version selected via the SW1 jumper (see figure below), which can be placed either on the STD position (right), or in the BKP position (left). N.B.: it is strongly suggested to upgrade ONLY one of the stored firmware revisions (generally the STD one): if both revision are simultaneously updated, and a failure occurs, it will not be possible to upload the firmware again!
- The Board Upgrade option allows to upgrade the firmware of the board in the selected slot

- The Remote Board Upgrade option allows to upgrade the firmware of the remote board selecting:
 - Slot of branch controller
 - Remote crate (branch) number
 - Remote crate slot of the board

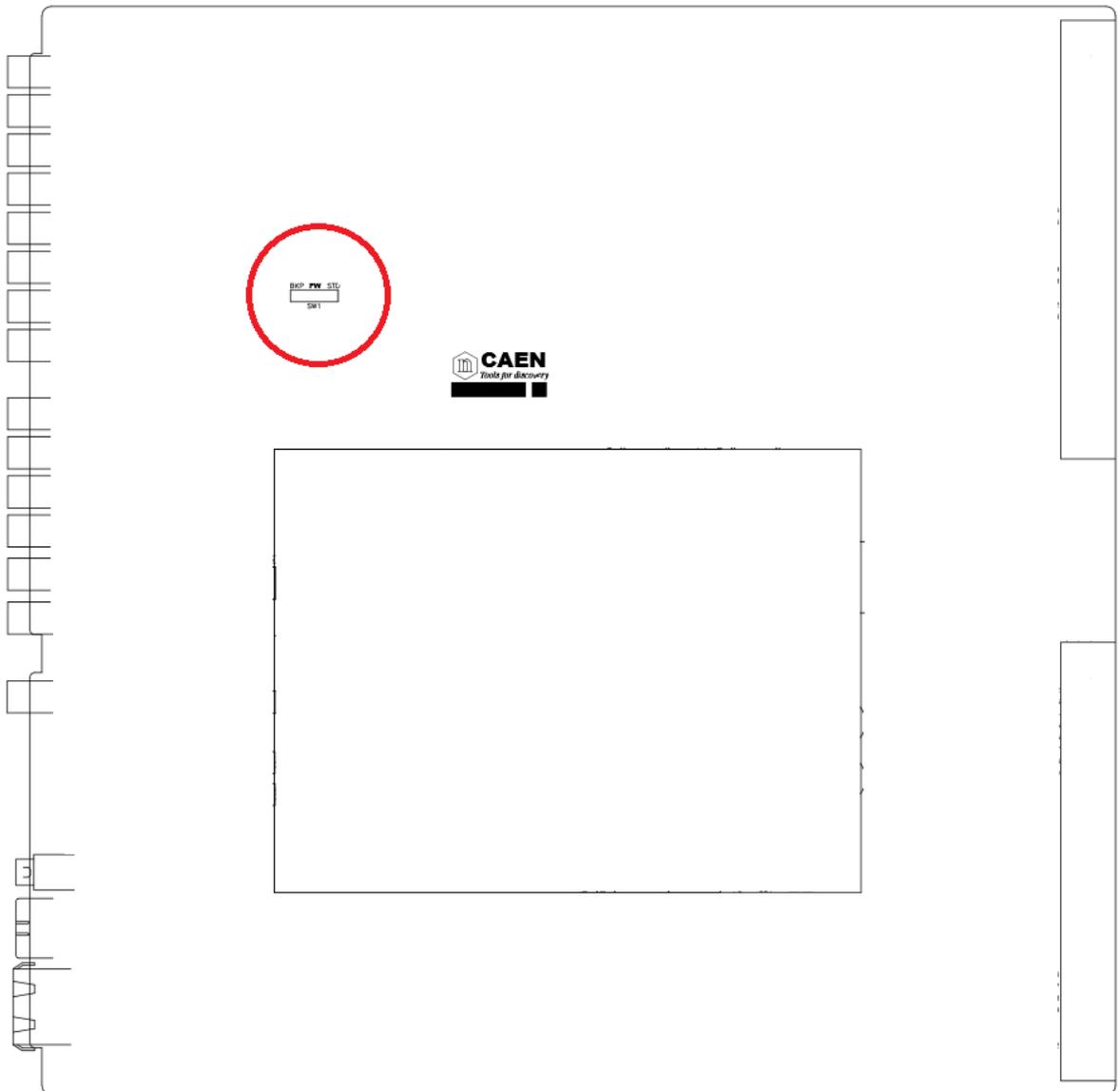


Fig. 28 – SW1 location on A4528 mother board

9. Trip handling

If a channel trips due to Over Current, it can be useful to have the possibility of letting automatically other channels (which are not in Over Current) trip; this feature is implemented on most of the PS boards. Please check also the Board User's Manual, since some boards provide decimal TripInt and TripExt parameters, while other boards provide hexadecimal TripInt and TripExt.

Internal Trip

A Power Supply Board features a number of "virtual" trip lines usually equal to half the number of its channels, so a 12 channel board features an internal 6-line Trip Bus. The channels communicate with each other through this bus: a channel can be allowed to either propagate or sense (or both propagate and sense) the *trip status* through one or more *trip lines*. This feature is achieved by writing a 2N-bit word (Dec. 0÷2^{2N}-1) in the relevant channel's TRIPINT parameter (see CAEN HV Control Software User's manual), where N is the number of the board's Internal Trip Bus lines. Bits [0;N-1] allow the channel to sense the trip status from the corresponding lines when set to one; in the same way, bits [N;2N-1] allow the channel to propagate the trip status over the Trip Bus: bit N on line 0 and so on.

For example we consider a 12 channel board with a 6-line trip bus (TRIPINT[n]: 0÷4095): if TRIPINT[0] is set to 64 (CH0 propagates the TRIP on line 0), TRIPINT[3] is set to 65, TRIPINT[4] is set to 65 (CH3 and CH4 both propagate and sense the TRIP on line 0) and TRIPINT[5] is set to 1 (CH5 senses the TRIP on line 0), then:

CH3 trips whenever either **CH0** or **CH4** trips

CH4 trips whenever either **CH0** or **CH3** trips

CH5 trips whenever either **CH0** or **CH3** trips or **CH4** trips

This configuration is shown below

INTERNAL TRIP BUS												
	Propagate						Sense					
	Line 5	Line 4	Line 3	Line 2	Line 1	Line 0	Line 5	Line 4	Line 3	Line 2	Line 1	Line 0
TRIPINT0	0	0	0	0	0	0	0	0	0	0	0	0
TRIPINT1	0	0	0	0	0	0	0	0	0	0	0	0
TRIPINT2	0	0	0	0	0	0	0	0	0	0	0	0
TRIPINT3	0	0	0	0	0	1	0	0	0	0	0	1
TRIPINT4	0	0	0	0	0	1	0	0	0	0	0	1
TRIPINT5	0	0	0	0	0	0	0	0	0	0	0	1
TRIPINT6	0	0	0	0	0	0	0	0	0	0	0	0
TRIPINT7	0	0	0	0	0	0	0	0	0	0	0	0
TRIPINT8	0	0	0	0	0	0	0	0	0	0	0	0
TRIPINT9	0	0	0	0	0	0	0	0	0	0	0	0
TRIPINT10	0	0	0	0	0	0	0	0	0	0	0	0
TRIPINT11	0	0	0	0	0	0	0	0	0	0	0	0

External Trip

The External Trip shares most of its features with the internal one. The number of lines is four, fixed for any kind of board, so the TRIPEXT parameter must be set in the 0÷255 range. Bits [0;3] allow the channel to sense the trip status from the corresponding lines when set to one; in the same way, bits [4;7] allow the channel to propagate the trip status over the trip bus of the system mainframe: bit 4 on line 0 and so on. Line 0 status of the trip bus of the system mainframe is exported by the TRIP out signal of the CPU (see Table 3).



CAEN SpA is acknowledged as the only company in the world providing a complete range of High/Low Voltage Power Supply systems and Front-End/Data Acquisition modules which meet IEEE Standards for Nuclear and Particle Physics. Extensive Research and Development capabilities have allowed CAEN SpA to play an important, long term role in this field. Our activities have always been at the forefront of technology, thanks to years of intensive collaborations with the most important Research Centres of the world. Our products appeal to a wide range of customers including engineers, scientists and technical professionals who all trust them to help achieve their goals faster and more effectively.



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