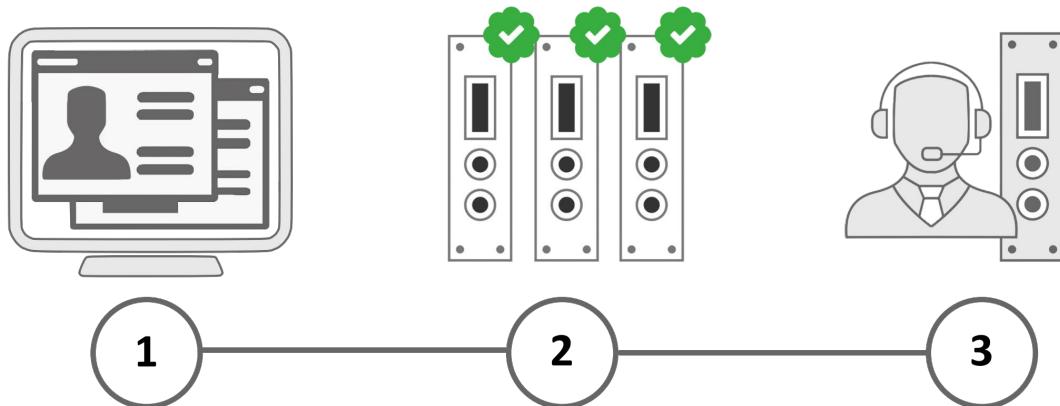


# Register your device

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.



<https://www.caen.it/become-mycaenplus-user/>

# Purpose of this Manual

This document is the A3009H 12 Ch 14V/5A (45W) Power Supply Board user manual; it contains information about the installation, the configuration and the use of the board.

## Change Document Record

Date	Revision	Changes
25 March 2022	0	First release
13 September 2022	1	Updated with voltage hardware limit

## Symbols, abbreviated terms and notation

N.A.

## Reference Documents

---

### Disclaimer

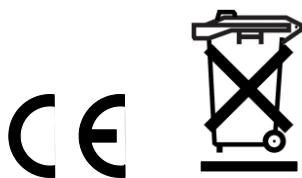
No part of this manual may be reproduced in any form or by any means, electronic, mechanical, recording, or otherwise, without the prior written permission of CAEN SpA.

CAEN will repair or replace any product within the guarantee period if the Guarantor declares that the product is defective due to workmanship or materials and has not been caused by mishandling, negligence on behalf of the User, accident or any abnormal conditions or operations.

CAEN declines all responsibility for damages or injuries caused by an improper use of the Modules due to negligence on behalf of the User. It is strongly recommended to read thoroughly the CAEN User's Manual before any kind of operation. *CAEN reserves the right to change partially or entirely the contents of this Manual at any time and without giving any notice.*

**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).



## Index

<b>1. Overview.....</b>	<b>4</b>
EASY (Embedded Assembly SYstem) .....	4
<b>2. A3009H Power Supply Board .....</b>	<b>6</b>
Channel Characteristic Table .....	7
Front Panel.....	8
Technical Specifications.....	8
Packaging .....	8
Front panel connections .....	9
Front panel trimmers and switches .....	9
Front Panel Displays.....	9
<b>3. Safety and installation requirements .....</b>	<b>10</b>
General safety information.....	10
Injury Precautions .....	10
Safety Terms and Symbols on the Product.....	10
Installation .....	10
Ventilation .....	10
<b>4. Operating modes.....</b>	<b>12</b>
Output control and monitoring .....	12
Internal Channel OPC Items .....	14
Output Channel OPC Items .....	15
Interlock operation .....	18
Voltage sensing.....	18
Ramp Up Operation .....	19

## List of Figures

Fig. 1 – A3009H and A3009HB front panel .....	8
Fig. 2 – Ventilation warning Label .....	11
Fig. 3 – Interlock diagram .....	18
Fig. 4 – Remote voltage sensing scheme .....	18

## List of Tables

Table 1 – Channel characteristics of the Mod. A3009H Board .....	7
Table 2 – CH0 Parameters (Board parameters) .....	12
Table 3 – CH 1..12 Parameters (output channel parameters) .....	13
Table 4 – Status word significant bits .....	14
Table 5 – A3009H Internal Channel items .....	15
Table 6 – A3009H Output Channel items .....	17

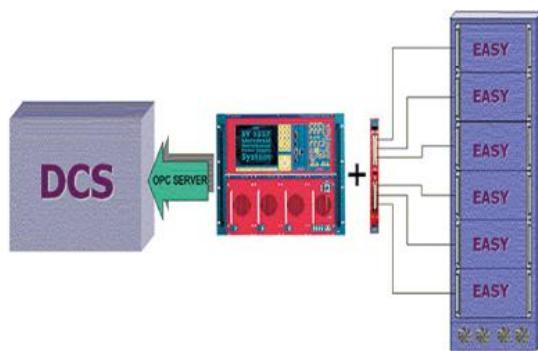
# 1. Overview

## EASY (Embedded Assembly SYstem)

**EASY** (Embedded Assembly SYstem) is the CAEN high/low voltage power supply to be used every time the magnetic field and radiation become a problem.

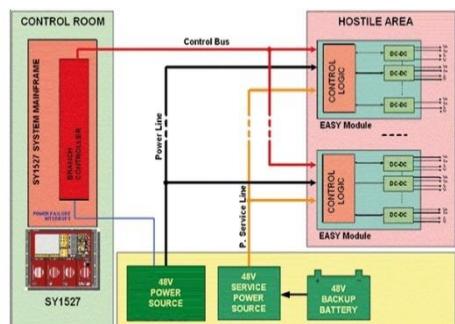
During the last decade, CAEN has been involved in developing different solutions to satisfy the requirements coming from main LHC experiments where the electronic equipment of the experiment is dealing with high dose of radiation and strong magnetic field. To provide safe and reliable operations in these hostile areas, CAEN started tests with rad-tolerance components and magnetic field resistant solutions, patenting this technology that is now used in a line of products for "hostile" area. In addition, even if designed for harsh environment the EASY modules can work also in normal conditions with excellent performance. Widely used in LHC experiments, producing over 6,500 electronic units, containing more than 190,000 sub-boards.

In addition, even if designed for harsh environment the EASY modules can work also in normal condition with excellent performance.



<http://www.caen.it/csite/CaenProfList.jsp?parent=199&Type=WOCategory&prodSupp=y> The power supply is located directly in the hostile area; here the **EASY** modules provide a wide variety of output voltages to satisfy the requirements of most detectors and front end electronics (LV up to 100A and HV up to 12 kV). The control of the EASY power supply system can be done remotely using a Branch Controller (model **A1676A**) plugged in a SY4527 mainframe located in the control room. Through the mainframe an immediate and "automatic" interfacing with the DCS or the custom control software is achieved using the provided and full reliable **OPC server software**.

Each branch controller module can handle up to 6 EASY crates. Since the A1676A is a one unit wide board, one SY4527 power system can house up to 16 branch controller boards, enabling the monitoring up to 96 EASY systems. The module can work even side by side with standard HV and/or LV board. An unique interface and a cost effective set-up for all the experiment's power requirements!



<http://www.caen.it/csite/CaenProfList.jsp?parent=199&Type=WOCategory&prodSupp=y> The EASY3000 (for boards up to 40cm long, A3XXX Family) can house up to 10 boards depending on the boards' width, while the EASY4000 (for boards up to 55cm long, A4XXX Family) can house up to 9 boards. As illustrated in

Figure, the branch controller is the interface between the supply unit (SYx527) and the remote boards in the EASY crate. The branch controller role is to configure the EASY channels as they belong to the supply unit slot in which the branch controller is located. In this way all the channels of the EASY boards, will be considered as channels of the branch control board, increasing hugely the number of channels the system can handle.

**EASY3000/4000 Crates and Boards hostile areas tolerances****Magnetic field: 2 kGauss****Radiation:** **$1 \cdot 10^{11}$  p/cm<sup>2</sup> TD** **$2 \cdot 10^{12}$  n/cm<sup>2</sup> TD****15 kRad TID**

## 2. A3009H Power Supply Board

This document shows the features of the CAEN Mod. A3009H 12 Channel Power Supply Board, developed for operation in magnetic field and moderate radioactive environment. One A3009H houses 12 positive 14 V / 5 A / 45 W maximum output power, channels.

Two versions are available: Mod. A3009H, provided with APP30 output connectors, and Mod. A3009HB, provided with screw locks for connecting the output cables.

The connector<sup>1</sup> output voltage range is 6 ÷ 14 V with 5 mV monitor resolution; channel control includes various alarms and protections. A  $11.8V \pm 0.1V$  hardware limit is available on request.

The board is provided with Remote Sensing Lines to compensate for the voltage drop over the connection cables.

If the output voltage differs from the programmed value by more than 3% of voltage full scale range, the channel is signalled to be either in OVER VOLTAGE or UNDER VOLTAGE condition.

Moreover, for each channel, a voltage protection limit SVMAX can be fixed via software with 5 mV resolution and the output voltage cannot be programmed beyond this value.

The output current is monitored with 10 mA resolution; if a channel tries to draw a current larger than its programmed limit it is signalled to be in OVERCURRENT condition; the SYx527 system detects this state as a fault and reacts according to the setting of the TRIP parameter<sup>2</sup>, which can be programmed in 0.1s steps from 0 to 1000s. Actually TRIP = 1000 s means *infinite*: in case of TRIP *infinite* the output current is permitted to keep the programmed limit; if the maximum output current value is reached the channel behaves like a constant current generator. In case of TRIP < 1000 s, the output current is permitted to keep the limit only for programmed time interval and then is switched off.

The maximum output voltage (VMAX) and the maximum output current (IMAX) can be fixed for each channel, through trimmers located on the front panel.

---

<sup>1</sup> A modest voltage drop along the connection lines, depending on the cables' length, must be expected

<sup>2</sup> Refer to the SYx527 User's Manuals for details about the TRIP Handling.

## Channel Characteristic Table

Table 1 – Channel characteristics of the Mod. A3009H Board

<b>Polarity:</b>	Positive
<b>Output Voltage:</b>	6 ÷ 14 V (connector output) 11.8V $\pm$ 0.1V hardware limit available on request <sup>3</sup> ; a label on the front panel indicates the hardware voltage limit installation
<b>Max. Output Current:</b>	5 A
<b>Voltage Set/Monitor Resolution:</b>	5 mV
<b>Current Set/Monitor Resolution:</b>	10 mA
<b>VMAX hardware:</b>	6 ÷ 14 V
<b>VMAX hardware accuracy:</b>	$\pm$ 2% of FSR
<b>VMAX software:</b>	6 ÷ 14 V
<b>VMAX software resolution:</b>	5 mV
<b>Ramp Up</b>	from 0.1 V/s to 400 V/s with 0.1 V/s steps
<b>Voltage Ripple:</b> <sup>4</sup>	<20mV pp on 10 $\mu$ F // 0.1 $\mu$ F 10Hz-15MHz
<b>Accuracy</b> <sup>5</sup>	Voltage Monitor vs. Output Voltage: max. $\pm$ 30 mV $\pm$ 0.3% of reading
	Voltage Set vs. Output Voltage: max. $\pm$ 30 mV $\pm$ 0.3% of reading
	Current Monitor vs. Output Current: $\pm$ 0.05A $\pm$ 2% of reading
	Current Set vs. Output Current: $\pm$ 0.05A $\pm$ 2% of reading
<b>Load Regulation:</b> <sup>6</sup>	$\pm$ 0.3 % (with sense wires) $\pm$ 2 % (without sense wires)
<b>Output power:</b>	45 W per channel
<b>Test Set Up:</b>	cable: length = 20~30m; $\varnothing$ = 10mm (for both output and return) with sense wires connected test load: 250÷2000 W (nominal) load capacitance: 100 $\mu$ F electrolytic // 100nF ceramic (// to the load)

<sup>3</sup> N.B.: If the output voltage hardware limit is installed, then an input voltage applied to the output connectors (for test purposes) must not exceed 11.8V, otherwise the LV channel will be damaged

<sup>4</sup> From 10 Hz to 15 MHz at full load; measured with the line terminated on a 10  $\mu$ F capacitance and a 100 nF ceramic capacitance in parallel to the load

<sup>5</sup> From 10% to 90% of Full Scale Range

<sup>6</sup> From 10% to 90% of Full Scale Range

## Front Panel

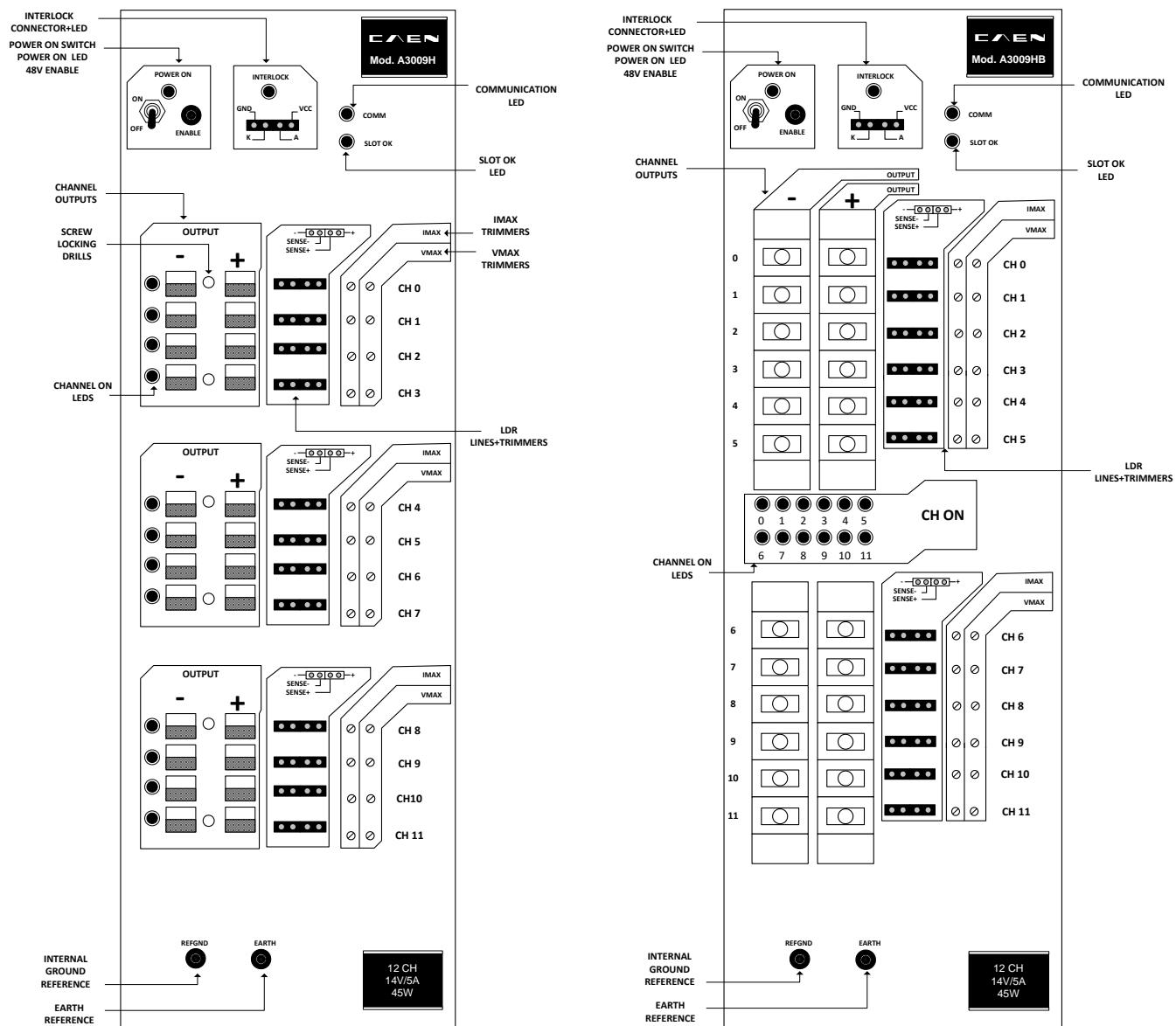


Fig. 1 – A3009H and A3009HB front panel

## Technical Specifications

### Packaging

The module is housed in a 16 TE wide, 6U-high mechanics.

## Front panel connections

The board front panel houses the following components:

Name	<b>A3009H</b>	<b>A3009HB</b>	Function
OUTPUT CH 0..11	APP30 1317G4 type	MOLEX 38720-7406 <sup>7</sup>	LV output
SENSE CH 0..11	AMP 280371-2 type	AMP 280371-2 type	Sensing lines to be connected to the load
INTERLOCK	AMP 280371-2 type	AMP 280371-2 type	Interlock enable jumpers
EARTH	RADIALL R921921 type	RADIALL R921921 type	earth auxiliary reference
REFGND	RADIALL R921921 type	RADIALL R921921 type	floating return, to be connected to the ground reference of the load
ENABLE	FISCHER DP101A004-28 (LEMO 00)	FISCHER DP101A004-28 (LEMO 00)	contact must be closed, in order to enable the 48 V Service power supply (general ON/OFF of the module); otherwise, a 50 Ohm termination can be inserted in order to enable the 48 V Service power supply

## Front panel trimmers and switches

The board front panel houses the following trimmers and switches:

VMAX 0..11:	Allows to set VOUT maximum hardware value
IMAX 0..11:	Allows to set IOUT maximum hardware value
POWER ON:	Allows to enable/disable the 48 V power supply (general ON/OFF of the module)

## Front Panel Displays

<b>CH ON 0..11 LEDs</b>	red LED; lights up as the channel is on
<b>PWGOOD LED</b>	green LED; lights up as the +48 V power, ±12V supplies are present
<b>COMM LED</b>	green LED; lights up as the communications take place
<b>INTERLOCK LED</b>	green LED; lights up as the interlock is active
<b>SLOT OK LED</b>	green LED; lights up as the module is recognised by the A1676A (the unit is expected in this slot by the EASY CRATE map table)

<sup>7</sup> Tighten with screwdriver PH2; max torque 1.4Nm(12in-lb); refer to [www.molex.com](http://www.molex.com) for details

## 3. Safety and installation requirements

### General safety information

This section contains the fundamental safety rules for the installation and operation of the boards. Read thoroughly this section before starting any procedure of installation or operation of the product.

#### Injury Precautions

Review the following 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.

<b>Avoid Electric Overload.</b>	To avoid electric shock or fire hazard, do not apply a voltage to a load that is outside the range specified for that load
<b>Avoid Electric Shock.</b>	To avoid injury or loss of life, do not connect or disconnect cables while they are connected to a voltage source.
<b>Do Not Operate Without Covers</b>	To avoid electric shock or fire hazard, do not operate this product with covers or panels removed.
<b>Do Not Operate in Wet/Damp Conditions</b>	To avoid electric shock, do not operate this product in wet or damp conditions.
<b>Do Not Operate in an Explosive Atmosphere</b>	To avoid injury or fire hazard, do not operate this product in an explosive atmosphere
<b>Do Not Operate With Suspected Failures</b>	If you suspect there is damage to this product, have it inspected by qualified service personnel

### 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 symbols may appear on the product:



### Installation

The Unit is a power supply board which has to be plugged in a EASY3000 Remote Crate for Hostile Area. For more information about operation with the EASY3000 System, please refer to the Mod. A1676A Branch Controller documentation.

The Mod. A1676A is a single-width board for the SYx527 systems. At power ON the SYx527 system processor will scan all the slots in the crate to find out where the module is plugged and what kind of module it is.

The A1676A must be connected to the EASY3000/4000 remote crates through the control lines. The control connectors are placed on the A1676A front panel and on the EASY3000/4000 back or front panel respectively.

### Ventilation

It is necessary to provide the unit the proper ventilation by using for example the CAEN Mod. A3000F Fan Unit; (A34FU Fan Unit must be used when the board is operated with EASY 3000 crate first issue). Ventilation is necessary even when channels and 48VPwS are off (see page 12).



Fig. 2 – Ventilation warning Label

## 4. Operating modes

The EASY3000 System boards can be controlled, either locally or remotely, through the SYx527 software interface.

For details on the EASY3000 System, please refer to the User's Manual of the A1676A Branch Controller. For details on SYx527 system operation, please refer to the User's Manual of this product.

### Output control and monitoring

The control software handles two types of channels: the **Channel 0**, which is a “virtual” internal channel and it is used to manage the board parameters, and the **Channel 1÷12**, which are the actual output channels. A1676A Branch Controller parameters are listed in the relevant User's Manual.

**Table 2 – CH0 Parameters (Board parameters)**

Name	Dir	Sign	ValType	Min	Max	Res	UM	OnStr	OffStr
Name	SET	UNSIGNED	STRING						
Rel	MON	UNSIGNED	NUMERIC	1.00	99.99	0.01	NONE		
SerNum	MON	UNSIGNED	NUMERIC	1	65535	1	NONE		
RemBdName	MON	UNSIGNED	ON_OFF					A3009H	A3009H
Temp	MON	SIGNED	NUMERIC	0	70	1	Celsius		
12VPwS	MON	UNSIGNED	ON_OFF					Fail	Ok
48VPwS	MON	UNSIGNED	ON_OFF					Fail	Ok
Sync	MON	UNSIGNED	ON_OFF					Fail	Ok
HVSync	MON	UNSIGNED	ON_OFF					Fail	Ok
RemIlk	MON	UNSIGNED	ON_OFF					Yes	No
MainPws	MON	UNSIGNED	ON_OFF					Fail	Ok
Status	MON		NUMERIC	0	65535	1	NONE		

<b>Name</b>	allows to assign a symbolic name to the board
<b>Rel</b>	allows to readout the module firmware release.
<b>SerNum</b>	allows to readout the module serial number.
<b>RemBdName</b>	allows to readout the module name.
<b>Temp</b>	allows to readout the Temperature value. The returned value is the maximum detected on the channels. <b>N.B.:</b> If <b>Temp &gt; 70°C</b> all channels are turned OFF.
<b>12VPwS</b>	allows to readout the status of the +/-12V voltages generated inside the module. <b>N.B.:</b> If <b>12VPwS = Fail</b> all channels are turned OFF.
<b>48VPwS</b>	allows to readout the status of the external +48V Power voltage. <b>N.B.:</b> If <b>48VPwS = Fail</b> all channels are turned OFF.
<b>Sync</b>	allows to readout the status of the 50Hz synchronisation signal (EASY BUS) provided by the A1676A Branch Controller . <b>N.B.:</b> If <b>Sync = Fail</b> all channels are turned OFF.
<b>HVSync</b>	allows to readout the status of the 625KHz EASY BUS clock signal provided by the A1676A <b>N.B.:</b> If <b>HVSync = Fail</b> the 625KHz signal is generated by the board itself.
<b>RemIlk</b>	allows to readout the status of the <b>Interlock</b> signal on the front panel. <b>N.B.:</b> If <b>RemIlk = Yes</b> all the channels are turned OFF.

**MainPwS** allows to readout the status of the **48V STATUS** Power and Service signals on the back panel of the EASY3000 crate

**N.B.:** if MainPwS = Fail all the channels are turned OFF.

**Table 3 – CH 1..12 Parameters (output channel parameters)**

Name	Dir	Sign	ValType	Min	Max	Res	UM	OnStr	OffStr
Name	SET	UNSIGNED	STRING						
VOSet	SET	UNSIGNED	NUMERIC	6.000	14.000	0.005	VOLT		
SVMax	SET	UNSIGNED	NUMERIC	6.000	14.000	0.005	VOLT		
VMon	MON	UNSIGNED	NUMERIC	0.000	14.000	0.005	VOLT		
VCon	MON	UNSIGNED	NUMERIC	0.000	14.200	0.005	VOLT		
IOSet	SET	UNSIGNED	NUMERIC	00.0	5.0	0.01	AMPERE		
IMon	MON	UNSIGNED	NUMERIC	00.0	5.0	0.01	AMPERE		
Trip	SET	UNSIGNED	NUMERIC	0.0	1000.0	0.1	SEC		
Pw	SET	UNSIGNED	ON_OFF					On	Off
GlbOffEn	SET	UNSIGNED	ON_OFF					En	Dis
GlbOnEn	SET	UNSIGNED	ON_OFF					En	Dis
RUp	SET	UNSIGNED	NUMERIC	0.1	400.0	0.1	VOLT/SEC		

<b>Name</b>	allows to assign a symbolic name to the board
<b>VOSet</b>	allows to set the output voltage.
<b>SVmax</b>	allows to set the upper limit of VOSet. (VOSet cannot exceed SVMax).
<b>VMon</b>	allows to readout the voltage on the load.
<b>VCon</b>	allows to readout the voltage on the output connector. <b>N.B.:</b> if <b>VCon &gt; 14.2V</b> the channel is turned OFF. If the 11.8V hardware limit is installed, then the channel is turned OFF if <b>VCon &gt; 11.8V</b>
<b>IOSet</b>	allows to set the current threshold value.
<b>IMon</b>	allows to readout the current value delivered by the channel.
<b>Trip</b>	allows to set the Trip time. <b>N.B.:</b> If the channel Over Current (Imon $\geq$ IOset) lasts more than the Trip time, the channel is turned OFF. TRIP = 1000 s means <i>infinite</i> : in case of TRIP <i>infinite</i> the output current is permitted to keep the programmed limit; if the maximum output current value is reached the channel behaves like a constant current generator. In case of TRIP < 1000 s, the output current is permitted to keep the limit only for programmed time interval and then is switched off.
<b>Pw</b>	allows to send the ON/OFF command to the channel.
<b>GlbOnEn</b>	allows to enable the channel to respond to a GlobalOn command provided by the A1676A. <b>N.B.:</b> All the channels with GlbOnEn = En are turned ON any time the A1676A broadcasts a GlobalOn command.
<b>GlbOffEn</b>	allows to enable the channel to respond to a GlobalOff command provided by the A1676A. <b>N.B.:</b> All the channels with GlbOffEn = En are turned OFF any time the A1676A broadcasts a GlobalOff command.
<b>RUp</b>	allows to set the channel output ramp up rate. It can be set from 0.1 V/s to 400 V/s with 0.1 V/s steps. Available with firmware revision 2.07 and later.

**Status** allows to readout the channel status value.

**Table 4 – Status word significant bits**

Status	Name	Meaning
Bit 0	ON/OFF	
Bit 1	RAMP UP	Channel ramping Up
Bit 3	OVC	Over Current : IMon = I0set
Bit 4	OVV	Over Voltage : VMon > V0set + 0.25V
Bit 5	UNV	Under Voltage : VMon < V0set - 0.25V
Bit 7	HVMAX	Hardware Vmax : Output voltage (load) > value set by panel trimmer And/Or Connector Voltage > 14.2V
Bit 9	TRIP	Channel in OVC for a duration > TRIP
Bit 10	CALERR	Calibration error
Bit 11	UNPLUGGED	Fail in communication with A1676A Branch Controller
Bit 13	OVP <sup>8</sup>	Over Voltage Protection : VCon > 14.5V
Bit 14	PWF	Power Fail : output power > 50W
Bit 15	TERR	Temperature Error : temperature > 70°C

**N.B.: If a channel is in 'TRIP', 'HVMAX', 'OVP', 'PWF' or 'TERR', (i.e. the corresponding bits are set) it is turned OFF.**

Before turning one channel ON, every fail cause must be removed via the 'Clear Alarm' command, sent by the SYx527 system.

## Internal Channel OPC Items

This chapter describes the items which are available for the control of the internal channel (Channel 0).

The **Name** item allows to assign to the channel a symbolic name.

A read access to the **Temp** item returns the channels temperature.

A read access to the **Temp#EU** item returns a string with the Temp Engineering Units.

A read access to the **Temp#HighEU** item returns the highest possible Temp value.

A read access to the **Temp#LowEU** item returns the lowest possible Temp value.

A read access to the **Rel** item returns a string with the board firmware release.

A read access to the **12VPwS** item returns the internal ±12 V status.

A read access to the **12VPwS#CoOpen** item returns back the label "Off" associated to 12VPwS=OK.

A read access to the **12VPwS#CoClose** item returns back the label "On" associated to 12VPwS=FAIL.

A read access to the **48VPwS** item returns the external +48 V status.

A read access to the **48VPwS#CoOpen** item returns back the label "Off" associated to 48VPwS=OK.

A read access to the **48VPwS#CoClose** item returns back the label "On" associated to 48VPwS=FAIL.

A read access to the **Sync** item returns the external 50 Hz status.

A read access to the **Sync#CoOpen** item returns back the label "Off" associated to Sync=OK.

A read access to the **Sync#CoClose** item returns back the label "On" associated to Sync=FAIL.

A read access to the **HVSync** item returns the external 625 Hz status.

A read access to the **HVSync#CoOpen** item returns back the label "Off" associated to HVSync=OK.

<sup>8</sup> This protection must be intended as a further safety limit beyond HVmax

A read access to the **HVSync#CoClose** item returns back the label “On” associated to HVSync=FAIL.

A read access to the **RemIlk** item returns the remote Interlock status.

A read access to the **RemIlk#CoOpen** item returns back the label “Off” associated to board=NO  
A read access to the **RemIlk#CoClose** item returns back the label “On” associated to board=YES

A read access to the **MainPwS** item returns the +48 V Power and Service status.

A read access to the **MainPwS#CoOpen** item returns back the label “Off” associated to MainPwS=OK.  
A read access to the **MainPwS#CoClose** item returns back the label “On” associated to MainPwS=FAIL.

A read access to the **SerNum** item returns the board serial number.

A read access to the **RemBdName** item returns the remote board name status.

A read access to the **RemBdName#CoOpen** item returns back the label “Off” associated to RemBdName =NO

A read access to the **RemBdName#CoClose** item returns back the label “On” associated to RemBdName =YES

**Table 5 – A3009H Internal Channel items**

ItemID	Data Type	Access Rights	Description
PowerSupplyName.BoardXX.Chan0.Name	String	R/W	Channel name
PowerSupplyName.BoardXX.Chan0.Temp	4-byte real	R	Board temperature
PowerSupplyName.BoardXX.Chan0.Temp#EU	String	R	Temperature EU
PowerSupplyName.BoardXX.Chan0.Temp#HighEU	8-byte real	R	Temp upper limit
PowerSupplyName.BoardXX.Chan0.Temp#LowEU	8-byte real	R	Temp lower limit
PowerSupplyName.BoardXX.Chan0.Rel	String	R	Board firmware release
PowerSupplyName.BoardXX.Chan0.12VPS	boolean	R	12VPS status
PowerSupplyName.BoardXX.Chan0.12VPS#CoOpen	string	R	12VPS open label
PowerSupplyName.BoardXX.Chan0.12VPS#CoClose	string	R	12VPS close label
PowerSupplyName.BoardXX.Chan0.48VPS	boolean	R	48VPS status
PowerSupplyName.BoardXX.Chan0.48VPS#CoOpen	string	R	48VPS open label
PowerSupplyName.BoardXX.Chan0.48VPS#CoClose	string	R	48VPS close label
PowerSupplyName.BoardXX.Chan0.Sync	boolean	R	Sync status
PowerSupplyName.BoardXX.Chan0.Sync#CoOpen	string	R	Sync open label
PowerSupplyName.BoardXX.Chan0.Sync#CoClose	string	R	Sync close label
PowerSupplyName.BoardXX.Chan0.HVSync	boolean	R	HVSync status
PowerSupplyName.BoardXX.Chan0.HVSync#CoOpen	string	R	HVSync open label
PowerSupplyName.BoardXX.Chan0.HVSync#CoClose	string	R	HVSync close label
PowerSupplyName.BoardXX.Chan0.RemIlk	boolean	R	RemIlk status
PowerSupplyName.BoardXX.Chan0.RemIlk#CoOpen	string	R	RemIlk open label
PowerSupplyName.BoardXX.Chan0.RemIlk#CoClose	string	R	RemIlk close label
PowerSupplyName.BoardXX.Chan0.MainPwS	boolean	R	MainPwS status
PowerSupplyName.BoardXX.Chan0.MainPwS#CoOpen	string	R	MainPwS open label
PowerSupplyName.BoardXX.Chan0.MainPwS#CoClose	string	R	MainPwS close label
PowerSupplyName.BoardXX.Chan0.SerNum	2-byte int.	R	Board serial number
PowerSupplyName.BoardXX.Chan0.RemBdName	boolean	R	Board name status
PowerSupplyName.BoardXX.Chan0.RemBdName#CoOpen	string	R	Board name open label
PowerSupplyName.BoardXX.Chan0.RemBdName#CoClose	string	R	Board name close label

## Output Channel OPC Items

This chapter describes the items which are available for the control of the power supply channel (Channel 1 to 12).

The **Name** item allows to assign to the channel a symbolic name.

The **V0set** item allows to set V0.

A read access to the **V0set#EU** item returns a string with the V0set Engineering Units.  
A read access to the **V0set#HighEU** item returns the highest possible V0set value.  
A read access to the **V0set#LowEU** item returns the lowest possible V0set value.

The **IOset** item allows to set IO.  
A read access to the **IOset#EU** item returns a string with the IOset Engineering Units.  
A read access to the **IOset#HighEU** item returns the highest possible IOset value.  
A read access to the **IOset#LowEU** item returns the lowest possible IOset value.

The **Trip** item allows to program the trip time.  
A read access to the **Trip#EU** item returns a string with the Trip Engineering Units.  
A read access to the **Trip#HighEU** item returns the highest possible Trip value.  
A read access to the **Trip#LowEU** item returns the lowest possible Trip value.

The **SVMax** item allows to set the software voltage limit.  
A read access to the **SVMax#EU** item returns a string with the SVMax Engineering Units.  
A read access to the **SVMax#HighEU** item returns the highest possible SVMax value.  
A read access to the **SVMax#LowEU** item returns the lowest possible SVMax value.

The **VMon** item returns back the VMon value.  
A read access to the **VMon#EU** item returns a string with the VMon Engineering Units.  
A read access to the **VMon#HighEU** item returns the highest possible VMon value.  
A read access to the **VMon#LowEU** item returns the lowest possible VMon value.

The **VCon** item returns back the VCon value.  
A read access to the **VCon#EU** item returns a string with the VCon Engineering Units.  
A read access to the **VCon#HighEU** item returns the highest possible VCon value.  
A read access to the **VCon#LowEU** item returns the lowest possible VCon value.

The **IMon** item returns back the IMon value.  
A read access to the **IMon#EU** item returns a string with the IMon Engineering Units.  
A read access to the **IMon#HighEU** item returns the highest possible IMon value.  
A read access to the **IMon#LowEU** item returns the lowest possible IMon value.

A read access to the **Status** item returns back a 16 bit pattern indicating channel status, as follows:

Bit 0: ON/OFF
Bit 1: don't care
Bit 2: don't care
Bit 3: OverCurrent
Bit 4: OverVoltage
Bit 5: UnderVoltage
Bit 6: don't care
Bit 7: Over HVmax
Bit 8: don't care
Bit 9: Internal Trip
Bit 10: Calibration Error
Bit 11: Unplugged
Bit 12: don't care
Bit 13: OverVoltage Protection
Bit 14: Power Fail
Bit 15: Temperature Error

The **Pw** item allows to switch ON/OFF the channel.  
A read access to the **Pw#CoOpen** returns back the label "Off" associated to Pw=0.  
A read access to the **Pw#CoClose** item back the label "On" associated to Pw=1.

The **GlbOn** item enables the channel to respond to the A1676A Global On command.  
A read access to **GlbOn#CoOpen** returns back the label "Off" associated to GlbOn=0.

A read access to **GlbOn#CoClose** returns back the label “On” associated to GlbOn=1.

The **GlbOff** item enables the channel to respond to the A1676A Global Off command.  
A read access to **GlbOff#CoOpen** returns back the label “On” associated to GlbOff=0.  
A read access to **GlbOff#CoClose** returns back the label “Off” associated to GlbOff=1.

The **Rup** item allows to set the Ramp Up rate  
A read access to the **RUp#EU** item returns a string with the RUp Engineering Units.  
A read access to the **RUp#HighEU** item returns the highest possible RUp value.  
A read access to the **RUp#LowEU** item returns the lowest possible RUp value.

**Table 6 – A3009H Output Channel items**

ItemID	Data Type	Access Rights	Description
PowerSupplyName.BoardXX.ChanYYY.Name	String	R/W	Channel name
PowerSupplyName.BoardXX.ChanYYY.V0Set	4-byte real	R/W	Set V0 voltage limit
PowerSupplyName.BoardXX.ChanYYY.V0Set#EU	String	R	V0set EU
PowerSupplyName.BoardXX.ChanYYY.V0Set#HighEU	8-byte real	R	V0set upper limit
PowerSupplyName.BoardXX.ChanYYY.V0Set#LowEU	8-byte real	R	V0set lower limit
PowerSupplyName.BoardXX.ChanYYY.I0Set	4-byte real	R/W	Set I0 current limit
PowerSupplyName.BoardXX.ChanYYY.I0Set#EU	String	R	I0set EU
PowerSupplyName.BoardXX.ChanYYY.I0Set#HighEU	8-byte real	R	I0set upper limit
PowerSupplyName.BoardXX.ChanYYY.I0Set#LowEU	8-byte real	R	I0set lower limit
PowerSupplyName.BoardXX.ChanYYY.Trip	4-byte real	R/W	Set trip time
PowerSupplyName.BoardXX.ChanYYY.Trip #EU	String	R	Trip time EU
PowerSupplyName.BoardXX.ChanYYY.Trip #HighEU	8-byte real	R	Trip time upper limit
PowerSupplyName.BoardXX.ChanYYY.Trip #LowEU	8-byte real	R	Trip time lower limit
PowerSupplyName.BoardXX.ChanYYY.SVMax	4-byte real	R/W	Set software voltage limit
PowerSupplyName.BoardXX.ChanYYY.SVMax #EU	String	R	SVMax EU
PowerSupplyName.BoardXX.ChanYYY.SVMax#HighU	8-byte real	R	SVMax upper limit
PowerSupplyName.BoardXX.ChanYYY.SVMax#LowEU	8-byte real	R	SVMax lower limit
PowerSupplyName.BoardXX.ChanYYY.VMon	4-byte real	R	VMon
PowerSupplyName.BoardXX.ChanYYY.VMon #EU	string	R	VMon EU
PowerSupplyName.BoardXX.ChanYYY.VMon#HighU	8-byte real	R	VMon upper limit
PowerSupplyName.BoardXX.ChanYYY.VMon#LowEU	8-byte real	R	VMon lower limit
PowerSupplyName.BoardXX.ChanYYY.VCon	4-byte real	R	VCon
PowerSupplyName.BoardXX.ChanYYY. VCon#EU	string	R	VCon EU
PowerSupplyName.BoardXX.ChanYYY. VCon#HighU	8-byte real	R	VCon upper limit
PowerSupplyName.BoardXX.ChanYYY. VCon#LowEU	8-byte real	R	VCon lower limit
PowerSupplyName.BoardXX.ChanYYY. IMon	4-byte real	R	IMon
PowerSupplyName.BoardXX.ChanYYY. IMon #EU	string	R	IMon EU
PowerSupplyName.BoardXX.ChanYYY. IMon#HighU	8-byte real	R	IMon upper limit
PowerSupplyName.BoardXX.ChanYYY. IMon#LowEU	8-byte real	R	IMon lower limit
PowerSupplyName.BoardXX.ChanYYY.Status	2-byte integer	R	Channel status
PowerSupplyName.BoardXX.ChanYYY.Pw	boolean	R/W	Power ON/OFF
PowerSupplyName.BoardXX.ChanYYY.Pw#CoClose	string	R	Pw close label
PowerSupplyName.BoardXX.ChanYYY.Pw#CoOpen	string	R	Pw open label
PowerSupplyName.BoardXX.ChanYYY.GlbOn	boolean	R/W	Enable global ON
PowerSupplyName.BoardXX.ChanYYY.GlbOn#CoClose	string	R	GlbOn close label
PowerSupplyName.BoardXX.ChanYYY.GlbOn#CoOpen	string	R	GlbOn open label
PowerSupplyName.BoardXX.ChanYYY.GlbOff	boolean	R/W	Enable global OFF
PowerSupplyName.BoardXX.ChanYYY.GlbOff#CoClose	string	R	GlbOff close label
PowerSupplyName.BoardXX.ChanYYY.GlbOff#CoOpen	string	R	GlbOff open label
PowerSupplyName.BoardXX.ChanYYY.RUp	4-byte real	R/W	Set RUp voltage limit
PowerSupplyName.BoardXX.ChanYYY.RUp#EU	String	R	RUp EU
PowerSupplyName.BoardXX.ChanYYY.RUp#HighEU	8-byte real	R	RUp upper limit

ItemID	Data Type	Access Rights	Description
PowerSupplyName.BoardXX.ChanYYY.RUp#LowEU	8-byte real	R	RUp lower limit

## Interlock operation

A schematic diagram of the Interlock input is shown in the fig. 4.1 where the diode is part of optocoupler stage.

To enable the output channel, the Interlock must be disabled in one of the following ways:

**PASSIVE OPERATION:** it is necessary to short circuit pin 1 ("GND", the first from left to right) with pin 2 ("K=katode"), and pin 3 ("A=anode") with pin 4 ("VCC").

**ACTIVE OPERATION:** it is necessary to send a voltage level (for example a TTL; the recommended current is about 10 mA) between pin 2 = katode and pin 3 = anode (high = interlock disabled, the channel can be turned on; low = interlock enabled, the channel cannot be turned on), leaving pin 1 and pin 4 disconnected.

The front panel Interlock LED is ON when the Board is in Interlock.

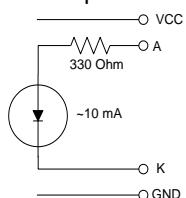


Fig. 3 – Interlock diagram

## Voltage sensing

The voltage drop along the cables can be recovered in the following way: all output channels have a Remote Sensing Line to compensate for the voltage drop over the cable. Voltage is monitored directly at the load by a high input impedance differential amplifier through the sense wires; the voltage sensing circuit is schematically illustrated in the figure below.

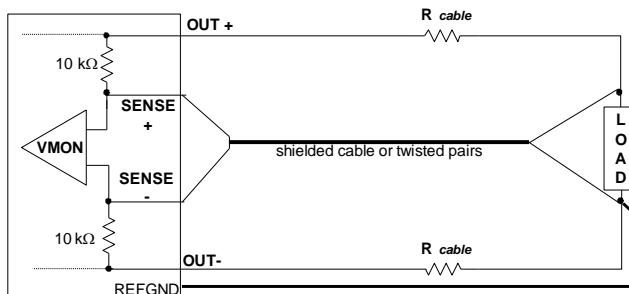


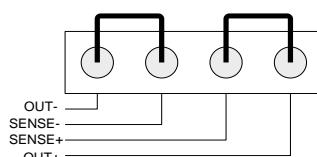
Fig. 4 – Remote voltage sensing scheme

**Sense wires must be shielded or, at least, twisted pairs.**

**The load must be referred to the internal reference ground of the board.**

When the sense wires are connected to the load, the Vset value equals the voltage on the load; if the sense wires are not connected (to the load), Vset will equal the voltage on the connector.

If the sense wires are not used, then it is necessary to connect the unused pins of the sense connector to the corresponding "Out" connector via jumpers, as shown in the picture below, in order to avoid partition effect during voltage reading.



## Ramp Up Operation

When loads with high capacitance are supplied, it is possible to set a channel ramp up speed that allows to control the load capacitance charge via the channel voltage loop. The channel ramp up speed can be set from 0.1V/s to 400V/s in 0.1V/s steps (14V can be reached in 20ms).







**CAEN S.p.A.**

Via Vetraia 11  
55049 - Viareggio  
Italy  
Phone +39 0584 388 398  
Fax +39 0584 388 959  
[info@caen.it](mailto:info@caen.it)  
[www.caen.it](http://www.caen.it)

**CAEN GmbH**

Brunnenweg 9  
64331 Weiterstadt  
Germany  
Tel. +49 (0)212 254 4077  
Mobile +49 (0)151 16 548 484  
[info@caen-de.com](mailto:info@caen-de.com)  
[www.caen-de.com](http://www.caen-de.com)

**CAEN Technologies, Inc.**

1 Edgewater Street - Suite 101  
Staten Island, NY 10305  
USA  
Phone: +1 (718) 981-0401  
Fax: +1 (718) 556-9185  
[info@caentechnologies.com](mailto:info@caentechnologies.com)  
[www.caentechnologies.com](http://www.caentechnologies.com)

**CAENspa INDIA Private Limited**

B205, BLDG42, B Wing,  
Azad Nagar Sangam CHS,  
Mhada Layout, Azad Nagar, Andheri (W)  
Mumbai, Mumbai City,  
Maharashtra, India, 400053  
[info@caen-india.in](mailto:info@caen-india.in)  
[www.caen-india.in](http://www.caen-india.in)



Copyright © CAEN SpA. All rights reserved. Information in this publication supersedes all earlier versions. Specifications subject to change without notice.