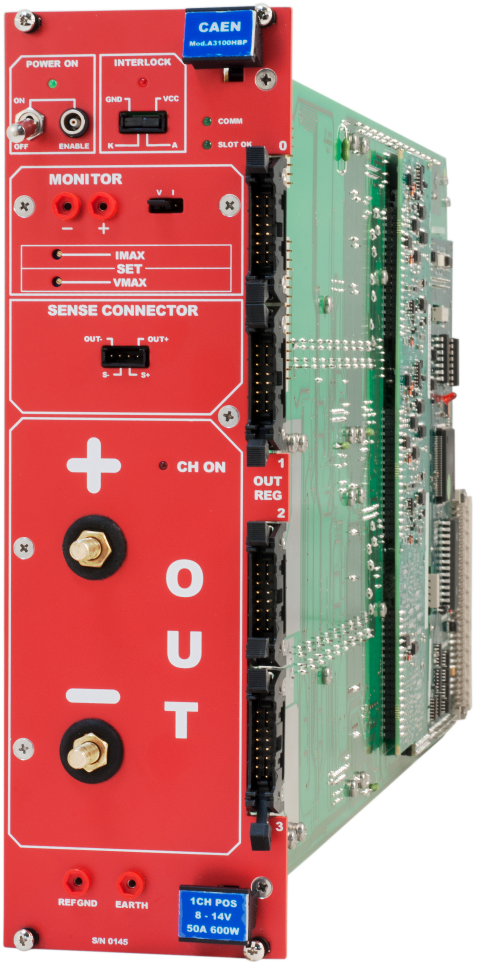
PRELIMINARY

Rev. 0 - 23/11/2017

A3100HBP

1 Channel 8 -14 V / 50 A / 600 W Power Supply Board



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User Manual

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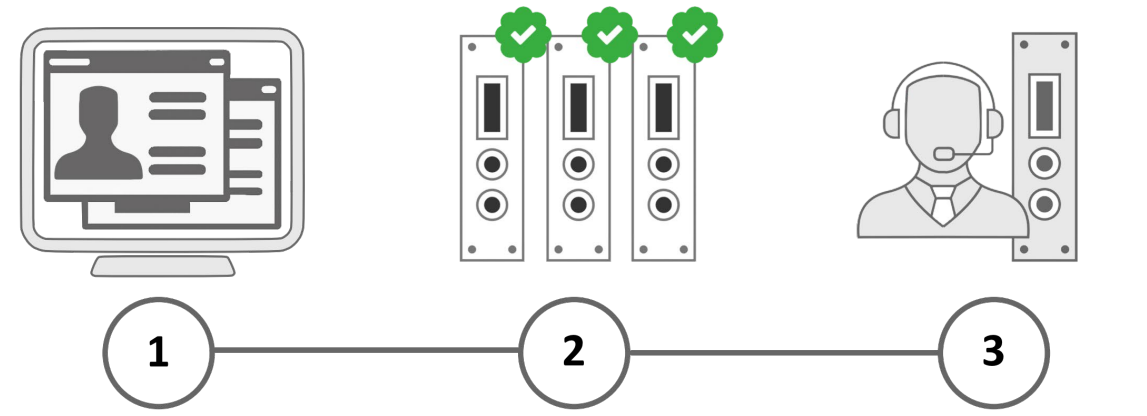

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Purpose of this Manual

This document is the A3100HBP 8–14V/50A (600W) Power Supply Board user manual; it contains information about the installation, the configuration and the use of the board.

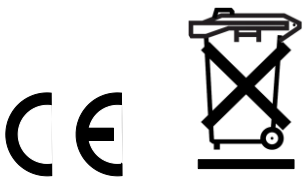
Change Document Record

Date	Revision	Changes
23 November 2017	0	PRELIMINARY Release

Symbols, abbreviated terms and notation

N.A.

Reference Documents



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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.
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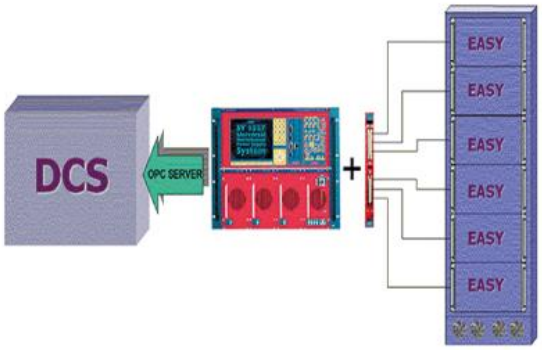
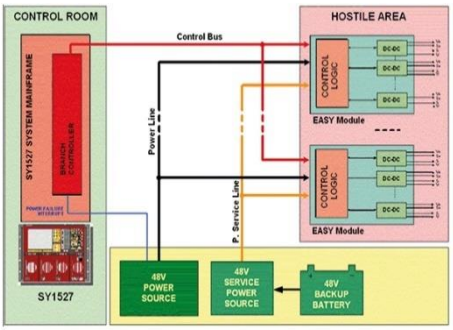


http://www.caen.it/csite/CaenProfList.jsp?parent=199&Type=WOCateg&prodsupp=yThe power supply is located directly in the hostile area; here the **EASY** modules provide a wide variety of output voltages to satisfy the requirements of most detectors and front end electronics (LV up to 100A and HV up to 12 kV).The control of the EASY power supply system can be done remotely using a Branch Controller (model **A1676A**) plugged in a SYx527 mainframe located in the control room. Trough 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=WOCateg&prodsupp=yThe 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^2 TD
$2 \cdot 10^{12}$ n/cm^2 TD
15 kRad TID

2. A3100HBP Power Supply Board

This document shows the features of the CAEN A3100HBP 8 – 14 V / 50 A (600W) Power Supply Board, developed for operation in magnetic field and moderate radioactive environment. One A3100HBP houses one positive 8 – 14 V / 50 A (600 W maximum output power) channel.

The unit is provided with screw locks for connecting the output cables.

The connector output voltage range is 8 - 14 V with 10 mV monitor resolution; channel control includes various alarms and protections.

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 10 mV resolution and the output voltage can not be programmed beyond this value.

The output current is monitored with 100 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, which can be programmed in 0.1s steps from 0 to 1000s. 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.

Channel Characteristic Table

Table 1 – Channel characteristics of the Mod. A3100HBP HV Board

Polarity:	Positive
Output Voltage[1]:	8 ÷ 14 V (connector output)
Max. Output Current:	50 A
Voltage Set/Monitor Resolution:	10 mV
Current Set/Monitor Resolution:	100 mA
VMAX hardware accuracy:	± 2% of FSR
VMAX software:	8 ÷ 14 V
VMAX software resolution:	10 m V
Voltage Ripple: [2]	< 10 mV pp
Voltage Monitor vs. Output Voltage Accuracy: [3]	max. ±50 mV ±0.3% of reading
Voltage Set vs. Output Voltage Accuracy: [5]	max. ±50 mV ±0.3% of reading
Current Monitor vs. Output Current Accuracy: [5]	± 0.5A ± 1% of reading (typical) ± 1A ± 1% of reading (max)
Current Set vs. Output Current Accuracy: [5]	± 0.5A ± 1% of reading (typical) ± 1A ± 1% of reading (max)
Load Regulation: [5]	± 0.3 % (with sense wires) ± 2 % (without sense wires/LDR ON/SENSE OFF)
Max. Output Power:	600 W
Test Set Up:	cable: length = 2m and 30m; ∅= 8mm (for both output and return) with sense wires connected decoupling capacitor: 47µF electrolytic test load: >600W load capacitance: 10µF electrolytic // 100nF ceramic (// to the load)
48Vin (Power & Service)	45÷51Vdc

[1] The board works properly with a Vset larger than 1.25 V and a current on the load larger than 10 A

[2] From 10 Hz to 15 MHz; current>0.1A; measured with the line terminated on a 10 µF capacitance and a 100 nF ceramic capacitance in parallel to the load

[3] From 10% to 90% of Full Scale Range

Front Panel

Fig. 1 – A3100HBP 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:

	OUT CH +	Screw locks	Positive LV output.
	OUT CH -	Screw locks	Output return
	MON +/-:	Radiall R921921	Monitor of Vmax and Imax
	SENSE +/-:	AMP 280371-2	sensing lines to be connected to the load
	INTERLOCK	AMP 280371-2	Interlock enable jumpers
	EARTH	RADIALL R921921	earth auxiliary reference
	REFGND	RADIALL R921921	floating return, to be connected to the ground reference of the load

48V STATUS/EN	FISCHER DP101A004-28 (LEMO 00)	TTL signal (active = ON), allows to enable/disable the 48 V power supply (general ON/OFF of the module). The module is ON with LEMO 50Ohm termination and switch set to ON.

OUTPUT REGISTER	32 bit Output Register (User defined)	4 x 16 pin header type connectors

Front panel trimmers and switches

The board front panel houses the following trimmers and switches:

IMAX: Allows to set IOUT maximum hardware value (see table)

VMAX: Allows to set VOUT maximum hardware value (see table)

Table 2 – Vmax/Imax vs. MON

MON (V)	Vmax (V)
6.8	14.0
6.3	13.0
5.8	12.0
5.3	11.0
4.8	10.0
4.3	9.0
3.8	8.0

MON (V)	Imax (A)
7.0	50
6.35	45
5.65	40
5	35
4.35	30
3.65	25
3	20
2.35	15
1.65	10
1	5

MONITOR is the value read on the voltmeter connected to the MONITOR +/- connectors, Vmax/Imax are the corresponding actual maximum values, set via the VMAX/IMAX.

Front Panel Displays

CH ON LED	red LED; lights up as the channel is on
PWGOOD LED	green LED; lights up as the +48 V power, +/ 12V supplies are present
COMM LED	green LED; lights up as the communications take place
INTERLOCK LED	green LED; lights up as the interlock is active
SLOT OK LED	green LED; lights up as the module is recognised by the A1676A (the A3100HBP is expected in this slot by the EASY CRATE map table)

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.

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.

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 Operate With Suspected Failures.

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:

DANGER
High Voltage

ATTENTION
Refer to Manual

Installation

The Mod. A3100HBP is a power supply board which has to be plugged in a EASY3000 Remote Crate for Hostile Area.

WARNING!

On Mod. A3100HBP Board output cables must be always identical on both output connectors

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 13).

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**, the actual output channel. A1676A Branch Controller parameters are listed in the relevant User's Manual.

Table 3 – 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					A3100HBP	
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

Name allows to assign a symbolic name to the board

Rel allows to readout the module firmware release.

SerNum allows to readout the module serial number.

RemBdName allows to readout the module name.

Temp allows to readout the Temperature value.

The returned value is the maximum detected on the channels.
N.B.: If **Temp > 70°C** all channels are turned OFF.

12VPwS allows to readout the status of the +/-12V voltages generated inside the module.

N.B.: If **12VPwS = Fail** all channels are turned OFF.

48VPwS allows to readout the status of the external +48V Power voltage.

N.B.: If **48VPwS = Fail** all channels are turned OFF.

Sync allows to readout the status of the 50Hz synchronisation signal (EASY BUS) provided by the A1676A Branch Controller .

N.B.: If **Sync = Fail** all channels are turned OFF.

HVSync allows to readout the status of the 625KHz EASY BUS clock signal provided by the A1676A

N.B.: If **HVSync = Fail** the 625KHz signal is generated by the board itself.

RemIlk allows to readout the status of the **Interlock** signal on the front panel.
N.B.: If **RemIlk = Yes** 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 4 – CH1 Parameters (output channel parameters)

Name	Dir	Sign	ValType	Min	Max	Res	UM	OnStr	OffStr
Name	SET	UNSIGNED	STRING						
V0Set	SET	UNSIGNED	NUMERIC	8.00	14.00	0.001	VOLT		
SVMax	SET	UNSIGNED	NUMERIC	8.00	14.00	0.001	VOLT		
VMon	MON	UNSIGNED	NUMERIC	0.000	14.00	0.001	VOLT		
VCon	MON	UNSIGNED	NUMERIC	0.000	14.50	0.001	VOLT		
I0Set	SET	UNSIGNED	NUMERIC	00.0	52.0	0.01	AMPERE		
IMon	MON	UNSIGNED	NUMERIC	00.0	50.0	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
OutReg	SET	UNSIGNED	BINARY	0	65535	1	HEX		
OutReg	SET	UNSIGNED	BINARY	0	65535	1	HEX		

Name allows to assign a symbolic name to the channel

V0Set allows to set the output voltage.

SVmax allows to set the upper limit of V0Set; if SVmax is lower than VSet, then VSet is upgraded (V0Set cannot exceed SVMax).

VMon allows to readout the voltage on the load.

VCon allows to readout the voltage on the output connector. **N.B.**: if **VCon > 14.5V** the channel is turned OFF and an OVP Alarm is produced on Status

I0Set allows to set the current threshold value.

IMon allows to readout the current value delivered by the channel.

Trip allows to set the Trip time.

N.B.: If the channel Over Current (Imon >= I0set) lasts more than the Trip time, the channel is turned OFF.

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.

Pw allows to send the ON/OFF command to the channel.

GlbOnEn allows to enable the channel to respond to a GlobalOn command provided by the A1676A.

N.B.: All the channels with GlbOnEn = En are turned ON any time the A1676A broadcasts a GlobalOn command.

GlbOffEn allows to enable the channel to respond to a GlobalOff command provided by the A1676A.

N.B.: All the channels with GlbOffEn = En are turned OFF any time the A1676A broadcasts a GlobalOff command.

OutReg allows to set the Output Register bits (see page 20).

Status allows to readout the channel status value.

Table 5 – Status word significant bits

Status	Name	Meaning
Bit 0	ON/OFF	
Bit 3	OVC	Over Current : IMon = I0set
Bit 4	OVV	Over Voltage : VMon > V0set + 0.42V
Bit 5	UNV	Under Voltage : VMon < V0set - 0.42V
Bit 7	HVMAX	Hardware Vmax : Output voltage (load) > value set by panel trimmer; And/Or Connector Voltage > 14.5V
Bit 9	TRIP	Channel in OVC for a duration > TRIP
Bit 10	CALERR	Calibration error

Status	Name	Meaning
Bit 11	NPLUGGED	Fail in communication with A1676A Branch Controller
Bit 13	OVP[4]	Over Voltage Protection : VCon > 14.5V
Bit 14	PWF	Power Fail : output power > 620W
Bit 15	TERR	Temperature Error : temperature > 70°C

N.B.: If a channel is in 'TRIP','HVMAX', 'OVP', 'PWF' or 'TERR', (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 Sx527.

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.

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

[4] This protection must be intended as a further safety limit beyond HVmax

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

Table 6 – A3100HBP Internal Channel items

ItemID	Data Type	Access Rights	Description
PowerSupplyName.BoardXX.ChanYYY.Name	String	R/W	Channel name
PowerSupplyName.BoardXX.ChanYYY.Temp	4-byte real	R	Board temperature
PowerSupplyName.BoardXX.ChanYYY.Temp#EU	String	R	Temperature EU
PowerSupplyName.BoardXX.ChanYYY.Temp#HighEU	8-byte real	R	Temp upper limit
PowerSupplyName.BoardXX.ChanYYY.Temp#LowEU	8-byte real	R	Temp lower limit
PowerSupplyName.BoardXX.ChanYYY.Rel	String	R	Board firmware release
PowerSupplyName.BoardXX.ChanYYY.12VPS	boolean	R	12VPS status
PowerSupplyName.BoardXX.ChanYYY.12VPS#CoOpen	string	R	12VPS open label
PowerSupplyName.BoardXX.ChanYYY.12VPS#CoClose	string	R	12VPS close label
PowerSupplyName.BoardXX.ChanYYY.48VPS	boolean	R	48VPS status
PowerSupplyName.BoardXX.ChanYYY.48VPS#CoOpen	string	R	48VPS open label
PowerSupplyName.BoardXX.ChanYYY.48VPS#CoClose	string	R	48VPS close label
PowerSupplyName.BoardXX.ChanYYY.Sync	boolean	R	Sync status
PowerSupplyName.BoardXX.ChanYYY.Sync#CoOpen	string	R	Sync open label
PowerSupplyName.BoardXX.ChanYYY.Sync#CoClose	string	R	Sync close label
PowerSupplyName.BoardXX.ChanYYY.HVSync	boolean	R	HVSync status
PowerSupplyName.BoardXX.ChanYYY.HVSync#CoOpen	string	R	HVSync open label
PowerSupplyName.BoardXX.ChanYYY.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
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 (Ch1).

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 **I0set** item allows to set I0.

A read access to the **I0set#EU** item returns a string with the I0set Engineering Units.

A read access to the **I0set#HighEU** item returns the highest possible I0set value.

A read access to the **I0set#LowEU** item returns the lowest possible I0set 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: don’t care
- 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.

A write access to the **OutReg** item allows to set a 16 bit Output Register

Table 7 – A3100HBP 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.OutReg	4-byte integer	R/W	Output register

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.

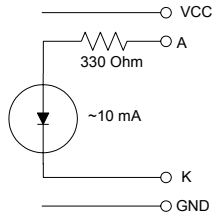


Fig. 3 – Interlock diagram

Voltage sensing

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 an high input impedance differential amplifier through the sense wires; the voltage sensing circuit is schematically illustrated in the figure below.

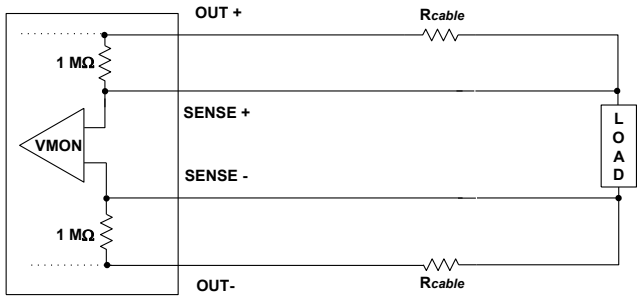


Fig. 4 – Remote voltage sensing scheme

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 sense lines are not used, then it is necessary to use jumpers to short circuit OUT+ with SENSE+ and OUT- with SENSE-

VMAX and IMAX hardware set

In order to set VMAX: connect the jumpers according to desired setting ("Voltage" fig. below). At this point turn the trimmer until the desired VMAX is reached; its value can be achieved by the Monitor± connectors value (relationship between monitored values and VMAX is explained at page 10).
Vmax range: 0 .. 14 V; if Vout > VMAX then the channel is turned off and the HVMAX status bit is set
To set IMAX: connect the jumpers according to desired setting ("Current" in the figure below). At this point turn the trimmer until the desired IMAX is reached; its value can be achieved by the Monitor± connectors value (relationship between monitored values and IMAX is explained at page 10).
Imax range 0..52 A; if Iout > IMAX then OVC status bit is set and the channel follows TRIP settings

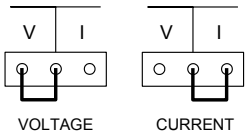


Fig. 5 – VMAX / IMAX jumpers setting

Output Register

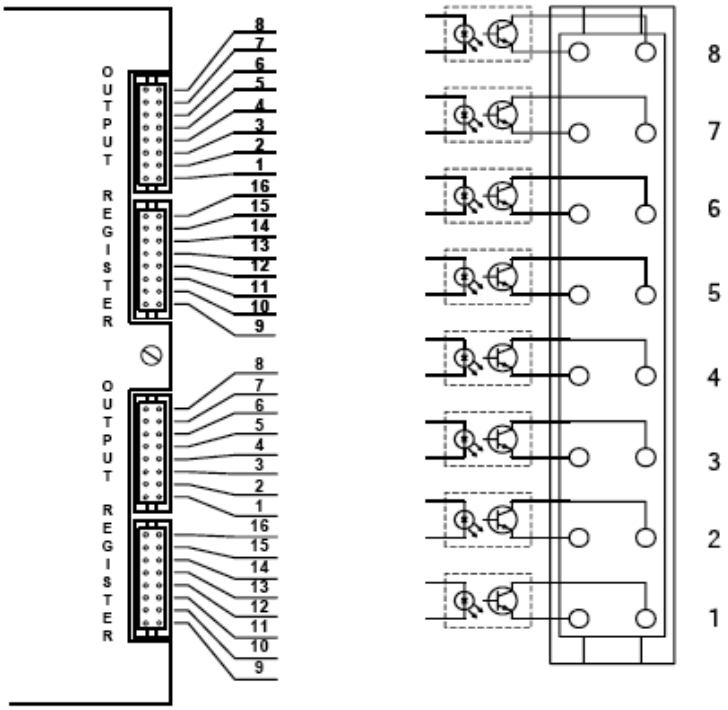


Fig. 6 – Output register electrical scheme

Each output is connected to a transistor which is closed according to the bits in the output register. The collectors and emitters are connected as shown in fig. above, so contiguous pin can be short circuited.
"Odd" outputs (1, 3, 5..31) have a pull-up to the FVDD (referred to the front panel REFGND) on the transistor collector, with 1 Kohm resistors; "Even" outputs instead are simply connected to the collector and to the emitter of the transistors.
Then it is possible either to drive high the post regulator enable, connected to the output register, by acting on the Odd outputs or to drive it low, by acting to the Even ones (see fig. below).

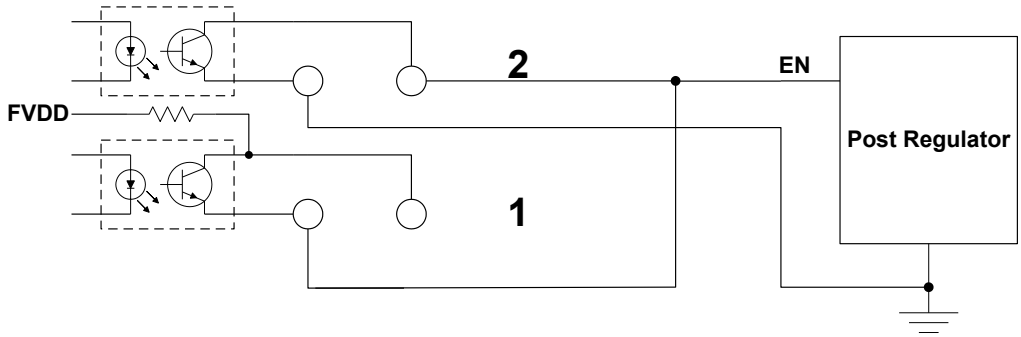


Fig. 7 – Connection between post regulator and Output register

ENCODING:
The HEX number written in the output register, translated to binary on 16 bit indicates with "1" the closed outputs and with "0" the open ones. For example, by writing "0x2E96":

Binary	0	0	1	0	1	1	1	0	1	0	0	1	0	1	1	0
Out	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

Fig. 8 – Output register Encoding

then outputs 14, 12, 11, 10, 8, 5, 3, 2 will be closed.
0 leads to all open, while 2^{33}-1 leads to all closed.

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