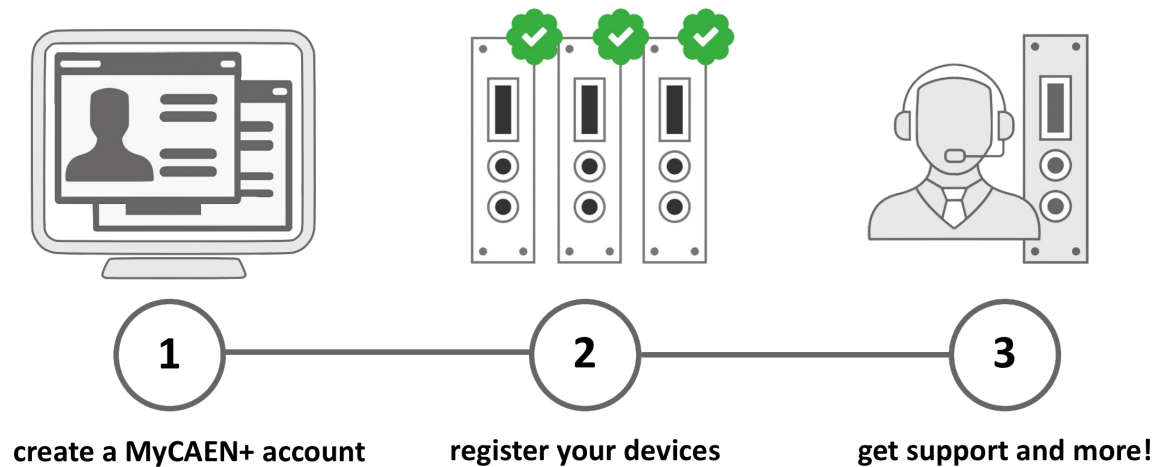# Register your device

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

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

1   **2**   **3**

create a MyCAEN+ account   register your devices   get support and more!

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Technical Information Manual

Revision n. 18
10 November 2020

MOD. EASY3000/4000
EMBEDDED ASSEMBLY
POWER SUPPLY SYSTEM
MANUAL REV.18

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.
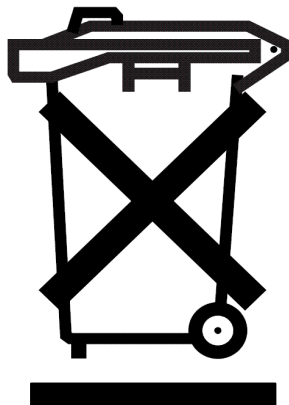
CAEN declines all responsibility for damages or injuries caused by an improper use of the Modules due to negligence on behalf of the User. It is strongly recommended to read thoroughly the CAEN User's Manual before any kind of operation.

$$\mathsf{C}\,\mathsf{E}$$

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.

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1. EASY3000 Embedded Assembly System

1.1   Functional description

EASY3000 (Embedded Assembly SYstem) is the new CAEN power supply solution for operation in magnetic field and radioactive environment. CAEN has been involved for more than a decade in developing different solutions for the main LHC experiments, where the electronic equipment of the experiment is dealing with high dose radiation and intense magnetic field. In order to provide safe and reliable operations in such hostile areas, CAEN started tests with rad-tolerant components and magnetic field resistant solutions, patenting the new technology that is now used in this new line of products. Moreover, though designed for harsh environment, the EASY3000 modules can work also in normal condition with excellent performance. In the new architecture, the power supply can be located directly in the hostile area (see Table 1.1), where the EASY3000 modules provide a wide variety of output voltages to satisfy the requirements of most detectors and front-end electronics. The control of the EASY3000 power supply system is done remotely using a Branch Controller (Mod. A1676A) plugged in a SYx527 mainframe located in the control room. Each A1676A branch controller can handle up to 6 EASY3000 crates. The EASY3000 crate can house up to 10 boards, depending on the boards' width. The branch controller is the interface between the mainframe (SYx527) and the remote boards in the EASY3000 crate: its role is to configure the EASY3000 channels as if they belong to the supply unit slot in which the branch controller is located. All the channels of the EASY3000 boards will be considered as channels of the branch controller, thus hugely increasing the number of channels the system can handle. Through the mainframe, the provided and fully reliable OPC server permits an immediate and "automatic" interfacing with the custom control software; moreover, a C-library for Windows and Linux is available as well. The EASY3000 crate can be used with an air and/or water intercooler and its standard width fit the rack mounting. Optional fan trays are available for the stand-alone operation of the EASY3000 crate when no magnetic field is present. EASY3000 is powered by external 48 V DC. The EASY architecture foresees two independent 48 V power supplies: the first (48 V Power) to power the channels regulators, the other (48 V Service) to power the control logic. The use of CAEN 48 V power sources (Mod. A3484 and A3485), allows to integrate into the channels control also the management of the 48 V power supplies. Fig. 1.1 shows the system's block diagram.

The EASY4000 crate is designed to house some custom PS boards that do not fit into the EASY3000 crates; it supports mechanically up to 9 PS boards and distributes control signals and power supplies.

Table 1.1 – 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
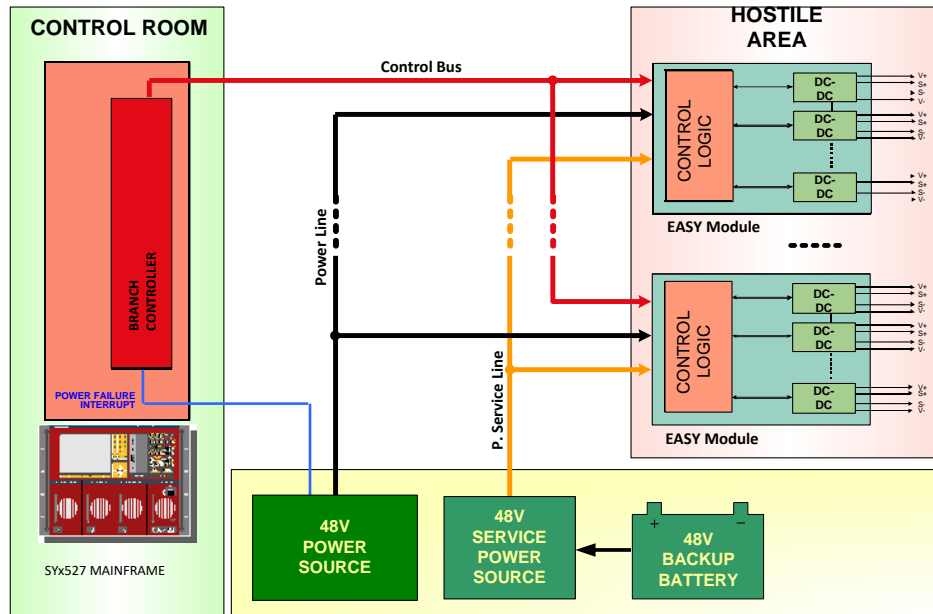
Fig. 1.1 – System's block diagram

2. The Mod. A1676A Branch Controller

2.1 A1676A Branch Controller overview

The Mod. A1676A EASY Branch Controller is implemented in a single width SYx527 board. Once plugged in, the Branch Controller must be linked to the EASY3000 and EASY4000 crates (which can work in the "hostile area"), via front panel connectors (Control and Power Supply). The A1676A is the interface between the mainframe and the remote boards in the EASY3000/4000 crate. It configures the EASY3000/4000 channels as if they belong to the slot in which the branch controller is located: the channels of the EASY3000/4000 boards operate as channels of the A1676A. Up to six EASY3000/4000 crates can be controlled by one A1676A.

The User has to configure the A1676A to operate with His EASY crate layout by using the provided software tool (see details in § 2.4).

The A1676A branch controller is a single width board and will be housed in one SYx527 system, while the remote sections will operate in the "hostile area".

2.2 A1676A Front Panel
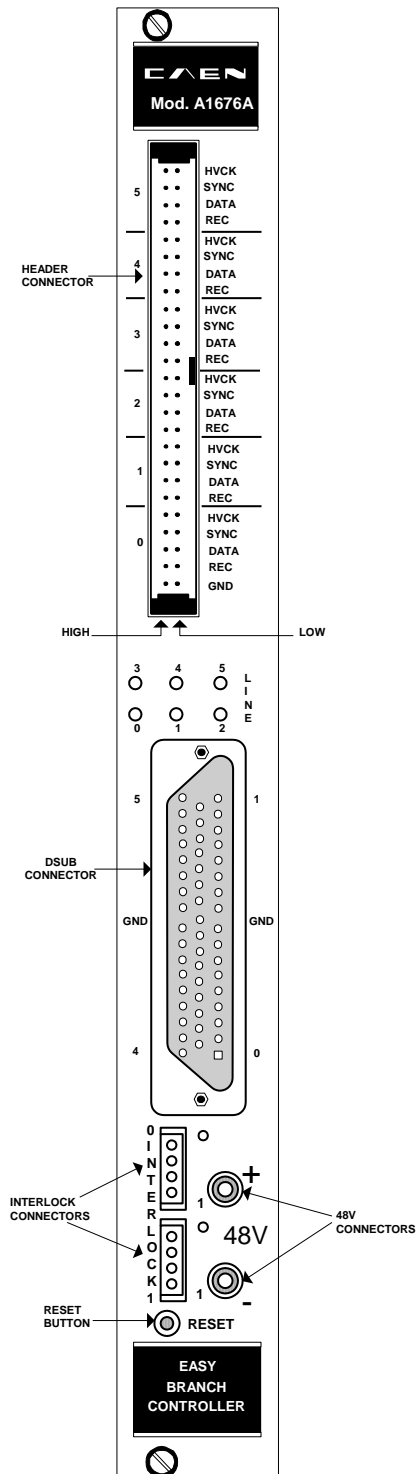
Fig. 2.1 – Mod. A1676A Branch Controller front panel

2.3 A1676A Technical specifications

The A1676A Branch Controller board can control up to six remote crates through the CANbus protocol (250 kbit/sec).

Remote crates controlled by the A1676A can house different sets of EASY3000/4000 boards, then it is necessary to configure the Branch Controller firmware through a set up file containing all the information about number, type and position of the boards in remote crates. After the configuration it is not possible to change the crate layout unless the A1676A configuration file is updated. The Branch Controller, in fact, scans the crates expecting to find the sets of boards corresponding to its configuration file; if any board is misplaced (or absent) with respect to the configuration file, then it is ignored and its channels are signalled as "unplugged" by the SYx527: in this case it is necessary to insert correctly the misplaced board, and then its channels will be accessed.

The User can build his crate configuration using the software tool described in § 2.4.

Control of remote crates is performed through 2 alternative output connectors (50-pin Header male or 50-pin DSUB female) placed on the front panel of the A1676A board (see fig. 2.1); maximum suggested cable length between A1676A and EASY crate is 150 m.

The front panel houses also six green LEDs (one per branch = remote crate); each LED lights up / blink as the branch communications take place.

The Reset button allows to reset the internal A1676A controller; during this operation all the remote channels continue operating with old settings. It is necessary to wait 15 seconds at least before monitoring or setting once more the remote channels.

The Interlock signal allows to shut down all the remote channels, keeping active the communications between remote boards and SYx527.

The A1676A provides also a 48 V / 2 A supply voltage (to be used for powering the crates) that can be enabled via the A1676A 48V parameter.

2.3.1 A1676A Packaging

The Mod. A1676A module is housed in a 5 TE-wide, 6U-high mechanics. The board requires one SYx527 slot (single-width).

2.3.2 A1676A Front panel connections

CONTROL Connectors: 50-pin Header male / 50-pin DSUB female

48 V OUT Connector: 2 x 4 mm connectors female

INTERLOCK Connectors: 2 x 4 pin Amp connectors
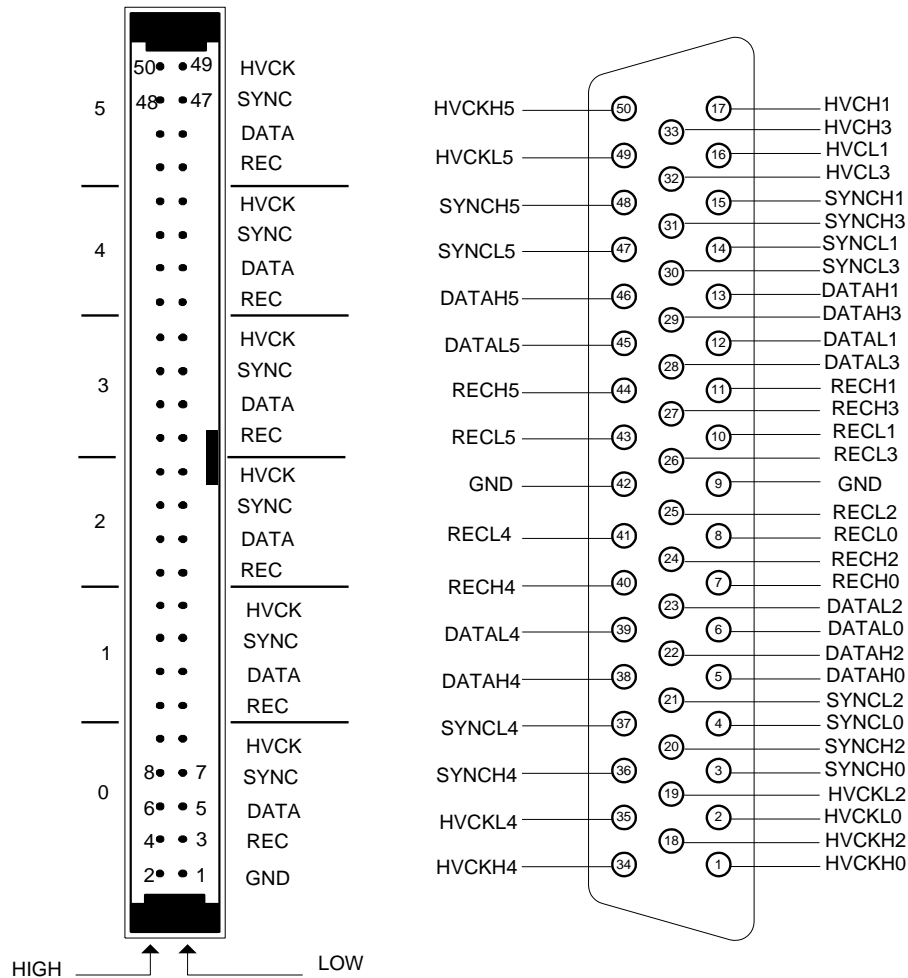
Fig. 2.2 –Header and DSUB50 Control connector pin assignment

2.3.3 A1676A Front panel switches

RESET button: Function: the A1676A is reset but HVCK and SYNC still provided

                                             Type: Monostable push-button

2.3.4 A1676A Front panel displays

LINE LEDs: *Function*: light up the when corresponding branch communicates with A1676A.
                                             Type: green LED.

INTERLOCK LEDs: *Function:* light up when the corresponding interlock input is active.
                                             Type: red LED.

2.3.5 Control signals

The Branch Controller Control signals are described in the following table.

Table 2.1 – A1676A Control Signals

SIGNAL	DESCRIPTION
HVCK	625 kHz synchronisation signal (one per branch) for switching parts of remote PS channel boards; however, if this signal fails, remote boards run properly (a synchronisation signal is generated by their controller), though lose synchronisation between each other, and an error message ("Fail") is returned by the SYx527. The HVCK presence is signalled by the remote board parameter "HVSync" (Ok or Fail)
SYNC	50 Hz clock (one per branch) for the board controllers synchronisation; if this signal fails, remote boards do not operate and an error message ("Fail") is returned by the SYx527. In order to remove the Fail message, it is necessary to send the "Clear Alarm" command
DATA	Communication data line
REC	Recovery / Reset lines, one for each remote EASY3000 crate; through the SYx527 it is possible to send a command to the controllers of a remote crate either switching off all the channels in the crate (HW Reset) or eventually leaving them on, if they were (Recovery)

The A1676A Branch Controller allows also to use the SYx527 System front panel signals (Kill, Interlock, Enable) on the remote channels.

2.4 A1676A Communication timing

2.4.1 Foreword

The A1676A board can handle, via the CANBUS protocol, up to 6 remote crates in parallel (EASY bus).
The remote crates, which can be of two different kinds developed so far, EASY3000 and EASY4000, can house respectively up to 23 and 20 nodes (EASY power supply boards, optional Fan Units and A34xx AC/DC Converters).

2.4.2 Communication mode

A remote board is defined by its number of channels along with the type and number of associated parameters.
Such parameters allow both to control the channel and to monitor constantly its status.

The A1676A asks in sequence all the functional parameters of each channel of each board. Each parameter foresees the transmission and the reception of a single CANBUS data packet.

The parameters request takes place through cycles, from the first channel of the first board until the last channel of the last board in the crate.

2.4.3 Requested parameters present on EASY3000 LV and HV boards

It is possible to distinguish between channel 0 parameters and other channel parameters:

Channel	Parameters
0	Temp, MainPwS, 12VPwS, 48VPwS, Sync, HVSync, RemIlk
1..n	V0Set, Vmon, Vcon (LV boards only), Imon, Status, Pw

Such parameters are continuously requested by the A1676A from the remote boards channels.

2.4.4 Timing

The average time necessary in order to update one parameter is 1.5 ms. Since the request of the parameters takes place through cycles, the time necessary to update a board depends thus on both the number of channels and the number of channels parameters.

If one channel has six parameters, then 6 x 1.5 ms = 9 ms are necessary for the complete refresh of its parameters.

Beyond the time necessary for the parameters request, a 10 ms latency between one node's scanning end and the beginning of the subsequent is introduced.

If more remote crates are added to the EASY bus, the time necessary for one board's scanning and for the parameters request, does not grows significantly, since communications take place in parallel.

2.4.5 Timing examples

2.4.5.1 A4601H

For example we consider the A4601H board (which is housed inside the EASY4000 crate); such board is composed by two Power Supply Units (1 Unit = 1 Node) with 5 channels each. The number of parameters per channel is as follows:

ch0 7 parameters
ch1 7 parameters
ch2 7 parameters
ch3 6 parameters
ch4 6 parameters

the total number of parameters per node is thus 33; the time necessary for scanning the A4601H is then 33 x 1.5ms x 2 = 99ms

If we have an EASY4000 crate completely filled with A4601H boards, the time necessary for the upgrade is:

99ms x 9 (max number of A4601H per crate) = 891 ms

plus the 10 ms latency per node: 10 ms x 9 x 2 = 180 ms

the total time is then 180 ms + 891 ms = **1071 ms**

Such time does not depend on the number of active EASY bus (from 1 to 6)

2.4.5.2   A3009

For example we consider the A3009 board (which is housed inside the EASY3000 crate); such board (1 Board = 1 Node) has 13 channels. The number of parameters per channel is as follows:
ch0 7 parameters
ch1..12 6 parameters

the total number of parameters per node is thus 79; the time necessary for scanning the A3009 is then 79 x 1.5 ms = 118.5 ms

If we have an EASY3000 crate completely filled with A3009 boards, the time necessary for the upgrade is:

118.5 ms x 5 (max number of A3009 per crate) = 592.5 ms

plus the 10 ms latency per board: 10 ms x 5 = 50 ms

the total time is then 50 ms + 592.5 ms = **642.5 ms**

Such time does not depend on the number of active EASY bus (from 1 to 6)

2.5   EASY Crate Configuration

CAEN EASY Rack Builder is a Java(TM) application which allows EASY Users to create their customised EASY Crate configurations.

2.5.1   *Installation and set up*

First of all it is necessary to connect the PC, which must run a Java(TM) 2 Platform Standard Edition, and must be connected to the Internet.
Now it is necessary to download the software tool from the web page:
www.caen.it   A1676A product page
Click on the *Software* menu and download the *CaenEASYRackBuilder-x.y.zip* file
Unzip the file then launch the *CaenEASYRackBuilder.jar* Java(TM) application

2.5.2   *Configuring the crates*

Now the following EASY Rack Builder window will open:
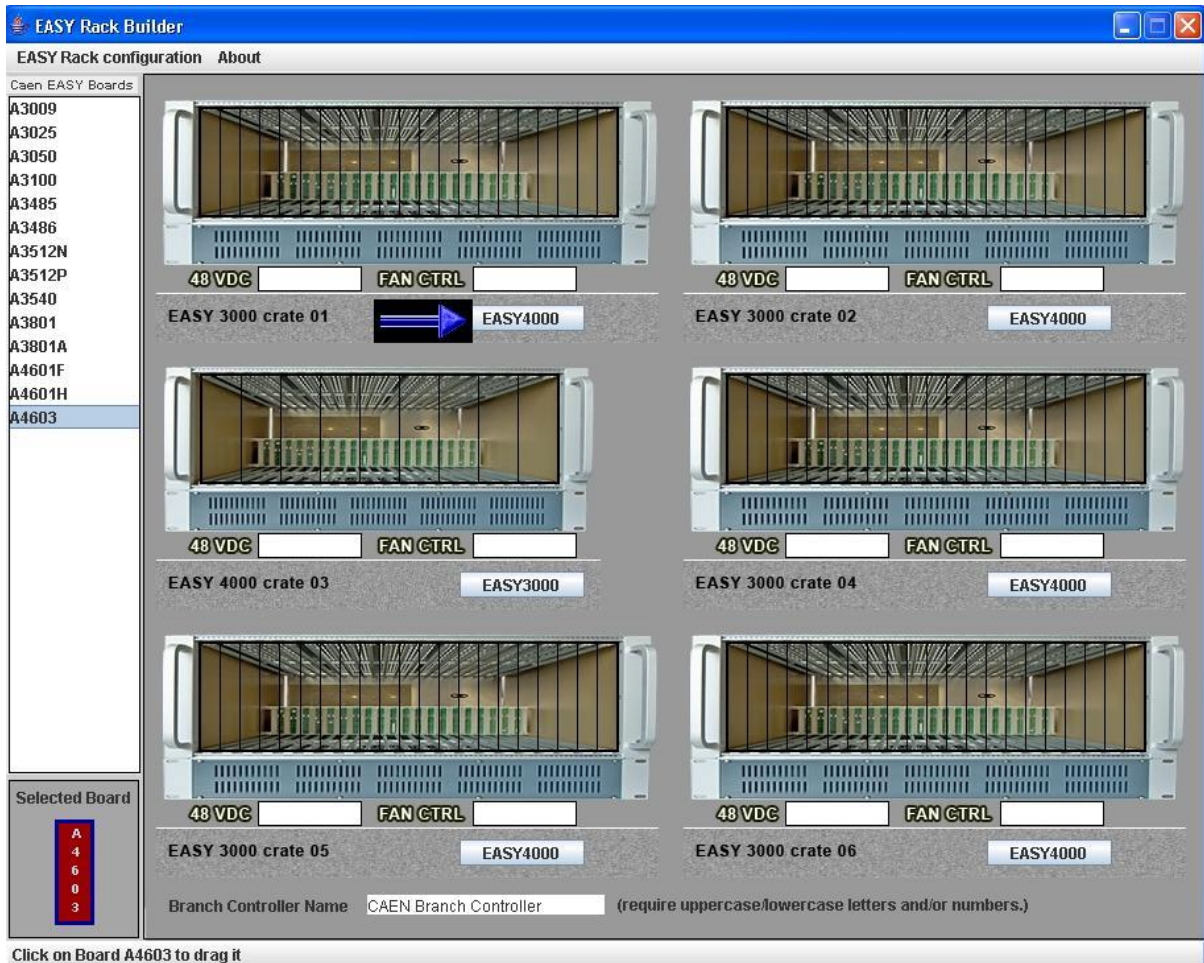
Fig. 2.3 – EASY Rack Builder main menu

The EASY Rack Builder shows six empty EASY crates, by clicking on the "Crate button" (see the arrow in fig. 2.3) it is possible to choose between EASY3000 and EASY4000 crates (according to the crates connected to the A1676A to be configured).

The menu on the white box on the left lists the EASY boards (including optional AC/DC converters and Fan units) available to fill the crates.

The operating parameters of such boards are stored in the *board.xml* files included in the folder:

\CaenEASYRackBuilder\Boards

Each time CAEN EASY Rack Builder is launched, such xml files are compared to those present in the CAEN data base and, if the comparison is successful, the corresponding boards are added in the white box list.

The updated xml files of each board can be downloaded in the software section at: www.caen.it board product page (for example A3009)

In order to configure the crates it is necessary to select the desired board by left clicking on its name and dragging it on the selected crate slot. Left click again to drop.

Boards can be removed from the crates left clicking on them and dragging and dropping them on the white box.
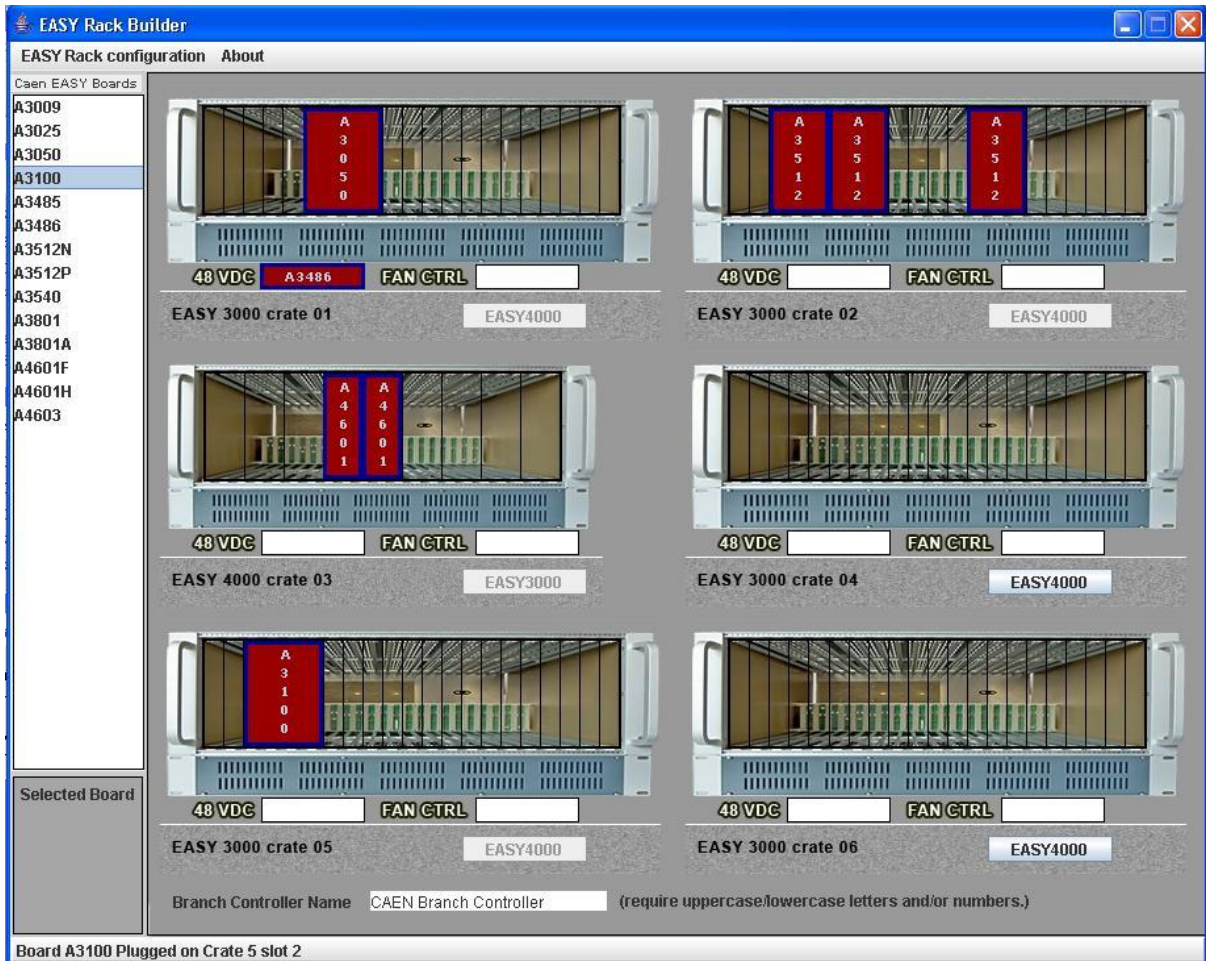
Fig. 2.4 – EASY Rack Builder with populated racks

When the crate configuration is complete, it is necessary to save the file; go to:

EASY Rack Configuration > Save as…

This allow to create an xml file which can be used for future purposes (modify, update etc.).

In order to configure the A1676A it is necessary to select:

EASY Rack Configuration > Generate Branch Controller update file

This allow to create a binary file that must be used to configure the A1676A via SYx527; now it is necessary to connect the PC to the SYx527 System which hosts the A1676A to be configured. The configuration procedure is described in the SYx527 User Manual.

3. EASY3000 and EASY4000 crates

3.1 EASY3000 crate overview

The EASY3000 crate is designed to house Power Supply and ADC boards of EASY3000 family; it supports mechanically EASY boards and distributes control signals and power supplies. It is handled by one of six branches of the A1676A – Branch Controller.

It is necessary to provide the crates the proper ventilation by using for example the CAEN Mod. A3000F Fan Unit; (A34FU Fan Unit must be used with EASY 3000 crate first issue).

Fig. 3.1 – Ventilation-warning Label

N.B.: Please note that EASY3000 crates and boards DO NOT support LIVE INSERTION and EXTRACTION: before inserting or removing a module, the crate must be powered OFF.

3.2 EASY3000 crates available versions

Table 3.1 – EASY 3000 model crates

Model	Slots #	Power Connectors	Service Connectors	Description
EASY3000	21	APP PC5933T	APP PP30 1317G4	Crate for Hostile Area
EASY3000S	21	Cables (see § 3.3.3)	Cables (see § 3.3.3)	Crate for Hostile Area Frontal Access
EASY3000B	21	M6 Bolts	M6 Bolts	Crate for Hostile Area
EASY3000M	9	Cables (see § 3.3.3)	Cables (see § 3.3.3)	Mini Crate "ATLAS TGC"

3.3 EASY 3000 crate panel connections and displays

3.3.1 EASY 3000 crate panel second issue
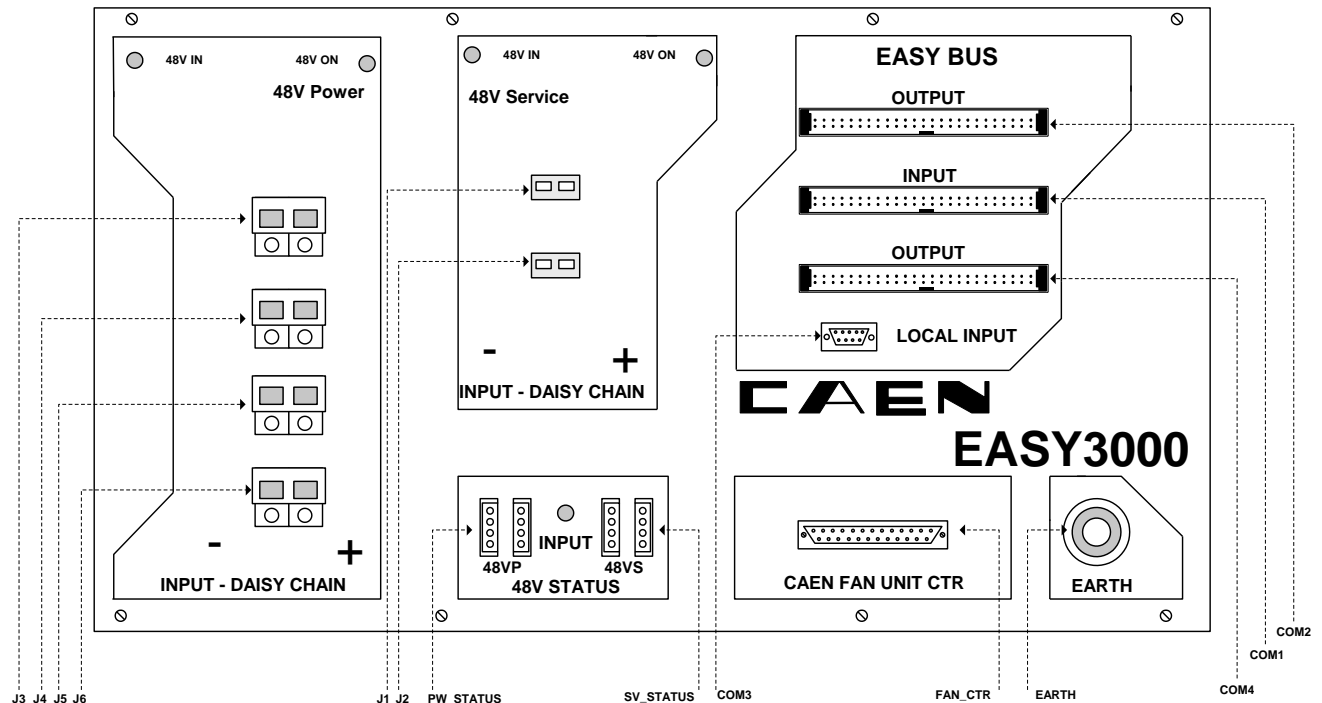
Fig. 3.2 – EASY 3000 crate panel second issue

The figure above shows the EASY 3000 crate panel second issue and subsequent; for this model the optional A3000F Fan Unit is available. The connections are explained in the following table:

Table 3.2 – EASY 3000 crate connections second issue

Name	Description
J1,J2	48V SERVICE connectors (in parallel); input of 48 V supply for auxiliary low voltages in boards
J3..6	48V POWER connectors (in parallel); input of 48 V supply for DC/DC converters
F2	100 Amps fuse on 48 V POWER line
Com1..4	I/O of EASY bus for remote control
48V power/service status[1]:	Connectors for inputs from 48V supplies. Through this input the remote EASY board microcontroller can detect failures in supply voltages and consequently enables PS channels ramping down, while service supply voltage is provided by a back up battery

---

[1] This feature is not yet implemented

FAN_CTR	Control link for fan unit (Mod. A3000F)
EARTH	Earth link for the crate

3.3.2 EASY 3000 crate panel first issue

Fig. 3.3 – EASY 3000 crate panel first issue

The figure above shows the EASY 3000 crate panel first issue; for this model the optional A34FU Fan Unit is available. The connections are explained in the following table:

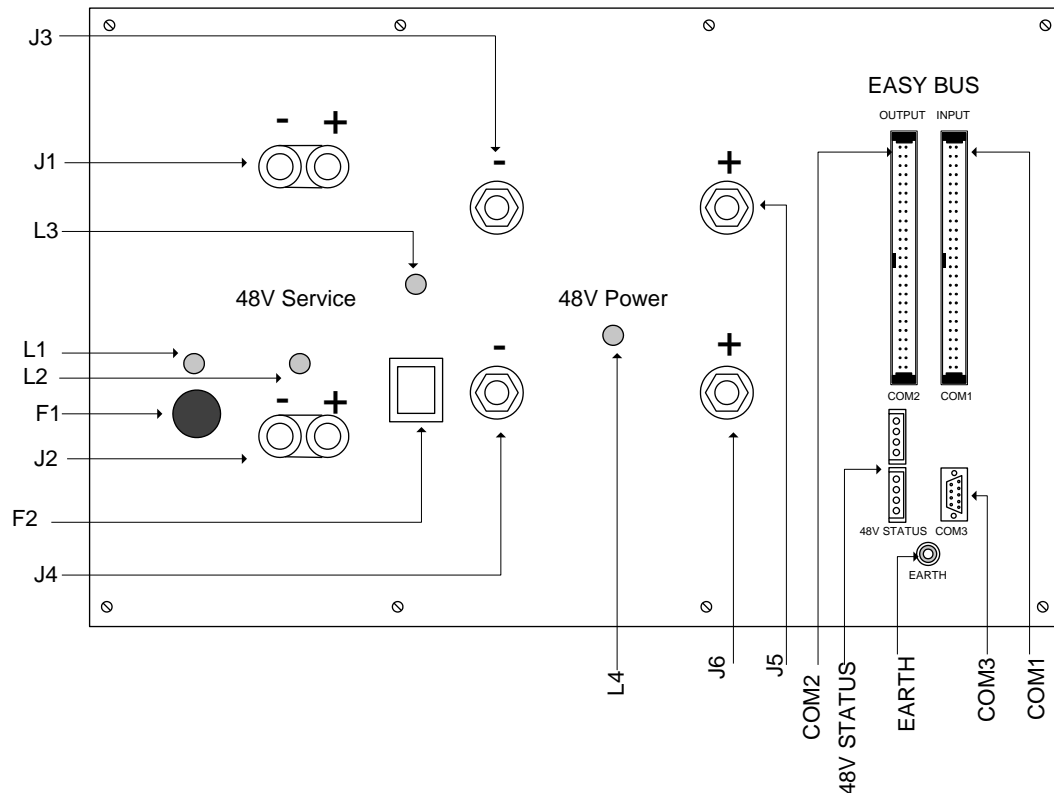**Table 3.3 – EASY 3000 crate first issue connections**

Name	Description
J1,J2	48V SERVICE connectors (in parallel); input of 48 V supply for auxiliary low voltages in boards
F1	20 Amps fuse on 48 V SERVICE line
L1	Red LED that lights up when F1 is interrupted
L2	Red LED that lights up when 48 V SERVICE is present
J3, J4, J5, J6	48V POWER connectors (in parallel); input of 48 V supply for DC/DC converters
F2	100 Amps fuse on 48 V POWER line
L3	Red LED that lights up when F2 is interrupted
L4	Red LED that lights up when 48 V POWER is present
Com1, Com2, Com3	I/O of EASY bus for remote control
48V status[2]:	Connectors for inputs from 48V supplies. Through this input the remote

---

[2] This feature is not yet implemented

	EASY board microcontroller can detect failures in supply voltages and consequently enables PS channels ramping down, while service supply voltage is provided by a back up battery
EARTH	Earth link for the crate

3.3.2.1 COM3 Port

9 Pin DB-type male connector

Fig. 3.4 – 9 Pin DB-type male connector signals

3.3.3   EASY 3000S / 3000M crate panel
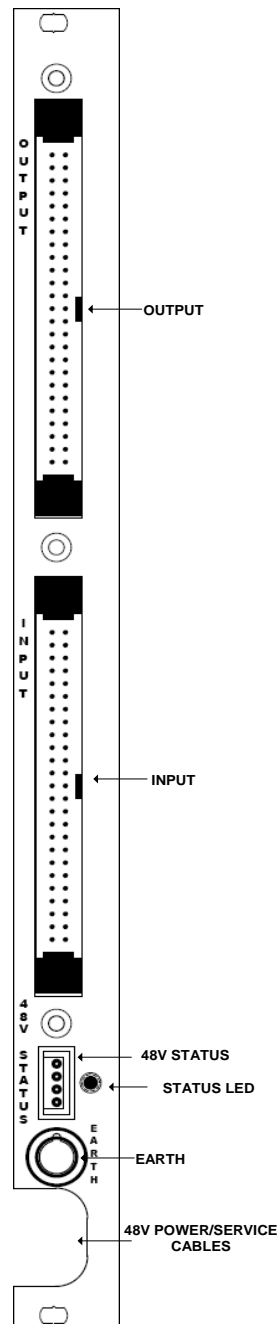
Fig. 3.5 – EASY 3000S/3000M crate panel

The figure above shows the EASY 3000S / 3000M crate front panel; for this model the optional A3000F Fan Unit is available. Connections are explained in the following table:

Table 3.4 – EASY 3000S/3000M crate connections

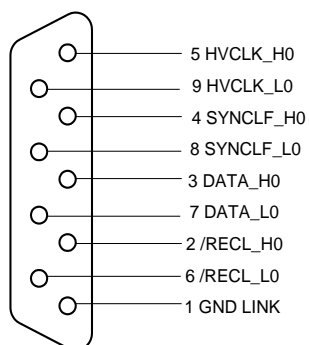| Name	Description
Input	Input of EASY bus for remote control, 50-pin Header male
Output	Output of EASY bus for remote control, 50-pin Header male

48V status:	Connectors for inputs from 48V supplies. Through this input the remote EASY board microcontroller can detect failures in supply voltages and consequently enables PS channels ramping down, while service supply voltage is provided by a back up battery. This feature can be disabled via a dip switch (SW1) on the EASY3000S controller PCB; AMP 280372-2 type connector
EARTH	Earth link for the crate; RADIALL R921921 type connector

3.3.4 EASY4000 crate overview

The EASY4000 crate is designed to house some custom PS boards that do not fit into the EASY3000 crates; it supports mechanically up to 9 PS boards and distributes control signals and power supplies. The crate has ten slots: slot 0 (the leftmost) is available for test purposes, while slot 1..9 are suitable to host PS boards. The EASY4000 crate is handled by one of six branches of the A1676A – Branch Controller. The crate panel is provided with I/O 50 pin flat connectors of the EASY bus remote control and the 48V Status input connector which allows the PS boards microcontrollers to detect failures in supply voltages and consequently to enable PS channels ramping down, while service supply voltage is provided by a back up battery; a green led signals the 48V activity. An Earth link for the crate is available as well. It is necessary to provide the crates the proper ventilation by using, for example, the A34FU Fan Unit.

N.B.: Please note that EASY4000 crates and boards DO NOT support LIVE INSERTION and

EXTRACTION: before inserting or removing a module, the crate must be powered OFF.
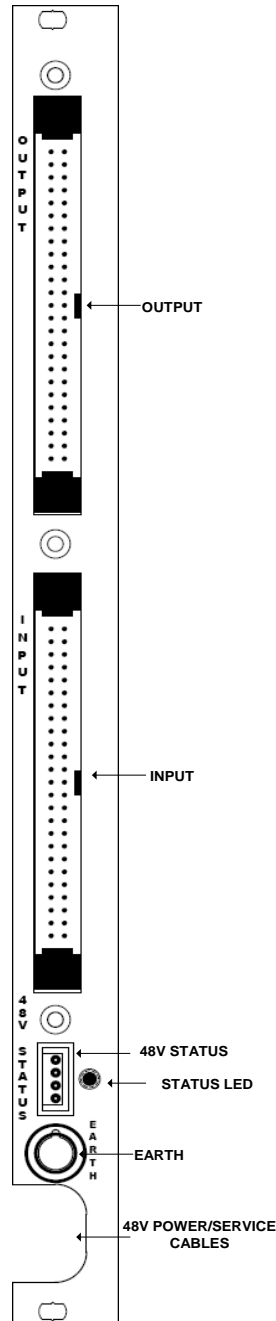
Fig. 3.6 – EASY4000 Connectors

3.3.5   A1676A – EASY3000/4000 CRATE connection

There are two different ways for connecting the A1676A Branch controller with up to six EASY3000/4000 crates; the first type of connection uses a 50-wires flat cable between the A1676A and the first crate as well as between the subsequent crates, as shown in the following figure:
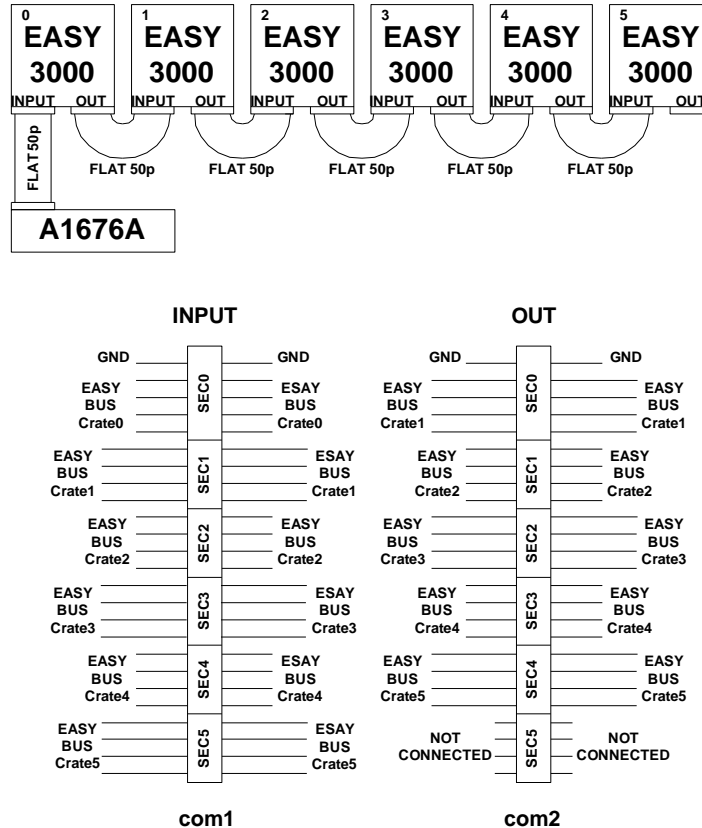
Fig. 3.7 – Connecting A1676A and the crates with 50 wires cable

The A1676A provides the signals for all the crates; the first crate uses only "Section 0" (see § 2.2) of such control signals arriving into the input connector and passes the other sections to its output connector. Each EASY 3000/4000 crate is connected in series to the subsequent other ones.

The main advantage of this way of connection is the easy manufacturing of cables.

The most evident disadvantage is the unnecessary connection of each crate with 50 wires, while only 4 couples and return would be required.

The second way of connection uses the DSUB50 control connector of the A1676A, which, via a split cable, is connected with each section of the EASY BUS through the crates DB9 connectors, as shown in the following figure:
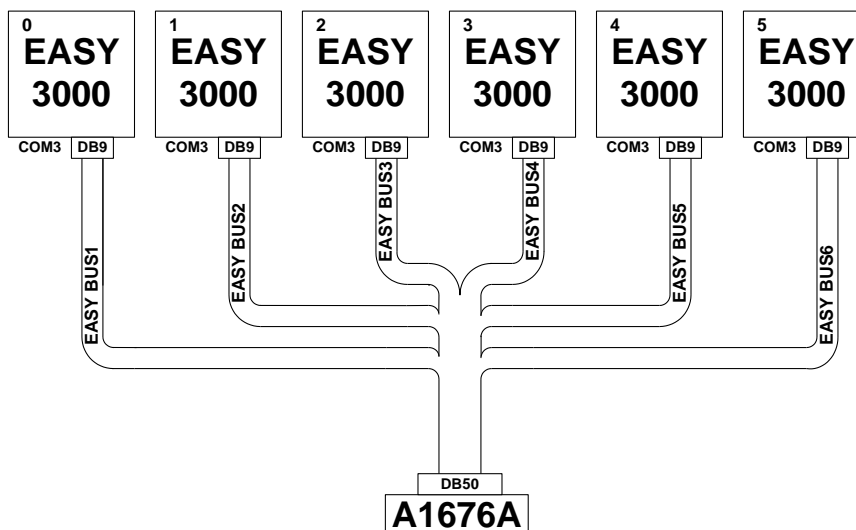
Fig. 3.8 – Connecting A1676A and the crates with split cable

The main advantage of this solution is the lower number of wires (9 for crates).
The most evident disadvantage is the more difficult manufacturing of split cables.
Note that cables must be shorter than 150 m; the Bus line does not require a termination.

IMPORTANT NOTE: use different AC/DC Converters to provide 48V Power and 48V Service to EASY Crates.

3.4   48 V Power Sources

3.4.1   *Mod. A3486 AC/DC Converter for Hostile Areas*

The CAEN Mod. A3486 is a two channel 220/400 Vac – 48 Vdc converter, which allows to integrate into the EASY channels control also the management of the 48 V power supplies. Each channel provides a 2 kW output and can be tracked in order to obtain one 4 kW output. This module is designed to work as main converter in LHC hostile areas, thus completing the EASY system. Features include local or remote control, overload protection and local or remote inhibit function.
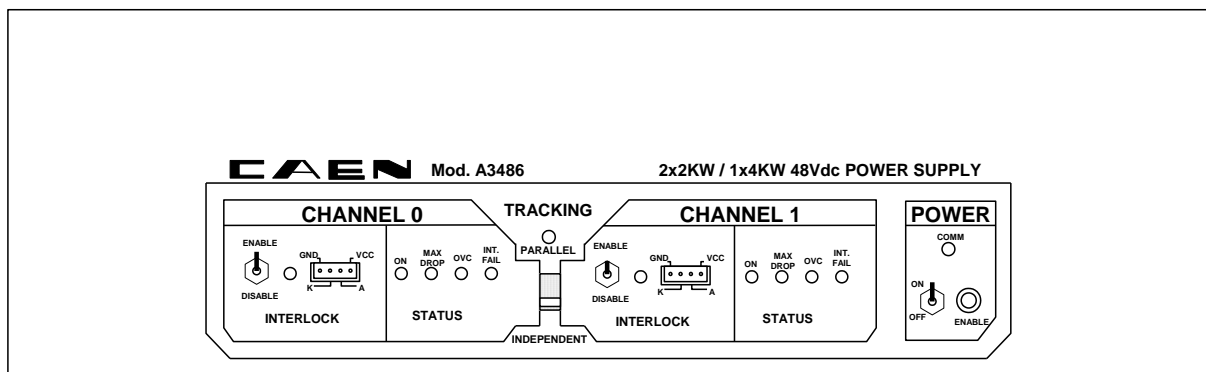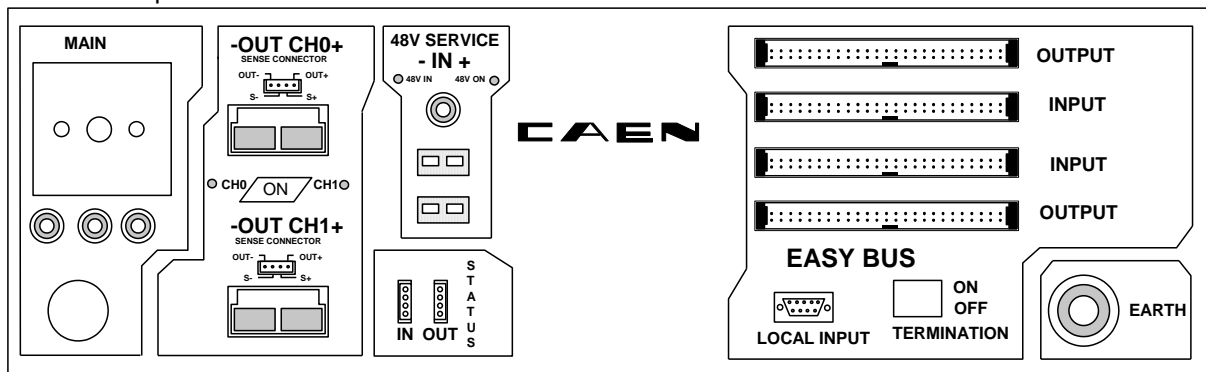
Fig. 3.9 – A3486 48 V Power Source for Hostile Areas front panel

Table 3.5 – Technical specifications of the A3486 48 V Power Source

Model:	A3486
Polarity:	positive
AC input:	3-phase 220/400 V 50/400 Hz
Output Voltage:	44 ÷ 52 V software adjustable
Max. Output Power:	4000 W
Voltage Ripple:	< 100 mV pp

3.4.2 Mod. A3484 and A3485 AC/DC Converters

CAEN can provide 2 types of 48 V power sources (Mod. A3484 and A3485), which allow to integrate into the channels control also the management of the 48 V power supplies. The modules are implemented in a 3U / 19" Euro Rack and have Single (A3484) or Dual (A3485) 48V output. Features include local or remote control, overload protection and local or remote inhibit function. The A3484 and the A3485 are designed to work in "friendly" environment (no magnetic field and radiation).
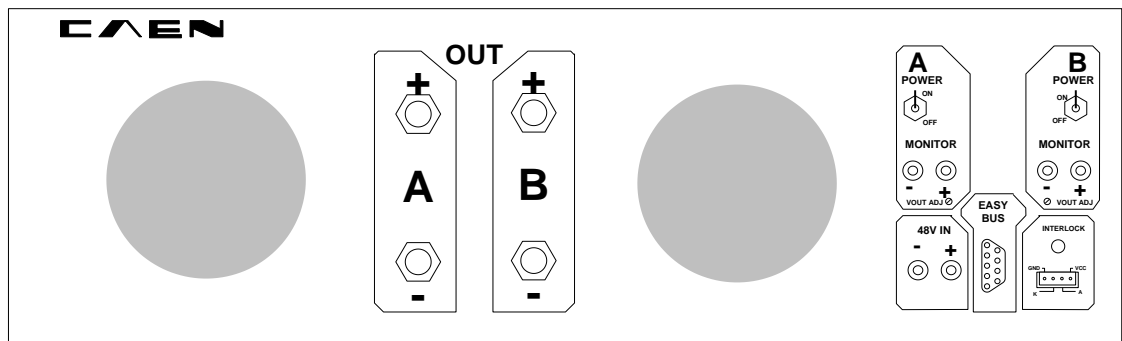
Fig. 3.10 – A3485 48 V Power Source front panel

Table 3.6 – Technical specifications of the A3484 and A3485 48 V Power Sources

Model:	A3484	A3485
Polarity:	positive	positive
AC input:	3-phase 400 V / 400 Hz	3-phase 400 V /400 Hz
Output Voltage:	48 V ± 5% trimmer adjustable	48 V ± 5% trimmer adjustable
Max. Output Power:	2500 W	5000 W
Voltage Ripple:	< 100 mV pp	< 100 mV pp

⚠ **IMPORTANT NOTE: do not use the same AC/DC Converter to provide 48V Power and 48V Service to EASY Crates.**

4. Safety information and installation requirements

4.1 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.

4.1.1 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.

4.2 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		ATTENTION
High Voltage		Refer to Manual

4.3 Installation

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 remote crates through the control lines. The control connectors are placed on the A1676A front panel and on the EASY3000 front panel.

4.4 Operating modes

The Mod. A1676A board can be controlled, either locally or remotely, through the SYx527 software interface. For details on SYx527 system operation, please refer to the User's Manual of this product.

> ⚠ **ATTENTION**
> **THE MOD. A1676A BOARD REQUIRES**
> **SY1527 FIRMWARE VERSION 2.00.01 OR LATER**

4.5 Output control and monitoring

The A1676A handles up to 6 remote crates and ac/dc converters connected to the EASY BUS lines. In order to communicate with the power supply boards inside the crates, it is necessary to load the configuration file into the A1676A (see § 2.5). It is possible, through the SYx527 system, to perform the following operations:

Table 4.1 – A1676A board items

Name	Dir	Sign	ValType	Min	Max	Res	UM	OnStr	OffStr
Name	SET	UNSIGNED	STRING						
Hw Reset0..5	SET	UNSIGNED	ON_OFF					On	Off
Recovery0..5	SET	UNSIGNED	ON_OFF					On	Off
48VA1676A	SET	UNSIGNED	ON_OFF					On	Off
GlobalOn	SET	UNSIGNED	ON_OFF					On	Off
GlobalOff	SET	UNSIGNED	ON_OFF					On	Off
Vsel	SET	UNSIGNED	NUMERIC	0	2	1	NONE		
A1676Ilk	Mon	UNSIGNED	NUMERIC	0	3	1	NONE		

Name: allows to assign a symbolic name to the board

HwReset0..5: allows to Reset the relevant EASY BUS line. This command allows to reset all the boards connected to such line and all the channels are turned off.

Recovery0..5: allows to Recover the relevant EASY BUS line. This command allows to reset all the boards connected to such line, but the channels status does not change.

48VA1676A: allows to turn ON/OFF the 48V output available on the front panel connectors.

GlobalOn: allows to enable the Global ON command, which acts on all the modules connected on EASY BUS lines. All the channels whose parameter '**GlbOnEn = En**' are turned ON.

GlobalOff: allows to enable the Global OFF command, which acts on all the modules connected on EASY BUS lines. All the channels whose parameter '**GlbOffEn = En**' are turned OFF.

Vsel: = 0 : the system parameter Vsel is picked from the SYx527 front panel
= 1 : the system parameter Vsel is not picked from the SYx527 front panel: Vsel = V0, independently from the SYx527 front panel value
= 2 : the system parameter Vsel is not picked from the SYx527 front panel: Vsel = V1, independently from the SYx527 front panel value

A1676Ilk: allows to readout the status of the 'INTERLOCK0/1' signals on the front panel. If one INTERLOCK lines becomes active, all the channels of all the modules connected on the EASY BUS lines are turned OFF.

4.5.1   A1676A OPC Items

This chapter describes the items which are available for the board control.

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

The **HwReset0..5** allows to Reset the relevant EASY BUS line.
A read access to the **HwReset0..5#CoOpen** returns back the label "Off" associated to HwReset0..5=0.
A read access to the **HwReset0..5#CoClose** item back the label "On" associated to HwReset0..5=1.

The **Recovery0..5** allows to Recover the relevant EASY BUS line.
A read access to the **Recovery0..5#CoOpen** returns back the label "Off" associated to Recovery0..5=0.
A read access to the **Recovery0..5#CoClose** item back the label "On" associated to Recovery0..5=1.

The **48VA1676A** allows to turn ON/OFF the 48V output available on the front panel connectors.
A read access to the **48VA1676A#CoOpen** returns back the label "Off" associated to 48VA1676A=0.
A read access to the **48VA1676A#CoClose** item back the label "On" associated to 48VA1676A=1.

The **GlbOn** item enables the 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 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 **Vsel** allows to select the programmed voltage value to be used (V0 or V1); see also § 4.5

A read access to the **A1676Ilk** allows to readout the status of the 'INTERLOCK0/1' signals on the front panel.

Table 4.2 – A1676A Board OPC items

ItemID	Data Type	Access Rights	Description
PowerSupplyName.BoardXX.Name	String	R/W	Channel name
PowerSupplyName.BoardXX.HwReset0..5	boolean	R/W	HwReset0..5 status
PowerSupplyName.BoardXX.HwReset0..5#CoOpen	string	R	HwReset0..5 open label
PowerSupplyName.BoardXX.HwReset0..5#CoClose	string	R	HwReset0..5 close label
PowerSupplyName.BoardXX.Recovery0..5	boolean	R/W	Recovery0..5 status
PowerSupplyName.BoardXX.Recovery 0..5#CoOpen	string	R	Recovery0..5 open label
PowerSupplyName.BoardXX.Recovery0..5#CoClose	string	R	Recovery0..5 close label
PowerSupplyName.BoardXX.48VA1676A	boolean	R/W	48VA1676A status
PowerSupplyName.BoardXX.48VA1676A#CoOpen	string	R	48VA1676A open label
PowerSupplyName.BoardXX.48VA1676A#CoClose	string	R	48VA1676A close label
PowerSupplyName.BoardXX.GlbOn	boolean	R/W	GlbOn status
PowerSupplyName.BoardXX.GlbOn#CoOpen	string	R	GlbOn open label
PowerSupplyName.BoardXX.GlbOn#CoClose	string	R	GlbOn close label
PowerSupplyName.BoardXX.GlbOff	boolean	R/W	GlbOff status
PowerSupplyName.BoardXX.GlbOff#CoOpen	string	R	GlbOff open label
PowerSupplyName.BoardXX.GlbOff#CoClose	string	R	GlbOff close label
PowerSupplyName.BoardXX.Vsel	string	R/W	Vsel value
PowerSupplyName.BoardXX.A1676Ilk	boolean	R/W	A1676Ilk status

4.5.2   SYx527 parameters

Some of the general parameters directly handled by the Sx527 system are used in the EASY system management.
ClearAlarm: allows to Clear a possible Fail situation. Once removed the channel OFF cause, it is necessary to send a 'ClearAlarm' before turning the channel ON.
FrontPanIn: allows to readout the status of the SYx527 system front panel lines.
The A1676A broadcasts to all the modules connected on the EASY BUS lines the status of the KILL, INTERLOCK and ENABLE (LOC/REM) front panel signals of SYx527.
It is important to remember:
If KILL and INTERLOCK signals are active, all the channels are turned OFF
If ENABLE signal is not active, the output voltages are = 0

4.6　　　Interlock operation

This section allows to enable/disable the module output and can work in two ways:

PASSIVE INTERLOCK: it is necessary to short circuit pin 4 ("GND", the uppermost) with pin 3 ("K=katode"), and pin 2 ("A=anode") with pin 1 ("VCC"), or put a 50 Ohm termination between pin 3 and pin 4.

ACTIVE INTERLOCK: it is necessary to send a voltage level (for example a TTL) between pin 3 = katode and pin 2 = 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.
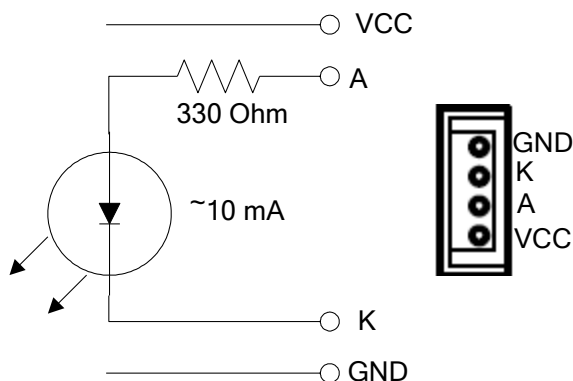

Fig. 4.1 – Interlock diagram

4.7　　　48V Status

EASY3000 and EASY4000 crates are delivered with jumpers inserted into the 48V Status section connectors; such jumpers must never be removed for any reason.
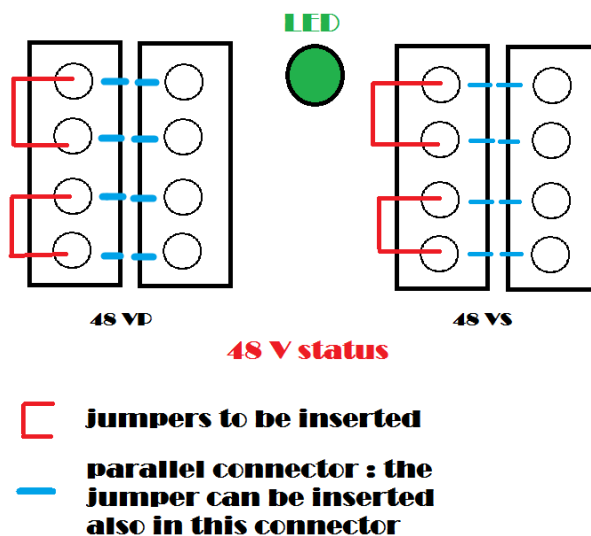

Fig. 4.2 – EASY3000 48V Status scheme

5. Revision History

Date	Revision	Changes
1 March 2019	17	Notes on EASY3000 and EASY4000 crate overview

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