

Technical Information Manual

Revision n. 10
8 October 2007

MOD. A3486
3-PHASE 400 V_{AC} TO
2x2 KW/1x4 KW 48 V_{DC}
MANUAL REV. 10

NPO:
00120/04:A3486.MUT_x/10

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.



This product must be installed by qualified personnel; in order to be CE compliant it requires 3-phase EMC filter type EPCOS B84143-A16-R105 on the mains supply cable; this filter does not support operation in hostile areas (magnetic field).

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. EASY Embedded Assembly System

1.1 Functional description

EASY (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 EASY 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, where the EASY modules provide a wide variety of output voltages to satisfy the requirements of most detectors and front-end electronics. The control of the EASY power supply system is done remotely using a Branch Controller (Mod. A1676A) plugged in a SY1527 or SY2527 mainframe located in the control room. Each A1676A branch controller can handle up to 6 EASY crates: in this way, one SY1527 power supply system, for example, housing up to 16 A1676A boards, can handle up to 96 EASY systems. The EASY crate can house up to 10 boards, depending on the boards' width. The branch controller is the interface between the mainframe (SY1527 or SY2527) and the remote boards in the EASY crate: its role is to configure the EASY channels as if they belong to the supply unit slot in which the branch controller is located. All the channels of the EASY boards will be considered as channels of the branch control board, 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 EASY crate can be used with an air and/or water intercooler and its standard width fit the rack mounting. Fig. 1.1 shows the system's block diagram.

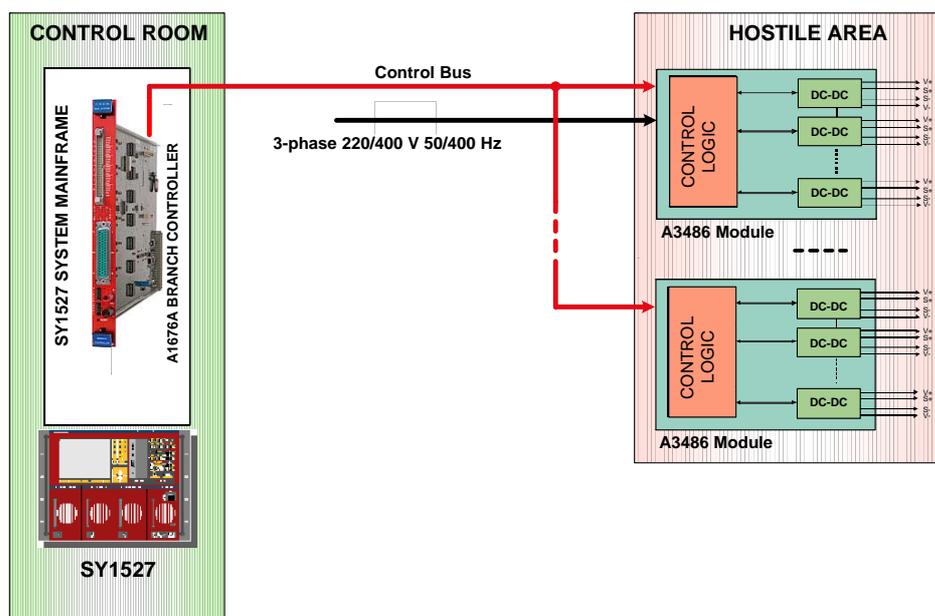


Fig. 1.1 – System's block diagram

1.2 The CAEN Multichannel Power Supply System Overview

The SY1527 system is the fully equipped experiment version of a new line of power supply systems which represent CAEN's latest proposal in the matter of High Voltage and Low Voltage Power Supplying. This system outlines a completely new approach to power generation and distribution by allowing the housing, in the same mainframe, of a wide range of boards with different functions, such as High/Low Voltage boards, generic I/O boards (temperature, pressure monitors, etc.) and branch controllers, where the latter are used to control other remote generators and distributors. Modularity, flexibility and reliability are the key-points of its design, enabling this module to meet the requirements needed in a wide range of experimental conditions, which range from those of LHC experiments, where the features of this model find prior application, to those of other less challenging, but still demanding, High Energy Physics experiments.

The mainframe is housed in a 19"-wide, 8U-high euro-mechanics rack and hosts four main sections:

- the Board Section, with 16 slots to house boards, distributors and branch controllers;
- the Fan Tray Section, housing 6 fans arranged on two rows;
- the Power Supply Section, which consists of the primary power supply and up to 3 power supply units;
- the CPU and Front Panel Section which includes all interface facilities.

The User Software Interface features the usual friendliness of the previous CAEN systems which now also includes a 7.7" colour LCD. A wide choice of interface facilities provides full communication compatibility with the previous systems and the feasibility of controlling heterogeneous external devices. Modularity has been one of the leading criteria in the design and development of the system: both the Power Supply Section and the Board Section are completely modular. The Power Supply Section allows different configurations with up to 3 power supply units per mainframe (up to 2250 W), while the Board Section can house up to 16 boards able to fulfil different functions. A complete line of power supply boards and distributors has been specially developed for this new system. The minimum system configuration consists of the primary power supply, one

Power Supply Unit and one board. The system allows also to deal with power supply solutions composed by “branch controllers” (housed in the system main frame) and on-detector “remote boards” (manufactured in order to be magnetic field and radiation tolerant). Channel trip control on other crates is performed via four external differential trip lines. A sophisticated trip handling via software allows to control and correlate trip conditions on the channels of the crate as well as of other crates connected to it. Live insertion and extraction of the boards, which reduces the down time of the global system, and easy access to the computing core and peripherals of the system complete the system flexibility. Easy interfacing is another key-point of the SY1527 system, which can be connected to SY127 and SY527 systems. The Ethernet interface (TCP/IP) allows both an easy Telnet access and the connection via OPC Server to a SCADA control system. Enhanced software programming features a unified command set independent from the interface used to communicate with the system. The Power Supply Section and Board Section can be externally synchronised via front panel connectors. Multi-layered access to the system via Intranet is foreseen through the management of several custom user profiles. In particular, three different access levels have been implemented: Guest, User and Administrator, each of which with password protection. Handy maintenance and upgrading, which constitute a major issue in the reliability of a system, are further guaranteed by the possibility of accessing and servicing the system via network facilities. Actually, the Telnet access facility allows remote debugging and technical support of the system, including future firmware upgrading. For a detailed description of the SY 1527 Universal Multichannel Power Supply System please refer to the *SY 1527 User's Manual*.

Table 1.1 – Technical specifications of the SY 1527 mainframe

Packaging	- 19"-wide, 8U-high Euro-mechanics rack; - Depth: 720 mm.
Weight	-Mainframe (*): 24 kg -Mod. A1532: 3.2 kg
Power requirements	<i>Voltage range:</i> 100/230 V <i>Frequency:</i> 50/60 Hz <i>Power:</i> 3400 W
Max. number of boards per crate	16
Max. nr. of power supply units per crate	3
Primary power supply output (Mod. A 1531)	± 12 V, 8 A +5 V, 20 A
Power supply unit output (Mod. A 1532)	+48 V, 15.6 A
Max. output power	2250 W
Operating temperature	From 0°C (dry atmosphere) to +40°C
Storage temperature	From -20°C (dry atmosphere) to +50°C

(*) One Primary Power Supply (Mod. A 1531) and one Power Supply Unit (Mod. A 1532) are included; boards are not included.

1.3 The Mod. A1676A Branch Controller overview

The Mod. A1676A EASY Branch Controller is implemented in a single width SY1527/SY2527 board. Once plugged in, the Branch Controller must be linked to the EASY crates (placed 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 EASY crate. It configures the EASY channels as if they belong to the slot in which the branch controller is located: the channels of the EASY boards operate as channels of the A1676A. Up to six EASY crates can be controlled by one A1676A. The provided software tool allows the User to configure the A1676A to operate with any EASY crate layout.

2. A3486 3-Phase 400Vac to 2x2kW/1x4kW 48Vdc

2.1 Technical description



Fig. 2.1 – Mod. A3486 and Power Supply cable

The CAEN Mod. A3486 is a two channel 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.

The module front panel houses LEDs and channels monitor signals. The channel outputs are provided through Anderson Power single pin connectors.

Mod. A3486S, with power supply and link connection on the front panel, is also available.

2.2 Channel Characteristic Table

Table 2.1 – Technical specifications of the A3486 48 V Power Source

Packaging	19"-wide, 3U-high Euro-mechanics rack; Depth: 50 cm.
Polarity	positive
AC input	3-phase 400 V / 50 Hz (see label below)
DC input	2A @ 48V (see label below)
Output Voltage	44 ÷ 52 V adjustable via software
Max. Output Power	4000 W
Max. Input Power	5000 W
Voltage Ripple	<100mVpp measured on 10Hz to 20MHz bandwidth
Voltage Monitor vs. Output Voltage Accuracy:	max. ±0.5%
Voltage Set vs. Output Voltage Accuracy:	max. ±0.5%
Current Monitor vs. Output Current Accuracy:	± 1A ± 2% of reading
Current Set vs. Output Current Accuracy:	± 1A ± 2% of setting

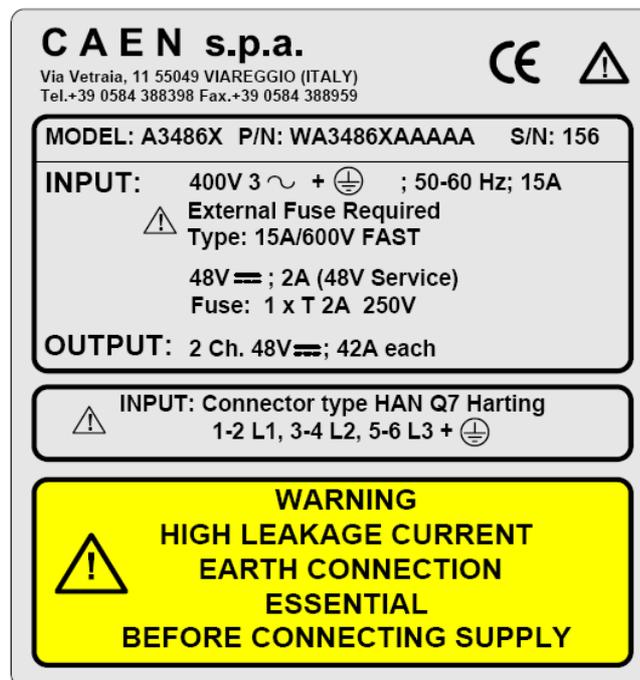


Fig. 2.2 – Back Panel Label

2.3 Front and back panel components

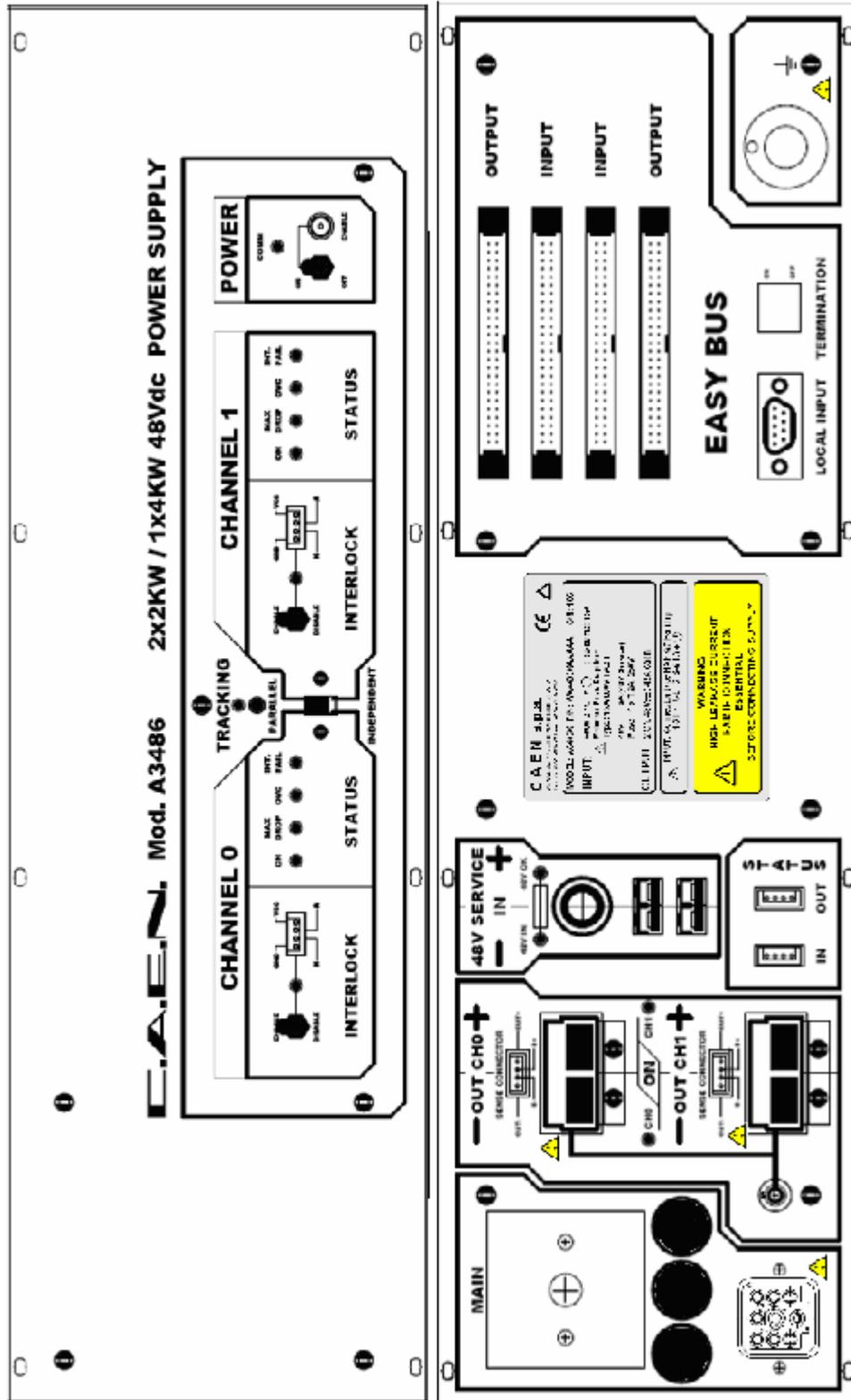


Fig. 2.3 – A3486 Front and Back Panel

2.4 Technical Specifications

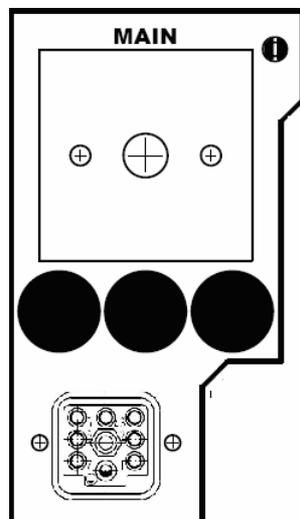
2.4.1 Packaging

The module is housed in a 3U 19" Euro Rack, 50 cm deep.

2.4.2 Rear panel connections, switches and displays

The Module rear panel houses the following components:

2.4.2.1 MAIN



This section provides the connections for the mains power supply and includes:
1 3-phase (400 Vac) connector Harting HAN Q 7/0 female insert 09.12.007.3101;
configuration pin: Harting HAN Q 7/0 female coding pin 09.12.000.9901;
case: Harting HAN Bulkhead mounting code 09.20.003.0301;
male pin contact: Harting 09.33.000.6102
1 3-phase switch



WARNING: HIGH LEAKAGE CURRENT; EARTH CONNECTION ESSENTIAL BEFORE CONNECTING SUPPLY

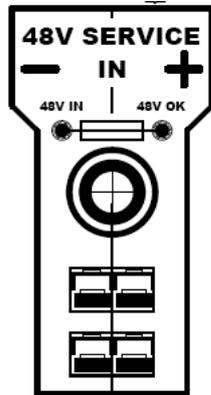


INTERNAL MAINS POWER SUPPLY FUSES; SEE § ERRORE. L'ORIGINE RIFERIMENTO NON È STATA TROVATA. FOR REPLACEMENT INSTRUCTIONS



WARNING: NO EFFECT MIGHT BE DETECTED IF ONE FUSE IS BLOWN; IN FACT IN SUCH CASE THE MODULE CONTINUES TO OPERATE WITH 2 PHASES, BUT THIS OPERATING MODE IS NOT OPTIMAL: CURRENTS ON OTHER PHASES AND OUTPUT RIPPLE INCREASE

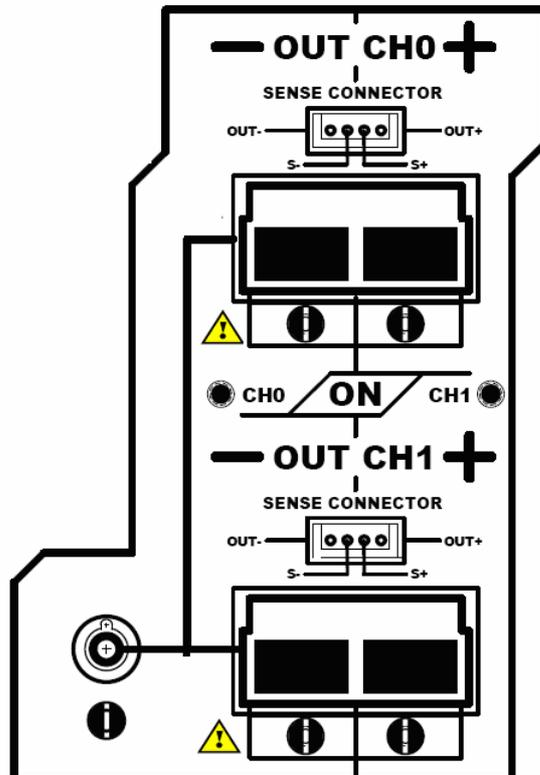
2.4.2.2 48V SERVICE



This section provides the input of 48 V supply for auxiliary low voltages and includes:
2 APP30 1317G4 type connectors (OR'ed); mates with APP PP45, contact: 269G3, body: 1327 (red) / 1327G6 (black), pad: 2399G8
1 2A Fuse
2 Red LEDs (48 V IN and 48V OK)

48 V IN LED lights up as the external 48V is present on the input; 48V OK LED lights up as the 48V is available for the internal electronics.

2.4.2.3 CHANNEL OUT \pm

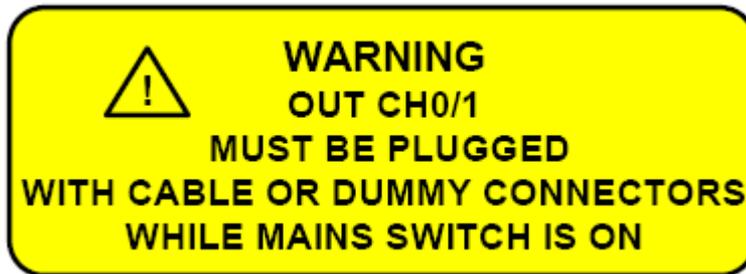


This section provides the channels output and includes:
2 APP PC5933T type connectors (channels output); mates with APP PP75, contact: 5900, body: 5916G7 (red) / PP75 5916G4 (black)

- 2 AMP 280372-2 type connectors (sense)
- 1 Distrelec 10 05 24 connector
- 2 red LEDs (channel ON)

⚠ WARNING: THESE TERMINALS DELIVER HIGH ENERGY (42A @ 48V EACH); ABSOLUTELY DO NOT SHORT THEM WHEN CABLE CONNECTORS ARE NOT PLUGGED, IN ORDER TO AVOID BIG SPARKS

⚠ NEGATIVE TERMINALS OF OUT CONNECTORS ARE INTERNALLY CONNECTED TO PROTECTION EARTH TERMINAL, PROVIDED BY MAINS POWER SUPPLY PLUG



The channels output connectors provide the 48V output. The Sense lines are used 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.

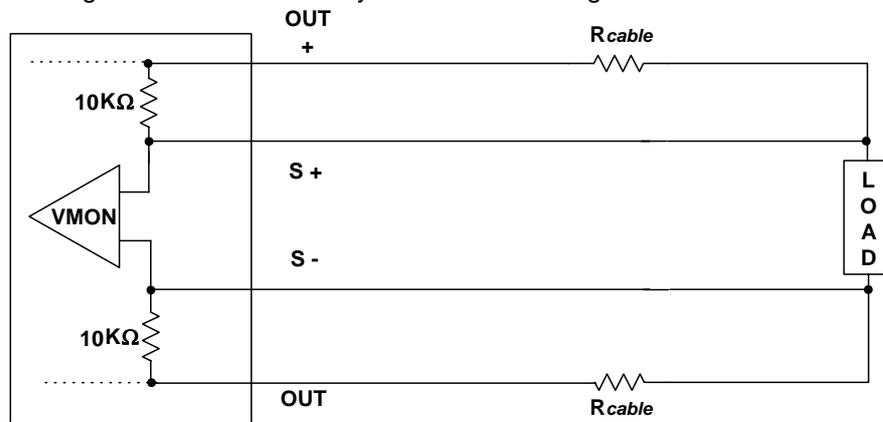


Fig. 2.4 – Remote voltage sensing scheme

When the sense wires are connected to the load (pin 2 = S- and pin 3 = S+ of the four-pin sense connector on back panel), the V_{set} value equals the voltage on the load; if the sense wires are not connected (to the load), V_{set} will equal the voltage on the connector. If sense wires will not be used, then is necessary to short circuit pin 1 = Out- with pin 2 = S- and pin 3 = S+ with pin 4 = Out+.

2.4.2.4 STATUS

This section provides the Status line for failure detection and includes:

- 1 Input AMP 280372-2 type connector
- 1 Output AMP 280372-2 type connector

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.
 The status input circuit is described in the following figure:

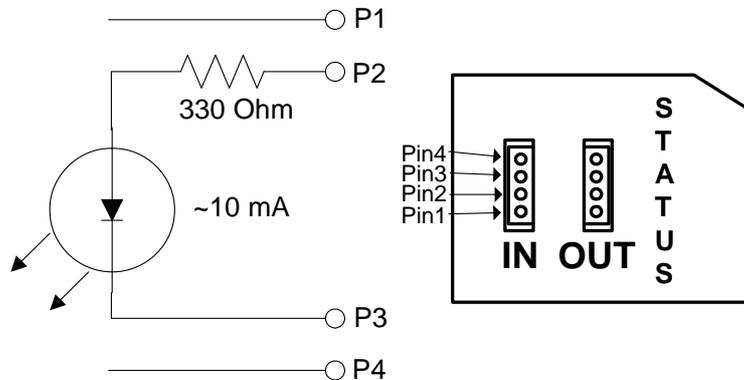


Fig. 2.5 – 48V Status IN scheme

It can work in two ways:

PASSIVE OPERATION: it is necessary to short circuit pin 1 (the 1st from bottom to top) with pin 2 (the 2nd from bottom to top), and pin 3 (the 3rd from bottom to top) with pin 4 (the 4th from bottom to top).

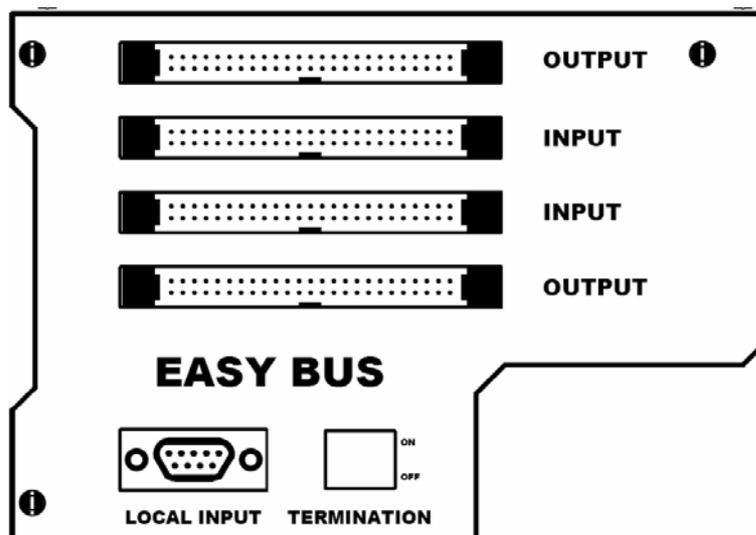
ACTIVE OPERATION: it is necessary to send a voltage level (for example a TTL; the recommended current is about 10 mA) between pin 2 and pin 3 (high = STATUS OK; low = STATUS FAIL), leaving pin 1 and pin 4 disconnected.

The output connector allows to pass the Status information to other converters and crates: it can be connected with the STATUS connector of EASY3000 crates and provides the following information:

STATUS OK = Both A3486 Channels ON

STATUS FAIL = At least one of A3486 Channels OFF

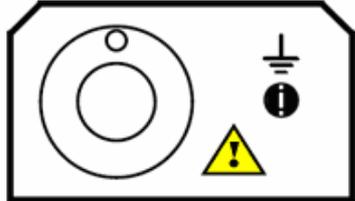
2.4.2.5 EASY BUS



This section provides the link for the module connection with the A1676A and the EASY3000 crates and includes:

- 2 INPUT internally wired 50 Pin flat male connectors
- 2 OUT internally wired 50 Pin flat male connectors
- 1 Local Input 9 Pin DB-type male connector (to be used with split cables, see A1676A User's Manual)
- 1 Termination switch (see figures for termination usage)

2.4.2.6 CHASSIS EARTH



This section provides the Earth auxiliary reference and includes:
1 Earth RADIALL R921921 type connector

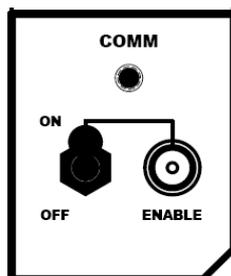


WARNING: ALTHOUGH THE CHASSIS IS ALREADY INTERNALLY CONNECTED TO PROTECTION EARTH PROVIDED BY MAINS POWER SUPPLY PLUG, CAEN STRONGLY ADVISES TO CONNECT THIS TERMINAL TO A GOOD EARTH WITH A LOW IMPEDANCE CABLE PATH, IN ORDER TO IMPROVE EMI SHIELDING AND SAFETY. THIS TERMINAL IS IN ITS TURN INTERNALLY CONNECTED TO PROTECTION EARTH.

2.4.3 *Front panel connections, switches and displays*

The Module front panel houses the following components:

2.4.3.1 POWER



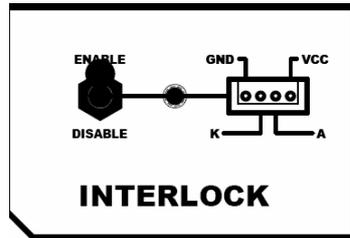
This section allows to turn the module ON/OFF and includes:
1 LEMO 00 connector (ENABLE)
1 Bistable switch (ON/OFF)
1 green LED (COMM)

The module can be turned ON (enabled) only if a 50 Ohm termination is inserted in the Enable LEMO 00 connector.

The ON/OFF switch allows to enable/disable the power supply (general ON/OFF of the module) when the 48V Service is active.

The COMM LED lights up as the communications with the A1676A take place.

2.4.3.2 CHANNEL INTERLOCK



This section allows to enable/disable the module output and includes:

- 1 AMP 280372-2 type connector
- 1 Bistable switch (ENABLE/DISABLE)
- 1 red LED

In order to enable the output channel the switch must be set on "ENABLE", then the Interlock can work in two 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 LED is ON when the Board is enabled.

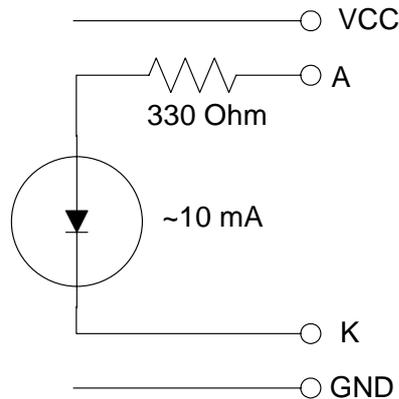
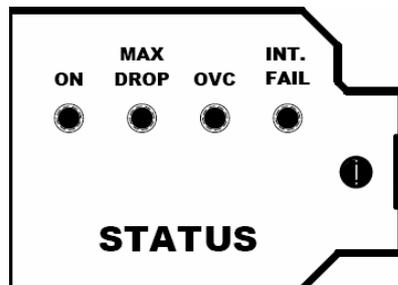


Fig. 2.6 – Interlock diagram

2.4.3.3 CHANNEL STATUS



This section includes four LEDs:

ON LED (red): lights up as the channel is on.

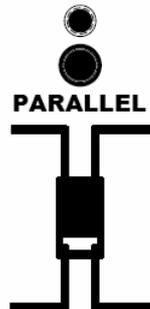
INT. FAIL LED (red): lights up in case of internal power supply failures. After the Internal Fail cause is removed, the LED remains on, unless a "Clear Alarm" is performed.

OVC LED (red): lights up as the channel is in overcurrent ($I_{mon} = I_{set}/I_{max}$ hardware). After the Overcurrent cause is removed, the LED remains on, unless a "Clear Alarm" is performed.

MAX DROP LED (red): lights up as the maximum allowed voltage drop is exceeded; i.e.: when Sense Wires are used and the detected drop is larger than 6 V, the channel is turned off automatically since it is not possible to recover it. After the Maximum Drop cause is removed, the LED remains on, unless a "Clear Alarm" is performed.

2.4.3.4 TRACKING

TRACKING



INDEPENDENT

This section allows to track the channels and includes:

- 1 Slide switch (Parallel/Independent)
- 1 green LED

Channels can be tracked in order to obtain one 4 kW output: for this purpose it is necessary to:

- turn the module off
- remove the screw-lock protection cap
- set the tracking switch on the "Parallel" position
- connect the output cables in parallel on the load
- connect the sense wires (if used, see § 2.4.2.3); only one pair is required
- install the screw-lock protection cap
- turn the module on

When the channels are tracked, the channels settings (see § 4.1) act on both channels; in particular: if one channel is disabled via Interlock, neither the other is active; V_{set}/I_{set} must be programmed on Output Channel 0, their value is copied on Output Channel 1 automatically. The green LED lights up as the channels are tracked.

3. Safety information and installation requirements

3.1 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.

3.1.1 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



**Protective Ground
Conductor Terminal
must be connected to
Earth Ground.**



ATTENTION
Refer to Manual

3.2 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.

3.2.1 Caution

The following safety precaution must be observed during all phases of operation, service and repair of this equipment. Failure to comply with the safety precautions or warnings in this document violates safety standards of design, manufacture and intended use of this equipment and may impair the built-in protections within.

CAEN shall not be liable for user's failure to comply with these requirements.

To avoid electric shock or fire hazard, do not apply a voltage to a load that is outside the range specified for that load.

To avoid electric shock or fire hazard, do not operate this product with covers or panels removed.

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.



WARNING: DO NOT TOP LOAD

3.2.2 **Grounding**

This product is a Safety Class 1 instrument. To minimize shock hazard, the instrument chassis must be connected to an electrical ground. The instrument must be connected to the AC power supply mains through a three conductor power cable, with the ground wire firmly connected to an electrical ground (safety ground) at the power outlet.

For instruments designed to be hard-wired to the supply mains, the protective earth terminal must be connected to the safety electrical ground before another connection is made. Any interruption of the protective ground conductor or disconnection of the protective earth terminal will cause a potential shock hazard that might cause personal injury.



WARNING: DUE TO THE HIGH LEAKAGE CURRENT, REMEMBER TO CONNECT ALSO THE CHASSIS EARTH TERMINAL (SEE § 2.4.2.6) TO A GOOD EARTH WITH A LOW IMPEDANCE CABLE PATH, IN ORDER TO IMPROVE SAFETY; SUCH TERMINAL IS IN ITS TURN INTERNALLY CONNECTED TO PROTECTION EARTH.

3.2.3 **Input ratings**

Do not use AC supply, which exceeds the input voltage and frequency rating of this instrument. For input voltage and frequency rating of the module see § 2.2. For safety reasons, the mains supply voltage fluctuations should not exceed above voltage range.

3.2.4 **Output connectors**

Output connectors deliver high energy (42A @ 48V each); be careful to not short them, when cable connectors are not plugged, otherwise big sparks will occur.

3.2.5 **Live circuits**

Operating personnel must not remove the instrument cover. No internal adjustment or component replacement is allowed by non-CAEN personnel. Never replace components with power cable connected. To avoid injuries, always disconnect power, discharge circuits and remove external voltage source before touching components (wait 15 min at least).

3.2.6 **Parts substitutions and modifications**

Parts substitutions and modifications are allowed by authorized CAEN service personnel only, except for fuses replacement, see § **Errore. L'origine riferimento non è stata trovata.**

3.3 **Installation**

This Chapter contains instructions for initial inspection, preparation for use and repackaging for shipment.

3.3.1 **General**

The CAEN Mod. A3486 is designed to work as main converter in LHC hostile areas, thus completing the EASY system. It must be connected to the EASY Bus just like EASY Crates; for more information about operation with the EASY3000 System, please refer to the Mod. A1676A Branch Controller documentation.

3.3.2 **Preparation for use**

In order to be operational the unit must be connected to an appropriate AC source. The AC source voltage should be within the unit specification.

3.3.3 **Initial inspection**

Prior to shipment this unit was inspected and found free of mechanical or electrical defects.

Upon unpacking of the unit, inspect for any damage, which may have occurred in transit. The inspection should confirm that there is no exterior damage to the unit such as broken knobs or connectors and that the front panel and meters face are not scratched or cracked. Keep all packing material until the inspection has been completed. If damage is detected, file a claim with carrier immediately and notify CAEN service.

3.3.4 **Rack mounting**

The Mod. A3486 is an equipment for BUILDING-IN: it **must** be ventilated **and** installed in a 19" equipment rack.

Use the front panel rack-mount brackets to install the unit in the rack.

It is necessary to provide the Mod. A3486 the proper ventilation by using for example the CAEN Mod. A3000F Fan Unit.



Fig. 3.1 – Ventilation-warning Label

This product must be installed by qualified personnel; in order to be CE compliant it requires 3-phase EMC filter type EPCOS B84143-A16-R105 on the mains supply cable; this filter does not support operation in hostile areas (magnetic field).

3.3.5 AC source

The Mod. A3486 ACsource is as follows:



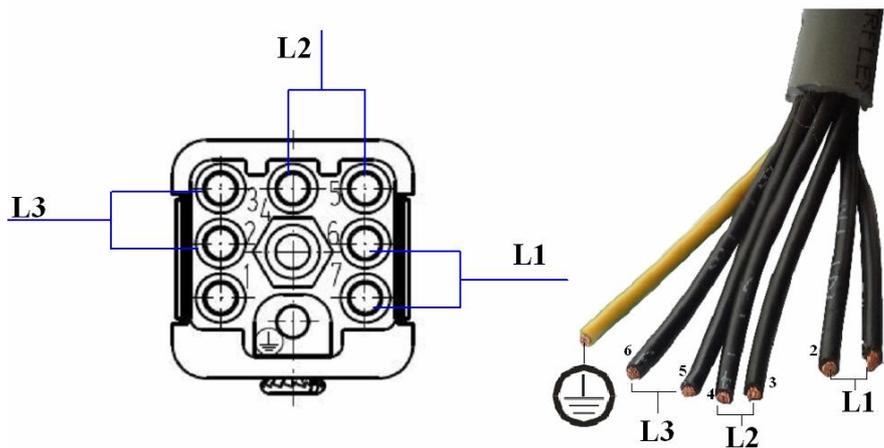
The input voltage range and current required is specified in § 2.2. Ensure that under heavy load, the AC voltage supplied to the unit does not fall below the specifications described in § 2.2.

3.3.6 3-phase power supply cable

The power supply cable to be connected to the MAIN connector (see § 2.4.2.1) is configured as follows (see also figure):

- EARTH : green-yellow cable
- L1: black cables N°1 & N°2
- L2: black cables N°3 & N°4
- L3: black cables N°5 & N°6

- Connector type: Harting 09.12.007.3001
- Hood: Harting 19.20.003.1440
- Contacts: Harting 09.15.000.6201
- Coding pin Female: Harting 09.12.000.9902
- Cable: 113408 LTZE-Superfelx PLUS-N-PUR suitable to 15A@400V



	<p>The Protective Earth Ground must be connected</p> <p>before applying AC Power to the unit</p>	
---	--	---

Fig. 3.2 – Power supply connector and cable

3.3.6.1 Fuses

This cable requires three (one per phase) external 15A/600V FAST acting fuses. (LITTELFUSE KLK15 15A/600V FAST acting or equivalent).

3.3.7 EASY BUS Connection

The Input/Output Flat connectors (see § 2.4.2.5) are redundant: either one or the other can be used, according to cabling configuration; they shall be used to connect the module to the EASY Bus communication link, via the A1676A Branch Controller as shown in the following schemes:

a) If the A1676A handles a remote chain composed only by A3486 modules, there are two types of possible connections, as shown in the following figure:

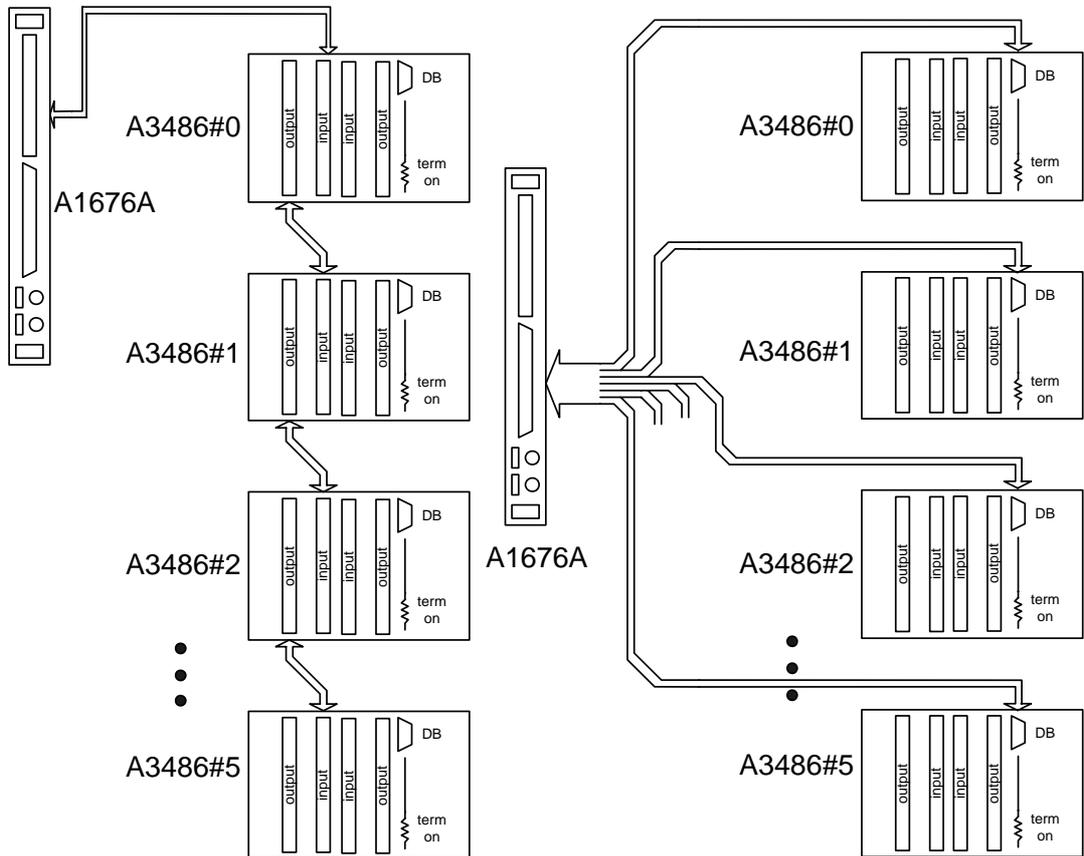


Fig. 3.3 – Bus connection with A3486 modules

The termination is required on each A3486 in both cases.

b) If the A1676A handles a chain which includes both EASY crates and A3486 modules, a possible connection is the following:

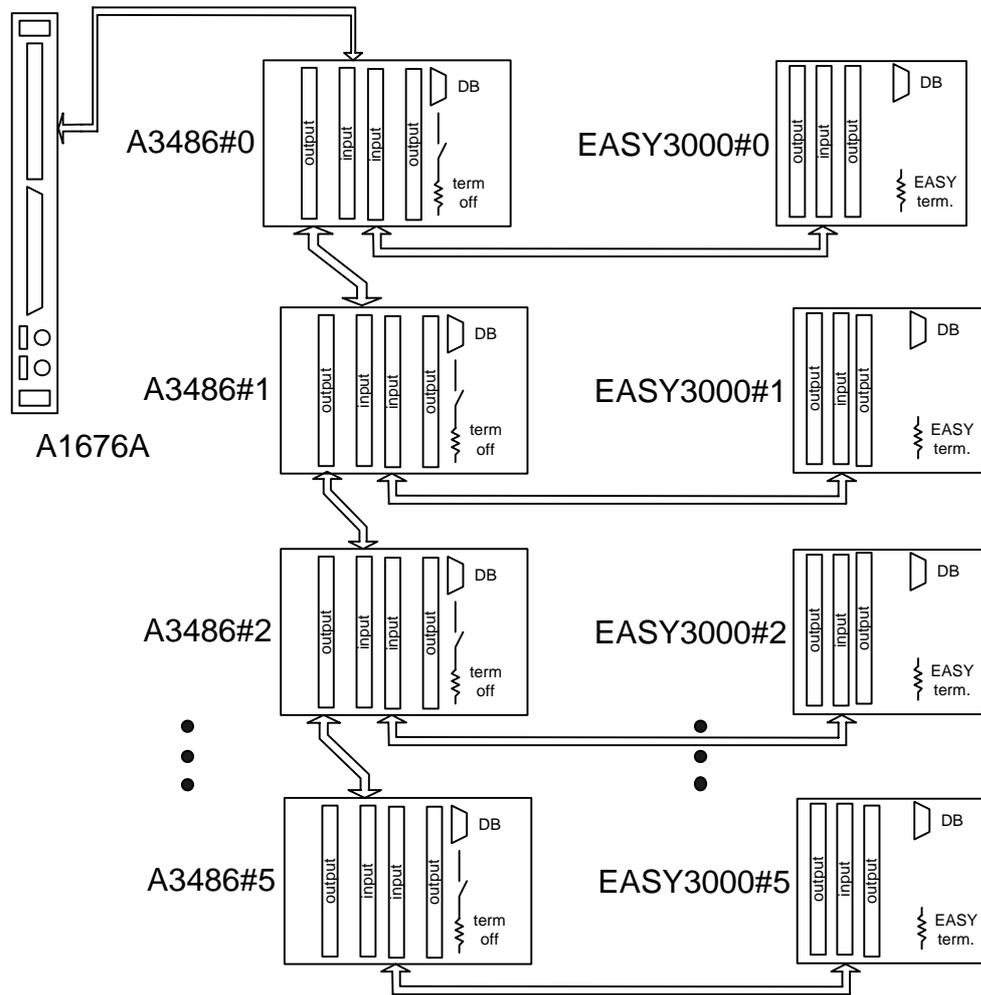


Fig. 3.4 – Bus connection with A3486 modules and EASY crates

The A3486 is handled as a crate slot and the communication is terminated by the crates backplane. The A3486 termination must be OFF.

N.B.: in this case the A3486 INPUT connector must be connected with the EASY3000 Crate INPUT connector.

c) EASY crates and A3486 modules can be also connected with the A1676A by using split cables, as shown in the following figure (termination provided by the crates backplane).

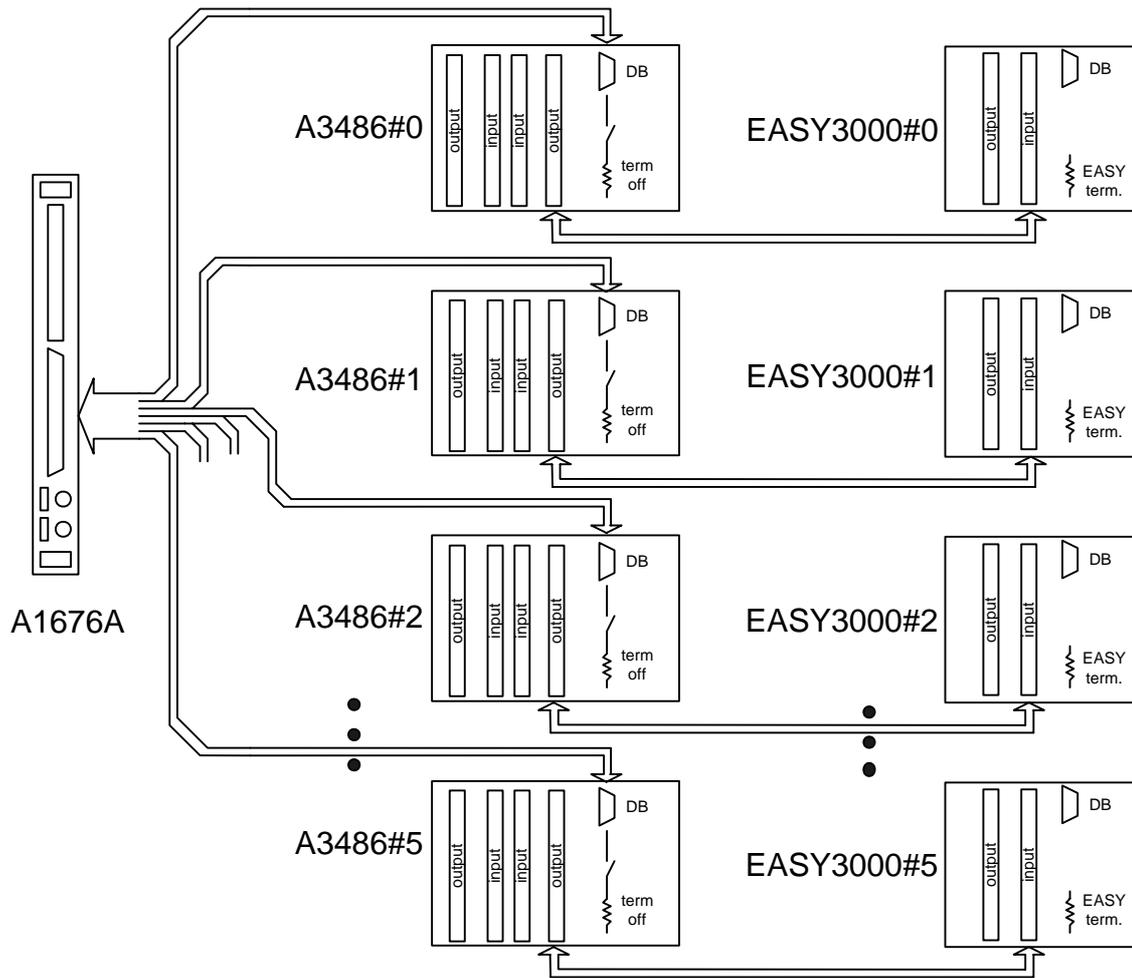


Fig. 3.5 – Bus connection with A3486 modules, EASY crates and split cables

In the two latter cases one A1676A branch handles one A3486 and one EASY crate.

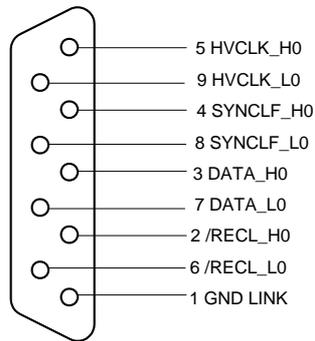


Fig. 3.6 – 9 Pin DB-type male connector signals

3.4 Maintenance

No routine maintenance of the unit is required except for periodic cleaning. To clean, disconnect the unit from the AC supply and allow 15 minutes for discharging. The metal surfaces should be cleaned using a damp soft cloth containing a mild solution of detergent and water. Use low pressure compressed air to blow dust from the unit.

4. Operating modes

The Mod. A3486 can be controlled, either locally or remotely, through the SY 1527 software interface.

For details on the EASY3000 System, please refer to the User's Manual of the A1676A Branch Controller. For details on SY 1527 system operation, please refer to the User's Manual of this product.



ATTENTION

**THE MOD. A1676A and A3486 BOARDS REQUIRE
 SY 1527 FIRMWARE VERSION 2.01.00 OR LATER**

4.1 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** and **2**, which are the actual output channels. A1676A Branch Controller parameters are listed in the relevant User's Manual.

Table 4.1 – 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		
12VPwS	MON	UNSIGNED	ON OFF					Fail	Ok
Svnc	MON	UNSIGNED	ON OFF					Fail	Ok
HVSvnc	MON	UNSIGNED	ON OFF					Fail	Ok
StatusIn	MON	UNSIGNED	ON OFF					Fail	Ok
Tracking	MON	UNSIGNED	ON OFF					On	Off
SerNum	MON	UNSIGNED	NUMERIC	1	65535	1	NONE		
RemBdName	MON	UNSIGNED	ON OFF					A3486	A3486

- Name** allows to assign a symbolic name to the board
- Rel** allows to readout the module firmware release.
- 12VPwS** allows to readout the status of the +/-12V voltages generated inside the module.
 If **12VPwS = 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 .
 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
 If **HVSync = Fail** the 625KHz signal is generated by the board itself.
- StatusIn** allows to readout the back panel STATUS IN signal.
 If **StatusIn = Fail** all the channels are turned OFF.
- Tracking** allows to readout the module operating mode selected via front panel switch.
- SerNum** allows to readout the module serial number.
- RemBdName** allows to readout the module name.

Table 4.2 – CH1..2 Parameters (output channel parameters)

Name	Dir	Sign	ValType	Min	Max	Res	UM	OnStr	OffStr
Name	SET	UNSIGNED	STRING						
Temp	MON	SIGNED	NUMERIC	0	70	1	CELSIUS		
Status	MON	UNSIGNED	STATUS	0	0	0	---		
Pw	SET	UNSIGNED	ON_OFF					On	Off
Trip	SET	UNSIGNED	NUMERIC	0.0	2.0	0.1	SEC		
VCon	MON	UNSIGNED	NUMERIC	0.0	55.0	0.1	VOLT		
SVMMax	SET	UNSIGNED	NUMERIC	44.0	52.0	0.1	VOLT		
VMon	MON	UNSIGNED	NUMERIC	0.0	52.0	0.1	VOLT		
GlbOffEn	SET	UNSIGNED	ON_OFF					En	Dis
GlbOnEn	SET	UNSIGNED	ON_OFF					En	Dis
RemIlk	MON	UNSIGNED	ON_OFF					Yes	No
V0Set	SET	UNSIGNED	NUMERIC	44.0	52.0	0.1	VOLT		
IMon	MON	UNSIGNED	NUMERIC	00.0	40.0	0.1	AMPERE		
I0Set	SET	UNSIGNED	NUMERIC	00.0	40.0	0.1	AMPERE		
IntFail	MON	UNSIGNED	ON_OFF					Yes	No
MaxDrop	MON	UNSIGNED	ON_OFF					Yes	No

- Name** allows to assign a symbolic name to the channel
- Temp** allows to readout the Temperature value.
 If **Temp > 70°C** the channel is turned OFF.
- Status** allows to readout the channel status value.
 the status word significant bits are:

Table 4.3 – Status word significant bits

Status	Name	Meaning
Bit 0	ON/OFF	
Bit 3	OVC	Over Current : IMon > I0set

Status	Name	Meaning
Bit 4	OVV	Over Voltage : VMon > V0set + 5V
Bit 5	UNV	Under Voltage : VMon < V0set - 5V
Bit 9	TRIP	Channel in OVC for a duration > TRIP
Bit 11	UNPLUGGED	Fail in communication with A1676A Branch Controller
Bit 13	OVP	Over Voltage Protection : Output voltage > 55V
Bit 15	TERR	Temperature Error : temperature > 70°C

If a channel is in '**TRIP**', '**OVP**', or '**TERR**', it is turned OFF.

Before turning one channel ON, every fail cause must be removed via the 'Clear Alarm' command, sent by the Sy1527/Sy2527 system.

- Pw** allows to send the ON/OFF command to the channel.
- Trip** allows to set the Trip time.
 If the channel Over Current (I_{mon} ≥ I_{0set}) lasts more than the Trip time, the channel is turned OFF.
 If Trip = 2 sec the channel in OVC is not turned OFF.
- VCon** allows to readout the voltage on the output connector.
 if **VCon > 55V** the channel is turned OFF.
- SVmax** allows to set the upper limit of V_{0Set}.
 (V_{0Set} cannot exceed SVM_{ax}).
- VMon** allows to readout the voltage on the load.
- GlbOnEn** allows to enable the channel to respond to a GlobalOn command provided by the A1676A.
 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.
 All the channels with GlbOffEn = En are turned OFF any time the A1676A broadcasts a GlobalOff command.
- Remllk** allows to readout the status of the **Interlock** signal on the front panel.
 If **Remllk = Yes** the channel is turned OFF.
- V0Set** allows to set the output voltage.
- IMon** allows to readout the current value delivered by the channel.
- I0Set** allows to set the current threshold value.
- IntFail** allows to readout the Internal Fail condition, provided by the channel in order to signal an internal failure.
 If **IntFail = Yes** the channel is turned OFF.
- MaxDrop** allows to readout the Max Drop condition, provided by the channel in order to signal that the drop between the voltage on the load and the voltage on the output connector is too big (it could be a cable problem).
 If **MaxDrop = Yes** the channel is turned OFF.

4.2 TRACKING Mode

The 2 48V/40A channels can be tracked in order to obtain one 48V/80 A channel. The used Set parameters are those referred to CH1, while the Monitor parameters are independent. To turn ON the tracked channels both must be enabled (Enable LED: ON). If one channel is either disabled or in 'TRIP', 'OVP', or 'TERR', both are turned OFF; see also § 2.4.3.4.

4.2.1 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 **SerNum** item returns the board serial number.

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

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

A read access to the **Tracking** item returns the Tracking status.

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

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

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=FAIL.

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

A read access to the **StatusIn** item returns the StatusIn connector signal.

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

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

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=FAIL.

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

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=FAIL.

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

A read access to the **RemBdName** item returns a string with the board name.

Table 4.4 – Internal Channel items

ItemID	Data Type	Access	Description
PowerSupplyName.BoardXX.ChanYYY.Name	String	R/W	Channel name
PowerSupplyName.BoardXX.Chan0.SerNum	2-byte int.	R	Board serial number

ItemID	Data Type	Access	Description
PowerSupplyName.BoardXX.Chan0.Rel	String	R	Board firmware release
PowerSupplyName.BoardXX.Chan0.Tracking	boolean	R	Tracking status
PowerSupplyName.BoardXX.Chan0.Tracking#CoOpen	string	R	Tracking open label
PowerSupplyName.BoardXX.Chan0.Tracking#CoClose	string	R	Tracking close label
PowerSupplyName.BoardXX.Chan0.12VPwS	boolean	R	12VPS status
PowerSupplyName.BoardXX.Chan0.12VPwS#CoOpen	string	R	12VPS open label
PowerSupplyName.BoardXX.Chan0.12VPwS#CoClose	string	R	12VPS close label
PowerSupplyName.BoardXX.Chan0.StatusIn	boolean	R	StatusIn status
PowerSupplyName.BoardXX.Chan0.StatusIn#CoOpen	string	R	StatusIn open label
PowerSupplyName.BoardXX.Chan0.StatusIn#CoClose	string	R	StatusIn 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.RemBdName	string	R	Board name

4.2.2 Output Channel OPC Items

This chapter describes the items which are available for the control of the power supply channels.

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.

The **Temp** item returns back the channel 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 **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 **RemIlk** item returns back the Remote Interlock value.

A read access to the **RemIlk#CoOpen** returns back the label "Off" associated to RemIlk =0.

A read access to the **RemIlk#CoClose** returns back the label "On" associated to RemIlk =1.

The **IntFail** item returns back the Internal Failure value.

A read access to the **IntFail#CoOpen** returns back the label "Off" associated to IntFail =0.

A read access to the **IntFail#CoClose** returns back the label "On" associated to IntFail =1.

The **MaxDrop** item returns back the Maximum Drop status value.

A read access to the **MaxDrop#CoOpen** returns back the label "Off" associated to MaxDrop =0.

A read access to the **MaxDrop#CoClose** returns back the label "On" associated to MaxDrop =1.

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** returns back the label "On" associated to Pw=1.

The **GlbOnEn** item enables the channel to respond to the A1676A Global On command.

A read access to **GlbOnEn#CoOpen** returns back the label “Off” associated to GlbOnEn=0.

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

The **GlbOffEn** item enables the channel to respond to the A1676A Global Off command.

A read access to **GlbOffEn#CoOpen** returns back the label “On” associated to GlbOffEn=0.

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

Table 4.5 – Output Channel items

ItemID	Data Type	Access	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.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

ItemID	Data Type	Access	Description
PowerSupplyName.BoardXX.ChanYYY.Temp#LowEU	8-byte real	R	Temp lower limit
PowerSupplyName.BoardXX.ChanYYY.Status	2-byte integer	R	Channel status
PowerSupplyName.BoardXX.ChanYYY.TripInt	4-byte real	R/W	Internal Trip
PowerSupplyName.BoardXX.ChanYYY.TripInt#EU	String	R	TripInt EU
PowerSupplyName.BoardXX.ChanYYY.TripInt#HighU	8-byte real	R	TripInt upper limit
PowerSupplyName.BoardXX.ChanYYY.TripInt#LowEU	8-byte real	R	TripInt lower limit
PowerSupplyName.BoardXX.ChanYYY.RemIlk	Boolean	R/W	Remote interlock ON/OFF
PowerSupplyName.BoardXX.ChanYYY.RemIlk#CoClose	String	R	Rem. interlock close label
PowerSupplyName.BoardXX.ChanYYY.RemIlk#CoOpen	String	R	Rem. interlock open label
PowerSupplyName.BoardXX.ChanYYY.IntFail	Boolean	R	Internal fail ON/OFF
PowerSupplyName.BoardXX.ChanYYY.IntFail#CoClose	String	R	Internal fail close label
PowerSupplyName.BoardXX.ChanYYY.IntFail#CoOpen	String	R	Internal fail open label
PowerSupplyName.BoardXX.ChanYYY.MaxDrop	Boolean	R	Max Drop ON/OFF
PowerSupplyName.BoardXX.ChanYYY.MaxDrop#CoClose	String	R	Max Drop close label
PowerSupplyName.BoardXX.ChanYYY.MaxDrop#CoOpen	String	R	Max Drop open label
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.GlbOnEn	boolean	R/W	Enable global ON
PowerSupplyName.BoardXX.ChanYYY.GlbOnEn#CoClose	string	R	GlbOnEn close label
PowerSupplyName.BoardXX.ChanYYY.GlbOnEn#CoOpen	string	R	GlbOnEn open label
PowerSupplyName.BoardXX.ChanYYY.GlbOffEn	boolean	R/W	Enable global OFF
PowerSupplyName.BoardXX.ChanYYY.GlbOffEn#CoClose	string	R	GlbOffEn close label
PowerSupplyName.BoardXX.ChanYYY.GlbOffEn#CoOpen	string	R	GlbOffEn open label