Rev. 07 - 24/03/2014

A1511B

12 Channel 500 V, 1/10 mA Individual Floating Channel Dual Range Board

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User Manual

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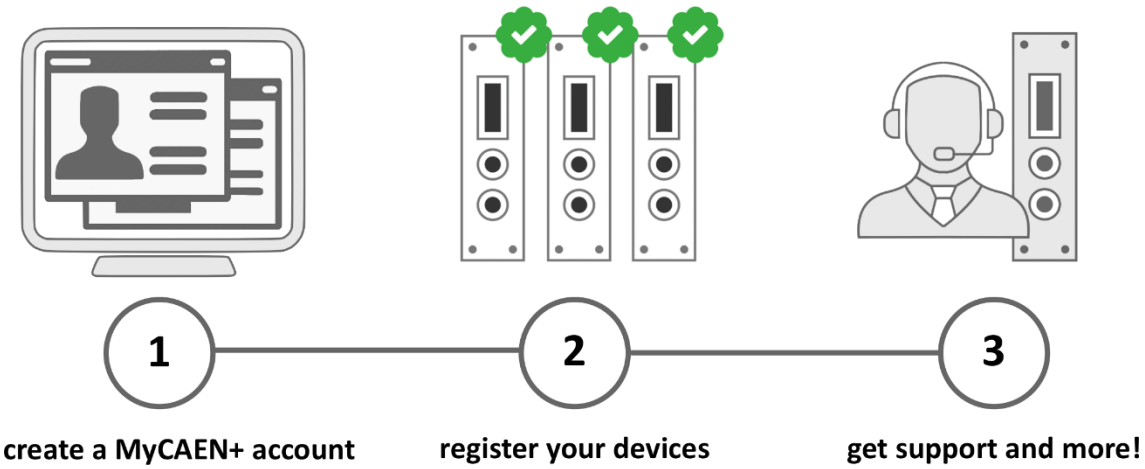

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Technical Information Manual

Revision n. 7
24 March 2014

MOD. A 1511B
12 CH FLOATING HV BOARD
MANUAL REV.7

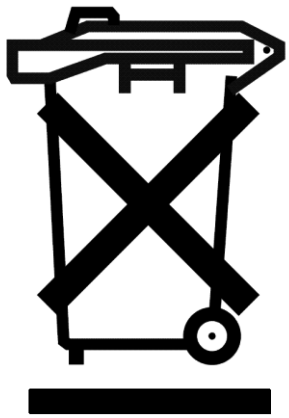
NPO:
00101/00:1511x.MUTx/07

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

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

CAEN reserves the right to change partially or entirely the contents of this Manual at any time and without giving any notice.

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



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1. Mod. A 1511B High Voltage Board

1.1 Functional description

The Model A 1511B single width board houses 12 H.V. floating channels (i.e. the channels do not share any ground reference). The output voltage can be programmed and monitored in the range 0÷500 V with 100 mV resolution. The floating channels allow on-detector grounding, thus avoiding ground-loops which may increase noise level. The Mod. A 1511B offers 1 mA / 10 mA dual current Full Scale Range (selectable via internal jumpers). The board is compatible with the CAEN Universal Multichannel Power Supply System (SYx527)

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 OVERVOLTAGE or UNDERVOLTAGE condition. Moreover, for each channel, a voltage protection limit SVMAX can be fixed via software with 1 V resolution and the output voltage can not be programmed beyond this value. The HV RAMP-UP and RAMP-DOWN rates may be selected independently for each channel in the range 1÷ 50 V/s in 1 V/s steps.

The output current is monitored with 100 nA / 1 μA resolution depending on current range; 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[1], namely:

1) TRIP=infinite (= 1000 s)

When the set output current value is reached the channel behaves like a constant current generator.

2) TRIP=finite (< 1000 s)

The output current keeps the set value only for programmed time interval and then is switched off.

The TRIP time (i.e. the maximum time an OVERCURRENT condition is allowed to last) can be programmed in 0.1 s steps.

The maximum output voltage (VMAX Hardware) can be fixed, through a potentiometer located on the front panel, at the same common value for all the board channels and this value can be read out via software.

The board hosts also a temperature sensor located on the PCB near the HV channels: the temperature values measured by this sensor are used to signal Over Temperature condition on the SYX527.

The board is provided with an "HV EN" input that disables the channels when it is not connected to ground.

[1] Refer to the SYx527 User's Manuals for details about the TRIP Handling.

1.2 Channel Characteristic Table

Table 1.1 – Channel characteristics of the Mod. A 1511B dual range HV Board

Output Voltage:	0÷500 V
Max. Output Current:	low range 1 mA high range 10 mA
Voltage Set/Monitor Resolution:	100 mV
Current Set/Monitor Resolution:	100 nA /1 μA depending on current range
VMAX hardware:	0÷500 V common for all the board channels
VMAX hardware accuracy:	± 2% of FSR
VMAX software:	0÷500 V settable for each channel
VMAX software resolution:	50 mV
Ramp Down:	1÷50 Volt/sec, 1 Volt/sec step
Ramp Up:	1÷50 Volt/sec, 1 Volt/sec step
Voltage Ripple: [2]	< 30 mV pp
Voltage Monitor vs. Output Voltage Accuracy: [3]	typical: ± 0.2% ± 0.3 V maximum: ± 0.2% ± 0.5 V
Voltage Set vs. Output Voltage Accuracy: [3]	typical: ± 0.2% ± 0.3 V maximum: ± 0.2% ± 0.5 V
Current Monitor vs. Output Current Accuracy: [3]	10 mA range typical: ± 2% ± 2 μA 10 mA range maximum: ± 2% ± 5 μA 1 mA range typical: ± 2% ± 0.5 μA 1 mA range maximum: ± 2% ± 1 μA
Current Set vs. Output Current Accuracy: [3]	10 mA range typical: ± 2% ± 2 μA 10 mA range maximum: ± 2% ± 5 μA 1 mA range typical: ± 2% ± 0.2 μA 1 mA range maximum: ± 2% ± 0.5 μA

[2] From 10 Hz to 20 MHz at full load

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

1.3 Front panel

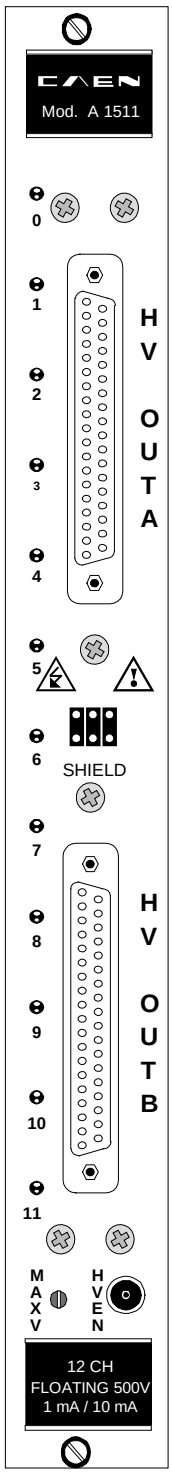

Fig. 1.1 – Mod. A 1511B front panel

1.4 Technical Specifications

1.4.1 Packaging

The module is housed in a 1 units wide, 6U-high mechanics.

1.4.2 External connections

The location of all components of the front panel is shown in Fig. 1.1. The function and electro-mechanical specifications of the external connectors are listed in the following subsections.

CH 0…5 HV CONNECTORS:	Mechanical specifications: DB 37 type female connector Electrical specifications: HV 37pin connector
CH 6…11 HV CONNECTORS:	Mechanical specifications: DB 37 type female connector Electrical specifications; HV 37pin connector
HV EN CONNECTOR:	Mechanical specifications: 00-type LEMO connector Electrical specifications: board ENABLE input, if it is connected to ground, the channels are enabled

1.4.3 Displays

CH ON 0…11 LEDs: *Function:* they light up as the relevant channel is on
Type: red LEDs

1.4.4 Front Panel Jumpers

JP1, JP2, JP3: *Type*: two pin jumpers
Function: grounding of the front panel connectors' shield (see also § 3.3.2)

1.4.5 Other components

MAXV trimmer: *Function:* it allows to adjust the hardware maximum voltage VMAX common to all the channels. Its value can be read out via software

2. Safety information and installation requirements

2.1 General safety information

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

2.1.1 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.

2.2 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

High Voltage

ATTENTION

Refer to Manual

2.3 Installation

The Mod. A 1511B is a single-width board. 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.
N.B.: the board does not allow "live extraction"; the board must be disabled (see § 3.4.1) before it is removed from the system.

3. Operating modes

The Mod. A 1511B 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. The following sections contain a description of commands available for the board control and status monitoring.

ATTENTION

THE MOD. A 1511B BOARD REQUIRE

SYX527 FIRMWARE VERSION 1.09.04 OR LATER

3.1 Output control and monitoring

For each output channel, it is possible, through the SYX527 system, to perform the following operations:

- Assign to channel a symbolic name
- Set output voltage (VSET)
- Set max. output current (ISET)
- Set output voltage software limit (SVMAX)
- Set voltage ramp-up speed (RAMP-UP)
- Set voltage ramp-down speed (RAMP-DOWN)
- Set TRIP parameter
- Enable/disable POWER ON option
- Switch channel ON/OFF
- Monitor output voltage (VMON)
- Monitor output current (IMON)
- Monitor channel status

If the POWER ON option is enabled, the channel, at POWER ON, is restored in the same condition it was before the POWER OFF or RESET; if this option is disabled, at POWER ON or after a RESET, the channel is kept OFF independently from its previous condition.

The following messages may be returned by the SYX527 when monitoring the channel status:

- OFF (channel turned OFF)
- RUP (channel ramping up)
- RDWN (channel ramping down)
- OVC (channel in OVERCURRENT condition)
- OVV (channel in OVERVOLTAGE condition)
- UNV (channel in UNDERVOLTAGE condition)
- EXTTRIP (channel OFF due to external TRIP line signal)

- INTTRIP (channel OFF due to internal OVERCURRENT condition)
- EXT_DIS (channel disabled by board INTERLOCK protection)
- SINK_OVC (channel sinking current larger than ISET- see § 3.5)

Moreover it is possible to monitor board temperature and to check board status; the following messages may be returned by the SYX527 when monitoring the board status:

- UNDER_TEMP (board temperature < 5°C)
- OVER_TEMP (board temperature > 65°C)

3.2 Current range setting

The Mod. A 1511B current Full Scale Range, can be selected between 1 mA and 10 mA for each channel via internal jumpers (two per channel).

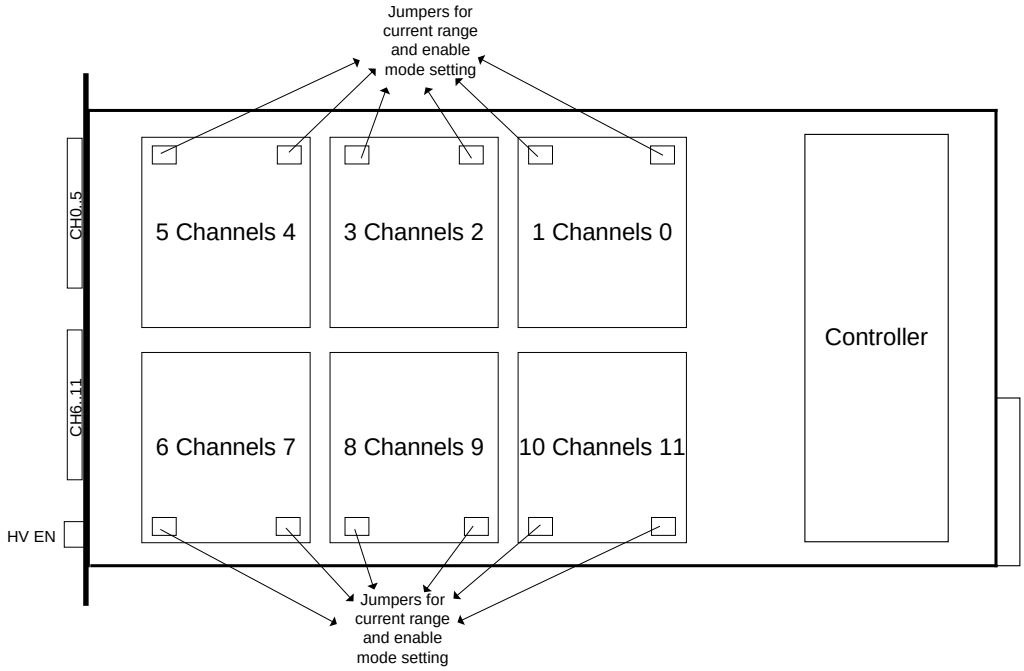

Fig. 3.1 – Mod. A 1511B side view

In order to select the desired current Full Scale Range (independent for each channels), the jumpers must be set as shown in Fig. 3.2 (i.e. the pins must be short circuited as shown); the channels are organised into 6 blocks of 2 channels (see Fig. 3.1). Current range selection must be performed before inserting the board into the crate. Default factory setting is 10 mA Full Scale Range.

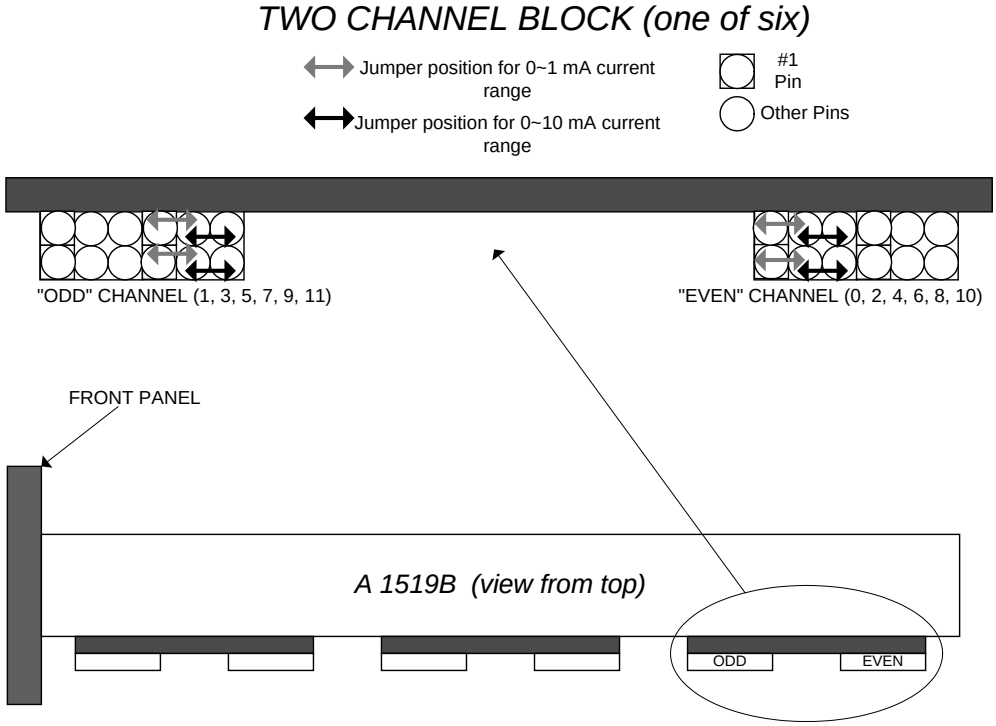
TWO CHANNEL BLOCK (one of six)
Jumper position for 0~1 mA current range
Jumper position for 0~10 mA current range
#1 Pin
Other Pins
"ODD" CHANNEL (1, 3, 5, 7, 9, 11)
"EVEN" CHANNEL (0, 2, 4, 6, 8, 10)
FRONT PANEL
A 1519B (view from top)
ODD
EVEN

Fig. 3.2 – Current range jumper setting

3.3 Pin assignment

The following figure shows the pin assignment of the front panel connectors:

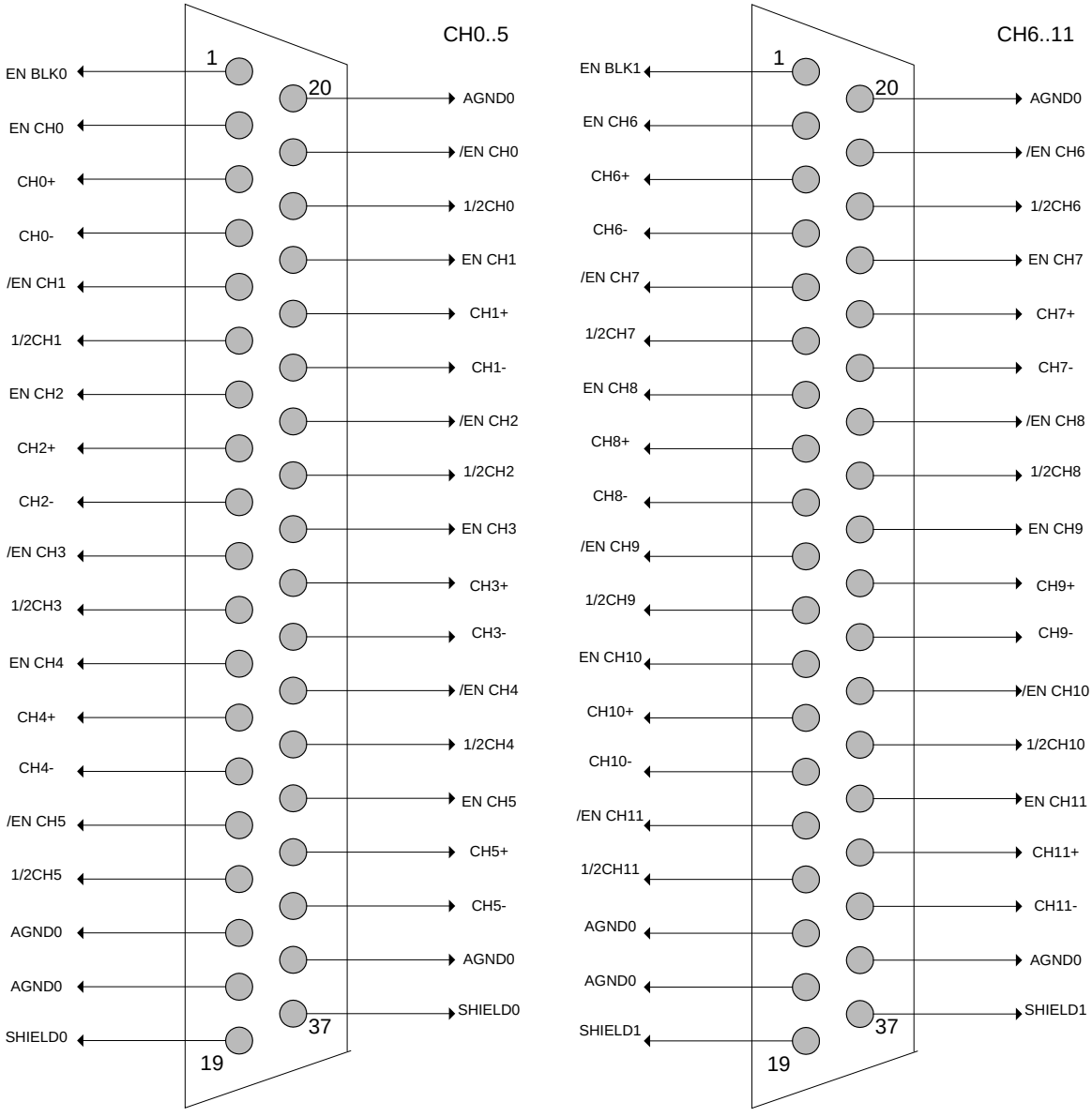

Fig. 3.3 - Mod. A 1511B front panel connectors pin assignment

3.3.1 Front panel connectors pin assignment description

- *CHx+* and *CHx-* : they are the x channel's HV outputs (x ranging from 0 to 11)
- *½ CHx* : it is a reference voltage (high impedance, thus not available as a power source) whose value is ½·|CHx+|

- *ENCHx* and */ENCHx* : ENMODE0: short circuiting these pins, x channel is disabled; ENMODE1: x channel is enabled when a +5 V d.c. voltage difference is applied between *ENCHx* and */ENCHx* pins (see § 3.4.2)
- *ENBLK0/1* : grounding these pins channels 0÷5 (ENBLK0) and 6÷11 (ENBLK1) are enabled
- *AGND0* : these pins are connected to the crate ground
- *SHIELD0/1* : these pins are connected to the connector's external shield

3.3.2 Front panel jumpers

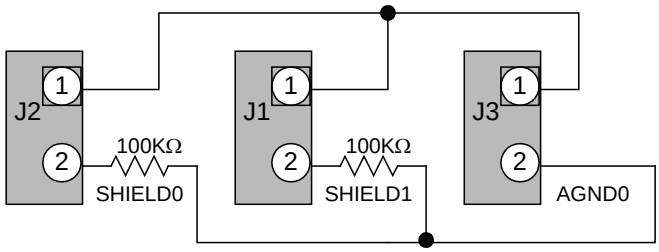

Fig. 3.4 - Front panel jumpers

The front panel jumpers J1, J2 and J3 allow to connect the two DB37 connectors shields (SHIELD0 and SHIELD1) with the ground reference of the crate (AGND0).

3.4 Output Enable

It is possible to enable the board's channels in the following ways.

3.4.1 Board Enable

The board is provided with an "HV EN" input that enables the channels when it is terminated on 50 Ohm. When the channels are disabled (the 50 Ohm termination is removed), the voltage outputs drop to zero at the maximum rate available; when the output disable cause is removed, i.e. the "HV EN" connector is terminated on 50 Ohm, the channels remain OFF until the User turns them ON via software.

3.4.2 Channel Enable

Each channel can be either enabled or disabled singularly. This operation can be performed in two ways, according to the mode, selected via jumpers:

- *ENMODE0*: if ENCHx and /ENCHx front connector pins (see Fig. 3.3) are not connected, x channel is enabled; if ENCHx and /ENCHx pins are short circuited, channel x is disabled
- *ENMODE1*: a +5 V d.c. voltage difference between ENCHx and /ENCHx pins must be applied in order to enable x channel

ENABLE0 is the default setting. Mode selection is shown in the following figure:

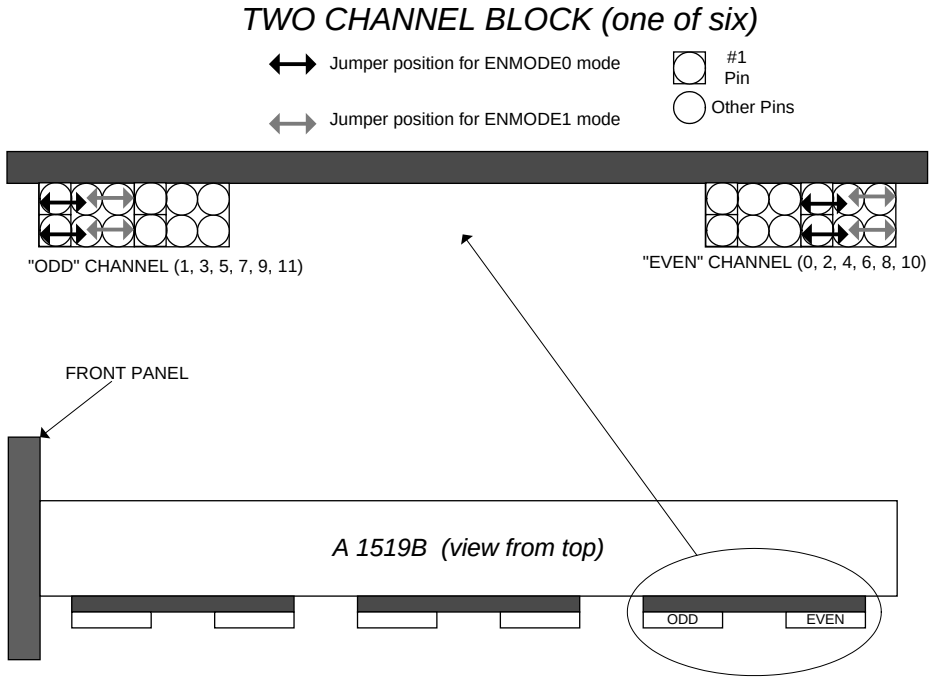

Fig. 3.5 - Enable mode jumpers setting

3.5 Sink mode

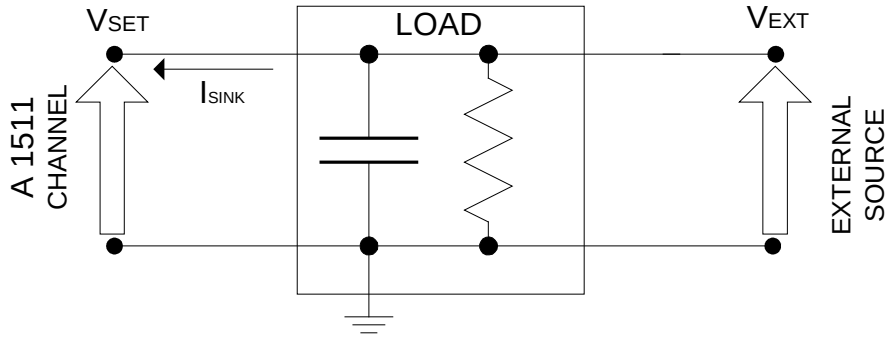

Fig 3.6 - Current sinking

The Mod. A 1511B output channels can either draw or sink current; if the detector input load is supplied with an external voltage VEXT larger than VSET, the channel sinks current (i.e. a negative IMON is displayed). If the negative IMON exceeds ISET (|IMON|>|ISET|), the SINK_OVC status is signalled and the voltage (after the TRIP time has passed, see § 1.1) decreases until turning off with a slew rate which is the slower between the RAMP-DOWN value and the detector's input capacitance discharge ramp.

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