User's Manual

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MOD. SY 3527
UNIVERSAL MULTICHANNEL
POWER SUPPLY SYSTEM
USER'S MANUAL

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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.

CE

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

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1. About this manual

The purpose of this guide is to illustrate:

- the several parameters and commands available for the control and status monitoring of the SY3527 Universal Multichannel Power Supply System and of the board channels
- the requirements and instructions for its correct operation
- the software used to control the system interactively

The preliminary section of the guide starts with a short description of the SY3527 system with a summary of its main features and performances.

A reference section describes the commands, alarms and parameters, which allow controlling and monitoring the system and the board channels.
The subsequent section illustrates the operating modes of the SY3527 system, showing how to access one power supply board's channels and functions.

1.1 Conventions

The conventions adopted all through the manual are shortly listed in the following.

1.1.1 Safety rules

The user is requested to pay particular attention to the parts of the document containing the following terms:

WARNING:
Warning statements identify conditions or practices that could result in injury or loss of life.

CAUTION:
Caution statements identify conditions or practices that could result in damage to this product or other property.

Please pay particular attention to the grey areas where warning and caution statements are emphasised, as shown in the following examples:

CAUTION

PLEASE NOTE THAT THE FAN TRAY GRID MUST

NOT BE COVERED UNDER ANY CIRCUMSTANCES!

WARNING

DO NOT OPERATE WITHOUT COVERS!

1.1.2 Electrical signal specifications

The user can choose the polarity of the electrical signals via software. As a consequence, in this guide it has been adopted the following convention:

TRUE: an electrical signal is indicated as TRUE when it is active.

FALSE: an electrical signal is indicated as FALSE when it is not active.

2. General description of the system

This preliminary section contains a short description of the SY3527 system with a summary of its features and some tables with its main technical specifications.

2.1 Overview

The SY3527 system is the portable version of the latest CAEN UNIVERSAL MULTICHANNEL POWER SUPPLY SYSTEM (see to Fig. 2.1). This system outlines a completely new approach to power generation and distribution by allowing to house, in the same mainframe, 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 it to meet the requirements of a wide range of experimental conditions.

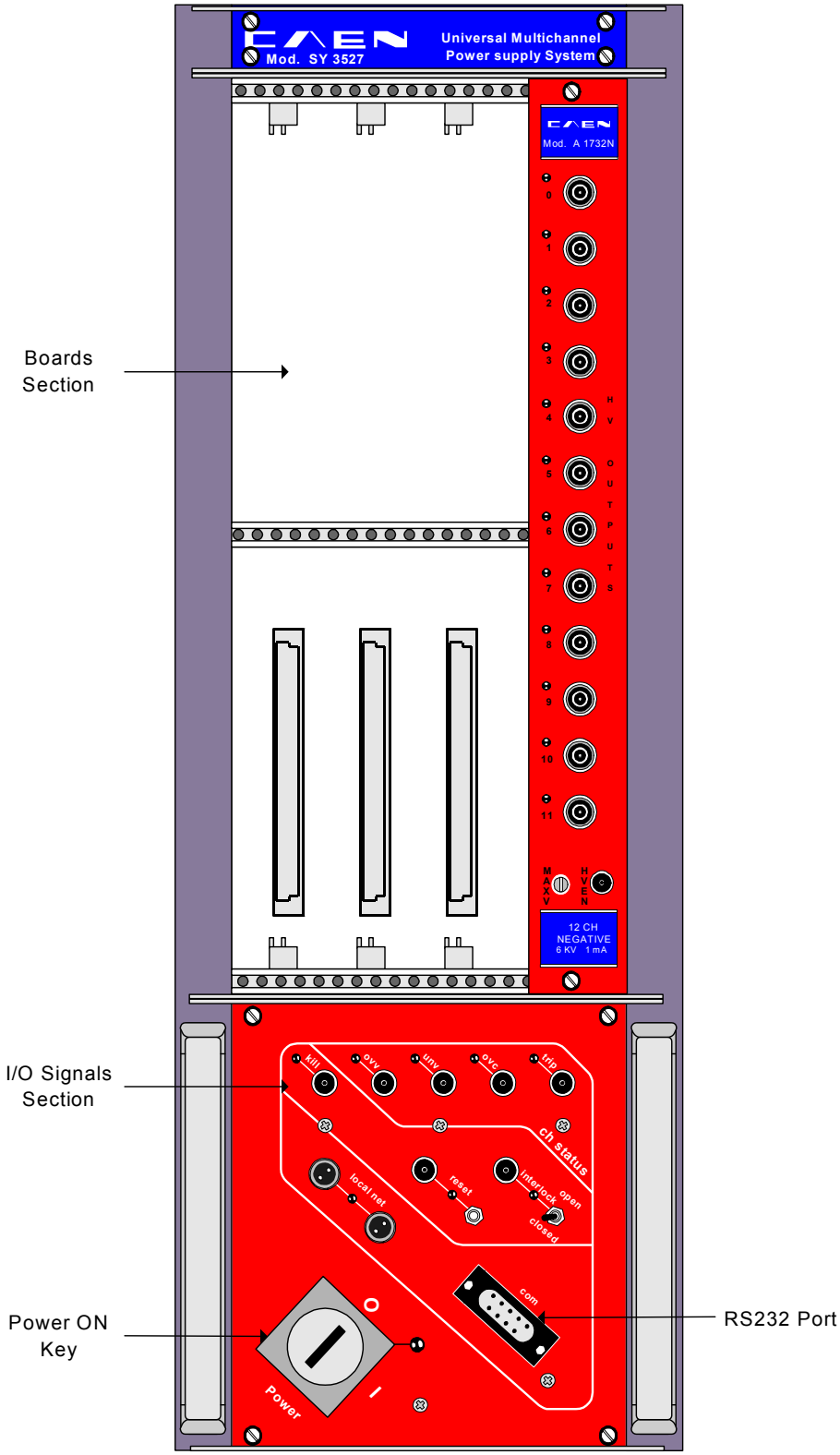


Fig. 2.1 –The SY3527 front panel (with an A1732 HV single width board inserted)

The *upper section* houses the slots where two (either single or double width) boards, able to perform different functions, can be inserted. The system has four backplane connectors (see Fig. 2.1), the first and the second (starting from left) are related to **Slot 0**, the third and the fourth to **Slot 1**, so caution is required in order to avoid placing two boards in the same *Slot*. The *lower section* hosts the RS232 port for external *VT100 Terminal* or *PC* running a *Terminal Emulator* program interfacing, the LOCAL NET I/O lines, the ON/OFF switch and some I/O control signals on LEMO 00 connectors. The system and the boards communicate through the lines carried by the system's *back plane*.

The extreme flexibility of the system, which allows housing indifferently, inside the same mainframe, boards with different functions, is further enhanced by the possibility of developing *ad-hoc* boards and even complete custom peripheral systems, including their hardware. The latter, actually, can be designed specifically for on-detector installation. All the custom electronics can be anyway controlled by single boards, which are inserted in the SY3527 mainframe and act as branch controllers.

All the operational parameters can be accessed for both setting and monitoring via a software interface, by using an external VT100 *Terminal* or *PC* running a *Terminal Emulator* program connected to the system's built-in RS232 port.

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 completes the system flexibility.

2.2 Short functional description

A single crate can host two Power Supply Boards (either single or double width), which can be chosen in a wide range of plug-in boards, from standard HV/LV boards and floating boards to generic I/O boards monitoring external parameters or branch controllers. All the types of boards can be freely mixed in the same crate so as to fit the user's needs.

The system can be controlled via either a *VT100 Terminal* or a *PC* running a *Terminal Emulator* program through the RS232 interface. A software interface is available, featuring symbolic names for channels, custom status displays and other features designed to help the management of a large number of channels.

Programmable parameters for each power channel include two voltage values (**V0set**, **V1set**) and two current limit values (**I0set**, **I1set**). The maximum voltage slew-rate (Volt/second) may be programmed for each channel. Two distinct values are available, **Ramp-Up** and **Ramp-Down**. Any command to change the voltage will result in a linear voltage increase or decrease with time, the rates being determined by the Ramp-Up or Ramp-Down parameters, respectively.

The ISET values of the channels represent a software-controlled protection on the channels' currents. If a channel tries to draw a current larger than the programmed limit, it is signalled to be in OVERCURRENT. The System detects this state as a fault and reacts according to the setting of the **TRIP** parameter, namely:

1) TRIP = infinite (*constant CURRENT mode*)
The output voltage is varied to keep the current below the programmed limit. The channel behaves like a current generator.

2) TRIP = finite value (TRIP mode)
In this case, the channel behaves as in the constant CURRENT mode for a time equal to the finite value set as TRIP parameter, and then it is switched off according to the selected **Power-Down** option (Kill/Ramp-Down). If the **Kill** option is selected, the channel will be switched off immediately. If the **Ramp-Down** option is selected, the voltage will drop to zero at a rate determined by the value of the **Ramp-Down** parameter programmed for that channel.

Other front panel signals and relevant LEDs are foreseen to signal the channel status, such as OVERVOLTAGE, UNDERVOLTAGE and TRIP. For a detailed description of these conditions please refer to Section 4 in this manual.

A RESET can be generated either manually via a front panel button or remotely by sending a proper signal through the relevant connector. In both cases it is possible to reset both the CPU and the boards. The System may be instructed to react to a Power On or to a Restart bringing all the channels from zero to the programmed value without the user's intervention via the **Power-On** parameter. If this option is enabled, the System will recover smoothly from a power failure or RESET, automatically restoring the status it had before the power was interrupted. KILL and INTERLOCK functions have been also implemented and allow dropping the channel output voltage to zero, independently from the Ramp-Down parameter set. For a detailed description of all system control and monitoring signals and of channel parameters please refer to Section 4 in this manual.

2.3 Technical specifications tables

Table 2.1 - Technical specifications of the SY3527 mainframe: general

Packaging (overall dimensions)	*Height*: 42.1 cm *Width*: 13.2 cm *Depth*: 59.7 cm
Weight	Mainframe *(*)*: 11 Kg
Voltage range	100÷230 V a.c.
Frequency	48÷64 Hz
Power	600 W
Overload protection	two F6.3A/250V fuses (placed next to mains connector)
Max. Number of boards per crate	2
Max. Output power	300 W
Operating temperature	From 5°C (dry atmosphere) to +40°C
Storage temperature	From -20°C (dry atmosphere) to +50°C

(*) boards are not included.

Table 2.2 - Technical specifications of the SY3527 mainframe: front and rear panel components

(refer to Fig. 2.1)

Displays **(*I/O control section*)**	– **OVC**, **UNV**, **TRIP**, **OVV**, red LEDs, light up as at least one channel is in *Over Current*, *Under Voltage*, *Trip*, *Over Voltage* condition, respectively – **KILL**, green LED, lights up as the system is in KILL condition – **RESET**, red LED, lights up as a RESET occurs – **INTERLOCK**, red LED, lights up as the system is in INTERLOCK condition – **LOCAL NET**, red LEDs, light up as the relevant connectors are in activity – **POWER ON**, red LED, lights up when Power ON key is on "1" position
Switches	– **INTERLOCK CLOSED/OPEN switch** to select if the INTERLOCK function is active when the contact is closed or open, respectively – **MAIN switch** (rear panel) to power the Power Supply Section – **POWER ON key** (front panel, primary power supply) to power on the system locally or to enable its remote power on
Buttons	– **RESET** push button
Remote Control Interfaces	– LOCAL NET (not yet implemented) – RS232 interface for connection to PC/VT100 Terminal

Table 2.3 - Technical specifications of the SY3527 mainframe: input and output signals

(refer to Fig. 2.1)

INPUTS	**KILL:**	Std. NIM/TTL; 00-type LEMO connector (high impedance[1]) *Function*: KILL from the front panel: it turns all channels off
	RESET:	Std. NIM/TTL; 00-type LEMO connector (high impedance[1]) *Function*: RESET from the front panel
	INTERLOCK:	open/closed contact; 00-type LEMO connector (high impedance[1]) *Function*: INTERLOCK command: it turns all the channels off as it is open/closed, according to the position of the relevant switch
OUTPUTS	**OVC:**	Std. NIM/TTL (selectable); 00-type LEMO connector *Function*: at least one channel is in *Over Current*
	UNV:	Std. NIM/TTL (selectable); 00-type LEMO connector *Function*: at least one channel is in *Under Voltage*
	OVV:	Std. NIM/TTL (selectable); 00-type LEMO connector *Function*: at least one channel is in *Over Voltage*.
	TRIP:	Std. NIM/TTL (selectable); 00-type LEMO connector *Function*: at least one channel in *Trip* condition
	LOCAL NET (I/O):	Bidirectional differential signal; 2-pin LEMO connector *Function*: Not yet implemented

All the above signals are referred to a common ground (COMMON GROUND) and are galvanically insulated up to 150 V with respect to the ground of the crate (CRATE GROUND).

[1] High impedance requires 50 Ω termination

3. Safety information and operation requirements

This section contains the fundamental safety rules for the installation and operation of the SY3527 system.
Read thoroughly this section before starting any procedure of installation or operation of the product.

3.1 General information

Review the following safety 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.

3.1.1 Injury Precautions

Use Proper Power Cord and HV Cables.
To avoid fire hazard, use only the power cord and HV cables specified for this product.

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.

Ground the Product.
This product is grounded through the grounding conductor of the power cord. To avoid electric shock, the grounding conductor must be connected to earth ground. Before making connections to any input or output terminals of the product, ensure that the product is properly grounded.

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 install the crates on top of each other.
A minimum distance of 15 cm is required between the top of a crate and any other object over it.

3.1.2 *Product Damage Precautions*

Use Proper Power Source.
Do not operate this product from a power source that applies more than the voltage specified.

Provide Proper Ventilation.
To prevent product overheating, provide proper ventilation.

Do Not Operate With Suspected Failures.
If you suspect there is damage to this product, have it inspected by qualified service personnel.

3.1.3 *EC Certifications and Compliance*

Use in conformity of the definition with fully equipped mainframe with fully closed slots by boards or dummy panels. Sufficient cooling and mains connection must be secured according to regulations. Signal lines length during all tests was less than 3 m. The RS232 cable must be properly shielded and have a length of less than 3 m. Admitted for powering by industrial mains only.

3.1.4 *Terms in this Manual*

These terms may appear in this manual:

WARNING:
Warning statements identify conditions or practices that could result in injury or loss of life.

CAUTION:
Caution statements identify conditions or practices that could result in damage to this product or other property.

3.2 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

3.3 General Operation Requirements

Before operation, check the following requirements:

Operating temperature:	5÷40°C (dry atmosphere)
Max. Length of cables:	according to cable specifications

4. System and channel control

4.1 Introduction

The CPU of the system handles all the parameters' readout or modification requests. The CPU also monitors the crate general parameters.
The current system status is stored in a permanent memory (EEPROM) so that all this information is not lost at Power-Off.

The Channel Boards as well house a microcontroller with its permanent memory (EEPROM) where it stores all the channels' parameters values. This feature allows easy upgrading and expansion of the system: new modules, or custom modules specially developed to fit the user's needs, can be added to the system without modifying the system CPU firmware.
The microcontroller has two main functions:

- control and monitoring of the channels of the board;
- communication with the system CPU.

The following sections contain an overview of the commands, parameters and alarms for the control and monitoring of the system and board channels.

4.2 System control

Several commands are available to control the system. These commands affect all the channels and can be sent to the system in different ways, depending on the type of command.
The most common way to forward a command to the system is to send a proper input signal through the relevant connector on the front panel; however, for some commands, a button or a switch has been foreseen.
The following sections are devoted to the description of the commands available.

Unless differently specified, all input signals mentioned below are referred to a common ground (COMMON GROUND) and are galvanically insulated up to 150 V with respect to the ground of the crate (CRATE GROUND).

A short summary of all front panel components is also given in Table 2.2 and Table 2.3 at page 12.
For component location on the front panel please refer to the Fig. 2.1.

4.2.1 KILL command

The **KILL input signal**, sent through the relevant connector, allows switching all the channels off at the maximum rate available, regardless of the Ramp-Down or other parameters.
The relevant green LED will be alight as the KILL signal is True.

The KILL command can be also forwarded via software (refer to § 5.5.1 for further details).

4.2.2 RESET command

The RESET command allows via the **RESET input signal** or the **RESET push-button** to reset the system CPU and the boards and to turn all the channels off.
After the RESET, the system will react as follows: if the Power-On option (refer to § 4.4.14) is enabled, each channel will be restored in the same condition it was before the RESET at the correct rate. If it is disabled, all the channels will be off, independently from the condition in which they were before the RESET. The signal must have a **1 ms** minimum duration.

4.2.3 INTERLOCK command

The INTERLOCK command allows switching off simultaneously all the channels, similarly to the KILL command (see § 4.2.1).
The INTERLOCK command can be activated via the **INTERLOCK input**, which acts as an open/closed contact. The selection of the contact position (open or closed), which will cause the INTERLOCK command, is performed via the two-position **INTERLOCK switch**:

- *Upper position (OPEN)*: the channels are switched off as the INTERLOCK contact is open (the ground connection in the INTERLOCK input is removed);
- *Lower position (CLOSED)*: the channels are switched off as the INTERLOCK contact is closed (the INTERLOCK input is grounded).

The INTERLOCK red LED alight signals the INTERLOCK condition of the system.

In order to turn the channels on again, the user must remove the INTERLOCK condition. Any attempt to turn the channels on without removing the INTERLOCK condition will result unsuccessful.

4.3 System status monitoring

Several output signals and alarms are available to monitor the system status, as described in the following subsections.

Please note that all output signals mentioned below, unless differently specified, are referred to a common ground (COMMON GROUND) and are galvanically insulated up to 150 V with respect to the ground of the crate (CRATE GROUND).

A short summary of all front panel components is also given in Table 2.2 and Table 2.3.

4.3.1 Over Current

The **Over Current** condition (**OVC**) occurs when at least one channel has reached the current limit. The Over Current condition is signalled by the OVC output signal True and the relevant red LED on.
The system detects this condition as a fault and reacts according to the setting of the **TRIP** parameter (see § 4.4.12 for its definition), namely:

1) TRIP = 1000 s (*constant CURRENT mode*)
The output voltage is varied to keep the current below the programmed limit (I0SET or I1SET, according to the ISEL signal level). The channel behaves like a current generator.

2) 0 < TRIP < 1000 s (*TRIP mode*)
In this case, the channel behaves as in the constant CURRENT mode for a time equal to the finite value set as TRIP parameter, and then it is switched off according to the selected **Power-Down** option (KILL/RAMP). If the **Kill** option is selected, the channel will be switched off at the maximum rate available. If the **Ramp** option is selected, the voltage will drop to zero at a rate determined by the value of the **Ramp** parameter programmed for that channel.

4.3.2 Under Voltage

The **Under Voltage** condition (UNV) occurs when at least the actual value of the channel output voltage is lower than the programmed value (3% of Full Scale Range).
The Under Voltage condition is signalled by the UNV output signal True and the relevant red LED on.

4.3.3 Over Voltage

The **Over Voltage** condition occurs when at least the actual value of the channel output voltage is higher than the programmed value (± 3% of Full Scale Range).
The Over Voltage condition is signalled by the OVV output signal True and the relevant red LED on.

4.3.4 Trip

The **TRIP** condition occurs as at least one channel has tripped and has been switched off due to an Over Current condition (see § 4.3.1).
This condition is signalled by the TRIP output signal, which is asserted True and the relevant red LED alight.

4.3.5 Power Supply Failure

If the system does not receive the correct power supplies, the System Menu General Window (see § 5.4), displays the following message:
either **±12V: FAULT** or **+48V: FAULT** (or even both, depending on the case),

the TRIP output (see § 2.3) starts pulsing with a circa 0.5 s period, accompanied by its LED flashing.

4.3.6 Fan Failure

The System Menu General Window (see § 5.4) allows to monitor the fans' operation: if they work properly, then the message **OK** is displayed next to their speed, if they do not then the message **FAIL** appears and the TRIP output (see § 2.3) starts pulsing with a circa 0.5 s period, accompanied by its LED flashing.

4.4 Channel parameters

Several parameters are associated with each channel, the number and type of these parameters depending on the Board type. They can be programmed and monitored by means of either a *VT100 Terminal* or a *PC* running a *Terminal Emulator* program connected to the system RS232 interface.

The following subsections contain a short description of all parameters associated with a standard HV Power Supply Board (HV PWS Board, Mod. A1526P). Although the number and type of parameters associated to each channel depend on the board's model, the following includes almost all parameters you can find when using a CAEN PWS Board. Section 5 will guide through the SY3527 operation.

4.4.1 Channel Name (CHANNEL)

It is the symbolic name of the channel; it may be up to 11 characters long and may contain any of the following characters:

"0..9", "A..Z", "a..z", "#", "&", "%", "$", "*", "_" and "-".

It can be programmed via software (see § 5.5.1).

4.4.2 VMAX Hardware (HVMAX)

It is a hardware voltage limit. Usually, it is fixed through a potentiometer placed on the **board front panel** and, consequently, cannot be modified via software.
It can be monitored via software (see § 5.5.1).

4.4.3 VMAX Software (SVMAX)

It is the maximum voltage value programmable for the channel.
It can be programmed via software (see § 5.5.1).

4.4.4 *V0SET*

It is the first of the two allowed voltage programmable values (in absolute value).
It is active when the V0-SEL is displayed in the Channel Configuration, its value can be programmed via software (see § 5.5.1).

4.4.5 *I0SET*

It is the first of the two allowed Current Limit programmable values (in absolute value).
It is active when the I0-SEL is displayed in the Channel Configuration window, its value can be programmed via software (see § 5.5.1).

4.4.6 *V1SET*

It is the second of the two allowed Voltage programmable values (in absolute value).
It is active when the V1-SEL is displayed in the Channel Configuration window, its value can be programmed via software (see § 5.5.1).

4.4.7 *I1SET*

It is the second of the two allowed Current Limit programmable values (in absolute value).
It is active when the I1-SEL is displayed in the Channel Configuration window, its value can be programmed via software (see § 5.5.1).

4.4.8 *Ramp-Up* (RUp)

Maximum Voltage programmable increase rate expressed in Volt/second. When a channel is switched on, or when it is switched from a lower Voltage value to a higher one, the Voltage output drifts from one value to the other at the rate expressed by the Ramp-Up parameter.
It can be programmed via software (see § 5.5.1).

4.4.9 *Ramp-Down* (RDwn)

Maximum Voltage programmable decrease rate expressed in Volt/second (in absolute value). When a channel is switched off, or when it is switched from a higher Voltage value to a lower one, the Voltage output drifts from one value to the other at the rate expressed by the Ramp-Down parameter.
The output voltage of a channel drops to zero following the Ramp-down parameter when:

- the channel is switched Off (**POWER** Parameter = Off);
- the channel has tripped with 0< **TRIP** Parameter < 1000 s (if the POWER-DOWN parameter is set to RAMP);

It can be programmed via software (see § 5.5.1).

4.4.10 VMON

It is the monitored value of the output voltage.
It can be monitored via software (see § 5.5.1).

4.4.11 IMON

It is the monitored value of the output voltage.
It can be monitored via software (see § 5.5.1).

4.4.12 Trip

It is the maximum time an **Overcurrent** condition is allowed to last. If an **Overcurrent** condition lasts for more than the programmed value, the System will react in the following ways:

If **Trip = 1000 s**: **Constant Current mode**.
The over current condition may last indefinitely.
The output voltage is varied to keep the current below the programmed limit (I0SET or I1SET, according to the ISEL signal level). The channel behaves like a current generator.

If **0 < Trip < 1000 s**: **Trip mode**.
The over current condition will cause the channel to "Trip": after an interval of time (equal to the Trip value) during which it behaves as in the constant CURRENT mode, the channel is switched off according to the selected POWER-DOWN option (KILL/RAMP). If the KILL option is selected, the channel will be switched off at the maximum rate available. If the RAMP option is selected, the voltage will drop to zero at a rate determined by the value of the RAMP parameter programmed for that channel.

The TRIP function is implemented by using a counter (TRIP counter), which is set to the programmed TRIP value each time one of the following actions is performed:

- the user sets the TRIP value;
- the user powers on the channel (POWER parameter);
- otherwise, when the channel is no longer in Over Current condition before the programmed TRIP value elapses.

This counter decreases as long as the channel is in Over Current condition and stops when one of the above conditions is met or the trip value is elapsed.
The TRIP parameter can be programmed via software (see § 5.5.1).

4.4.13 *POWER* (PW)

It is the On/Off Status of the channel.
If the INTERLOCK is not active and the channels are enabled, the channel is turned on by setting this parameter ON.

As the channel is turned on, the output drifts from 0 to the programmed value (V0SET or V1SET according to the VSEL signal level) at the programmed rate (RAMP-UP parameter).

Setting the POWER parameter to ON, the TRIP counter is brought again to its initial programmed value, so that the TRIP counter will start again from the programmed TRIP value as soon as another Over Current condition occurs. Refer to § 4.4.12 for further details on the TRIP counter.

4.4.14 POWER-ON (POn)

This parameter controls the behaviour of the channel at Power-On or after a Restart.
It can be set as:

- Enabled (ON),
- Disabled (OFF).

If it is enabled, at Power-On or after a Restart each channel is restored in the same condition (defined by the POWER parameter) it was before the Power-Off or Reset.
If this option is disabled, at Power-On or after a Restart all the channels are off, independently from the condition in which they were before the Power-Off or Reset.

4.4.15 POWER-DOWN (PDwn)

This parameter affects the way the channels react at a Power-Off command caused by a TRIP condition. It can be set as:

- KILL
- RAMP

If the KILL option is selected, the relevant channel will be switched off immediately.
If the RAMP option is selected, the voltage will drop to zero at a rate determined by the value of the Ramp-Down parameter programmed for that channel.
It can be programmed via software (see § 5.5.1).

5. Operating modes

This section guides the user step-by-step through the SY3527 operation. The examples refer to a SY3527 system with a Mod. A1526P power supply board plugged in, interfaced via the RS232 port to an IBM™–type PC running *Hyperterminal* (Copyright © Hilgraeve, Inc. 2000).

5.1 Preliminary check

Before powering the system, check that:

1. The boards, after the required hardware settings (see the *User's Manual* of the board), are plugged into the slots and fixed properly;
2. The crate is connected to the mains correctly;
3. Safety instructions, installation requirements and operation requirements given in Section 3 of this manual, respectively, have been thoroughly complied.

5.2 Power-On

To power-On the system follow this procedure:

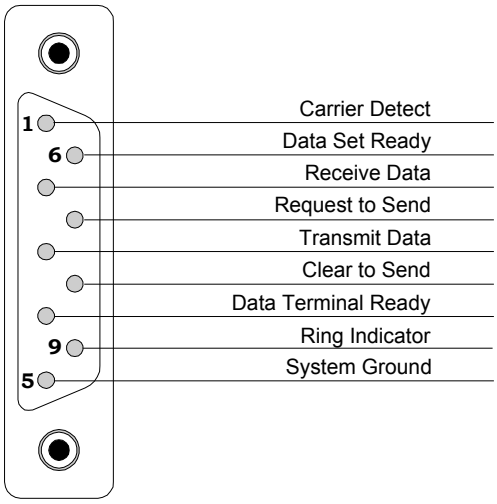
1. Turn the Power-On key, located on the front panel, in the "1" position (ON).
2. The relevant LED will light up.

5.3 Configuring the RS232 interface

The RS232 interface provided with the system is a 9-pin D-type male RS232 serial port and can be used to interface the SY3527 with a standard Personal Computer or a VT100 Terminal. When opening *Hyperterminal*, the user is asked to choose the port for the connection (usually COM1 or COM2), then to insert the RS232 interface settings.
The settings of the RS232 interface are as listed in Table 5.1, while the RS232 pin assignment is given in Fig. 5.1.

Table 5.1 – RS232 Port Default Settings

Baud rate	9600
Parity	None
Character length	8 bits
Number of stop bits	1 bit
Flow control	Xon/Xoff



9-pin D-type male RS232 connector

Fig. 5.1 – RS232 connector pin assignment

5.4 Main Menu

Once the RS232 port has been configured, the **Main Menu** is displayed by pressing any key, except <Enter>, which must not be typed at this stage (see Fig. 5.2):

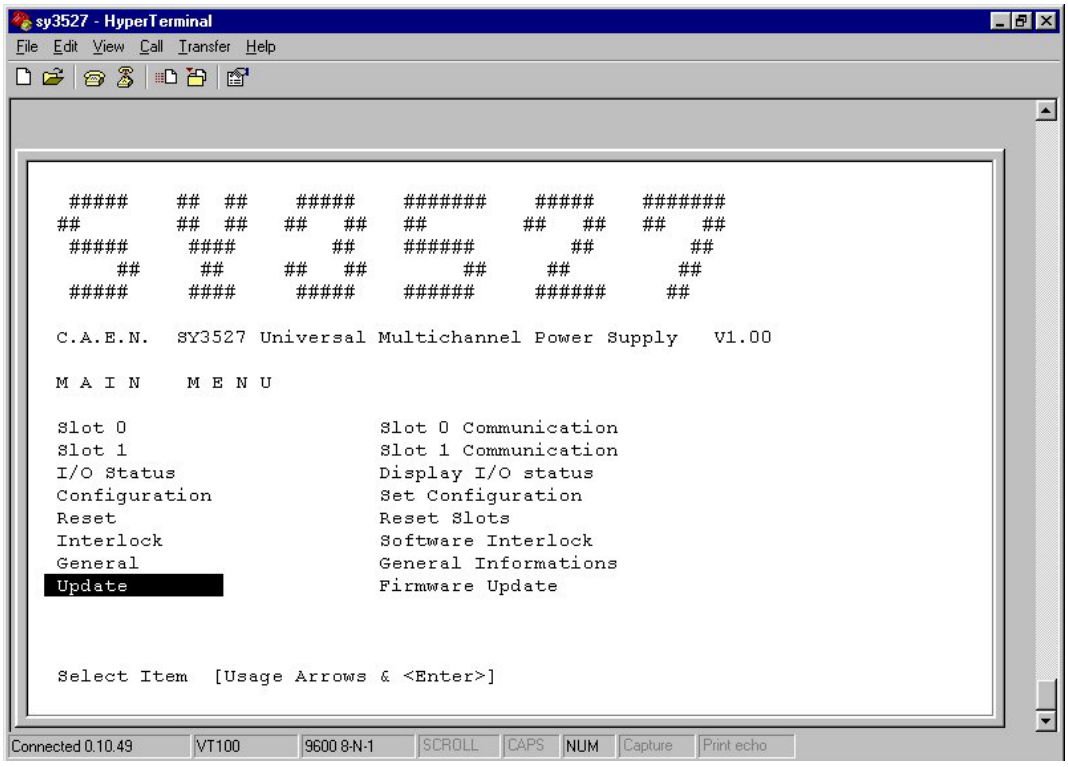


Fig. 5.2 – Main Menu

Two columns are shown: the selectable items are in the left one and their description is in the right one. Each item can be selected with the arrow keys (↑,↓) and confirmed with <Enter>. The available items are the following:

SLOT 0 / SLOT 1: allow accessing the power supply board inserted in the selected slot (see § 5.5)

I/O STATUS: shows the status of the system's front panel and back plane signals (see Fig. 5.3)

CONFIGURATION: allows performing some system's settings (see § 5.4.1)

RESET: allows resetting the board section (not the CPU, see also § 4.2.2)

INTERLOCK: allows sending the INTERLOCK command (see also § 4.2.3) via software

GENERAL: shows some system's general information (see Fig. 5.4)

UPDATE: allows uploading the firmware upgrade for the system and the boards (see § 5.4.2).

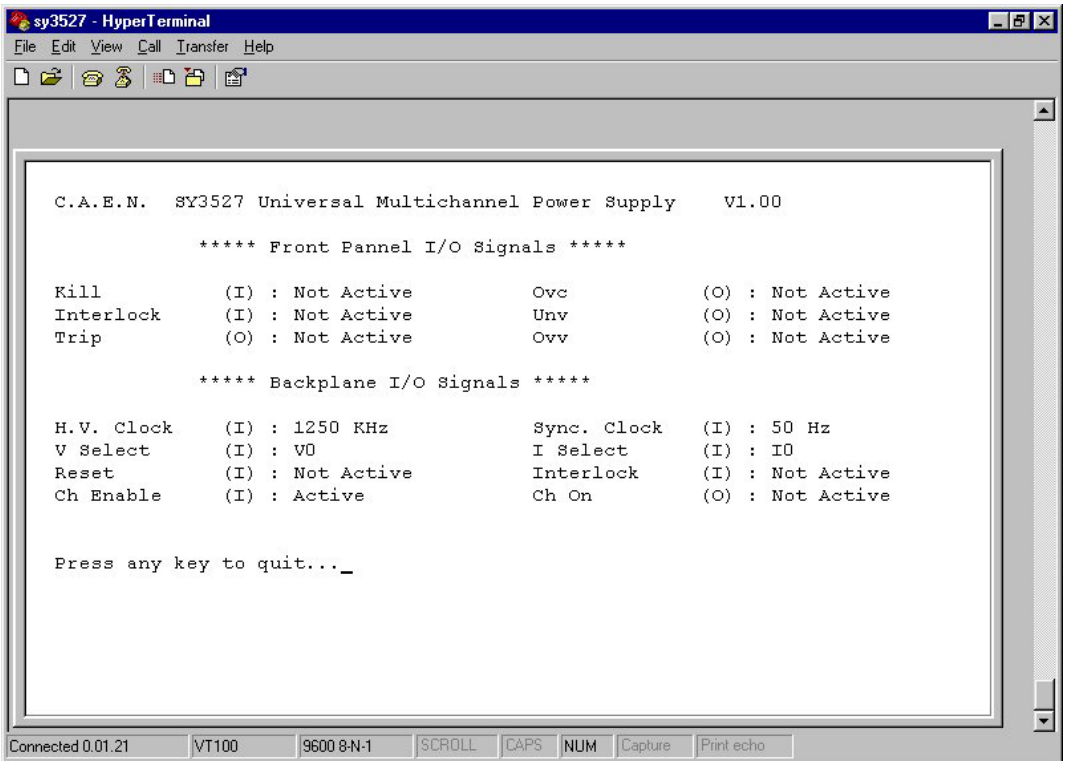


Fig. 5.3 – I/O Status Window

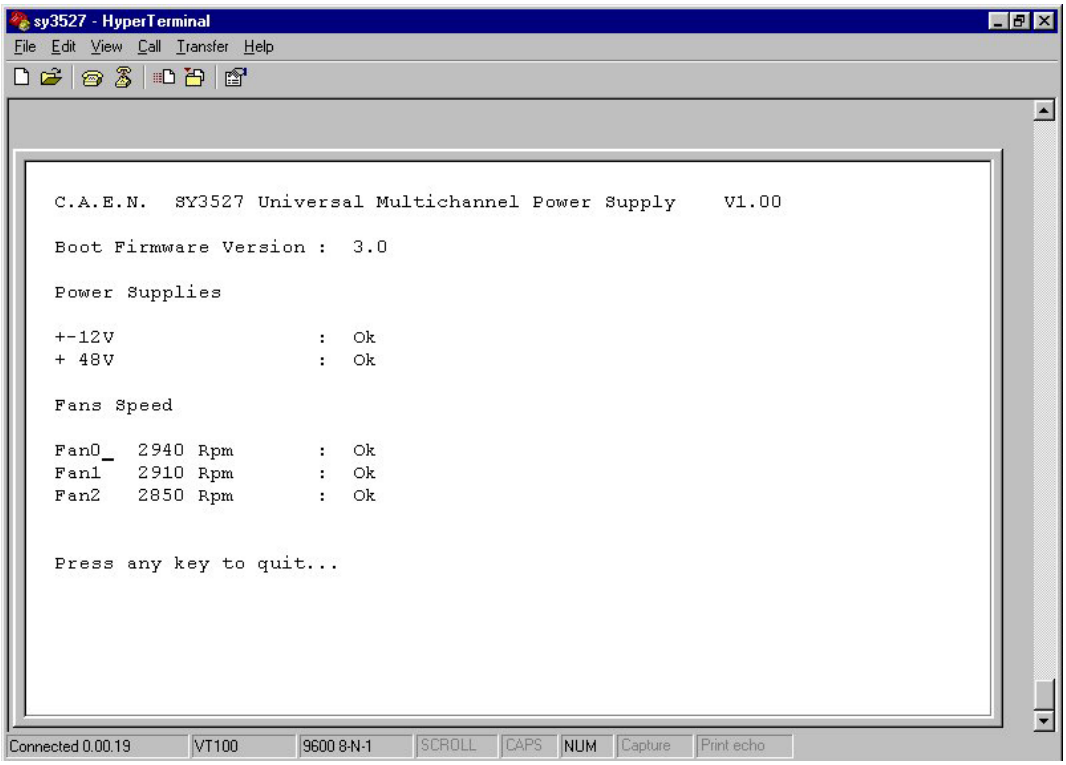


Fig. 5.4 – General Window

5.4.1 Configuration Window

This menu allows configuring the system via software (see Fig. 5.5):

CRATE NUMBER: Allows assigning a local net crate number, ranging from 0 to 7 (**operating with the current firmware revision the CRATE NUMBER must be set at 0**)

LOCAL NET: Currently not implemented, **must be *Disabled*** (see § 2.3)

OUTPUT LEVEL: Allows selecting the front panel output signals level (NIM or TTL)

V0 / V1 SELECT: Allows selecting the board channels' voltage preset value (V0 or V1)

I0 / I1 SELECT: Allows selecting the board channels' current preset limit (I0 or I1)

CHANNEL ENABLE: Allows to enable/disable the board channels

If the configuration is saved, then it will not be lost at turning off. V0 / V1 and I0 / I1 are factory-preset values (see § 5.5.1).

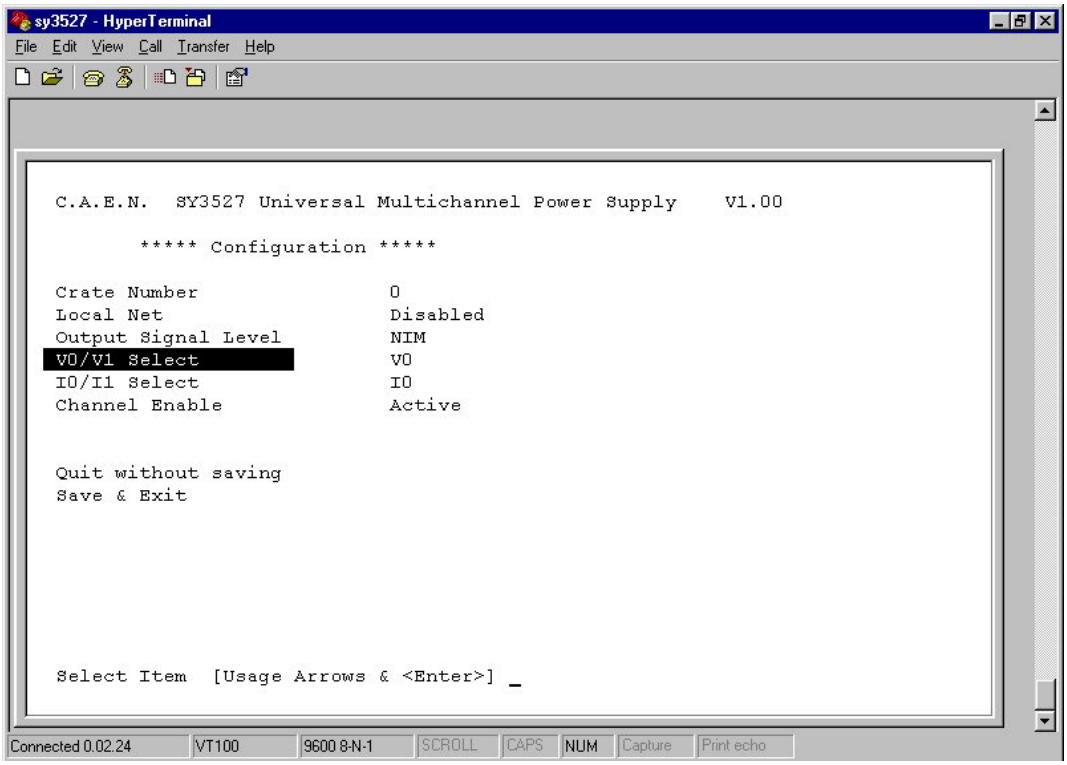


Fig. 5.5 – Configuration Window

5.4.2 Firmware update

The SY3527 Firmware can be updated by choosing *Update*, from the Main Menu. Then, a menu guides through updating (see Fig. 5.6):

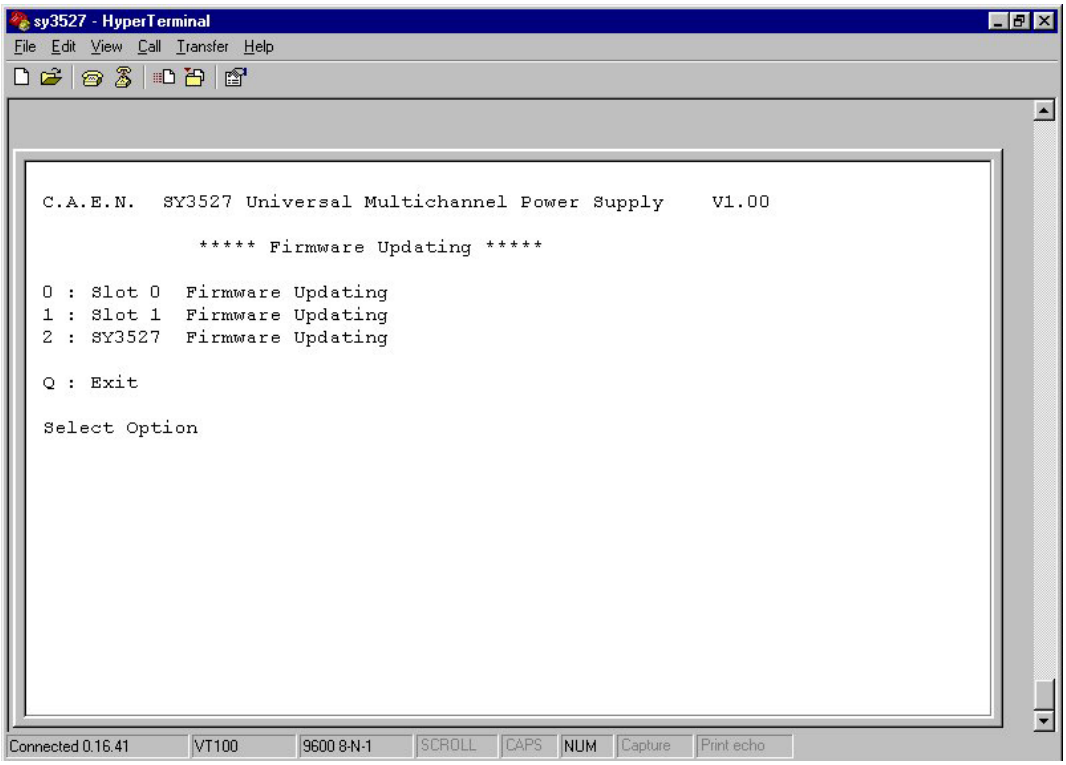


Fig. 5.6 – Firmware Update Menu

0 Allows to update the firmware of the board housed in Slot 0
1 Allows to update the firmware of the board housed in Slot 1
2 Allows to update the SY3527 firmware

If <2> is typed, the system firmware update will start (Fig. 5.7); the user will be asked to upload the **new** firmware, by using the <Transfer> button in the upper toolbar of the window; the command sequence is:

<Transfer> → <Send Text File> → <*select path*>
(i.e. the user must choose the directory where the new firmware is)

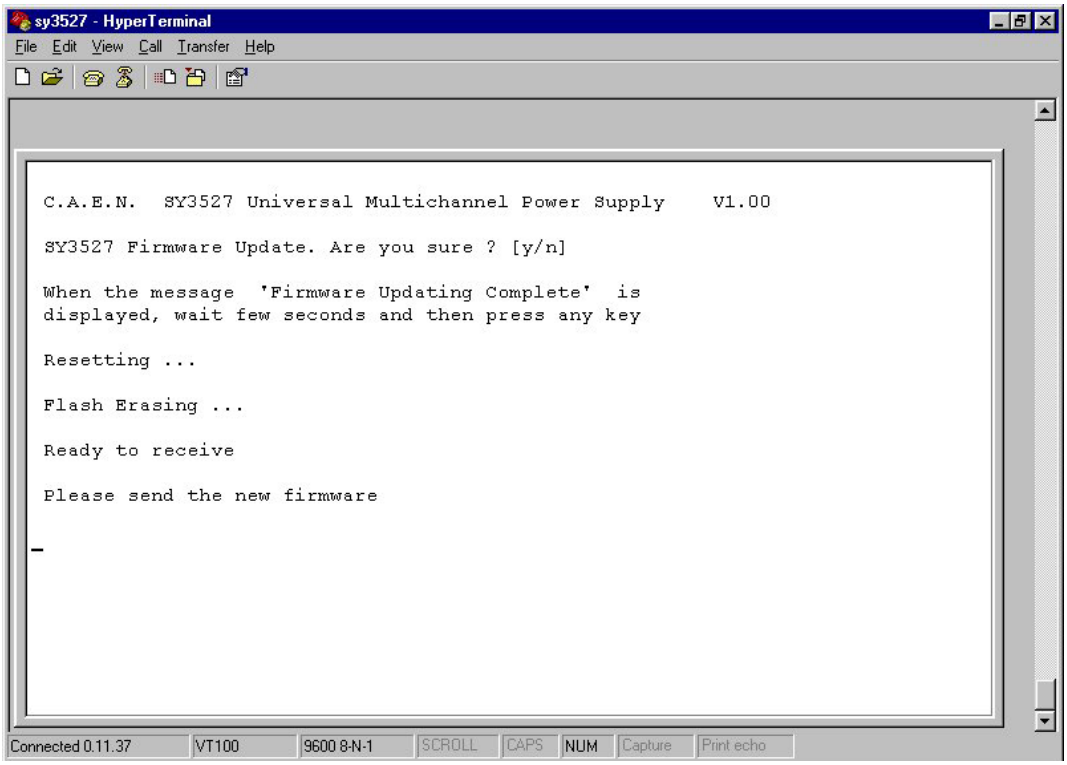


Fig. 5.7 – SY3527 Firmware Update Window

Once the upload is complete the message *FIRMWARE UPDATING OK* will appear. A similar window guides through one board's firmware upgrading.

5.5 Board Menu

The **Board Menu** can be accessed by inserting a power supply board in one slot and selecting the relevant item (**Slot 0** or **Slot 1**) from the Main Menu. The Board Menu refers to the A1526P Power Supply Board (Fig. 5.8) inserted in Slot 1:

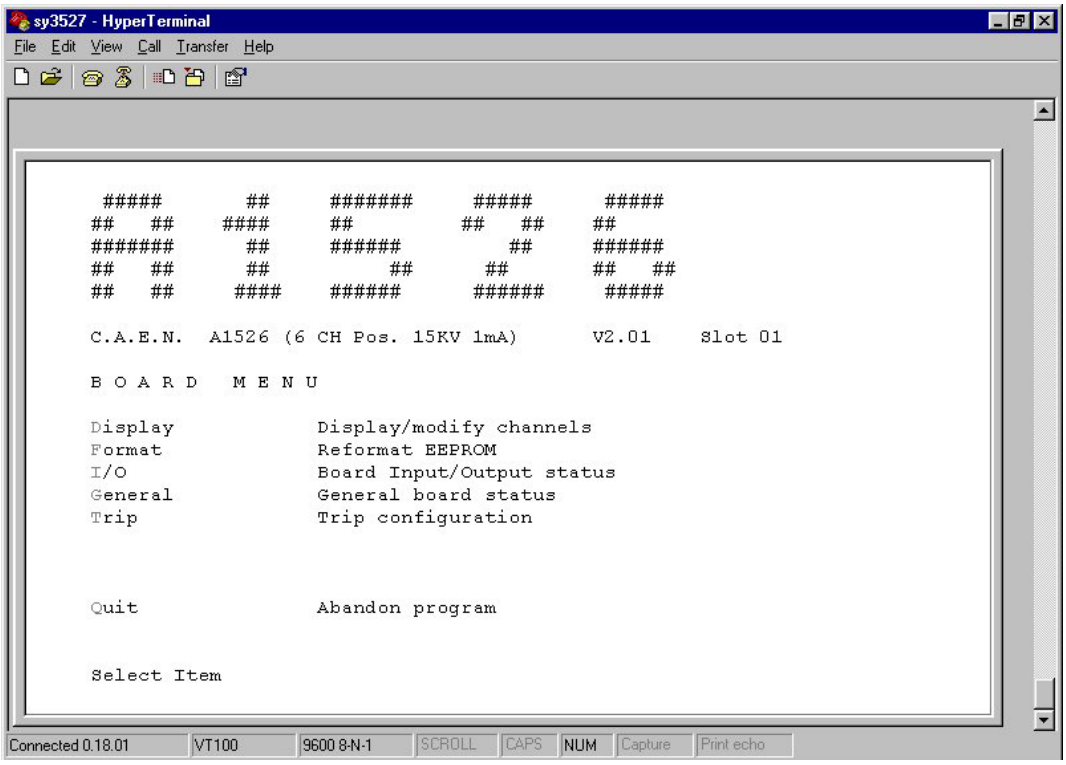


Fig. 5.8 – Board Menu

Two columns are shown: the selectable items are in the left one and their description is in the right one. Each item can be selected by typing its first letter (e. g.: <q> for Quit). The available items are the following:

- **DISPLAY**: allows to access to the board's channels settings (see § 5.5.1)
- **FORMAT**: allows to format the board's EEPROM
- **I/O**: shows the board's back panel signals status
- **GENERAL**: shows some board's general information
- **TRIP**: allows to access to the Trip Bus settings (see § 5.6)
- **QUIT**: allows to return to the Main Menu

5.5.1 Channel configuration

The board channels can be configured by choosing [D]isplay from the Board Menu; the following menu will be thus displayed (Fig. 5.9):

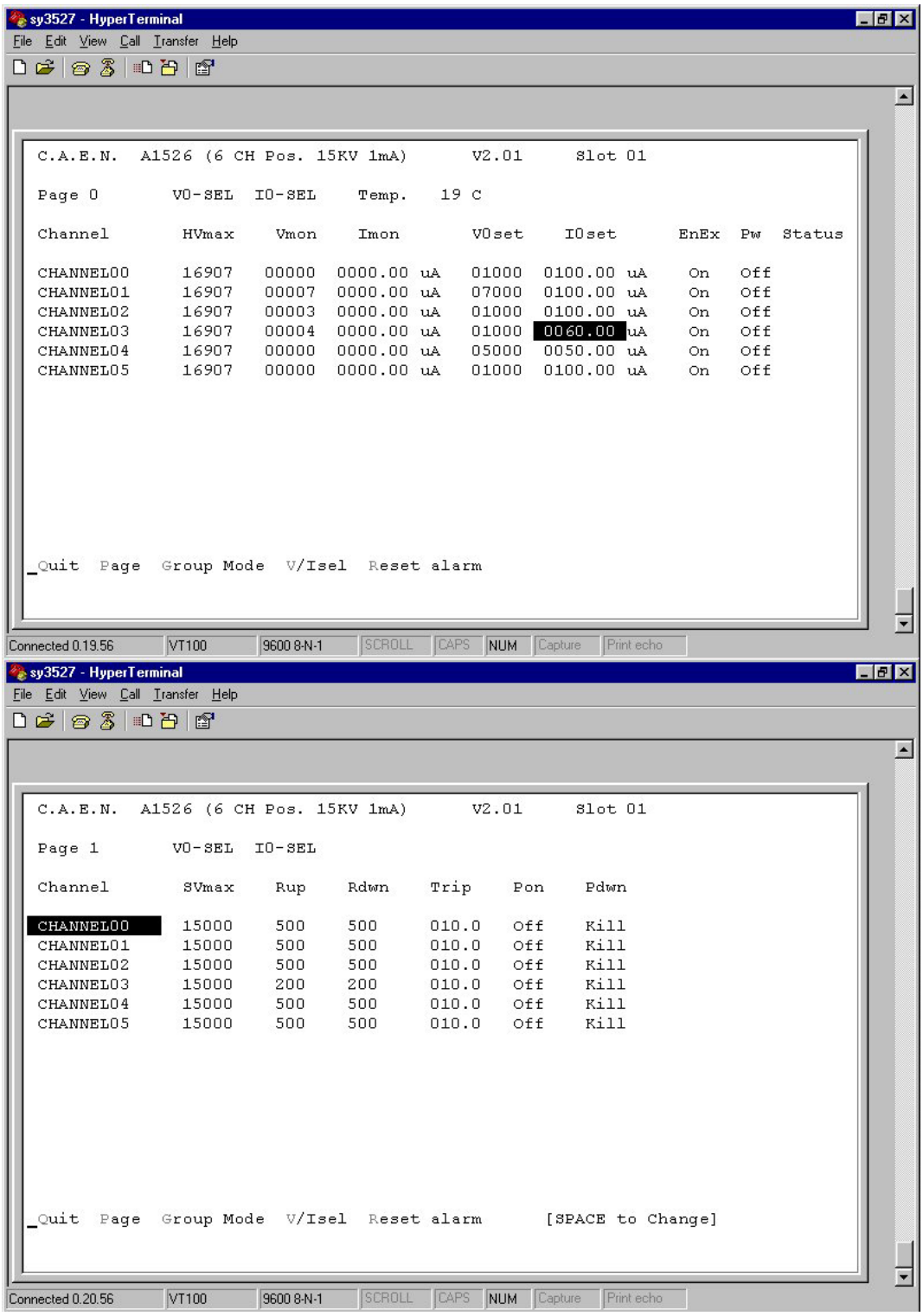


Fig. 5.9 – Channel configuration (Page 0 and Page 1)

For the A1526P board, this menu lies on two “pages” (Page 0 and Page 1), which can be switched, as usual, by pressing the item’s first letter (<p>). In order to change one parameter: point the parameter with the arrow keys, (press also <Space>, in order to re-name one channel) and type the desired value, confirm by pressing <Enter>.
In more detail, the parameters displayed in the **Channels Window** for each channel are:

CHANNEL NAME (settable):	descriptive name for the relevant channel.
V0SET / V1SET (settable):	the selected one of the two allowed voltage programmable values.
I0SET / I1SET (settable):	the selected one of the two allowed current limit programmable values.
V0-SEL / V1-SEL (selectable):	displayed selection between V0 and V1.
I0-SEL / I1-SEL (selectable):	displayed selection between I0 and I1.
VMON (monitor):	monitored voltage value.
IMON (monitor):	monitored current value.
EnEx (monitor):	board external enable (see the board’s user’s manual).
PW (settable ON/OFF):	the Power parameter shows the ON/OFF channel status. As this parameter is set ON, the channel is switched on (if the INTERLOCK is not active and if the channel is enabled either locally or remotely).
STATUS (monitor):	it displays the channel status.
TRIP (settable):	the TRIP parameter value, i.e. the maximum time an Over Current condition is allowed to last. Refer to § 4.4.12, for further details on the TRIP parameter.
SVMAX (settable):	the maximum voltage value programmable for the channel. If the value set as SVMAX is less than the current value of the V0SET / V1SET parameter, the latter will automatically decrease to the SVMAX value.
RDwn (settable):	the Ramp-Down parameter value, i.e. the maximum voltage programmable decrease rate.
HVMAX (monitor):	the hardware voltage limit for the board channels. It is adjusted via the relevant trimmer placed on the board front panel.
TEMP (monitor):	the temperature value detected on the board by the relevant sensor. If this value is out of the range TMIN ÷ TMAX, where TMIN and TMAX are the two threshold temperature parameters depending on the type of board, the system signals an Over Temperature condition.
RUp (settable):	the Ramp-Up parameter value, i.e. the maximum voltage programmable increase rate.
POn (settable ON/OFF):	Power-On option, which can be enabled or disabled. If this option is enabled, at Power-On or after a Restart each channel is restored in the same condition (defined by the Power parameter) it was before the Power-Off or Reset. If this option is disabled, at

Power-On or after a Restart all the channels are off, independently from the condition in which they were before the Power-Off or Reset.

PDwn (settable KILL/RAMP): Power-Down option, which can be set as KILL or RAMP. It affects the way the channels react at a Power-Off command caused by a TRIP condition. If the KILL option is selected, the relevant channel will be switched off at the maximum rate available. If the RAMP option is selected, the voltage will drop to zero at a rate determined by the value of the Ramp-Down parameter programmed for that channel.

Please note that any intervention on the output values (V0SET / V1SET, I0SET / I1SET), does not affect the factory-preset values (see § 5.4.1).

5.6 Trip handling

If a channel trips due to Over Current (see § 4.3.1), it can be useful to have the possibility of letting automatically other channels (which are not in Over Current) trip; this feature is implemented on the SY3527:

Internal Trip: a PS Board features a number of trip lines equal to half the number of its channels, so the A1526 board features an internal 3-line Trip Bus. The channels communicate with each other through this bus: a channel can be allowed to either propagate or sense (or both propagate and sense) the **trip status** through one or more trip lines (see § 4.4.12 for details about the *Trip*). Once selected Trip from the Board Menu (see § 5.5), this feature can be handled in the following way (refer to Fig. 5.10):

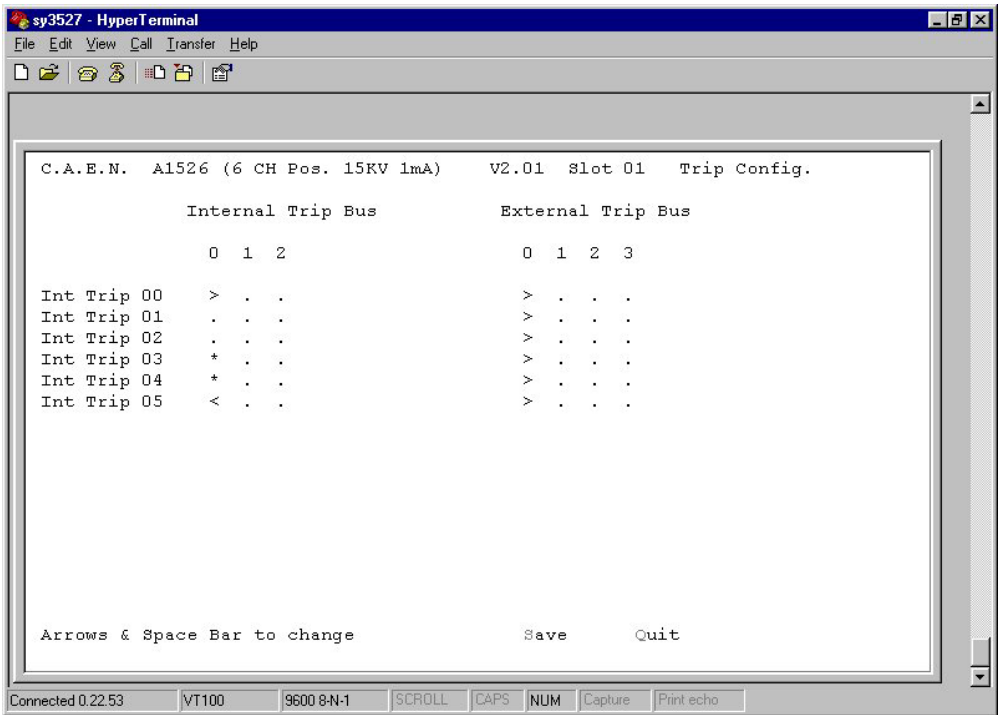


Fig. 5.10 – Trip handling

The dots represent the 3-lines: each dot can be replaced by one of the following symbols:

> The relevant channel can propagate the trip status through the relevant line

< The relevant channel can sense the trip status from the relevant line

***** The relevant channel can both propagate and sense the trip command through the relevant line

The dot (default) means that the relevant channel is not connected to the line.
The Arrow Keys allow to choose the line and the Space Bar allows to choose **<**, **>**, ***** or **.**
The Trip Bus configuration shown in Fig. 5.10 is the following:

- **CH3** trips whenever either **CH0** or **CH4** trips
- **CH4** trips whenever either **CH0** or **CH3** trips
- **CH5** trips whenever either **CH0** or **CH3** trips or **CH4** trips

The trip status is transferred from one channel to another within 1 ms.

External Trip: currently not supported by the SY3527.