



# Quick Start Guide



MAGNET POWER SUPPLY SYSTEMS

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## Quick Start Guide – Models

*This manual covers the following standard Power Supplies models:*

- **FAST-Bi-1K5**

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# Document Revisions

Revision	Date	Comment
0.1	January 31 <sup>st</sup> , 2024	Draft Release.
0.2	February 5 <sup>th</sup> , 2024	Text revision and added internal memory description.
0.3	February 6 <sup>th</sup> , 2024	Added Local control chapter. Added section "Controls toolbar".

# 1. Introduction

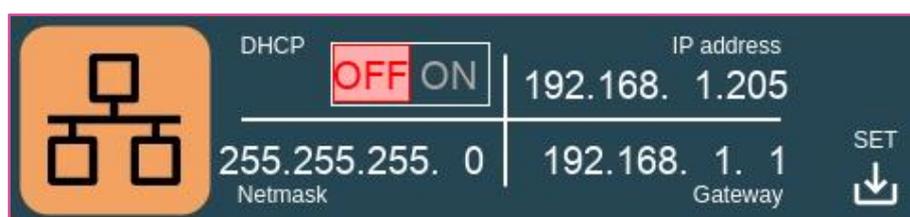
The Power Supplies (PS) can be controlled in two different ways:

- **REMOTELY**:
  - By accessing a Graphical User Interface (GUI) from a web browser;
  - By using TCP/IP (SCPI-like) commands (see the “*Commands Reference Manual*”);
- **LOCALLY**: from the Local Display and Navigation Switch on the PS front panel.

Remote and Local control will be addressed respectively in chapter 2 and chapter 3.

## 2. Remote Control: GUI

In order to access the GUI, the PS network settings have to be configured accordingly to the User's network. The PS network settings can be configured from the Local Display as reported in **Figure 1**, or from the Device Manager (see the Device Manager "*Quick Start Guide*" for more information).



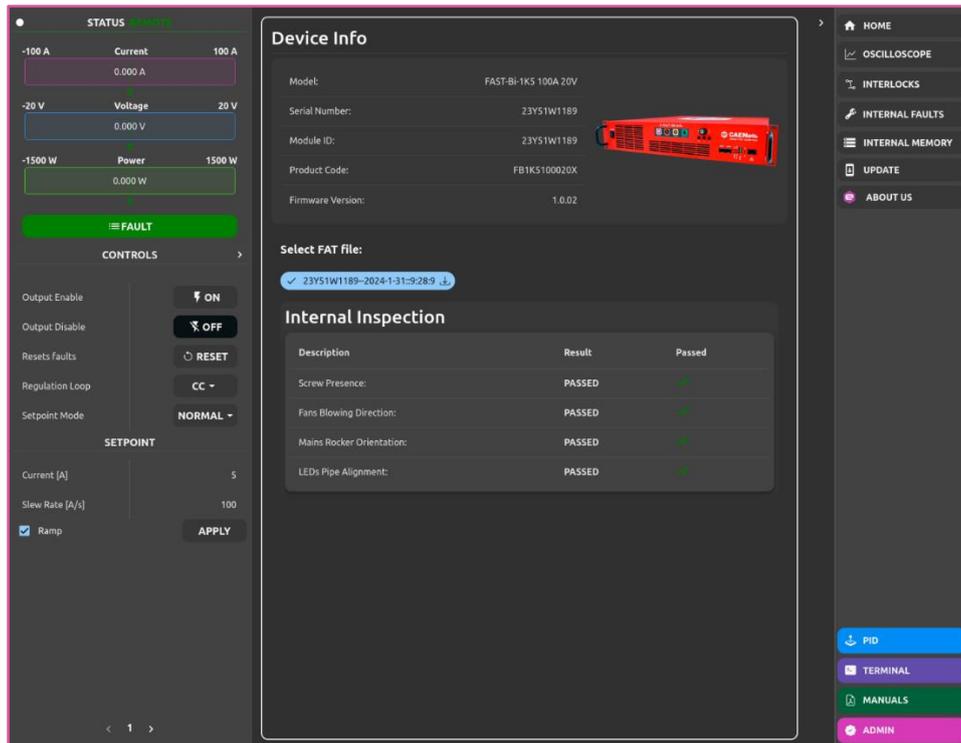
**Figure 1:** Local display, network menu.

In order to establish connection with the Power Supply (PS), double check that the network configuration of the User's PC is on the same subnet of the PS.

When the network is configured, open a web browser and type the PS IP address on the address bar. At the first connection you'll be asked to accept the EULA license agreement (**Figure 2**). Once you accept and click on "*continue*" you'll be redirect to the GUI Home Page (**Figure 3**).



**Figure 2:** EULA agreement.

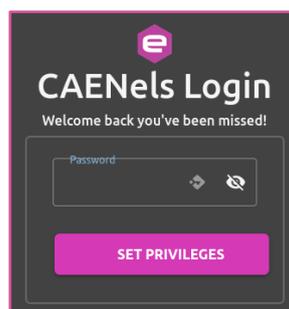


**Figure 3:** Home page.

The GUI (**Figure 3**) is structured in 3 parts:

1. *Controls toolbar*: this is the toolbar on the left side of the GUI from which are accessible the basic controls of the PS.
2. *Navigation toolbar*: this is the toolbar on the right side of the GUI from which are accessible the advanced configurations of the PS.
3. *Main window*: this is the central part of the GUI which changes its content depending on the page selected from the *Navigation toolbar*.

As first step into the GUI, let's open the *Login* page from the bottom of the *Navigation toolbar*.



**Figure 4:** Login page.

When in the *Login* page (**Figure 4**) two level of privileges are available:

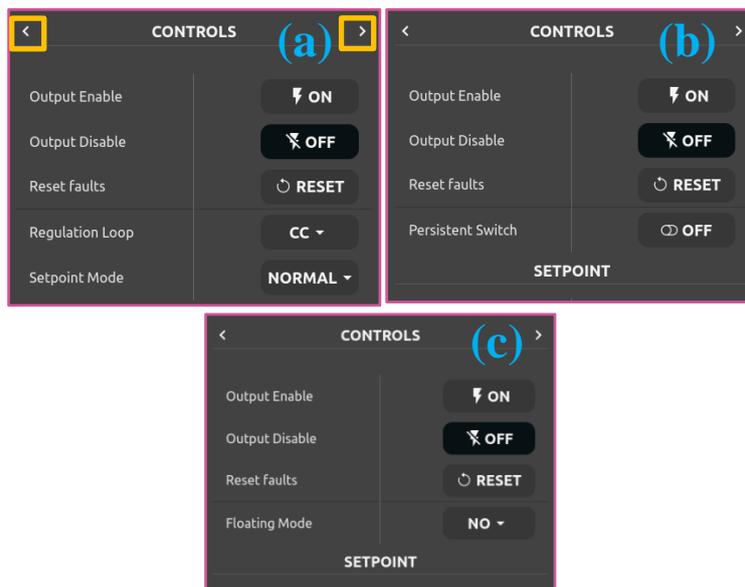
- “*user*”: for user privileges, automatically logged-in, very limited controls and configurations;
- “*ps-admin*”: for administrator privileges, access to all the advanced controls and configuration features;

**From now on let’s consider to be logged-in as administrator.**

## 2.1 Controls Toolbar

The PS can be operated from the *Controls toolbar*. This toolbar is divided in vertical sections that are described here from top to bottom:

1. *Status*: in this section are reported the real-time values of *Current*, *Voltage* and *Power*. Additionally, a *Fault indicator* indicates the PS fault status. By clicking the *Fault indicator*, a window will show up with the faults list;
2. *Controls*: the control section (see **Figure 5**) is sub-divided in 2 regions. The top region is fixed (Output Enable, Output Disable and Reset faults) and the bottom region has three available menus which can be selected with the *Controls arrows* (left and right, highlighted in orange in **Figure 5(a)**). From the top region the PS output can be enabled or disabled and the faults can be reset. From the bottom region there are three available menus:
  - a. *Regulation loop and setpoint mode*;
  - b. *Persistent Switch*: from this menu it is possible to enable/disable the persistent switch;
  - c. *Floating Mode*: from this menu it is possible to configure the PS to be floating or not, depending on the grounding connections;
3. *Setpoint*: in this section, depending on the setpoint mode selected, the PS setpoint and its configuration can be changed.

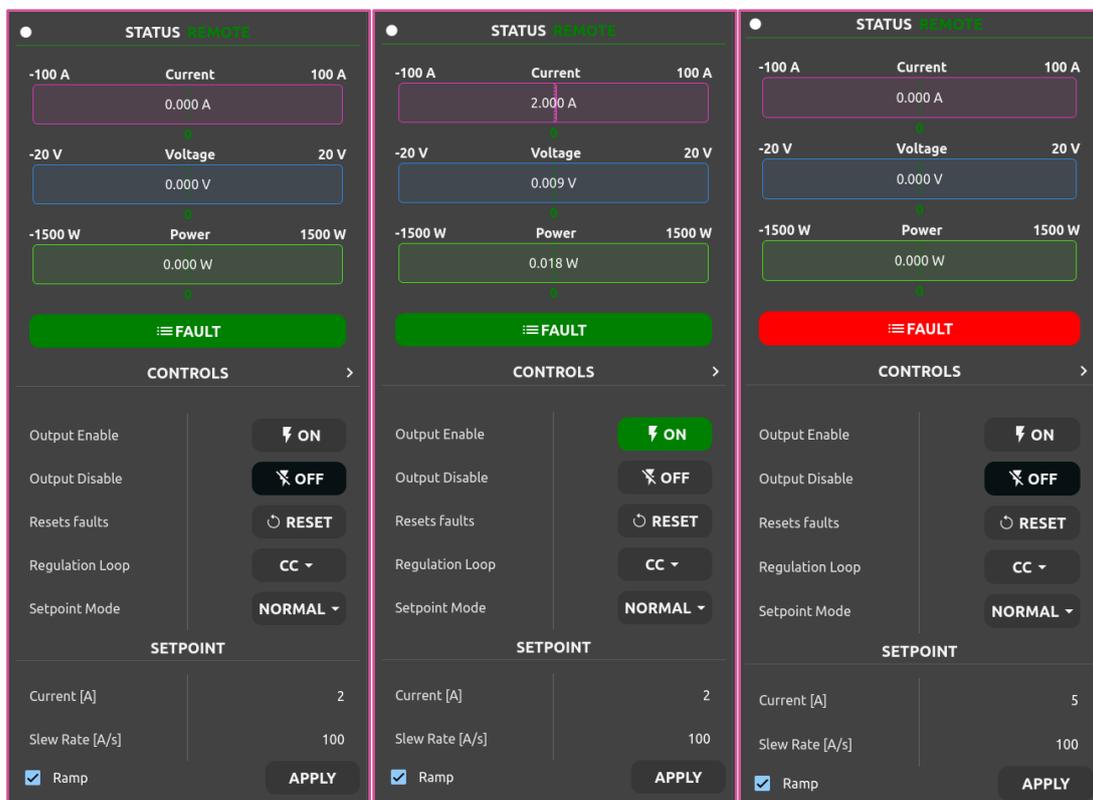


**Figure 5:** Controls pages.

The different *Regulation loop and setpoint modes* of the PS will be addressed in the following sections.

### 2.1.1 Setpoint Mode: NORMAL

The PS always powers-up in *OFF* condition (Output Disabled, **Figure 6**). The PS output can be enabled by clicking the *ON* button (Output Enabled, **Figure 6**). **When the PS output is enabled, the setpoint is always kept at 0 for safety reasons.** To apply a setpoint, click on the *Apply* button in the *Setpoint* section. If, during the operation, a fault arises, the *Fault indicator* will become red (see **Figure 6**), the PS will automatically go in *OFF* condition. By clicking on the *Fault indicator*, a window will show up with the faults list (**Figure 7**). The PS output cannot be enabled again if the faults are not resolved. When the faults are resolved, reset the faults status with the *Reset faults* button.



**Figure 6:** PS OFF (left), PS ON (center) and PS in fault condition (right).

Faults Register		
GENERAL		
4	EARTH LEAKAGE	✓
5	EARTH FUSE	✓
6	REGULATION FAULT	✓
8	DCCT ERROR	✓
10	CROWBAR	● 1st
11	QUENCH	✓
12	PARALLEL LINK FAULT	✓
13	OUTPUT OVERCURRENT	✓
14	OUTPUT OVERVOLTAGE	✓

**Figure 7:** Faults list.

### 2.1.2 Setpoint Mode: WAVE

The *Waveform* setpoint mode can be used to generate a custom waveform.

The correct procedure to work with a custom waveform should be the following:

1. Select *Wave* as setpoint mode from the *Controls toolbar*;
2. Configure the custom waveform from the *Main Window*, and click *Apply* to save the waveform settings;
3. Enable the PS output (*ON* button);
4. Click on *Start* from the waveform *Main Window* to actually output the custom waveform;
5. When completed, click on *Stop* button to stop the waveform. **When the waveform is stopped the PS will output the last waveform setpoint;**
6. Disable the PS output (*OFF* button).

The screenshot displays the 'Waveform Settings' menu. On the left, the 'STATUS' section shows 'REMOTE' and 'FAULT' indicators. Below that, 'CONTROLS' includes buttons for 'Output Enable' (ON), 'Output Disable' (OFF), 'Resets faults' (RESET), 'Regulation Loop' (CC), and 'Setpoint Mode' (WAVE). The 'WAVEFORM CONFIGURATION' section has a 'WAVEFORM MENU' button. The main area shows a table of settings:

Name	Value
Offset	1
Amplitude	1
Frequency [Hz]	1
Period [s]	1
Number of points	100000
N periods (0 for +Inf)	0
Phase [deg]	0
Min Threshold	0
Max Threshold	3

Below the table is a waveform graph showing 'Value' vs 'Time [s]' with a 'SINE' waveform and 'LIMIT MAX'/'LIMIT MIN' lines. At the bottom, there are 'SAVE', 'APPLY', 'START', and 'STOP' buttons.

**Figure 8:** Waveform menu.

### 2.1.2.1 Custom waveform settings

When selected a custom waveform (drop down menu “2” in **Figure 9**) it is possible to upload a custom waveform file (from the button “1” in **Figure 9**). **The custom waveform file has to be formatted as:**

{x: 0, y: 0}, {x: 0.25, y: 1.0}, {x: 0.5, y: 0.0}, {x: 0.75, y: 1.0}

where “x” is the horizontal variable (time in [s]) and “y” is the vertical variable (current in [A] if the PS is in regulation mode CC, or voltage in [V] if the PS is in regulation mode CV).

When the custom waveform is uploaded it is possible to select how to interpolate the custom wave points (“3” in **Figure 9**). Available options are: linear, step, polynomial or spline.



**Figure 9:** Waveform settings.

### 2.1.3 Setpoint Mode: AIN

The *Ain* setpoint mode can be used to output a waveform supplied externally from the “AIN” input on the rear panel (see the PS “*User’s Manual*” for more details regarding the analog input hardware connections).

The correct procedure to work with the analog input should be the following:

1. Select *Ain* as setpoint mode from the *Controls toolbar*;
2. Supply an external signal on the “AIN” input on the rear panel;
3. Check the setpoint on the *Oscilloscope* page before enabling the output;
4. If the setpoint is as desired, enable the PS output (*ON* button);
5. The PS output should follow the input signal (setpoint), as reported in **Figure 10**;
6. When the operation is completed, disable the PS output (*OFF* button).

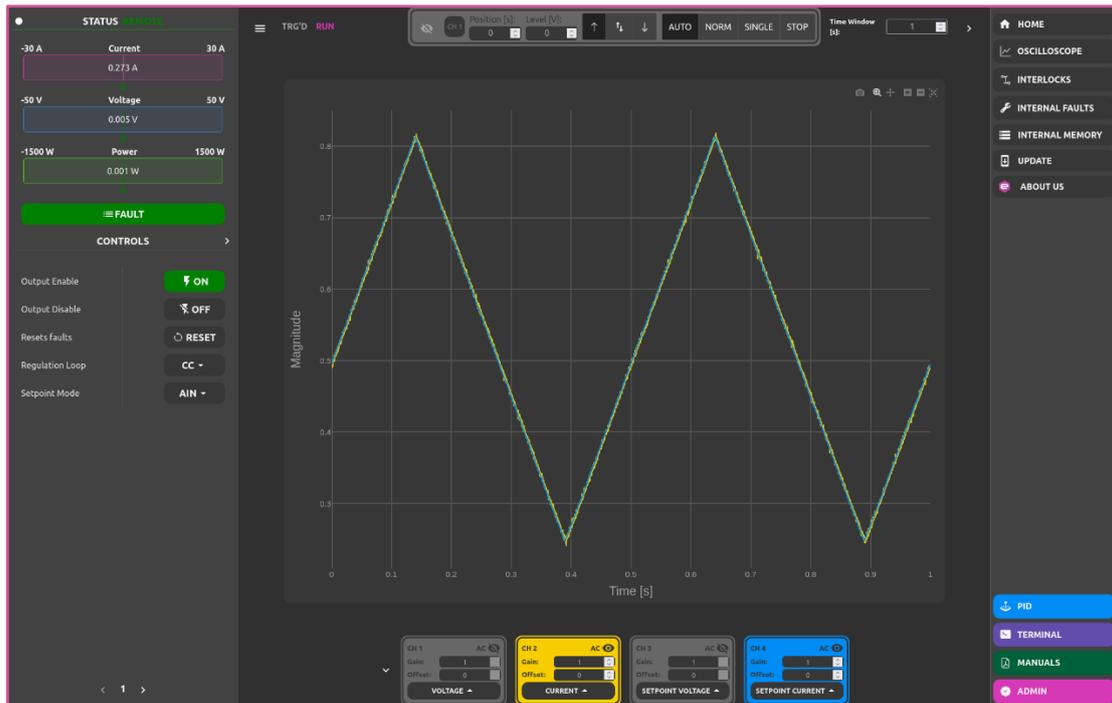


Figure 10: Analog input setpoint mode.

## 2.1.4 Setpoint Mode: SFP

Not yet implemented.

## 2.2 Navigation Toolbar

A quick introduction before addressing the navigation toolbar pages is necessary to understand how the memory of the PS works. The memory is organized as a table with the following columns:

ID	Name	Value	Privileges
----	------	-------	------------

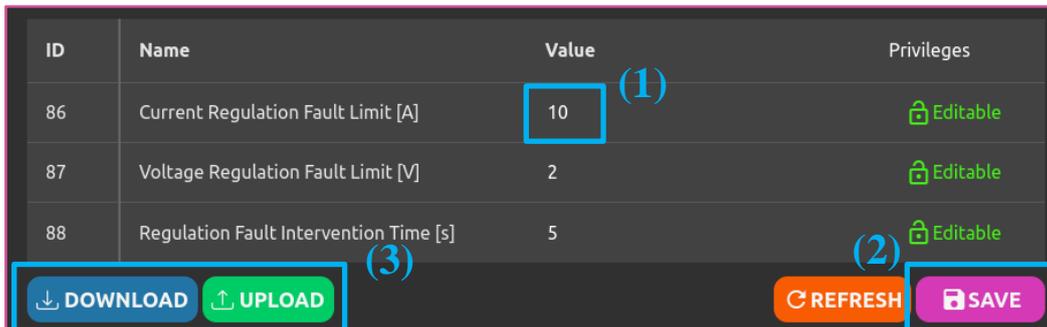
- *ID*: memory address (not editable);
- *Name*: name of the variable (not editable);
- *Value*: variable value (editable);
- *Privileges*: variable privileges (not editable).

**A *Value* can be edited by clicking on the value cell [(1) in Figure 11] and saved temporarily by pressing *Enter*. Temporarily means that it won't be saved permanently in the memory and it will be discarded if the PS is power-cycled.**

**To save the edited values permanently, use the *Save* button [(2) in Figure 11].**

**It is possible to download/upload the memory configuration by using the *Download/Upload* buttons [(3) in Figure 11].**

**Keep the same text format and file extension of the downloaded file when uploading a new memory configuration file.**



ID	Name	Value	Privileges
86	Current Regulation Fault Limit [A]	10 (1)	🔒 Editable
87	Voltage Regulation Fault Limit [V]	2	🔒 Editable
88	Regulation Fault Intervention Time [s]	5	🔒 Editable

(3) [DOWNLOAD] [UPLOAD] [REFRESH] [SAVE] (2)

**Figure 11:** Editing memory variables.

## 2.2.1 Home

From the Home page the User can access the main device information. Additionally the User can also inspect and download the Factory Acceptant Test (FAT) file.

The screenshot displays the Home page of a device control interface. The page is divided into several sections:

- STATUS:** Shows real-time readings for Current (0.000 A), Voltage (0.000 V), and Power (0.000 W). A green bar indicates the status is "OK".
- CONTROLS:** Includes buttons for Output Enable (ON/OFF), Resets faults (RESET), Regulation Loop (CC), and Setpoint Mode (NORMAL).
- SETPOINT:** Allows setting Current [A] to 5, Slew Rate [A/s] to 100, and a checked Ramp option.
- Device Info:** Lists Model (FAST-Bi-1K5 100A 20V), Serial Number (23YS1W1189), Module ID (23YS1W1189), Product Code (FB1K5100020X), and Firmware Version (1.0.02). It includes a small image of the device.
- Select FAT file:** Shows a selected file: 23YS1W1189-2024-1-31-9:28:9.
- Internal Inspection:** A table showing inspection results:

Description	Result	Passed
Screw Presence:	PASSED	✓
Fans Blowing Direction:	PASSED	✓
Mains Rocker Orientation:	PASSED	✓
LEDs Pipe Alignment:	PASSED	✓

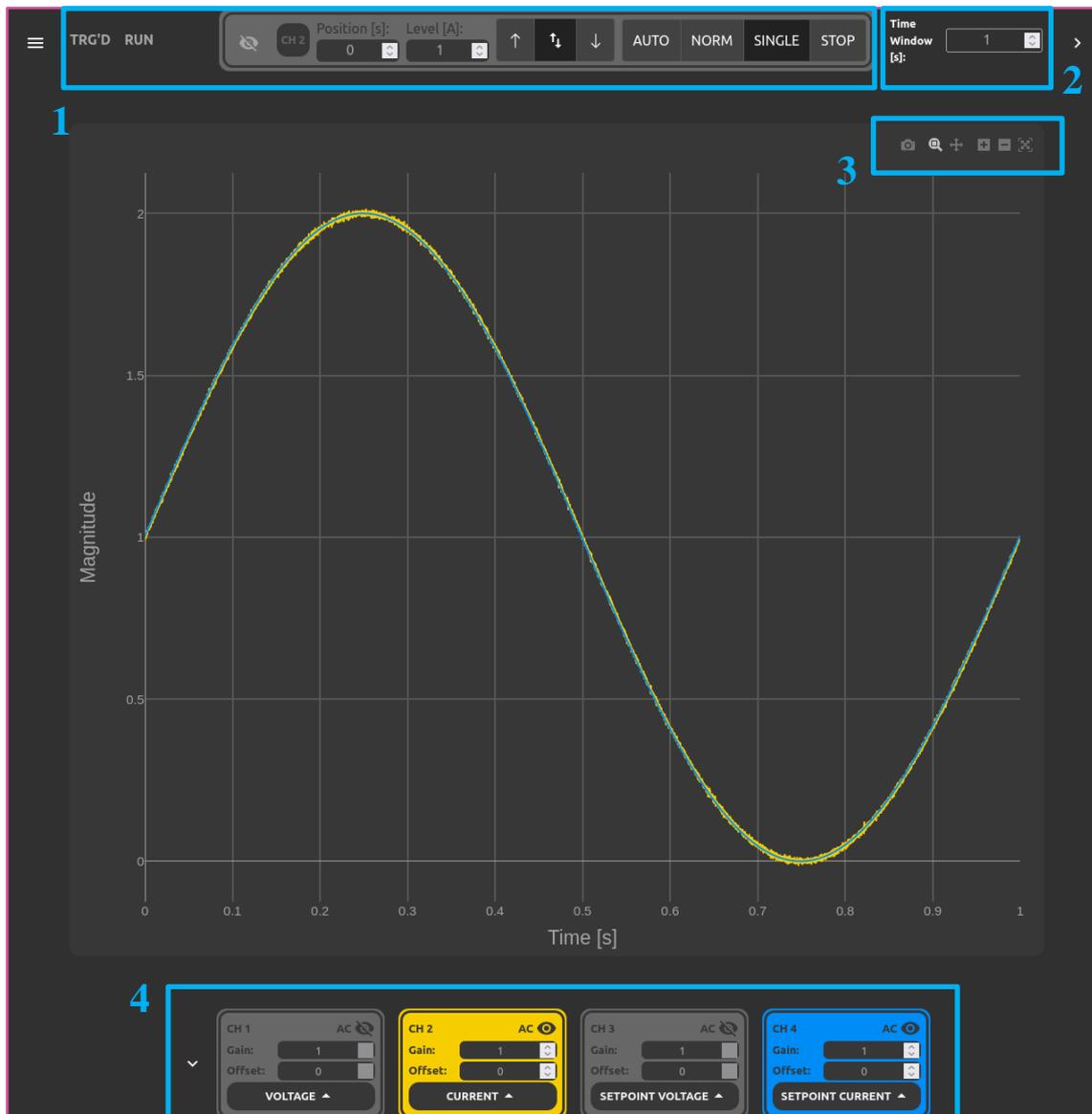
The right sidebar contains navigation links: HOME, OSCILLOSCOPE, INTERLOCKS, INTERNAL FAULTS, INTERNAL MEMORY, UPDATE, and ABOUT US. At the bottom right, there are buttons for PID, TERMINAL, MANUALS, and ADMIN.

Figure 12: Home page.

## 2.2.2 Oscilloscope

The real-time oscilloscope is an essential tool of the PS. The main oscilloscope configurations are highlighted in **Figure 13** and are the following:

1. *Trigger toolbar*: trigger indicator (on the left) and trigger configuration (on the right);
2. *Time window* configuration;
3. *Graph toolbar*: take a snapshot, zoom with cursor, moving pan, zoom in, zoom out and autoscale (buttons from left to right respectively);
4. *Channel toolbar*: from this toolbar is possible to enable/disable a channel, enable/disable the DC component and set a gain/offset.



**Figure 13:** Oscilloscope page.

### 2.2.3 Interlocks

The *Interlocks* page gives access to the interlock configuration. Possible configuration are:

1. Enable/Disable;
2. Interlock name (or label);
3. Intervention time in [ms];
4. Polarity: unchecked (fault if open) or checked (fault if closed).

The External Interlock configuration are applied and saved permanently only when the *Apply&Save* button is pressed.



**Figure 14:** Interlocks page.

## 2.2.4 Internal Faults

From the *Internal faults* page the User can access the configuration of configurable internal faults, as reported in **Figure 15**.

**Over-Current / Over-Voltage**

ID	Name	Value	Privileges
80	Output Over-Current Limit [A]	105	Editable
81	Output Over-Voltage Limit [V]	21	Editable

**Earth Leakage Fault**

ID	Name	Value	Privileges
84	Earth Leakage Threshold [A]	0.1	Editable

**Regulation Faults**

ID	Name	Value	Privileges
86	Current Regulation Fault Limit [A]	10	Editable
87	Voltage Regulation Fault Limit [V]	2	Editable
88	Regulation Fault Intervention Time [s]	5	Editable

DOWNLOAD UPLOAD REFRESH SAVE

**Figure 15:** Internal faults page.

### 2.2.5 Internal Memory

Additional advanced configurations are accessible to the User from the *Internal memory* page.

ID	Name	Value	Privileges
0	Firmware ID	FAST-BI-1K5	Read Only
1	Model	FB1K5100020X	Read Only
2	Serial Number	23Y51W1189	Read Only
3	MAC Ethernet	00-12-5E-01-29-F0	Read Only
4	MAC SFP#1	00-12-5E-01-29-F1	Read Only
5	MAC SFP#2	00-12-5E-01-29-F2	Read Only
6	Hardware Rev.	0	Read Only
7	Reserved	-	Read Only
8	Reserved	-	Read Only
9	Calibration date	25/06/2020	Read Only

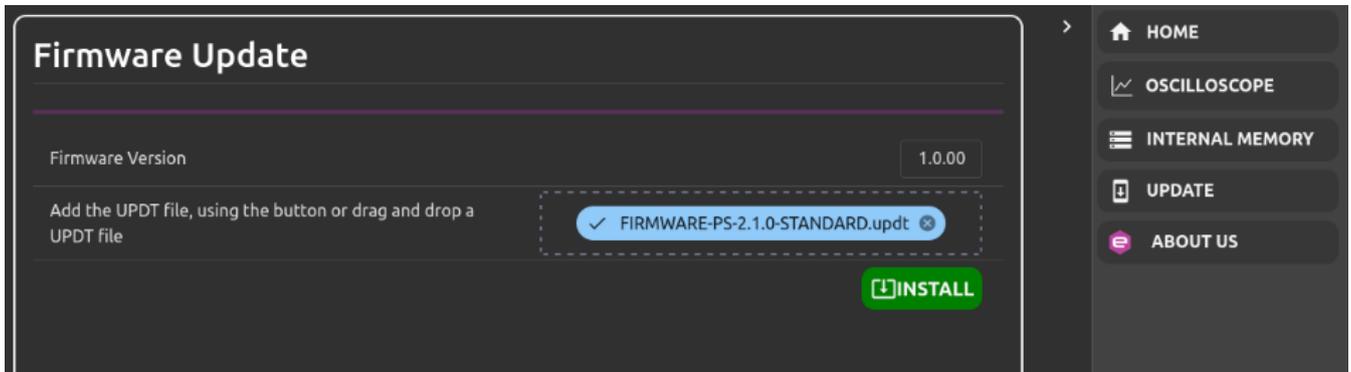
Items per page: 10 1 – 10 of 131

DOWNLOAD UPLOAD REFRESH SAVE

**Figure 16:** Internal memory page.

## 2.2.6 Update

Load the firmware file and click on *Install* button, as shown in **Figure 17**.



**Figure 17:** Upload firmware file.

**The firmware update procedure can take up to 5 minutes to complete.**

At the end of the update procedure the PS is automatically rebooted and once the reboot is completed the webpage should refresh automatically. If not, refresh the webpage manually.

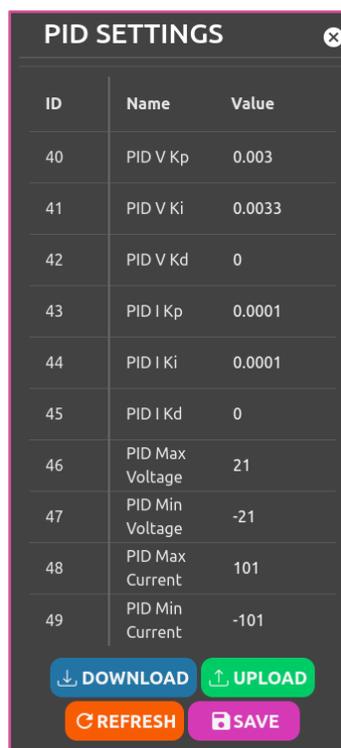
More information about the firmware update on the PS “*User’s Manual*”.

## 2.2.7 PID

By accessing the *PID page* a window will pop-up with the configurable PID settings. This window can be kept floating while operating the PS and tuning the PID.

### WARNING

- **Only experienced Users should change the PID settings.**
- **Always keep the Oscilloscope in background when changing the PID parameters in order to see the actual effect of the changed PID parameter.**
- **When tuning the PID always use small (~ 1% of Full Scale) square wave signals.**



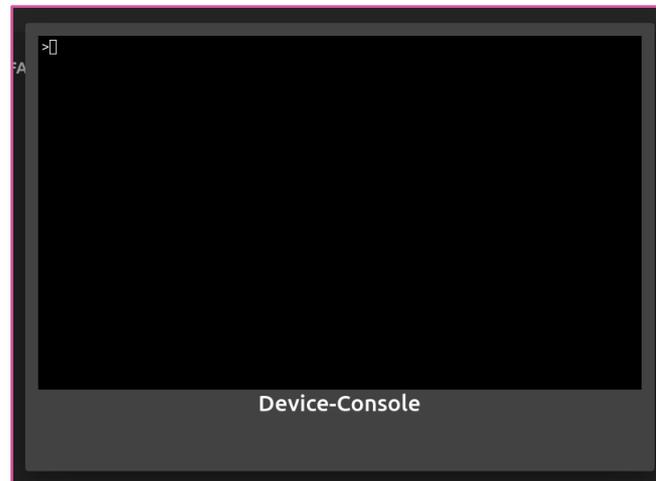
The screenshot shows a 'PID SETTINGS' window with a close button (X) in the top right corner. It contains a table with 10 rows of parameters. Below the table are four buttons: 'DOWNLOAD' (blue), 'UPLOAD' (green), 'REFRESH' (orange), and 'SAVE' (purple).

ID	Name	Value
40	PID V Kp	0.003
41	PID V Ki	0.0033
42	PID V Kd	0
43	PID I Kp	0.0001
44	PID I Ki	0.0001
45	PID I Kd	0
46	PID Max Voltage	21
47	PID Min Voltage	-21
48	PID Max Current	101
49	PID Min Current	-101

**Figure 18:** PID page.

### 2.2.8 Terminal

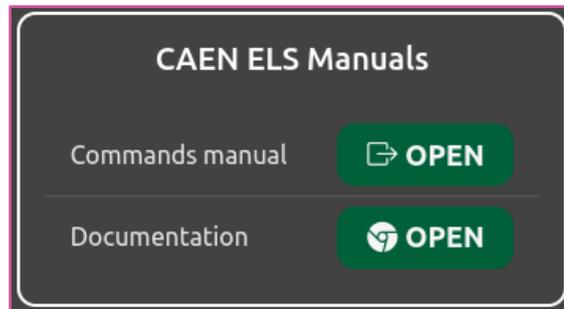
By clicking on the *Terminal* page a *Console* will open. From the *Console* the User can send direct TCP/IP commands (SCPI-like commands) to the PS. For the complete list of commands see the “*Commands Reference Manual*”.



**Figure 19:** Terminal page.

## 2.2.9 Manuals

From the *Manuals page* the User can access the PS manuals.



**Figure 20:** Manuals page.

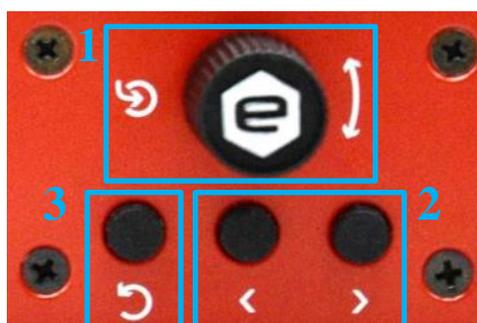
## 3. Local Control

This chapter describes the local control functionalities provided by the PS Local Display and Navigation Switch and some useful information on how to use them.

The PS can work either in LOCAL mode or in REMOTE mode. The control mode (LOCAL or REMOTE) can be set on the *Configuration Page* of the local display.

### 3.1 Navigation Switch

The front panel Navigation Switch (reported in **Figure 21**) of the PS, in combination with the Local Display, allows the user to locally control the PS.



**Figure 21: Navigation switch.**

The Navigation Switch allows the user to perform three main actions (refer to **Figure 21**):

1. Rotary encoder with central pushbutton (it will be referred as “Enter”);
2. Left and Right arrow pushbuttons;
3. Back pushbutton.

### 3.2 Local Display

The Local Display on the PS front panel is used in combination with the Navigation Switch to locally control the PS. Screens and pages of the local display can be navigated using the Navigation Switch.

By default, the Local Display will be automatically turned off after 30 minutes from the last local command or from the PS power on time.

### 3.2.1 Power-up

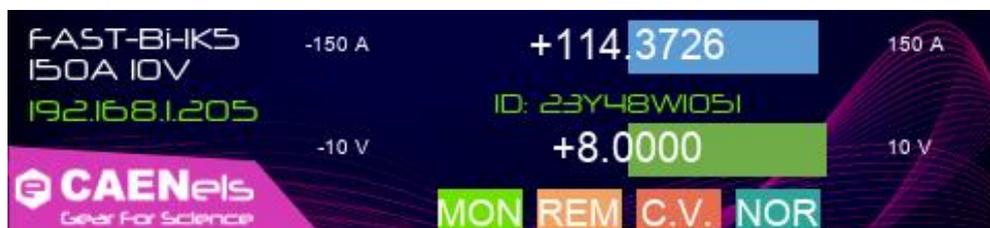
The PS, upon power-up or power-cycle, will display an empty screen until the unit embedded OS is initialized.

**Please note that this procedure will take approximately 25-seconds before the Home Screen is displayed.**

### 3.2.2 Home Screen

The PS *Home Screen* (**Figure 22**) is the main page and contains the following information:

- the PS model;
- the module IP address;
- output current readback value [A] with the light blue status bar;
- PS module ID;
- output voltage readback value [V] with the green status bar;
- four (4) indicators on the bottom side (described in the next paragraph).



**Figure 22: Home Screen**

The *Home screen* presents four indications on the bottom side of the Local Display (zoom in **Figure 23**) with the following information:

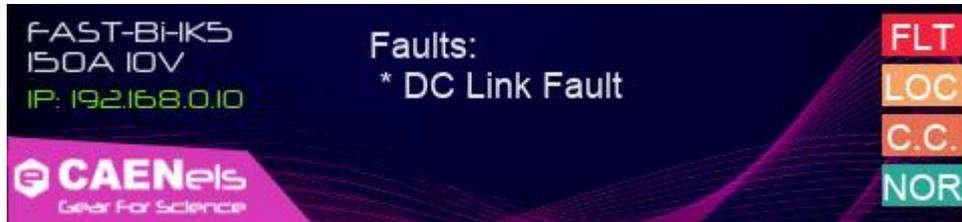
- **MON – OFF**: shows if the PS output is enabled or not;
- **REM – LOC**: shows the active control mode;
- **C.C. – C.V.**: shows the active regulation mode;
- **NOR – WAV – AIN – SFP**: shows the active setpoint mode.

For more information on the modes of operation see **section** Errore. L'origine riferimento non è stata trovata..



**Figure 23: Home Screen indicators**

If the PS has experienced one or more faults – e.g. interlock intervention, over-temperature, DC-Link, etc. – the *Home Screen* would display a list the faults (as reported in **Figure 24**).

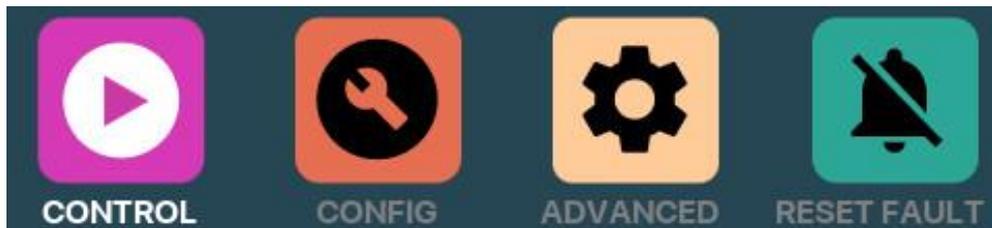


**Figure 24: LCD faults.**

### 3.2.3 Menu Page

The *Menu page* is reachable by performing any action on the navigation switch when in the *Home Screen*.

The *Menu Page* gives access to all the local features of the PS. There are four options that can be selected as shown in **Figure 25**:



**Figure 25: Menu Page.**

The accessible sub-pages and/or actions from this page are hereafter listed (note that the selected sub-page is lightened in a lighter shade):

- **CONTROL** – *sub-page*;
- **CONFIG** – *sub-page*;
- **ADVANCED** – *sub-page*;
- **RESET FAULTS** - *action*;

The access to each sub-page (or action) is necessary to highlight the selected rectangle by using the encoder or the arrows of the navigation switch and press the “Enter” button.

The **Reset faults** rectangle, once pressed, resets the status register of the power supply and sends back to the visualization of the *Home Screen*.

### 3.2.4 Control Page

The *Control Page* is reachable by selecting the corresponding rectangle from the *Menu Page*.

The *Control Page* gives access to the main settings of the PS. An example of a *Control Page* visualization is shown in **Figure 26**:



Figure 26: Control Page.

**From this page it is possible to turn the PS output ON and OFF and to set the output current or voltage (depending on the regulation mode, C.C. or C.V.).**

Actual values of output current and output voltage (readbacks) can be reported on the right side.

### 3.2.5 Config Page

The *Config Page* is reachable by selecting the corresponding rectangle from the *Menu Page*. This page allows the user to set the PS modes of operation.

An example of a *Config Page* visualization is shown in **Figure 27**:



Figure 27: Config Page.

### 3.2.6 Advanced Page

The *Advanced Page* is reachable by selecting the corresponding icon from the *Menu Page*. An example of an *Advanced Page* visualization is shown in **Figure 28**:

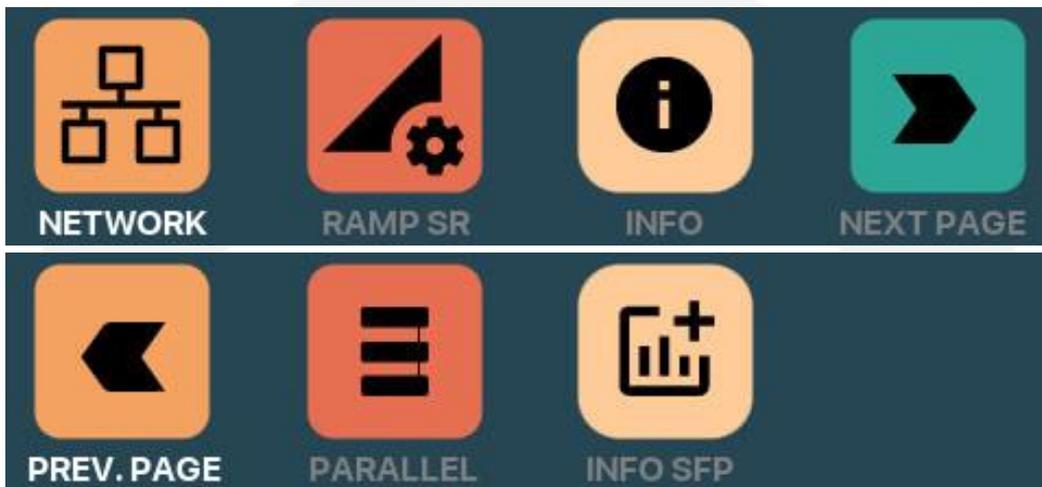


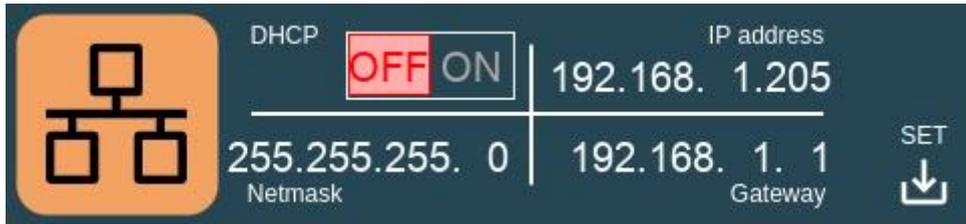
Figure 28: Advanced Pages. Top: page 1, bottom: page 2.

The accessible sub-pages and/or actions from this page are hereafter listed (note that the selected sub-page is lightened in a lighter shade):

- **NETWORK** – *sub-page*;
- **RAMP SR** – *sub-page*;
- **INFO** – *sub-page*;
- **NEXT PAGE** - *action*;
- **PREV. PAGE** - *action*;
- **PARALLEL** – *sub-page*;
- **INFO SFP** – *sub-page*;

The access to each sub-page (or action) is necessary to highlight the selected rectangle by using the encoder or the arrows of the navigation switch and press the “Enter” button.

The Network sub-page is reported in **Figure 29**.



**Figure 29: Network sub-page.**

This page allows to locally set the power PS IP address, the Network Mask and the Gateway. Alternatively, the user may select “DHCP ON” and the Network configuration will be automatically assigned by DHCP server (if present).

To change the Network configuration, use the Navigation Switch and complete the operation by placing the cursor on the “SET” icon and by pressing *Enter*. **Wait some seconds for the configuration to be applied.**