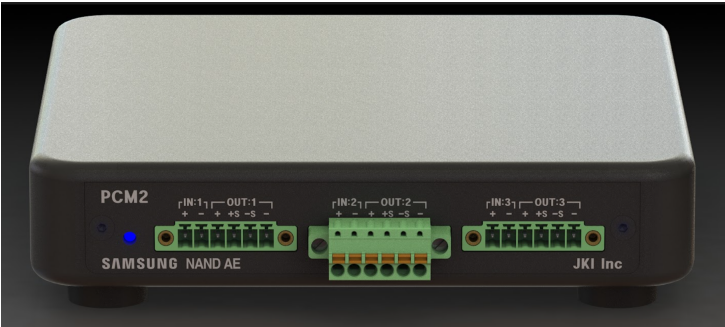


JKI DC Power Analyzer

User Manual

Applicable Product: PCM2



Version 2.1

JKI Inc.

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Version History

Version	Date	Remarks
1.0.0	2022-06-15	Draft release.
1.1.0	2022-07-27	Added current sort.
2.0.0	2022-10-13	Added sort options and refactoring Command Line Interface.
2.1.0	2022-12-13	Added Inter-process communication in Command Line Interface.

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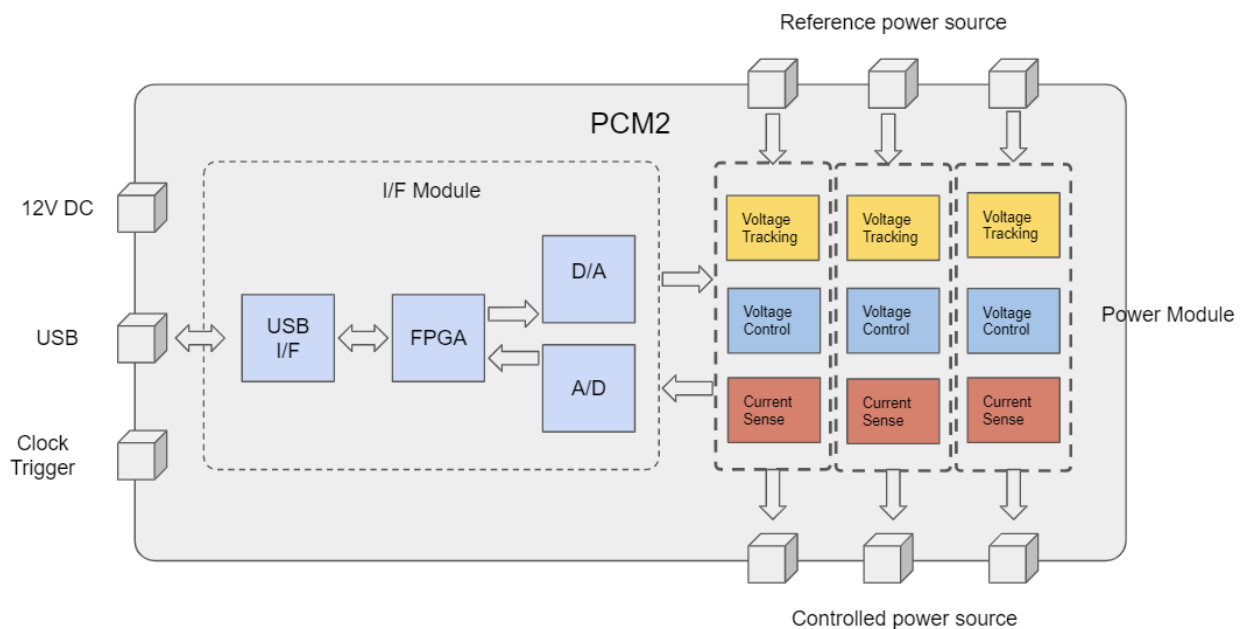
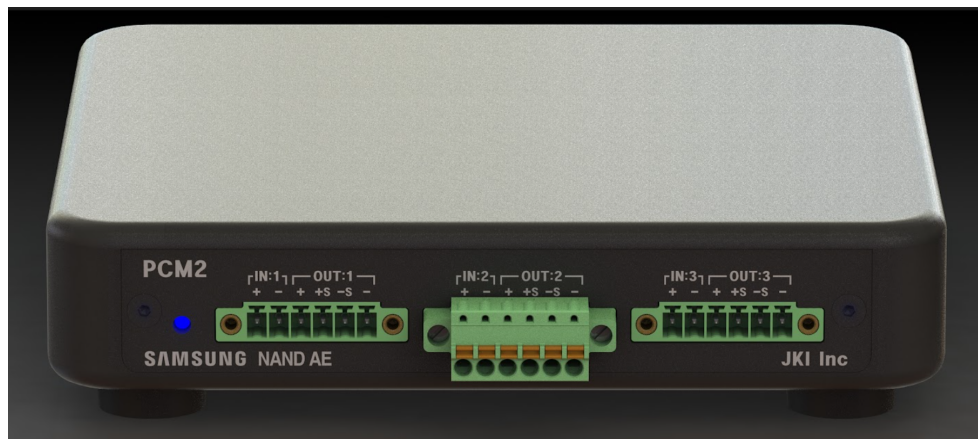
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1. Overview

1.1. Description

The PCM2 DC Power Analyzer provides unrivaled productivity gains when sourcing and measuring DC voltage and current into a DUT. The JKI PCM2 DC Power Analyzer is a highly integrated instrument that combines up to three advanced DC power supplies, DMM, oscilloscope and datalogger. It provides an easy-to-use interface, with all sourcing and measuring functions available from the USB interface.

JKI precision power modules provide precise control and measurements in the milliampere and microampere region with the ability to simultaneously digitize voltage and current. Analyze captured voltage and current measurements over time like an oscilloscope.



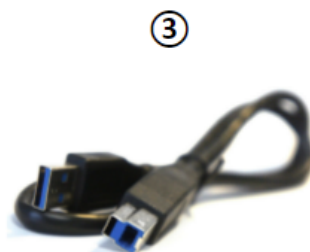
1.2. Features

- Ideal for R&D testing and design validation
- Sources and measures DC voltage and current into your device under test (DUT)
- Combines up to three DC power supplies, DMM, oscilloscope and data logger in one integrated instrument
- Log data for seconds, minutes, hours, or even days to see current/power consumption or capture anomalies
- Track input reference voltage to source voltage and current into DUT with same level and adding offset voltage
- Connect via USB 3.0
- Software supports via GUI & CLI mode

1.3. Included Components

※ Kits Components ※

- | | |
|----------------------------|-----------------------------|
| ① DC Power Analyzer (PCM2) | ② Terminal Block Cable x3ea |
| ③ USB 3.0 Cable (B-Type) | ④ DC Power Adapter (12V/2A) |



2. Software Installation

2.1. Download

The DC power analyzer software is provided free of charge and can be installed on as many machines as you want. The latest release of the software can be downloaded via the given file.

2.2. Supported Operating Systems

The PCM2 software is supported in the following operating systems.

- Windows 7 (x86/64)
- Windows 10 (x86/64)
- Windows 11 (x86/64)

2.3. Installation

No installation process is required, just unzip the provided compressed file and copy it to any folder.

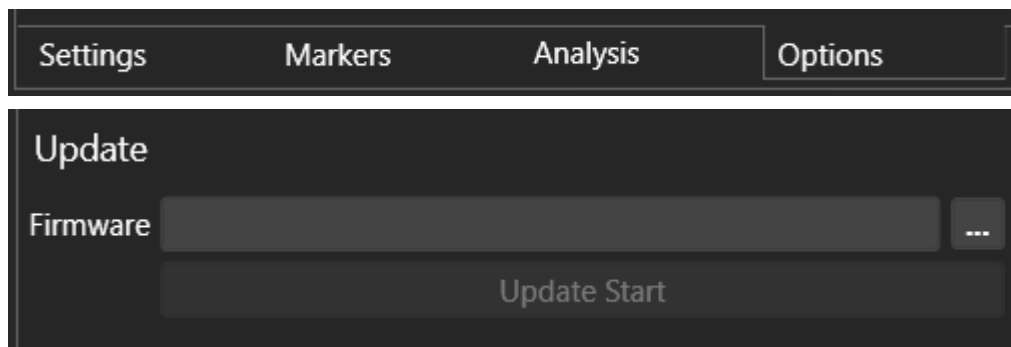
2.4. Firmware Updates

If you need to update the firmware such as bug fixes, you can update the firmware through the PCM2 software.

Precautions

- Do not operate/change the power or USB connection during the update.
- The update process takes about 1 minute to complete.
- The firmware works with proper S/W version, so avoid using mixed versions.

How to update



- Disconnect all output cables before firmware update.
- In PCM2 software, connect to the device.
- In the Option tab, specify the firmware file(.bin) and click the update button to start.
- If the update fails due to power or USB disconnection, try again from the beginning.
- After the update, reboot to apply the new firmware.

3. Getting Started

3.1. Setup

Caution: Turn-off the instrument before connecting the cables.

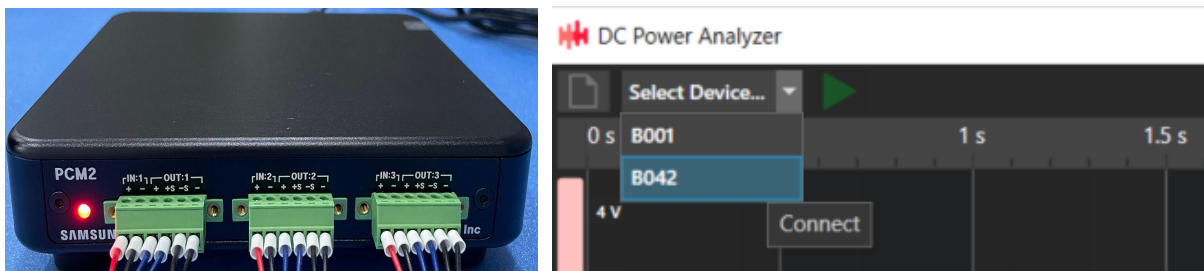
1. Connect one or more terminal block cables to the instrument.
2. Connect one or more signal wires to the DUT as you wish to measure.
3. Connect the included 12V power adapter to the DC IN terminal on instrument.
4. Connect one end of the included USB cable to the instrument.
5. Connect the other end of the USB cable to the PC's USB port.



To learn more, see the [Accessories and Connection Guide](#) section of the User Guide.

3.2. Initiate

1. Turn on the instrument's power switch
2. Make sure the status LED is turned on and the LED will be lit Red.
3. Start the PCM2 software.
4. Click "Select device..." and select an instrument to connect.
5. The status LED will be lit Green.

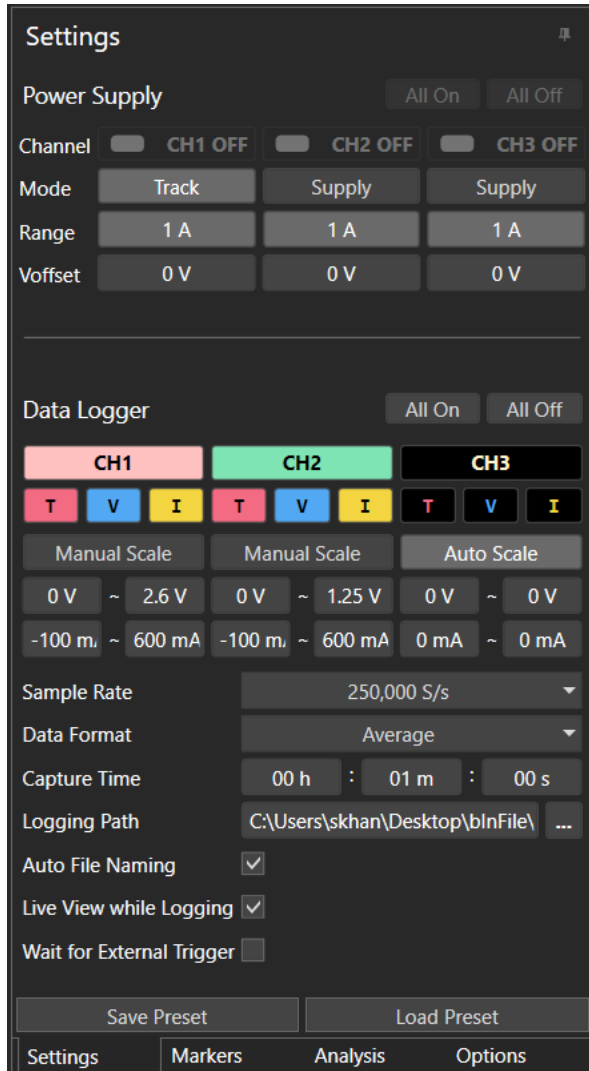


Color	Status	Description
Red	Power On	When the power is turned on, the status LED will be lit red.
Green	Connect	If connected to the PC via USB, the status LED will be lit green.
Blue	Capture	During Capture, the status LED will be lit blue

3.3. Configure

Before you use the power analyzer, click on the Settings tab to configure the power analyzer. Select the power supply settings and data logger settings relevant to your preferred source and capture parameters.

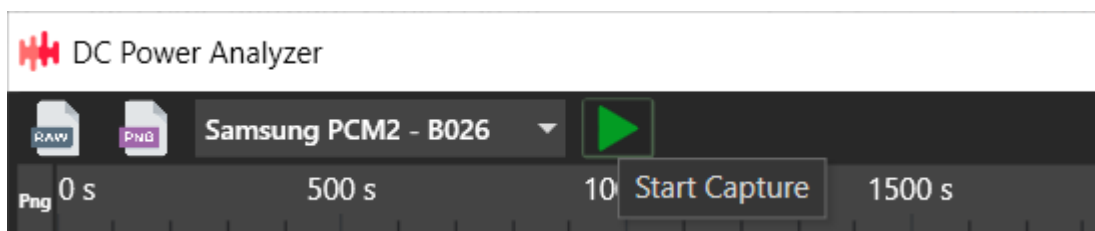
Caution: the power supply channel's toggle button controls the instrument's output power immediately.



To learn more, see the [Device Settings](#) section of the User Guide.

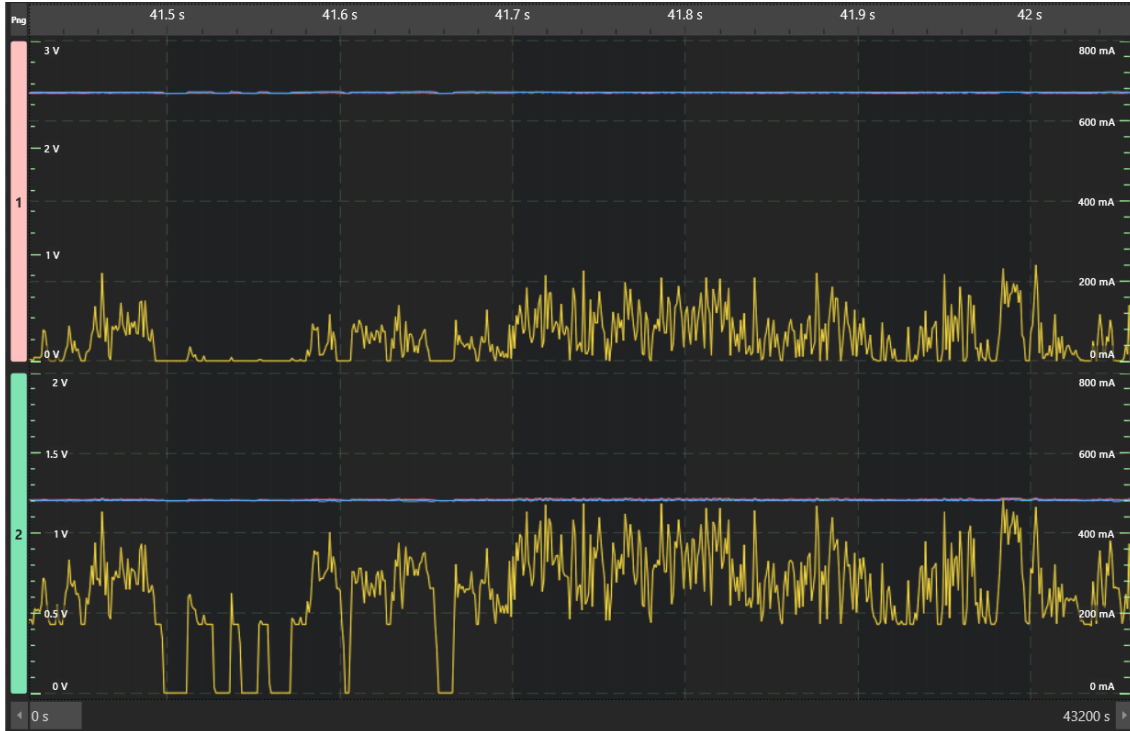
3.4. Record

Click the **Start button** to begin recording data from the data logger.



3.5. Navigate

Once you have captured data, you can zoom in and out of your captured data by using your mouse wheel. Click-and-drag in the viewport or use the Mouse right Click-and-drag in the waveform surface to pan left and right.



To learn more navigation actions, see the [Keyboard Shortcuts](#) & [Navigating the Software](#) sections of the User Guide.

3.6. Analyze

Once you have captured data, you can analyze, trim or export your data.



To learn more, see the [Analyzing & Exporting Data](#) sections of the User Guide

4. Using Power Analyzer

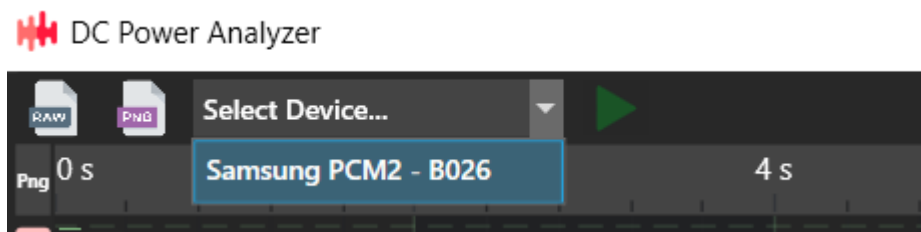
4.1. Navigating the Software

The PCM2 software consists of the following sections.



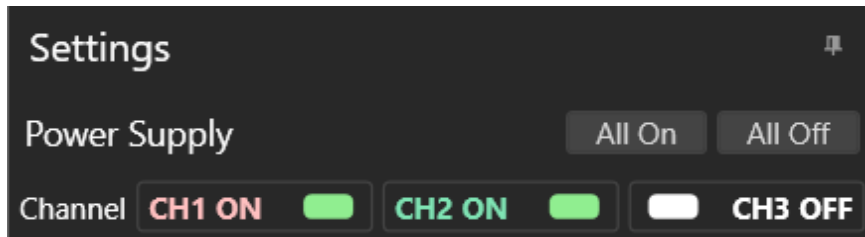
Connecting the Power Analyzer

1. Open the PCM2 software.
2. Connect the included 12V power adapter to the DC IN terminal on PCM2.
3. Connect one end of the included USB cable to the PCM2.
4. Connect the other end of the USB cable to the PC's USB port. Ensure that the proper USB port is used for the specific device. Due to the amount of bandwidth required, it is recommended to directly connect to the PC's USB port rather than through a docking station or a USB hub.
 - PCM2 requires a USB 3.0 port
 - Only one-to-one connections at a time
5. After selecting the device in the software, the PCM2 led will light green and it is ready to use.

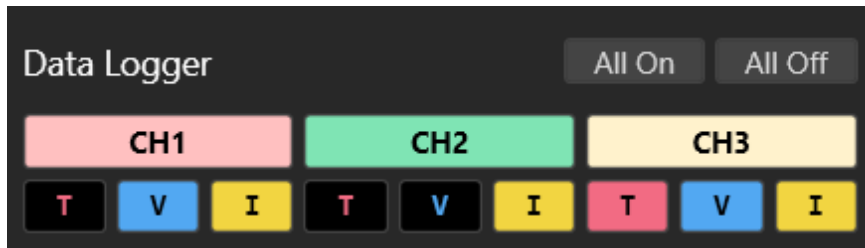


Enabling and Disabling Channels

- Use the Settings panel to enable or disable the power supply channels.



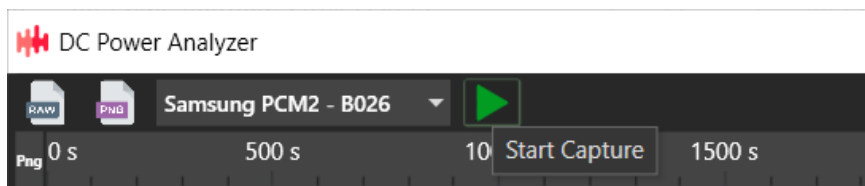
- Use the Settings panel to enable or disable the data logger channels.



The Start Button

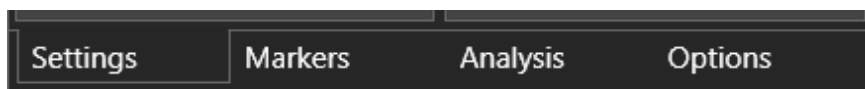
Click the green "Start" button to begin a data capture.

This would begin capturing data from its enabled channels. After the capture has started, you can stop it before it finishes, which will retain the data to that point.



Side Panel Buttons

The side panel buttons offer various ways to configure your power analyzer settings, markers, analysis tools and options. More information on these settings can be found in the next articles.

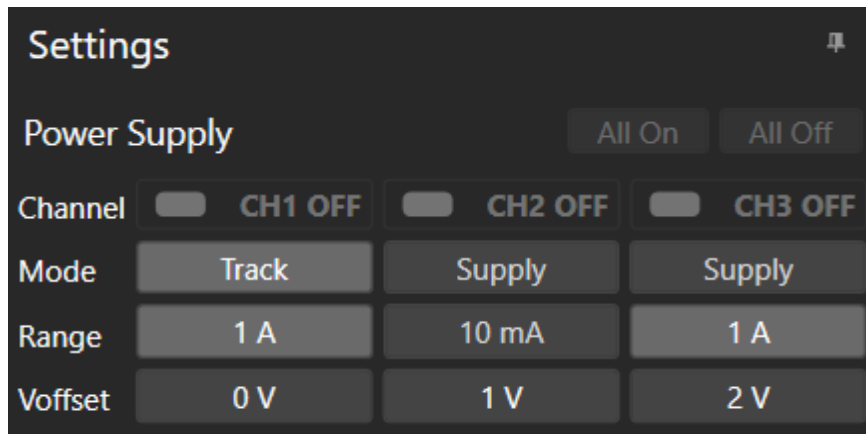


4.2. Device Settings

The Device Settings Panel can be opened up by clicking on the “Settings” tab located on the software's side panel on the right.

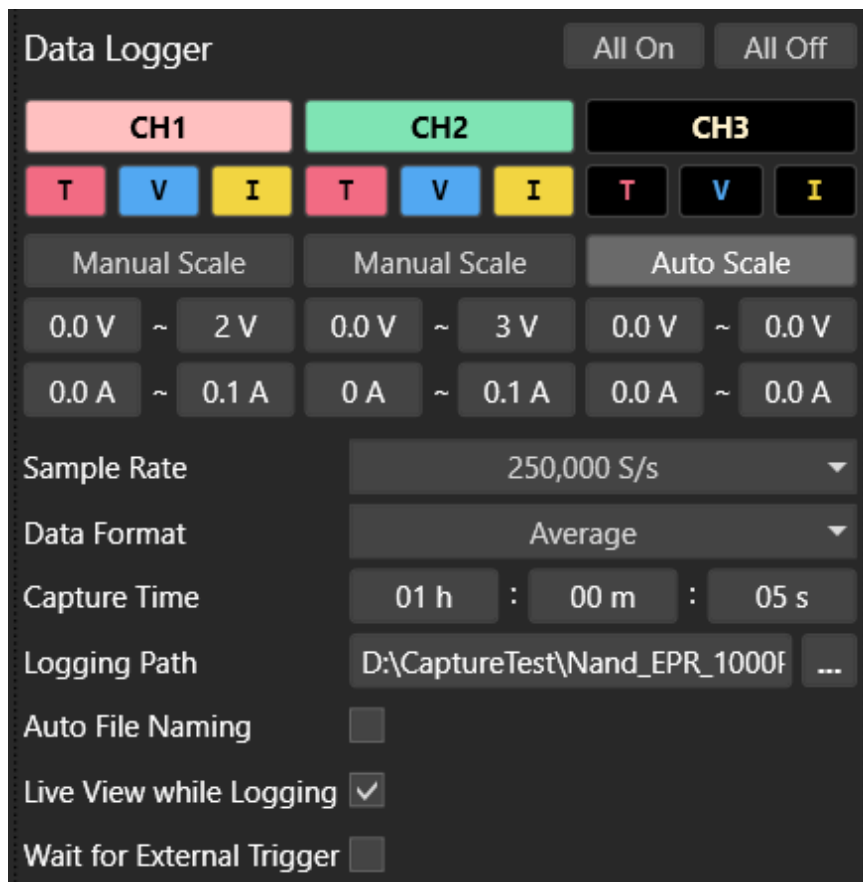


Power Supply Settings



- Power Channel Selection
 - Individual channels can be enabled and disabled.
 - **Caution: the power supply channel's toggle button controls the instrument's output power immediately.**
- Power Mode Selection
 - **Track mode: the output voltage is synchronized to the input track pin voltage.**
 - **Supply mode: the output voltage is not synchronized to the input track pin voltage.**
- Current Range
 - 1A current range
 - 10mA current range
- Voffset Voltage
 - **at Track mode: Voffset value is added to the input track voltage.**
 - **at Supply mode: Voffset value is output as is.**

Data Logger Settings



Data Logger [All On] [All Off]

CH1			CH2			CH3		
T	V	I	T	V	I	T	V	I
Manual Scale			Manual Scale			Auto Scale		
0.0 V ~ 2 V			0.0 V ~ 3 V			0.0 V ~ 0.0 V		
0.0 A ~ 0.1 A			0 A ~ 0.1 A			0.0 A ~ 0.0 A		

Sample Rate: 250,000 S/s

Data Format: Average

Capture Time: 01 h : 00 m : 05 s

Logging Path: D:\CaptureTest\Nand_EPR_1000f ...

Auto File Naming: ☐

Live View while Logging: ☒

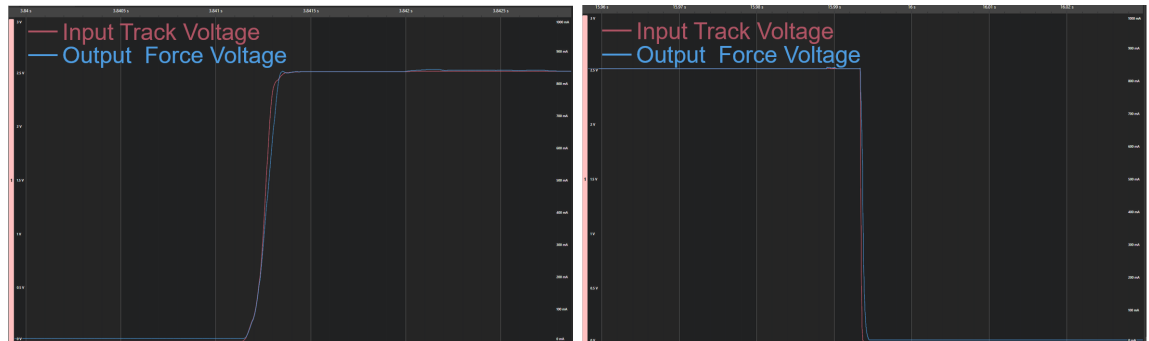
Wait for External Trigger: ☐

- **Logger Channel Selection**
 - Individual channels can be enabled and disabled.
- **T/V/I Logging Selection**
 - Logging data selection for each channel
 - T: input track voltage for each channel
 - V: output voltage for each channel
 - I: output current for each channel
- **Y-Axis Scale**
 - auto scale: automatically scaling Y-Axis display range
 - manual: manually setting Y-Axis display range for Voltage and Current
- **Sample Rate**
 - set data logger sample rate
 - 1 KS/s ~ 250 KS/s
- **Data Format**
 - All: save all data (min/max/average) - only available under 25 KS/s.
 - Average: save average data only (over-sampling)
 - Sample: save sampling data only (not averaging)
- **Capture Time**: set the capture time (hour/min/sec)
- **Logging Path**: set the logging file name
- **Auto File Naming**: automatically changing the logging file name for each run
- **Live View while Logging**: automatically drawing waveform while capturing data (this option might decrease logging performance)
- **Wait for External Trigger**: wait starting capture for external trigger event

4.3. Power Modes

Track Mode

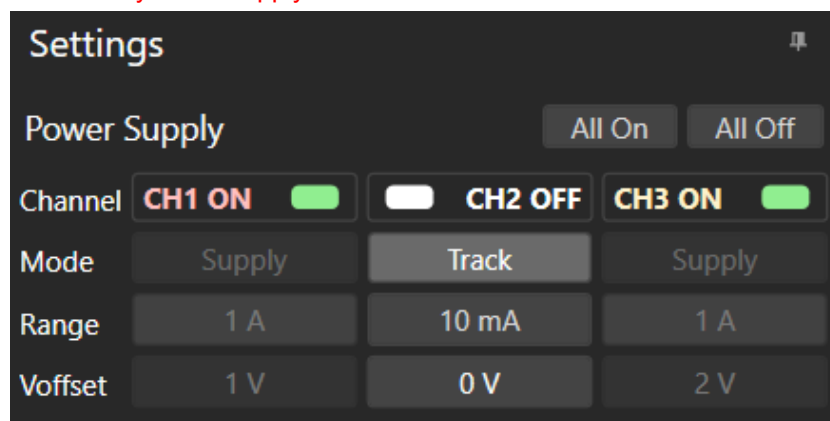
To use the track mode, connect the input track pin of the terminal block to the track power of DUT. When the track mode is enabled, the output voltage is synchronized to the input track voltage like below ramp-up and ramp-down waveform.



Supply Mode

When the supply mode is activated, the voltage is sourced as output with the value set in the Voffset field regardless of the state of the track input pin.

Caution: the power supply channel's toggle button controls the instrument's output power immediately in the supply mode.



4.4. Capture Modes

Timer Mode

The timer mode is the simplest mode of data capture. A pre-defined duration is set by the user and the capture will end once the duration is reached. This mode is the default mode and operates when the Wait for External Trigger in Settings is unchecked.

Trigger Mode

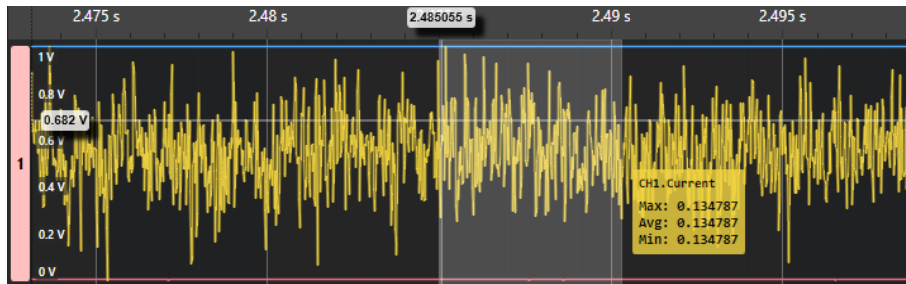
The trigger mode will continuously wait data until a trigger is found on the trigger-in port. It operates when Wait for External Trigger in Settings is checked.

4.5. Navigating Your Data

In the PCM2 software, several methods exist for navigating your data. Here are some of the most common methods.

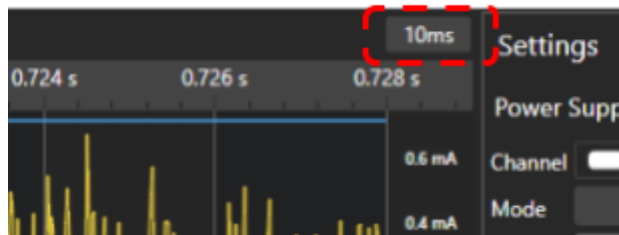
Zooming a Region

- Marquee zoom (i.e. zooming in by drag-selecting a region of the waveform) is available.



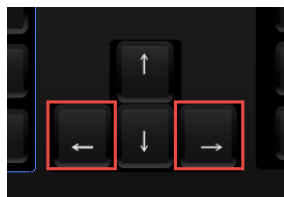
Zooming In and Out

- To zoom in and out, use your mouse wheel.
- Left mouse click and drag (only zoom in)
- Changing the time scale value



Panning Left and Right

- To pan left and right, click and drag the display.
- Use the left/right arrow keys to shift the screen by $\frac{1}{4}$ of visible range
- Use the page up/down keys to shift the screen by 1 of visible range



Scrolling

- Mouse click and drag on the scrollbar. (the waveform is updated when the button is released.)

4.6. Timing Markers

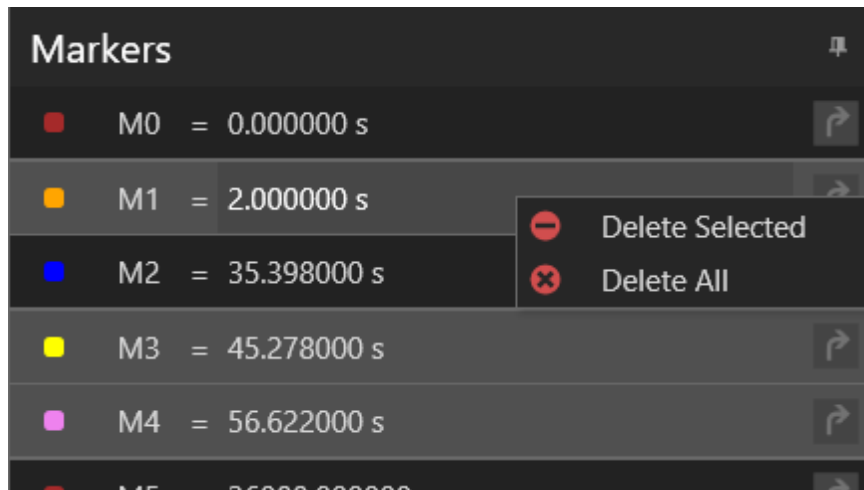
The Markers Panel can be opened up by clicking on the “Markers” tab located on the software's side panel on the right.



Adding and Deleting

By clicking the time bar at the top of the software, the marker can be added.

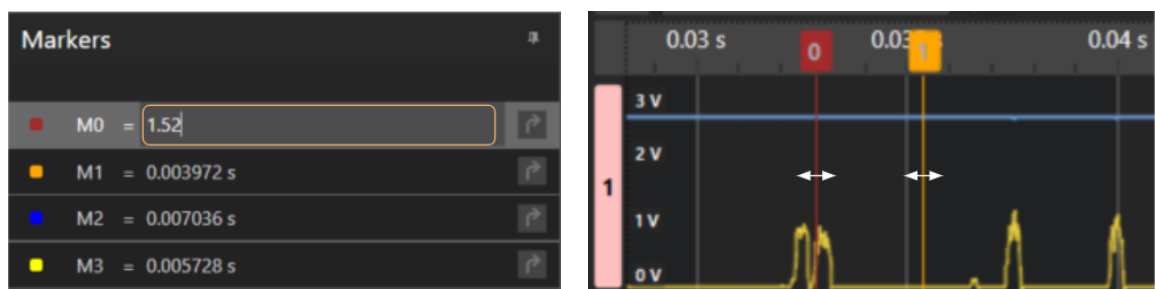
By right-clicking the items on the Marker Panel, you can delete the selected or all markers.



Editing and Moving

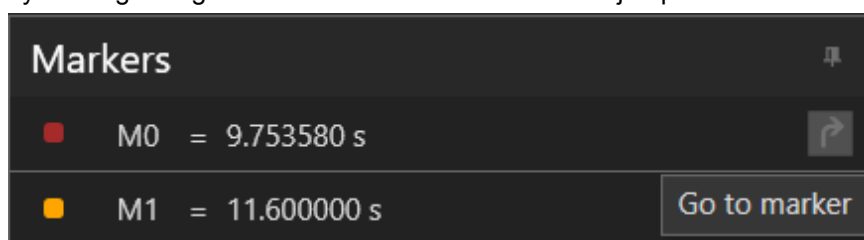
By double clicking and editing the time at each marker can change the marker location.

By clicking and dragging each marker can also change the marker location.



Goto Marker

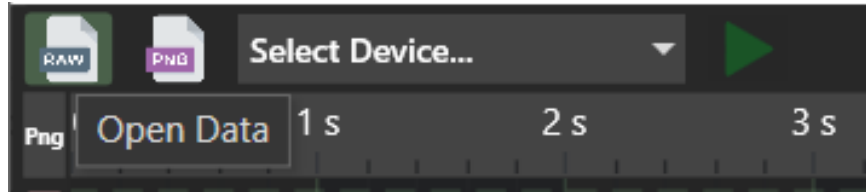
By clicking the "go to" icon at each marker item can jump to the marker location.



4.7. Capture & Preset File Management

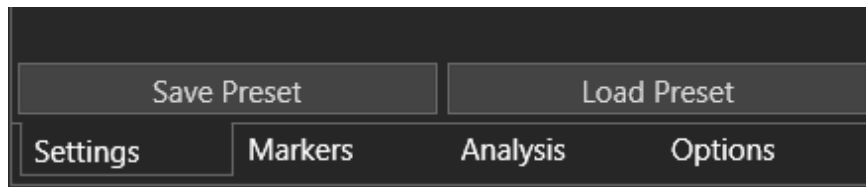
Saving & Opening Captures (*.jpa)

Capture files are automatically saved as logging paths when you start and stop capturing. To open an existing capture file (.jpa file format), click "Open Capture." button.



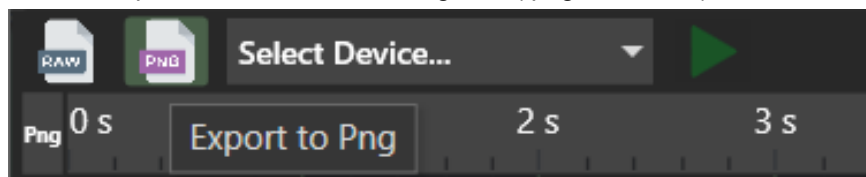
Saving & Opening Presets (*.json)

The most recently used capture settings should be automatically loaded in the PCM2 software upon opening the app. You can also save and load capture settings presets as needed.

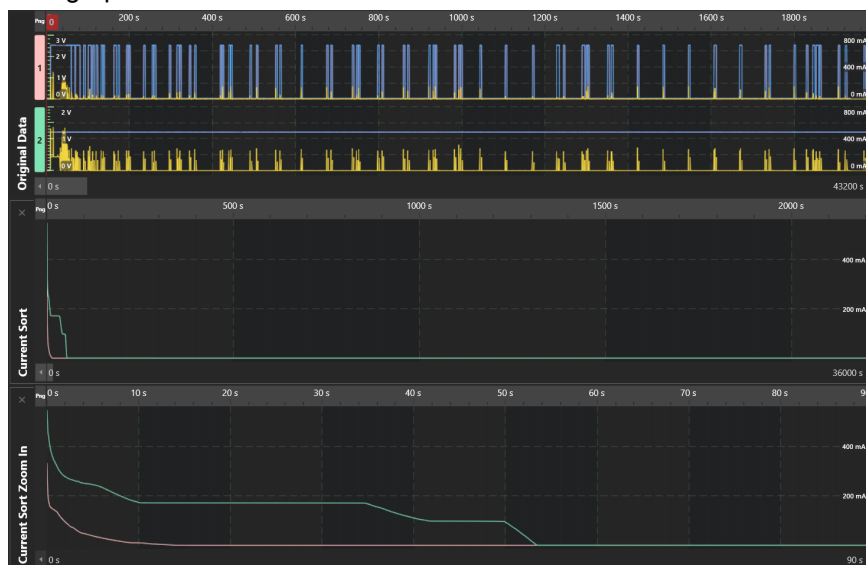


Saving Captures (*.png)

You can export the screen as an image file (.png file format).



You can also export as an image file by clicking the Png button on the left side of the time axis of each graph.



4.8. Analyzing & Exporting Data

The Analysis Panel can be opened up by clicking on the “Analysis” tab located on the software's side panel on the right.



Analyzing Statistics

The PCM2 software can analyze statistics (minimum/maximum/average) of each voltage and current channel from the capture file. To analyze the data, select a marker to specify a start and end point and press the “Analyze” button. To go to the min/max sample location, double-click each cell on the data grid.

Trimming Data

The PCM2 software allows trimming of the entire data entries from the existing capture file to a new capture file format. To trim the data, select a marker to specify a start and end point and press the “Trim” button.

Exporting Data to CSV

The PCM2 software allows exporting of the entire data entries from the capture file to csv file format. To export the data, select a marker to specify a start and end point and press the “Export” button.

Current or Power Sorting

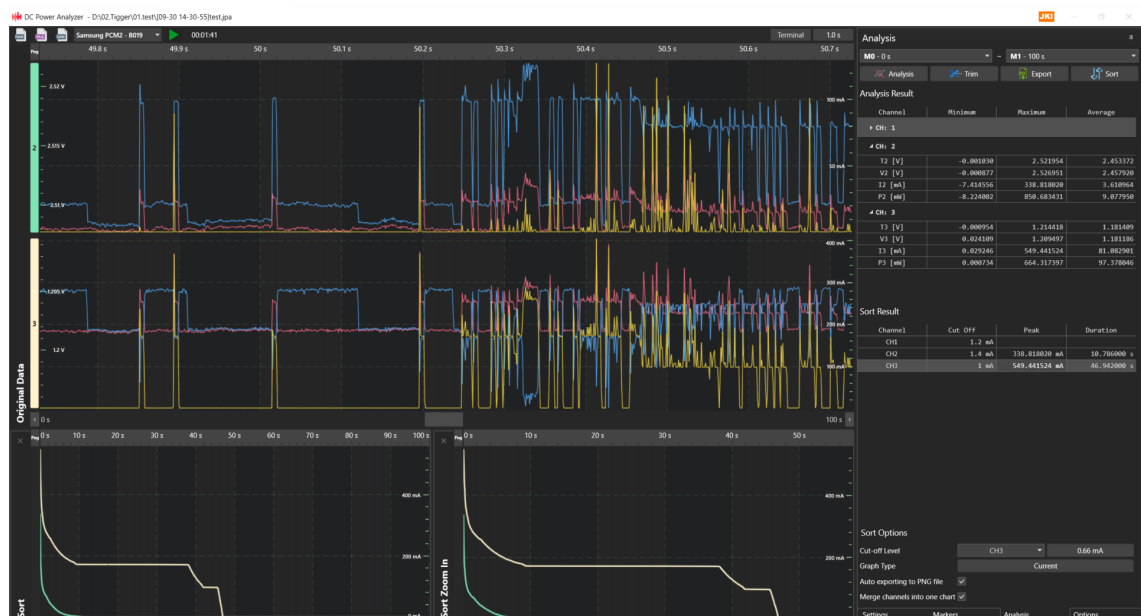
The PCM2 software allows sorting the current graph in descending order, select a marker to specify a start and end point and press the “Sort” button.

- **Cut-Off Level:** in the sorted graph, cut below the current value of the set channel and draw a graph.
- **Graph Type:** Select whether to use power or current data when sorting.
- **Auto exporting to PNG file:** after sorting is completed, the image file is saved in the same location with the same name as the current capture file.
- **Merge channels into one chart:** when using multiple channels, it is displayed on one graph.
- **Sort Result:** In the sort result table, you can check the maximum value for each channel and the duration that reached the set **Cut Off** value.

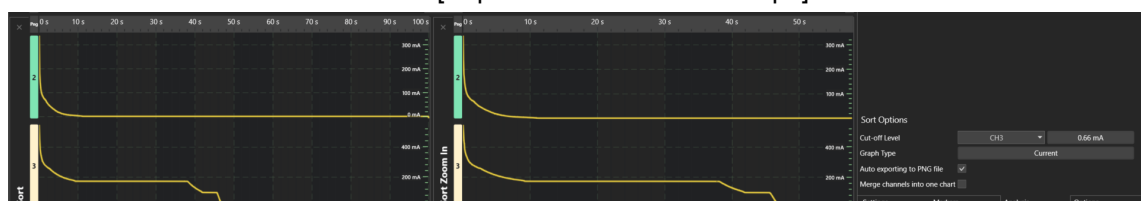
[Sort Result]

Channel	Cut Off	Peak	Duration
CH1	1.2 mA		
CH2	1.4 mA	338.818020 mA	10.786000 s
CH3	1 mA	549.441524 mA	46.942000 s

[Merged Current Sort Graph]



[Separated Current Sort Graph]



4.9. Running in CLI Mode

The PCM program support these two types of command-line interface mechanisms:

- **Command Line Sessions:** to provide their own prompt and accepting command lines after launch.

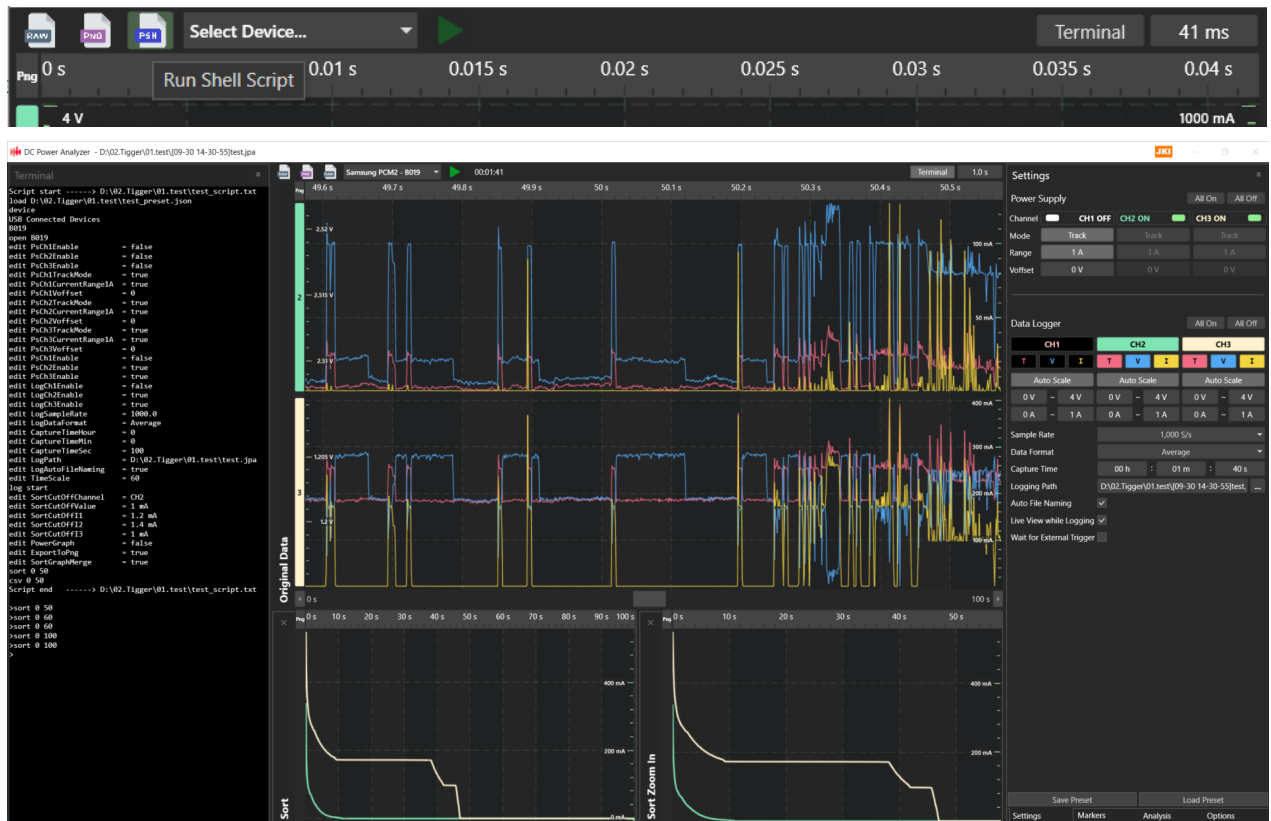
The UI can be manipulated using the commands defined below, and tests can be automated by creating a script file.

Script files can be executed by using the run command in the terminal or by clicking the “Run Shell Script” button on the upper left of the UI.

- **Inter-process communication:** Provides an independent means to enter commands to the operator after execution.

The PCM2 software supports to automate other application programs and PCM together in Windows.

[Run Command Line Sessions script]



[Script execution using inter-process communication]

```
C: > Users > jyeel > Desktop > pcmBat.bat
1  rem Other application behavior1 ...
2
3  rem Execute Command Line Session Script from PCM
4  "D:\PCM2\PCM2.exe" "D:\Script\Test1.psh"
5
6  rem Other application behavior2 ...
7
8  rem Execute Command Line Session Script from PCM
9  "D:\PCM2\PCM2.exe" "D:\Script\Test2.psh"
10
```

Option	Option value	Description
run	Script file path	Run script
abort	-	Abort script
device	-	Show the connected devices on PCM terminal
open	Board ID	Connect & initialize to the specified device
load	Preset file path	Load the preset file
print	-	Print the preset parameters
edit	Key=value, ...	Edit the preset parameters
log	start or stop	Start or stop the data logging
sort	t1 t2 or stop	Sort t1 ~ t2 data in descending order
csv	t1 t2 or file path or stop	t1 t2: Export t1 ~ t2 range data to csv file file path(.jpa): Export all range data to csv file

4.10. Keyboard Shortcuts

Key	Description
Home	Jump to the start of waveform
End	Jump to the end of waveform
Page up	Move right by 1 of visible range
Page down	Move left by 1 of visible range
Right Arrow Keys (→)	Move right by ¼ of visible range
Left Arrow Keys (←)	Move left by ¼ of visible range
Ctrl + OemTilde (~, `)	Open or close terminal

5. Product Specifications (**Preliminary**)

5.1. Power Module Specifications

Track Voltage Range	0 ~ 3.6 V
Output Voltage Range	0.2 ~ 3.6 V
Max. Output Current	~ 1 A
Ripple & noise (p-p / rms)	10 mV / 2mV
Voltage Programming Resolution	76.294 μ V
Voltage Measurement Resolution	38.146 μ V
Current Measurement Resolution	22.89 μ A (@1A Range) 228.9 nA (@10mA Range)
Voltage Programming Accuracy	0.1% + 5 mV
Voltage Measurement Accuracy	0.1% + 5 mV
Current Measurement Accuracy	0.2% + 400 μ A (@1A Range) 0.2% + 40 μ A (@10mA Range)
Load Regulation	40mV (@600mA Transient Response)
External Trigger IN (SMA Port)	0.8V (VIL Max) / 2.0V (VIH Min)
External Trigger OUT (SMA Port)	0.4V (VOL Max) / 2.9V (VOH Min)

5.2. Mainframe Key Characteristics

Host Interface	USB 3.0
Power Supply	100 VAC – 240 VAC (DC 12V / 2A)
Operating Temperature	0 °C to 55 °C
Relative humidity	Up to 95%
Dimensions	157 mm x 157 mm x 30mm (W x L x H)
Net Weight	1.0 kg

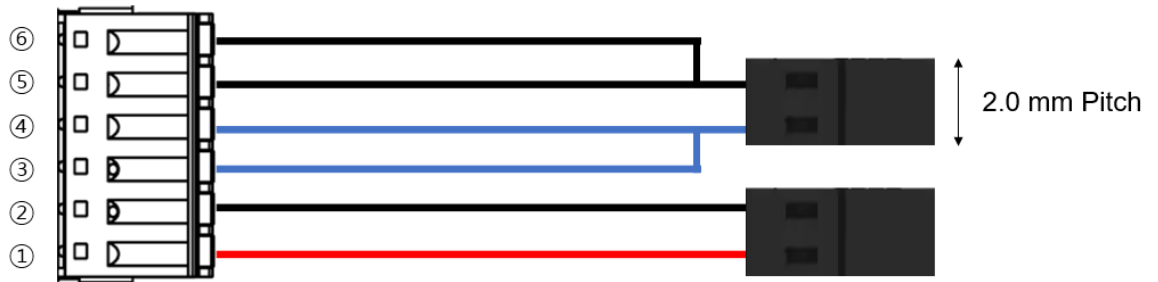
5.3. Ports Description



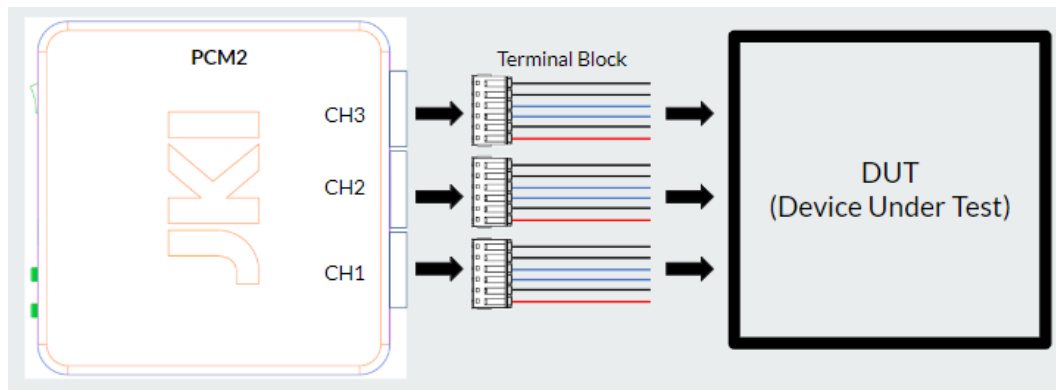
- | | | |
|---------------|------------------|------------------|
| ① Status LED | ② Terminal Block | ③ ON/OFF Switch |
| ④ Power Input | ⑤ USB 3.0 Port | ⑥ Trigger In/Out |

5.4. Accessories and Connection Guide

Terminal Block Assembly



Connecting Terminal Block to DUT



Terminal Block Pin Description

PIN	Name	Function	DUT Connection
1	IN (+)	Input Track	In Track mode, connect to the track power of DUT. In Supply mode, this pin can be opened.
2	IN (-)	GND	Connect to the Ground pin of DUT.
3	OUT (+)	Output Force	Connect to the Power pin of DUT.
4	OUT (+ S)	Output Sense	Connect to the Power pin of DUT.
5	OUT (- S)	GND Sense	Connect to the Ground pin of DUT.
6	OUT (-)	GND	Connect to the Ground pin of DUT.

6. Safety and Warranty

6.1. Safety Summary

Caution: Before operating your JKI product for the first time, please carefully review the safety guidelines below to avoid any injury and damage.

Electrical Isolation

Caution: All inputs on every product share a common ground internally, and that ground is also shared with the USB connection, and thus the host PC.

None of the JKI devices electrically isolate the ground of the device under test from the host PC's USB port ground. For most applications, this merely requires extra care from the user to prevent accidental ground loop short circuits. However, there are applications where electrical isolation between the device under test and the host PC is absolutely required.

High Voltage Safety

Caution: Connecting one of the input channels to voltages outside this range, even for a very short time, can result in damage to the device.

Safety Tip: If you're working with high voltages near the absolute maximum limit, first ensure that the wire harnesses are securely attached to your DUT and you've done some basic testing to make sure the clips won't pop off your connections. Afterwards, you can connect the wire harnesses to the power analyzer.

Ground Current Safety

Caution: Specifically, this is when a high current flows from the ground pin on the power analyzer to the ground on the USB port of your computer, or vice versa. This current can easily damage the power analyzer, your PC, and your DUT.

6.2. Warranty and Service

This power analyzer is provided with a full one year warranty, parts and labor.
Contact your JKI Inc. representative for details.

(주)제이케이아이

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