PathWave Advanced Power Application Suite

PathWave Advanced Power Application Suite is a comprehensive software solution that seamlessly integrates three separate applications into one unified platform.

Introduction

The Keysight PathWave Advanced Power Application Suite (PW9254A) consolidates PW9251A PathWave IV Curve Measurement Software, PW9252A PathWave Advanced Power Control and Analysis, and PW9253A PathWave Advanced Battery Test and Emulation into a unified PathWave software solution, enhancing usability and accelerating development cycles for future products.



KEYSIGHT

PATHWAVE

PW9254A

PathWave Advanced Power Application Suite Bundle License

PW9254A is a 3 in 1 bundle license. The PW9254A bundle license activates the following software:

1. PW9251A Pathwave IV Curve measurement software
2. PW9252A PathWave Advanced Power Control and Analysis
3. PW9253A PathWave Advanced Battery Test and Emulation

Key benefits

- Easily and quickly transfer data in real time between PW9252A and PW9253A software application within a click.
- Experience using PW9251A, PW9252A and PW9253A software simultaneously.

For more information

Find the product page here www.keysight.com/find/PW9254A

Free 30-days Trial: www.keysight.com/find/PW9254ATrial

PW9251A

Pathwave IV Curve measurement software

PathWave IV Curve is a powerful GUI software designed to simplify and accelerate the process of performing synchronous current-voltage (IV) measurements. With a user-friendly interface, the software enables researchers, engineers, and developers to perform IV measurements without any programming knowledge.



Synchronous Current-Voltage (IV) Measurements with Graphical Results

The PathWave IV curve is a ready-made GUI software to perform a variety of synchronous current-voltage (IV) measurements on up to 40 channels, depending on the number of license purchased. Each license connects to one instrument, supporting up to 10 instruments max, all without requiring programming. Various analysis functions on graphs and tables allow users to review test results immediately after the measurement. Export functions of graphs with markers and tables support efficient reporting. In addition, the test result files contain all the settings, allowing users to accurately review and repeat the test.

The PathWave IV curve accelerates your research, development, and design verification with increasing productivity, enabling more accurate and reliable data acquisition and more efficient use of the equipment.

Key features

- Easily and quickly performing synchronous current-voltage (IV) measurements without programming
- Immediately reviewing test results on graphs with markers and tables
- Efficiently making reports or post-processing by exporting graphs in image files and tables in CSV files
- Easily repeating/reviewing the test result by loading/saving the test results with entire test setups
- Experience the full range of the application's capabilities without the need for a software license by previewing its features in Demo Mode
- Includes API functions to facilitate integration into your programming environment

Powerful setup menu for maximum flexibility

The setup menu allows you to specify and preview the settings on multiple SMU channels before you perform a measurement, giving you the flexibility and ease of setting up the SMU channels.

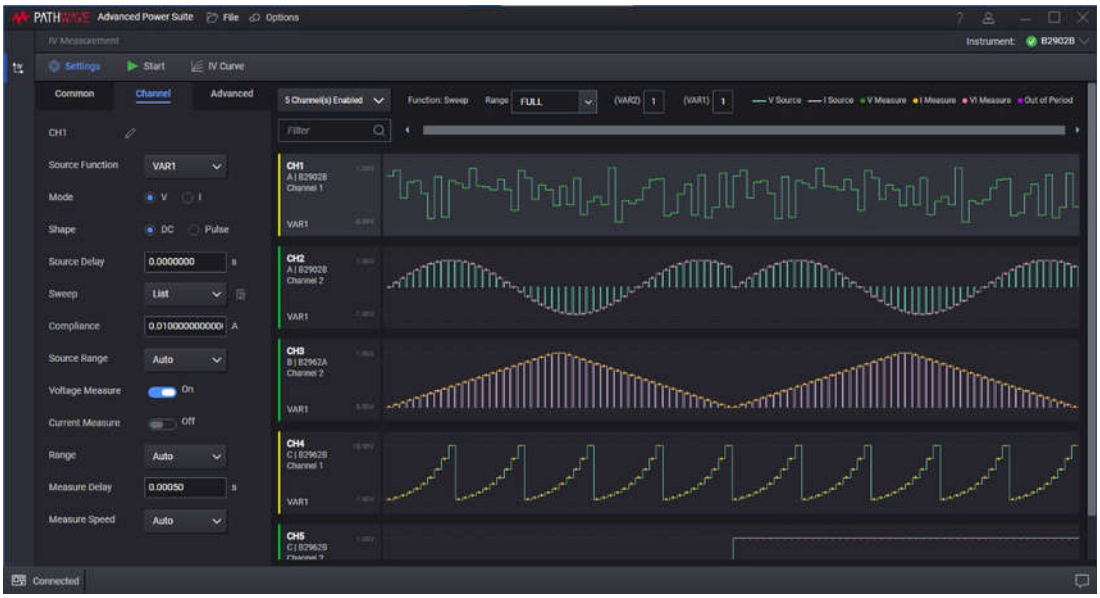


Figure 1. Previewing the settings of multiple SMU channels

Improve efficiency with the built-in graph function

The built-in graph function supports basic and advanced features, enabling immediate review of the test results through graphs with markers.

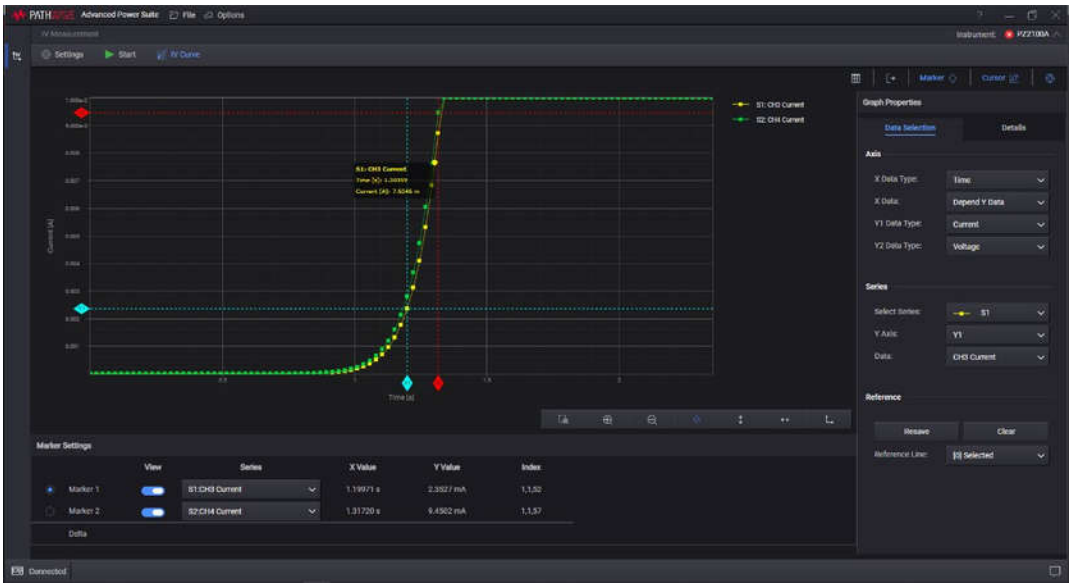


Figure 2. Reviewing test results through graphs with markers

Post-processing at ease

View numerical measurement results in a table format. You can easily export these data into an Excel spreadsheet for post-analysis.

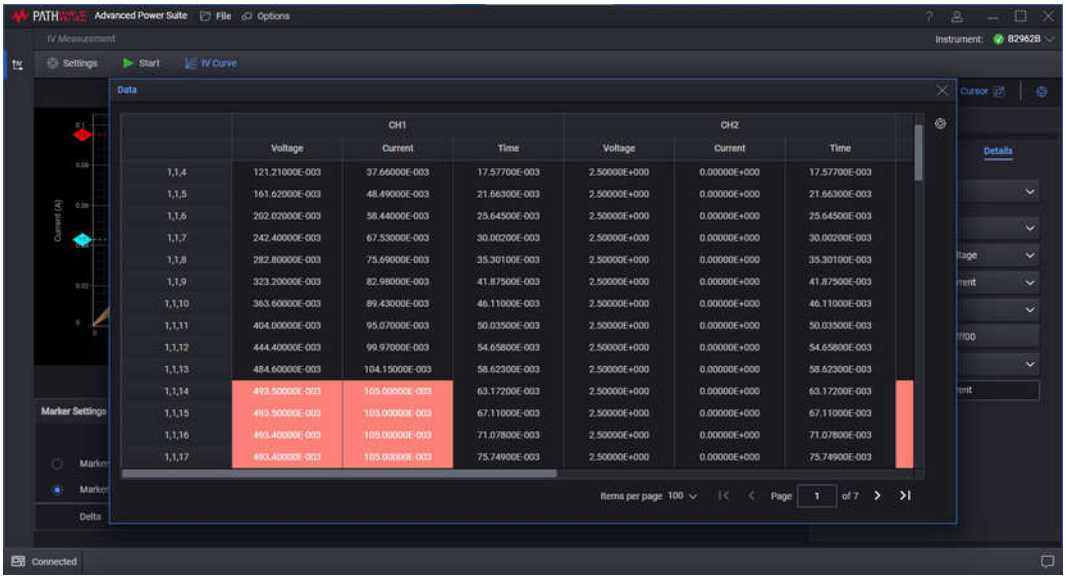


Figure 3. Viewing measurement results in a table format and easily exporting the data into an Excel spreadsheet for post-analysis.

Supported models

B2901A, B2902A, B2911A, B2912A, B2961A, B2962A, B2901B, B2901BL, B2902B, B2910B, B2911B, B2912B, B2961B, B2962B
PZ2120A, PZ2121A, PZ2130A, PZ2131A, PZ2110A, RP7971A, RP7981A

For more information

Find the supported models here: www.keysight.com/find/BenchVueInstruments

Download your software at www.keysight.com/find/PW9251A

Free 30-days Trial: www.keysight.com/find/PW9251ATrial

PW9252A

PathWave Advanced Power Control and Analysis

Introduction

The PW9252A PathWave Advanced Power Control and Analysis from Keysight Technologies are advanced tools designed for easy access to sophisticated sourcing and measurement capabilities in the N6705 DC power analyzer, RP7900 Series Regenerative Power System, Advanced Power System (APS) N7900 Series power supplies, and E36150 Series DC Bench Power Supply.



Easily Access Your Power Supply's Advanced Sourcing and Measurement Features

The Keysight Technologies PW9252A PathWave Advanced Power Control and Analysis software for advanced power supplies was designed to give you fast and easy access to the advanced sourcing and measurement functionality of your N6705 DC power analyzer, RP7900 Series Regenerative Power System, and/or Advanced Power System (APS) N7900 Series power supplies without any programming. They can control any of the N6700 family's more than 36 DC power modules when installed in a N6705 mainframe, any of the RP7900 Series' 23 models, as well as any of the APS N7900 Series' 12 models. When used to control an N6781A SMU, they can be used for advanced battery drain analysis applications. The PW9252A also supports RP7900 Series operation in primary/secondary mode which enables parallel units to be configured easily for greater output current. Depending on the number of licenses purchased, each license connects to one instrument, supporting up to 10 instruments simultaneously.

Compare Features

N6705 DC power analyzer	Advanced power system N7900 Series/RP7900 Series regenerative power system
• Complements the N6705 DC power analyzer's front panel controls • Controls and analyzes data up to ten N6705 DC power analyzer mainframes and any installed modules at once – that's up to 40 power supplies simultaneously • Controls any of the more than 36 N6700 DC power modules when installed in the N6705 DC power analyzer	• Provides easy access to the advanced features of the N7900 or RP7900 without any programming • Controls and analyzes data up to ten N7900 Advanced Power System or RP7900 Series Regenerative Power System models

- Integrate software functions into users programming environment via API (Automation Programming Interface)
- Control any combination of four N6705, N7900 or RP7900 models
- Four modes of operation: scope (short-term waveform capture), data logger (long-term waveform capture), CCDF (statistical analysis), and ARB (waveform creation)
- Enhanced control and analysis of data – use familiar PC controls and large display
- Graphical user software – no programming required
- Accurately capture current drain measurements from seconds to days at up to 200,000 measurements per second (in scope mode) directly to a PC
- Advanced marker readout (min, avg, max, RMS, peak-to-peak, charge/energy)
- Easily create complex waveforms to stimulate or load a DUT by inputting a formula, choosing from built-in waveforms or importing waveform data
- Data log measurements directly to a PC
- Export data to a Microsoft Excel spreadsheet or text file
- Capture a waveform, then "play" it back – use scope or data logger to capture a waveform, then use the power supply's source/sink function to reproduce it
- Apply mathematic functions to waveforms
- Name and choose colors for waveform traces for easy identification
- Perform statistical analysis (CCDF) of power consumption

Control

Access all the features of the power supply you are connected to via a virtual front panel of the instrument or the scope, data logger, CCDF, or ARB features of the software.



Figure 4. PW9252A connected to N6705C

Measurements: Scope and data logger modes

Setup short-term measurements using scope mode or long-term measurements using data logger mode to gain insights into your device's power consumption quickly and easily. If you know how to use an oscilloscope, you'll find the software easy and intuitive to use.



Figure 5. PW9252A in data logger mode

Statistical analysis CCDF mode

To help you analyze distribution profiles, the PW9252A software includes a Complementary Cumulative Distribution Function (CCDF) [1]. This function provides a concise way to display long-term dynamic random current drain. It is also an effective way to quantify the impact of design changes (hardware, firmware or software) on current flows in your device.

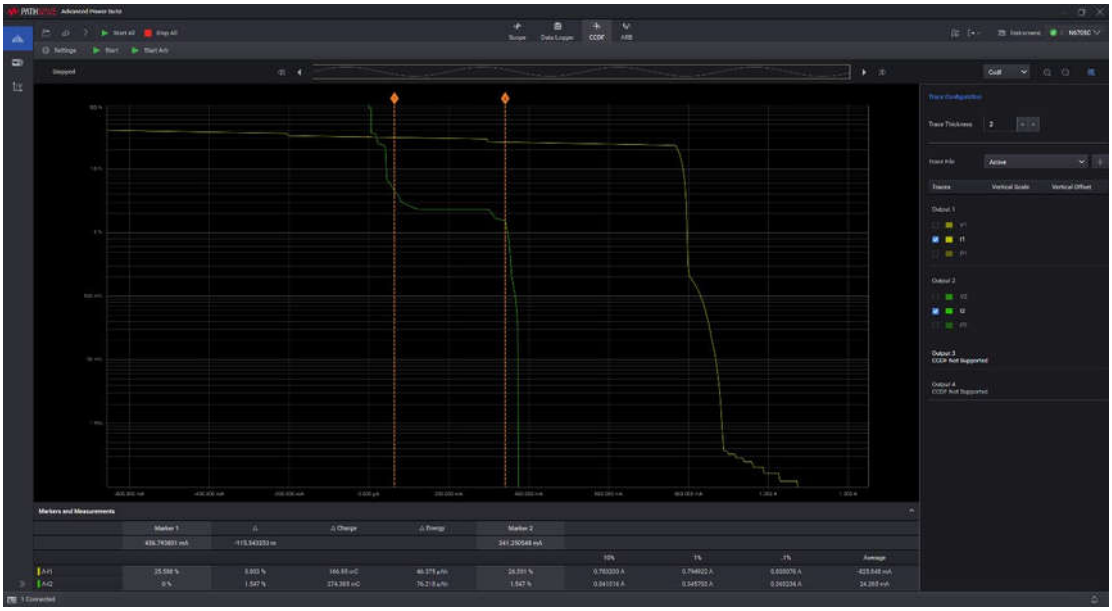


Figure 6. PW9252A in CCDF mode

Arbitrary waveforms

Easily create complex waveforms to stimulate or load a DUT by inputting a formula, choosing from built-in or importing waveform data.

Record and playback – Combining the power of measurement and source/sink capabilities

Use the scope or data logger modes to capture a waveform and easily transfer the data to the ARB function of the software. Once transferred, the data can be used to reproduce the waveform via the power supply's source or sink (electronic load) capabilities.

1 The CCDF value equals (1 – CDF) and the CDF is the area under the Probability Density Function (PDF) curve. Because the CDF ranges from 0 to 100 percent probability, the CCDF ranges from 100 to 0 percent probability.

Supported models

N6705A, N6705B, N6705C, N6731B,N6732B, N6733B, N6734B, N6735B, N6736B, N6741B,
N6742B, N6743B, N6744B, N6745B, N6746B,
N6751A, N6752A, N6753A, N6754A, N6755A, N6756A, N6761A,
N6762A, N6763A, N6764A, N6765A, N6766A, N6773A, N6774A,
N6775A, N6776A, N6777A, N6781A, N6782A, N6783A-BAT, N6783A-MFG,
N6784A, N6785A, N6786A, N6791A, N6792A, N7950A, N7951A, N7952A,
N7953A, N7954A, N7970A, N7971A, N7972A, N7973A, N7974A, N7975A,
N7976A, N7977A, N69143A, N69145A, N69146A, N69172A, N69173A,
RP7951A, RP7951AT, RP7952A, RP7952AT, RP7953A, RP7961A, RP7962A,
RP7963A, RP7931A, RP7932A, RP7933A, RP7935A, RP7936A, RP7941A,
RP7942A, RP7943A, RP7945A, RP7946A, RP7971A, RP7972A, RP7973A, RP7981A, RP7982A,
RP7983A,RP7984A, E36154A, E36155A

For more information

Find the supported models here: www.keysight.com/find/BenchVueInstruments

Download your software at: www.keysight.com/find/PW9252A

Free 30-days Trial: www.keysight.com/find/PW9252ATrial

PW9253A

PathWave Advanced Battery Test and Emulation

Introduction

The PW9253A PathWave Advanced Battery Test and Emulation application software provides a test environment for you to easily run battery tests, generate battery models and perform battery emulation using one or more Keysight two-quadrant power supplies. The emulation function allows you to quickly output the desired battery operation conditions. It allows you to cover various test scenarios without having to wait for a real battery to go through discharging or charging conditions. Integrating the PW9253A software with Keysight's advanced two-quadrant product families, covers a broad range of low to high power level applications, across various industries from consumer electronics, medical devices, e-mobility, residential energy storage and automotive. The PW9253A also supports RP7900 Series operation in primary/secondary mode which enables parallel units to be configured easily for greater output current/power. Depending on the number of licenses purchased, each license connects to one instrument, supporting up to 10 instruments simultaneously.



Features

- Tests and emulates batteries up to 200 kW and up to 2000 V
- Supports four modes of operation: emulation, profiler, discharge/charge, and cycler
- Creates custom battery models
- Emulate battery characteristics at various temperature
- Controls up to ten instruments simultaneously, with each license connecting to a single instrument.
- Includes API functions to facilitate integration into your programming environment
- Provides advanced control capabilities - capacity rating, state of charge, constant or dynamic level selection, pulse width control, constant resistance discharge, constant power discharge, temperature
- Simultaneously measures voltage and current with its built-in digitizer
- Accurately captures voltage, current, capacity from seconds up to days
- Creates custom dynamic loading characteristics for discharging
- Import battery models
- Exports combine measurement data
- Provides a graphical view of the battery model
- Supports cut-off condition for battery charging of NiMH or NiCD batteries with time, Negative Delta Voltage (NDV) and temperature
- Provides customizable battery protection parameters
- Includes cycler temperature protection, which halts battery cycle operation when a temperature limit is detected.

Profiler - Creating Battery Model Tailored Around Device Behavior

A battery profiler is a must tool to have if you are working with different batteries and need to create your own custom battery model library. This ensures you are getting the most accurate models for battery life predictions tailored to your devices and working scenarios. The PW9253A software has the capability of creating custom battery models. It creates a battery model when discharging or charging a physical battery. Discharging a battery can be performed by either static current or dynamic current loading profile or constant resistance or constant power. A battery model created by the PW9253A will consist of a file with of up to 200 points, each point includes the Open Circuit Voltage (Voc), Series Resistance (Ri), and State of Charge (SoC). The software will continue to build up battery model automatically until the stopping condition is reached. While discharging or charging a battery, in real-time the software continuously captures parameters like Voc, Vt, Ri, Current, Time, Capacity, SoC and Temperature. The profiler also can export all graphed data while the test is running for further analysis.



Figure 7. PW9253A creating a battery model with static profile function

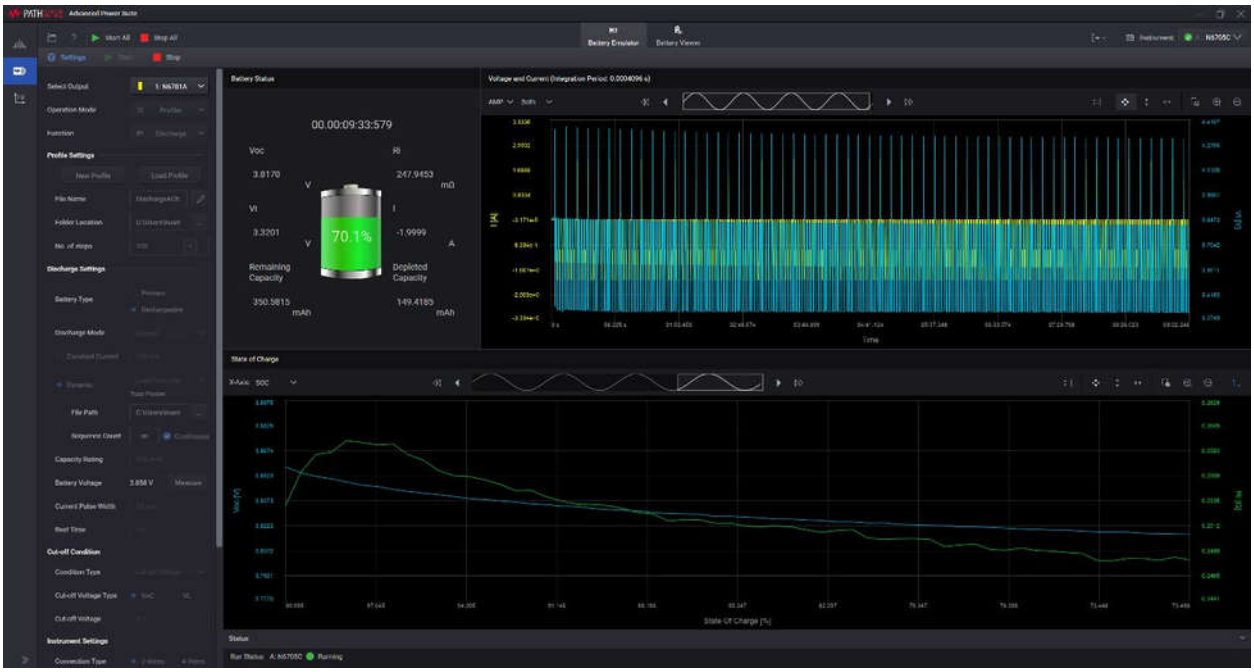


Figure 8. PW9254A creating a battery model with dynamic profile function

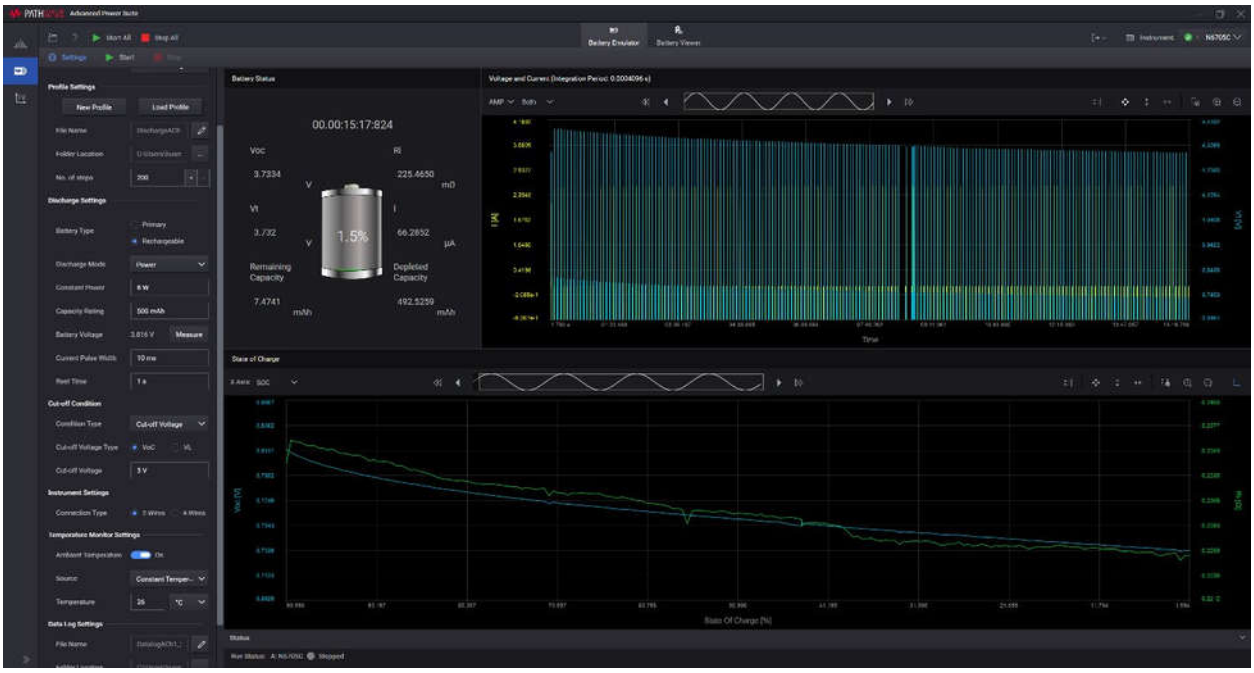


Figure 9. PW9254A creating a battery profiler with ambient temperature, constant power discharge features

Emulation – Battery Emulation Reduces Test Time

Battery emulation is a critical process as it allows one to understand how the battery or the device would behave in a real-life scenario when connected to each other. Using a battery emulator instead of a real battery has many advantages. A battery emulator helps to create a safer test environment and allowing to validate the various operation modes of the device. To emulate battery characteristics, start by loading a battery model into PW9253A Advanced Battery Test and Emulation software. The software algorithm will follow the battery model in real-time and emulate the battery behavior. The software allows two methods for battery models - open profiles generated by the software or importing external battery models with Voc, SoC, and Ri parameters in a CSV file. For simplicity, you will only need to enter four parameters to emulate a battery – capacity rating, current limit, initial SoC, and a cut-off condition. While emulating a battery, it can simultaneously measure voltage and current continuously and save the measurement results. The software also has capability that allows you to load multiple battery models that have been created at different temperatures.



Figure 10. PW9254A Emulating Lithium battery powering a low power device



Figure 11. PW9254A Emulating multiple battery models at different temperatures

Cycler – Life Cycling Battery Characteristics

The cycling function as the flexibility allows you to create a custom sequence of charging, resting, and discharging a battery at various test conditions. The software enables you to make up to 1000 cycle operations on the battery to determine the battery's age effect and reliability under sequence test conditions. While continuously monitoring the battery's health and recording test data parameters of capacity, terminal voltage, current, and time. The cut-off condition features allows you to define a stop condition where cycling will automatically stop once capacity loss percentage is reached.



Figure 12. PW9254A Cycle testing a 18650 battery



Figure 13. PW9254A Performing a battery charge on iron phosphate battery



Figure 14. PW9254A enables you to choose various discharge mode option (constant current, power, resistance, and dynamic current discharge)

Importing Battery Model Characteristics

The PW9253A software provides an easy way for you to import battery models created outside of the PW9253A test environment. You can import a CSV file consisting of the following battery parameters: state of charge, open circuit voltage, and series resistance parameters.

State of Charge(%)	Open Circuit Voltage(V)	Internal Resistance(ohm)	Status
100.00	9.609423	7.544065	
99.50	8.828673	3.889564	
99.00	8.645126	3.791465	
98.50	8.516480	3.767940	
98.00	8.411436	3.780916	
97.50	8.320710	3.804418	
97.00	8.240466	3.840828	
96.50	8.167970	3.886445	
96.00	8.102751	3.927822	
95.50	8.043658	3.971063	
95.00	7.990255	4.014665	
94.50	7.942882	4.057762	
94.00	7.899871	4.098643	

Figure 15. PW9253A Importing a CSV file battery model

Supported models

N6705A, N6705B, N6705C, N6700C, N6701C, N6702C
N6781A, N6782A, N6784A, N6785A, N6786A
N7950A, N7951A, N7952A, N7953A, N7954A, N7970A, N7971A, N7972A,
N7973A, N7974A, N7976A, N7977A, N7953ALG,
RP7951A, RP7952A, RP7953A, RP7961A, RP7962A, RP7963A, RP7951AT,
RP7952AT, RP7953AT, RP7961AT, RP7962AT, RP7963AT, RP7931A, RP7932A,
RP7933A, RP7935A, RP7936A, RP7941A, RP7942A, RP7943A, RP7945A,
RP7946A, RP7971A, RP7972A, RP7973A, RP7981A, RP7982A, RP7983A, RP7984A
34970A, 34972A, DAQ970A, DAQ973A
E36731A

For more information

Find the supported models here: www.keysight.com/find/BenchVueInstruments

Download your software at www.keysight.com/find/PW9253A

Free 30-days Trial: www.keysight.com/find/PW9253ATrial

System and Installation Requirements

Computer operating system

Windows 10,11	64-bit (version 1809 or later)
Computer hardware	**Recommended processor:** Intel Core i5 (or equivalent) **RAM:** 16 GB **Storage:** 900 MB free space for Windows
Interfaces	USB, GPIB, LAN, RS-232
Display resolution	1280x1024 minimum recommended for single instrument view (higher resolution recommended for multiple instrument view) 1920 x 1080 minimum
Data exports to Excel or csv	Pathwave supports Microsoft Office 2003 and later

Free Trial and Licensing

The PW9254A PathWave Advance Power Application Suite software is available to download with a 30-days free trial period. Download a free 30-day trial today at: www.keysight.com/find/PW9254ATrial

Each license connects to one instrument, supporting up to 10 instruments simultaneously.

How to order a license :

Product	License type	License term		
		Perpetual		Subscription
		License	Support	License & support
E.g:BV0001B	Node-locked	SW1000-LIC-01	SW1000-SUP-01	SW1000-SUB-01
	Transportable			
	USB portable [1]			
	Floating (single site, single region, worldwide)			

1. USB portable license requires a certified USB dongle (available for additional purchase, Keysight part number SW1000-D10).

Step 1
Determine the software model

Choose the right software model:

- PW9251A Pathwave IV Curve Measurement Software
- PW9252A PathWave Advanced Power Control and Analysis
- PW9253A PathWave Advanced Battery Test and Emulation
- PW9254A PathWave Advanced Power Application Suite Bundle License

Step 2
Choose License Term

- Perpetual
- Subscription

Step 3
Select License Type

- Node-locked
- Transportable
- USB portable
- Floating
  - Single site
  - Single region
  - Worldwide

Step 4
Select duration

- 12,24,36,60 months (Perpetual)
- 3,6,12,24,36 months (Subscription)

Step 5
Select USB HW Key

- Only applicable for USB portable licenses and if the customer currently does not possess an existing USB dongle

Step 6
Select Delivery Method

- Paper Certificate
- eMail and Paper Certificate
- eMail Certificate

An Entitlement Certificate is delivered with each purchased software order. Follow the directions on the certificate to redeem your order for your license. License redemption requires an internet connection.

Keysight enables innovators to push the boundaries of engineering by quickly solving design, emulation, and test challenges to create the best product experiences. Start your innovation journey at www.keysight.com.

KEYSIGHT

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