

EP1150A PathWave Lab Operations for Battery Test

Accelerate and optimize your battery test lab operations

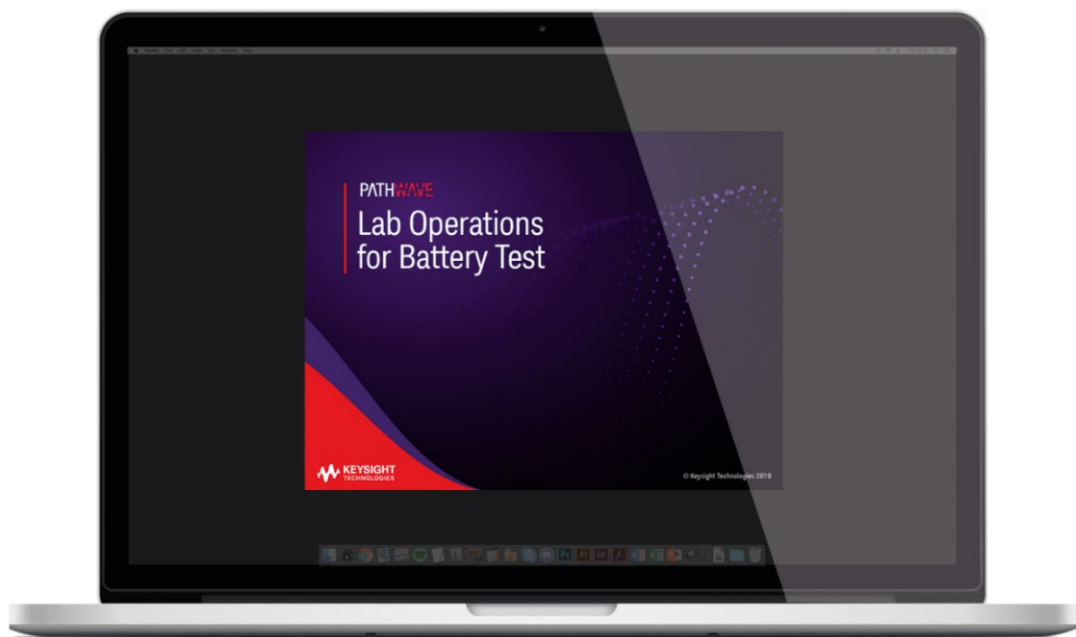


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Accelerate and Optimize Your Battery Test Lab Operations

Keysight's PathWave Lab Operations for Battery Test enables efficient planning and coordination of your entire battery test laboratory. It manages all resources, including test facilities, test systems, and your test objects or devices under test (DUTs). PathWave Lab Operations for Battery Test provides an integrated, web-based lab management platform that helps you modernize your test workflows, eliminating legacy paper-based processes, and increasing data integrity and traceability.

This powerful set of tools helps you to improve test throughput for all the cells and batteries you need to test, to fulfill the testing requirements for your projects on-schedule, and to optimize test asset utilization.

Key features

- Easily register and track test objects in your lab.
- Quickly analyze your data and statistics.
- Organize your test lab workflow, documents, lab orders, and tasks. Orders allow you to structure tasks. Tasks tell lab personnel what to do.
- Plan and optimize your test capacities and sequences.
- Share and control test plans, results, data, and other documents. Collaboration and discussion among lab staff become easy and productive.
- Remotely control your lab and its devices anywhere, anytime.
- Manage and route notifications to your preferred device or email service.
- Work efficiently thanks to a comprehensive suite of tools.
- Automated, networked, and scalable for any size of testing lab – up to thousands of channels.



Figure 1. Exemplary photo of a battery cell.



Figure 2. Exemplary photo of a battery pack.

Meeting the Challenges in Li-Ion Cell and Battery Test

The EV powertrain becomes the key technology and the key differentiator for electric vehicles. This is driving a rapid increase in investments in the testing and development of new cells and batteries, as they've become the critical element in both performance and cost differentiation. This creates a situation where understanding and verifying the performance of cells and batteries becomes critical to their designers and manufacturers. And it's just as critical to their users and consumers, such as vehicle OEMs and tier-1/2 suppliers.

The rapidly growing amount of required test capacity is creating pressure to optimize the utilization of those test assets – both financial pressure, and pressure to support the volume of test demand. For both designers and manufacturers as well as for users of these cells and batteries, performance testing is in the critical path of successfully competing by quickly getting new designs of cells, batteries, and EVs to a rapidly growing market.

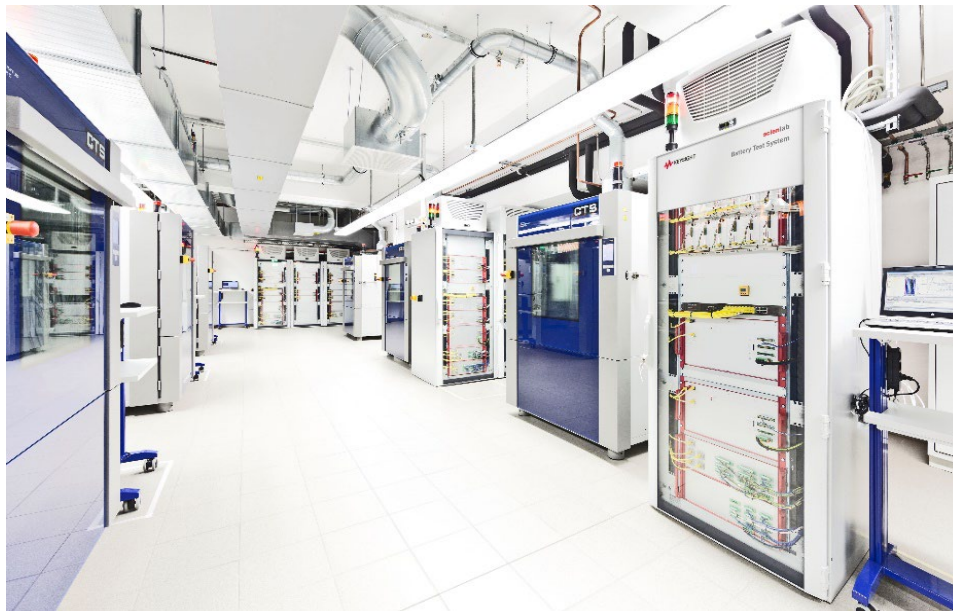


Figure 3. Battery test laboratory managed by PathWave Lab Operations for Battery Test.

In this time-to-market race, designers, manufacturers, and users of these cells and batteries realize they don't have the time or resources to develop and manage this test capacity themselves. They need to obtain this capability from a reliable source and get it online quickly. In the same way, they also realize that they don't have the time and resources to develop the software to manage their multiple test resources to meet their objectives for test throughput, asset utilization, project schedules, and performance optimization – whether it be for a small number of test systems or for multiple test systems distributed across several test laboratories around the world.

As the number of test systems or testing assets in your facility increases to meet this testing demand, it becomes more and more important that your software resources support your need to maintain and improve productivity in your testing function. If you only have a very small number of test systems, you may be able to manage and coordinate those test systems with rudimentary tools like a spreadsheet.

But as your testing volume grows and your test lab expands, those tools cannot meet your needs to productively manage workflows and to efficiently coordinate testing assets. You will need software tools designed specifically to optimize your test lab operations.

Keysight's PathWave Lab Operations for Battery Test equips you to efficiently manage people, hardware, and information in your battery test laboratory.

Supporting Operations in Your Battery Test Laboratory

PathWave Lab Operations for Battery Test helps you optimize your lab workflows throughout the testing process. You can assign different roles to your personnel, with those roles defined to have different levels of access and capability.

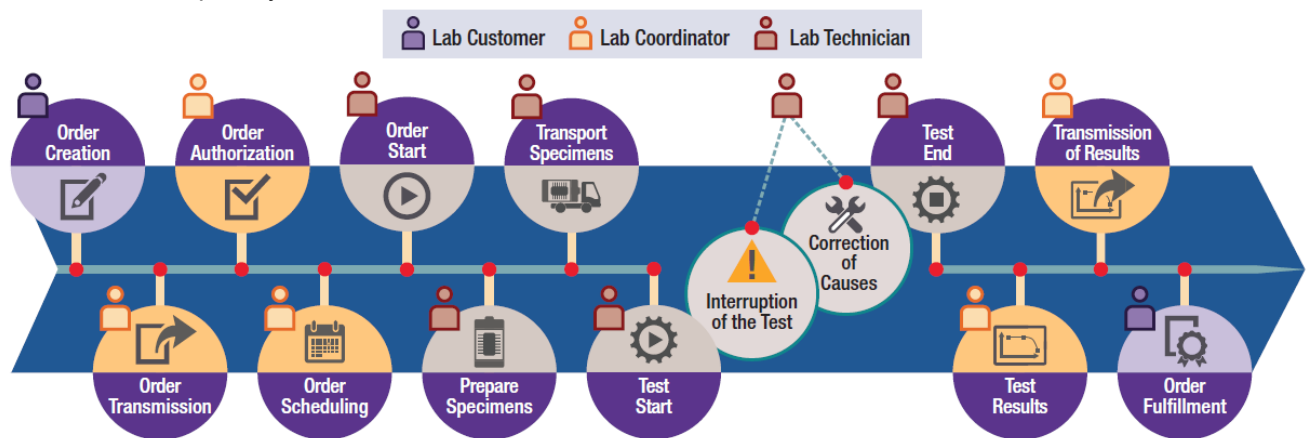


Figure 4. Typical workflow for battery test operations.

Test orders are input into PathWave Lab Operations for Battery Test by persons having the role of “lab customer”; these can be from inside or outside your organization. Orders are received and approved by people in your organization authorized to do so (“lab coordinators”).

Once the orders are approved, the software assists lab personnel in planning and scheduling those orders, and in having “lab technicians” execute the tasks required to fulfill the order. Roles and their assignments to your personnel are stored in the software.

This process creates a set of tasks and schedules for those tasks. This allows you to optimize scheduled tasks and tests to best utilize your testing assets and personnel, depending on factors such as:

- The characteristics of the cells or batteries to be tested.
- The capabilities and channel counts of the available test systems.
- Test requirements and durations for the order being scheduled.
- Other tasks and tests currently scheduled.
- Planned calibration and maintenance of your test systems.

When it's time for a test to start, PathWave Lab Operations for Battery Test will notify your test personnel to begin each of a sequence of steps such as:

- Retrieving the test specimens (cells or batteries) from storage for the test.
- Preparing the test specimens (e.g., placing cells into holders or contacting fixtures).
- Transporting the specimens to the correct test system.
- Loading specimens into the contacting system.
- Starting the test.

Your test personnel are notified by PathWave Lab Operations for Battery Test when the test is completed or interrupted. The cause of the interruption can be resolved, and the test resumed. When complete, the test results are provided, and reports are created and sent to those specified on the test order, which fulfills the order received to start the process.

Software Elements

PathWave Lab Operations for Battery Test scales from smaller test labs with one or two test systems up to large laboratories consisting of multiple test systems of different types. If you have multiple labs in different locations, test plans and data can be shared to improve productivity and allow common analysis of test data.

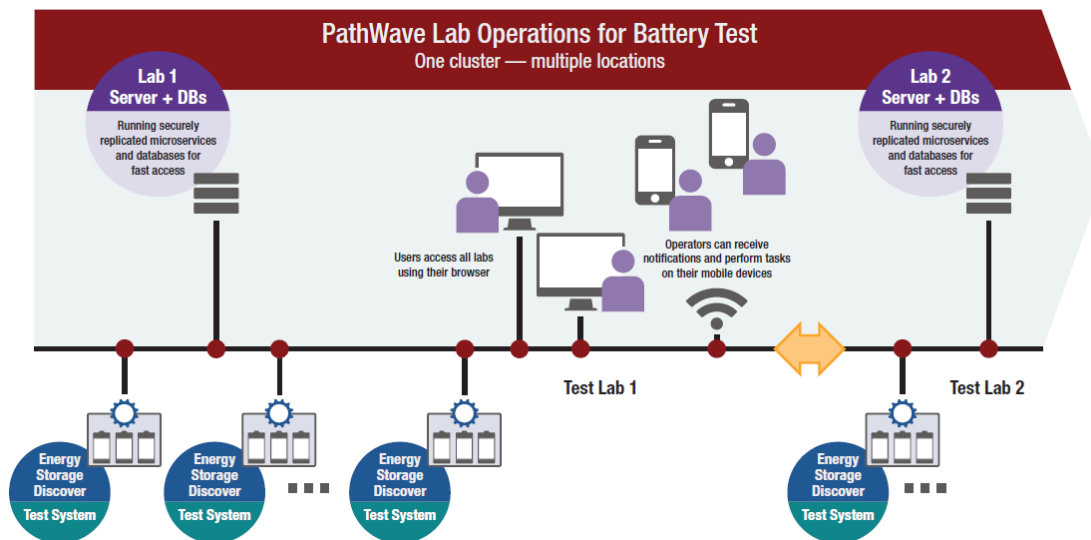


Figure 5. Computing and communications architecture for PathWave Lab Operations for Battery Test.

PathWave Lab Operations for Battery Test microservices and databases run on one or more Linux servers. The users' interfaces to the software are through supported web browsers (Chrome or Firefox).

The lab management software consists of core elements required for each installation plus available extensions that allow you to configure only the capability you need for your situation.

Required software elements

EP1151A Core Module

EP1152A Test Bench License

EP1153A User License

Available extensions

EP1154A Lab Insights

EP1156A Test Orders

EP1158A Logistics and Materials

EP1160A Advanced Collaboration

EP1162A Power Allocation Management

EP1151A PathWave Lab Operations for Battery Test Core Module

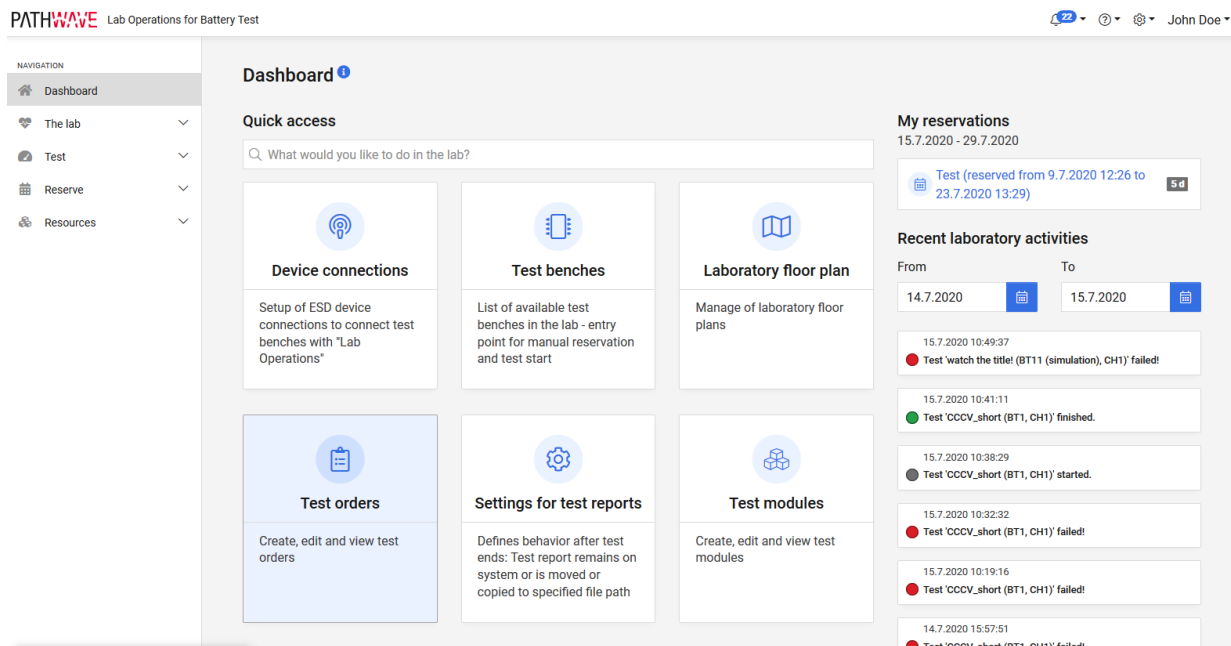


Figure 6. EP1151A Core dashboard.

Keysight's Lab Operations for Battery Test provides several powerful features and options to control and monitor test laboratories. The following functions are included in the EP1151A Core Module:

Platform features

- Modern browser-based intranet solution accessed from anywhere within your network.
- Connect, control and monitor test benches remotely.
- Deploy software updates without test system downtime.
- Open APIs allow seamless integration into your existing IT solutions.
- Established technologies like Docker and Kubernetes allow scaling the solution to fit your requirements.

User management

- Manage access to information based on user, role, and group permissions.
- Users and permissions can be retrieved from an active directory, allowing a single log-in for multiple user types or roles (available in a future release)

Define and create tests, and start them remotely

- Create your own tests and define the workflow in detail.
- Add extended descriptions or instructions to the workflow steps. These descriptions can contain images and URLs, allowing you to provide detailed instructions on how to perform the workflow.
- Test programs and associated libraries can be uploaded from your file browser with drag and drop.
- Tests can be scheduled to run immediately or at a specified time. You can also reserve your resources for a specific test order and mark this reservation as tentative, if needed.
 - When creating a task with a deadline, a reservation for the task on the selected resource is automatically created. When creating a task with a reservation, the user is notified about the possible conflicts.
 - Tasks of test objects that have set due dates can only be started chronologically.
 - Blocked tasks can be assigned to a specific person so not everybody can start certain tests. Once a blocking task is finished, aborted or cancelled, the task with the next due date will be unblocked and can be started.
- Keep an overview of your test runs: You can view all the latest test runs executed on the channel. The active test run is displayed in the table with "Current".

Monitoring and controlling test systems

- Test benches can be controlled while tests are running. Tests can be started, suspended, and canceled remotely.
- Test bench overviews show the status of test systems.
 - A calibration result can be registered manually to test benches and channels with a timestamp and the next calibration schedule. A warning sign will appear beside the next calibration date when the due date is passed.
- Test channel measurements like voltage, current and power, are available in the browser interface.
- Test channel status adaptations:

- It is possible to trigger a reactivation of a channel that is in internal error. This feature is accessible for a single channel and via bulk actions. If the reactivation succeeded, the last active test run on this channel will also be reactivated.
 - The error history of a single channel can be traced in the Channel details page.
- You can also plan to deactivate a channel or to mark it as defective at the next available restore point and provide comments about this event. This affects the displayed channel state and is also taken into account in the laboratory statistics.

Notifications

- Notifications are shown in the browser interface and are also delivered by email.
- Examples of typical notifications:
 - You can subscribe to Test Benches to receive notifications about important events on your test systems, for example, a test finishing.
 - You can subscribe to your tests, so you are immediately notified if your test is started, interrupted or finished.
- Notifications are automatically deleted after one year to limit the storage space required and improve performance.

Records and logs (extensions available in EP1154A Lab Insights)

- Relevant events in the laboratory are logged and displayed in the browser interface. This includes important status changes in the test bench or other events.
 - Stay informed through the laboratory status page where the total numbers of test runs, test orders, test objects and channels are displayed.
- You can create and edit detailed floor plans.
- Reports contain a record of all relevant events during test execution and can be viewed in the SL1091A Scienlab Energy Storage Discover test system software for the associated test system (SL1091A is purchased separately).
- Extended record and logging features are available through the EP1154A Lab Insights Extension.

Document management (extensions available in EP1160A Advanced Collaboration)

- Upload and manage any documents you need with a simple drag and drop from your file explorer. Download them from anywhere.
- Test programs and libraries can be uploaded and executed on a test system by the person who created them.
- Scroll through the list or filter the list by document name.
- With the EP1160A Advanced Collaboration Extension, files can be shared among team members to facilitate data analysis or test plan creation by others.

EP1152A Test Bench License

The Test Bench License enables integration of the supported test systems into PathWave Lab Operations for Battery Test. Each test bench requires a Test Bench License for integration in the software.

EP1153A Core Module User License

The Core Module User License enables each user to work with the EP1151A PathWave Lab Operations for Battery Test. Each user requires a User License for using the EP1151A software and to purchase extensions.

Software Extensions

All extensions require the EP1151A PathWave Lab Operations for Battery Test. Each EP1151A requires at least one EP1152A Test Bench License and at least one EP1153A Core Module User License. Extensions can be purchased and installed at the same time as the EP1151A/52A/53A or purchased and installed later as needed.

EP1154A Lab Insights

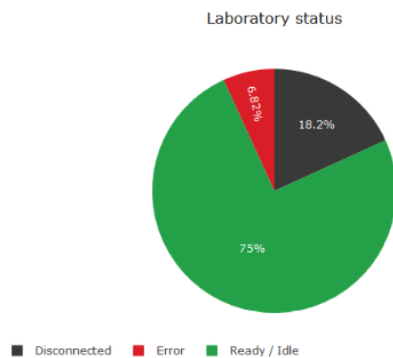


Figure 7. EP1154A Laboratory status.

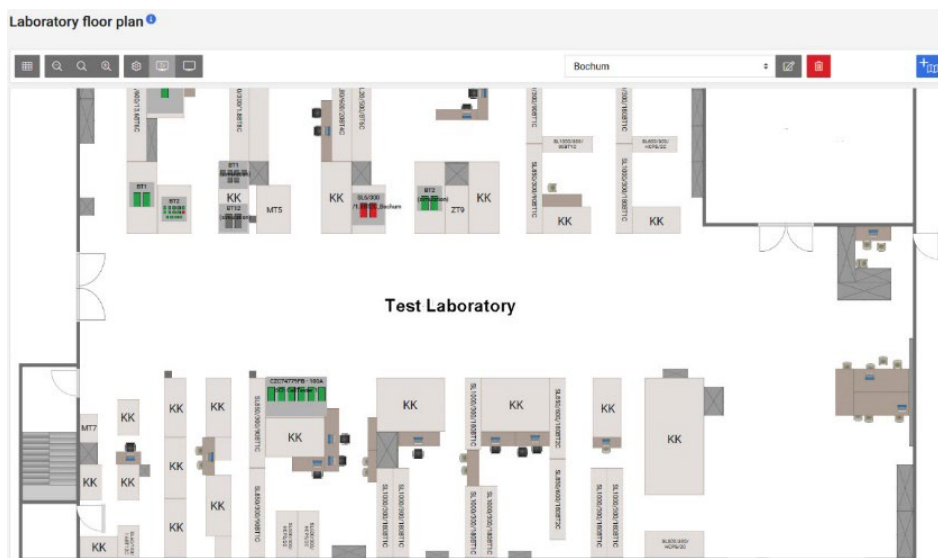


Figure 8. Floor plan views.

The EP1154A Lab Insights extension provides features for analyzing processes and workflows in laboratories using data aggregated over test runs. The EP1154A also offers advanced features for maintaining smooth operations of your test systems.

Lab overview

- Gain advanced insights into ongoing laboratory operations. You can organize test systems on a large, comprehensive display to see system status at a glance. You can use this to:
 - Recreate your lab's floor plan, including all systems and their status. Existing floor plans are shown in a scrollable list and can be filtered by floor plan names.
 - Offer a full-screen view for large monitors.
 - For a large test lab, display an overview consisting of successive views of different lab areas on a single monitor.
- All existing floor plans are displayed in a scrollable list. The list can be filtered by floor plan names. A selection of floor plans can also be made using keyboard shortcuts.
- Aggregate the status of Test Benches, tests, and test objects (DUTs).
- Display the history of the test channel states of the laboratory.

Test object overview

Save your entries so that the created test object is adopted in the list view. View and edit all relevant test object data with the test object detail view. In the menu bar, you will find different tools to add lab work tasks, print labels and import a battery file or export the associated battery file of the test object.

The screenshot displays the 'Test object overview' interface. At the top, there is a menu bar with icons for State, Stock, Edit, Add lab work, Print label, Import battery file, Export battery file, and Delete. Below this, the interface is divided into several sections:

- Identification:** Fields for Custom ID (ExampleObject01), Name (BatteryCell01), Serial number (12345), and Type (Example Test Cell).
- Tracking:** Fields for Location (BT1, CH8), Owner (ExampleUser), Delivery to lab (12/18/2022), Shipping out of the lab (12/22/2022), and Mounted to fixture (Not mounted).
- Customer information:** Fields for Customer contact (End Customer), Order number (1235H0345), and Delivery note number.
- Additional fields:** Fields for Custom_Field_1 (15 V), Custom_Field_2 (Custom Information), and Custom_Field_3 (More Custom Information).
- Timeline:** A calendar view showing the timeline from 2022 to 2023, with events for Delivery and Shipping.
- Latest measurements:** A table showing measurements for mountingTorque (5 Nm), visualCheck (good), and voltage (6 V).
- Linked test orders:** A table showing test orders with columns for Order, State, Last Update, Due Date, and Requested by.

Figure 9. Keep the overview: View and edit all relevant test object data.

Advanced search

The advanced search enables you to create sophisticated queries to find executed test runs and test objects. Keep your search more accurate, less time-consuming, and more efficient.

For example, you can easily:

- Search for all test objects delivered at a certain time.
- Find all test runs performed during a defined period.
- Find all test runs performed on a certain test object.

Figure 10 shows an example of the advanced search in which test runs are searched which were executed in the period from December 10, 2021 11:15 to December 17, 2021 11:15 and in which test objects of the type Pouch - LiNiMnCoO2 were tested.

Advanced search for test runs ⓘ

And ⇅

[Add filter](#) [Add relation](#) [Add combination](#)

testObject ⇅

↓

type = ⇅ Pouch - LiNiMnCoO2 [Delete](#)

scheduledStartTime <= ⇅ 12/17/2021 [📅](#) 11 : 15 [AM](#) [Delete](#)

scheduledStartTime >= ⇅ 12/10/2021 [📅](#) 11 : 15 [AM](#) [Delete](#)

[< Back to overview](#) [Search now](#)

Figure 10. Advanced search for test runs in a certain time horizon with particular type of test object.

Advanced logging

Advanced logging enables you to trace the history of test objects (DUTs) and fixtures in the laboratory. For example, you can view the history of status changes as well as the physical locations.

Service features

Service features in this option help you maintain your lab.

- Track test systems and component calibration status.
- Track calibration and adjustment results.
- Track installed software versions on the Test Benches.
- Update installed software version remotely.

Enhanced service features

- Notification of pending service tasks.
- Track work progress within the browser interface.

The software automatically takes maintenance into account when planning tests. Tests will not be interrupted by maintenance tasks such as calibration and adjustments.

EP1156A Test Orders

General Info Select Test Objects Select tests Order Summary

Choose Workflow and Test Objects 2020-07-15/11:17:15/YourUser Account

General Mounting Instructions

Please select a workflow

Please select a workflow

Standard

Demo

Only Perform a Visual Check

T1234	test	Test	t	Oliver	Add
to4sh	to4ty	Test	BT1 (simulation), ...	to4ow	Add
testy	type	Stock	Batterie-Lager1	me	Add
Example 01	Li-Ion	Stock	Factory stock	Example User	Add
Example02	Li-Ion	Test	BT12 (simulation)...	Example User	Add
test	test	Test	-	test	Add
M1234	321	Stock	-	Oliver	Add
Test0001	Test1234	Test	-	Oliver	Add
to1234n	to1234ty	Test	BT1 (simulation), ...	to1234ow	Add
test	test	Test	L-Lager2/R-Regal...	test	Add

1 - 10 of 16 results. Last updated a few seconds ago. Items per page: 10 1 2 » »

Figure 11. EP1156A - Creating a test order.

The EP1156A Test Orders extension allows “lab customers” and “lab coordinators” to formally request tests and assist in managing the work happening around the test orders. Test Orders also helps with the evaluation of test results.

Order management

- “Lab coordinators” within the testing lab and “lab customers” external to the testing lab (but within your greater organization) can request tests. This includes:
 - Enter the necessary information for the order directly in the browser interface, incl. upper and lower limits for the measurements.
 - Lab coordinators can review, accept, copy, and reject orders.
 - Lab coordinators and customers can discuss orders via the comment system.
 - Lab coordinators can book time slots for the tests needed to fulfill an order. It is also possible to schedule many orders simultaneously with the bulk scheduling feature.
 - Possibility to reschedule failed test runs.
 - All invested parties can track order progress through the web interface.

Test orders and Workflow management

- Create, edit and duplicate test orders. You can individually define your test run information.
- You can schedule single or many test objects simultaneously in a streamlined and more efficient way using the bulk scheduling feature.
- When creating or editing a workflow, it is now possible to specify an upper and lower limit for measurements in mounting processes as well as a custom message.
 - If the measured value violates these limits, a warning along with a user-defined message will be displayed.

Test suites

- Multiple tests can be grouped into a test suite.
 - In the simplest case, a test suite is just a set of tests running one after the other.
 - Multiple test objects (DUTs) can go through a test suite simultaneously and Lab Operations automatically orchestrates the execution of the tests in the test suite for each DUT.
 - In more complex cases, test suites can make subsets of cells go through different branches of testing based on characteristics of the test objects (DUTs) that were determined in previous tests (available in a future release).
 - For example, a battery test suite can start with a test that determines the capacity of the batteries and then performs:
 - An aging test on the batteries with the highest capacity.
 - A destructive test on the cells with the lowest capacity.
- Test suites can be parameterized. If, for example, a test cycles a battery, the number of cycles can be entered through the web interface for each time a test suite is run.
- This allows labs to offer both standardized suites of tests to reliably characterize test objects (DUTs), and the flexibility to adapt the tests for more exploratory evaluations.

EP1158A Logistics and Materials

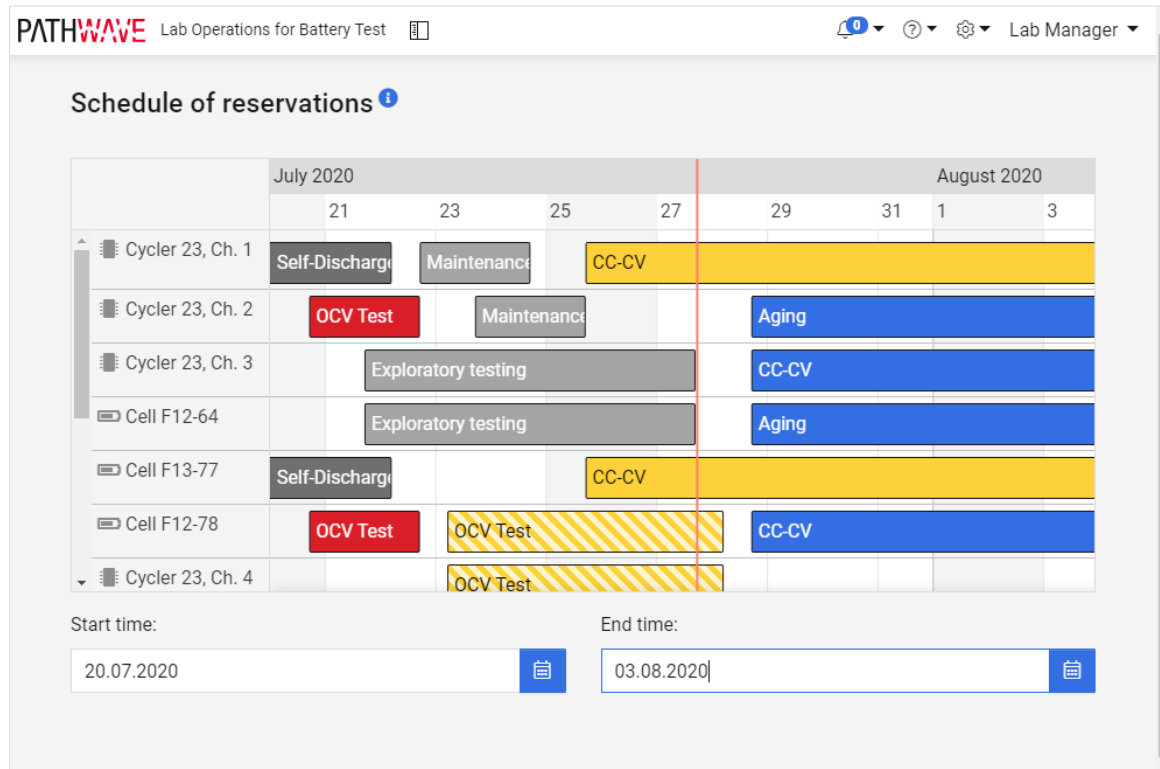


Figure 12. Schedule reserved time slots for tests with the EP1158A.

The EP1158A Logistics and Materials extension helps in managing inventory of the laboratory materials and tracks logistic and lab processes.

Lab work

- Guided lab work supports the correct execution of all tasks.
- Define and create individual lab work processes and link lab work tasks to test orders.
- Save measurement data for single test objects.
- Keep track of all lab work tasks and linked orders and their status and specify due dates, if needed.
- The linked orders are visible in the lab work tasks list to keep an overview. You can also create lab work tasks directly from that list, and you can also add extended descriptions/instructions to the workflow steps.
 - This description can contain images and URLs, allowing you to provide more detailed instructions on how to perform workflows.

Execute workflow Instructions Comments

✓ Check-In
✓ Test Object
✎ Temperature of Cell body
4 Voltage
5 Weight Measurement
6 Summary

Temperature of Cell body i

Connected to workBench1
● Idle

📅
Show action log

❗
Report defective object

Temperature [°C] i (required)

Figure 13. Define your lab workflow according to your needs.

Resource and material management

- Define and manage new resource and material types.
- Track materials, including reservation status, availability, and location.
- Print and scan optical codes for materials.
- Create label templates for different resources or storage locations. Search easily for existing label templates within the list based on the name or resource type and/or select them by using keyboard shortcuts.
- Location of materials equipped with RFID tags is tracked automatically (in laboratories that employ Keysight's RFID solution).
- Customize the data tracked for materials by adding new fields for data input.
- Excel import for generic resources: It is now possible to import resources using an Excel file for all types of resources.
 - When importing test objects from an Excel file, you can use * for measurements to apply them to all test objects in the sheet.

EP1160A Advanced Collaboration

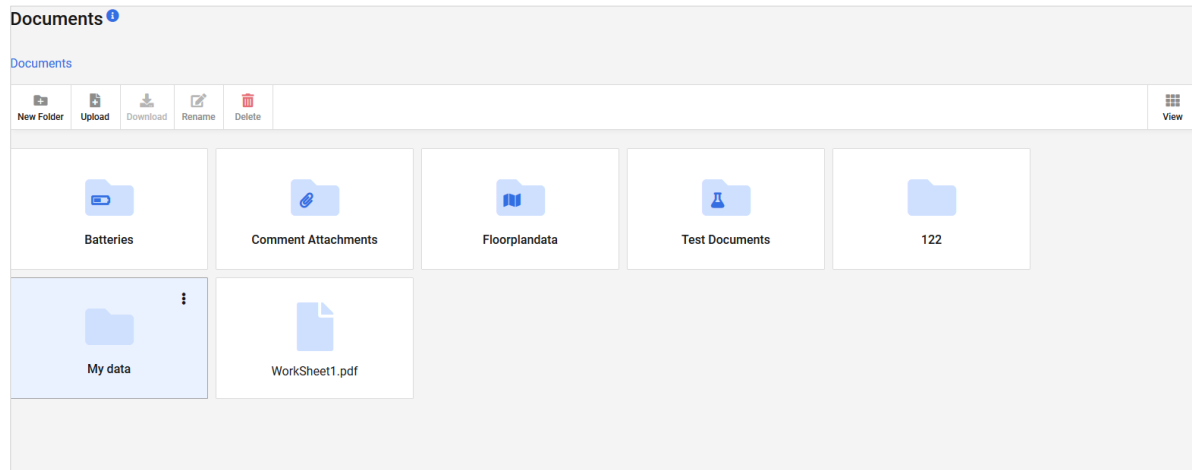


Figure 14. The EP1160A supports easy document sharing and collaboration.

The EP1160A Advanced Collaboration Extension provides features that foster communication and exchange among the users of PathWave Lab Operations for Battery Test.

The document system becomes a collaborative document for all users and provides a way to organize files and information in your lab. You can easily provide, for example, work instructions and make them available to everyone in the lab. Furthermore the Advanced Collaboration Extension provides an option to add and track information about externally executed test runs.

Document cloud

- Files are shared with all users that are provided access through this system.
 - Access to uploaded documents can be restricted (available in a future release).
 - The history of documents is tracked.
 - New uploads generate a new version that users receive when they download the file.
 - Old document versions are kept and can be accessed and restored from the web interface.
 - Comments are now retained after updating the document version.
 - This allows you to review and manage changes.

Collaboration platform

The EP1160A Advanced Collaboration Extension offers a comment system allowing richly formatted comments on most things in the laboratory. Users can reply to comments and join selected discussions (e.g. discussions regarding test orders).

Teams distributed across multiple shifts or multiple locations can collaborate through a central system.

EP1162A Power Allocation Management

The EP1162A Power Allocation Management License is used for battery test labs that have implemented the new **SL1770A Scienlab Power Allocation Management Solution for Battery Testing**. It is a flexible power management solution with which the power distribution in the laboratory can be effectively controlled and distributed as required.

Gain more flexibility in distributing the power within the lab with the new functions of the Power Allocation Management license. After establishing a connection to the Power Allocation Manager, various power management functions are available.

Define test benches

Custom Test Bench Control Unit (TBCU) names are shown on the Lab Power Allocation page. Please note that these TBCUs must be configured directly via the Power Allocation Control's API service.

Allocate power manually

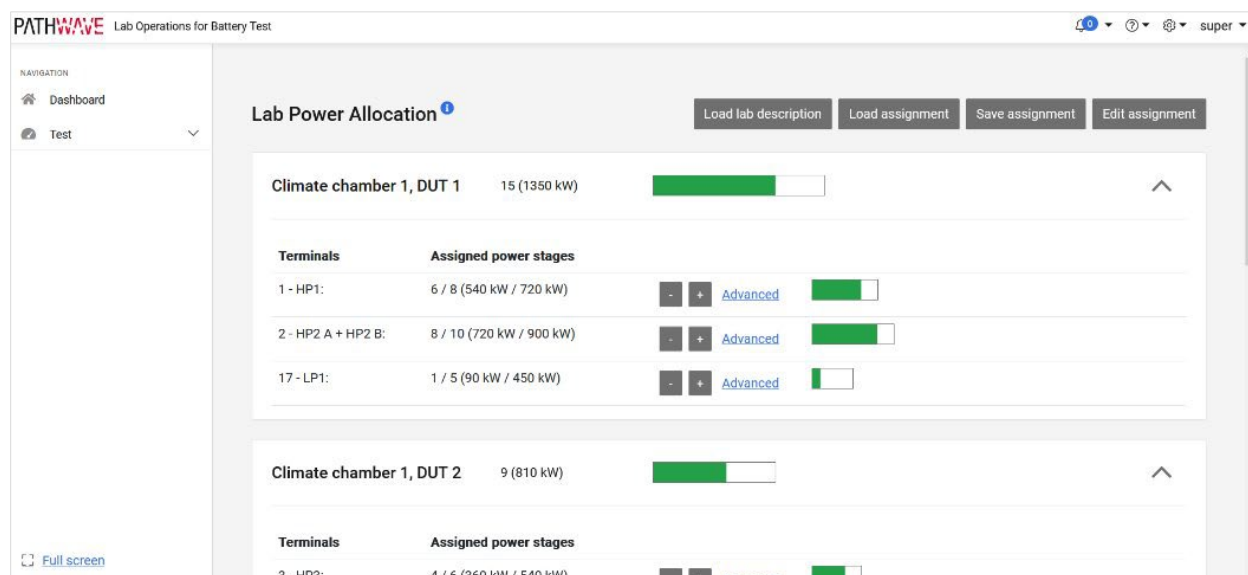


Figure 15. Manual power allocation for more flexibility

- Influence the power allocation to test objects within the climate chamber actively: Figure 15 shows climate chambers that are available in the laboratory, and the total number of output stages and power currently assigned to each climate chamber.
 - Assign power stages to the test object terminals via the +/- buttons and thus increase or decrease the power in *90 kW steps*/per selected power stage.
- It is also possible to select power stages individually. To do this, use the "Advanced" link and select the desired power stages if they are available. Power stages that are already assigned elsewhere can also be selected.
 - Please note that this overwrites the currently active allocation and cannot be restored!

Prioritize power allocations in the laboratory

Besides the active influence of the allocation of power in the laboratory, a prioritization is also possible by the lab manager. This allows to not only to influence the priority of the individual test objects in the climate chamber, but also to change the prioritization of all climate chambers within the laboratory.

The screenshot shows the PATHWAVE Lab Operations for Battery Test interface. The 'Test Priorities' section is active, displaying a list of climate chambers. The interface includes a header with the PATHWAVE logo, a sub-header 'Lab Operations for Battery Test', and a user profile 'super'. The 'Test Priorities' section has a title bar with an information icon and buttons for 'History' and 'Edit'. Below the title bar, there are tabs for 'Sort by' (Location, Priority) and 'Filter' (All, Granted, Not granted). The list of climate chambers is as follows:

Status	Climate Chamber	Priority	Controls
Granted	Climate Chamber 1, Channel 1	4	- + ▾
Error	Climate Chamber 1, Channel 2	4	Show conflicts - + ▾
Granted	Climate Chamber 2, Channel 1	10	- + ▾
Waiting	Climate Chamber 2, Channel 2	3	Show conflicts - + ▾

At the bottom right, there is a link '< Back to overview'.

Figure 16. Prioritization of Power Allocation - Change the prioritization of climate chambers within the laboratory

- The order of prioritization runs from top to bottom. This means that the higher the position of the climate chamber or the position of the test object within a climate chamber, the higher the priority. Edits in the current configuration can be made by using the edit button.
- Use the *up/down buttons* to change the priority of the test objects within the climate chamber or move the entire climate chamber up or down in the sequence.
- As soon as the changes are applied, the currently active priority list is overwritten with the new configuration. This process cannot be restored!

Processing power requests from ESD test programs

With the version *Energy Storage Discover 10.1*, ESD test programs can also contain power requests and switching the DUT inputs. This is carried out via the *PowerRequest* command in the ESD test program. A detailed description of how to use the command is provided in the ESD user guides.

Error management

In the action column of the PAM, you will find menu items that can help you in the event of an error.

Customization of PathWave Lab Operations for Battery Test

Because each laboratory or facility for testing cells and batteries is unique, you may find that your specific design and implementation of PathWave Lab Operations for Battery Test will require some customization. This will enable the installation to best suit your needs, allowing you to achieve optimal productivity and test asset utilization in your specific workflow environment.

Keysight can work with you to:

- Implement new features in the software that fit your needs based on the requirements we work on together with you.
- Analyze your lab's workflow and propose ways to optimally realize this workflow within the software.

Contact your sales representative to create a detailed statement of the requested customization.

License Types and Subscriptions

The elements of PathWave Lab Operations for Battery Test are available with subscription licenses. License periods of 12-, 24-, or 36-months are available as node-locked licenses.

Subscription licenses include software support subscriptions that allow you to access Keysight support resources.

Server Requirements

To run PathWave Lab Operations for Battery Test, a server with the following minimum requirements is needed.

Hardware requirements

Server	This can be a virtual machine (VM) or a bare-metal server. Ideally, a VM will be provisioned so that disk space, RAM and available CPU power can be adapted as the requirements of the lab evolve during use.
CPU	At least two cores, each with 2.5 GHz frequency.
RAM	32 GB
Disk space	250 GB

Software requirements

Operating system	Linux
Docker	Version 27.4.1
Docker compose	Version 2.30.0

Please note: If you are planning to store report data generated by SL1091A Scienlab Energy Storage Discover on a network drive, it is recommended to use a separate server.

Support Services

PS-S40-03 Productivity Assistance

PathWave Lab Operations for Battery Test deploys to one or more servers that you manage locally. Keysight supports you in the deployment process and helps you set up a cluster of servers that fit the scale of your lab.

Based on your needs, this may include working with your IT department to ensure servers are set up with the appropriate software and hardware configuration. This may also include advising you on your local network setup and ensuring that the software runs smoothly in your lab.

Note: Keysight recommends at least 10 days of Productivity assistance for each PathWave Lab Operations for Battery Test project (5 days at customer site, 5 days remote service). Contact your Keysight representative for more information.

Education Service

Education Service provides insight into the solution setup and quickly prepares your team to use the solution. Keysight experts help you optimize your usage of Keysight solutions whether through integration or optimization of performance. Receive training at your site to gain the confidence to make accurate, efficient, fast, and repeatable measurements, every time.

PS-S40-01 Startup Assistance

Instrument fundamentals and operations starter training

- Switching a system on, order of instruments
- Getting a system in ready mode (software & hardware)
- Resetting system & safety matrix after emergency off
- Connect cables to DUT
- Setting up a system in software and start a test
- System care

PS-S40-02 Advanced Training

Technology and measurement science standard training

- User interface
- Programming examples and exercises
- Details on system warnings/errors and how to react to them

PS-XPS-100 Premium Consulting

Custom training to focus on your application

- Customized content based on customer needs

Extend the Capabilities of Your Test Solution

SL1091A Scienlab Energy Storage Discover (ESD)

Productive control of individual test systems

In order to successfully develop and deploy batteries, it is essential to have an environment for performing comprehensive tests. This necessitates a mature, stable and intuitive test-software allowing users to conduct tests that deliver concrete, stable and reproducible test results.

Scienlab Energy Storage Discover (ESD) is the software solution for satisfying these complex and comprehensive test procedures.



Figure 17. PC-based Scienlab Energy Storage Discover.

- Central controlling component for all Keysight Scienlab-brand energy storage test environments.
- Comprehensive overview, user-friendly operation, easy-to-learn.
- Powerful visualization of tests and results.
- ESD supports creating test programs even offline.
- Available simulation environment for offline test.
- Ethernet communication with the battery test system.
- Easy integration with external control and monitoring software via optional standardized remote-interface.
- Holistic vehicle emulation from the perspective of battery cell, module and pack levels.
- Support for Windows 10. Single software license per workstation.
- Integration of external components into the test environment and process, such as environmental chambers, cooling and heating equipment, or optional Scienlab-brand Measurement and Control Modules.

Find out more about SL1091A Scienlab ESD [here](#).

For more information on Keysight Technologies' products, applications, or services, please visit: www.keysight.com



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