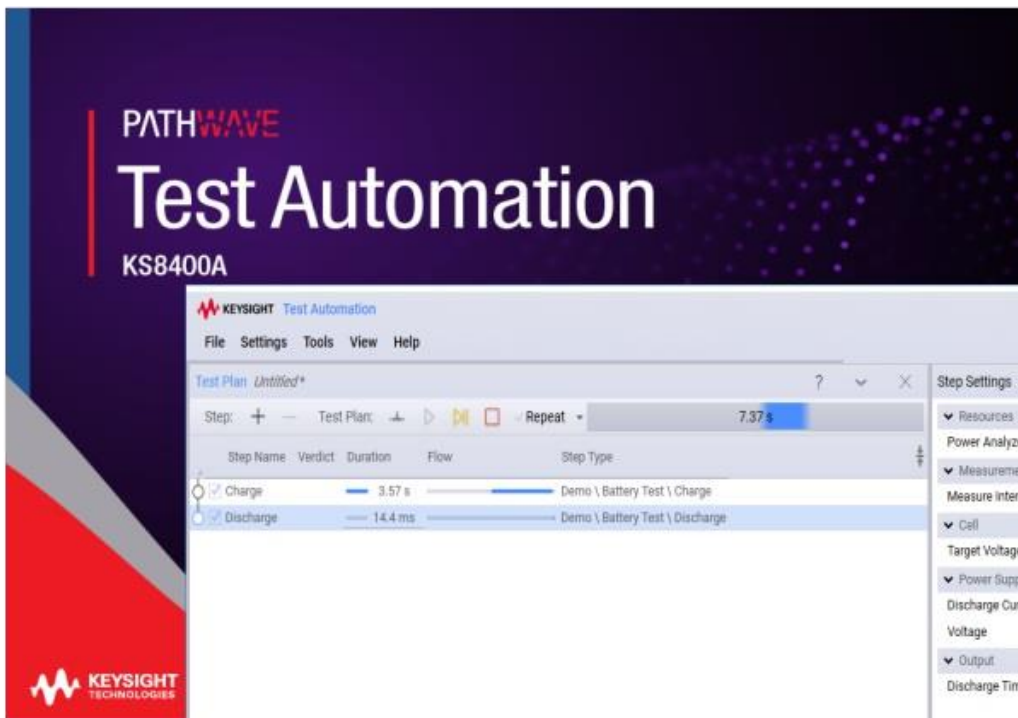


# PathWave Test Automation Training

## Lab 1 - Editor Introduction



The screenshot displays the PathWave Test Automation software interface. The main window is titled "Test Automation" and shows a test plan editor. The test plan is named "Untitled\*" and contains two steps: "Charge" (3.57 s) and "Discharge" (14.4 ms). The "Charge" step is selected, and its settings are visible in the "Step Settings" panel on the right. The settings include: Power Analyzer (PSU), Measurements (Measure Interval: 0.2 s), Cell (Target Voltage Margin: 0.8 V), Power Supply (Discharge Current: 5 A, Voltage: 2.2 V), and Output (Discharge Time: 0 s).

The "Log" window at the bottom shows a list of test steps and their results. The log is filtered to show "Information" and "Debug" messages. The following table represents the data shown in the log:

Time	TestStep	Voltage	Current	Power	Energy
09:52:31.216	TestStep	Voltage: 3.18414	2	.....	4.7
09:52:31.438	TestStep	Voltage: 3.21145	2	.....	4.7
09:52:31.631	TestStep	Voltage: 3.31167	2	.....	4.7
09:52:31.832	TestStep	Voltage: 3.41221	2	.....	4.7
09:52:32.033	TestStep	Voltage: 3.51263	2	.....	4.7
09:52:32.234	TestStep	Voltage: 3.6132	2	.....	4.7
09:52:32.435	TestStep	Voltage: 3.71391	2	.....	4.7
09:52:32.649	TestStep	Voltage: 3.8187	2	.....	4.7
09:52:32.850	TestStep	Voltage: 3.88424	2	.....	4.7
09:52:33.051	TestStep	Voltage: 3.9439	2	.....	4.7
09:52:33.252	TestStep	Voltage: 3.99281	2	.....	4.7
09:52:33.453	TestStep	Voltage: 4.03255	2	.....	4.7
09:52:33.654	TestStep	Voltage: 4.06484	2	.....	4.7
09:52:33.868	TestStep	Voltage: 4.09279	2	.....	4.7

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## Document History

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# Overview

## Lab Objectives

This lab session provides an introduction to using and navigating the PathWave Test Automation Editor. You will learn how to:

- Navigate the **PathWave Test Automation Editor**
  - Install **plugins**
  - Create a **test plan** and configure **test steps**
  - Add and configure **Resources**: Instruments, DUTs, and Result Listeners
- View results using **Run Explorer** and **Results Viewer**
- Use **Timing Analyzer** to optimize test plans

## Lab Procedure

The first part of this lab focuses on installing PathWave Test Automation, getting a license, and starting the Editor. If you already have the latest version of PathWave Test Automation installed and a license activated, go to [Starting the Editor](#).

## Software Requirements

This lab requires the following software:

- **PathWave Test Automation**: Download the latest version from [PathWave Test Automation](#) at [www.keysight.com](http://www.keysight.com).

Please note that PathWave Test Automation is installed in either:

- For **64-bit systems**: C:/Program Files/Keysight/Test Automation
  - For **32-bit systems**: C:/Program Files (x86)/Keysight/Test Automation
- In this document, the install directory is referred to as **TAP\_PATH**.

- **License**: Upon first start, you will be prompted to request a free trial license.
- **Keysight License Manager (KLM)**: KLM is installed with PathWave Test Automation. You will use it to install your license.

Installation is covered below.

# Installing PathWave Test Automation

Follow these steps to install PathWave Test Automation:

1. Download PathWave Test Automation:
  - Go to [PathWave Test Automation](#) at [www.keysight.com](http://www.keysight.com).
  - Click on the **Trials & Licenses** tab.
  - Click the **Details & Download** button.

- Click the **Download** button.
- Enter your information and click **Download**.
- 2. Uninstall all previous versions of PathWave Test Automation (if any are present):
- Select **Windows Start > Control Panel**.
- Select **Programs and Features**.
- Find **Keysight Test Automation**. Click **Uninstall**.

3. Install PathWave Test Automation:

- Launch **TestAutomation.version.exe**.
- Follow the prompts to install PathWave Test Automation

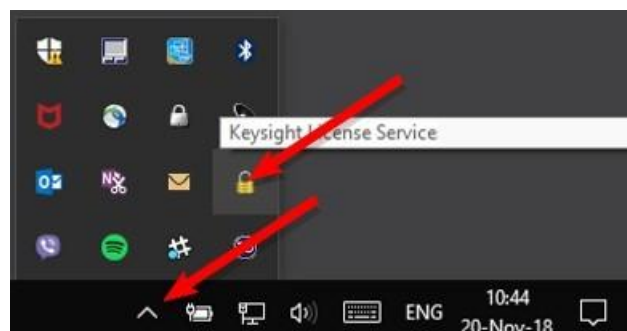
4. Obtain a license:

- Start PathWave Test Automation from the Start menu or by double-clicking:
  - C:/Program Files/Keysight/Test Automation/Editor.exe (64-bit system)
  - C:/Program Files (x86)/Keysight/Test Automation/Editor.exe (32-bit system)
- (32-bit system) Click **Request Trial License**, then follow the prompts to obtain a license.

5. Install the license:

- Start Keysight License Manager. Either:
  - Select **Start** and navigate to **Keysight License Manager > Keysight License Manager**

Click the up arrow on your task bar to open the Windows Notification Area, then double-click the lock icon:



- In Keysight License Manager, select



**(Tools) > Install License File.**

- Navigate to your **.lic** file and click **Open**. This installs your evaluation license.

You are now ready to use PathWave Test Automation for the first time!

# Starting the Editor

1. Select **Windows Start > Keysight Test Automation** Editor. You can also start it directly from
  - C:/Program Files/Keysight/Test Automation/Editor.exe (64-bit version)
  - C:/Program Files (x86)/Keysight/Test Automation/Editor.exe (32-bit version)
2. The Editor opens and displays a welcome
  - It gives an introduction about what is included in PathWave Test Automation and contains what you get
  - Uncheck **Show welcome** option to hide the welcome screen on
  - **Close** the welcome

## Welcome to Keysight Test Automation

It will let you quickly and easily automate your tests, view and analyze results, and optimize test performance.

### With it you can:

- Use the SDK to create custom plugins for devices under test (DUTs), instruments, and test steps
- Create test plans using supplied test steps, third-party developed test steps, and your own custom test steps
- Run test plans, save and view results (Using the Results Viewer)
- Analyze and optimize test plan timing (Using the Timing Analyzer)

- Show welcome screen at startup. (Use GUI settings to show or hide later)

### Getting Started

Click [here](#) for a step-by-step procedure showing how to:

- Create and run test plans
- Save test plan results to a database
- View test plan results

### Plugin Development

- [SDK Examples](#)
- [Developer Guide](#)

### Open Recent Test Plan Files

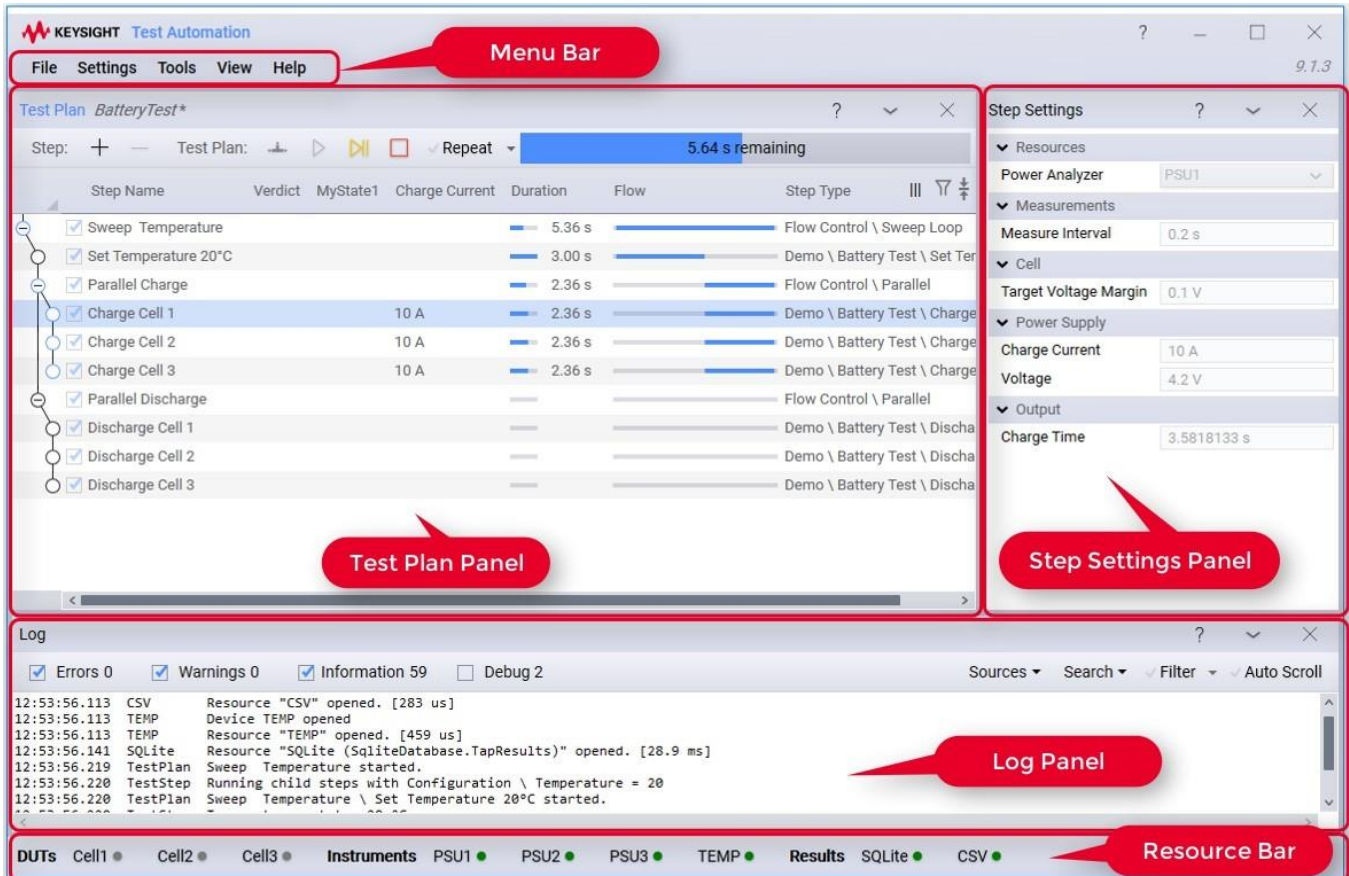
- [OperatorPlan.TapPlan](#)
- [Untitled.TapPlan](#)
- [ExternalParameters.TapPlan](#)



# Introduction to the Editor

The main Editor contains five

- Test Plan
- Step Settings
- Log
- Menu
- Resource bar



## Editor Panels

- The **Test Plan panel** displays the test steps that have been added as part of the current test plan. When an individual test step is selected, the **Step Settings panel** shows available configuration settings (if any). These include input and output settings as well as resources such as DUTs and Instruments.
- The **Log panel** displays log messages from PathWave Test Automation during startup as well as during test plan execution. Log messages are classified as *Error*, *Warning*, *Information*, and *Debug* level events. The content displayed in the log panel is also saved in the Session log.

## Menu Bar and Resource Bar

- The **Menu Bar** provides the following:
  - **File** lets you open and save test plans.
  - **Settings** let you configure basic Editor settings and Resources (Instruments, DUTs, and Result Listeners). **Tools** let you open the Results Viewer, Timing Analyzer, Run Explorer and Package Manager (all discussed later).

**View** allows for panels to be shown/hidden or custom panels to be displayed and docked.

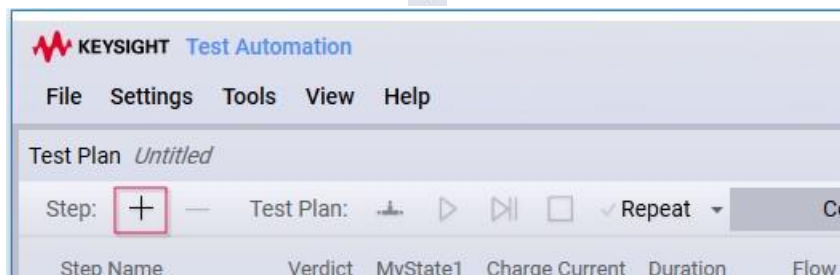
**Help** provides links to various forms of documentation.

- The **Resource Bar** shows what is currently configured for PathWave Test Automation. *Resource* is the general term for a DUT, Instrument, or Result Listener used by a test plan. Circular status indicators next to the resource indicate its state:
  - Green Light = in use
  - Grey Light = not currently being used

## Creating a Simple Test Plan

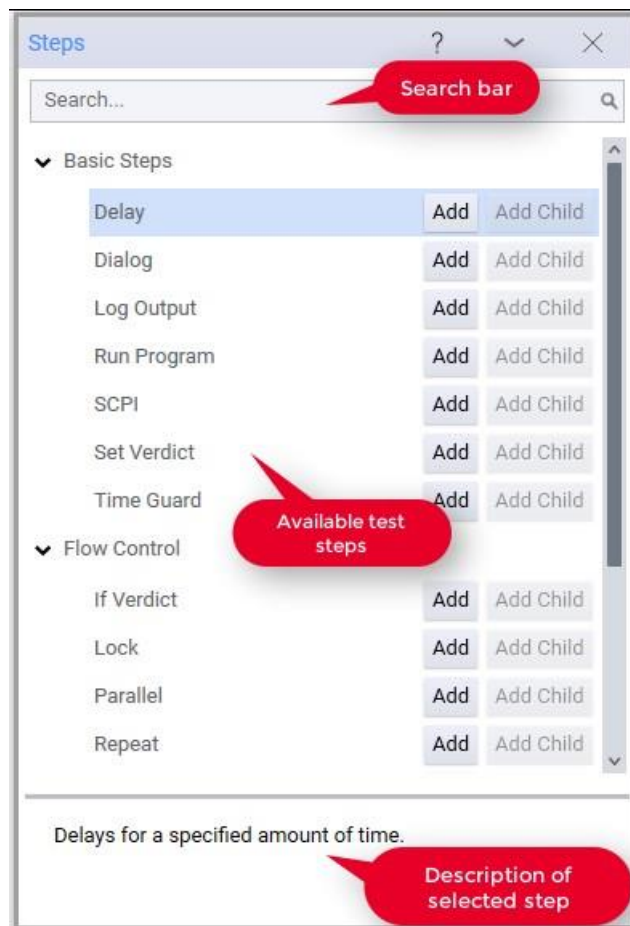
Now let's take a closer look at creating a test plan formed by some test steps.

1. Click the icon in the Test Plan panel or  press **Ctrl + T**:



2. The **Add New Steps** window opens, displaying a list of available **test steps** organized in expandable groups:





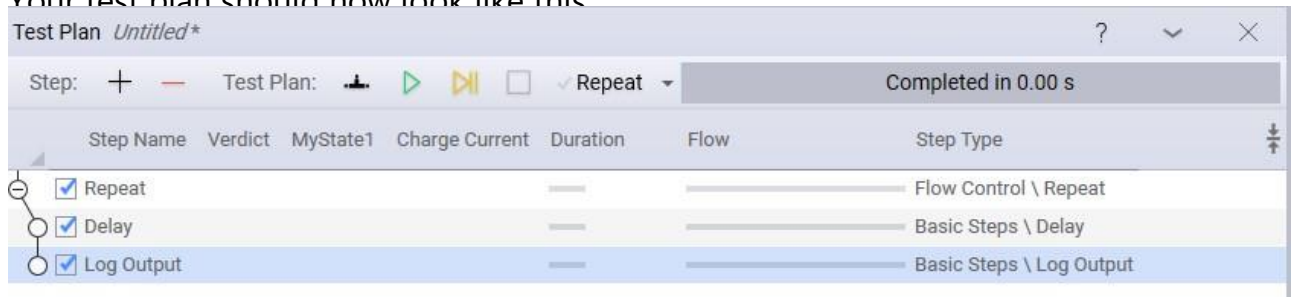
PathWave Test Automation comes preinstalled with the **Basic Steps** and **Flow Control** plugins. Custom test steps will also be displayed here. As your list of test steps grows, the search bar at the top will become useful.

3. In the **Add New Steps** dialog box, add a *Repeat* step: Either:
  - Select **Repeat** and click **Add**, or
  - Double-click the **Repeat** step.

Notice the description of the step appears at the bottom of the window.

4. Add a *Delay* child step: Select **Delay**.
  - Click **Add Child**.
5. Add a **Log Output** step, using either the Add button or by double-clicking. Note that steps are added based on the scope of the previous step. In this case **Delay** was a child step of **Repeat**, so **Log Output** will be a child step of **Repeat** as well.

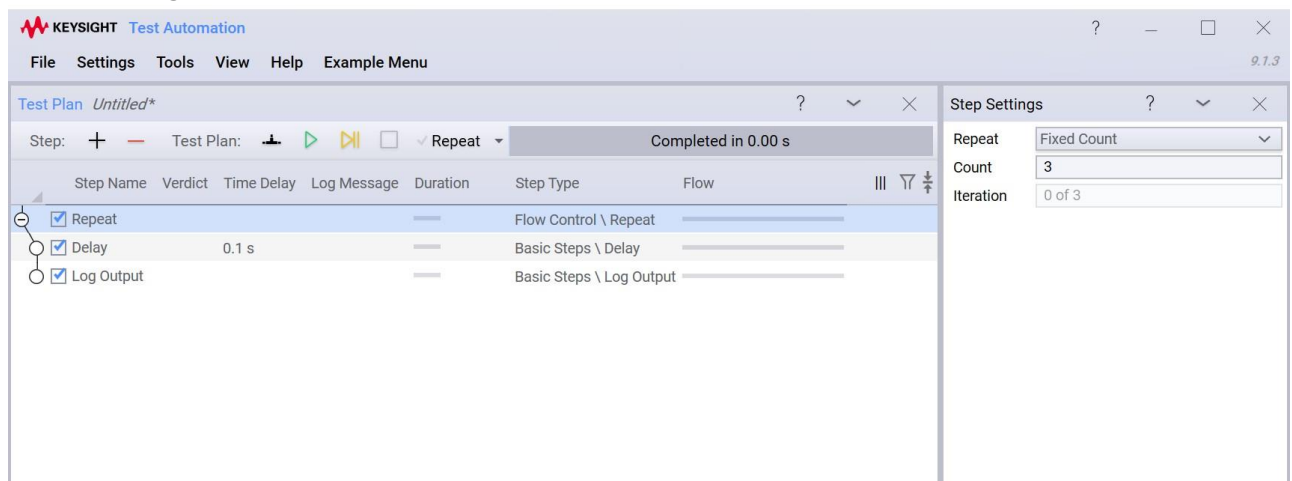
Your test plan should now look like this:



### Note

- Child steps are represented in the Editor by an
- Test steps can be reordered by manually dragging them to a new

6. Close the **Add New Steps** window.
7. Select the **Repeat** step by clicking on it. Notice that the **Step Settings Panel** now shows two settings:



This will cause the **Delay** and **Log Output** steps to execute 3 times.

8. Select the **Delay** and **Log Output** steps and notice that they have their own **Step Settings**. Select **Log Output** and enter your own **Log Message** in the text box.

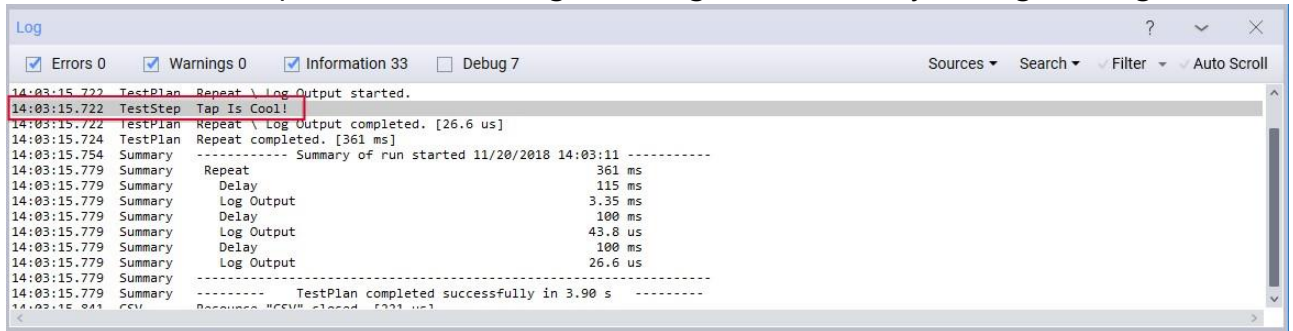


9. Run this test plan by clicking



or by pressing F5.

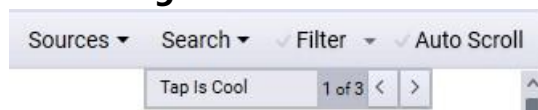
10. After the run completes, scroll through the Log Panel to find your log message:



11. If you do not see your log

Make sure that the **Information** tab in the log panel is checked. This is needed because in the Log Output step's property called Log Severity, we used the default value: Information.

o The **Search** on the right of the **Log Panel** can also be used:



Search

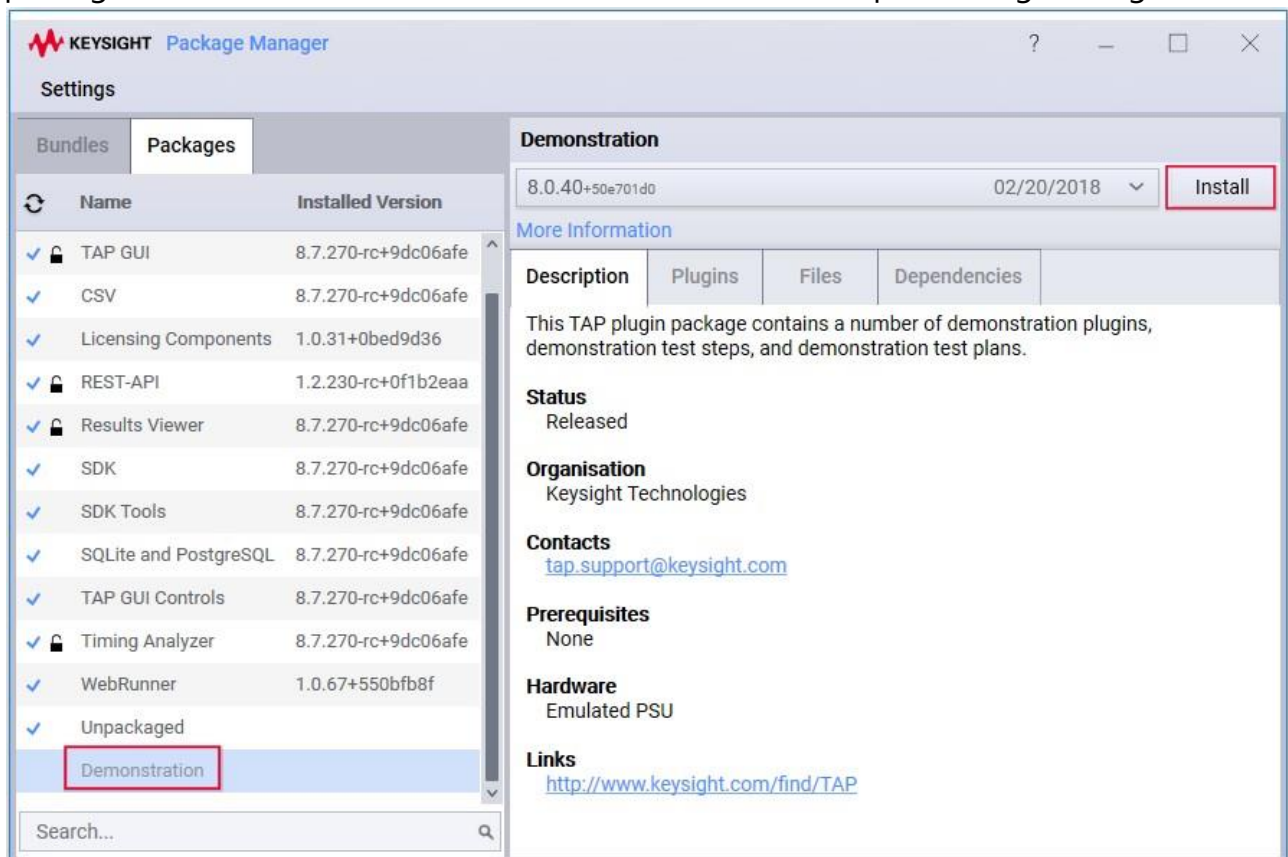
You've just run your first test plan! Wasn't that easy?

# A Real Use Case

## Using the Demonstration Plugin

Now let's install a **Plugin** containing some demo test steps and Instruments. We will use the **Demonstration** plugin for simulating charging and discharging batteries that involves a power analyzer. No real instruments are needed.

1. Click **Tools > Package Manager**.
2. The **Package Manager** opens. It can be configured to point to any server where packages are hosted. This tool lets us download and install preexisting Packages:



In the Package

- Selecting **Package** in the left panel displays information about that plugin. Packages can contain test steps, Instruments, DUTs, Result Listeners and test plans.
- The **Description** tab gives a general overview of the plugin.
- The **Plugins** tab shows all the custom test steps, Instruments, DUTs, Result Listeners and other components contained in the plugin.
- The **Files** tab shows all the files included in the plugin.
- The **Dependencies** tab shows if the plugin is dependent on any other packages.

3. Select the **Demonstration** plugin (which is included with the PathWave Test Automation installation) and click **Install**. After installation the Demonstration plugin displays a check mark next to it in the Package Manager, indicating that it is installed.

4. Close the Package Manager.

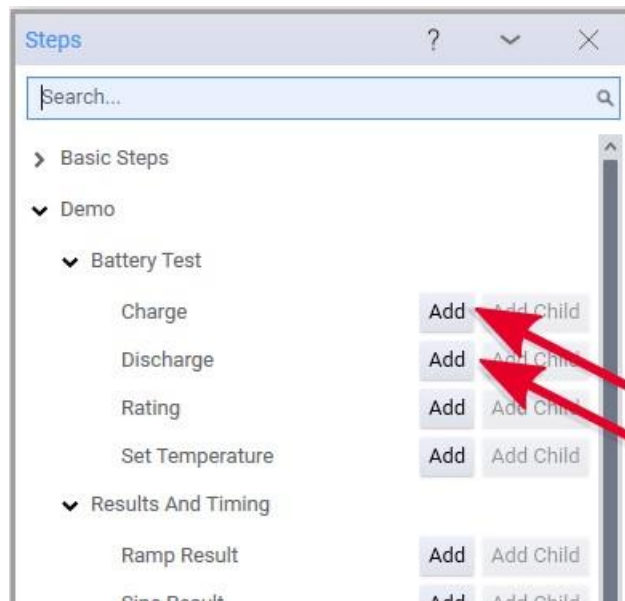
## Constructing a Test Plan

1. Remove any test steps (if they are left over from the previous example). Select the Test Step, then either:
  - Click the



button, or

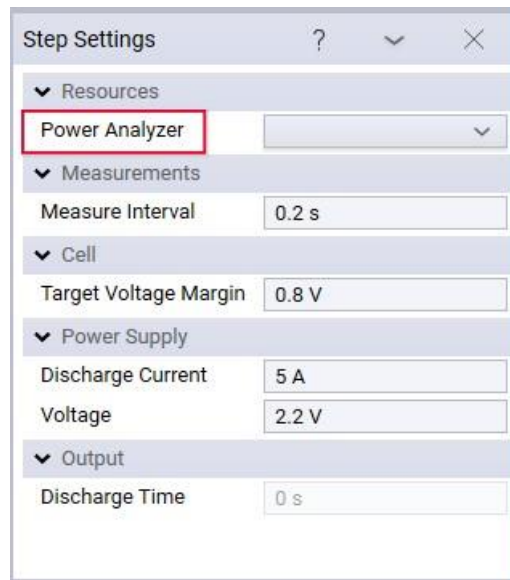
- Press Delete on the keyboard.
2. Click the + button (or press **Ctrl+T**) to open the **Add New Steps** window. You will notice that there is now a new group called **Demo**.
  3. From the **Demo** group's **Battery Test** subgroup, add a: **Charge** step
    - **Discharge** step



4. Close the **Add New Steps** window. Your test plan should now look like this:

Step Name	Verdict	Duration	Flow	Step Type
<input checked="" type="checkbox"/> Charge				Demo \ Battery Test \ Charge
<input checked="" type="checkbox"/> Discharge				Demo \ Battery Test \ Discharge

5. In the test plan panel, select either of the two test steps. You will notice that both steps reference an instrument resource: **Power Analyzer**.

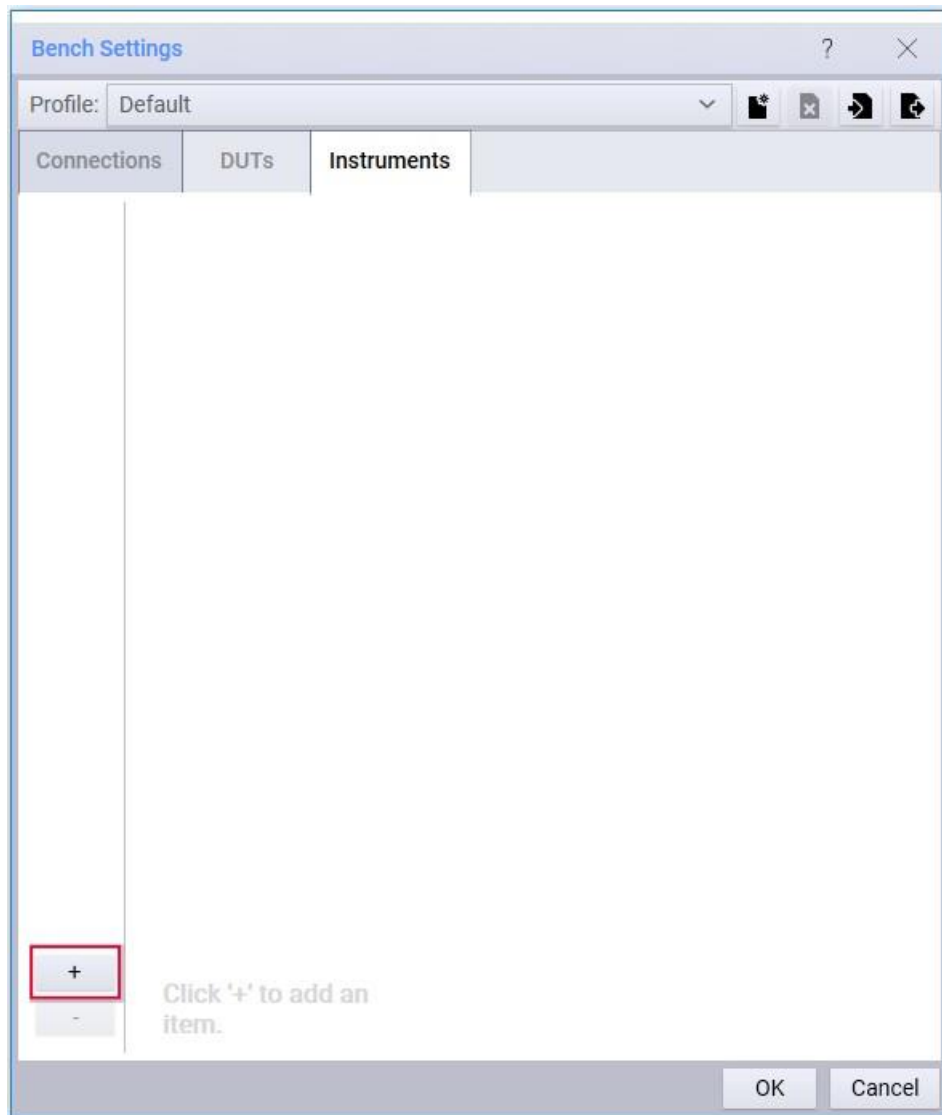


6. We need to add a Power Analyzer instrument as a resource:

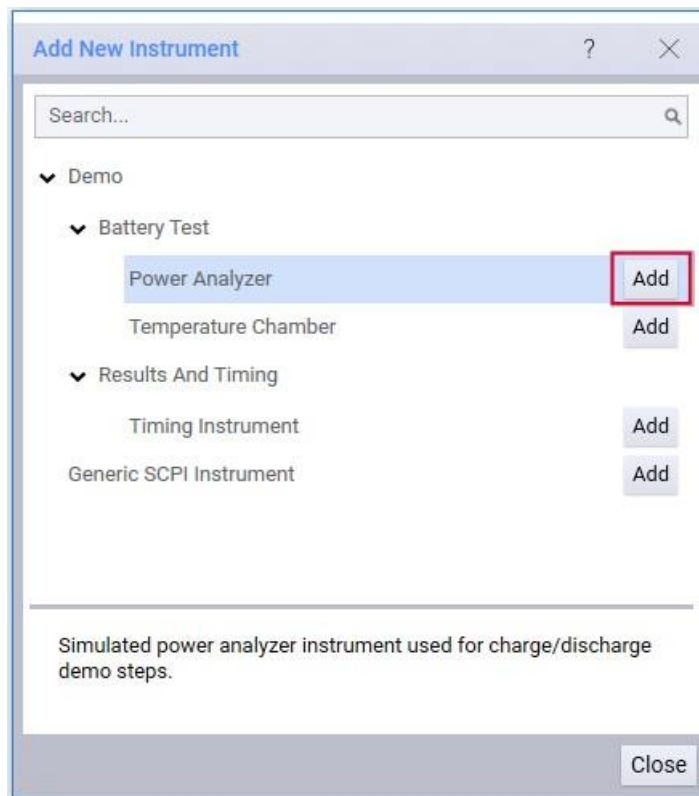
- In the Resource Bar, select **Add New** next to **Instruments**.



- In the **Bench Settings** window (which also can be opened via **Settings > Bench > Instrument**), select the + in the lower-left corner.



- o The **Add New Instrument** window opens. Select **Power Analyzer**, then click **Add**:



- o **Close** the Add New Instrument window.

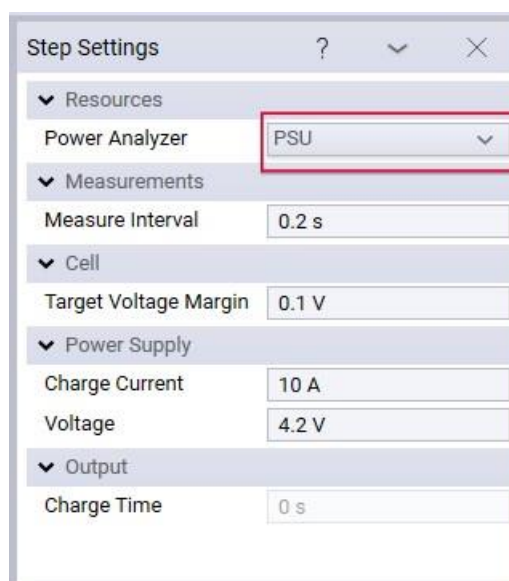
7. Next you would typically configure the instrument address and other settings. Because this is a simulated instrument, we can just click **OK** to close the **Bench Settings** window.

8. In the **Test Plan** panel, notice that:

- o The **Resource Bar** now shows one Instrument: PSU



- o The step settings for both the **Charge** and **Discharge** steps show the PSU as the Power Analyzer resource.





PathWave Test Automation knew to do this because the expected instrument type in the **Step Settings** matched the instrument type that we added.

## Using the Results Viewer

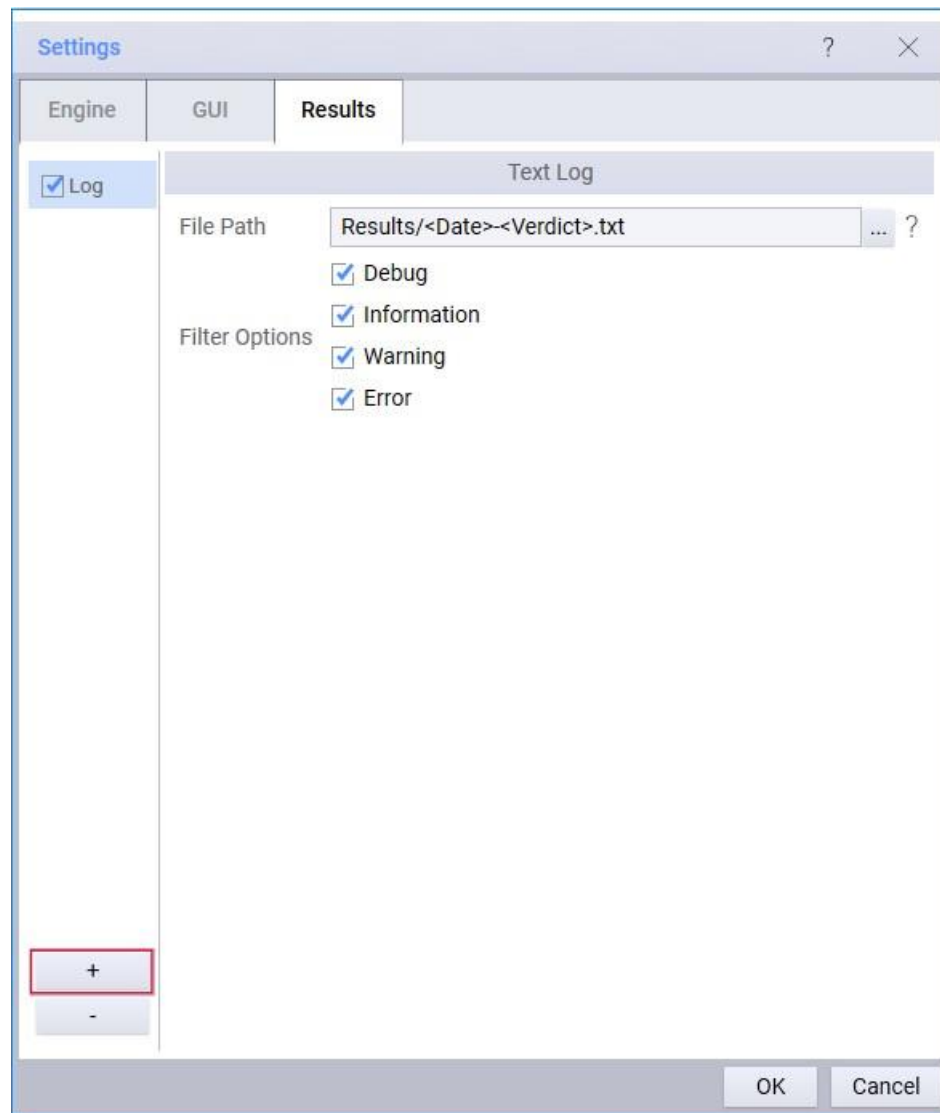
In PathWave Test Automation, a **Result Listener** is also a resource, just like an instrument or DUT. Result Listeners store data created by the test steps.

We can also add database-style Result Listeners that allow us to look at our data more in depth. This lets us do things like plot results, track trends, and find errors. This can all be done in the **Results Viewer**.

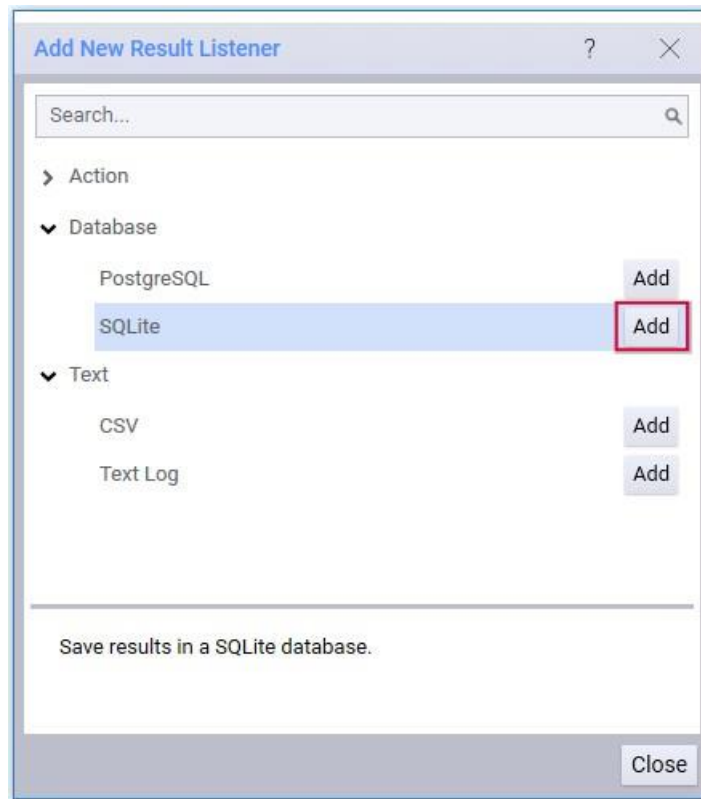
To use the **Run Explorer** and **Results Viewer**, a **database** Result Listener is needed. So, let's add an **SQLite** Result Listener. **SQLite** is a lightweight database provided by PathWave Test Automation. It consists of a single file that encapsulates the full data set, but other types of databases can be used as well.

Note that we will add the Log Result Listener as well. Multiple Result Listeners can be configured at the same time and will process the data from PathWave Test Automation in parallel. This happens in a separate thread, so it will not impact the execution speed of the test plan.

1. Select **Settings > Results** from the **Menu Bar**. In the **Settings** window:
  - Add the **Text Log** Result Listener under the
  - **Text** group. Click the + in the bottom left corner of the window.



2. In the **Add New Result Listener** window:
  - Expand the **Database** group.
  - Add the **SQLite** Result Listener.

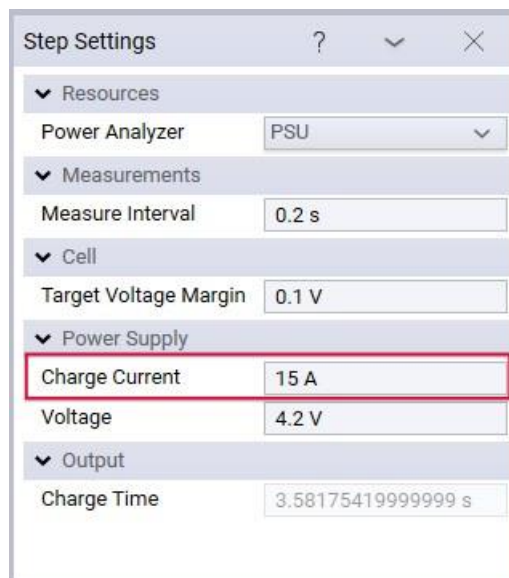


3. **Close** the **Add New Result Listener** window, then close the **Settings** window.
4. Execute the test plan by clicking



in the **Test Plan panel** or by pressing **F5**.

5. Now we will make our results a little more interesting. Select the **Charge Test Step** and change the **Charge Current** from 10 A to **15 A**.

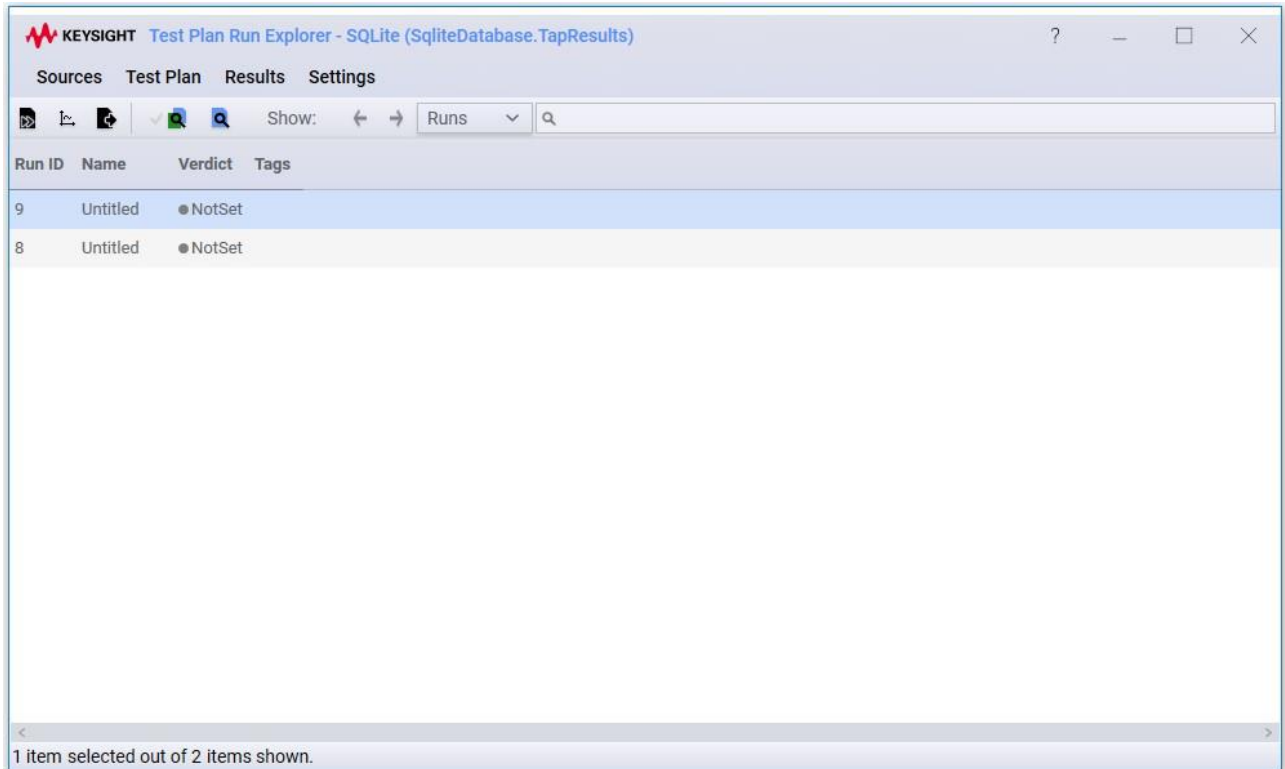


Note that this will create a separate run result when you run the test plan again.

6. Run the test plan again so we can look at the data that was captured.

7. Select **Tools > Run Explorer**. (Notice that the **Results Viewer** and **Timing Analyzer** also can be opened directly from the **Tools** menu.)

The **Run Explorer** opens. This window displays some basic information about the history of our test plan runs stored in our SQLite database, including a **Run ID**, **Test Plan Name** and **Verdict** (Pass, Fail, or Error). In our case, neither of the last two have been set:



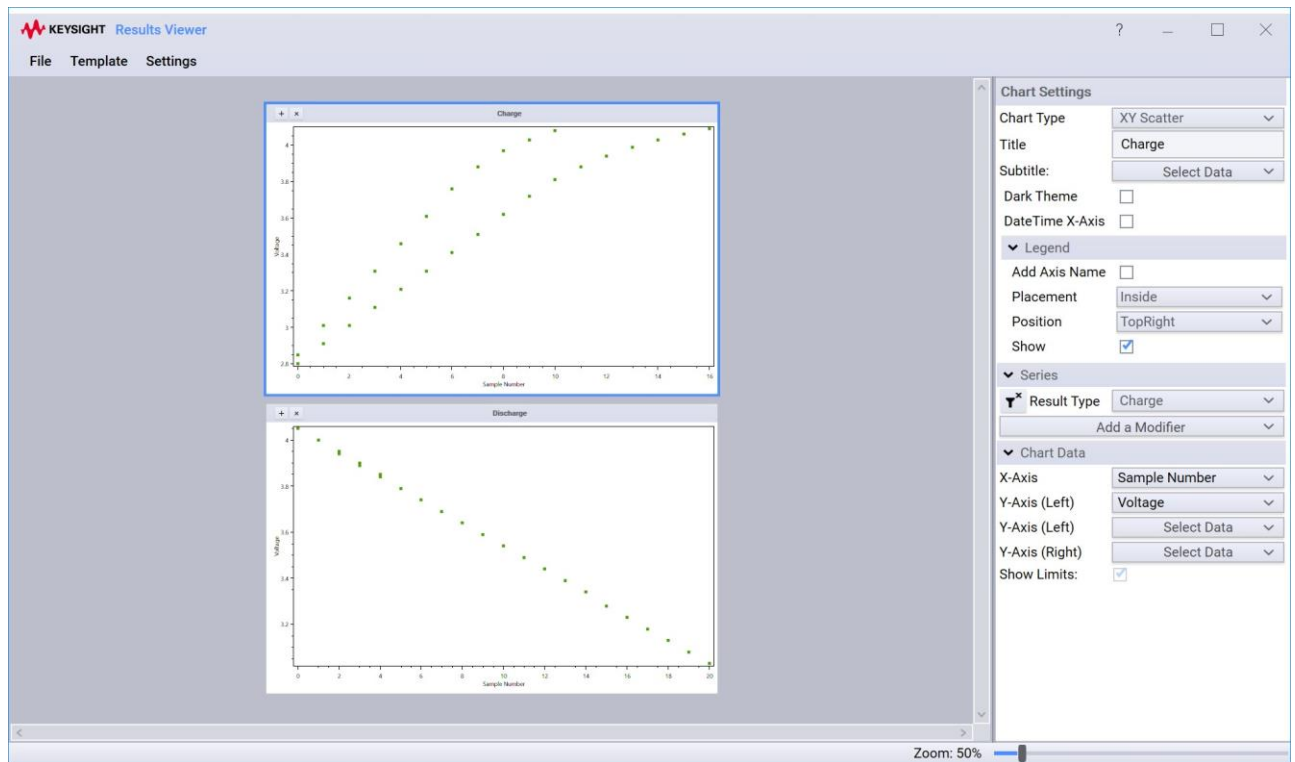
8. Now we will view the results of those test runs:

- Hold **Shift** and select the **Test Plan Runs** at the top of the list. Note **Run IDs** may be
- Open the **Results Viewer**
  - Clicking the **View results from test plan**



- Right-clicking the test plan runs and select **Plot Selected**.

- The **Results Viewer** shows two different plots one under the other (one for *Charge* and one for *Discharge*), as well as some **Chart Settings** to the right:



◦ With the **Charge** plot selected, locate **Series** setting. Select **Add a Modifier** click **Split**

**Chart Settings**

Chart Type: XY Scatter

Title: Charge

Subtitle: Select Data

Dark Theme:

DateTime X-Axis:

Legend

Add Axis Name:

Placement: Inside

Position: TopRight

Show:

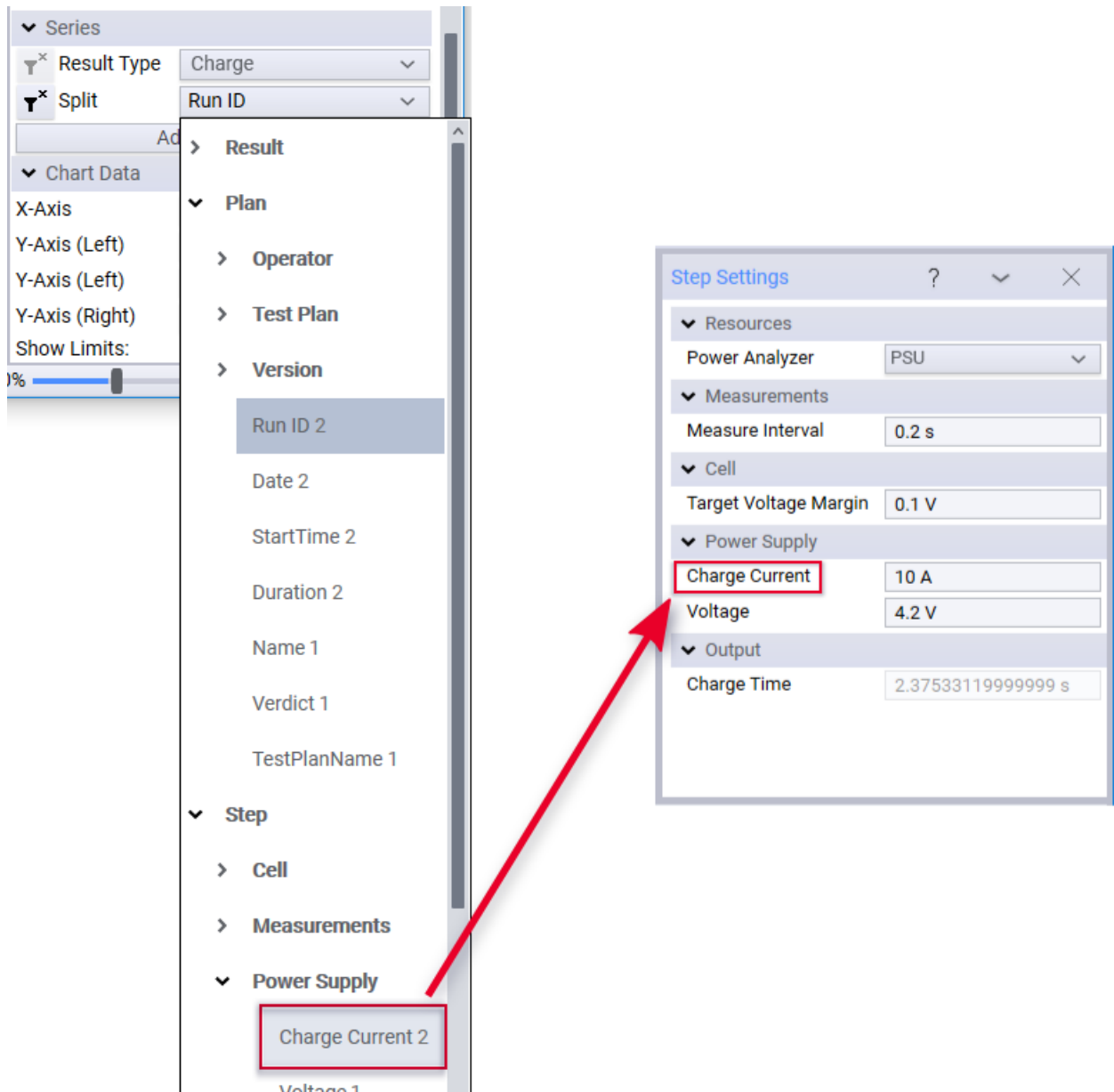
Series

Result Type: Charge

Add a Modifier

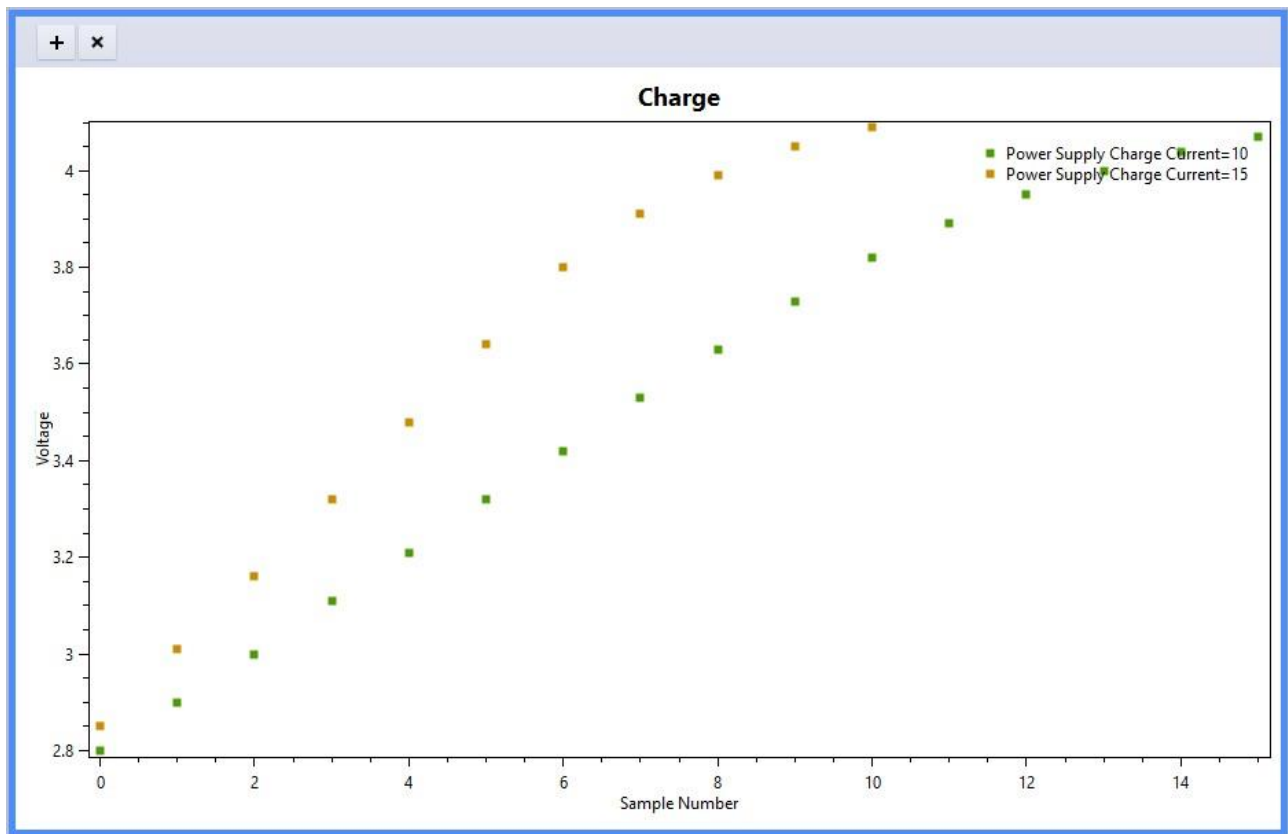
- Split
- Filter
- Result Type
- Order Series
- Order Points
- Tag Filter

9. Click on the drop-down arrow, navigate to **Step > Power Supply**, and select Charge Current:



**Charge Current** is here because it is a *setting* in the Power Supply group of our Charge test step. The number **2** next to Charge Current indicates that there are two unique values in the data set.

10. Notice the chart is automatically updated:



11. Play around with the other **Chart Settings**. PathWave Test Automation provides powerful plotting capabilities that make evaluating data fast and easy. Some of the most commonly used are:

- Chart Types, such as XY Scatter, XY Line, Histogram, etc.
- Series Modifiers, particularly Split and Filter

Chart Data, which is based on what is passed in to the Result Listener by the test step

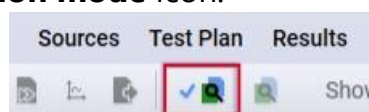
Note that the Chart Settings only apply to the selected chart, which is highlighted in blue. This allows you to configure the charts individually.

12. Close the Results Viewer.

## Timing Analyzer

The **Timing Analyzer** is another powerful tool built in to PathWave Test Automation. It helps users optimize their test plans, locate bottlenecks in execution, and identify areas where parallel execution could be done.

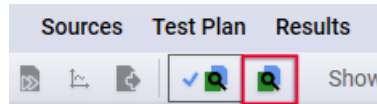
1. Navigate back to the **Run Explorer**.
2. Click the **Compare logs selection mode** icon:



3. This adds check boxes to the **Run Explorer**. Select the top test plan as **Left** and the other as **Right**:

Left	Right	Run ID	Name	Verdict	Tags
<input checked="" type="checkbox"/>	<input type="checkbox"/>	13	Untitled	● NotSet	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	12	Untitled	● NotSet	

4. Click the **Compare logs for selected runs** icon (the magnifying glass icon on the right) to open the **Timing Analyzer**:



5. The **Timing Analyzer** displays each element of the Test Plan on the left (1). The **Time View** window on the right (2) shows time sequentially, with a visual break down of how long each action took and when they occurred:

The screenshot shows the KEYSIGHT Timing Analyzer interface. On the left, a tree view (1) lists test plan elements like 'TestPlan' and 'TestStep'. On the right, a 'Time View' graph (2) displays a timeline with colored bars representing the duration of each action. Below the graph, two log windows show detailed messages and timestamps, such as 'Discharge completed. [4.44 s]' and 'Test step runs finished. [6.81 s]'.

6. The **Time View** window supports the standard zooming functionality with either a mouse wheel or by using **Ctrl+** or **Ctrl-**, as well as left and right scrolling.

7. The **Log** messages are also linked to the **Time View** graphs. Select one of the messages, and notice that the associated bar becomes highlighted.

8. Zoom in on the **Charge completed** time bar:





9. Notice the times for the **Charge** steps (your times may be slightly different):

- The top test run took **2.37s**
- The bottom test run took **3.54s**

This is because we changed the **Charge Current** between runs. A 5A increase in charge current resulted in a **1.17s** decrease in charge time. This is an example of the type of timing analysis that can be done easily with the **Timing Analyzer**.

**This completes the exercises on the Editor.**

We hope you found it interesting and are keen to learn more in the following labs, and maybe even to start using PathWave Test Automation on your own!