

Keysight Technologies

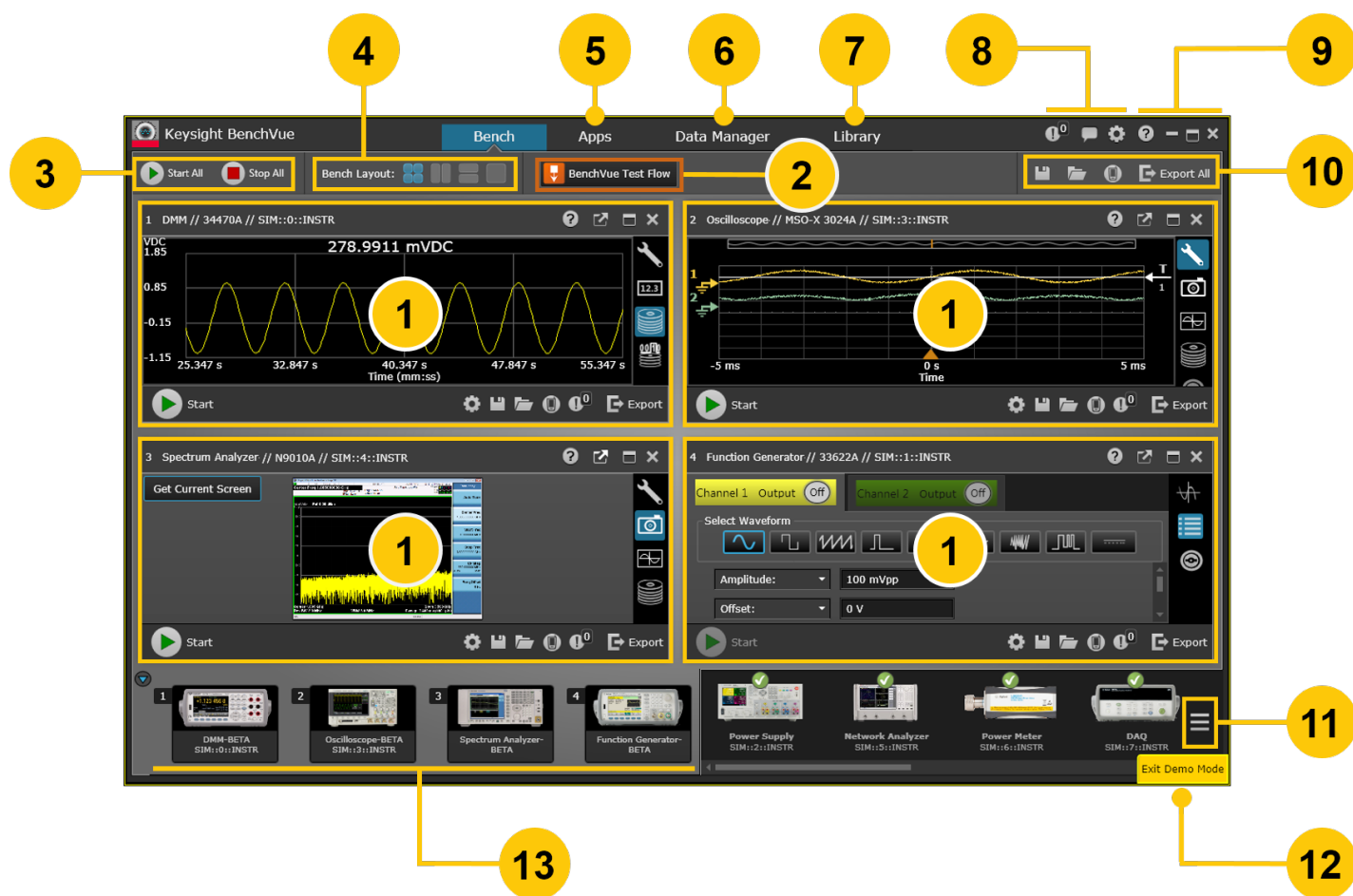
BenchVue 2017 Software

Demo Guide



Designed to Simplify and Accelerate Measurements

Keysight's BenchVue software provides powerful apps to make it simple to control, analyze measurements and quickly build automated tests with Keysight instruments. With no need to program and an intuitive interface, this expandable software platform accelerates data capturing, measurement analysis and overall workflow.



Keysight BenchVue 2017 at a glance

1. Individual bench application windows are shown running within the BenchVue Platform.
2. Launch the **Test Flow** application to quickly create automated tests – without any programming.
3. Start/stop acquisitions on all connected bench instruments.
4. Select the desired layout of the bench application windows.
5. View details for each BenchVue application and obtain licensing information from the "Apps" tab.
6. View saved data logs from the "Data Manager" tab.
7. View the latest instrument manuals, software, FAQs, videos, etc. from the "Library" tab.
8. View notifications, send feedback, report an issue, or configure the global application settings.
9. Open the Help file or minimize/maximize the BenchVue application window.
10. Save/load the instrument state, enable **BenchVue Mobile**, or export screen images and trace data.
11. Manage the list of instruments currently shown on the Instrument Panel.
12. Toggle between **Demo Mode** with simulated instruments and "live" mode with actual instruments.
13. View all connected and launched instruments on the Instrument Panel.

Key features and benefits

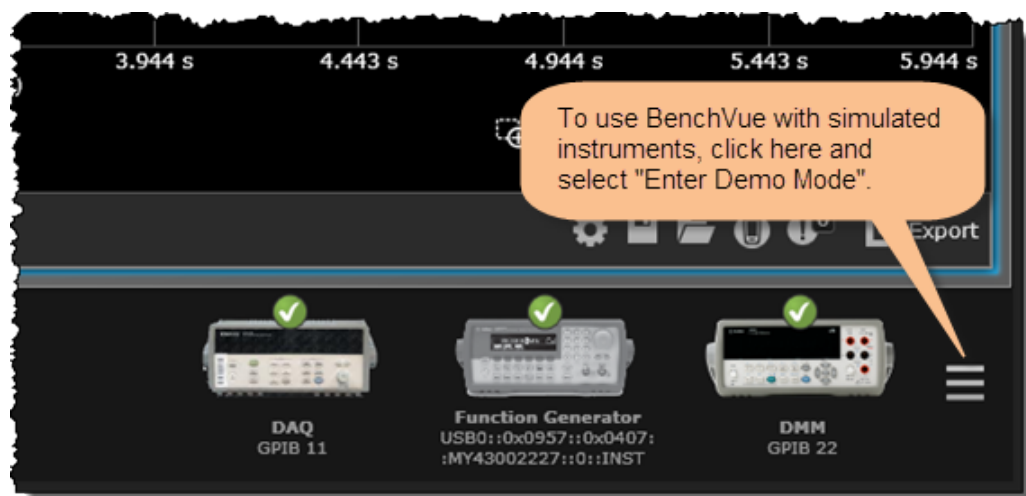
Below is a summary of the key features and benefits of the BenchVue 2017 software.

- Simplify test documentation, data collection, and data analysis, all without the hassles of programming.
- Speed up instrument discovery and connection for a broad range of Keysight instruments. With one-click access to Keysight **Connection Expert**, you can easily connect to your instruments via USB, LAN, GPIB, or RS-232.
- Use **Test Flow** automation within BenchVue to quickly create automated tests in minutes and save days or weeks of development and analysis time.
- Use Keysight **Command Expert** blocks within Test Flow to get deeper control of instruments for configurations that BenchVue does not currently support.
- Capture and export data to your computer. Capture screen images from your Keysight instrument, log measurements under computer control, or upload measurement data captured directly from the instrument.
- Export data from one or more instruments directly to other applications such as MATLAB, Microsoft Word and Excel.
- Store and recall the state of individual instruments or your entire workbench.

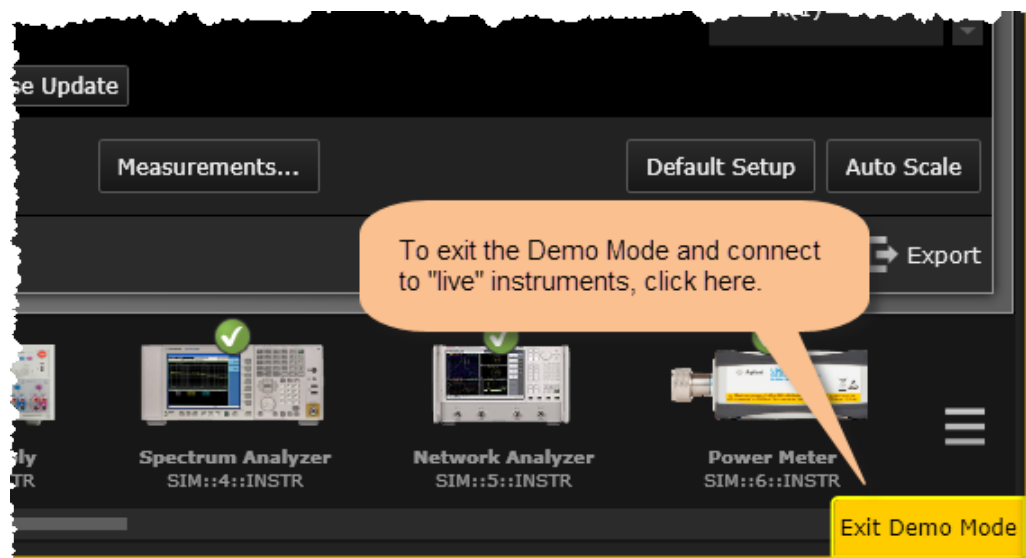
Launch the BenchVue Application

After installing BenchVue, launch the platform application from the desktop icon or from the Windows Start menu by clicking **Start > All Programs > Keysight > Keysight BenchVue**. When BenchVue first opens, the Instrument Panel is displayed along the bottom of the user interface and is automatically populated with instruments currently connected to your computer.

If you do not currently have any connected instruments available, use the **Demo Mode** with simulated instruments and measured data. To enable the **Demo Mode**, go to the Manage Instrument Panel menu and select "Enter Demo Mode".



While in the Demo Mode, a yellow "Exit Demo Mode" button is displayed in the lower right-hand corner of the BenchVue application with a yellow border around the entire application window.



BenchVue Software Licensing

To evaluate one of the BenchVue applications for a free 30-day trial period, go to the BenchVue "Apps" tab, click once on the desired application, and click on the "Start Trial" button. After the trial period expires, you will be required to purchase a software license for that application. Keysight's flexible licensing options allow you to select the license type and license terms that best fit your software needs. For more information on BenchVue software free trials and licensing options, go to www.keysight.com/find/benchvue_apps.



Launch an Instrument's Bench Application

Once an instrument is connected and is available in the Instrument Panel, you can launch the corresponding BenchVue bench application. You can then easily control and configure your instruments using simple point-and-click operations.

To begin controlling an instrument, double-click or drag-and-drop an instrument icon from the Instrument Panel to the BenchVue desktop. Right-click on an instrument icon to see more details including the serial number, links to firmware updates, etc.

The screenshot displays the Keysight BenchVue software interface. The top menu bar includes 'Keysight BenchVue', 'Bench', 'Apps', 'Data Manager', and 'Library'. Below the menu bar, there are buttons for 'Start All', 'Stop All', 'Bench Layout', and 'BenchVue Test Flow'. The main workspace shows the 'Oscilloscope // MSO-X 3024A // SIM::3::INSTR' application. It features a 'Waveform Data' section with four channels (1, 2, 3, 4) and their respective settings (e.g., 1 V / -2.5 V, 1 V / -500 mV, 1.5 V, 3.5 V). A 'Run Control' section includes 'Run Stop' and 'Single' buttons. The 'Measurements' section displays 'Frequency(1)' as 100.478 kHz and 'Rise Time(1)' as 24 ms. The bottom 'Instrument Panel' shows various instrument icons: Oscilloscope (SIM::3::INSTR), DMM (SIM::0::INSTR), Function Generator (SIM::1::INSTR), Power Supply (SIM::2::INSTR), Spectrum Analyzer (SIM::4::INSTR), Network Analyzer (SIM::5::INSTR), and Power Meter (SIM::6::INSTR). A yellow box highlights the 'N9010A: Right-click for details.' text. Two callout boxes provide instructions: 'The Oscilloscope application is currently launched.' and 'The Instrument Panel is populated with available instruments. Double-click an instrument icon to launch the bench application window.'

Launch an Instrument's Bench Application (Continued)

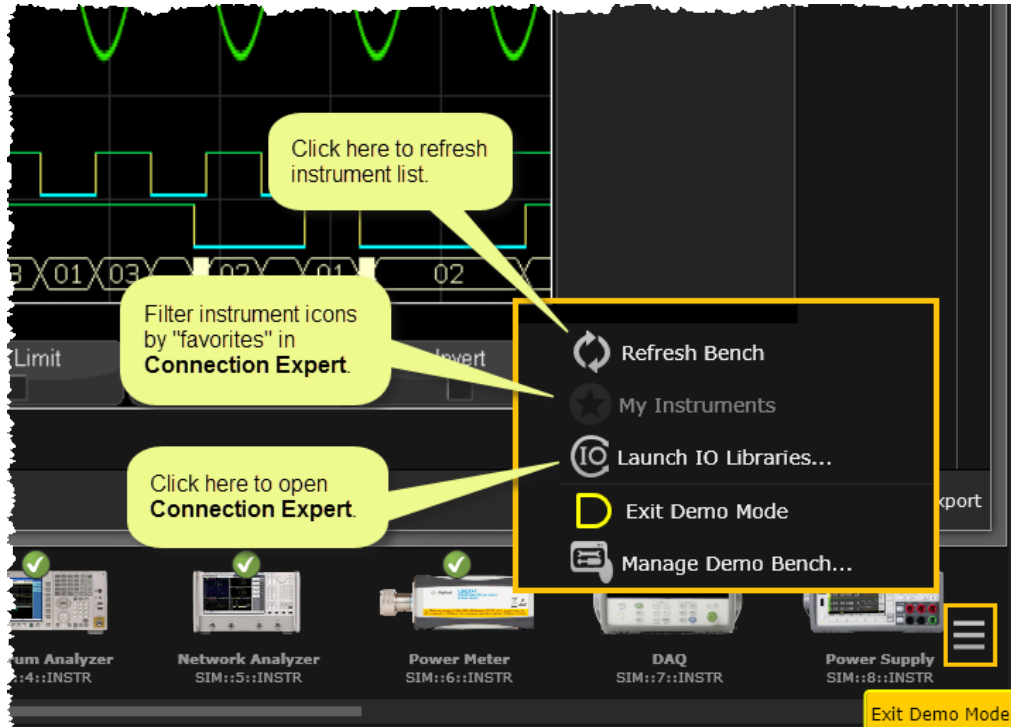
Each type of instrument is supported by its own bench application, with features and controls unique to that instrument. Each bench application has feature-specific tabs, which allow you to configure the instrument, gather measurement data, and analyze the results. For example, the Oscilloscope application has the following tabs:

- The **Instrument Settings** tab is used to configure the instrument's settings.
- The **Screen Image** tab is used to capture the instrument's screen as an image.
- The **Trace Data** tab is used to capture the instrument's traces as measurement data.
- The **Measurement Datalog** tab (selected below) is used to configure the instrument to log measurements over time. To start the data log, click on the 'Start' button located in the lower left corner of the application window.



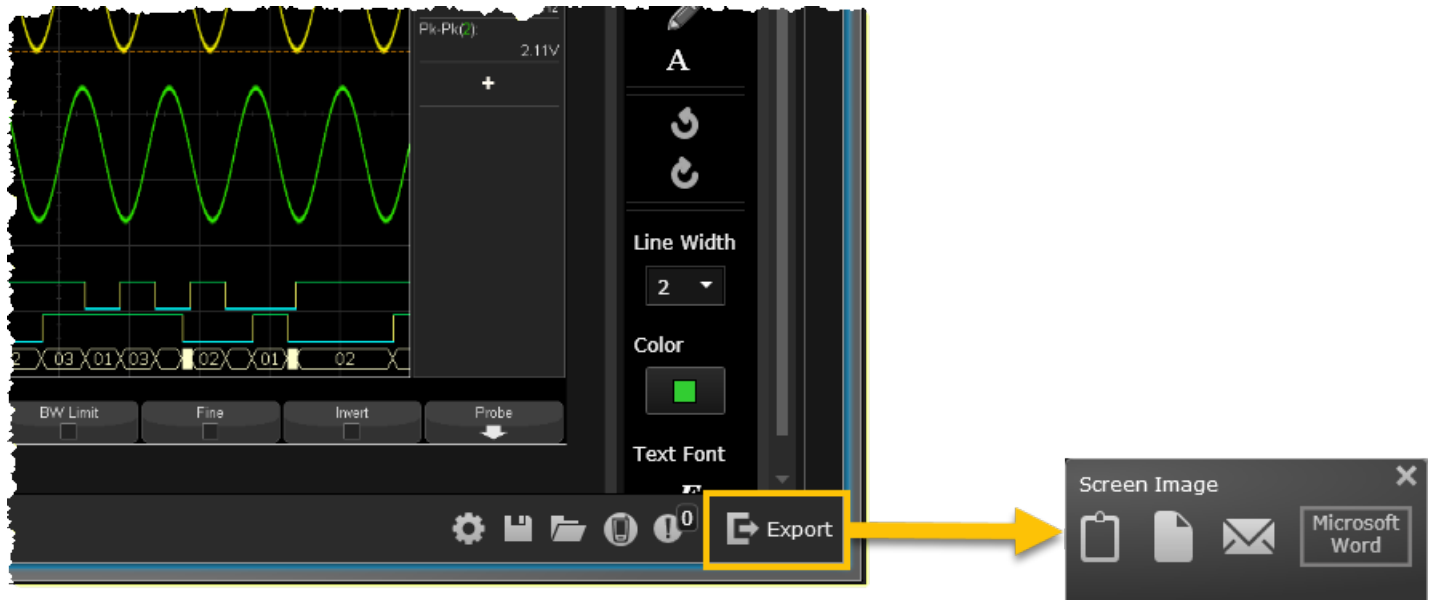
Troubleshoot Instrument Connections

Most Keysight instruments are automatically discovered by BenchVue and you will see those instruments listed in the Instrument Panel. To troubleshoot any connection issues, you may need to launch Keysight **Connection Expert** to manually add an instrument to your configuration.



Export Screen Captures or Trace Data

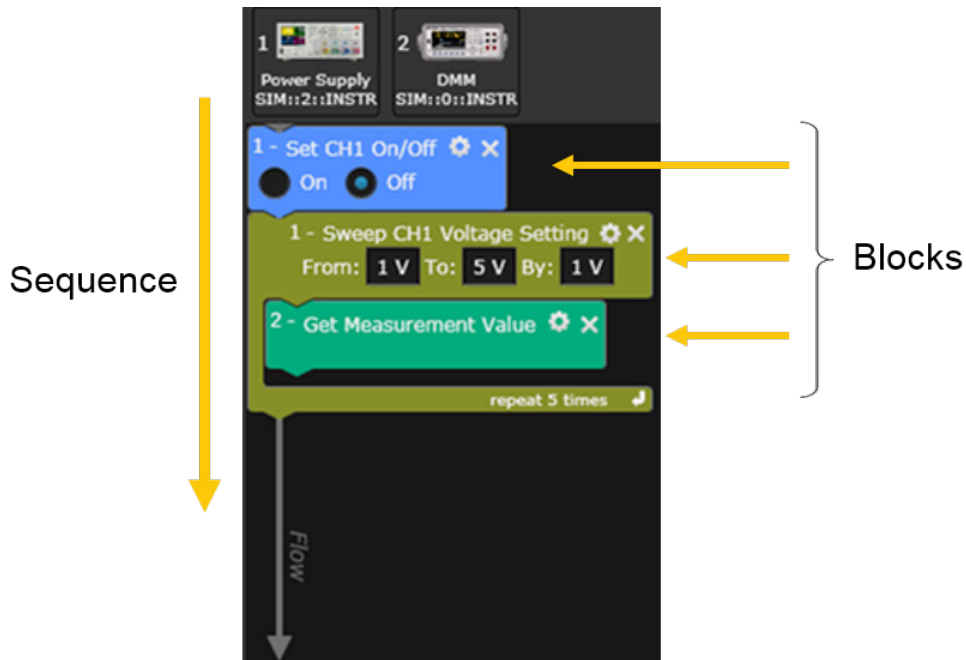
Most bench applications provide an export feature which enables you to export screen images or measurement trace data. With the Oscilloscope application, for example, you can export a screen image to (1) the Windows clipboard, (2) a PNG, JPEG, or BMP image file, (3) an e-mail recipient, or (4) Microsoft Word. You can also export trace data to common file formats such as MATLAB, Microsoft Excel, Microsoft Word, and CSV (comma-separated values).



Create Automated Tests Using BenchVue Test Flow

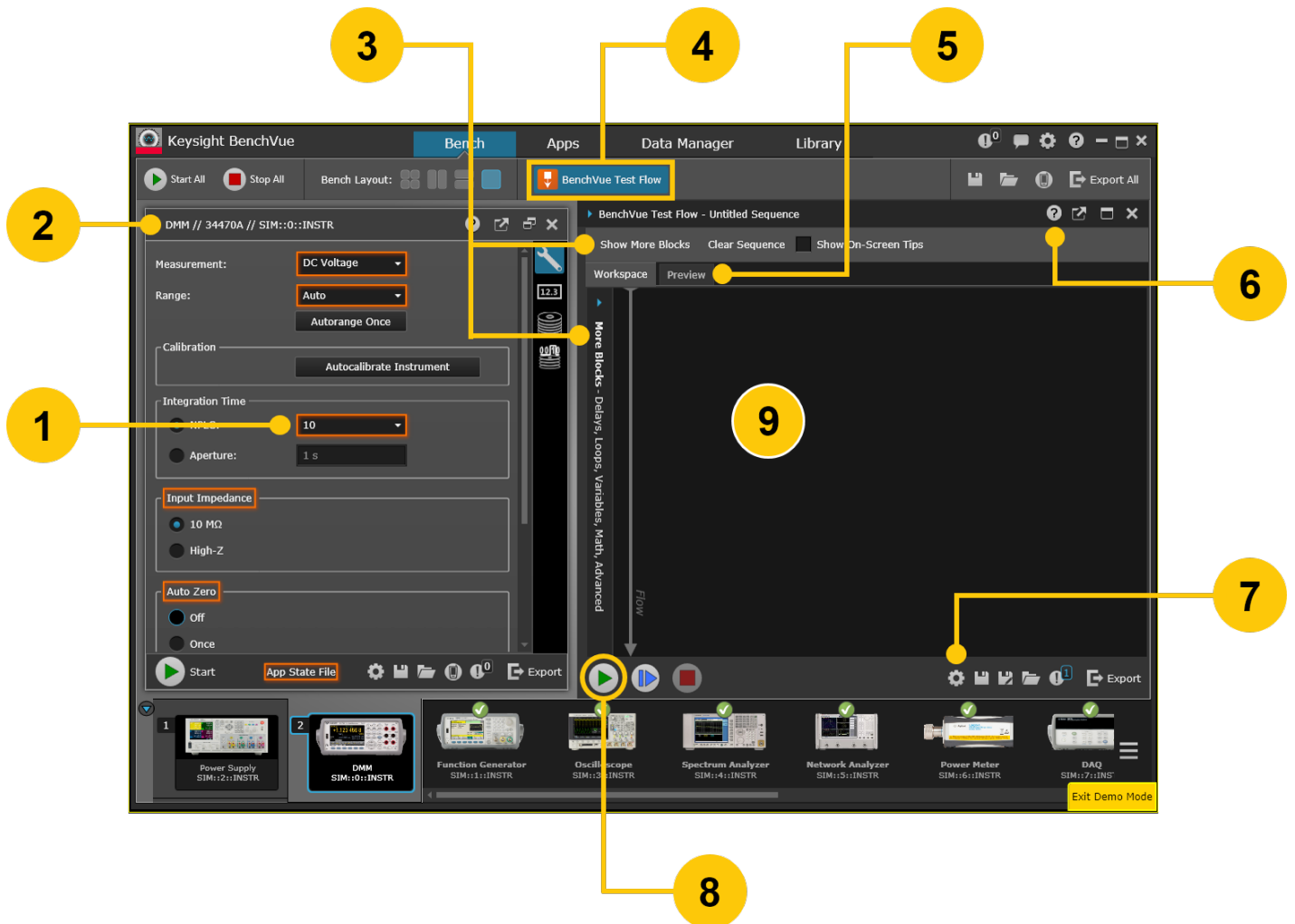
The **Test Flow** application is an embedded application which runs within the BenchVue framework. Test Flow enhances the power of BenchVue by enabling you to quickly create and analyze automated tests – without the need for programming. Using an intuitive drag-and-drop interface, Test Flow allows you to combine multiple instruments into an automated test for better characterization of your device-under-test.

Within Test Flow, the term *Sequence* refers to a series of individual steps or operations that make up an automated test. Each step or operation, called a *Block*, corresponds to a measurement, configuration setting, or property from a launched bench application, such as a power supply or digital multimeter. Using Test Flow's drag-and-drop interface, you can easily add new blocks, move existing blocks, and also add loops and delays to the Sequence.



BenchVue Test Flow at a glance

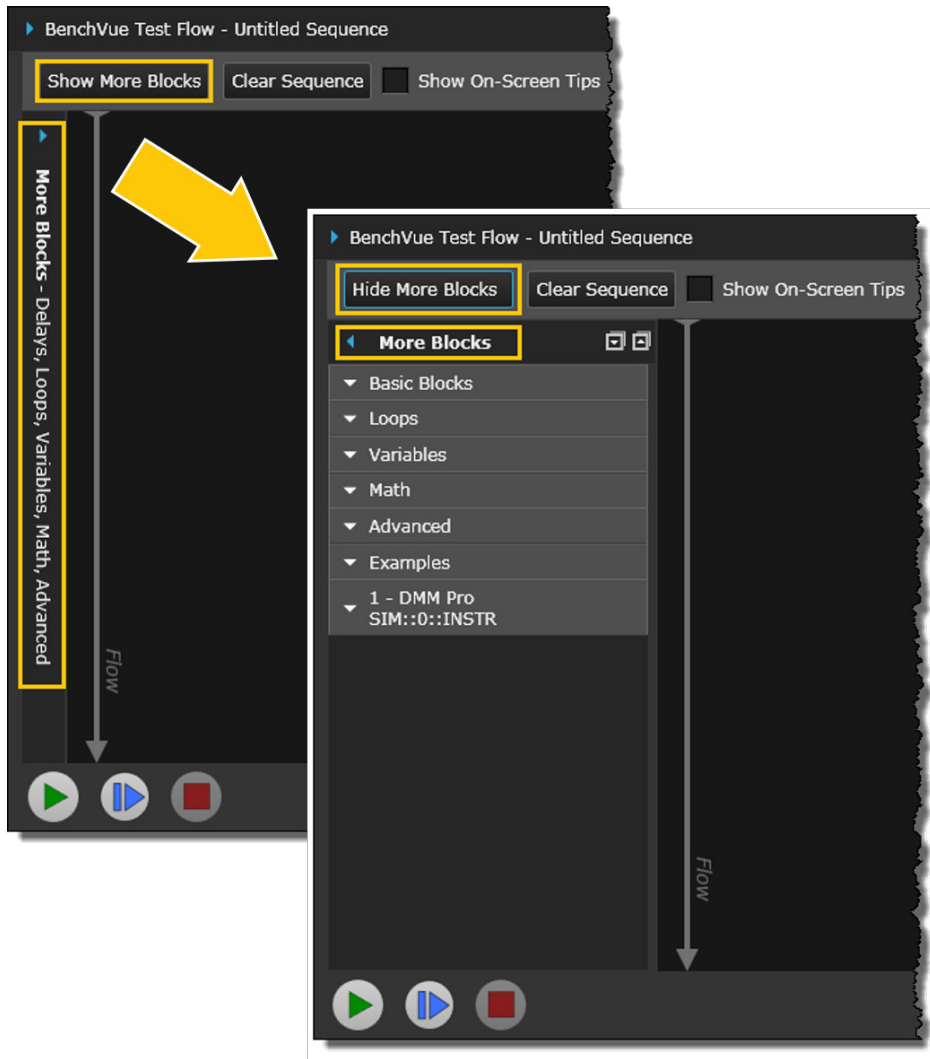
When launched, the Test Flow application occupies the right-hand panel of the BenchVue user interface as shown below.



1. Instrument controls and properties outlined with orange rectangles can be added to a Sequence. To add a control or measurement block to the Sequence, use your mouse to drag the block from the bench application and drop it in the *Sequence Workspace* on the right (see "9" above).
2. Test Flow uses controls and measurements from launched bench applications to create a Sequence. When Test Flow is running, launched bench applications occupy the left-hand panel.
3. Click on the "More Block" expander or "Show More Blocks" button to show the underlying toolbars for access to additional Sequence block types and tools (see the next page for more information).
4. Click here to launch the Test Flow application.
5. Click the "Preview" tab to verify your steps in chart form before executing the Sequence (use the slider bars to resize the Preview area as needed).
6. View the Help file for the Test Flow application.
7. Use the Settings menu to configure Test Flow options or view the Welcome Screen.
8. Click the "Start" button to execute the current Sequence and store the test data.
9. Sequences are created in the *Sequence Workspace* area. Use your mouse to drag orange blocks from a running bench application and drop them here in the Workspace.

"More Blocks" panel

Click on the "More Block" expander panel or "Show More Blocks" button to show the underlying toolbars for access to additional Sequence block types and tools.



The following toolbars are available within the "More Blocks" panel:

- **Basic Blocks** – Insert a time delay, add conditional statements, or display a prompt message during the Sequence.
- **Loops Blocks** – Include conditional looping blocks within the Sequence.
- **Variables Blocks** – Insert variables into other blocks within the Sequence.
- **Math Blocks** – Include math operations in the Sequence.
- **Advanced Blocks** – Include a Keysight Command Expert sequence, send SCPI command strings, or launch an external program from within a Sequence.
- **View Sequence Examples** – Review the example Sequences, which can be found from the BenchVue "Library" tab.
- **Instrument Command Blocks** – As an alternative to viewing instrument controls and properties from the graphical bench application panels, you can use the Instrument Command toolbars to add blocks to a Sequence directly from an instrument-specific command list.

Create a Test Flow sequence

To create a Sequence using Test Flow, use your mouse to drag the desired orange blocks from a launched bench application and drop them into the *Sequence Workspace*. In the example below, the DMM application and Power Supply application are shown in the Demo Mode.

1. From the BenchVue **Instrument Panel**, select the DMM application by clicking on the corresponding instrument icon. Notice that certain controls and properties are outlined with orange rectangles. These identify the operations that can be used as individual Blocks within the Test Flow Sequence.

The screenshot displays the Keysight BenchVue 2017 Software interface. The top menu bar includes 'Keysight BenchVue', 'Bench', 'Apps', 'Data Manager', and 'Library'. Below the menu, there are buttons for 'Start All', 'Stop All', 'Bench Layout', and 'BenchVue Test Flow'. The main workspace is divided into two panels: the 'Instrument Panel' on the left and the 'Test Flow' workspace on the right.

Instrument Panel (DMM Application):

- Measurement:** DC Voltage (highlighted with an orange rectangle).
- Range:** Auto (highlighted with an orange rectangle).
- Calibration:** Autocalibrate Instrument (button).
- Integration Time:** NPLC: 10 (highlighted with an orange rectangle).
- Input Impedance:** 10 MΩ (highlighted with an orange rectangle).
- Auto Zero:** On (highlighted with an orange rectangle).
- Start:** (button).
- App State File:** (button, highlighted with an orange rectangle).

Test Flow Workspace:

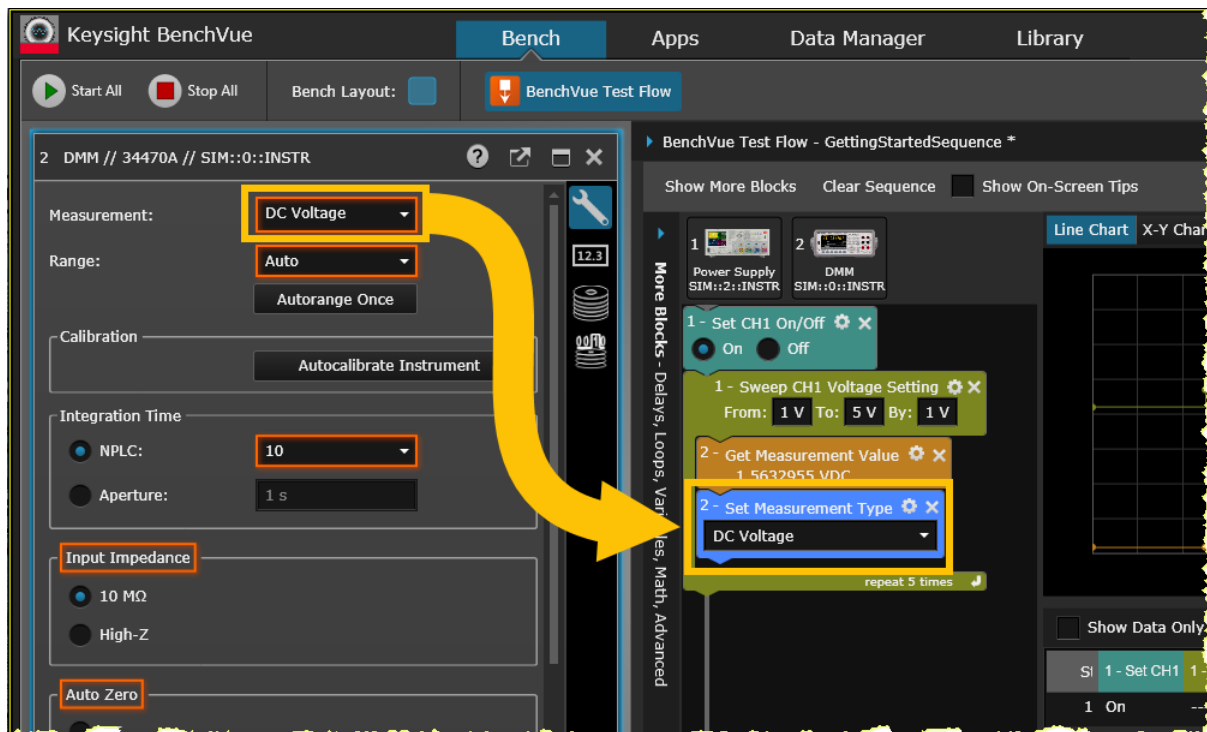
- Sequence Name:** BenchVue Test Flow - GettingStartedSequence *.
- Blocks:**
 - 1 - Set CH1 On/Off (On/Off buttons).
 - 1 - Sweep CH1 Voltage Setting (From: 1 V To: 5 V By: 1 V).
 - 2 - Get Measurement Value (1.5632955 VDC).
- Results:** A line chart showing the measurement value over time (91.009 m to 355.036 m).
- Data Table:**

SI	1 - Set CH1	1 - Sweep CH1	2 - Get Meas	Time
1	On	---	---	00:00:00
2	---	1 V	51.4282 mV	00:00:00.091000
3	---	2 V	435.3368 m	00:00:00.150000

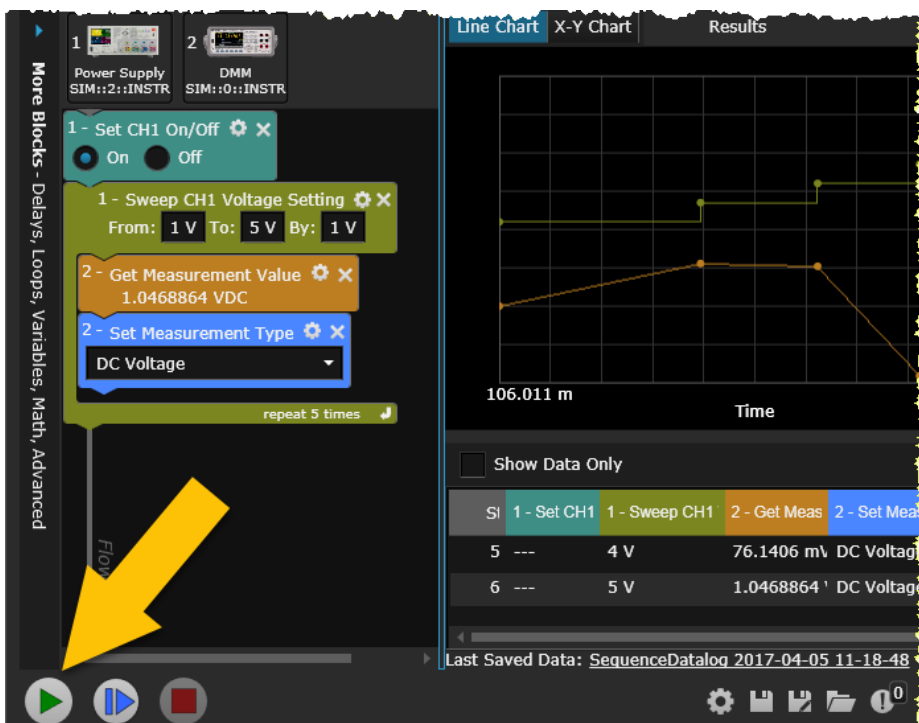
A large yellow arrow points from the 'App State File' button in the Instrument Panel to the 'Test Flow' workspace, indicating that the application state is being saved into the sequence.

In the above example, a "Sweep" block has been added to the Sequence to set up a loop and step through a range of voltages on Channel 1 of the power supply – the sweep steps from 1 V to 5 V in increments of 1 V. With each sweep, the power supply voltage is incremented to the next value for a total of 5 sweeps.

- To add a new block to the Sequence, use your mouse to drag-and-drop the control over to the Sequence Workspace. For this example, drag a measurement function control from the DMM application and drop it in the Sequence Workspace, within the existing Sweep block as shown below.



- Click the Start button on the bottom toolbar of the Test Flow panel to run the Sequence. The blocks are executed in order from *top to bottom* and the resulting test data is plotted on the chart and in the data table.



View sequence data in Data Manager

Each time you execute a Test Flow Sequence, the results are automatically stored in the BenchVue "Data Manager" tab. From the filtering panel on the left side of the "Data Manager" tab, select "Test Flow" to list only the results from Sequences. Double-click on a Sequence to display the contents in a separate **Test Flow Viewer** window (depending on the size of the data log file, it could take some time for this window to open).

The screenshot displays the Keysight BenchVue Data Manager interface. The 'Data Manager' tab is selected at the top. The left sidebar contains a 'Filters' panel with a 'Date Range' filter set to '3/1/2013' to '4/5/2017'. Under the 'Select all Apps' section, 'Test Flow' is selected and highlighted with a yellow box. The main area shows a table of sequence data logs, sorted by 'Date/Time'. One entry is highlighted with a yellow box: 'TF SequenceDataLog 2017-01-13 09-25-36'. A yellow arrow points to the 'Refresh Data Logs' button in the top toolbar. The bottom of the interface shows instrument icons for Power Supply, DMM, Oscilloscope, Function Generator, Spectrum Analyzer, Network Analyzer, Power Meter, and DAQ. An 'Exit Demo Mode' button is located in the bottom right corner.

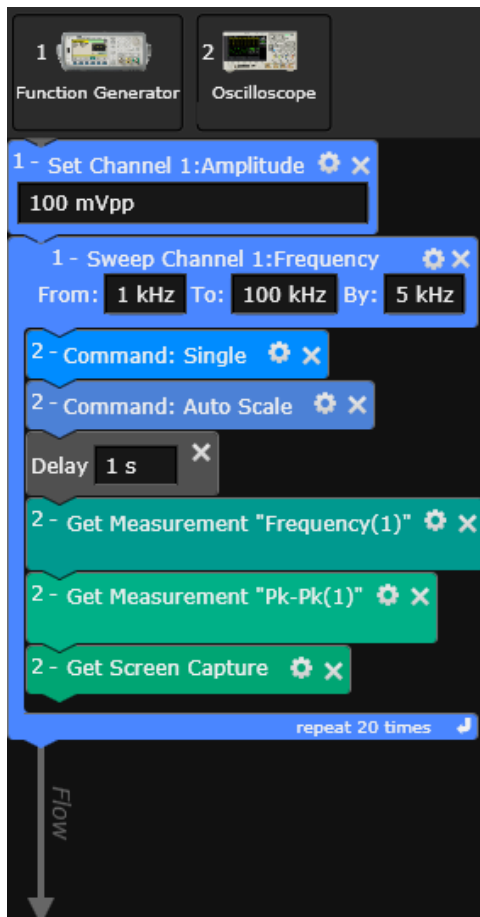
TF	SequenceDataLog	2017-01-30 16-16-31	2017-01-30 16:24:11	2017-01-30 16:24:11	
TF	SequenceDataLog	2017-01-30 16-16-31	2017-01-30 16:19:01	2017-01-30 16:19:01	
TF	SequenceDataLog	2017-01-30 16-16-31	2017-01-30 16:16:31	2017-01-30 16:16:31	
TF	SequenceDataLog	2017-01-30 16-15-29	2017-01-30 16:15:29	2017-01-30 16:15:29	
TF	SequenceDataLog	2017-01-30 16-14-19	2017-01-30 16:14:19	2017-01-30 16:14:20	
TF	SequenceDataLog	2017-01-13 09-25-36	2017-01-13 09:25:37	2017-01-13 09:28:41	33522B , DSO-X 4032A
TF	SequenceDataLog	2016-12-01 16-37-37	2016-12-01 16:37:37	2016-12-01 16:37:37	
TF	SequenceDataLog	2016-12-01 16-33-42	2016-12-01 16:33:42	2016-12-01 16:33:42	
TF	SequenceDataLog	2016-12-01 16-31-51	2016-12-01 16:31:51	2016-12-01 16:31:52	

Test Flow example – simple frequency response test

To show how fast and easy it is to create a Test Flow Sequence to generate a powerful automated test, an example is included below – no programming is required. The example shows how to use a Sequence to generate a frequency response test for a device under test.

The example Sequence uses the Function Generator (FG) application and the Oscilloscope (Scope) application. The example Sequence is also available from the BenchVue "Library" tab – go to "BenchVue Test Flow Examples", then to the "Applications" folder, and then select the "Simple Frequency Response Test" sequence from the list.

The blocks for this example Sequence are shown below. Click the Start button on the bottom toolbar of the Test Flow panel to run the Sequence. The blocks are executed in order from *top to bottom*.



The steps in the above Sequence are summarized below.

1. Set the FG output amplitude to 100 mVpp.
2. Add a Sweep block to sweep the FG output frequency from 1 kHz to 100 kHz in 5 kHz increments (20 steps total).
3. Within the Sweep block, the following actions are performed with each sweep:
 - a. Set the Scope to auto scale.
 - b. Insert a 1-second delay to allow for settling.
 - c. Take a frequency measurement on the Scope.
 - d. Take a peak-to-peak amplitude measurement on the Scope.
 - e. Capture a screen shot from the front-panel of the Scope.

The results from the test are shown below in a **Test Flow Viewer** window. Note that the colors of the traces (chart) and the column headers (table) correspond to the block colors in the Sequence Workspace.



1. Sequence blocks are executed in order from top to bottom and the resulting test data is plotted on the chart and in the data table.
2. View the sequence data in **Line Chart** or **X-Y Chart** format. Use your mouse to hover over specific data points in the chart.
3. In the X-Y Chart view, use the axis drop-downs to select the desired parameter to be displayed on the corresponding axis.
4. Select the "Show Data Only" checkbox to show the results only from Get Block, Sweep Block, and List Block operations. All other Sequence operations, such as instrument configurations and parameter settings, are not included in the data table.
5. View the sequence data in tabular form. The color of the column headers in the table correspond to the block colors in the Sequence Workspace.
6. Click the camera icon to view a screen capture at each step of the sequence.

Intuitive Software for More Productivity, Faster Analysis, and Stronger Results

With Keysight BenchVue software's Test Flow, a tedious repetitive process can now be created quickly without having to write any software, and results can be exported easily for further analysis or documentation. This can dramatically reduce the time and costs of characterizing devices.

For more information

- To visit the BenchVue Software page, go to **www.keysight.com/find/BenchVue**.
- For more information on BenchVue software free trials and licensing options, go to **www.keysight.com/find/benchvue_apps**.
- For a complete list of Keysight instruments supported by BenchVue, go to **www.keysight.com/find/BenchVueInstruments**.
- To post a question on the BenchVue Software Forum (a login is required), go to **www.keysight.com/find/BenchVueForum**. This is a great resource if you want to review questions that other BenchVue users have posted.
- To view the BenchVue Help files, go to **www.keysight.com/find/BenchVueDocumentation**.

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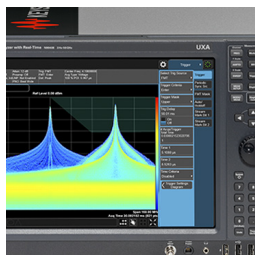
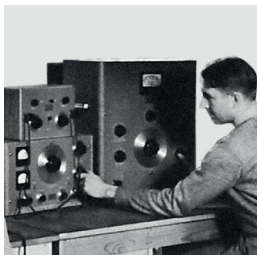
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