



# Work Seamlessly and Productively with Modern Test Workbenches

## Test, Analyze, and Share Collaboratively

Remote learning technology spending has experienced double-digit percentage growth, year-over-year. The COVID-19 pandemic helped catalyze that growth, as universities and colleges realized the importance of having a remote learning infrastructure to adapt to this new environment.

Transformation is underway. According to a recent survey by Ipsos for the World Economic Forum, 72% of respondents from 29 countries expect a hybrid model of higher education, with both in-person and online learning, by 2025. Even in electronics teaching labs, a real need exists for technology that requires students and educators to test, analyze, and share results collaboratively.

## PATHWAVE



### Global remote learning technology market trend:

- The market will experience an estimated growth of 14.7% CAGR between 2020 and 2030. <sup>1</sup>
- Most universities struggle to adapt to the new environment, seeking blended learning experience with the right technology.
- In 2025, higher education will be a hybrid of in-person and online learning. <sup>2</sup>

1. 2020 Analysis and Review: Remote Learning Technology Spending Market by Solution – Software and Services for 2020 – 2030. N.d. Future Market Insights. REP-GB-12538.  
2. Whiting, Kate. “Is This What Higher Education Will Look Like in 5 Years?” World Economic Forum. Accessed January 6, 2021. <https://www.weforum.org/agenda/2020/11/higher-education-online-change-cost-covid-19/>.

## Keysight solution

Keysight's new Smart Bench Essential Series teaching lab equipment is affordable and modern. It works seamlessly with Keysight PathWave software, allowing you to test, analyze, and share results collaboratively, across the room or around the world. The differentiated Keysight Lab Manager software allows you to configure your lab with the click of a button and manage all your lab assets effortlessly. With remote learning becoming the new normal, Keysight Remote Access Lab software allows you to access your lab equipment, even from home. It also comes with KeysightCare, which provides access to technical experts from Keysight and 24/7 knowledge center to help you get up to speed in the shortest time.



## Keysight Smart Bench Essential Series

Many test equipment vendors do not have a complete portfolio of products for their teaching lab solutions. They mix and match models with an inconsistent look and feel, graphical user interface, and connectivity. Keysight Smart Bench Essential Series is a modern design solution for test workbenches in teaching labs, as well as for aspiring new product development electronics engineers.

When testing your device, you need a complete portfolio of test instruments to perform specific functions:

- The power supply should provide the exact DC biasing power to your device under test (DUT). Otherwise, it will not operate properly.
- The function generator should provide the various test input signals for your DUT to respond. The output signals from your DUT are the responses to your stimulated test input signals.
- The oscilloscope measures the dynamic responses of your DUT output signals. The digital multimeter measures various parametric responses from the DUT, directly or indirectly. Those responses include DC voltage or current consumed by the DUT and temperature changes of the DUT.

Figure 1 shows how all the instruments work together to test your DUT. However, there is more to how each instrument performs its primary functions.

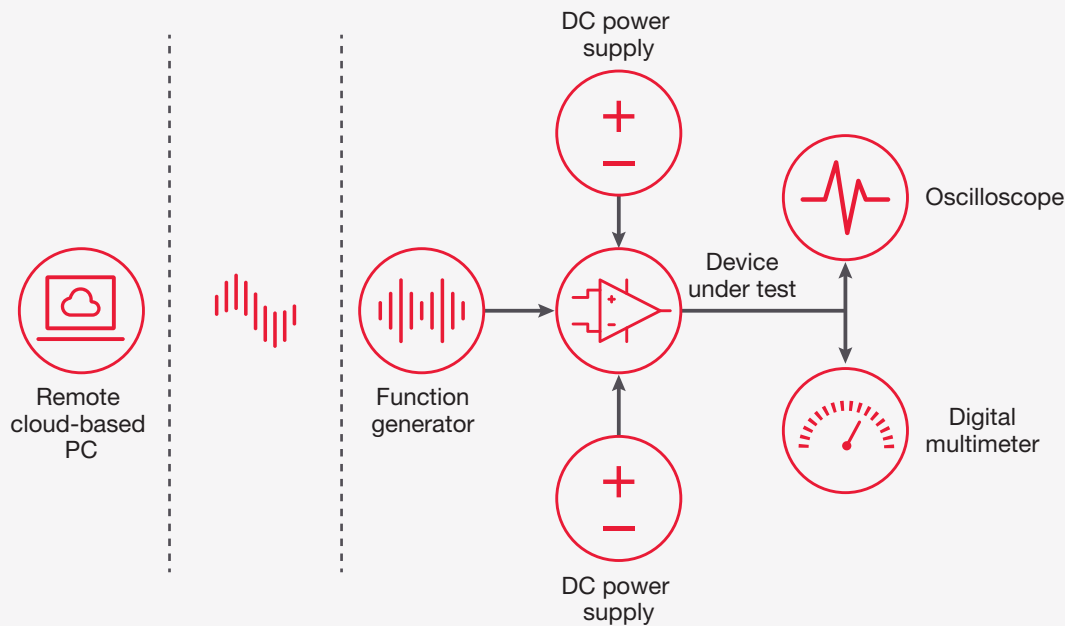


Figure 1. Smart Bench Essential Series instruments work together to test the DUT

Many teaching labs have limited workspace and workbenches that have test instruments with inconsistent user interfaces and connectivity. Keysight offers a complete portfolio of instruments with a common user interface and software, allowing students or electronics engineers to do more with these instruments directly or remotely from anywhere, at any time.

### Connected to your next innovation

The Smart Bench Essential Series makes your work easier and more intuitive. All four instruments come with a 7-inch liquid crystal display with intuitive soft buttons and a consistent graphical user interface. The color coding for each channel is uniform among the instruments.



Figure 2. Large screen with a consistent and intuitive graphical user interface

### Connected to each other

The Smart Bench Essential Series helps you accelerate your work with a connected bench. The instruments come with PathWave BenchVue software applications to help you easily configure your instruments, operate them on the same PC screen to test your DUT, capture all the data, and share results with your peers. You can also store all your data on a PC and export them in common readable formats for post-analysis work and report generation. The instrument hardware and software help you work seamlessly and productively.



PathWave  
oscilloscope



PathWave  
DC power supply



PathWave  
digital multimeter



PathWave  
function generator

Figure 3. PathWave BenchVue software applications for the Smart Bench Essential Series

## Connected to the lab

Many work or teaching labs have a mixture of old and new instruments that are not interconnected. Configurations for each bench are done manually on the front panel of each instrument. Setting up each instrument configuration individually in a teaching lab with 10 or more benches quickly becomes cumbersome and unproductive.

Keysight PathWave Lab Manager software works seamlessly with the Smart Bench Essential Series instruments to perform the following functions:

- Lab configuration tool allows you to arrange the lab layout, number of benches, type and number of instruments, and name of the benches according to the lab layout.
- Lab administration tool lets you monitor the status of all the bench instruments in the lab and send instrument configurations to selected instruments. You can reset all instruments in the lab into default configuration, if necessary.
- Asset tracking tool allows educators to intuitively manage a long list of lab assets, including instruments, equipment, and accessories. This function also helps you track calibration due dates for all your instruments.
- Mass firmware update tool allows educators to update the firmware of their connected Keysight instruments in one click.

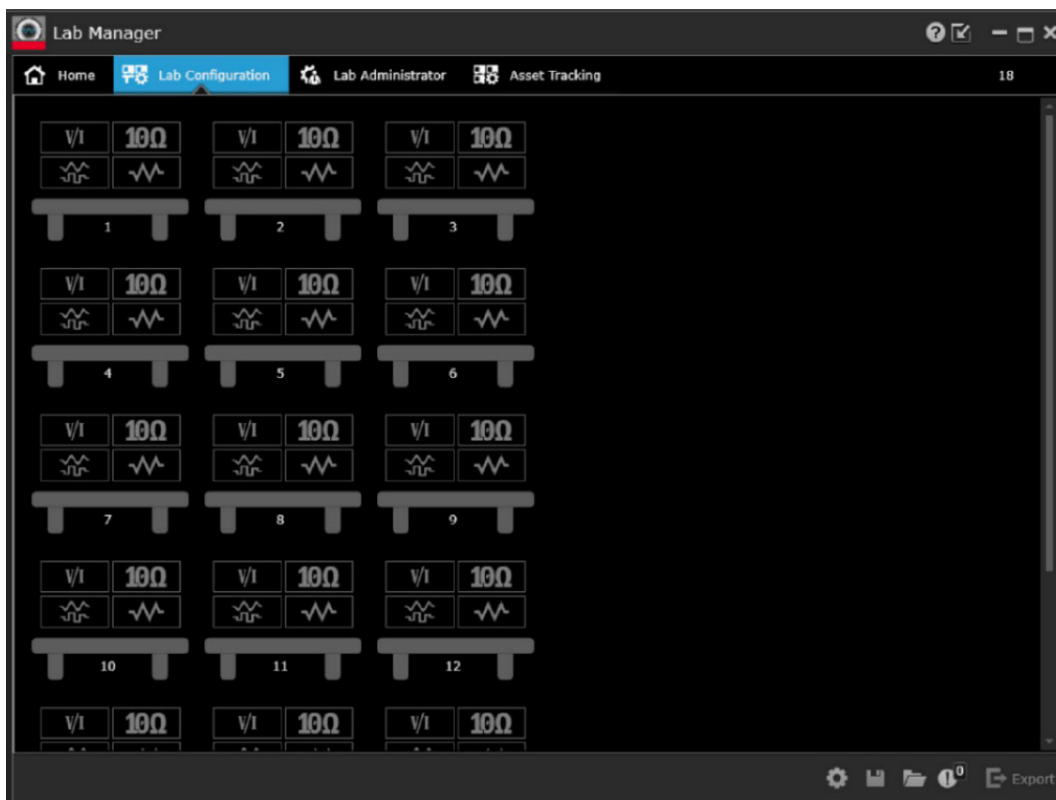


Figure 4. Keysight PathWave Lab Manager software

The PathWave Lab Manager software helps streamline and simplify lab management, saving lab administrators and educators time. It provides overview connection statuses of all instruments via a customizable home screen with widget control. It allows administrators to configure the measurement settings of all instruments at once, all from a single admin PC.

## Connected to the cloud

Having mature remote connected technology for higher education is essential as most universities move into hybrid mode. A similar trend is apparent in remote working arrangements across industries.

Keysight PathWave Remote Access Lab software provides a seamless way to move into online learning. This end-to-end solution delivers a complete remote setup of your basic instrument lab and includes the following functions:

- Secure, cloud-based remote lab scheduling and session booking allows up to five concurrent remote users per bench PC and up to 50 concurrent users maximum.
- Remote access to the lab setups is available through a centralized control server that manages, monitors, and configures all instruments in the lab.
- Perform lab work remotely through a web browser that controls your industry-grade Smart Bench Essential Series instruments. Store all your test results in the cloud.
- The PathWave Remote Access Lab software comes with a chat room for collaboration and a storage file transfer facility to upload or download your test data.

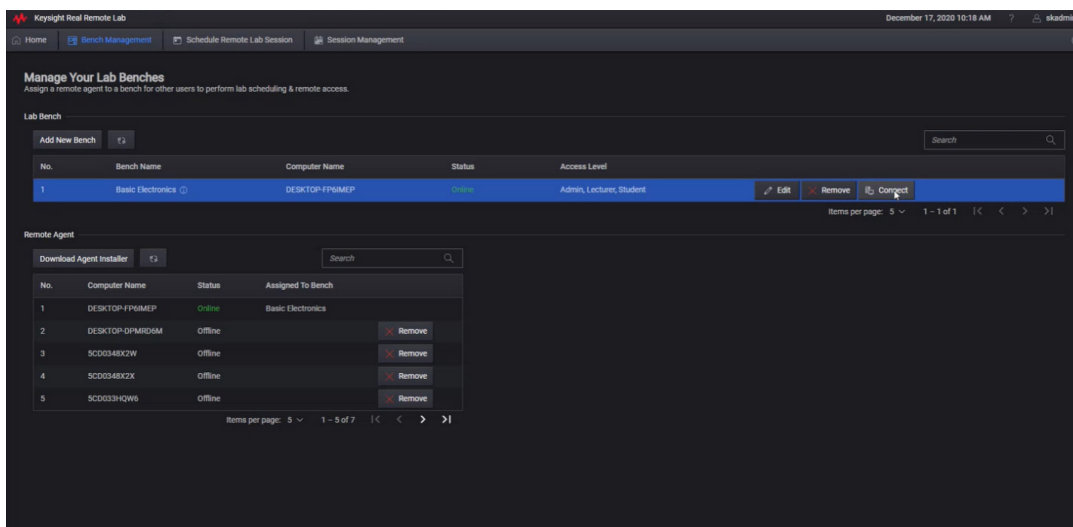


Figure 5. Keysight PathWave Remote Access Lab software



## Conclusion

Keysight Smart Bench Essential Series' portfolio of bench instruments and Keysight PathWave Remote Access Lab, Lab Manager, and BenchVue instrument application software provide a complete learning lab or a new working lab solution with smart connectivity to improve your lab experience.

Learn more about [Keysight Smart Bench Essential Series and PathWave software](#).



Figure 6. Keysight PathWave BenchVue software controlling the Smart Bench Essential Series instruments

Learn more at: [www.keysight.com](http://www.keysight.com)

For more information on Keysight Technologies' products, applications or services, please contact your local Keysight office. The complete list is available at: [www.keysight.com/find/contactus](http://www.keysight.com/find/contactus)

