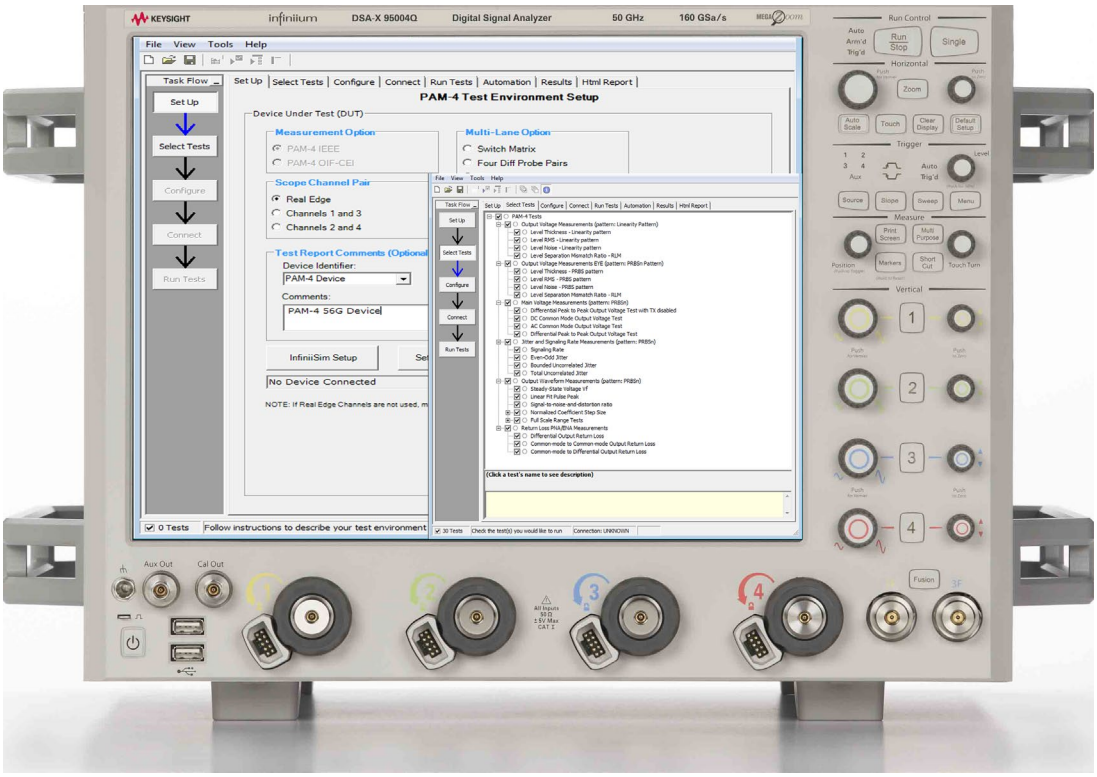
DATA SHEET

N8836A
PAM-4 Measurement Application

For Infiniium S-Series, 90000A, V-Series, 90000 X-Series, 90000 Q-Series, and Z-Series Oscilloscopes

Characterize electrical pulse amplitude modulated (PAM) signals quickly and accurately according to IEEE P802.3bs and the OIF-CEI 4.0 draft specification



KEYSIGHT TECHNOLOGIES

Introduction

Several industry groups and standards bodies are using (or actively considering) pulse amplitude modulation 4-Level (PAM-4) technology to jump to the next-generation speed class. PAM-4 signaling enables higher throughput for a given channel bandwidth compared to traditional non-return-to-zero (NRZ) signaling.

Working groups within the Optical Internetworking Forum - Common Electrical Interface (OIF-CEI 4.0) and IEEE 400G Ethernet (P802.3bs) are leveraging many of the PAM-4 measurements outlined in IEEE P802.3bs. Examples of standards or Implementation Agreements (IA) that propose PAM-4 signaling include:

- IEEE 400G Ethernet (P802.3bs)
- OIF-CEI-4.0 (56G)
  - OIF-CEI-56G-XSR-PAM4 (Extra Short Reach interface)
  - OIF-CEI-56G-VSR-PAM4 (Very Short Reach interface)
  - OIF-CEI-56G-MR-PAM4 (Medium Reach interface)
  - OIF-CEI-56G-LR-PAM4 (Long Reach interface)

While the PAM-4 parameters are still in the development stages, companies are moving forward with their PAM-4 development and need measurement tools to help analyze their designs quickly and accurately.

Transform complexity into simplicity

The Keysight Technologies, Inc. N8836A PAM-4 measurement application for Infiniium real-time oscilloscopes saves you time and money by automating the task of preforming PAM-4 pre-compliance measurements for PAM-4 standards that have yet to be been ratified.

The N8836A PAM-4 measurement application for Infiniium real-time oscilloscopes is an easy-to-use oscilloscope application that:

- Saves time in understanding details of standards
- Reduces the time it takes to characterize your PAM-4 design from hours to minutes
- Helps to debug your device using custom configurations
- Allows you to quickly generate early HTML reports summarizing your device characteristics

Debug and Verify Your Designs Quickly and Easily

Select your measurement tools

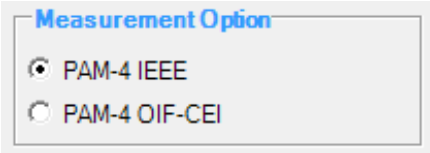
Choose from a wide array of high performance real-time oscilloscopes supporting up to 63 GHz and 160 GSa/s with the lowest noise floor in the industry. The N8836A software also allows you to make required return loss measurements and supports automated control of either an 86100D combined with a N1055A TDR module, or an economy or performance network analyzer. Either of these tools can be configured in the N8836A to measure the S-parameters of your device under test.

Select the desired PAM-4 test suite

The N8836A measurement application covers PAM-4 transmitter measurements outlined in IEEE P802.3bs and four OIF-CEI-4.0 (56G) clauses. The tests are sorted conveniently by clause. Click on the desired test group, and the appropriate tests are offered in Select Tests (factory-installed options shown).

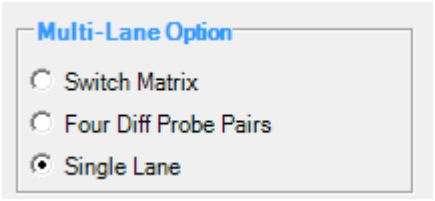
N8836A-1FP performs PAM-4 transmitter tests outlined in:

- IEEE P802.3bs, Annex 120D, CDAUI-8 chip-to-chip
- IEEE P802.3bs, Annex 120E, CDAUI-8 chip-to-module



N8836A-4FP performs PAM-4 transmitter tests outlined in:

- OIF-CEI-56G-XSR-PAM4 (Extra Short Reach interface)
- OIF-CEI-56G-VSR-PAM4 (Very Short Reach interface)
- OIF-CEI-56G-MR-PAM4 (Medium Reach interface)
- OIF-CEI-56G-LR-PAM4 (Long Reach interface)

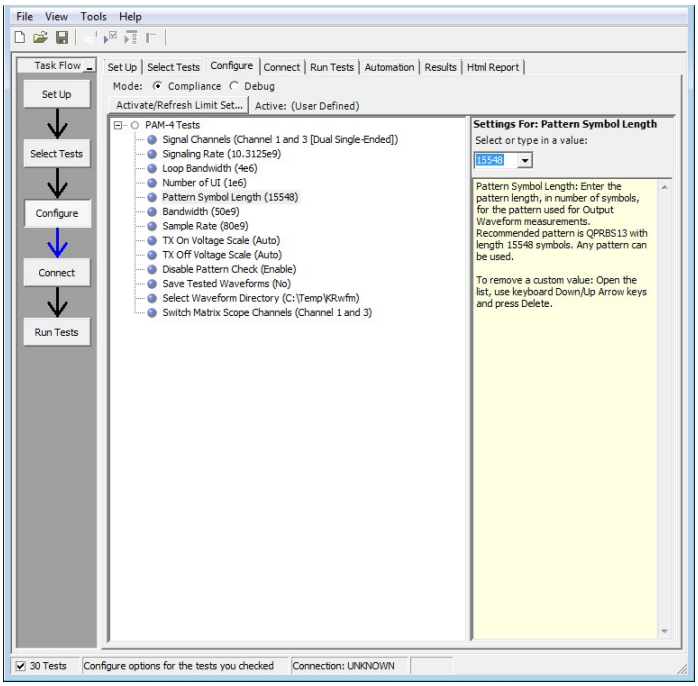


N8836A-7FP

- Provides the ability to control a switch, allowing you to use a single differential connection to the oscilloscope to test multiple DUT lanes

Configure your measurements

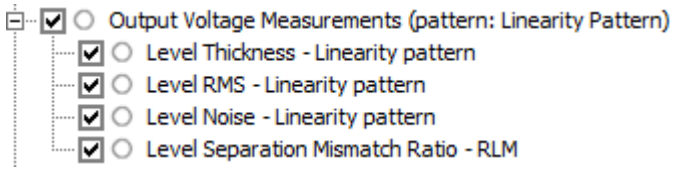
Customize parameters that are specific to your setup, such as signaling rate and attenuation. Use default values or enter your own settings including number of waveforms taken, type of pattern, and pattern symbol length. Choose Normal mode to test within limits or choose Debug mode to test to your custom limits and adjust other test parameters.



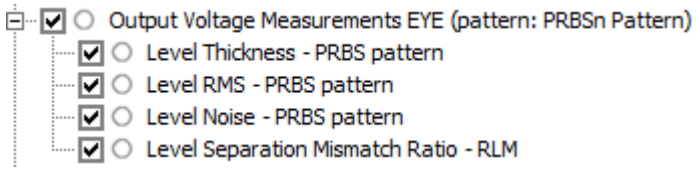
Choose your tests

The N8836A software provides comprehensive coverage of all PAM-4 tests that are specific to the clause you are testing. You may click on all available tests, a group of tests, or select individual tests to run. The full test name appears in the test list and is also shown in the test results and reports. A description of the test and reference to the Standard/IA is shown for each test.

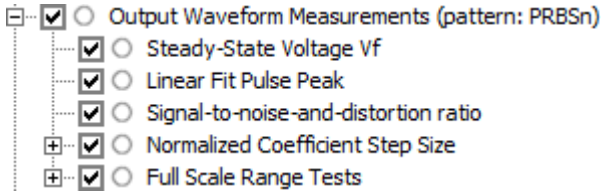
- Level noise, thickness, RMS, linearity (R_{LM}) linearity pattern



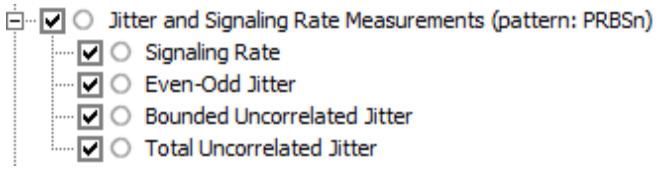
- EYE, level noise, thickness, RMS, linearity (R_{LM}) PRBSn pattern



- Output waveform measurements

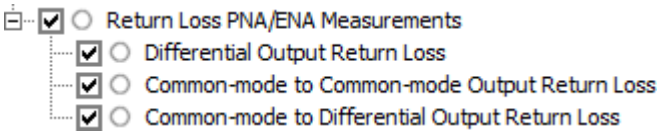


- Jitter and signaling rate measurements



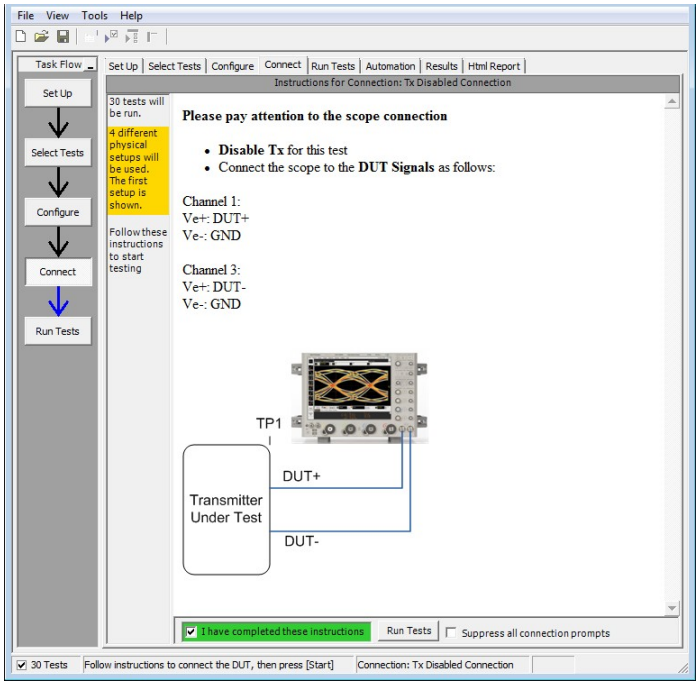
Automated return loss measurements

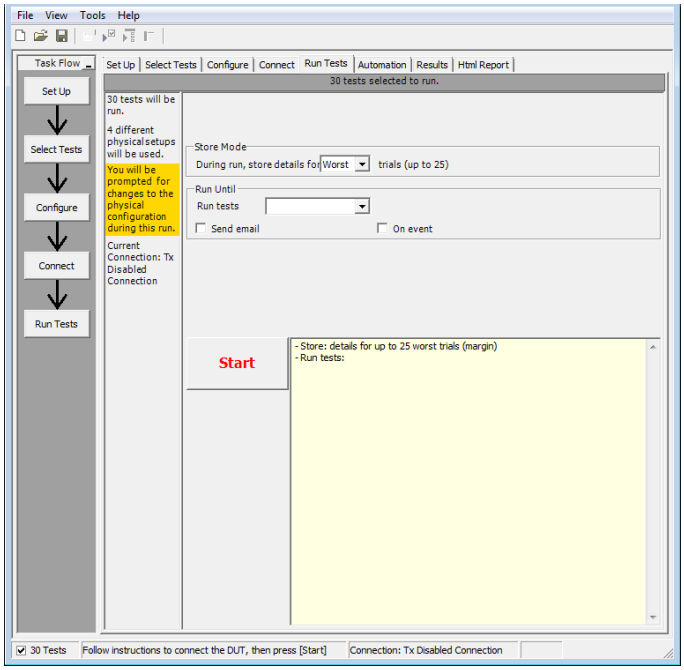
When used in conjunction with an ENA or PNA vector network analyzer the N8836A performs Differential and Common mode return loss measurements.



Guided connection diagrams for easy setup

Simply follow the steps to connect and configure your device under test and click **Run Tests**. The N8836A automatically configures and controls your supported Infiniium real-time oscilloscope.

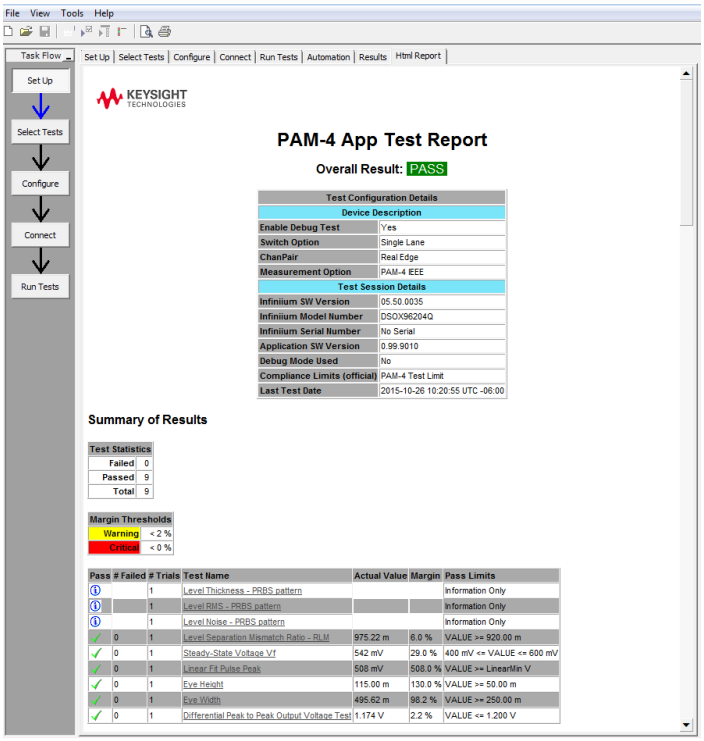




More Features to Further Streamline Your Development

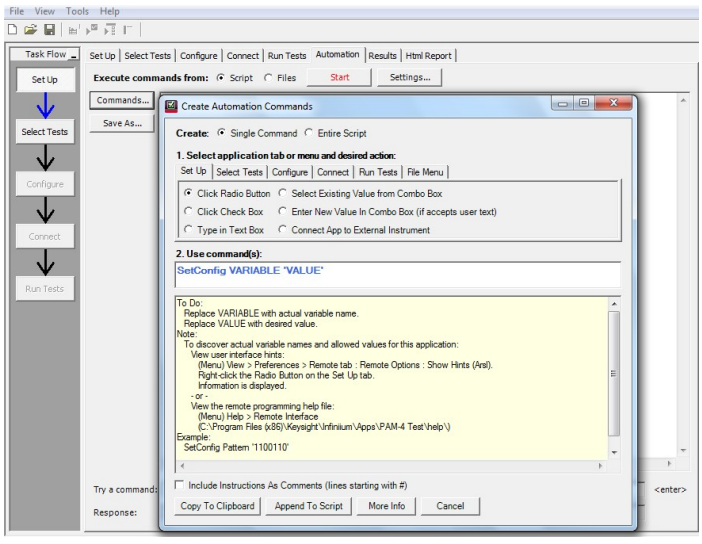
Generate reports

Your team members and your customers are interested in the performance of your device. Share a test results report with them that shows the test conditions, summary of pass/fail, summary of all tests, and details for each test. Many include a test-specific screen shot of the measured parameter.



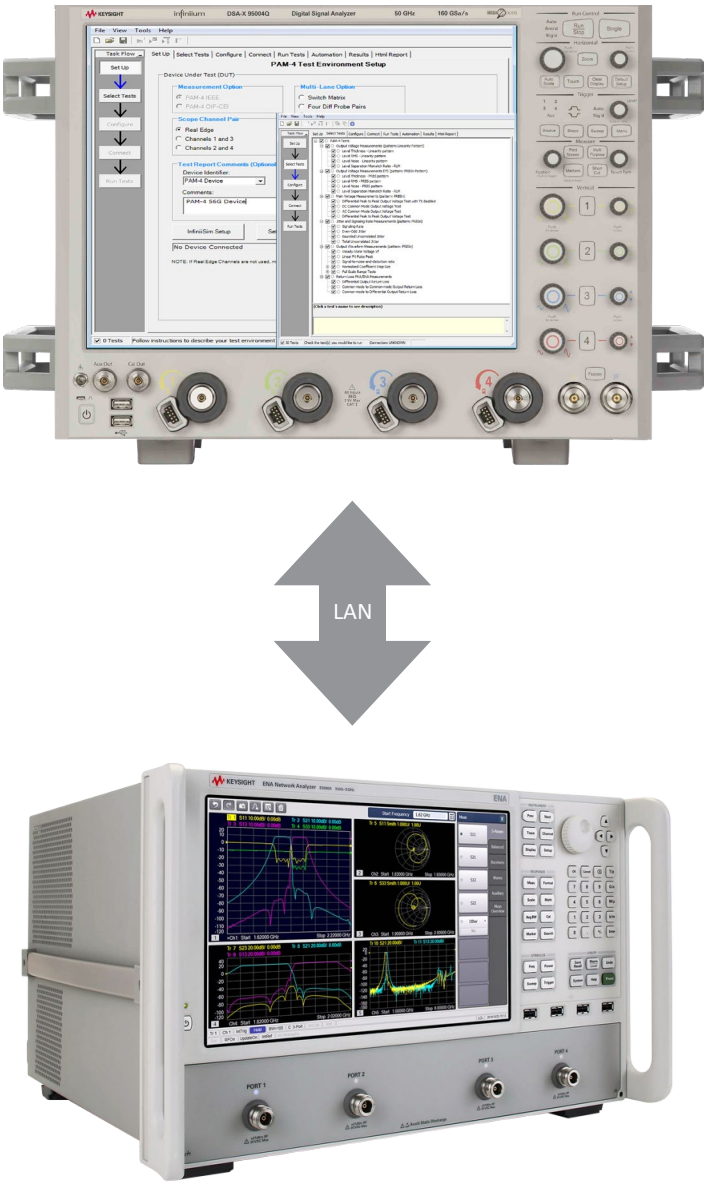
Control your device or other equipment

The Automation tab enables you to enter commands to control external devices or equipment, and to further sequence your tests or control timing.



Flexible licensing and VNA control for RL measurements

The N8836A PAM-4 measurement application can be licensed to enable a single dedicated scope for you to use in your lab, or you can purchase a server-based license, which allows you to check out a license that can be used on any supported scope you have available to you. In addition, for return loss measurements, the N8836A can control an ENA/PNA vector network analyzer to perform measurements automatically.



Oscilloscope compatibility

Oscilloscopes	Software revision
V-Series	5.5 or higher
Z-Series	5.5 or higher
90000 Q-Series	5.5 or higher
90000 X-Series	5.5 or higher
90000A Series	5.5 or higher
S-Series	5.5 or higher

Ordering instructions

The N8836A PAM-4 measurement application is available as an option when you order your new V-Series or Z-Series oscilloscope, available as a standalone license that is assigned by the user to a single Infiniium oscilloscope, or may be ordered as a transportable license (-1TP) that can be moved by the user from one instrument (or PC) to another.

To purchase the N8836A PAM-4 measurement application with a new Infiniium oscilloscope, please order the option indicated in the following table.

Coverage: IEEE P802.3bs draft PAM-4 measurements

License type			Infiniium V-Series/ Z-Series	Infiniium S-Series	Infiniium 90000A, 90000 X-, 90000 Q-Series	Infiniium Offline
N8836A/B PAM-4 characterization application for real-time oscilloscopes	Fixed	Factory-installed	N8836A-1FP	N8836A-1FP		
		User-installed	N8836A-1FP	N8836A-1FP	N8836A-1FP	
	Floating	Transportable	N8836A-1TP	N8836A-1TP	N8836A-1TP	N8836A-1TP
		Server-based	N5435A-094	N5435A-094		

Coverage: OIF-CEI 56G draft PAM-4 measurements

License type			Infiniium V-Series/ Z-Series	Infiniium S-Series	Infiniium 90000A, 90000 X-, 90000 Q-Series	Infiniium Offline
N8836A/B PAM-4 characterization application for real-time oscilloscopes	Fixed	Factory-installed	N8836A-4FP	N8836A-4FP		
		User-installed	N8836A-4FP	N8836A-4FP	N8836A-4FP	
	Floating	Transportable	N8836A-4TP	N8836A-4TP	N8836A-4TP	N8836A-4TP
		Server-based	N5435A-095	N5435A-095		

Coverage: PAM-4 draft measurements, switch control

License type			Infiniium V-Series/ Z-Series	Infiniium S-Series	Infiniium 90000A, 90000 X-, 90000 Q-Series	Infiniium Offline
N8836A/B PAM-4 characterization application for real-time oscilloscopes	Fixed	Factory-installed	N8836A-7FP	N8836A-7FP		
		User-installed	N8836A-7FP	N8836A-7FP	N8836A-7FP	
	Floating	Transportable	N8836A-7TP	N8836A-7TP	N8836A-7FP	N8836A-7TP
		Server-based	N5435A-095	N5435A-095		

Required software options

The N8836A requires that the E2688A serial data analysis package and the N8827A PAM-4 analysis software also be licensed on the platform.

If you are using the N8900A Infiniium Offline software with the N8836A, then N8900-006 and N8900-002 must also be licensed in addition to the appropriate N8836A software option indicated in the above table.

Learn more at: 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

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