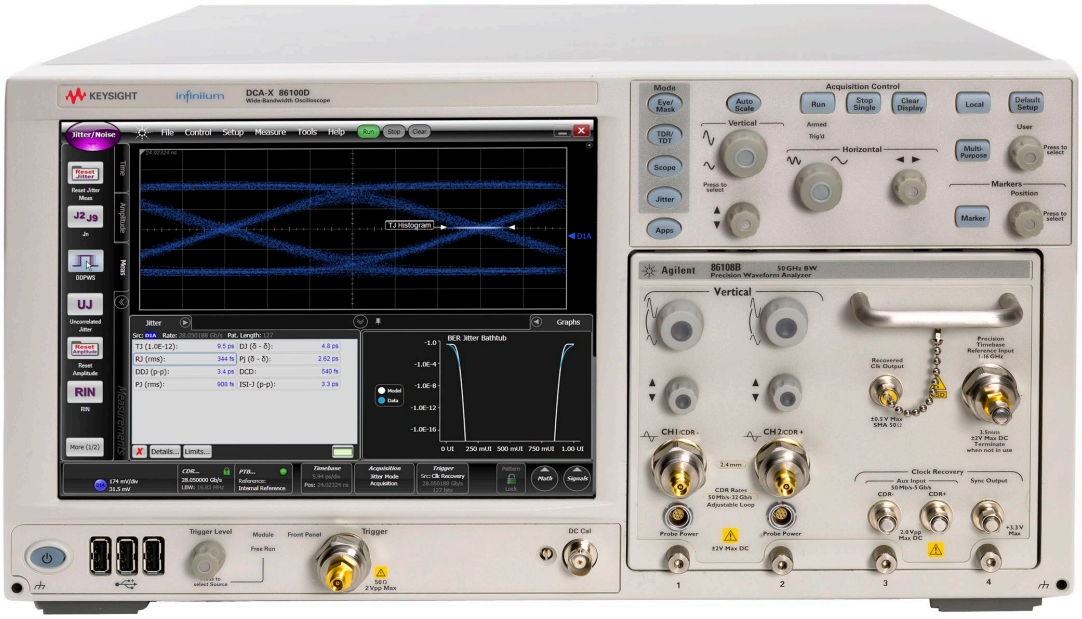
Keysight Technologies
IEEE 802.3 Ethernet Compliance and Debug Applications
For 86100D DCA-X Oscilloscopes

Data Sheet



KEYSIGHT TECHNOLOGIES

Unlocking Measurement Insights

Introduction

Easy-to-use oscilloscope application that lets you:

- Save time in understanding details of standards
- Reduce your IEEE 802.3 test times from hours to minutes
- Debug your device using custom configurations
- Characterize up to 10 lanes in multi-lane devices

The greatly increased worldwide demand for video and data transfer has created new requirements for network expansion, driving innovative network elements for operation up to 100 Gb/s. New designs are facing more challenges while transferring these signals on printed circuit boards within hosts and modules, even for short distances. Measuring the IEEE 802.3 parameters can take a full day when manually characterized, and recalculating factors and equation-driven limits adds to the time the designer spends on testing.

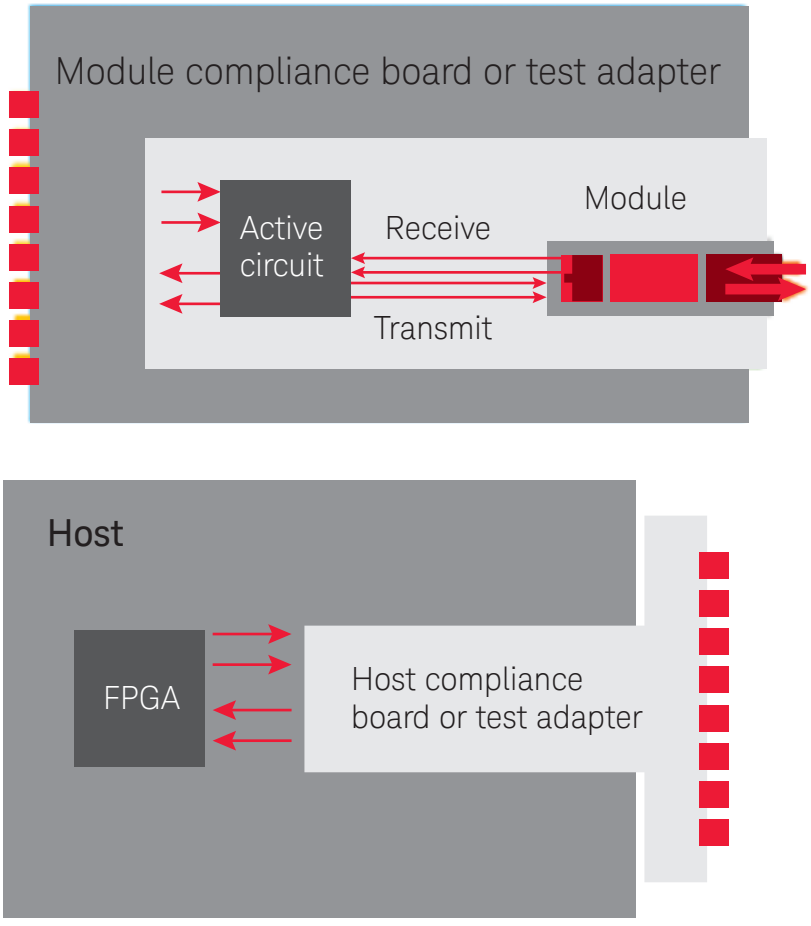
Keysight Technologies, Inc. created the N1081A, N1082A, N1083A and N1084A IEEE 802.3 Compliance and Debug Applications to simplify measuring these transmitter parameters and to obtain full results to test limits in a few minutes. This will keep you focused on getting your products to market knowing that your results are built on the heritage and consistency of Keysight measurement technology.

Transform Complexity into Simplicity

Satisfying the comprehensive requirements of the IEEE 802.3 clauses can be very complex. The list of tests and test conditions vary from clause to clause, and each can be challenging to properly set up. The tests for each IEEE 802.3 clause vary, as do the test limits. An example of one group of tests from clause 93 is below. The time for your test development team to read and interpret the specification and then implement that understanding into test plans can take several months of effort.

Parameter	Subclause reference	Value	Units
Signaling rate	93.8.1.2	25.78125 ± 100 ppm	GBd
Differential peak-to-peak output voltage (max.)	93.8.1.3		
– Transmitter disabled		30	mv
– Transmitter enabled		1200	mv
DC common-mode output voltage (max.)	93.8.1.3	1.9	V
DC common-mode output voltage (min.)	93.8.1.3	0	V
AC common-mode output voltage (RMS, max.)	93.8.1.3	12	mV
Differential output return loss (min.)	93.8.1.4	Equation (93-3)	dB
Common-mode output return loss (min.)	93.8.1.4	Equation (93-4)	dB

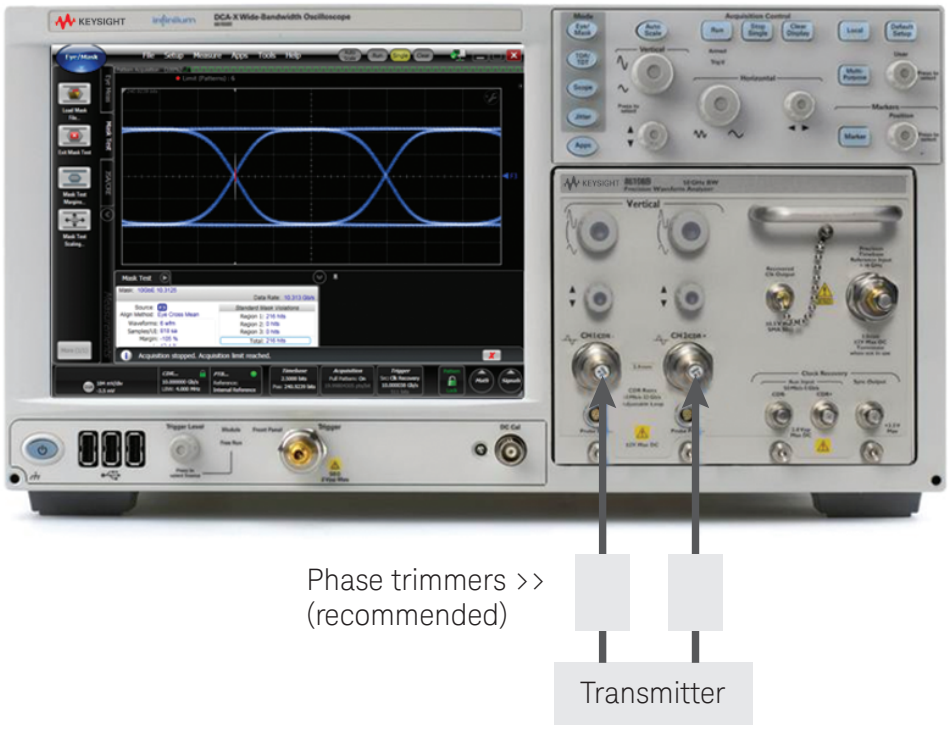
Hosts and modules have unique interface connectors and require compliance boards or test adapters to enable connection to test equipment. Designers endeavor to minimize the trace lengths on the compliance boards and cable lengths.



Debug and Verify Your Designs Quickly and Easily

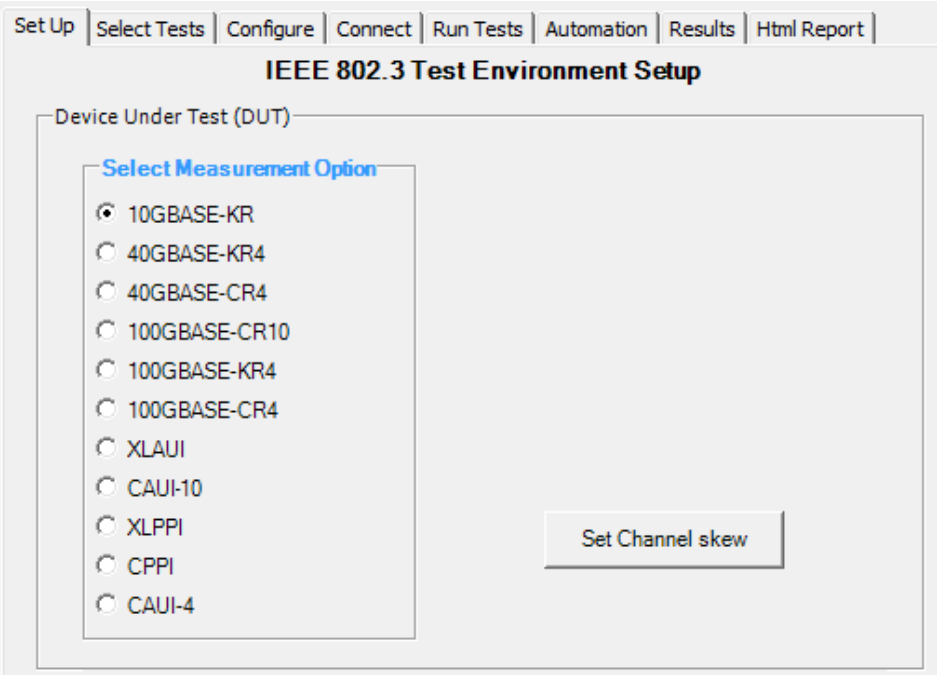
Select industry-leading hardware

Configure your oscilloscope for a single module (as below) or multi-module (listed in ordering guide). Connect your device through the recommended phase trimmers to have access to measurements with intrinsic jitter as low as 50 fs. For return loss, also connect the Economy or Performance Network Analyzer, which are controlled by the DCA-X for S-parameter measurements.



Select desired 10G/25G transmit clause

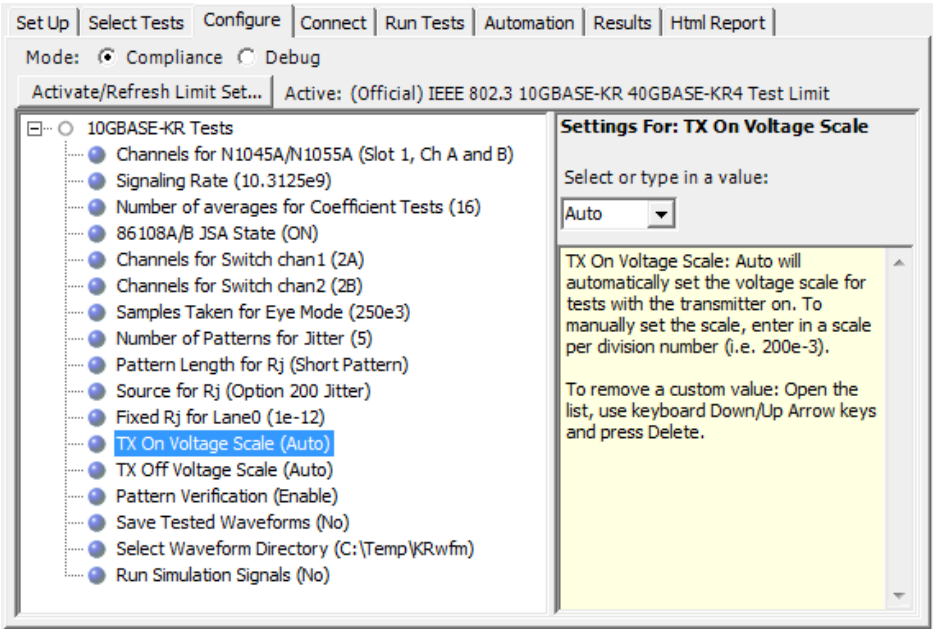
The N108xA IEEE 802.3 applications cover all transmitter tests for 12 clauses and conveniently organize the tests by clause. Click on the desired test group, and the appropriate tests are offered in Select Tests.



Debug and Verify Your Designs Quickly and Easily (Continued)

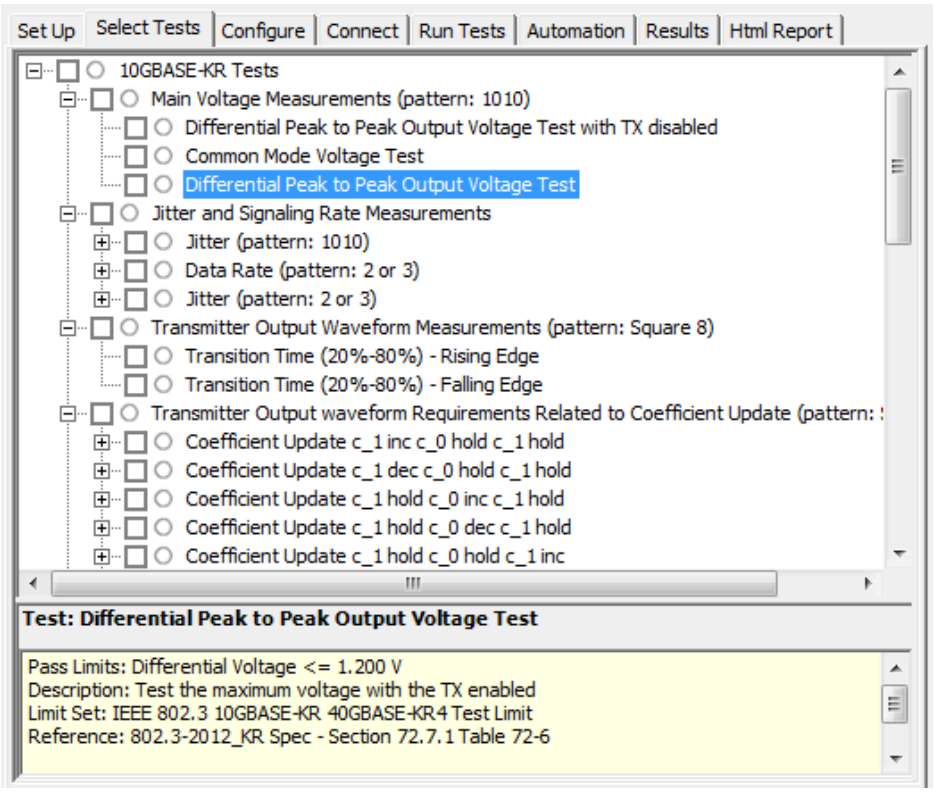
Configure your measurements

Customize parameters that are specific to your setup, such as data rate and attenuation. Use default values or enter your own settings including number of waveforms or patterns taken; type of pattern; and whether or not to remove the effects of test cables. Choose Compliance mode to test within compliance limits or choose Debug mode to test to your custom limits and adjust other test parameters.



Choose from more than 400 tests

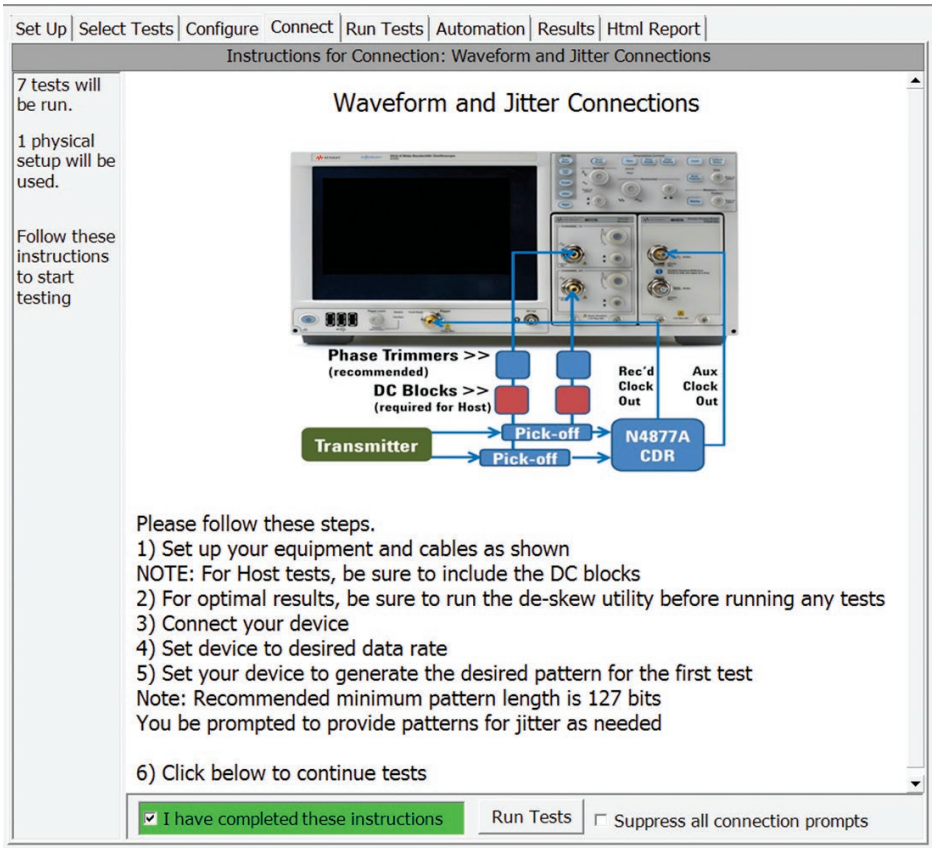
The tests required for each of the transmit and test signal groups are available. You can click on all tests, a group of tests or individual tests. The full test name appears in the test list and is shown in the test results and reports. A description of the test and reference to the IEEE 802.3 clauses are shown for each test.



Debug and Verify Your Designs Quickly and Easily (Continued)

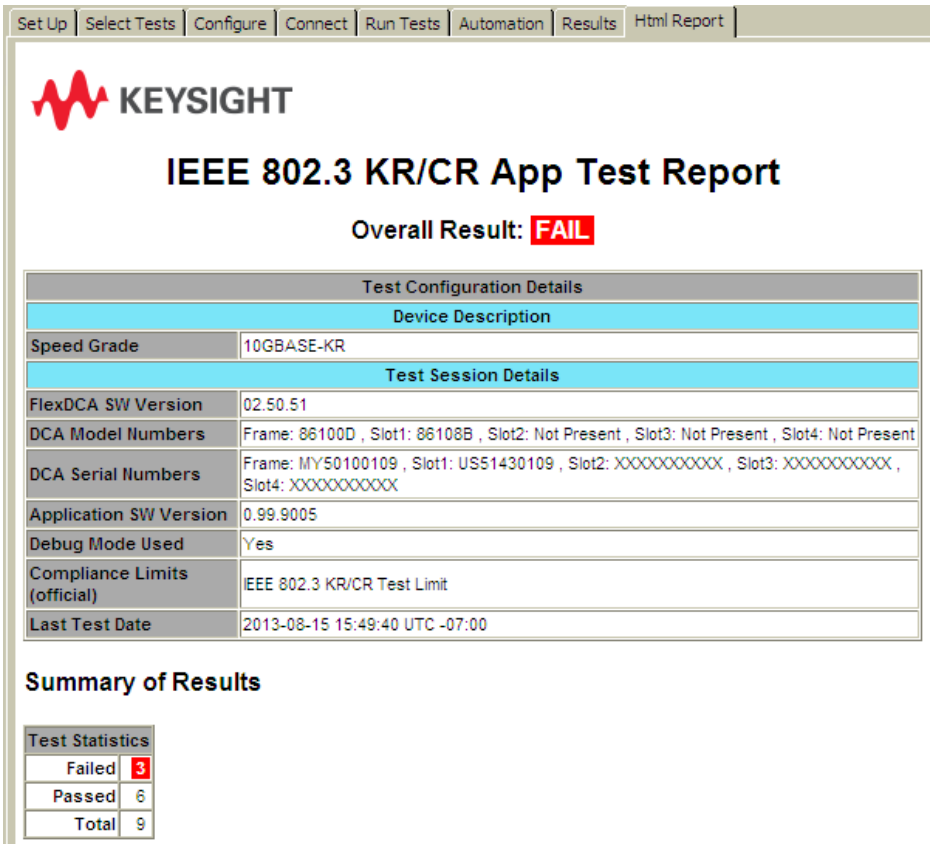
Measure challenging parameters fast

Simply follow the steps and click Run Tests. The N108xA applications, 86100D DCA-X and ENA/PNA readily measure your device.



Obtain concise compliance reports

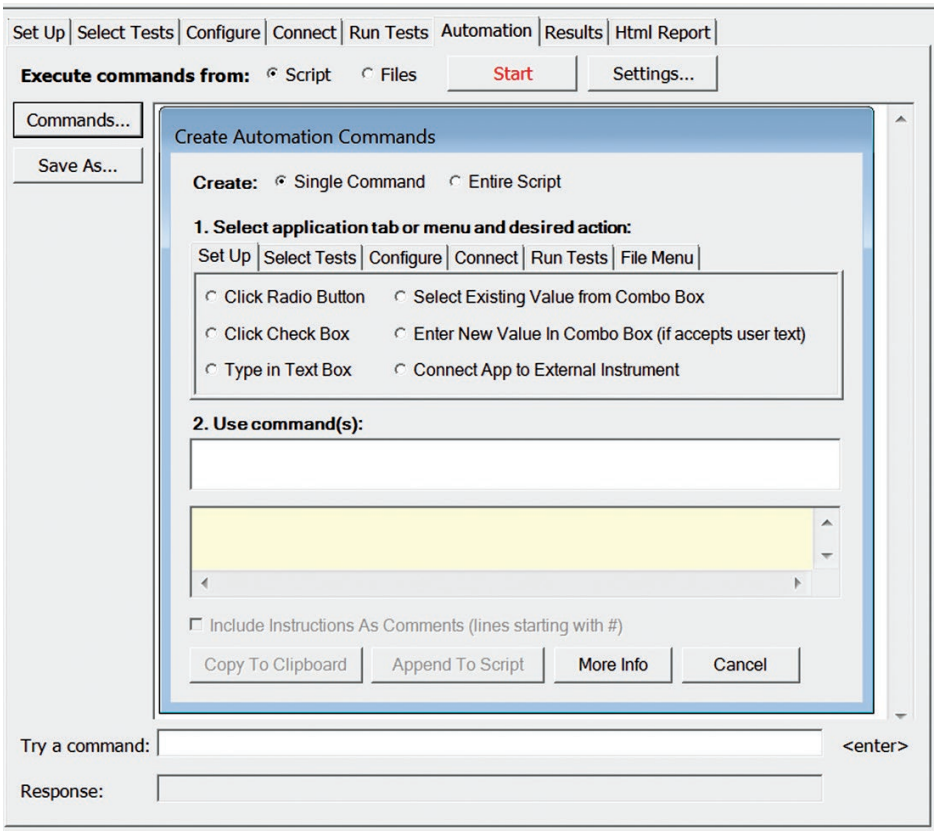
Users and customers are interested in the performance of your devices. Share a report that shows the test conditions, summary of pass/fail, summary of all tests, and details for each test. Many include the appropriate screen shot of the measured parameter.



Debug and Verify Your Designs Quickly and Easily (Continued)

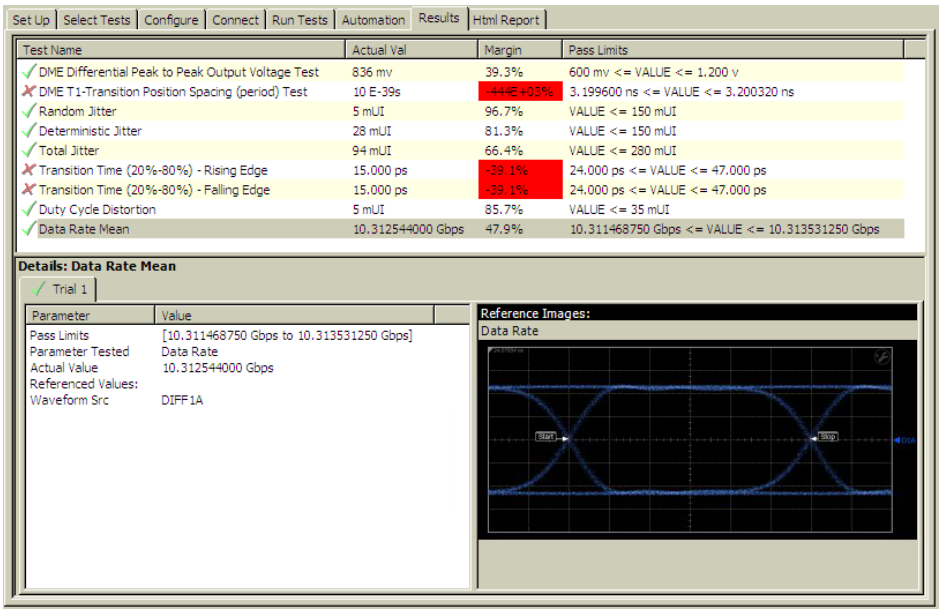
Control your device or other equipment

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



See device performance in one view

In a few minutes, you'll have test results showing which parameters passed or failed and the margin compared to limits. These results will provide immediate insight into how you'll need to improve your design to meet the challenging tests in the IEEE 802.3 clauses.

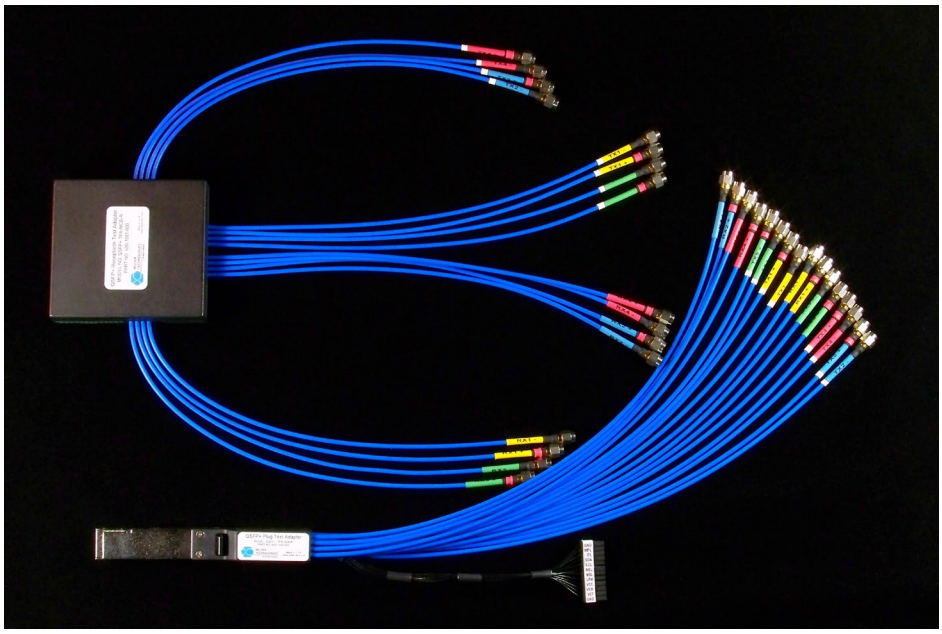


More Features to Further Streamline Your Development

Utilize test adapters

Development and characterization of advanced integrated circuits is time-consuming and expensive. Designers utilize test adapters to fully characterize their parts for use in their own or their customer's circuits.

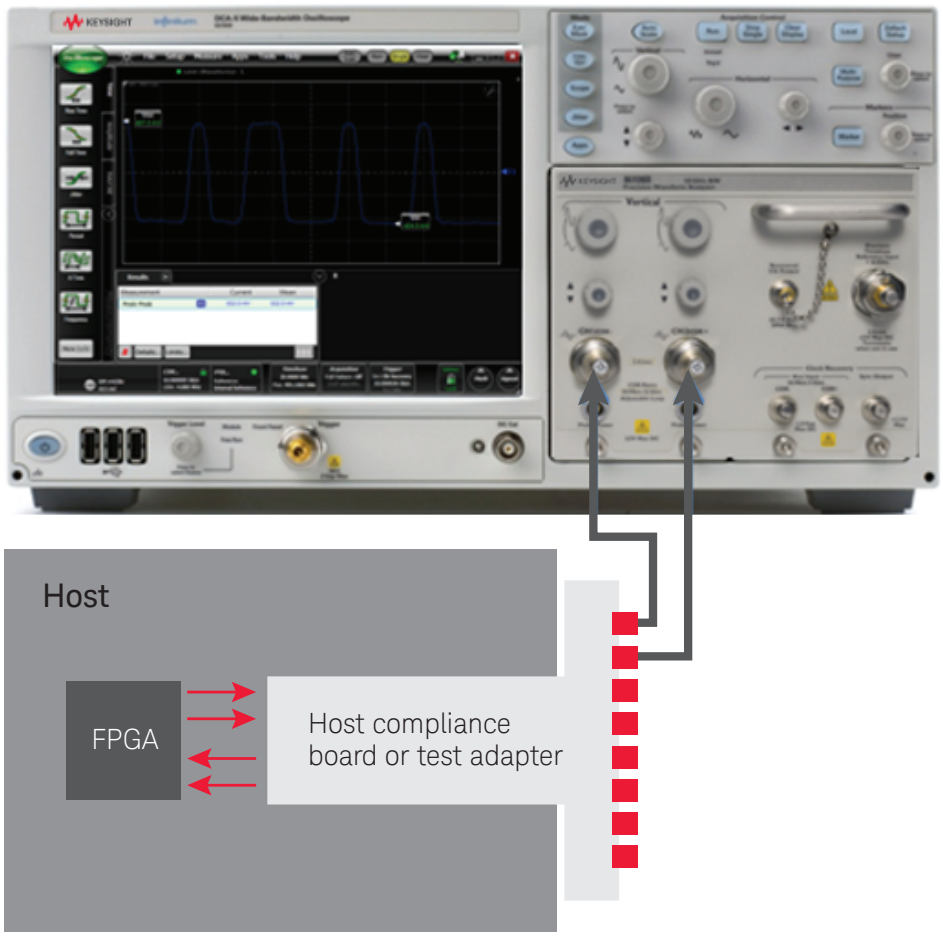
For more information about these adapters, please visit **http://shop.wilder-tech.com/category_s/42.htm**.



...or host and module compliance boards

By pairing your test adapter or compliance board with the 86100D, 86108B and N108xA software, you will have the simplest and most powerful solution available to optimize your designs and offer the best products to your customers.

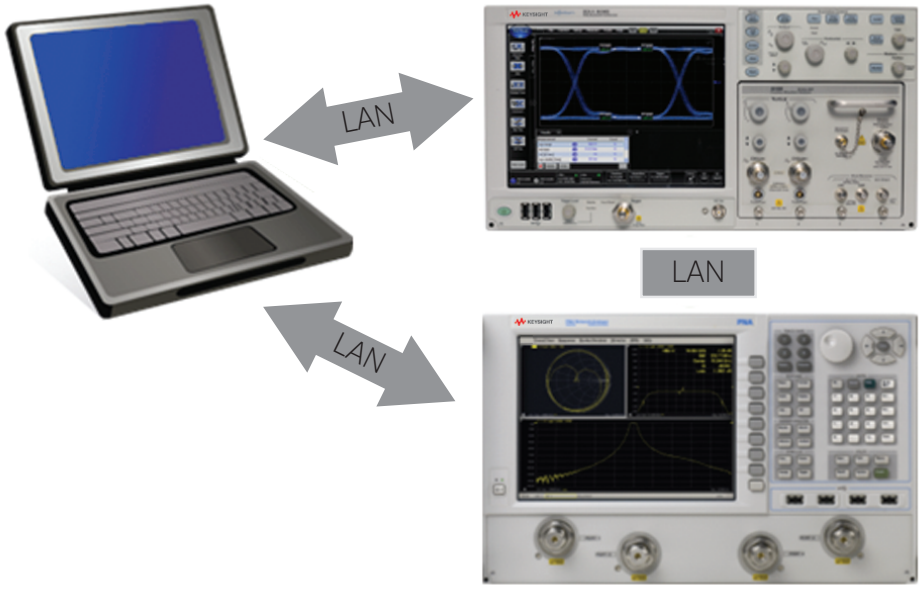
Phase trimmers and a pair of cables complement your setup for the most consistent and accurate measurements.



More Features to Further Streamline Your Development (Continued)

Configure your solution in three ways

The hardware and software architecture provides wide flexibility. You may install the N108xA on the mainframe, which includes FlexDCA, or the N108xA on your PC, controlling FlexDCA on the DCA, or install both N1010A FlexDCA and N108xA on your PC. This lets you use your PC for more processing power and other applications, or you can have all measurement capability consolidated into a compact solution. The ENA/PNA is controlled by the N108xA via the PC or the DCA.



Conveniently de-skew your cables

Skew between the true and complement signals will often degrade your measured performance. While you need to characterize performance with the DUT skew included, the N108xA guides you to quickly de-skew your test cables using phase trimmers or to de-skew the N1045A or 86118A-H01 remote heads for best results.



Characterize Nearly 400 Parameters

The IEEE 802.3 clauses include many challenging tests, and the table below shows each of the transmit parameters by the appropriate table number required by the standards. The N108xA applications measure all of these parameters; empty cells indicate that the parameter is not required for that clause. Several other parameters such as Energy Efficient Ethernet, coefficient update and coefficient status are also included.

Parameter	Model	N1081A	N1082A		N1082A-4TP	N1083A	N1084A	
		10G-KR/ 40G-KR4	XLAUI/ CAUI-10	nPPI	CAUI-4	40G-CR4/ 100G-CR10	100G-KR4	100G-CR4
				Measured on DCA				
Signaling rate		72-6	83A-1	86-2	83D-1, 83E-1, 83E-3	85-5	93-4	92-6
Transition times		72-6	83A-1, 83B-3,5	86A-1,3	83E-1, 83E-3			
Differential output voltage		72-6	83A-1, 83B-3		83D-1, 83E-1, 83E-3	85-5	93-4	92-6
Common mode DC voltage		72-6			83D-1, 83E-1, 83E-3	85-5	93-4	92-6
Common mode AC voltage			83A-1, 83B-3,5	86A-1,3	83D-1, 83E-1, 83E-3	85-5	93-4	92-6
Single-ended output voltage			83A-1	86A-1,3	83E-1			
Transmitted output waveform						85-5	93-4	92-6
Far end output noise						85-5		
Transmitter DC amplitude						85-5		92-6
Linear fit pulse					83D-1	85-5		92-6
De-emphasis			83A-1, 83B-3					
Minimum VMA			83A-1, 83B-3					
Eye mask			83A-1, 83B-3,5	86A-1,3				
Eye width					83E-1, 83E-3			
Eye height					83E-1, 83E-3			
Vertical eye closure					83E-3			
Crosstalk source VMA				86A-1,3				
Crosstalk source transition times				86A-1,3				
Random jitter		72-6			83D-1	85-5	93-4	92-6
Deterministic jitter		72-6	83A-1, 83B-3,5					
Duty cycle distortion		72-6				85-5		
Even odd jitter					83D-1		93-4	92-6
Total jitter		72-6	83A-1, 83B-3,5			85-5		
Bounded uncorrelated jitter					83D-1		93-4	92-6
J2 jitter				86A-1,3				
J9 jitter				86A-1,3				
Data dependent pulse width shrinkage				86A-1				
Signal to noise ratio				86A-1	83D-1		93-4	92-6
				ENA/PNA/TDR				
Differential output return loss		72-6	83A-1, 83B-2,4	86A-1,3	83D-1, 83E-1, 83E-3	85-5	93-4	92-6
Common mode output return loss		72-6	83A-1	86A-1,3	83D-1	85-5	93-4	
CM to differential return loss					83E-1, 83E-3			92-6
CM to CM return loss								92-6

Choose Industry-Leading Solutions

Keysight offers a wide range of electrical and optical test solutions to address current and emerging communications standards. For IEEE 802.3, you may choose a hardware combination that fits your device data rate and other higher rate tests for other standards. Each row shows the recommended configuration of hardware and software to measure the many parameters. The multi-module approach is useful for designers who may already own a plug-in module.

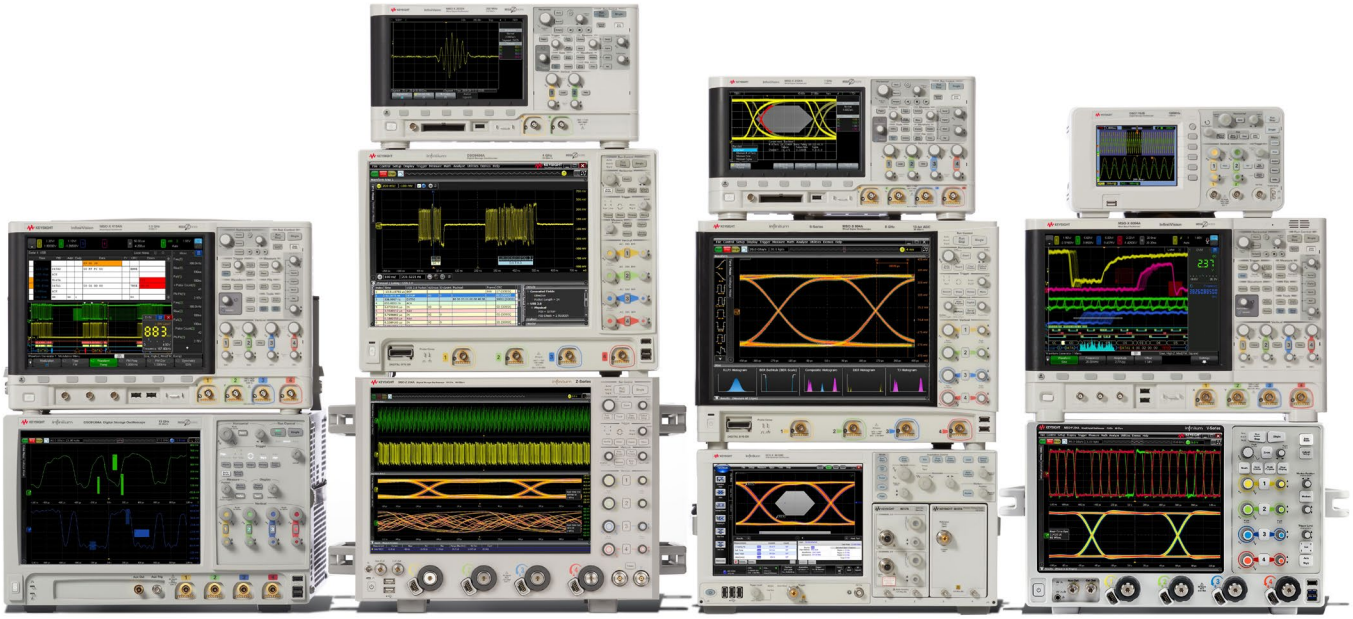
Recommended hardware and software

	Single plug-in module	Multiple module solution
Digital communications analyzer		
Oscilloscope mainframe	86100D DCA-X 86100D-ETR extended trigger 86100D-200 enhanced jitter analysis 86100D-201 advanced waveform analysis	
Plug-in module	86108A or 86108B LBW/HBW, 216/232	N1045A, N1055A, 86117A or 86118A-H01 dual receiver 86107A, any option N4877A-216/232 (for clock recovery)
Software	N1081A, N1082A, N1083A and N1084A IEEE 802.3 compliance applications 86100DU-401 advanced eye software, for jitter on PRBS31 Keysight I/O Libraries, 16.3 or higher	
Matched cable set (1)	86108B-CA3	86108B-CA3
Phase trimmers (2)	86108B-PT3	86108B-PT3
DC blocks (2)	86108B-DC3, N9398C, N9399C or 11742A	
Pick-offs (2)	N/A	N4915A-015 or N1027A-MC1 [1]
Network analyzer		
Economy (ENA)	Any 4-port model with a frequency range of at least 19 GHz	
Performance (PNA)	Any 4-port model with frequency range of at least 19 GHz	

1. N1027A-MC1 kit includes pick-offs and specially-matched cables to ensure accurate jitter measurements.

Ordering Information

Model	Description	Transportable license
N1081A	IEEE 802.3 10G-KR and 40G-KR4	1TP
N1082A	IEEE 802.3 XLAUI, CAUI-10 and nPPI	1TP
N1082A	IEEE 802.3 CAUI-4	4TP
N1083A	IEEE 802.3 40G-CR4 and 100G-CR10	1TP
N1084A	IEEE 802.3 100G-KR4 and 100G-CR4	1TP
All	Switch control	7TP



Keysight Oscilloscopes

Multiple form factors from 20 MHz to > 90 GHz | Industry leading specs | Powerful applications

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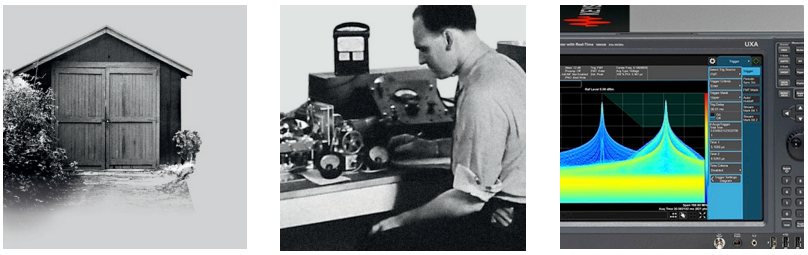
LAN eXtensions for Instruments puts the power of Ethernet and the Web inside your test systems. Keysight is a founding member of the LXI consortium.

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For more than 75 years, we've been helping you unlock measurement insights. Our unique combination of hardware, software and people can help you reach your next breakthrough. Unlocking measurement insights since 1939.



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