Keysight Technologies
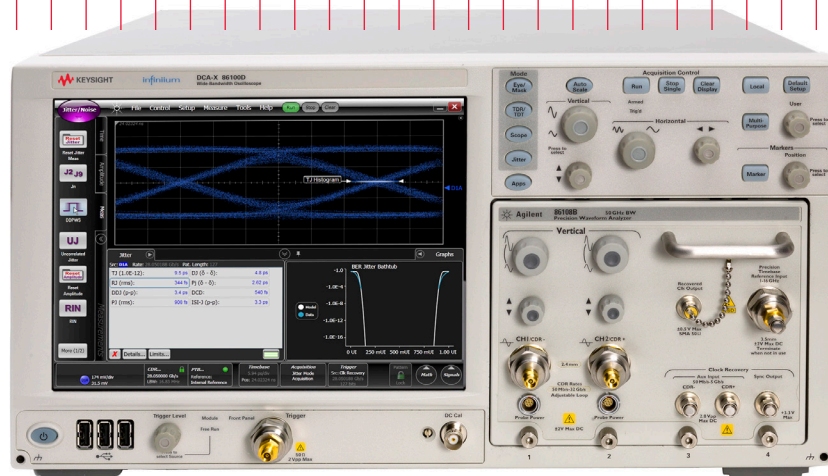
IEEE 802.3 Ethernet KR/CR Compliance and Debug Applications

For 86100D DCA-X Oscilloscopes

Data Sheet

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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 four 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 between 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 (93-2)	dB
Common-mode output return loss (min.)	93.8.1.4	Equation (93-3)	dB
Transition time (20-80% min.) no equalization	93.8.1.5	8	ps

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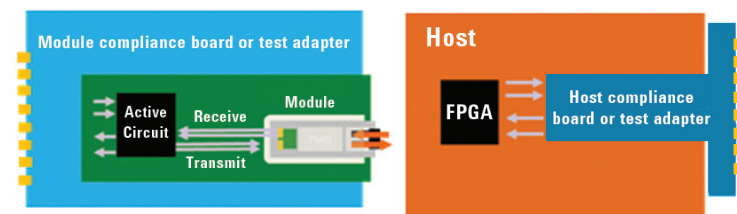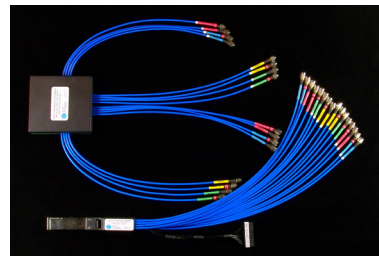
Hosts and modules have unique interface connectors and require compliance boards or test adapters to enable connection to test equipment. Designers endeavor to minimize the trace lengths on the compliance boards and cable lengths.
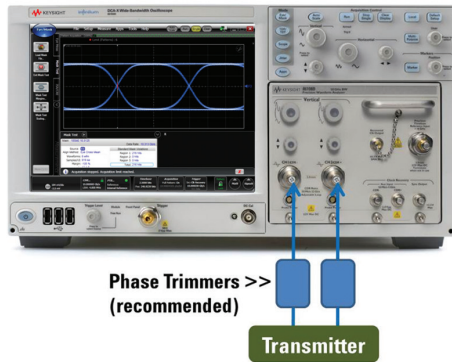

By pairing your test adapter or compliance board with the 86100D, 86108B and N108xA software, you will have the simplest and most powerful solution available to optimize your designs and offer the best products to your customers. Phase trimmers and a pair of cables complement your setup for the most consistent and accurate measurements.

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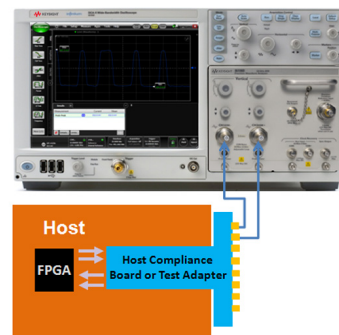
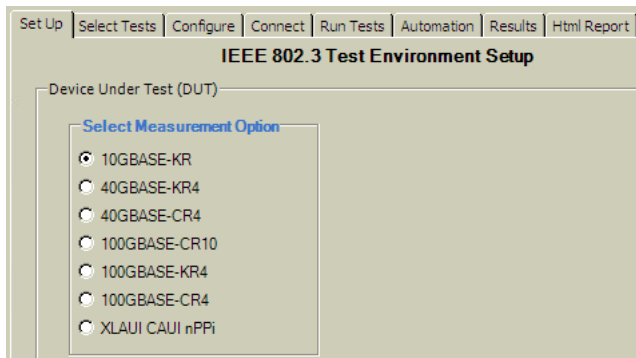# Debug and Verify Your Designs Quickly and Easily

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.

Phase Trimmers >>
(recommended)

Transmitter

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 Normal mode to test within compliance limits or choose Debug mode to test to your custom limits and adjust other test parameters.
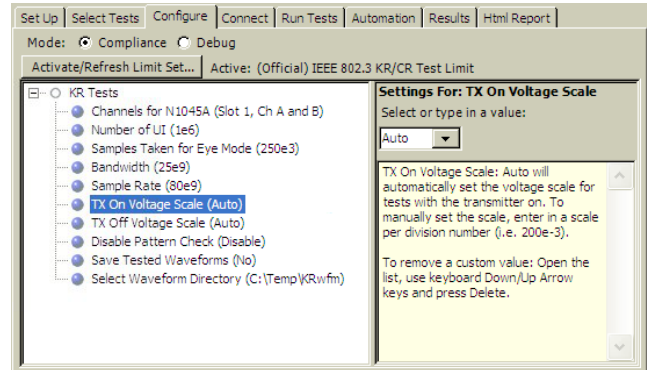

Select desired 10G/25G transmit clause

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

Choose from nearly 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.
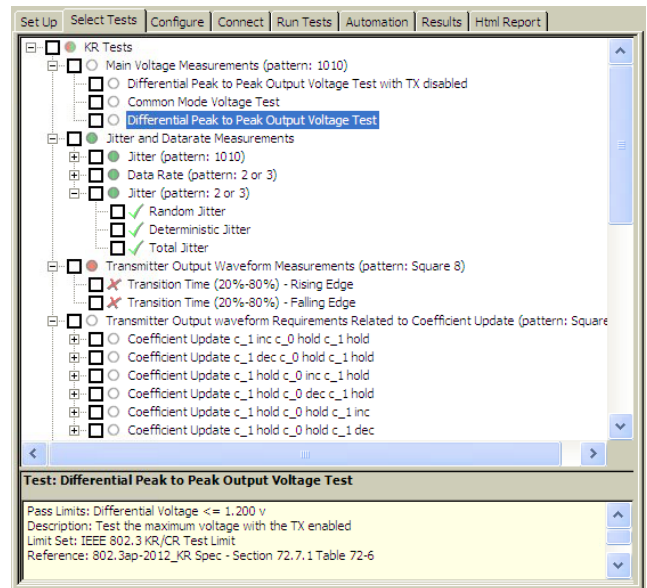
Debug and Verify Your Designs Quickly and Easily

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.

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.

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.

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 or their customer's circuits.

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

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.

... 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.

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.

| | Model N1081A | N1082A | | N1083A | N1084A | |
Parameter	10G-KR / 40G-KR4	XLAUI / CAUI	nPPI	40G-CR4 / 100G-CR10	100G-KR4	100G-CR4
Measured on DCA						
Signaling rate	72-6	83A-1	86-2	85-5	93-4	92-6
Transition times	72-6	83A-1, 83B-3/5	86A-1, 3		93-4	92-6
Differential output voltage	72-6	83A-1, 83B-3		85-5	93-4	92-6
Common mode DC voltage	72-6			85-5	93-4	92-6
Common mode AC voltage		83A-1, 83B-3, 5	86A-1, 3	85-5	93-4	92-6
Single-ended output voltage		83A-1	86A-1, 3			
Transmitted output waveform				85-5	93-4	92-6
Far end output noise				85-5	93-4	92-6
Transmitter DC amplitude				85-5		92-6
Linear fit pulse				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			
Crosstalk source VMA			86A-1, 3			
Crosstalk source transition times			86A-1, 3			
Random jitter	72-6			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					93-4	92-6
Total jitter	72-6	83A-1, 83B-3/5		85-5		
Bounded uncorrelated jitter					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		93-4	92-6
ENA / PNA/DMM						
Differential output return loss	72-6	83A-1, 83B-2/4	86A-1, 3	85-5	93-4	92-6
Common mode output return loss	72-6	83A-1, 83B-2	86A-1, 3	85-5	93-4	
CM to differential return loss						92-6
CM to CM return loss						92-6
Termination mismatch		83A-1, 83B-2	86A-1, 3			

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, 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
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	

Ordering Information

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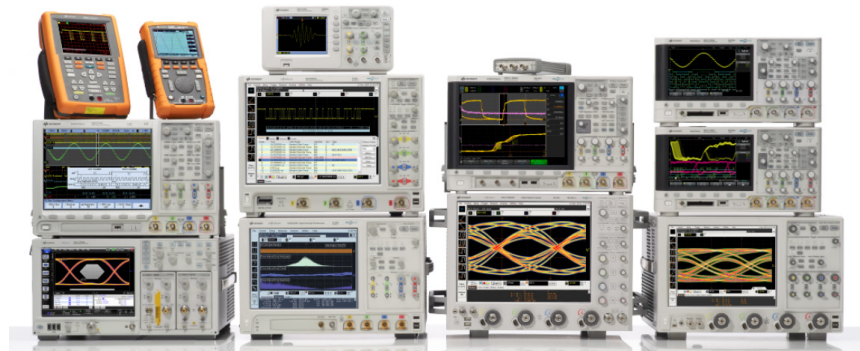
Keysight Technologies Oscilloscopes

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.

www.pxisa.org

PCI eXtensions for Instrumentation (PXI) modular instrumentation delivers a rugged, PC-based high-performance measurement and automation system.

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