

D9020USBC USB 3.2 Transmitter Compliance Test Application Software

Introduction

The Keysight Technologies, Inc. USB 3.2 compliance test application provides a fast and easy way to test, debug and characterize your USB 3.2 Gen 1, Gen 2, x1, and x2 designs. The tests performed by the D9020USBC software is based on the USB-IF Compliance Test Specifications (CTS). In addition, the application features Characterization mode, which goes beyond compliance and enables capabilities like embedding your own loss channels and using custom equalization. The test application offers a user-friendly setup wizard and a comprehensive report that includes margin analysis. In addition to the automated compliance testing, there is also a Configuration menu that allows customized setups including different LFPS levels and jitter setups.



Key Features

- Setup wizard for quick setup, configuration and test selection
- Gen 1 (5 Gbps)) or Gen 2 (10 Gbps) testing, including x2 mode
- Tests for component/embedded retimers, redrivers, and active cables
- Results consistent with USB-IF SigTest software utility
- USB Type-C interface control with N7018A Type-C Test Controller
- Automated scope measurement setup
- Test results report generation
- Pass/fail margin analysis
- Test framework that reports multi trial results with full array of statistics for each measurement with worst case measurement result.

Comprehensive Test Coverage

The USB 3.2 compliance test application automatically configures the oscilloscope for each test and provides results which includes margin and statistical analysis. The test coverage includes electrical, timing and eye diagram tests as stated in the USB 3.2 specification and the CTS. The signal is optimized for most accurate test result and measurement repeatability. If you discover a problem with your device, the Characterization mode features are available to aid in root-cause analysis.

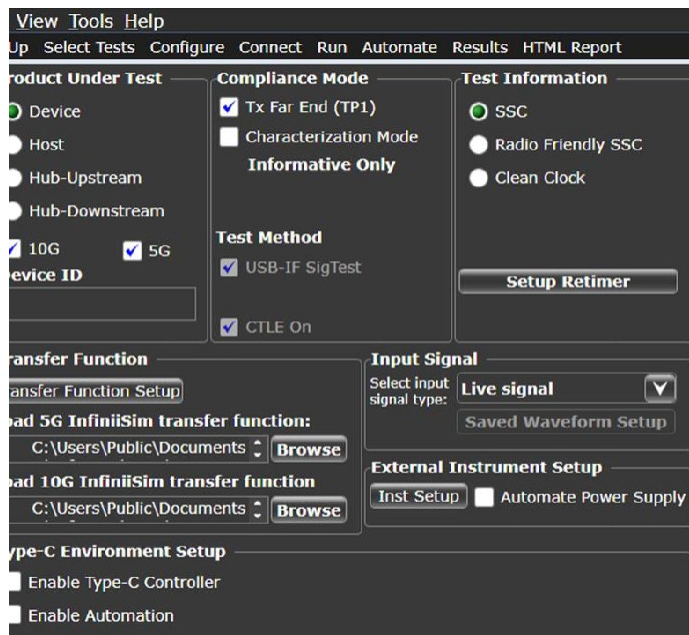


Figure 1. USB 3.2 application test setup screen

Determining the proper compliance loss channel can be complicated. The USB 3.2 compliance test application automatically embeds the compliant channel depending on your test configuration.

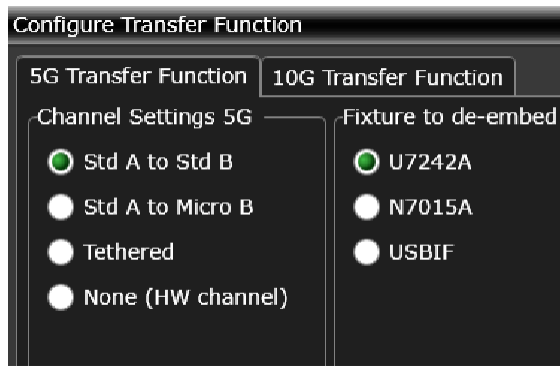


Figure 2. USB 3.2 compliant channel setup.

One of the biggest challenges with testing USB 3.2 is getting the product to output the correct compliance test pattern. The Keysight automated test framework allows you to pick from a variety of generators that are automatically controlled by the application to output the precise compliance pattern.



Figure 3. USB 3.2 pattern generators for precise compliance pattern generation

Easy Test Definition

The test application enhances the usability of Keysight Infiniium oscilloscopes for testing USB 3.2 products. The Keysight automated test framework guides you quickly through the steps required to define the setup, perform the tests and view the test results. You can select a category of tests or select an individual test. The user interface is designed to minimize unnecessary reconnections, which will help save test time and minimize potential operator error. You can save the tests and configurations as project files and recall them for quick testing and review previous results. You can also run the compliance test with saved waveform files from the oscilloscope or the ADS simulation tool on your PC, freeing the oscilloscope for other data acquisition purposes.

Configurability and Guided Connection

The USB 3.2 compliance test application provides flexibility in your test setup. Once you have configured the tests, the connection page will display the connection diagram for the test you have selected.

You can also specify the number of test trials and only stop running selected tests when the stop condition is met. The application will save the worst-case test result to help you track down the anomalies in your signals.

The configuration menu allow customized test setups specific to your product.

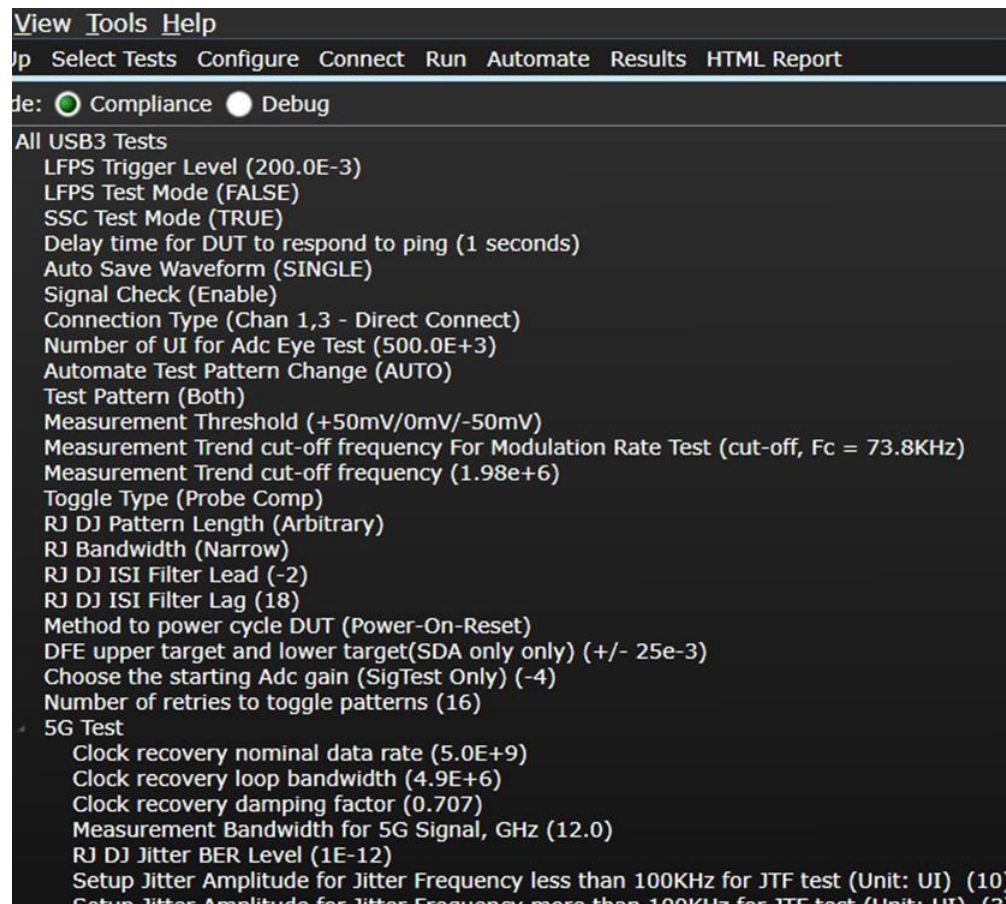


Figure 4. Configuration menu allows for flexible and customized test conditions

Comprehensive Result Analysis

In addition to providing you with measurement results, the compliance test application reports how close your test results are to the specified test limit. You can specify the level at which warnings are to be issued. You are provided a full array of statistics for each measurement.

File View Tools Help				
Set Up Select Tests Configure Connect Run Automate Results HTML Report				
	Test Name	Actual Value	Margin %	Pass Limits
✓	5G SSC Modulation Rate	31.085680 kHz	36.2	30.000000 kHz <= VALUE <= 33.000000 kHz
✓	5G SSC Slew Rate	4.738 ms	52.6	VALUE <= 10.000 ms
ⓘ	5G Short Channel Random Jitter	682 fs		Information Only
✓	5G Short Channel Maximum Deterministic Jitter	15.876 ps	81.5	VALUE <= 86.000 ps
✓	5G Short Channel Total Jitter at BER-12	25.476 ps	80.7	VALUE <= 132.000 ps
✓	5G Short Channel Template Test	0.000	100.0	VALUE = 0.000
✓	5G Short Channel Differential Output Voltage	340.9 mV	21.9	100.0 mV <= VALUE <= 1.2000 V
ⓘ	5G Random Jitter (CTLE ON)	629 fs		Information Only
✓	5G Far End Maximum Deterministic Jitter (CTLE ON)	37.089 ps	56.9	VALUE <= 86.000 ps
✓	5G Far End Total Jitter at BER-12 (CTLE ON)	45.933 ps	65.2	VALUE <= 132.000 ps
✓	5G Far End Template Test (CTLE ON)	0.000	100.0	VALUE = 0.000
✓	10G Short Channel Template Test	0.000	100.0	VALUE = 0.000
✓	10G Short Channel Differential Output Voltage	131.3 mV	5.4	70.0 mV <= VALUE <= 1.2000 V
✓	10G Short Channel Extrapolated Eye Height	98.4 mV	40.6	VALUE >= 70.0 mV
✓	10G Short Channel Minimum Eye Width	53.3488 ps	11.1	VALUE >= 48.0000 ps
✓	10G Random Jitter	454 fs	54.6	VALUE <= 1.000 ps
ⓘ	10G Far End Maximum Deterministic Jitter (CTLE ON)	25.207 ps		Information Only
ⓘ	10G Far End Total Jitter at BER-6 (CTLE ON)	29.528 ps		Information Only
✓	10G Far End Template Test (CTLE ON)	0.000	100.0	VALUE = 0.000
✓	Extrapolated Eye Height	127.9 mV	82.7	VALUE >= 70.0 mV
✓	Minimum Eye Width	70.4724 ps	46.8	VALUE >= 48.0000 ps

Figure 5. The USB 3.2 test application documents your test parameters, pass or fail status, test limits and measured values and margin.

Thorough Performance Reporting

The USB 3.2 compliance test application generates HTML reports that captures the performance, status and margins of your device under test. It also captures screenshots of critical measurements of your reference and documentation. This report is suitable for printing and sharing with your test vendors, customers and suppliers.

File View Tools Help						
Set Up Select Tests Configure Connect Run Automate Results HTML Report						
Refresh						
Pass	# Failed	# Trials	Test Name	Actual Value	Margin	Pass Limits
✓	0	1	5G TSSC-Freq-Dev-Min	-4.608662 kppm	43.2 %	-5.300000 kppm <= VALUE <= -3.700000 kppm
✓	0	1	5G TSSC-Freq-Dev-Max	135.018 ppm	27.5 %	TSSCMin ppm <= VALUE <= TSSCMax ppm
✓	0	1	5G SSC Modulation Rate	31.085680 kHz	36.2 %	30.000000 kHz <= VALUE <= 33.000000 kHz
✓	0	1	5G SSC Slew Rate	4.738 ms	52.6 %	VALUE <= 10.000 ms
ⓘ		1	5G Short Channel Random Jitter	682 fs		Information Only
✓	0	1	5G Short Channel Maximum Deterministic Jitter	15.876 ps	81.5 %	VALUE <= 86.000 ps
✓	0	1	5G Short Channel Total Jitter at BER-12	25.476 ps	80.7 %	VALUE <= 132.000 ps
✓	0	1	5G Short Channel Template Test	0.000	100.0 %	VALUE = 0.000
✓	0	1	5G Short Channel Differential Output Voltage	340.9 mV	21.9 %	100.0 mV <= VALUE <= 1.2000 V
ⓘ		1	5G Random Jitter (CTLE ON)	629 fs		Information Only
✓	0	1	5G Far End Maximum Deterministic Jitter (CTLE ON)	37.089 ps	56.9 %	VALUE <= 86.000 ps
✓	0	1	5G Far End Total Jitter at BER-12 (CTLE ON)	45.933 ps	65.2 %	VALUE <= 132.000 ps
✓	0	1	5G Far End Template Test (CTLE ON)	0.000	100.0 %	VALUE = 0.000
✓	0	1	10G Short Channel Template Test	0.000	100.0 %	VALUE = 0.000
✓	0	1	10G Short Channel Differential Output Voltage	131.3 mV	5.4 %	70.0 mV <= VALUE <= 1.2000 V
✓	0	1	10G Short Channel Extrapolated Eye Height	98.4 mV	40.6 %	VALUE >= 70.0 mV
✓	0	1	10G Short Channel Minimum Eye Width	53.3488 ps	11.1 %	VALUE >= 48.0000 ps
✓	0	1	10G Random Jitter	454 fs	54.6 %	VALUE <= 1.000 ps
ⓘ		1	10G Far End Maximum Deterministic Jitter (CTLE ON)	25.207 ps		Information Only
ⓘ		1	10G Far End Total Jitter at BER-6 (CTLE ON)	29.528 ps		Information Only
✓	0	1	10G Far End Template Test (CTLE ON)	0.000	100.0 %	VALUE = 0.000
✓	0	1	Extrapolated Eye Height	127.9 mV	82.7 %	VALUE >= 70.0 mV
✓	0	1	Minimum Eye Width	70.4724 ps	46.8 %	VALUE >= 48.0000 ps

Figure 6. The USB 3.2 compliance test application generates a summary report for quick results viewing. The report includes details such as test limits, test description and test results.

Recommended Oscilloscope

The D9020USBC USB 3.2 software is compatible with the Infiniium series oscilloscopes with operating software revision of 6.30 or higher.

Data rate	Minimum bandwidth	Minimum sample rate	Minimum channels	Description
5 Gb/s	13 GHz. Higher bandwidth is required if performing Receiver calibration or debugging close to silicon.	40 GSa/s	4	V-series, UXR oscilloscopes
10 Gb/s	16 GHz. Higher bandwidth is required if performing Receiver calibration or debugging close to silicon.	80 GSa/S	4	V-series, UXR oscilloscopes

Ordering Information

Model number	Description	Note
D9020USBC	USB 3.2 Compliance Test Software	Required
D9020ASIA or D9010DMBA	Advanced Signal Integrity Software (Crosstalk) or De-embedding Software (PrecisionProbe, InfiiniSim Basic)	Required
D9020JITA	Jitter, Vertical and Phase Noise Analysis Software	Required

Flexible Software Licensing and KeysightCare Software Support Subscriptions

Keysight offers a variety of flexible licensing options to fit your needs and budget. Choose your license term, license type, and KeysightCare software support subscription.

License terms

Perpetual – Perpetual licenses can be used indefinitely.

Subscription – Subscription licenses can be used through the term of the license only (6, 12, 24, or 36 months).

License types

Node-locked – License can be used on one specified instrument/computer.

Transportable – License can be used on one instrument/computer at a time but may be transferred to another using Keysight Software Manager (internet connection required).

USB Portable – License can be used on one instrument/computer at a time but may be transferred to another using a certified USB dongle (available for additional purchase with Keysight part number E8900-D10).

Floating (single site) – Networked instruments/computers can access a license from a server one at a time. Multiple licenses can be purchased for concurrent usage.

KeysightCare Software Support Subscriptions

Perpetual licenses are sold with a 12 (default), 24, 36, or 60-month software support subscription. Support subscriptions can be renewed for a fee after that.

Subscription licenses include a software support subscription through the term of the license.

KeysightCare Software Support Subscription provides peace of mind amid evolving technologies.

- Ensure your software is always current with the latest enhancements and measurement standards.
- Gain additional insight into your problems with live access to our team of technical experts.
- Stay on schedule with fast turnaround times and priority escalations when you need support.

Selecting your license:

Step 1. Choose your software product (eg. S1234567A).

Step 2. Choose your license term: Perpetual or time-based.

Step 3. Choose your license type: node-locked, transportable, USB portable, or floating.

Step 4. Depending on the license term, choose your support subscription duration.

Subscription-based Compliance Test Software Suites

A new ownership model of multiple Compliance Test Software Applications is now available.

With this new subscription-based model, the USB software suites bundle the Compliance Test Software Applications under a model number. Using a subscription-based ownership, you can enjoy all the test software features covered under USB across multiple generations and variants.

Software support and continuity

Under the subscription plan, software support is made available with no extra support cost. Ensuring your software always stays up to date with the latest enhancements and measurement standards while having access to our team of technical experts when you need support.

On top of that all upgrades are made available to you as the USB standards progresses with no additional costs.

Subscription-based Compliance Test Software Suites

Each suite comes with a 12, 24, or 36-month software suite subscription.

Suite license	Technology generation and variants coverage (current)
SW00USBH USB High Speed Validation License	USB 3.2 TX Test (D9020USBC) USB4 TX Test (D9040USBC) USB4v2 TX Test (D9050USBC)
SW02USBH USB High Speed Full TX Test Suite	USB 3.2 TX Test (D9020USBC) USB4 TX Test (D9040USBC) USB4v2 TX Test (D9050USBC) USB 4.0, 3.2, 2.0 Protocol Decode (D9010USBP)

Keysight enables innovators to push the boundaries of engineering by quickly solving design, emulation, and test challenges to create the best product experiences. Start your innovation journey at www.keysight.com.



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