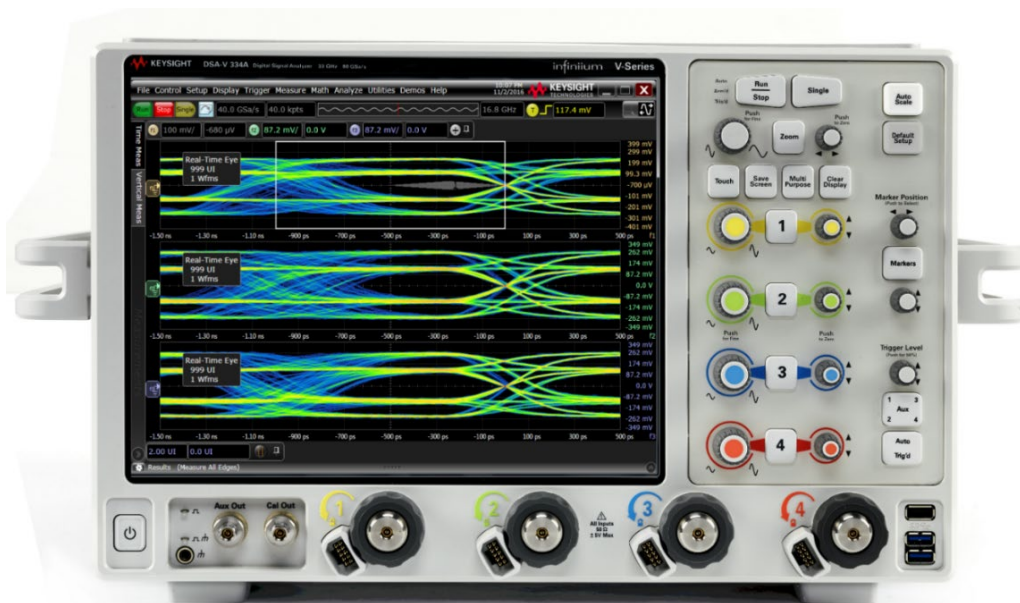# D9010CPHC
MIPI C-PHY Compliance Test
Software for Infiniium Oscilloscopes

KEYSIGHT

Validate and Debug Your Embedded C-PHY Data Links Quickly and Easily

The Keysight Technologies, Inc. MIPI® C-PHY[SM] conformance test software for Infiniium oscilloscopes gives you a fast, easy way to validate and debug your embedded C-PHY data links. The C-PHY electrical test software allows you to automatically execute C-PHY conformance tests for your CSI2 and DSI2 architectures. The application automatically displays the results in a flexible report format. In addition to measurement data, the report provides margin analysis that shows how closely your product passed each test. The C-PHY conformance test software performs the complete range of tests to meet the physical layer requirement for your transmitter. It follows Section 9 and 10 of the MIPI Alliance Specification for C-PHY v1.0, v1.1, v1.2 and v2.0 and Section 1 of the C-PHY v1.1 and v2.0 Conformance Test Suite (CTS). The C-PHY conformance test software helps you execute the most difficult physical layers tests for transmitters (Tx test only) that can be measured with a high bandwidth oscilloscope.
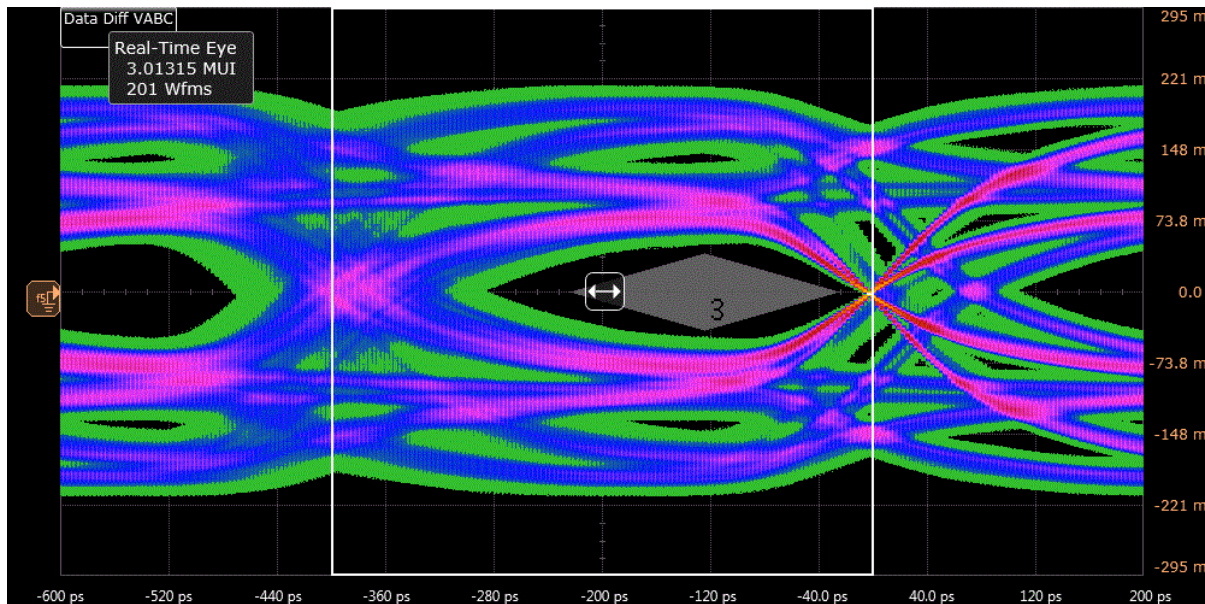

Figure 1. C-PHY eye diagram test example

Key features

- Complete MIPI Alliance Specification for C-PHY v1.0, v1.1, v1.2 and v2.0 Section 9 and 10 and CTS for C-PHY v1.1 and v2.0 Section 1
- Tests LP and HS tests for all speeds
- Automated scope measurement setup, testing, and reporting for increased accuracy, time-savings and repeatability
- Advanced debug modes for troubleshooting
- Automated margin analysis and pass/fail conformance reporting

Save Time with the C-PHY Conformance Application

The C-PHY Conformance test software saves your time by setting the stage for automatic execution of all the required electrical tests. The primary difficulty of performing electrical tests for C-PHY is connecting the oscilloscope to the target device, correctly configuring the oscilloscope measurement system for ultimate accuracy, issuing the proper commands to perform the tests, and then analyzing the measured results by comparing them to the limits published in the specification. The C-PHY conformance test software automates this work to provide rapid, accurate, and repeatable test execution.
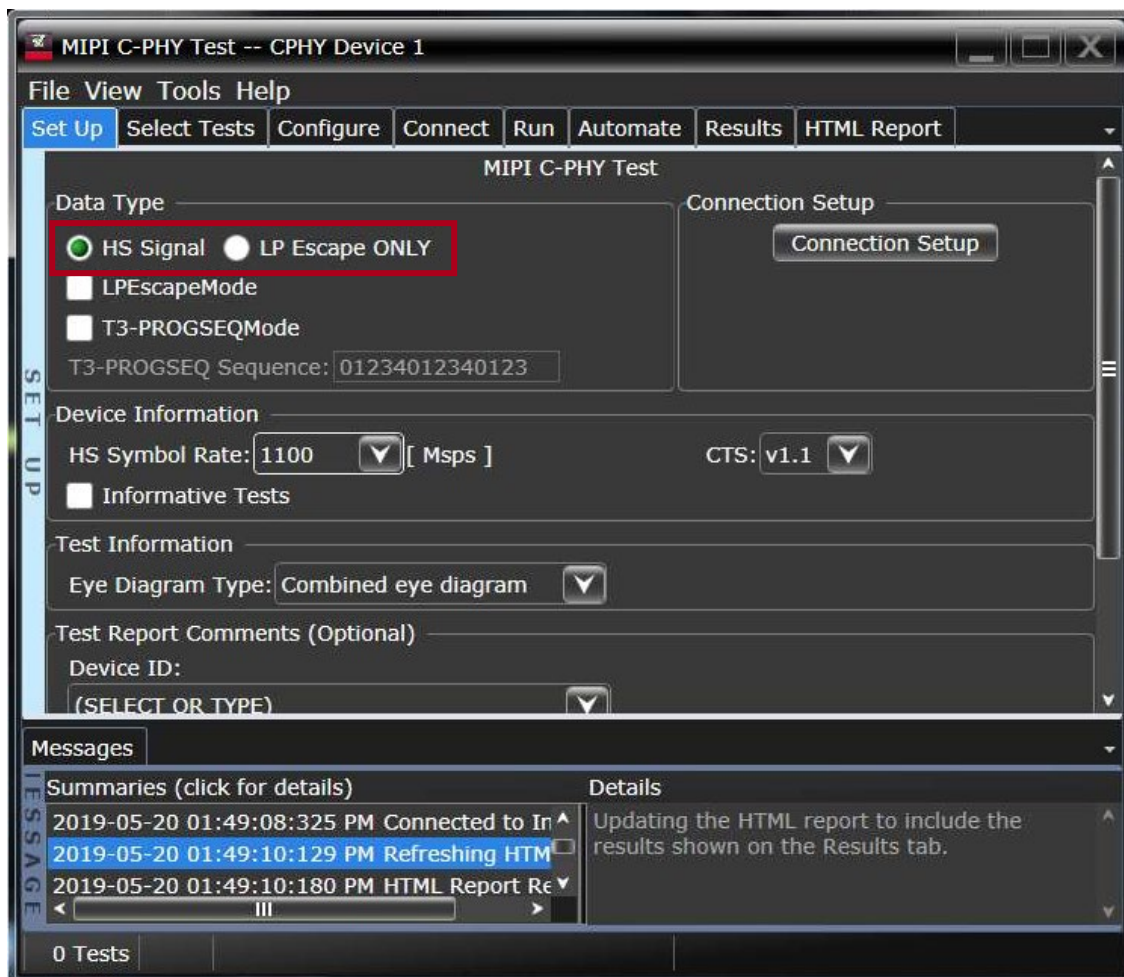

Figure 2. Supports both LP and HS tests

Define Tests Easily

The C-PHY conformance test software extends the ease-of-use advantages of Keysight's Infiniium oscilloscopes to testing C-PHY designs. The Keysight automated test engine walks you quickly through the steps required to define and configure the tests, execute the tests, and view the test results. Select all the tests, an entire category of tests, or specify individual tests. Save tests and configurations as project files and recall them later for quick re-testing or review of previous test. Straightforward menus let you perform tests with minimum effort.
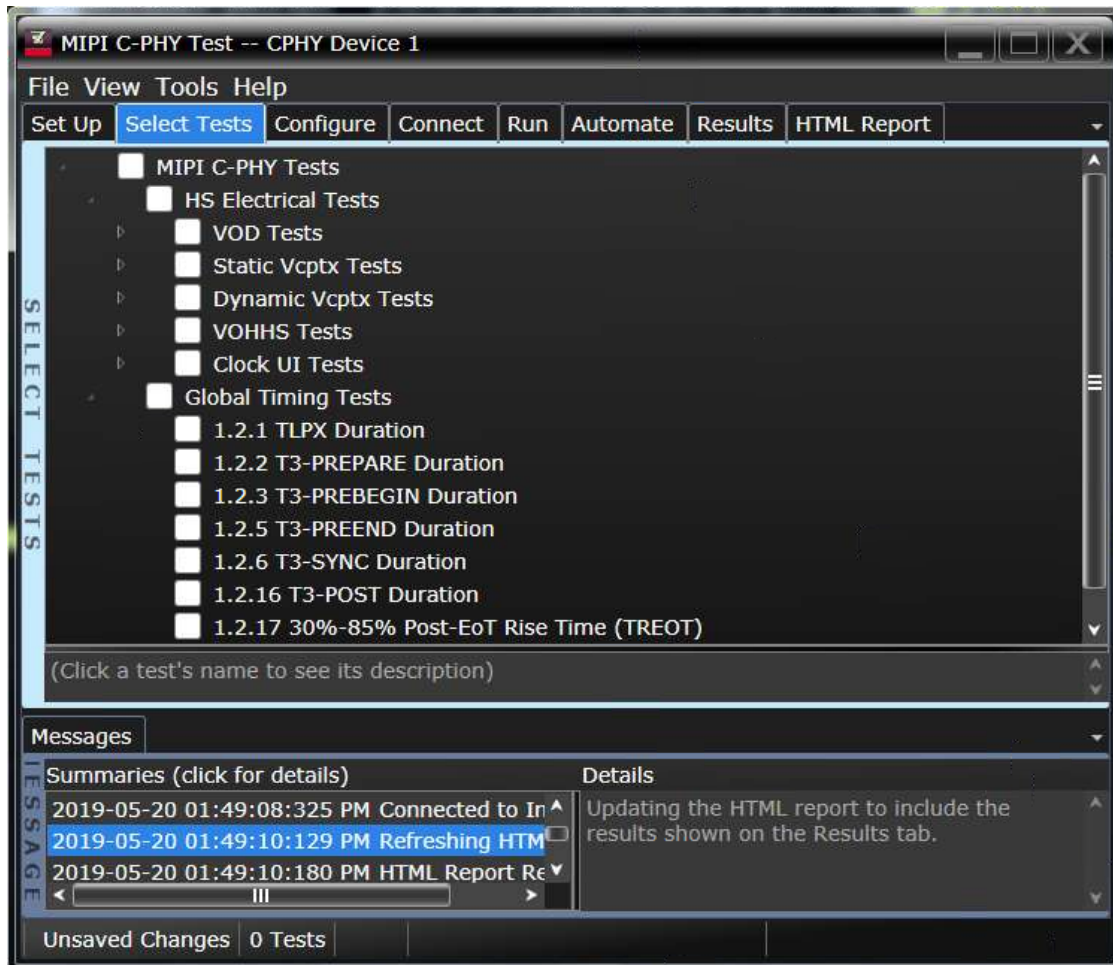

Figure 3. Easy to select the test want to perform

Test Coverage

HS Electrical Characteristics

Burst mode

Test 1.2.1 TPLX Duration
Test 1.2.2 T3-PREPARE Duration
Test 1.2.3 T3-PREBEGIN Duration
Test 1.2.4 T3-PROGSEQ Duration
Test 1.2.5 T3-PREEND Duration
Test 1.2.6 T3-SYNC Duration
Test 1.2.7 HS-TX Differential Voltage (VOD-AB, VOD-BC, VOD-CA)
Test 1.2.8 HS-TX Differential Voltage Mismatch (ΔVOD)
Test 1.2.9 HS-TX Single-Ended Output High Voltages (VOHHS(VA), VOHHS(VB), VOHHS(VC))
Test 1.2.10 HS-TX Static Common-Point Voltage (VCPTX)
Test 1.2.11 HS-TX Static Common-Point Voltage Mismatch (ΔVCPXT(HS))
Test 1.2.12 HS-TX Dynamic Common-Point Variations Between 50-450Mhz (ΔVCPTX(LF))
Test 1.2.13 HS-TX Dynamic Common-Point Variations Above 450MHz (ΔVCPTX(HF))
Test 1.2.14 HS-TX Rise Time (tR)(Informative)
Test 1.2.15 HS-TX Fall Time(tF)(Informative)
Test 1.2.16 T3-POST Duration
Test 1.2.17 30 to 85% Post-EoT Rise Time (TREOT)
Test 1.2.18 THS-EXIT Value
Test 1.2.19 HS Clock Instantaneous UI (UIINST)
Test 1.2.20 HS Clock Delta UI (ΔUI) (Obsolete)

Continuous mode

Test 1.2.7 HS-TX Differential Voltage (VOD-AB, VOD-BC, VOD-CA)
Test 1.2.8 HS-TX Differential Voltage Mismatch (ΔVOD)
Test 1.2.9 HS-TX Single-Ended Output High Voltages (VOHHS(VA), VOHHS(VB), VOHHS(VC)) [1]
Test 1.2.10 HS-TX Static Common-Point Voltage (VCPTX) [1]
Test 1.2.11 HS-TX Static Common-Point Voltage Mismatch (ΔVCPXT(HS)) [1]
Test 1.2.12 HS-TX Dynamic Common-Point Variations Between 50-450Mhz (ΔVCPTX(LF)) [1]
Test 1.2.13 HS-TX Dynamic Common-Point Variations Above 450MHz (ΔVCPTX(HF)) [1]
Test 1.2.19 HS Clock Instantaneous UI (UIINST)
Test 1.2.20 HS Clock Delta UI (ΔUI) (Obsolete)
Test 1.2.21 HS-TX Eye Diagram (VABC, VA, VB, VC) [2]
Test 1.2.22 HS-TX UI Jitter (UI_JitterPEAK_TX) [2]

LP Electrical Characteristics

Test 1.1.1 LP-TX Thevenin Output High Level Voltage (VOH)
Test 1.1.2 LP-TX Thevenin Output Low Level Voltage (VOL)
Test 1.1.3 LP-TX 15 to 85% Rise Time (TRLP)
Test 1.1.4 LP-TX 15 to 85% Fall Time (TFLP)
Test 1.1.5 LP-TX Slew Rate vs. CLOAD
Test 1.1.6 LP-TX Pulse Width of Exclusive-OR Clock (TLP-PULSE-TX)
Test 1.1.7 LP-TX Period of Exclusive-OR Clock (TLP-PER-TX)

1. Requires N7010A active termination adopter to providing termination voltage.
2. Requires InfiniiSim option to add reference channel and package model and Equalization option to apply Receiver equalization (CTLE) for C-PHY v2.0 CTS.

Extensibility

You may add additional custom tests or steps to your application using the D9010UDAA User Defined Application (UDA) development tool (www.keysight.com/find/uda). Use UDA to develop functional "Add-Ins" that you can plug into your application. Add-ins may be designed as:

- Complete custom tests (with configuration variables and connection prompts)
- Any custom steps such as pre or post processing scripts, external instrument control and your own device control.

Automation

You can completely automate execution of your application's tests and Add-Ins from a separate PC using the included N5452A Remote Interface feature (download free toolkit from www.keysight.com/find/scope-apps-sw). You can even create and execute automation scripts right inside the application using a convenient built-in client.

The commands required for each task may be created using a command wizard or from "remote hints" accessible throughout the user interface.

Using automation, you can accelerate complex testing scenarios and even automate manual tasks such as:

- Opening projects, executing tests and saving results
- Executing tests repeatedly while changing configurations
- Sending commands to external instruments
- Executing tests out of order

Combine the power of built-in automation and extensibility to transform your application into a complete test suite executive:

- Interact with your device controller to place it into desired states or test modes before test execution
- Configure additional instruments used in your test suite such as a pattern generator and probe switch matrix
- Export data generated by your tests and post-process it uses your favorite environment, such as MATLAB, Python, LabVIEW, C, C++, Visual Basic etc.
- Sequence or repeat the tests and "Add-In" custom steps execution in any order for complete test coverage of the test plan
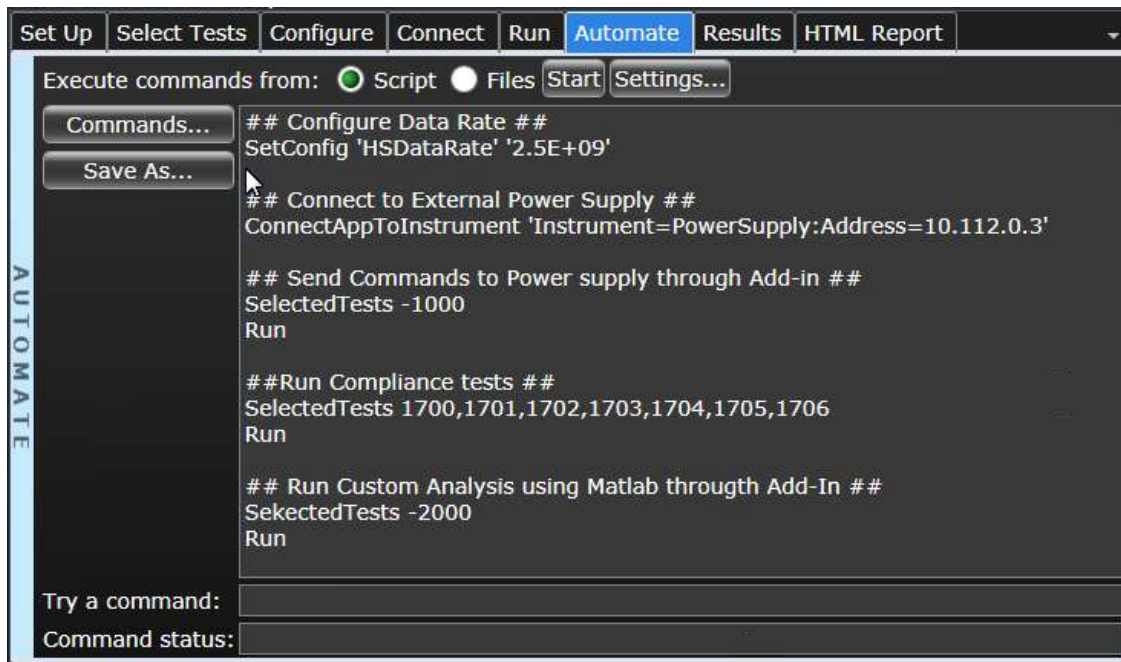
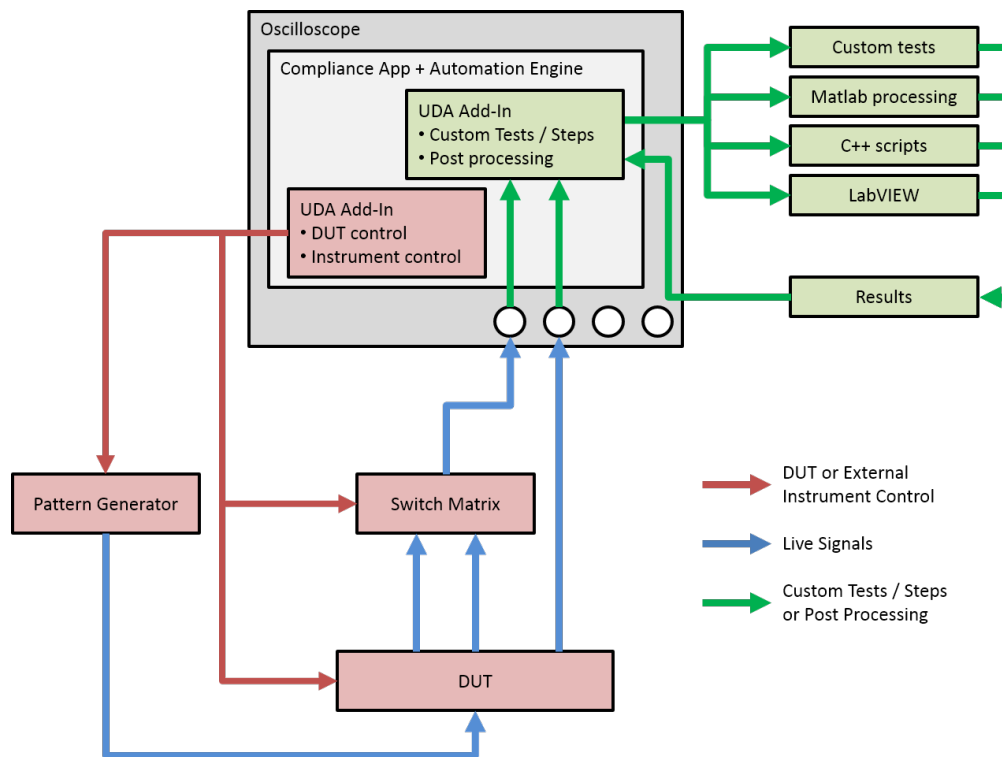**Figure 4.** Remote programming script in the Automation tab.

Figure 5. Combine the power of built-in automation and extensibility to transform your application into a complete test suite executive.

Recommended Oscilloscopes

The C-PHY compliance software is compatible with Keysight Infiniium Series oscilloscopes with operating software revision 6.55,10.20 (for UXR model) or higher. For oscilloscopes with earlier revisions, free upgrade software is available here: www.keysight.com/find/scope-apps-sw.

Symbol rate	Minimum bandwidth	Minimum channels	Compatible oscilloscopes
Up to 1.5 Gsps	6 GHz	3 Analog channels	V-Series, Z-Series, EXR-Series, MXR-Series and UXR-Series
Up to 2.5 Gsps	8 GHz		V-Series, Z-Series and UXR-Series
Up to 4.5 Gsps	12 GHz		V-Series, Z-Series and UXR-Series
Up to 6 Gsps	15 GHz		V-Series, Z-Series and UXR-Series [1]

1. Due to new RX EQ in C-PHY specification v2.0, the test time will be increased significantly on old oscilloscope models, so it is not recommended to test C-PHY interface with old oscilloscope models.

Ordering Information

Model number	Description	Note
D9010CPHC	MIPI C-PHY Tx Compliance Software	Mandatory
D9020ASIA	Advanced Signal Integrity Software (Crosstalk)	Mandatory
D9020SCNA	InfiniiScan Event Identification Software	Mandatory

Other Hardware, Probes and Accessories

Model number	Description	Quantity
MX0020/21/22/23/24/25A	InfiniiMax Ultra Probe, bandwidth 10/13/16/25/20/25 GHz	3
MX0109A	InfiniiMax III GHz Extreme Temperature Solder-in Head, 26 GHz (Recommended head for Ultra-series probes above)	3
1132B/1134B/1168B/1169B	InfiniiMax Probe, bandwidth 5/7/10/13 GHz	3[1]
E2669B	Differential probe connectivity kit (includes 4x E2677B 12GHz solder-in heads, 2x E2678B 12GHz socketed heads, and 1x E2675B browser head). Recommended head for 113xB/116xB probes.	1
15443A	Matched cable pair (2 x SMA(m) to SMA(m) cable included)	2
N7010A	30GHz Active Termination Adapter for Continuous mode test	3

1. Alternate option to Ultra-series probes. Preferred probe for MXR scopes (no adapter 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.
- Time-based – Time-based 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 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.

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.

Time-based licenses include a software support subscription through the term of the license.

Selecting your license

- **Step 1.** Choose your software product (e.g. D9010CPHC).
- **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 MIPI 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 MIPI 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 MIPI standards progresses with no additional costs.

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

Suite License	Technology Generation and Variants Coverage (current)
SW00MIPI MIPI Validation License	• C-PHY TX Validation (D9010CPHC) • D-PHY TX Validation (D9020DPHC) • D-PHY TX Validation, V3.5 FCM (D9030DPHC) • M-PHY TX Validation, HS-GEARs 1-4 (D9040MPHC) • M-PHY TX Validation, HS-GEARs 1-5 (D9050MPHC)
SW02MIPI MIPI Full TX Test Suite	• C-PHY TX Validation (D9010CPHC) • D-PHY TX Validation (D9020DPHC) • D-PHY TX Validation, V3.5 FCM (D9030DPHC) • M-PHY TX Validation, HS-GEARs 1-4 (D9040MPHC) • M-PHY TX Validation, HS-GEARs 1-5 (D9050MPHC) • C-PHY and D-PHY Protocol Validation (D9010MCDP) • M-PHY Protocol Validation (D9010MPMP) • LowSpeed Protocol Validation (D9010MPLP)

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