
M8091BMCA Receiver Conformance Test Application for IEEE 802.3bm

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To search for software updates for your product, please visit the Keysight Technical Support website at:

<https://www.keysight.com/us/en/support/M8091BMCA>

User Documentation

Our user documentation includes comprehensive information on features that may impact the secure deployment, use, and decommissioning of our products. This includes details on exposed network ports, the use of cryptography and authentication, and firmware security settings, if necessary.

Additional Resources

- [Network Security Solutions](#): Learn how Keysight helps protect your network from threats.
- [Creating a More Connected and Secure World](#): Discover Keysight's commitment to cybersecurity.

Contents

Keysight Cybersecurity 3

1 Introduction

Overview 10

Chip-to-Module 10

Chip-to-Chip, KR, CR 10

Related Documents 11

Contacting Keysight Technologies 12

2 Installing the M8091BMCA Rx Conformance Test App

System Requirements 14

Required Configuration & Licenses 15

Installing the Software 22

Installing the License Key 25

Using Keysight Software Manager Utility 25

27

3 Preparing to Take Measurements

Calibrating the Instruments 30

Calibrating the FlexDCA Oscilloscope 30

Calibrating the UXR Oscilloscope 30

Skew Calibration 31

Starting the Test Application 34

Launching the M8091BMCA Receiver Conformance Test
Application 34

- Setting up the M8091BMCA Receiver Conformance Test Application** 37
 - Understanding Calibration Data Persistence 41
 - Calibration Editor 46
- Viewing Results** 51
 - Calibration View Tab 51
 - Results Tab 51
- Viewing the Application Log** 53
- Compliance Boards** 54
- Stressed Eye Receiver Test Method** 55
- Overview of Channel Operating Margin (COM)** 57
 - Detailed Steps for Calibration Procedures 62
- 4 IEEE-25G C2M Calibrations**
 - Calibration Parameters in Debug Mode** 66
 - Crosstalk Calibration** 68
 - Amplitude Calibration** 74
 - SJ Calibration** 77
 - RJ Calibration** 78
 - TJ Calibration** 79
 - Stressed Eye Calibration** 80
 - Peak to Peak Amplitude Calibration for Voltage Tolerance Test** 88
- 5 IEEE-25G C2M Tests**
 - Test Parameters in Debug Mode** 96
 - Multi-lane Stressed Input Test** 98
 - Voltage Tolerance Test** 103

6 IEEE-25G C2C/KR/CR Calibrations

Calibration Parameters in Debug Mode	108
C2C/KR/CR Configuration in the Test App	111
Calibration Procedure	113
Overview of Calibration Procedures	113
Amplitude Calibration	115
SJ Calibration	119
RJ Calibration	121
BUJ Calibration	123
Broadband Noise Calibration	125
SNDR Calibration	127
Channel Characterization using COM Model	129
Transmitter Measurements for COM Model – Rx ITol	132
Rx Calibration using COM Model	134
Peak to Peak Amplitude Calibration for Amplitude Tolerance Test	136

7 IEEE-25G C2C/KR/CR Tests

Test Parameters in Debug Mode	140
Rx Test Procedures	143
Overview of Receiver Tests	143
Detailed Steps for Rx Test Procedures	143
Receiver Interference Tolerance Test	145
Receiver Jitter Tolerance Test	150
Receiver Input Amplitude Tolerance Test	153

8 Calibration & Test Results

About Calibration View	158
Exporting Measurement Results to Repository	160
Keysight KS6800A Series Data Analytics Software	170

9 Appendix: Acronyms and Abbreviations

List of Acronyms	174
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Keysight M8091BMCA Receiver Conformance Test Application for IEEE 802.3bm

User Guide

1 Introduction

Overview 10

Related Documents 11

Contacting Keysight Technologies 12

To install the Keysight M8091BMCA Receiver Conformance Test Application for IEEE 802.3bm, you require the installer file and the licenses necessary for the installation and for running various tests.

NOTE

The name for the “Keysight M8091BMCA Receiver Conformance Test Application for IEEE 802.3bm” used within the application itself is “Compliance Rx Test Automation for IEEE 25G” or simply “IEEE-25G ValiFrame” for short.

Overview

The Keysight M8091BMCA Electrical Receiver Conformance Test Application for the IEEE 802.3bm standard provides a framework for using Keysight M8000 BERT Test Solutions along with Keysight DCA and Keysight UXR Oscilloscopes to perform Receiver testing based on the calibration and test procedures defined in Annex 83E Chip-to-module 100 Gb/s four-lane Attachment Unit Interface; Annex 83D Chip-to-chip 100 Gb/s four-lane Attachment Unit Interface; 111. Physical Medium Dependent (PMD) sublayer and baseband medium, type 25GBASE-KR and 25GBASE-KR-S and 110. Physical Medium Dependent (PMD) sublayer and baseband medium, type 25GBASE-CR and 25GBASE-CR-S.

Chip-to-Module

The Chip-to-Module (C2M) test procedures are based on the stressed eye method. Characteristics of a test signal are adjusted towards specific values following a precise calibration procedure. The stress input test signal is defined for devices on both module and host sides.

Chip-to-Chip, KR, CR

The Chip-to-Chip (C2C) test procedure is based on the Channel Operating Margin (COM) method, which was first introduced in *IEEE Annex 93C, IEEE Std 802.3bj-2014, Amendment to IEEE Std 802.3-2012: Ethernet*. For the receiver interference tolerance test, broadband noise is injected into the test signal after the channel, so that the targeted COM, which the receiver is supposed to accommodate for, is achieved. The amplitude of the broadband noise depends on the transmitter and channel characteristics and must be adjusted very carefully. No broadband noise is injected for the receiver jitter tolerance test.

Related Documents

- *IEEE Std 802.3-2018, IEEE Standard for Ethernet - Annex 83E, Annex 83D, Clause 111, Clause 110*
- M8070B documentation
 - For more information about M8070B software, refer to the M8070B documentation. To locate the M8070B documents, click **Start > Keysight M8070B > Keysight M8070B Documentation**. Alternatively, you may also visit www.keysight.com/find/M8070B to find the latest versions of the M8070B manuals.

Contacting Keysight Technologies

For more information on products, applications or services associated with Keysight Technologies, contact your local Keysight office.

The complete list is available at: www.keysight.com/find/contactus.

2 Installing the M8091BMCA Rx Conformance Test App

System Requirements	14
Installing the Software	22
Installing the License Key	25

As a prerequisite to installing the Keysight M8091BMCA Receiver Conformance Test Application for IEEE 802.3bm, in addition to the necessary hardware, you also need to have certain software installed on the PC along with the corresponding licenses.

NOTE

The name for the “Keysight M8091BMCA Receiver Conformance Test Application for IEEE 802.3bm” used within the application itself is “Compliance Rx Test Automation for IEEE 25G” or simply “IEEE-25G ValiFrame” for short.

System Requirements

NOTE

For following requirements, please see the latest release notes:

- Operating System
- Required Softwares
- Supported Hardware and Software

Table 1 shows the required equipment for each IEEE 802.3 (IEEE-25G) standard option supported by the Test Application.

Table 1 Equipment required for each standard option supported by the Test App

Equipment Type	C2M (Host and Module)	C2C / KR / CR
Victim Pattern Generator	M8045A	
Crosstalk Generator	2nd channel of M8045A or 3rd party Crosstalk Generator	N/A
Interference Source	N/A	M8054A / M8195A / M8196A or 3rd party Noise Generator
Victim Error Detector	M8046A or DCI (DUT Control Interface)	
Clock Recovery	M8046A - 0A4 (internal CDR) or N107xA / N1076B / N1077A / N1078A	
Oscilloscope	N1000A + N1060A or N1092C(E)/N1094A(B) + N1076B/N1077A/N1078A or UXR0592A/UXR0592B	

NOTE

You can retrieve the BER from the DUT internal error counters (if available) by making use of the “DUT Control Interface (DCI)”. For information about DCI, refer to the “DUT Control Interface” topic in the [M8070ADVB Advanced Measurement Package User Guide](#).

Required Configuration & Licenses

The Keysight M8091BMCA Receiver Conformance Test Application for IEEE 802.3bm is a licensed feature. To use the application with the recommended hardware and software arrangements, the instruments, software and licenses listed in [Table 2](#) to [Table 10](#) are required.

NOTE

Please see product data sheet on [Keysight.com](https://www.keysight.com) for updated license requirements.

Table 2 M8040A 64 GBaud High-performance BERT minimum required configuration

Product	Description
M8040A-BU2	Bundle consisting of one M9505A 5-slot AXIe Chassis plus control module with USB option
M8045A	Pattern generator and clock module 32/64 GBaud, 3-slot AXIe
▪ M8045A-G32	Pattern generator one channel NRZ, data rate up to 32 GBaud (requires remote head, e.g. M8057A)
▪ M8045A-0G2	Second channel, hardware and license (requires remote head, e.g. M8057B) – recommended but not mandatory
▪ M8045A-0G3	Advanced jitter sources for receiver characterization, module-wide license
▪ M8045A-0G4	De-emphasis, module-wide license
▪ M8057B-FG	Remote head for M8045A pattern generator, 1 channel; two remote heads are needed
M8046A	Analyzer module, 32/64 GBaud, 1-slot AXIe
▪ M8046A-A32	Analyzer, one channel, data rate up to 32 GBaud, NRZ
▪ M8046A-0A4	Clock recovery for 32 GBaud, license
▪ M8046A-802	Matched cable pair 2.4 mm (m) to 2.4 mm (m), 2 ps, length 0.85 m (recommended for data input of M8046A analyzer)

Table 3 M8000 system software configuration

Product	Description
M8070B	System software for M8000 Series of BER test solutions
M8070ADVB-1xx	Advanced Measurement Package for M8000 Series of BERT Test Solutions (node-locked, transportable, floating or USB license)

Table 4 N107xx Clock Recovery configurations*

Product	Description
N1076A/N1077A	Electrical/optical clock recovery
▪ N107xA-232	Supported input rates: 50 MBd to 32 GBd
▪ N1076A-CR1	Clock recovery phase matching kit for N1076A electrical
▪ N1076A-2P2	Microwave pick-off tee 2.4 mm connectors, matched pair
▪ 11900B	2.4 mm female to 2.4 mm female adapter
▪ 83059A	Coaxial adapter, 3.5 mm male-male
▪ N1027A-2P8	Microwave pick-off tee 1.85 mm connectors, matched pair
▪ M8046A-802	Matched cable pair 2.4 mm (m) to 2.4 mm (m); two matched cable pairs are required
N1076B/N1078A	Electrical/optical clock recovery
▪ N107xx-232	Supported input rates: 125 MBd to 32 GBd
▪ N1076B-CR1	Clock recovery phase matching kit for N1076B electrical
▪ N1027A-2P8	Microwave pick-off tee 1.85 mm connectors, matched pair
▪ 11900B	2.4 mm female to 2.4 mm female adapter
▪ 83059A	Coaxial adapter, 3.5 mm male-male
▪ M8046A-802	Matched cable pair 2.4 mm (m) to 2.4 mm (m); two matched cable pairs are required

* One of these configurations is required if the M8046A-0A4 option is not selected.

Cabling Setup for N1076B/N1078A

Figure 1 shows the recommended connection setup for NRZ up to 64 GBd which should be made to control N1076B/N1078A from M8070B system software.

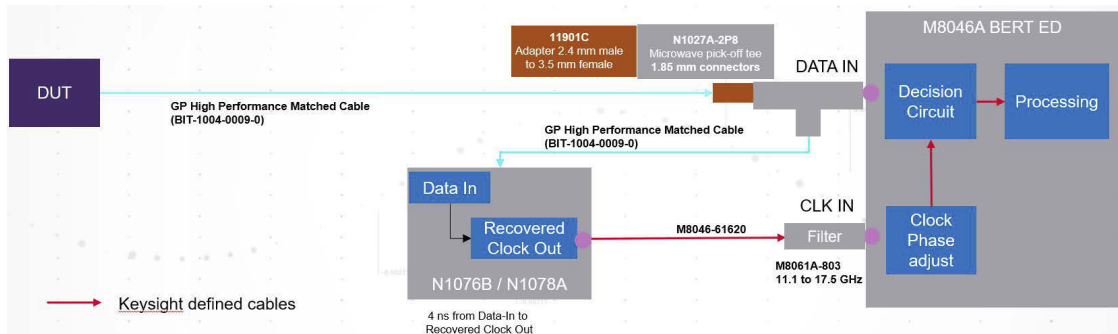


Figure 1 Scheme of cabling setup for N1076B/N1078A

NOTE

The filter at CLK IN must be used for symbol rates above 32 GBd and up to 32.414 GBd. It may not be used above 32.414 GBd.

Cabling Setup for N1076A/N1077A

Figure 2 shows the recommended connection setup which should be made to control N1076A/N1077A from M8070B system software.

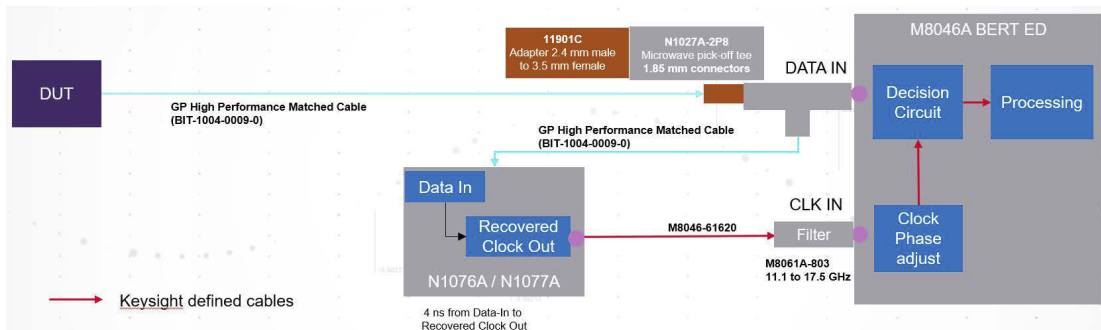


Figure 2 Scheme of cabling setup for N1076A/N1077A

NOTE

The filter at CLK IN needs to be used for symbol rates of 25 GBd and above and has to be removed for symbol rates below 25 GBd.

NOTE

To establish a successful connection between the Keysight M8091BMCA Receiver Conformance Test Application for IEEE 802.3bm and the BERT as well as the Interference Source, you must configure the modules in the following sequence on a 5-slot AXIe chassis:

- M8045A in slots 1-3 (M1)
- M8046A in slot 4 (M2)
- M8054A or M819xA in slot 5 (M3)

In a configuration that does not involve M8046A (M2), the following sequence can be used:

- M8045A in slots 1-3 (M1)
- M8054A or M819xA in slot 4 or 5 (M2)

Table 5 Interference source minimum required configuration for C2C/KR/CR application*

Product	Description
▪ M8054A	Interference Source 32 GHz or
▪ M8195A-001	Arbitrary Waveform Generator, 1 Channel, 65 GSa/s OR
▪ M8196A-001	Arbitrary Waveform Generator, 1 Channel, 92 GSa/s

* Select one of the listed signal generators for Gaussian noise interference.

Table 6 Select DCA configuration (N1000 DCA-X + N1060A or N109xx DCA-M + N1076B / 77A / 78A Clock Recovery)*

Product	Description
N1000A	DCA-X wide-bandwidth oscilloscope mainframe
▪ N1000A-PLK	Pattern lock trigger hardware model
N1060A	Precision waveform analyzer
▪ N1060A-050	Two 50 GHz channels
▪ N1060A-EVA	Equalizer integrated variable
▪ N1060A-232	Supported input rates: 125 MBd to 32 GBd
▪ N1060A-PTB	Precision timebase, ultra-low random jitter
▪ N1060A-JSA	Jitter spectrum analysis and clock recovery emulation
OR	
N109xx	DCA-M optical and electrical sampling oscilloscopes
▪ N1092C	DCA-M sampling oscilloscope (1 optical and 2 electrical channels)
▪ N1092E	DCA-M sampling oscilloscope (2 optical and 2 electrical channels)
▪ N1094A	DCA-M sampling oscilloscope (2 electrical channels)
▪ N1094B	DCA-M sampling oscilloscope (4 electrical channels)

* Configure Slot7 to the N109xx module and Slot8 to the N107xx module.

Table 7 FlexDCA N1000-Series System software – choose DCA options or R&D package*

Product	Description
DCA Options	
N1010AT-200	Enhanced jitter analysis software
N1010AT-201	Advanced waveform analysis
N1010AT-SIM	InfiniiSim-DCA (embedding/de-embedding of cables or fixtures)
R&D Package	
N1010100A	Research and development package for FlexDCA DCA-X mainframe minimum configuration

* Refer to **Table 8** if DCA options are not selected.

Table 8 UXR Oscilloscope configuration

Product	Description
UXR0592A/UXR0592B	59GHz, 2-channel, 1.85 mm input Infiniium UXR-series real-time oscilloscope
D9020ASIA	Advanced signal integrity software (EQ, InfiniSimAdv, crosstalk)
D9020JITA	Jitter, vertical and phase noise analysis software for 90000, V-, Z- and UXR-series oscilloscopes

Table 9 Recommended Accessories

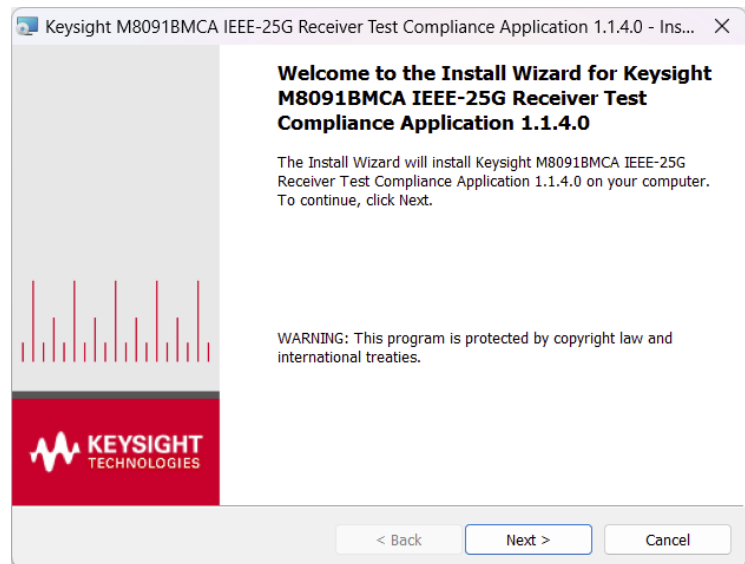
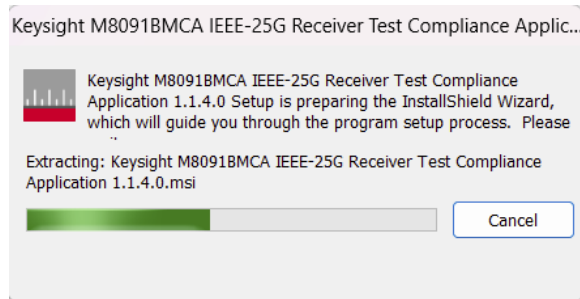
Product	Description
M8045A-801	Short cable, 1.85 mm (m) to 1.85 mm (m), 0.15 m, 699 ps delay $\pm$ 1 ps (two for each M8057B remote head and two for noise injection recommended)
11636C	Power Divider, DC to 50 GHz, 2.4 mm (two required for broadband noise injection for CR)
M8045A-802	Matched directional coupler pair, 50 GHz, 13 dB, 2.4 mm (recommended for RI and higher BW for C2C and KR)
M8046A-801	Cable, length 0.5 m
M8195A-810	Cable, 2.92 mm (m) to 2.92 mm (m), length 0.85 m (for crosstalk injection)
M8195A-820	Coaxial termination 50 Ω DC to 26.5 GHz, 3.5 mm (m) (two required)
SP0610A	Wilder QSFP28 100 Gbps MCB 3.5 mm Receptacle Test Adapter
SP0611A	Wilder QSFP28 100 Gbps 3.5 mm Plug Test Adapter
M8049A-002	ISI channel board, nine traces from 0.8 to 8.0 inches
M8049A-003	ISI channel board, seven traces from 9.1 to 22.3 inches
Y1901B	Adapter, 1.0 mm ruggedized (f) to 1.85 mm (f), DC to 67 GHz
N2125A	Infiniium UXR Real-Time Oscilloscope Calibration Module, 1 mm

Table 10 M8091BMCA Software Configuration

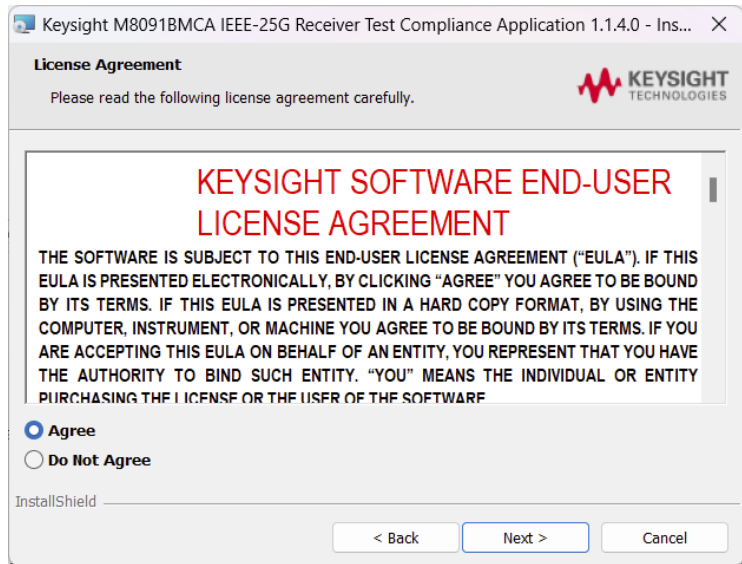
Product	Description
M8091BMCA-1xx	Rx Conformance Test Application for IEEE 802.3bm

Installing the Software

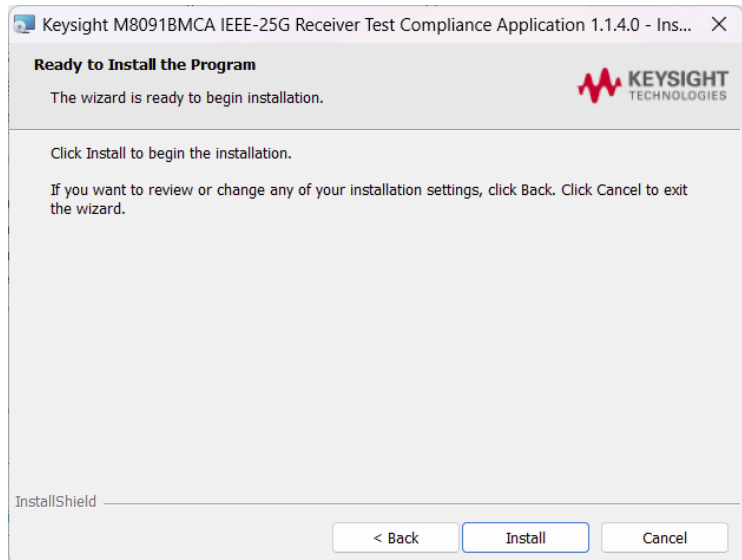
- 1 To obtain the M8091BMCA (IEEE-25G) Conformance Rx Test Application installer, please go to Keysight website:
<https://www.keysight.com/find/M8091BMCA>
- 2 Click **Visit Technical Support > Drivers, Firmware and Software** tab> Installer Link > **Current Version** tab > **Download** button.
- 3 Double-click the downloaded installer file on your PC.



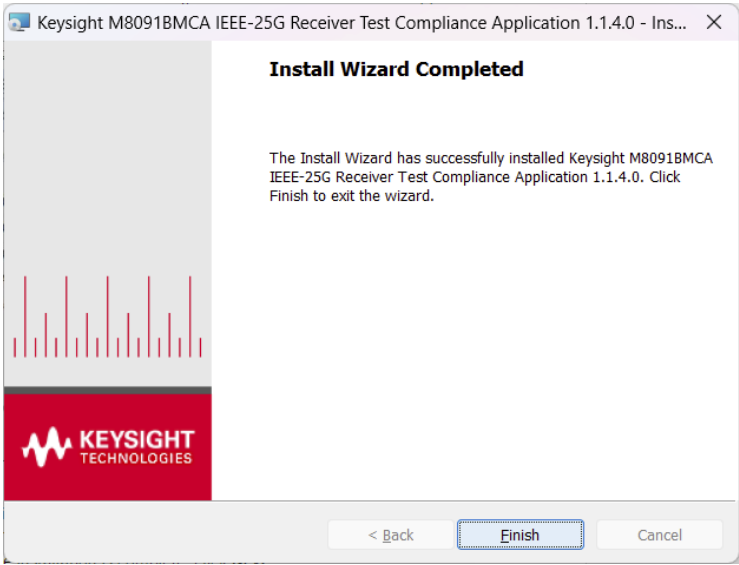
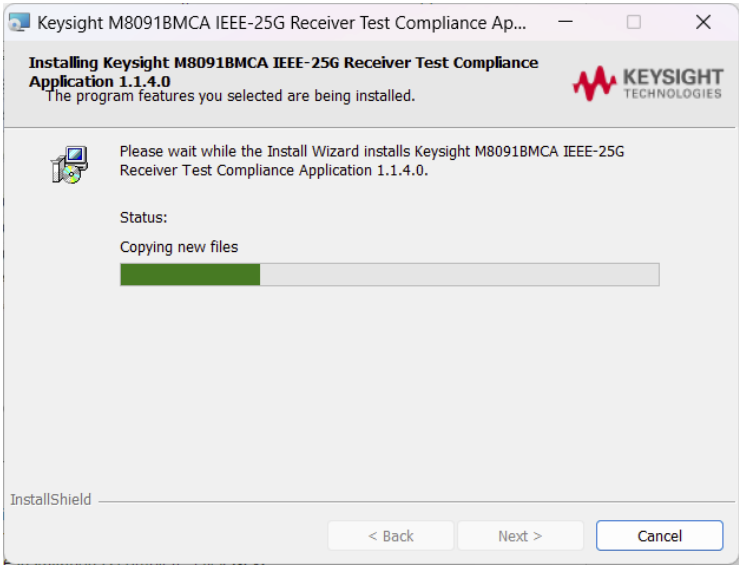
- 4 Click **Next**.



- 5 Select **Agree** to agree to the license agreement and click the **Next** button.



6 Click **Install**.



7 Click **Finish** to complete the installation and exit the setup.

Installing the License Key

To procure a license, you require the Ethernet Address information that is displayed in the Keysight Software Manager Utility installed on the same machine where you wish to install the license.

Using Keysight Software Manager Utility

To view and copy the Ethernet Address from Keysight Software Manager Utility:

- 1 Launch **Keysight Software Manager Utility** on the machine where you wish to run the Test Application and its features.
- 2 Copy the **Ethernet Address**, which is a set of alphanumeric values (as highlighted in [Figure 3](#)) that appears in the **Add License** tab of the application.

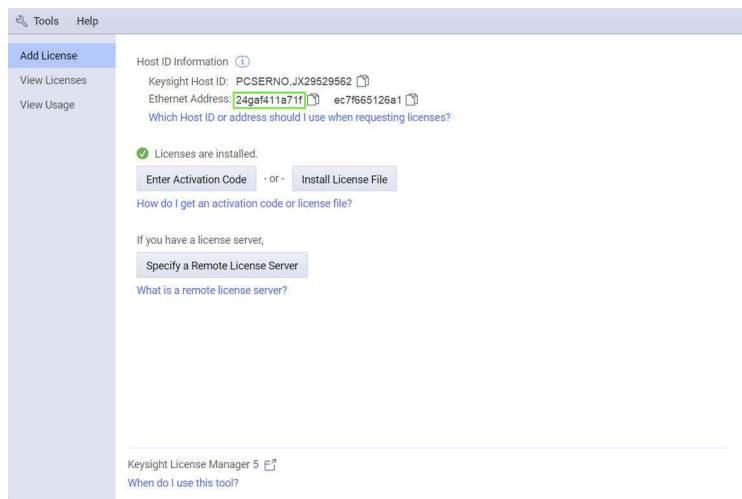


Figure 3 Viewing the Ethernet Address

To install one of the procured licenses using the Keysight Software Manager Utility application:

- 1 Save the license files on the machine where you wish to run the Test Application and its features.
- 2 Launch Keysight Software Manager Utility.
- 3 In the **Add License** tab (Figure 4), use one of the options to install the license file.

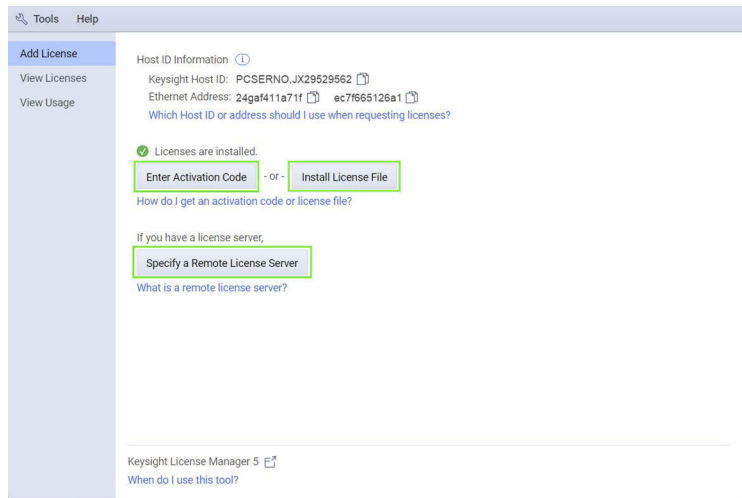


Figure 4 License installation options

For more information regarding installation of procured licenses in Keysight Software Manager Utility, refer to **Supporting Documentation** section on the [Keysight Software Manager Utility](#) web page.

3

Preparing to Take Measurements

Calibrating the Instruments	30
Starting the Test Application	34
Setting up the M8091BMCA Receiver Conformance Test Application	37
Viewing Results	51
Viewing the Application Log	53
Compliance Boards	54
Stressed Eye Receiver Test Method	55
Overview of Channel Operating Margin (COM)	57

Before you can begin to take measurements, the setup has to be prepared. For example, the instruments have to be calibrated and the test application started. The necessary procedures are described in this chapter.

NOTE

The name for the “Keysight M8091BMCA Receiver Conformance Test Application for IEEE 802.3bm” used within the application itself is “Compliance Rx Test Automation for IEEE 25G” or simply “IEEE-25G ValiFrame” for short.

NOTE

Ensure that all instruments specified in [Required Configuration & Licenses](#) on page 15 are defined in the *Keysight Connection Expert* on the PC where the M8091BMCA Receiver Conformance Test Application is installed.

Calibrating the Instruments

Calibrating the FlexDCA Oscilloscope

If you haven't already calibrated the FlexDCA oscilloscope, Keysight recommends calibrating the oscilloscope before performing calibrations or tests using the Keysight M8091BMCA Receiver Conformance Test Application for IEEE 802.3bm.

- 1 Disconnect all the cables that may be connected to the FlexDCA oscilloscope.
- 2 From the main menu of the FlexDCA N1000-Series System Software, select **Tools > Calibrations...**
- 3 Follow the on-screen instructions to perform calibrations.

If the calibrations are not performed, warning messages are logged for each calibration performed from the M8070B software.

To learn how to perform calibrations on the oscilloscope, refer to the *DCA-X, DCA-M and FlexDCA Help v6.40 User's Guide* for more details.

Calibrating the UXR Oscilloscope

If you haven't already calibrated the UXR oscilloscope, Keysight recommends calibrating the oscilloscope before performing calibrations or tests using the Keysight M8091BMCA Receiver Conformance Test Application for IEEE 802.3bm.

If the calibrations are not performed, warning messages are logged for each calibration performed from the M8070B software.

To learn how to perform calibrations on the oscilloscope, refer to the *Keysight Infiniium UXR Real-Time Oscilloscope User's Guide* for more details.

Skew Calibration

Before you perform the IEEE-25G C2M/C2C/KR/CR calibrations and tests, Keysight recommends the use of external Phase Trimmers to measure and remove the skew contributed by the pattern generator, fixture, and cables.

NOTE

First, ensure that the oscilloscope calibrations and internal skew calibration are valid. You can find information on how to do this in the oscilloscope User Guide.

System Calibrations

For any calibrations where the M8040A BERT remote head is directly connected to the DCA Oscilloscope, **if the recommended M8045A-801 short matched cables are used, there should be no need to de-skew the data normal and data complement signals.**

If other cables are used, then the skew should be checked and, if needed, adjusted to be less than 3 ps. Insert a phase trimmer, Keysight part number N1027A-PT2, in both the data normal and data complement signal paths and adjust them until the desired skew is obtained. It should be possible to essentially zero-out the skew to just a few hundred femtoseconds. When the de-skew is complete, lock the phase trimmer adjustment, and keep the phase trimmers in the normal and complement paths throughout the entire calibration and DUT test procedures.

As an example, [Figure 5](#) shows the M8040A remote head connected directly to the DCA Oscilloscope with M8045A-801 cables, as used in Amplitude, SJ, RJ and BUJ calibrations for both C2M and C2C/KR/CR interfaces.



Figure 5 System Calibrations

Stressed Eye Calibrations

Stressed Eye calibrations are performed only for C2M.

For Stressed Eye calibrations, the skew should be checked at the output of the MCB/HCB pair **for each calibration configuration** and, if needed, adjusted to be less than 1 ps. Insert a phase trimmer, Keysight part number N1027A-PT2, in both the data normal and data complement signal paths and adjust them until the desired skew is obtained. It should be possible to essentially zero-out the skew to just a few hundred femtoseconds. When the de-skew is complete, lock the phase trimmer adjustment, and keep the phase trimmers in the normal and complement paths throughout the entire calibration and DUT test procedures.

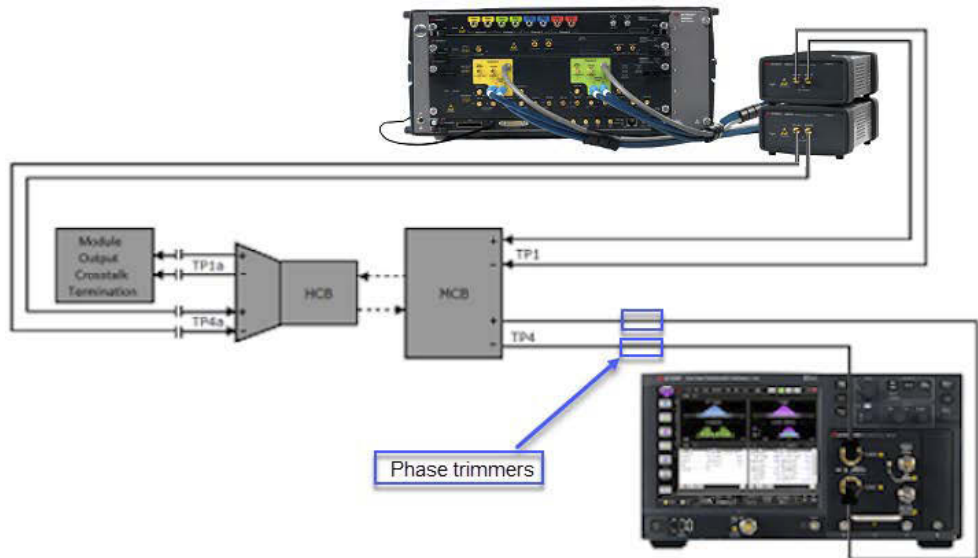


Figure 6 Stressed Eye Calibration connections for C2M Host with phase trimmers for de-skew

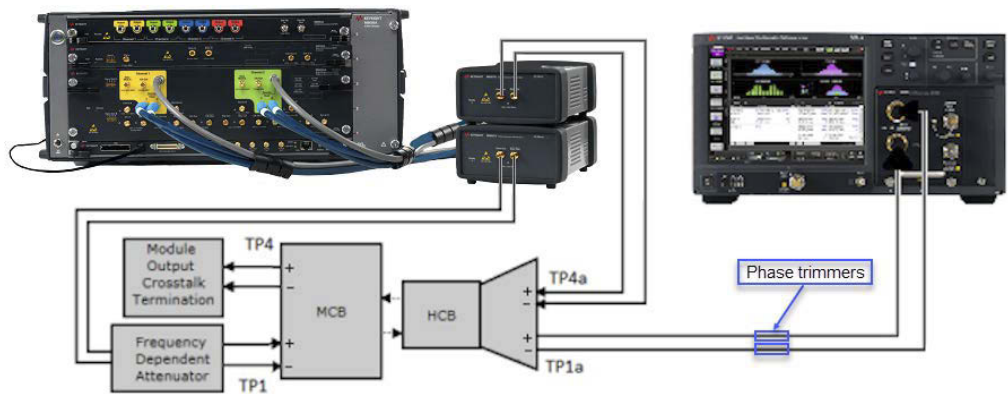


Figure 7 Stressed Eye Calibration connections for C2M Module with phase trimmers for de-skew

Starting the Test Application

The M8091BMCA Receiver Conformance Test Application is available to be run as a stand-alone application on a PC, either locally or remotely.

Before you launch the M8091BMCA Receiver Conformance Test Application, make sure that Keysight M8070B software and Keysight Infiniium Oscilloscope Software or FlexDCA N1000-Series System Software are online and active on the respective instruments.

For calibrations and tests, the C2M standard options require mated compliance boards and ISI channel boards, whereas the C2C, KR and CR standard options require ISI channel boards only. Ensure that proper connections with the test instruments are established and that the measurement instruments are connected on the same LAN as the remote PC where the M8091BMCA Receiver Conformance Test Application is installed.

Launching the M8091BMCA Receiver Conformance Test Application

- 1 You can access the M8091BMCA Receiver Conformance Test Application either by double-clicking the IEEE-25G ValiFrame (M8091) icon on the desktop or from the Windows **Start** menu: **BitifEye IEEE-25G M8091 > IEEE-25G ValiFrame (M8091)**.

NOTE

If you do not see the “BitifEye IEEE-25G M8091” folder listed in the Start menu, the Compliance Rx Test Automation for IEEE 25G has not yet been installed on the PC.

Refer to **Installing the Software** on page 22 for installation instructions.

- If only a single instance of the M8070B software is running, the Compliance Rx Test Automation for IEEE 25G launches after automatically connecting to the M8070B software.
- If the M8091BMCA Receiver Conformance Test Application detects more than one instance of the M8070B software running, the **Connect to M8070B System Software for M8000 Series of BER Test Solutions (M8070)** window appears (Figure 8).

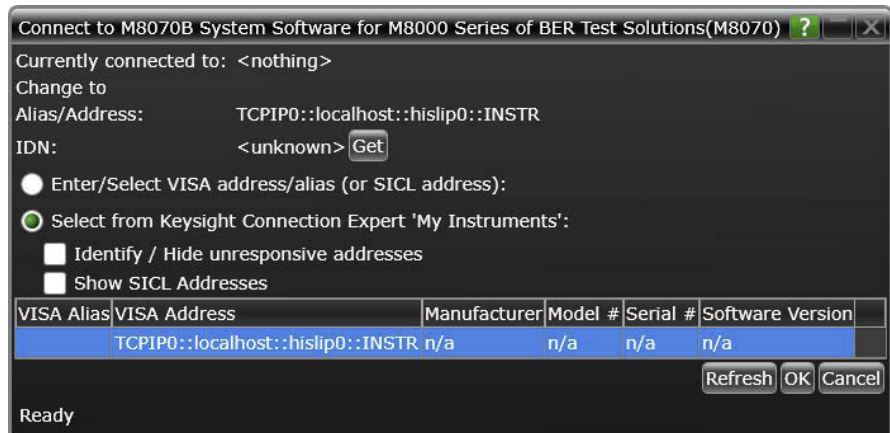


Figure 8 Connecting to M8070B if multiple instances are active

2 Perform one of the following actions:

- In the **Enter/Select VISA address/alias (or SICL address):** text field, you can type the VISA/SICL address directly or copy it from the Keysight M8070B Software and paste it here. To verify the correct VISA address to connect to M8070B, access the **SCPI Server Information** window (Figure 9) by clicking **Utilities > SCPI Server Information...** from the main menu of the Keysight M8070B software.

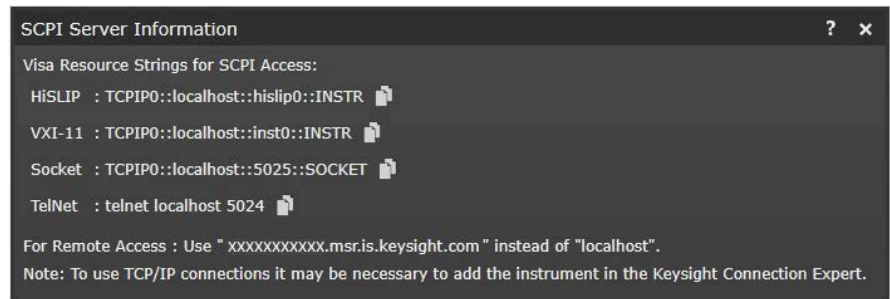


Figure 9 SCPI Server Information window on the M8070B Software

- If the BERT device is online and defined in the *Keysight Connection Expert*, click **Select from Keysight Connection Expert favorites:**. The VISA address list defined in the Keysight Connection Expert software for each online instrument is displayed. After you have verified the VISA/SICL address, select the correct VISA address from the list.
- 3 Click **Get** in the **Connect to M8070B System Software for M8000 Series of BER Test Solutions(M8070)** window (Figure 10). The **IDN:** field displays the instrument name.

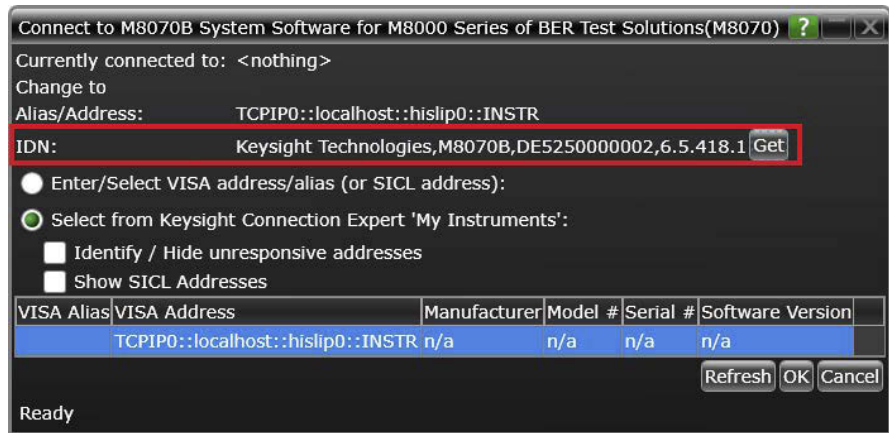


Figure 10 IDN: field displaying successful connection to M8070B

- 4 Click **OK** to establish connection with M8070B and to launch the Compliance Rx Test Automation for IEEE 25G. If a connection is not established, the application fails to launch.
- The Compliance Rx Test Automation for IEEE 25G appears with the **Set Up** tab as default (see Figure 11 on page 37).

NOTE

The Compliance Rx Test Automation for IEEE 25G User Interface is flexible. You can order and resize the various tabs and panes as you see fit. Most of the illustrations in this guide show the default view.

For more information on how to use the various features in the M8091BMCA Receiver Conformance Test Application, refer to the *Keysight M8091BMCA Receiver Conformance Test Application for IEEE 802.3bm Online Help*.

Setting up the M8091BMCA Receiver Conformance Test Application

Calibrations are performed using mated Compliance Boards, whereas the Device Under Test (DUT) is required to run the tests. However, before you begin performing the IEEE-25G calibrations, you must first set up the Test Application.

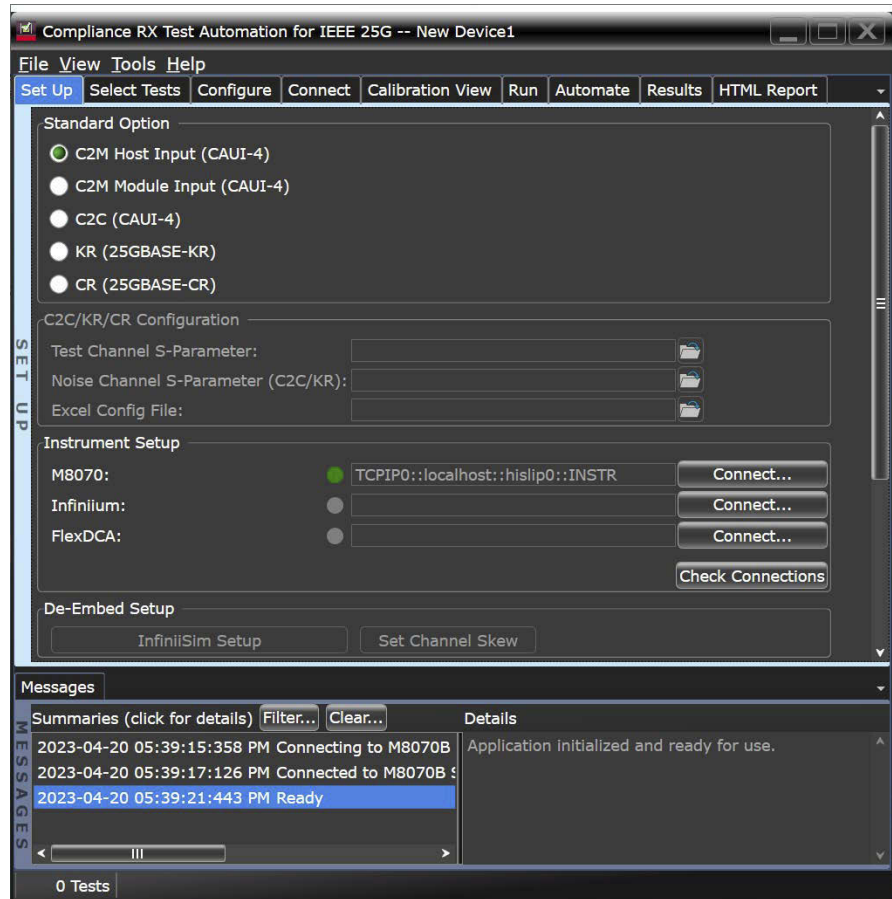


Figure 11 Set Up tab of the Compliance Rx Test Automation for IEEE 25G, default view

- 1 Under the **Set Up** tab (see [Figure 11](#)):
 - a Select an option in the **Standard Option** area, to indicate the standard for which the calibrations/tests are to be performed. The

Select Tests tab then displays the corresponding calibrations and tests. By default, **C2M Host Input (CAUI-4)** is selected.

- b If **C2C (CAUI-4)**, **KR (25GBASE-KR)** or **CR (25GBASE-CR)** is selected as the **Standard Option**, you must perform the **C2C/KR/CR Configuration** step, i.e., select the Test Channel S-Parameter file, the Noise Parameter Configuration file (for C2C and KR) and the Excel configuration file. To learn more about configuring these standard options, refer to the *Configuring C2C/KR/CR Standard Options* section in the *Keysight M8091BMCA Receiver Conformance Test Application for IEEE 802.3bm Online Help*.
- c In the **Instrument Setup** area:
 - i Click **Connect...** corresponding to M8070B and Infiniium or FlexDCA to connect to the respective instrument using the SIDL/VISA address, if not connected already. By default, when you start the M8091BMCA Receiver Conformance Test Application, a connection dialog is displayed to connect at least to the BERT device, otherwise the application fails to launch. A green dot indicates that the instrument is already connected.
 - ii Click **Check Connections** to verify that M8070B and Infiniium or FlexDCA are properly connected to the Compliance Rx Test Automation for IEEE 25G.

NOTE

To establish a successful connection between the Keysight M8091BMCA Receiver Conformance Test Application for IEEE 802.3bm and the BERT as well as the Interference Source, you must configure the modules in the following sequence on a 5-slot AXIe chassis:

- M8045A in slots 1-3 (M1)
- M8046A in slot 4 (M2)
- For M8054A or M819xA in slot 5 (M3)

In a configuration that does not involve M8046A (M2), the following sequence can be used:

- M8045A in slots 1-3 (M1)
- For M8054A or M819xA in slot 4 or 5 (M2)

-
- d Click **InfiniiSim Setup** in the **De-Embed Setup** area to configure the Oscilloscope's de-embedding. The **InfiniiSim Setup** button is enabled only after a connection with the oscilloscope has been

- established. To learn more about configuring InfiniiSim for Infiniium or DCA within the Test Application, refer to the *Configuring InfiniiSim for Infiniium* or *Configuring InfiniiSim for DCA* section in the *Keysight M8091BMCA Receiver Conformance Test Application for IEEE 802.3bm Online Help*.
- e In the **Calibration Data Persistence** area, you can save the calibration data in zip format for future use and load existing calibration data in zip format. To understand the functionality of the Calibration Data Persistence, refer to [Understanding Calibration Data Persistence](#) on page 41.
 - f In the **Test Report Comments (Optional)** area, enter appropriate values in the **Device Identifier:**, **Device User Description:**, and **Comments:** text fields. These comments will appear in the HTML Report that is generated after test runs. This step is optional. However, Keysight recommends entering values so that it is clear which DUT the results belong to when there are a large number of DUTs to be tested.
- 2 Under the **Select Tests** tab, select one or more Calibrations or Tests or both options for the standard selected earlier.
 - 3 Under the **Configure** tab (see [Figure 12](#)), chose either Compliance or Debug Mode then modify the configuration parameters based on the values defined in *IEEE Std 802.3-2018, IEEE Standard for Ethernet – Annex 83E, Annex 83D, Clause 111, Clause 110*.

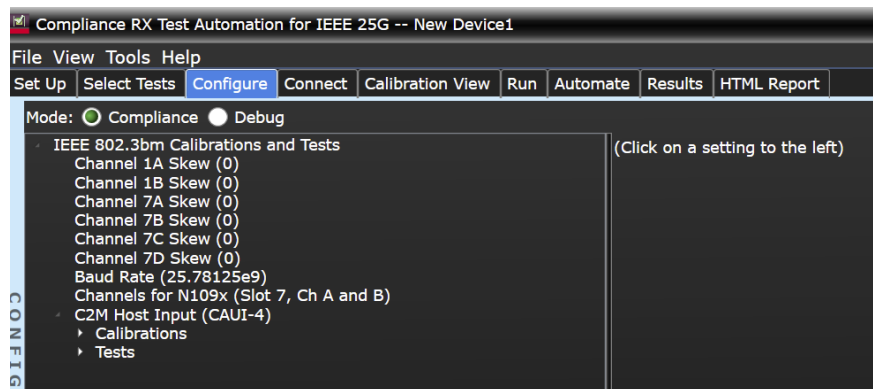


Figure 12 Configure tab of the Compliance Rx Test Automation for IEEE 25G

- 4 In the **Connect** tab, the instructions and the connection diagram for how to connect the test boards and the instruments are displayed.

Follow the instructions to establish the appropriate connections for each calibration/test.

- 5 In the **Run** tab, once the connections have been verified and the application setup is complete, click Run (in green) to start running Calibrations/Tests.

Understanding Calibration Data Persistence

The **Calibration Data Persistence** feature of the M8091BMCA Receiver Conformance Test Application provides a way to save and load the Calibration data (Figure 13). The advantage of this feature is that it avoids having to repeat calibrations that are prerequisite to running the IEEE-25G Rx tests and thus saves time. The M8091BMCA Receiver Conformance Test Application manages the Calibration data in the *.zip file format.

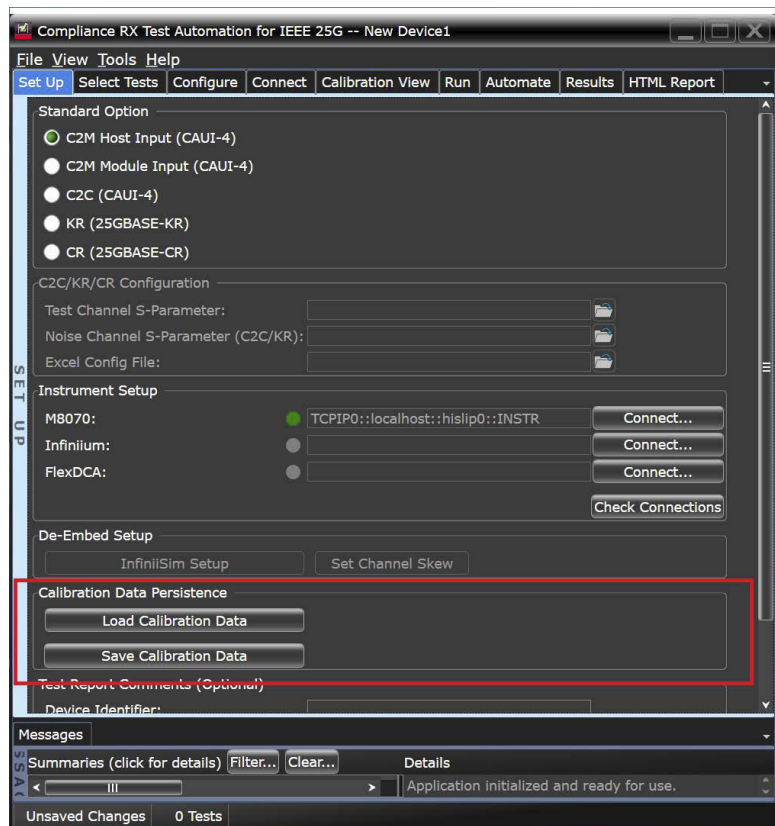


Figure 13 Calibration Data Persistence (loading and saving calibration data)

- To learn how to load calibration data before running IEEE-25G Tests, see [Loading Calibration Data](#) on page 42.
- To learn how to save calibration data after running IEEE-25G Calibrations, see [Saving Calibration Data](#) on page 44.

Loading Calibration Data

The M8091BMCA (IEEE-25G) Rx tests are dependent on the calibration data, which can be obtained after performing one or more Calibrations with respect to a standard option. Pre-saved calibration data can be used to run tests in the current instance of the Test Application.

To load such Calibration data into the Test Application:

- 1 In the **Calibration Data Persistence** area, click **Load Calibration Data**.
- 2 In the **Open** window that appears, navigate to the folder where the Calibration data file is located in *zip* format.
- 3 Select the required data file and click **Open** (Figure 14).

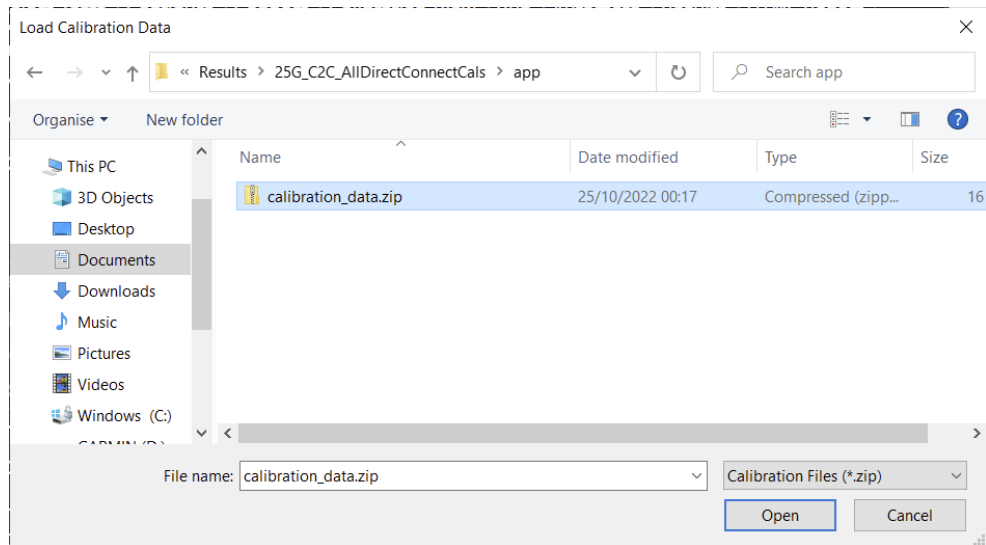


Figure 14 Selecting the Calibration Data Zip file from the target directory

- 4 The **Messages** area of the M8091BMCA Receiver Conformance Test Application indicates whether the calibration data has loaded successfully.

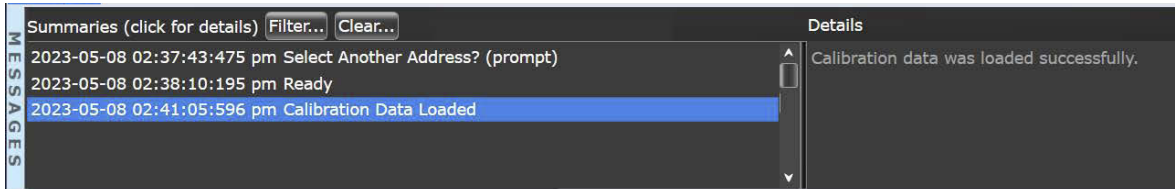


Figure 15 Messages area of Set Up tab view after successfully loading Calibration Data

After you load the Calibration Data, the Test Application automatically identifies the data corresponding to the M8091BMCA (IEEE-25G) standard option and uses the respective data during test runs in that instance of the Test Application.

Saving Calibration Data

The M8091BMCA (IEEE-25G) Rx tests are dependent on the calibration data, which can be obtained after performing one or more Calibrations with respect to a standard option. Running Calibrations is time-consuming and so some time may elapse before you have run each calibration (along with modifying the hardware setup for each calibration) and obtained the required data.

The **Save Calibration Data** feature helps you to save the Calibration data for future use. After you have performed all calibrations successfully, Keysight recommends that the Calibration data be saved, so that you can use the calibrated values for M8091BMCA (IEEE-25G) tests later, if required.

To save the Calibration data,

- 1 In the **Calibration Data Persistence** area, click **Save Calibration Data**.
- 2 In the **Save As** window that appears, navigate to the folder where you wish to save the Calibration data in zip file format.

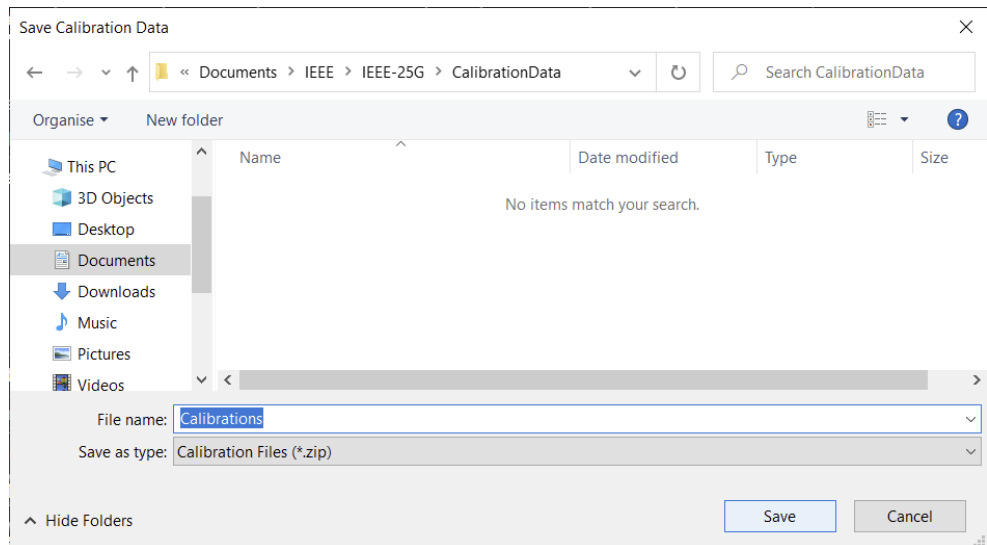


Figure 16 Saving the Calibration Data Zip file in the target directory

- 3 Click **Save**.

- 4 The **Messages** area in the Compliance Rx Test Automation for IEEE 25G indicates whether the calibration data has been saved successfully.

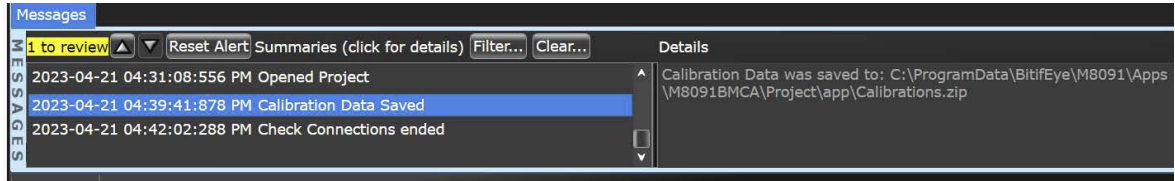


Figure 17 Messages part of the Set Up tab after Calibration Data has been successfully saved

NOTE

The **Calibration Data Persistence** feature only lets you (i) save calibration data after calibrations have been performed in the Test Application or (ii) load any pre-saved calibration data into the Test Application prior to running tests. If you wish to modify the calibrated data, you have to use the **Calibration Editor** feature within the Test Application.

Calibration Editor

The Calibration Editor feature in the Test Application offers you capabilities to view and to modify calibrated values that may have been saved using the Calibration Data Persistence feature or appear in the current instance of the Test Application after one or more calibrations have been performed.

- 1 From the main menu of the Test Application, click **Tools > Calibration Editor...**

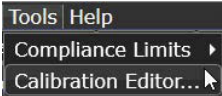


Figure 18 Launching Calibration Editor from the Tools menu

- 2 In the Calibration Editor window that is displayed, click a calibration type (C2M Host, C2M Module, C2C, KR or CR) and calibration name to view the corresponding default calibration data or the data from a recent calibration run in the current instance of the Test Application.

Figure 19 displays the default calibration data for Amplitude calibration under C2M Host.

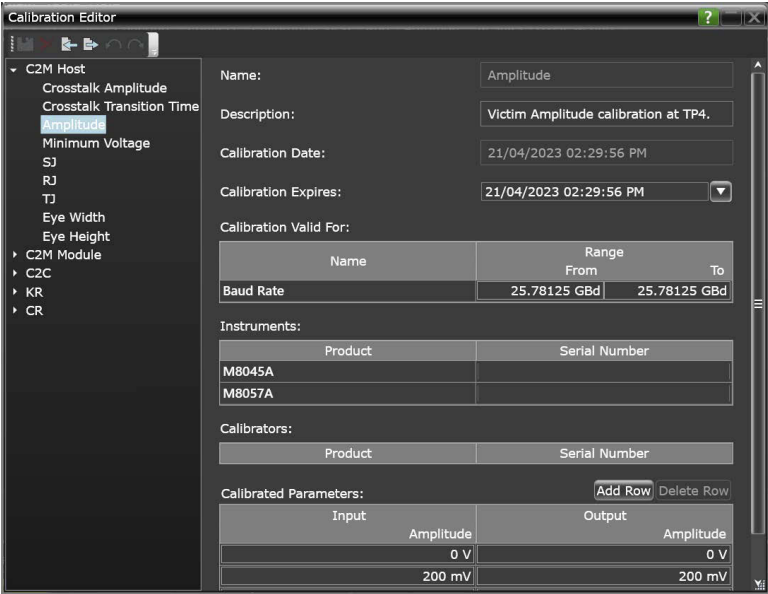


Figure 19 Default information in the Calibration Editor for the selected calibration type

Figure 20 and Figure 21 display the calibration data either after the Test Application has performed the Amplitude Calibration in the current instance or after pre-saved calibration data corresponding to Amplitude Calibration has been loaded.

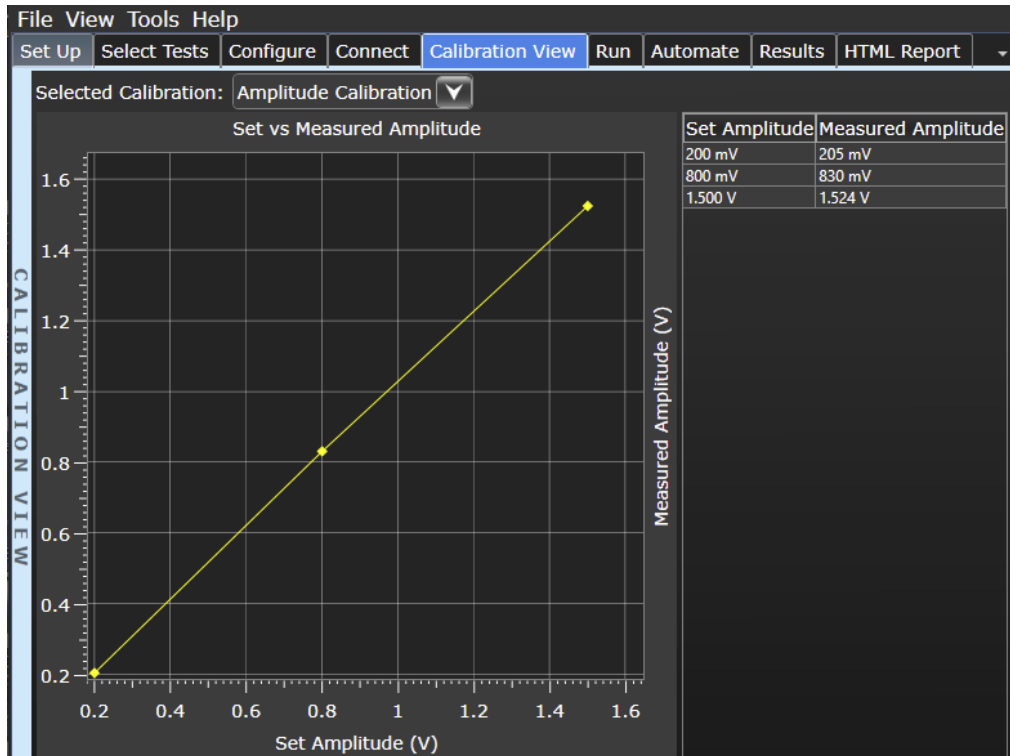


Figure 20 Plotted data in the Calibration Viewer for Amplitude Calibration

Calibration Editor

C2M Host

- Crosstalk Amplitude
- Crosstalk Transition Time
- Amplitude**
- Minimum Voltage
- SJ
- RJ
- TJ
- Eye Width
- Eye Height

► C2M Module

► C2C

► KR

► CR

Name: Amplitude

Description: Victim Amplitude calibration at TP4.

Calibration Date: 08/03/2023 09:27:59 AM

Calibration Expires: 31/12/9999 11:59:59 PM

Calibration Valid For:

Name	Range From	To
Baud Rate	25.78125 GBd	25.78125 GBd

Instruments:

Product	Serial Number
M8045A	MY58C01200
M8057B	MY59400315

Calibrators:

Product	Serial Number
N1000A	MY59280515
N1060A	US60420109

Calibrated Parameters: Add Row Delete Row

Input	Amplitude	Output	Amplitude
	0 V		0 V
	201 mV		200 mV
	808 mV		800 mV
	1.5 V		1.5 V

Figure 21 Amplitude Calibration data displayed in Calibration Editor

Table 11 describes the attributes in the calibrated data for each type.

Table 11 Attributes in the Calibration Editor

Attribute name	Description
Name	Name of the selected calibration type.
Description	Description of the selected calibration type along with the test point where the calibration is to be performed.
Calibration Date	The date and time stamp when the selected calibration type was performed.
Calibration Expires	The date and time stamp to indicate the validity of the calibrated values for the selected calibrated type.
Calibration Valid For	The list of parameters and their ranges of values, which decide the validity of the calibrated values.
Instruments	The list of instruments that were used to perform the calibration and the serial number of each instrument.
Calibrators	The Oscilloscope and its modules used for the calibration.
Calibrated Parameters	The parameter values that were measured by the Oscilloscope are displayed under the Input column whereas the calibrated parameters and their values are displayed under the Output column. These correlate with the Measured Amplitude and Set Amplitude values in the Calibration Viewer window of the Test Application. Some calibration types may have more than one output parameter.

You can use the functional features that appear in the top menu in the Calibration Editor to:

- Save any changes
- Discard all changes
- Import calibration data for editing
- Export edited calibration data into a zipped file
- Undo or redo any changes in the current instance
- Modify
 - Text in the **Description** field
 - Date and Time stamp in the **Calibration Expires** field
 - **Range** values in **Calibration Valid For** table
 - **Serial Number** values in the **Instruments** and **Calibrators** tables
 - Both **Input** and **Output** cells in the **Calibrated Parameters** table

- Add one or more rows in the **Calibrated Parameters** table only; each new row will display interpolated values.
- Delete one or more rows in the **Calibrated Parameters** table only.

After you export the modified data, you may use the **Calibration Data Persistence** feature to use the calibrated values for a specific calibration to run associated tests.

For more information on each feature that appears in the Calibration Editor, refer to *Using the Calibration Editor* section in the *Keysight M8091BMCA Receiver Conformance Test Application for IEEE 802.3bm Online Help*.

Viewing Results

Once a calibration or test has been run, the results can be viewed in different places depending on the form of the results.

Calibration View Tab

Under the Calibration View tab, the calibration results are displayed in both graphical and tabular form. See [About Calibration View](#) on page 158.

This view is available only if several calibration points are measured. For the Compliance Rx Test Automation for IEEE 25G this applies only to the following:

- For C2M Host and C2M Module
 - [Amplitude Calibration](#) on page 74
 - [SJ Calibration](#) on page 77
- For C2C/KR/CR
 - [SJ Calibration](#) on page 119
 - [RJ Calibration](#) on page 121
 - [Broadband Noise Calibration](#) on page 125 (for C2C, KR)
 - [SNDR Calibration](#) on page 127 (for CR)

Results Tab

Under the Results tab, a list of the procedures that have already been run appears. Click on the one you are interested in. [Figure 22](#) on page 52 shows an example for BUJ Calibration for C2C. At the bottom, detailed results are given as 'Additional Info'. This includes the status, target value and measured value of the standard parameter(s) and the nominal and actual values of the instrument parameter(s).

File View Tools Help

Set Up | Select Tests | Configure | Connect | Calibration View | Run | Automate | Results | HTML Report

Test Name	Actual Value	Margin %	Pass Limits	# Trials
✓ Amplitude Calibration	Pass	100.000	Pass/Fail	1
✓ SJ Calibration	Pass	100.000	Pass/Fail	1
✓ RJ Calibration	Pass	100.000	Pass/Fail	1
✓ BUJ Calibration	Pass	100.000	Pass/Fail	1
✓ Broadband Noise Calibration	Pass	100.000	Pass/Fail	1
✓ Channel Characterization using COM model	Pass	100.000	Pass/Fail	1
✓ Transmitter Measurements for COM Model-Rx ITol	Pass	100.000	Pass/Fail	1

RESULTS

Parameter	Value														
BUJ Calibration Result - IEEE 802.3bs NRZ C2C TP0a	Pass														
---Additional Info---															
BUJ Calibration Results	<table><tr><th>Standard Parameter</th><th>Status</th><th>Target</th><th>Measured</th><th>Instrument Parameter</th><th>Nominal</th><th>Actual</th></tr><tr><td>BUJ</td><td>Pass</td><td>100.00 mUI</td><td>99.50 mUI</td><td>BUJ</td><td>100.0 mUI</td><td>114.3 mUI</td></tr></table>	Standard Parameter	Status	Target	Measured	Instrument Parameter	Nominal	Actual	BUJ	Pass	100.00 mUI	99.50 mUI	BUJ	100.0 mUI	114.3 mUI
Standard Parameter	Status	Target	Measured	Instrument Parameter	Nominal	Actual									
BUJ	Pass	100.00 mUI	99.50 mUI	BUJ	100.0 mUI	114.3 mUI									

Figure 22 BUJ Calibration results in the Results tab for C2C

If a procedure is more than once, a summary of the various trials is available in the Results tab. [Figure 23](#) shows an example in which the C2M Host RJ Calibration was run twice.

File View Tools Help

Set Up | Select Tests | Configure | Connect | Calibration View | Run | Automate | Results | HTML Report

Test Name	Actual Value	Margin %	Pass Limits	# Trials
SJ Calibration	Pass	100.000	Pass/Fail	1
RJ Calibration	Pass	100.000	Pass/Fail	2
TJ Calibration	Pass	100.000	Pass/Fail	1

RESULTS

Trial Summary		Actual Value	Margin	Parameter	Value
Completed:	2	Mean	100.0 %	RJ Calibration Result - IEEE 802.3bs NRZ C2M Host TP0a	Pass
Passed:	2	StdDev	0.000 %	---Additional Info---	
Failed:	0	Range	0.000 %	RJ Calibration Results	Standard Parameter
Worst:	2	Min	100.0 %		Status
Max Displayed:	10	Max	100.0 %	RJ	Pass
		Sum	200.0 %	Target	150.0
Trial 2		Pass	Pass		
Trial 1		Pass	Pass		

III

Figure 23 C2M Host RJ Calibration results in the Results tab for two trials

Viewing the Application Log

To view the application log files, navigate to the log folder:

C:\ProgramData\BitfEye\M8091\Apps\M8091BMCA\log

Compliance Boards

Use of compliance boards for testing is assumed for several parameters defined in the *IEEE Std 802.3-2018, IEEE Standard for Ethernet*.

Compliance boards are reference test fixtures that are used to access the electrical specification parameters.

The output of the Host Compliance Board (HCB) provides access to the host-to-module electrical signal (host electrical output) defined at TP1a. Additional module electrical input specifications for host-to-module communication are defined at TP1, the input of the Module Compliance Board (MCB).

The output of the MCB provides access to the module-to-host electrical signal (module electrical output) defined at TP4. Additional host electrical input specifications for module-to-host communication are defined at TP4a, the input of the HCB.

Stressed Eye Receiver Test Method

The Stressed Eye Test Method is used in IEEE 802.3bm (IEEE-25G) for C2M Host and C2M Module.

The purpose of the Stressed Eye Test Method is to apply the worst possible signal allowed by the standard to the receiver under test. For this, parameters such as transmitter amplitude, de-emphasis, and jitter must be adjusted to meet the target metrics. The signal is captured and analyzed at the end of a compliant test channel (TP4 for the Host input test and TP1a for the Module input test) using an oscilloscope emulating the reference receiver. Note that transmitter de-emphasis and receiver have to be optimized for the actual test channel.

The receiver is compliant if the resulting Bit Error Ratio (BER) is below $1e-15$.

The calibration steps for the Stressed Eye Test Method are as follows:

Step#1. Crosstalk Calibration (recommended)

The stressed eye must be calibrated in the presence of a single aggressor channel (crosstalk).

Step#2. Amplitude Calibration (recommended)

This step is required to ensure that the generated signal is within the valid amplitude range.

Step#3. Jitter Amplitude Calibration (mandatory)

A specific amount of jitter must be injected into the stressed eye to carry out the jitter tolerance jitter test. For Keysight BERTs, this calibration can be performed at a single frequency (e.g., 40 MHz).

Step#4. UUGJ and BUJ Calibration (optional)

This step is required because the amount of BUJ and UUGJ injected into the stressed signal must be known accurately (e.g., for repeatability purposes).

Step#5. Victim Lane Calibration (mandatory)

The pattern generator de-emphasis and reference receiver CTLE are first optimized for the given channel. Then amplitude and random jitter are adjusted in the presence of a fixed amount of sinusoidal jitter and crosstalk to reach the Eye Height and Eye Width targets.

Step#6. Receiver Test

The victim lane is applied to the receiver DUT, and BER and error statistics are measured by the internal error checker or by looping back the signal to an error detector.

Overview of Channel Operating Margin (COM)

COM is a figure of merit (FOM) determined from a minimum reference PHY architecture and a channel's S-parameters. It allows designers to explore physical design trade-offs between loss, reflection ISI, crosstalk, and device specifications.

COM is the Signal-to-Noise Ratio (SNR) of available signal amplitude (A_s) to statistical noise amplitude (A_n) in dB. It can be calculated using the equation

$$\text{COM} = 20 * \log_{10}(A_s/N)$$

where N = Peak BER Noise and A_s = Peak Signal

Both N and A_s are calculated based on the transmitter and channel characteristics assuming a reference receiver with optimized equalization.

A channel set contains a victim channel response called THRU and associated near-end aggressor crosstalk files (NEXT) and far-end aggressor crosstalk files (FEXT). See [Figure 24](#).

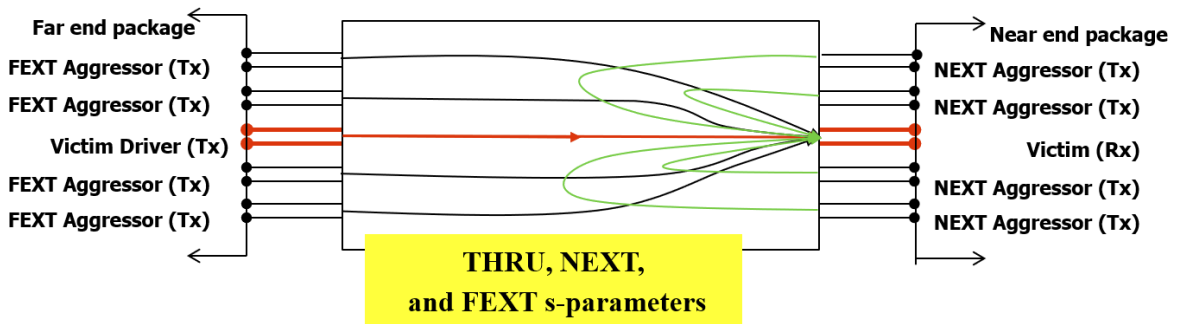


Figure 24 Channel Model for COM

The C2C, KR and CR test procedures defined in *IEEE 802.3bm Annex 83D, Clause 111 and Clause 110, respectively*, rely on the Channel Operating Margin (COM) method defined by the procedure in *Annex 93C, IEEE Std 802.3bj-2014, Amendment to IEEE Std 802.3-2012: Ethernet*. COM was first introduced to measure the performance margin of a channel and then extended to digital systems. Interoperability of digital receivers can be expressed in terms of COM requirements. COM is calculated from channel 4-ports S-parameters (for victim and aggressor lanes) as well as the noise and equalization functionality of the considered transmitter and receiver.

For the IEEE 802.3bm C2C interface, COM shall be greater than or equal to 3.0 dB for each test. This minimum value allocates margin for practical limitations on the receiver implementation, the largest step size allowed for transmitter equalizer coefficients.

The COM-based receiver test workflow consists of the steps listed in [Table 12](#). The figures mentioned there are based on those in *Annexure 93C, IEEE Std 802.3bj-2014, Amendment to IEEE Std 802.3-2012: Ethernet*.

These steps or procedures are briefly described in slightly more detail in [Detailed Steps for Calibration Procedures](#) on page 62.

Table 12 Calibration procedure step summary

#	Procedure	Summary of steps
1	Channel Characterization	Measure S4P for Test channel and additional Noise channel (Figure 25 and Figure 26).
2	Tx Equalization	Obtain a working link by adjusting Tx de-emphasis towards best Rx performance (Figure 27).
3	Equipment Calibration	Calibrate Tx jitter and amplitude (Figure 28). Note that amplitude is calibrated using optimized de-emphasis (see step 2).
4	Tx Characterization	Measure Tx characteristics (Figure 28).
5	Rx testing	Perform interference and jitter tolerance test.

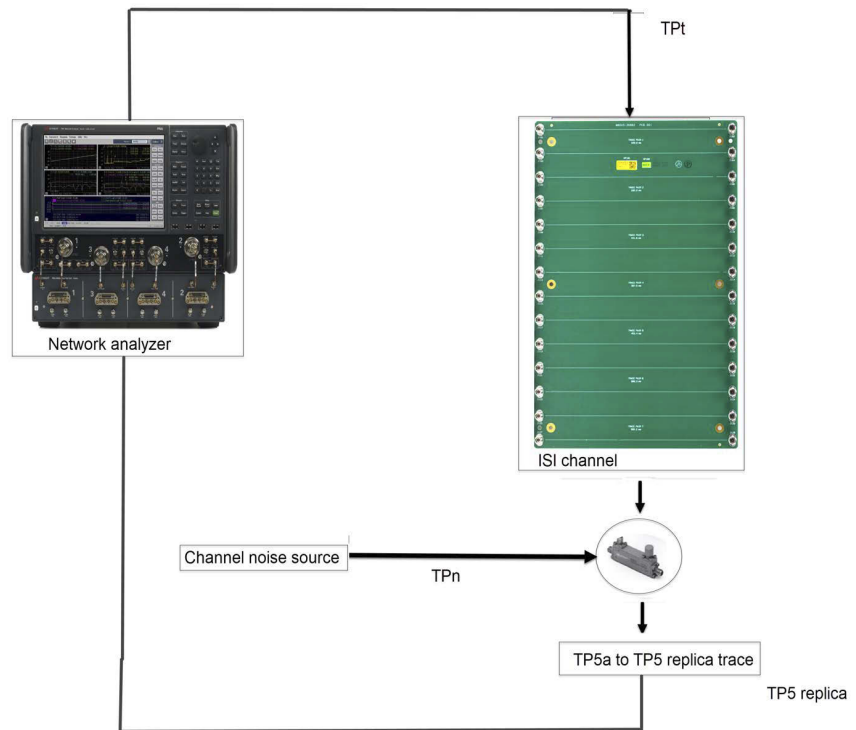


Figure 25 COM procedure: Schematic test setup for channel characterization (Test Channel S-Parameters)

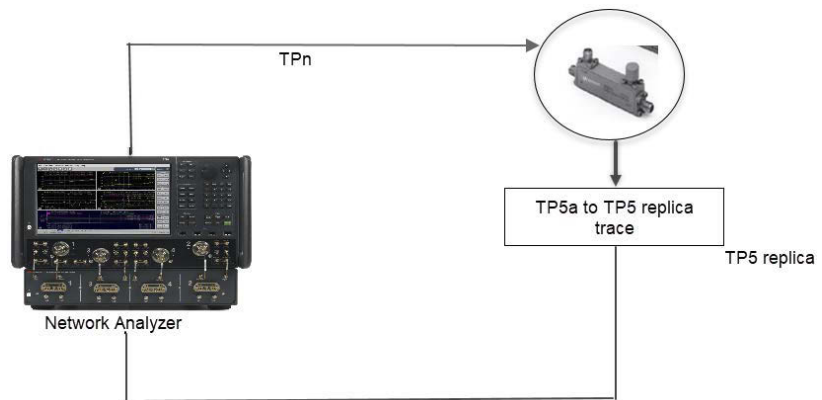


Figure 26 COM procedure: Schematic test setup for channel characterization (Noise Channel S-Parameters)

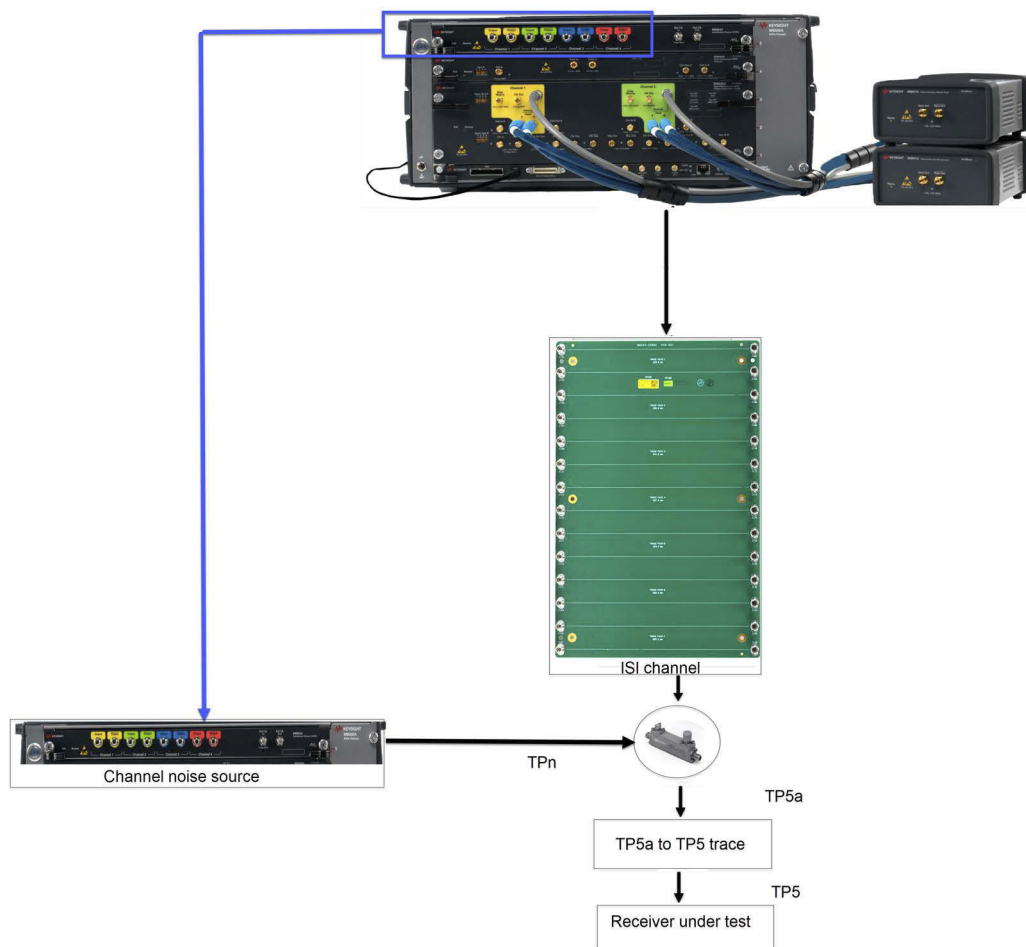


Figure 27 COM procedure: Schematic test setup for Tx equalization



Figure 28 COM procedure: Schematic test setup for equipment calibration and Tx characterization



Figure 29 COM Procedure: Schematic test setup for noise source calibration

Detailed Steps for Calibration Procedures

Step#1. Start with S4P Channel Characterization

- 1 Measure the scattering parameters, $S^{(tc)}$ on the Test channel (TPt to TP5 replica) (schematic test setup shown in [Figure 25](#)).
- 2 Measure the scattering parameters, $S^{(nc)}$ on the Noise Channel with additional network (TPn to TP5 replica) (schematic test setup shown in [Figure 26](#)).

Step#2. Obtain a working link

- 3 Using the test setup shown in [Figure 27](#) (that is, with Test Channel but without the noise source), initiate the Tx Equalization sequence.
 - Optimize Tx de-emphasis taps towards minimum BER.
 - Retain the resulting transmitter [opti Tx Eq taps] coefficients.

NOTE

For the C2C standard option, the **Channel Characterization using COM model** calibration will determine the channel de-emphasis taps settings (Channel EQ Pre-cursor2/1 and Channel EQ Post-Cursor1/2) under the **Configure** tab and automatically update the channel equalization coefficients in the de-emphasis taps. For more information on Channel Characterization using the COM model calibration, refer to [Channel Characterization using COM Model](#) on page 129.

Step#3. Calibrate the equipment

- 4 Calibrate Tx amplitude (schematic test setup shown in [Figure 28](#)).
 - Use optimized Tx de-emphasis [opti Tx Eq taps] shown in [Figure 25](#)).
- 5 Calibrate Tx SJ injection (schematic test setup shown in [Figure 28](#)).
 - Do not use de-emphasis.
- 6 Calibrate the broadband noise source (schematic test setup shown in [Figure 29](#) on page 61).

Step#4. Perform TX Characterization

- 7 Measure Tx jitter parameters (j_{4u} or j_{3u} , J_{rms}) using the test setup shown in [Figure 28](#).
 - Do not use Channel Eq Post/Pre-cursors.
 - Embed transmitter replica trace S-parameters.
 - Jitter injection (for example, 20 mUI SJ @40 MHz) may be required to be achieved to ensure a realistic jitter profile.
- 8 Measure the noise parameters SNR_{TX} (or SNDR) using the test setup in [Figure 28](#).
- 9 Measure the Tx transition time T_{rm} following using the test setup shown in [Figure 28](#).
 - Do not use Channel Eq Post/Pre-cursors.

See [Channel Characterization using COM Model](#) on page 129 and [Transmitter Measurements for COM Model – Rx ITol](#) on page 132.

4 IEEE-25G C2M Calibrations

Calibration Parameters in Debug Mode	66
Crosstalk Calibration	68
Amplitude Calibration	74
SJ Calibration	77
RJ Calibration	78
TJ Calibration	79
Stressed Eye Calibration	80
Peak to Peak Amplitude Calibration for Voltage Tolerance Test	88

This chapter describes the test procedures for the IEEE-25G Conformance Rx Calibrations that are applicable for both C2M Host and C2M Module standards.

Before performing the IEEE-25G C2M tests, you have to calibrate all the related parameters. Perform calibrations in the order displayed in the M8091BMCA Receiver Conformance Test Application.

As mentioned earlier, ensure that the UXR Infiniium or FlexDCA Oscilloscope has been calibrated and the mated Compliance Board is properly connected to the testing instruments to perform IEEE-25G Calibrations.

Calibration Parameters in Debug Mode

The Debug Mode in the Configure tab of the Test Application includes some parameters in addition to those that can be configured in the Compliance Mode. Besides, for some of the configuration options, you may enter custom values, which provides a greater flexibility in performing calibrations and tests.

For the C2M Host Input option and for the C2M Module Input option, the parameters listed in [Table 13](#) are available for configuration.

Table 13 Calibration parameters in debug mode for C2M Host Input and C2M Module Input options

Calibration Parameter	Description
Parameters Common to All Calibrations	
Channel 1A Skew	Specify a skew value in seconds for Channel 1A.
Channel 1B Skew	Specify a skew value in seconds for Channel 1B.
Channel 7A Skew	Specify a skew value in seconds for Channel 7A.
Channel 7B Skew	Specify a skew value in seconds for Channel 7B.
Channel 7C Skew	Specify a skew value in seconds for Channel 7C.
Channel 7D Skew	Specify a skew value in seconds for Channel 7D.
Baud Rate	Baud Rate for testing device and for all calibrations.
Channels for N109x	When using the N109x, you may use a 2-channel or 4-channel module and install the module n Slot 7.
CDR Source	Select the source used for clock recovery.
Loop Bandwidth	Select or enter the Loop BW to be used in the clock recovery.
SIRC Response	Select the SIRC response. This will automatically be applied to any pattern lock waveform.
SIRC Bandwidth	Select or enter the SIRC BW. This will automatically be applied to any pattern lock waveform.
Eye Height/Width Probability	Select the eye probability to which eye height and width are measured in "Stressed Eye Calibration".
Parameters for Crosstalk Calibration	
Crosstalk Amplitude	Value duplicated from/to Stressed Eye Calibration.

Calibration Parameter	Description
Crosstalk Transition Time	Value duplicated from/to Stressed Eye Calibration.
Parameters for Stressed Eye Calibration	
Crosstalk Amplitude	Value duplicated from/to Crosstalk Calibration.
Crosstalk Transition Time	Value duplicated from/to Crosstalk Calibration.
Transmitter Pre-Cursor2	Controls the transmitter equalization coefficient for pre-cursor 2.
Transmitter Pre-Cursor	Controls the pre-cursor equalization coefficient.
Transmitter Post-Cursor	Controls the post-cursor equalization coefficient.
Transmitter Post-Cursor2	Controls the transmitter equalization coefficient for post-cursor 2.
SJ	Sinusoidal Jitter at 10x receiver loop bandwidth.
RJ	Unbounded Uncorrelated Gaussian Jitter. This is a peak-peak value and is converted to rms value when it is set on the BERT.
TJ	Controls the amplitude of the TJ jitter source.
Eye Width	Eye Width @ 1e-15.
Eye Height	Eye Height @ 1e-15.
Start value for CTLE	Select the starting CTLE setting to use for the Auto-Tune. Auto-Tune will use the range of settings from this start value to the stop value set in the StopCTLE configuration.
Stop value for CTLE	Select the last CTLE setting to use for the Auto-Tune. Auto-Tune will use the range of settings from start value selected in the StartCTLE configuration to the stop value set here.

Crosstalk Calibration

Overview The Crosstalk Calibration is performed to calibrate the crosstalk amplitude and transition time.

Connection Diagram Connect the instruments as shown in Figure 30 to Figure 39. For further information, select the test name in the Select Tests tab and then go to the Connect tab.

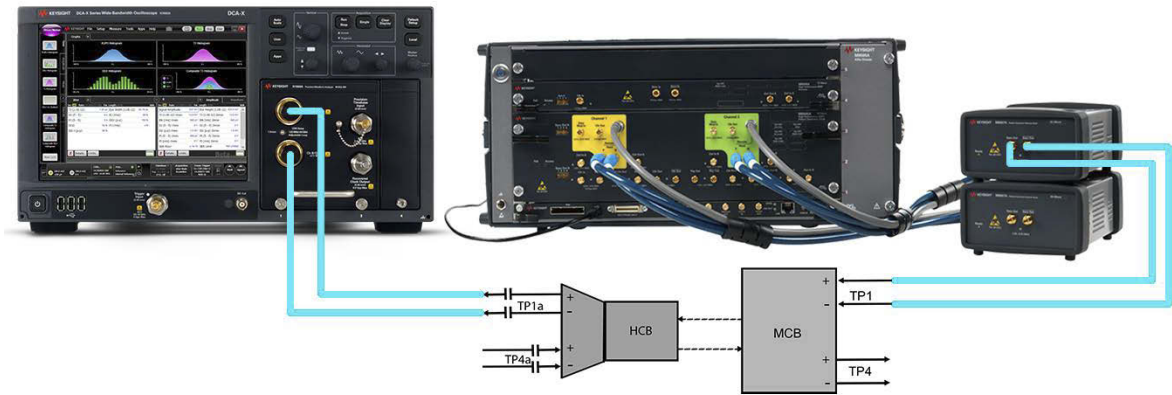


Figure 30 Crosstalk Calibration connections for C2M Host using DCA-X oscilloscope and M8040A

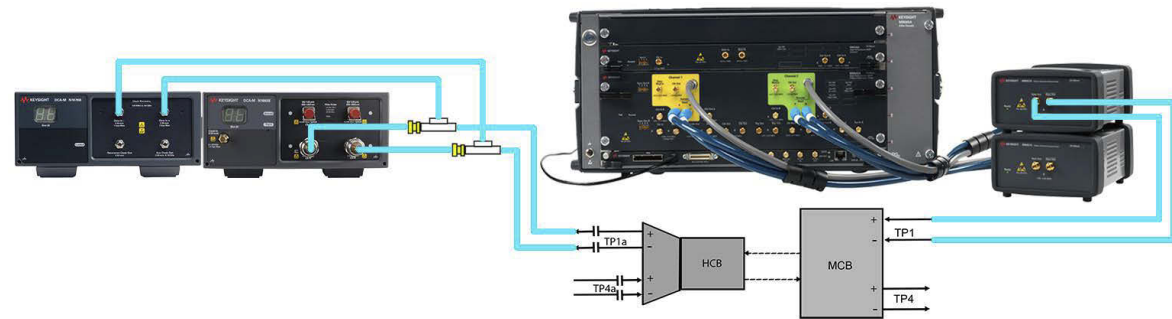


Figure 31 Crosstalk Calibration connections for C2M Host using DCA-M oscilloscope (2 channels) and M8040A

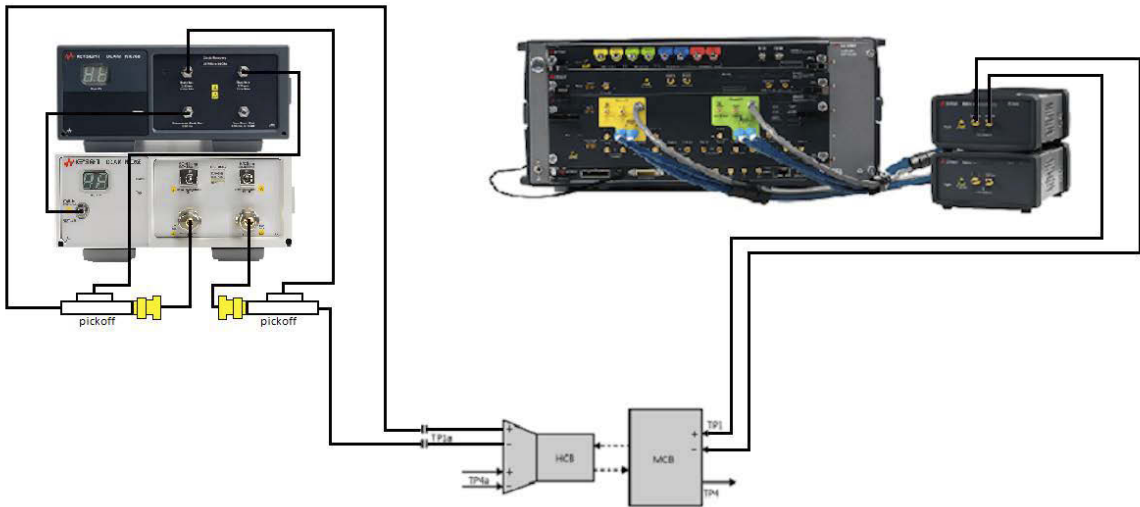


Figure 32 Crosstalk Calibration connections for C2M Host using DCA-M oscilloscope (4 channels) and M8040A

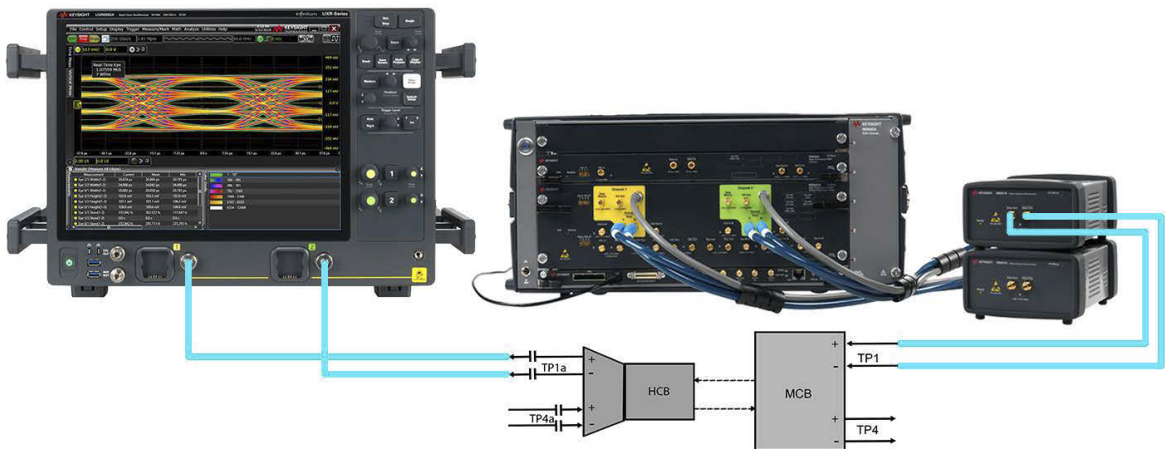


Figure 33 Crosstalk Calibration connections for C2M Host using UXR oscilloscope (2 channels) and M8040A

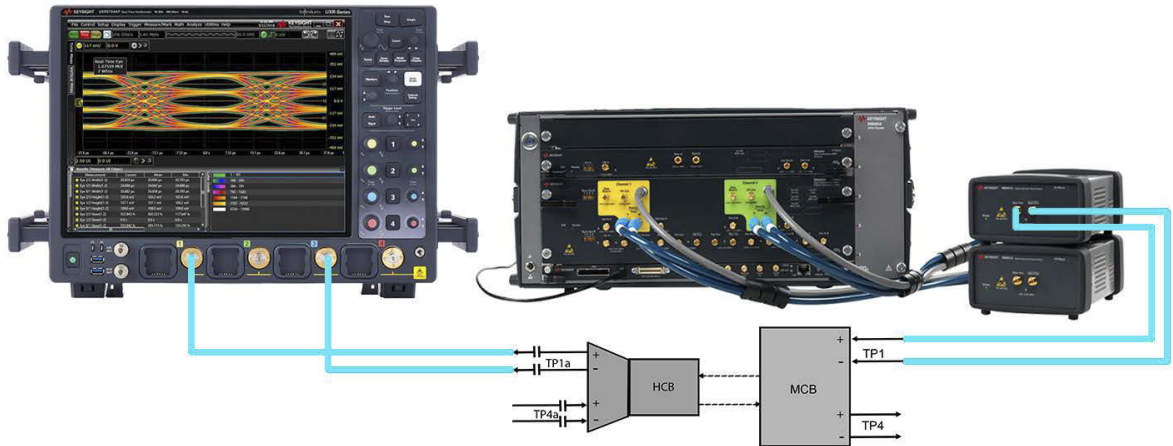


Figure 34 Crosstalk Calibration connections for C2M Host using UXR oscilloscope (4 channels) and M8040A

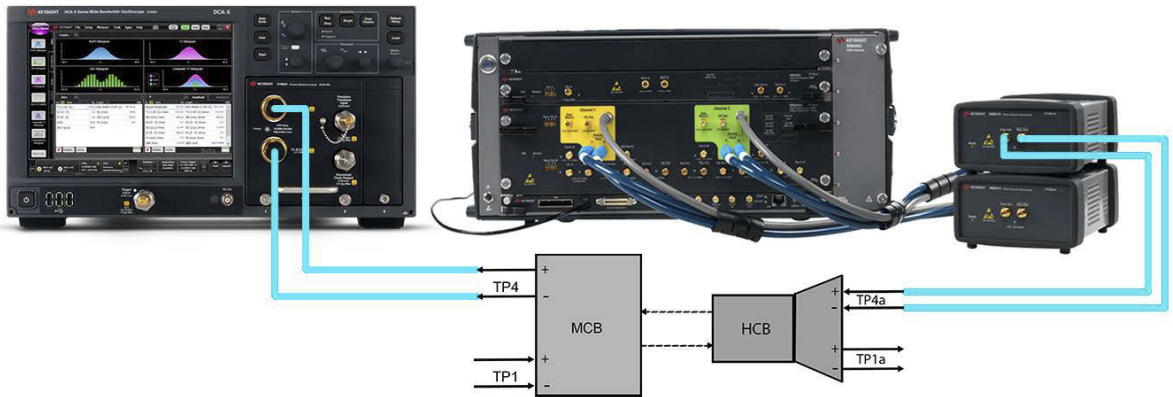


Figure 35 Crosstalk Calibration connections for C2M Module using DCA-X oscilloscope and M8040A

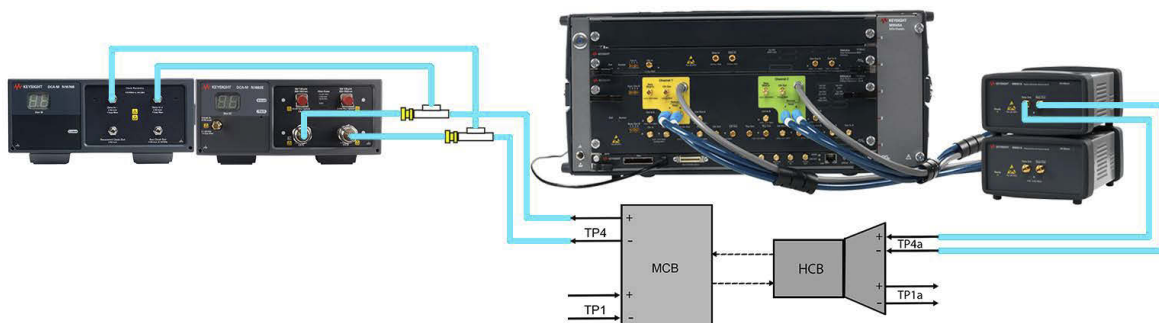


Figure 36 Crosstalk Calibration connections for C2M Module using DCA-M oscilloscope (2 channels) and M8040A

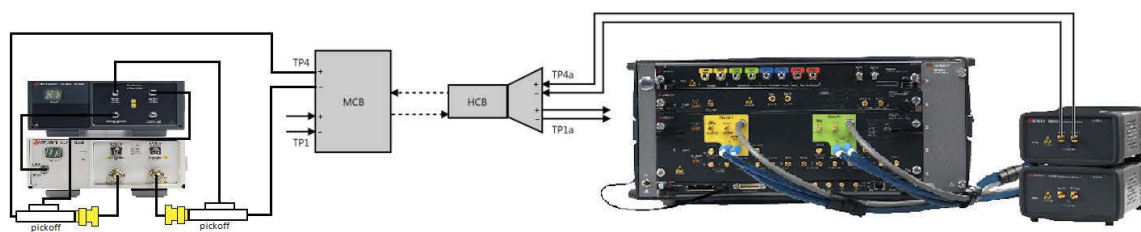


Figure 37 Crosstalk Calibration connections for C2M Module using DCA-M oscilloscope (4 channels) and M8040A

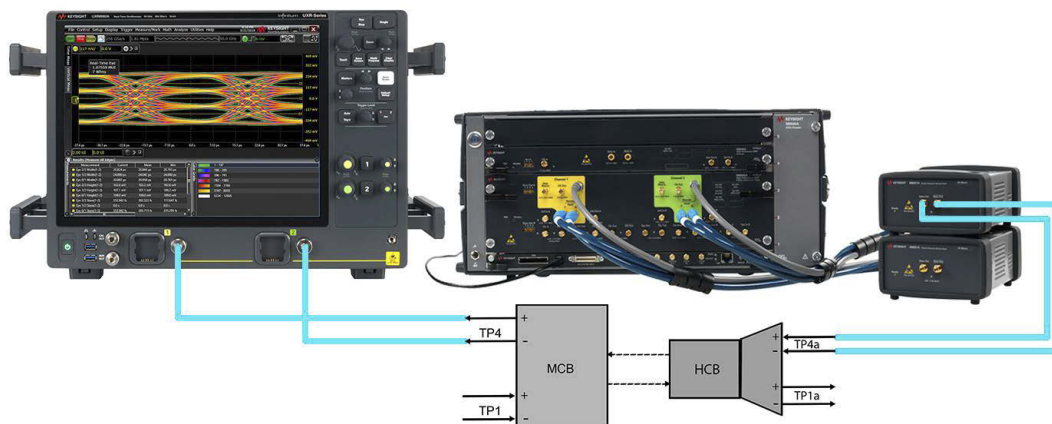


Figure 38 Crosstalk Calibration connections for C2M Module using UXR oscilloscope (2 channels) and M8040A



Figure 39 Crosstalk Calibration connections for C2M Module using UXR oscilloscope (4 channels) and M8040A

ID

Standard Name	Test ID
C2M Host	1100
C2M Module	201100

Dependencies None

Parameters Refer to [Calibration Parameters in Debug Mode](#) on page 66.

Procedure This calibration uses the PRBS9 pattern.

Results The Crosstalk Calibration displays the pass/fail result and the following additional information in the Results tab:

- Standard Parameters
 - Crosstalk Amplitude
 - Crosstalk Transition Time
- Instrument Parameters
 - Amplitude
 - De-Emphasis parameters
 - Pre-Cursor1
 - Post-Cursor1

Troubleshooting steps

Perform the following step if this calibration fails:

- Ensure that the cable to the oscilloscope is de-embedded.

Parameter	Value						
Crosstalk Calibration Result - IEEE 802.3bs NRZ C2M Host TP1a	Pass						
---Additional Info---							
Crosstalk Calibration Results	Standard Parameter	Status	Target	Measured	Instrument Parameter	Nominal	Actual
	Crosstalk Amplitude	Pass	900 mV	901 mV	Amplitude	900 mV	1.106 V
	Crosstalk Transition Time	Pass	19.0 ps	18.9 ps	Pre-Cursor1	0	-0.03
	Crosstalk Transition Time	Pass	19.0 ps	18.9 ps	Post-Cursor1	0	-0.03

Figure 40 Crosstalk Calibration results for C2M Host Input

Parameter	Value						
Crosstalk Calibration Result - IEEE 802.3bs NRZ C2M Module TP4	Pass						
---Additional Info---							
Crosstalk Calibration Results	Standard Parameter	Status	Target	Measured	Instrument Parameter	Nominal	Actual
	Crosstalk Amplitude	Pass	900 mV	903 mV	Amplitude	900 mV	1.205 V
	Crosstalk Transition Time	Pass	12.0 ps	12.0 ps	Pre-Cursor1	0	-0.11
	Crosstalk Transition Time	Pass	12.0 ps	12.0 ps	Post-Cursor1	0	-0.11

Figure 41 Crosstalk Calibration results for C2M Module Input

Amplitude Calibration

Overview The Amplitude Calibration is performed to calibrate the Victim Generator Amplitude for the Voltage Tolerance test.

Connection Diagram Connect the instruments as shown in [Figure 42](#) to [Figure 45](#).



Figure 42 Amplitude Calibration connections for C2M Host and C2M Module using DCA-X oscilloscope and M8040A



Figure 43 Amplitude Calibration connections for C2M Host and C2M Module using DCA-M oscilloscope and M8040A



Figure 44 Amplitude Calibration connections for C2M Host and C2M Module using UXR oscilloscope (2 channels)



Figure 45 Amplitude Calibration connections for C2M Host and C2M Module using UXR oscilloscope (4 channels)

ID

Standard Name	Test ID
C2M Host	1101
C2M Module	201101

Dependencies None

Parameters Refer to [Calibration Parameters in Debug Mode](#) on page 66.

Procedure This calibration uses the PRBS9 pattern.

The Victim Generator Amplitude is set and measured for multiple Amplitudes.

Results The Amplitude Calibration returns the results for Measured Amplitude versus Set Amplitude in the Calibration View tab in graphical and tabular formats.

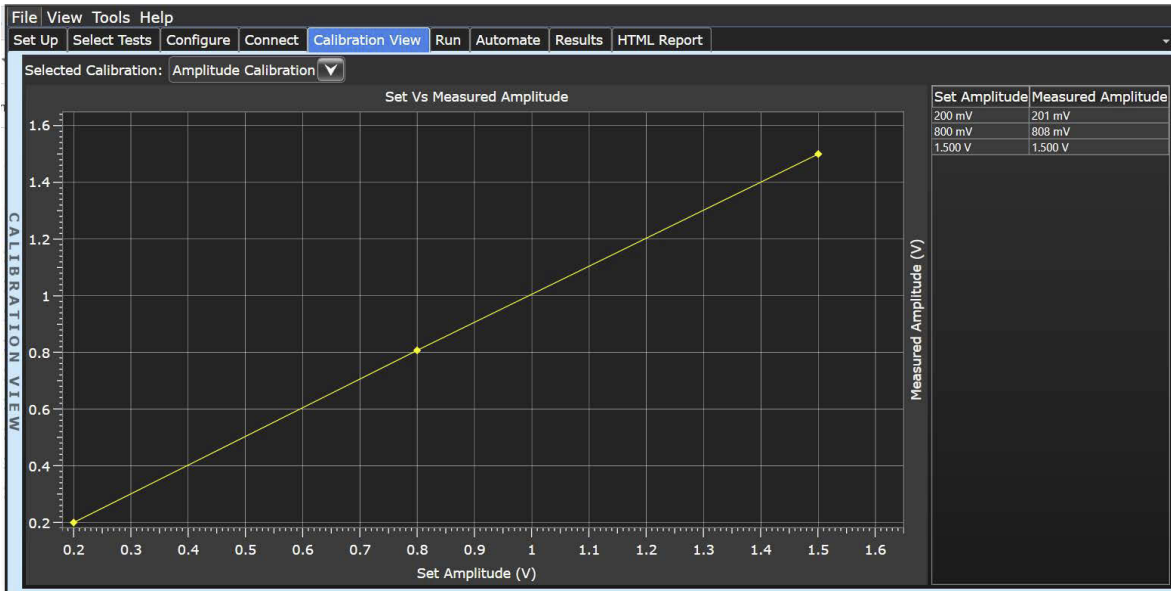


Figure 46 Amplitude Calibration results in the Calibration View tab

SJ Calibration

Overview The SJ Calibration is performed to calibrate the Sinusoidal Jitter.

Connection Diagram Same as for Amplitude Calibration connection (refer to [Amplitude Calibration](#) on page 74).

ID

Standard Name	Test ID
C2M Host	1102
C2M Module	201102

Dependencies [Amplitude Calibration](#)

Parameters Refer to [Calibration Parameters in Debug Mode](#) on page 66.

Procedure This calibration uses the 1010... toggle pattern.
The Victim Generator PJ1 is set to various values until the desired SJ value is measured.

Results The SJ Calibration returns the results for measured SJ versus set PJ1 in the Calibration View tab in graphical and tabular formats.

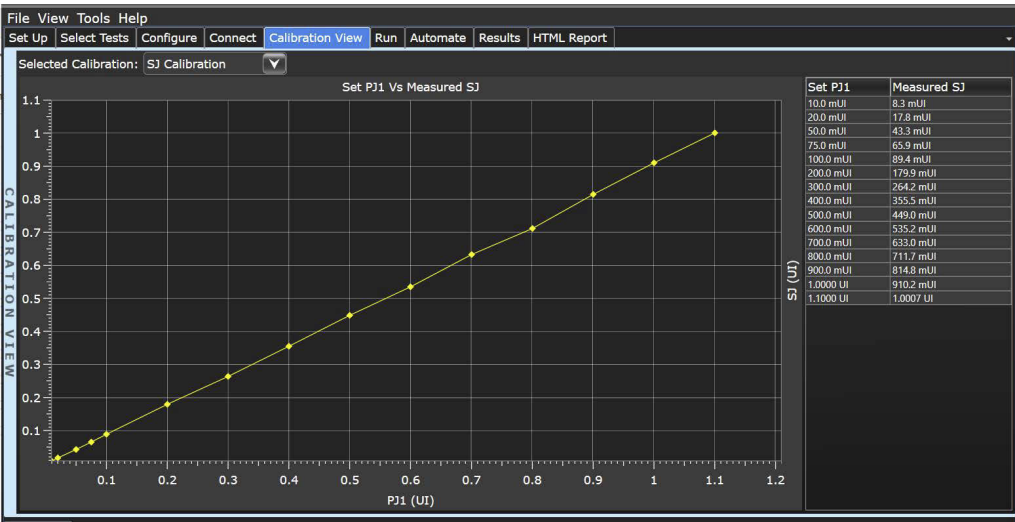


Figure 47 SJ Calibration results in Calibration View tab

RJ Calibration

Overview The RJ Calibration is performed to calibrate the Random Jitter (RJ) at TP0a.

Connection Diagram Same as for Amplitude Calibration connection (refer to [Amplitude Calibration](#) on page 74).

ID

Standard Name	Test ID
C2M Host	1103
C2M Module	201103

Dependencies [Amplitude Calibration](#)

Parameters Refer to [Calibration Parameters in Debug Mode](#) on page 66.

Procedure This calibration uses the PBRs9 pattern.
The Victim Generator Random Jitter (RJ) is set to various values until the desired RJ value is measured.

Results The RJ Calibration displays the pass/fail result and additional information in the Results tab. The C2M Host and C2M Module results look similar.

Parameter		Value					
RJ Calibration Result - IEEE 802.3bs NRZ C2M Host TP0a		Pass					
---Additional Info---							
RJ Calibration Results	Standard Parameter	Status	Target	Measured	Instrument Parameter	Nominal	Actual
	RJ	Pass	150.00 mUI	150.94 mUI	RJ	150.00 mUI	149.49 mUI

Figure 48 RJ Calibration results in the Results tab

TJ Calibration

Overview

The TJ Calibration is performed to calibrate the Total Jitter.

Connection Diagram

Same as for Amplitude Calibration connection (refer to [Amplitude Calibration](#) on page 74).

ID

Standard Name	Test ID
C2M Host	1104
C2M Module	201104

Dependencies

[Amplitude Calibration](#)

Parameters

Refer to [Calibration Parameters in Debug Mode](#) on page 66.

Procedure

This calibration uses the 1010... toggle pattern.

The Victim Generator BUJ is set until the desired TJ value is measured.

Results

The TJ Calibration displays the pass/fail result and additional information in the Results tab. The C2M Host and C2M Module results look similar.

File View Tools Help

Set UpSelect TestsConfigureConnectCalibration ViewRunAutomateResultsHTML Report

Test Name	Actual Value	Margin %	Pass Limits	# Trials
✓ Crosstalk Calibration	Pass	100.000	Pass/Fail	1
✓ Amplitude Calibration	Pass	100.000	Pass/Fail	1
✓ SJ Calibration	Pass	100.000	Pass/Fail	1
✓ RJ Calibration	Pass	100.000	Pass/Fail	1
✓ TJ Calibration	Pass	100.000	Pass/Fail	1
✓ Stressed Eye Calibration	Pass	100.000	Pass/Fail	1
✓ Peak to Peak Amplitude Calibration	Pass	100.000	Pass/Fail	1
✓ Multi-lane Stressed Input Test	Pass	100.000	Pass/Fail	1

RESULTS

Parameter	Value														
TJ calibration Result - IEEE 802.3bs NRZ Module TP0a	Pass														
---Additional Info---															
TJ Calibration Results	<table><thead><tr><th>Standard Parameter</th><th>Status</th><th>Target</th><th>Measured</th><th>Instrument Parameter</th><th>Nominal</th><th>Actual</th></tr></thead><tbody><tr><td>TJ</td><td>Pass</td><td>280.0 mUI</td><td>275.7 mUI</td><td>BUJ</td><td>80.0 mUI</td><td>102.7 mUI</td></tr></tbody></table>	Standard Parameter	Status	Target	Measured	Instrument Parameter	Nominal	Actual	TJ	Pass	280.0 mUI	275.7 mUI	BUJ	80.0 mUI	102.7 mUI
Standard Parameter	Status	Target	Measured	Instrument Parameter	Nominal	Actual									
TJ	Pass	280.0 mUI	275.7 mUI	BUJ	80.0 mUI	102.7 mUI									

Figure 49 TJ Calibration results in the Results tab

Stressed Eye Calibration

Overview The Stressed Eye Calibration is performed to calibrate the stressed eye signal for the Host or Module Stressed Input Test.

Connection Diagram Connect the instruments as shown in [Figure 50](#) to [Figure 59](#).

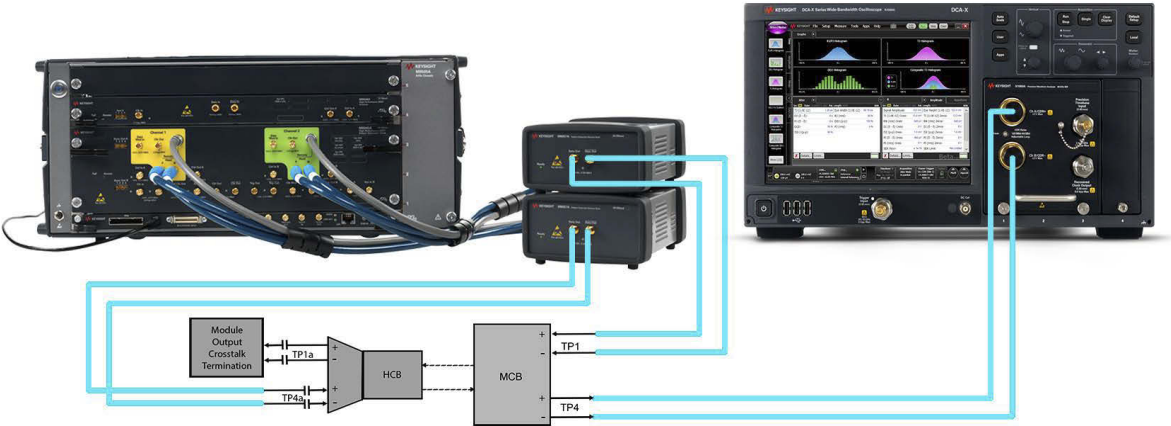


Figure 50 Stressed Eye Calibration connections for C2M Host using DCA-X oscilloscope and M8040A

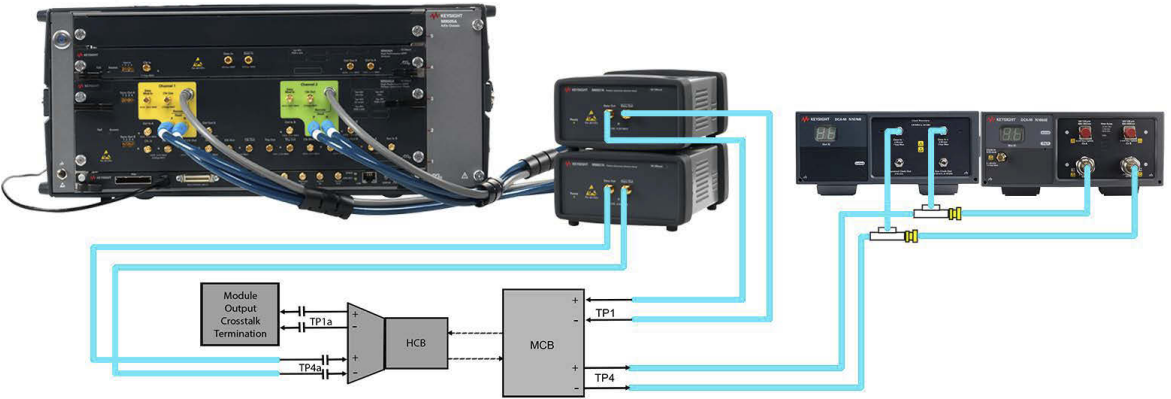


Figure 51 Stressed Eye Calibration connections for C2M Host using DCA-M oscilloscope (2 channels) and M8040A

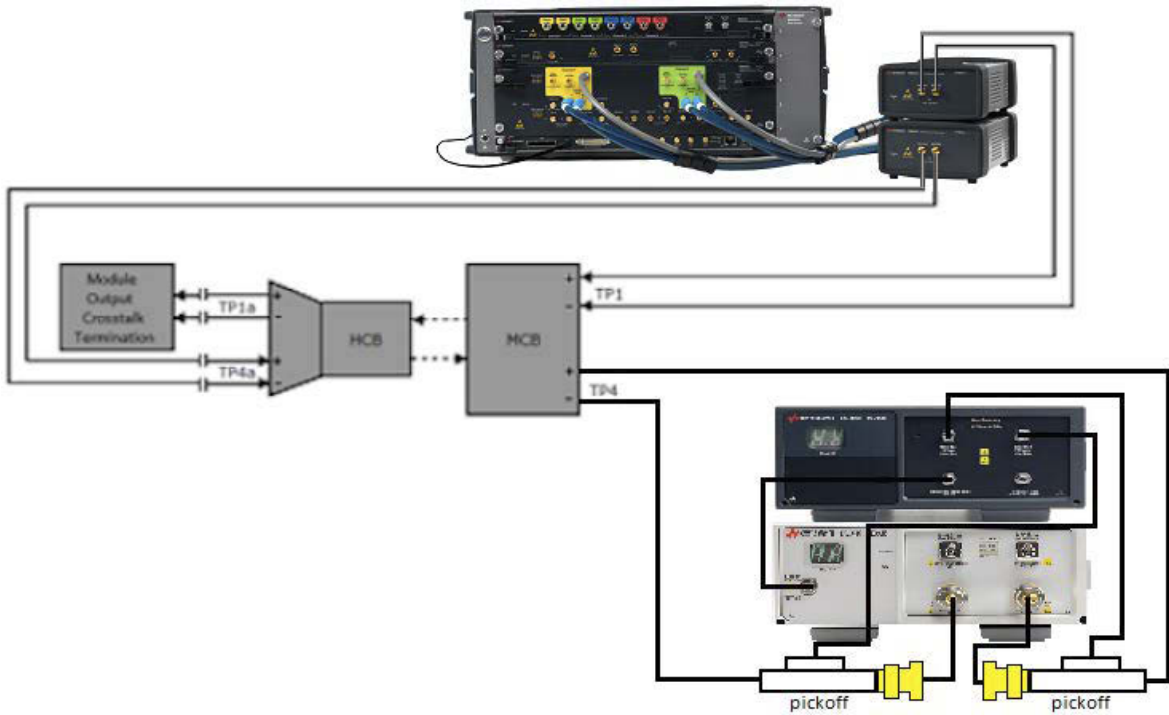


Figure 52 Stressed Eye Calibration connections for C2M Host using DCA-M oscilloscope (4 channels) and M8040A

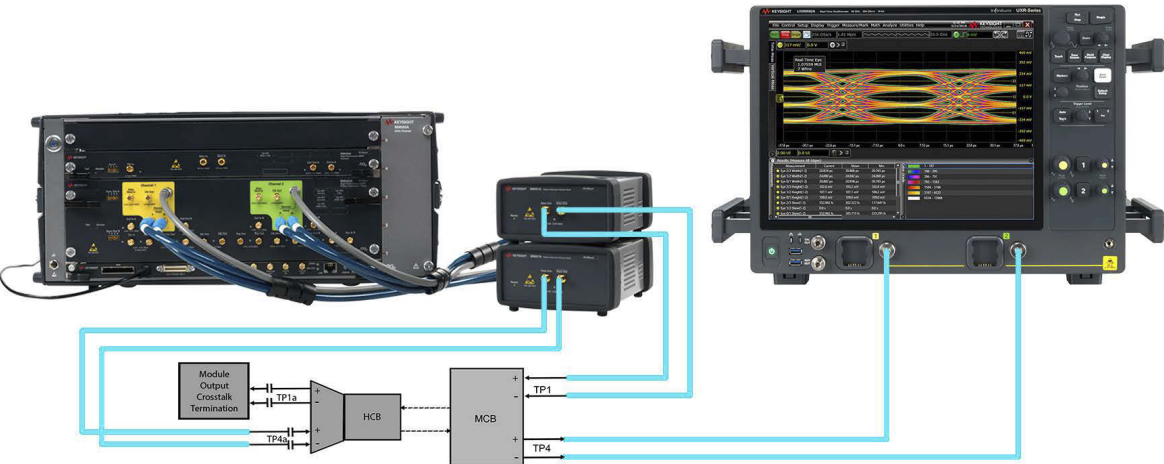


Figure 53 Stressed Eye Calibration connections for C2M Host using UXR oscilloscope (2 channels) and M8040A

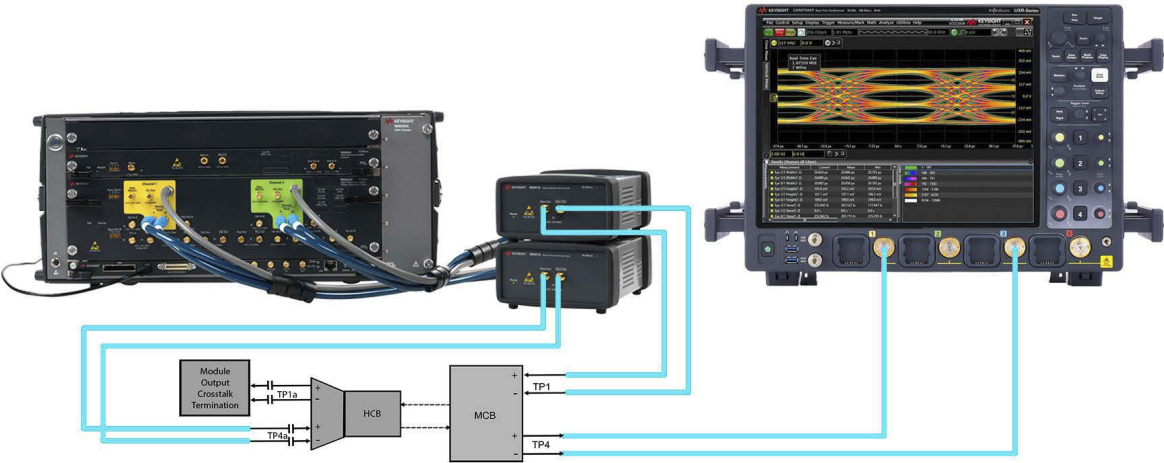


Figure 54 Stressed Eye Calibration connections for C2M Host using UXR oscilloscope (4 channels) and M8040A

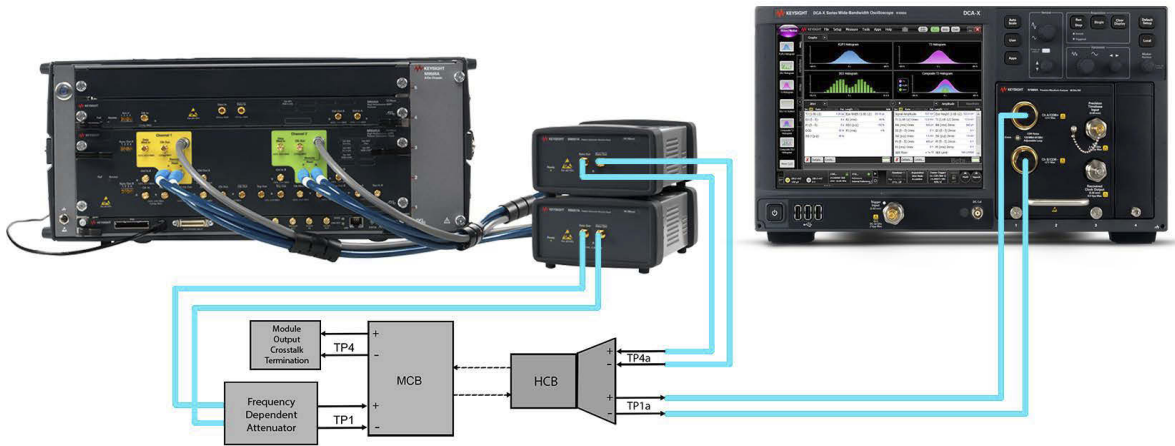


Figure 55 Stressed Eye Calibration connections for C2M Module using DCA-X oscilloscope and M8040A

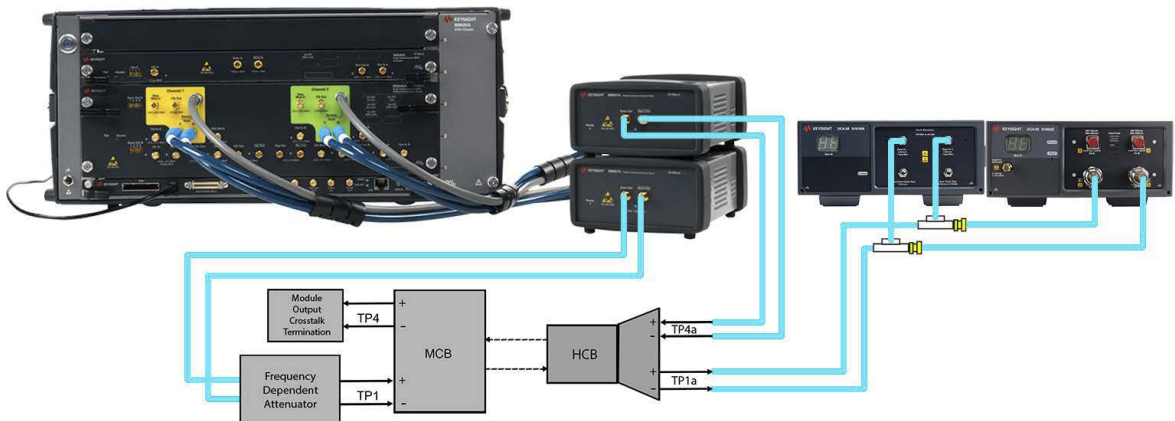


Figure 56 Stressed Eye Calibration connections for C2M Module using DCA-M oscilloscope (2 channels) and M8040A

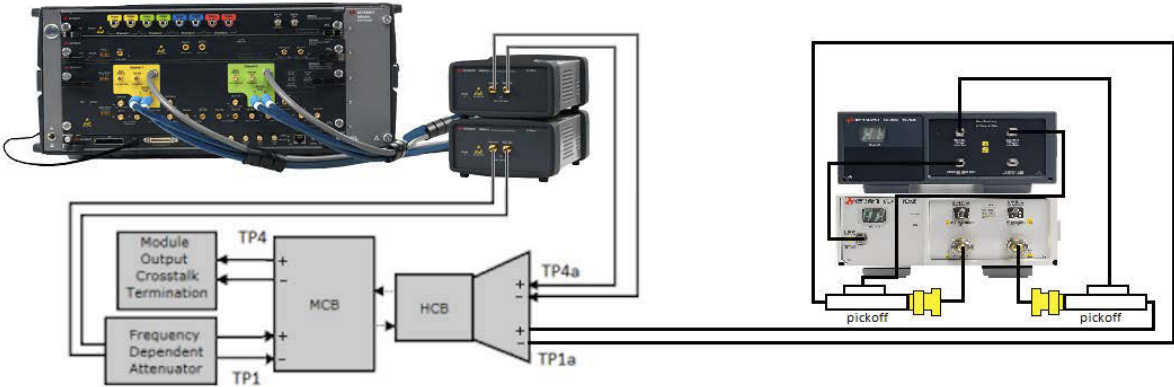


Figure 57 Stressed Eye Calibration connections for C2M Module using DCA-M oscilloscope (4 channels) and M8040A

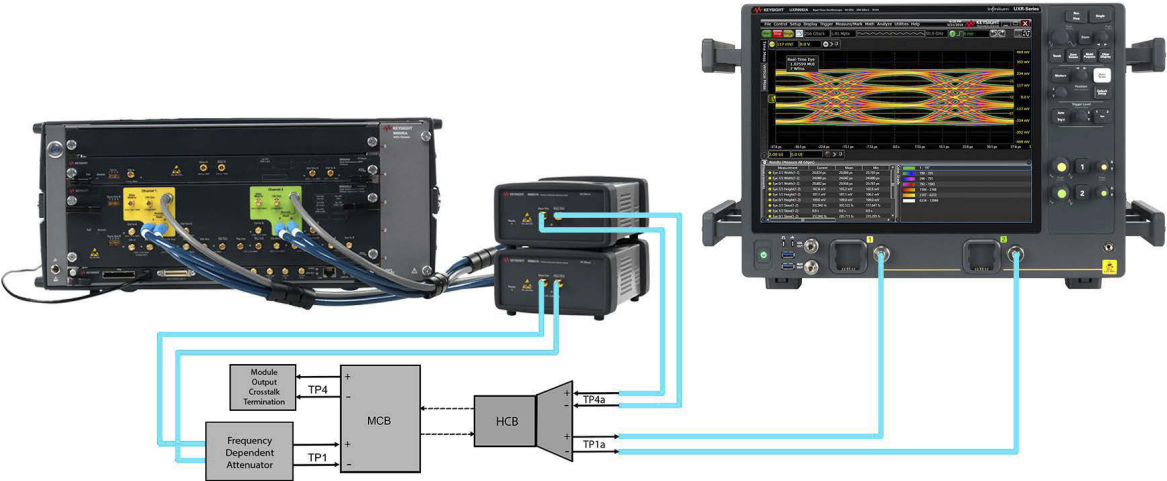


Figure 58 Stressed Eye Calibration connections for C2M Module using UXR oscilloscope (2 channels) and M8040A

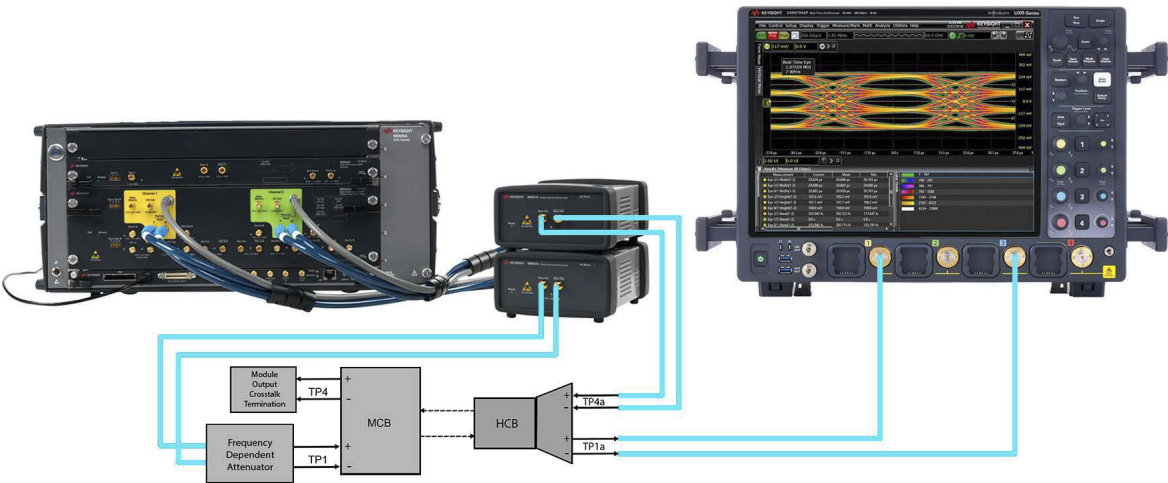


Figure 59 Stressed Eye Calibration connections for C2M Module using UXR oscilloscope (4 channels) and M8040A

ID

Standard Name	Test ID
C2M Host	1105
C2M Module	201105

Dependencies All calibrations performed previously:

- Crosstalk Calibration
- Amplitude Calibration
- SJ Calibration
- RJ Calibration
- TJ Calibration

Parameters Refer to Calibration Parameters in Debug Mode on page 66.

Procedure This calibration uses the PRBS9 pattern.

Results The Stressed Eye Calibration returns a screenshot and the following results in tabular format:

- Standard Parameters
 - Eye Width

- Eye Height
- Instrument Parameters
 - PJ1
 - RJ
 - BUJ
- De-Emphasis parameters
 - Pre-Cursor2
 - Pre-Cursor1
 - Post-Cursor1
 - Post-Cursor2
- Amplitude

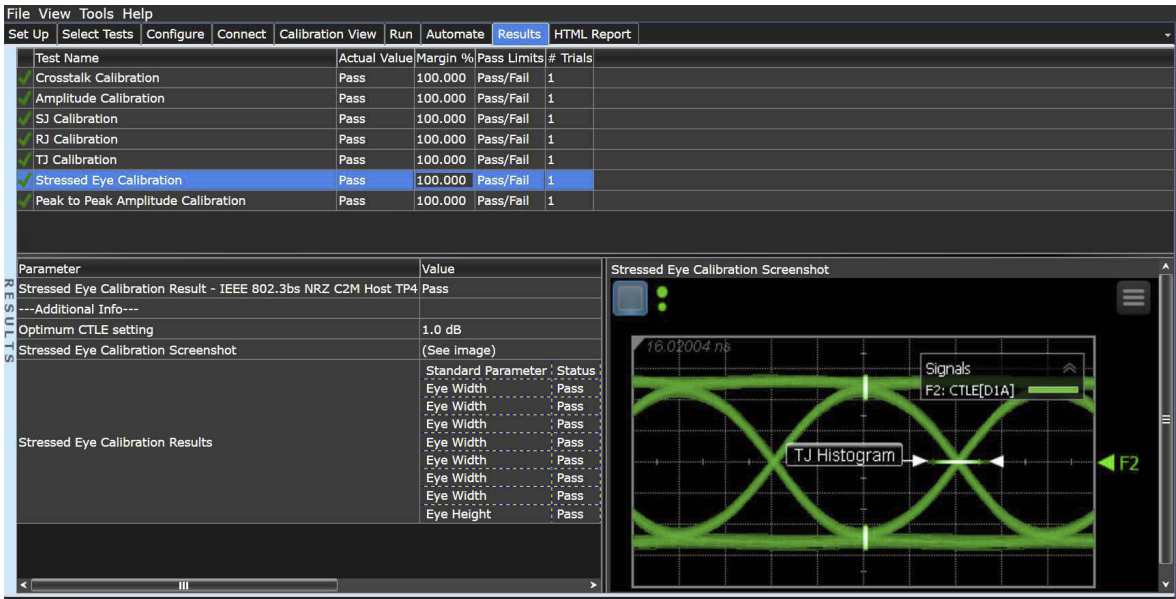


Figure 60 Stressed Eye Calibration example results for C2M Host in the Results tab. For C2M Module the eye is more closed

Parameter	Value
Stressed Eye Calibration Result - IEEE 802.3bs NRZ C2M Host TP4	Pass
---Additional Info---	
Optimum CTLE setting	1.0 dB
Stressed Eye Calibration Screenshot	(See image)
Stressed Eye Calibration Results	Standard Parameter Status Target Measured Instrument Parameter Nominal Actual
	Eye Width Pass 570 mUI 570 mUI PJ1 50.0 mUI 57.4 mUI
	Eye Width Pass 570 mUI 570 mUI RJ 150.00 mUI 228.21 mUI
	Eye Width Pass 570 mUI 570 mUI BUJ 80.0 mUI 114.3 mUI
	Eye Width Pass 570 mUI 570 mUI Pre-Cursor2 0 0
	Eye Width Pass 570 mUI 570 mUI Pre-Cursor1 0 0
	Eye Width Pass 570 mUI 570 mUI Post-Cursor1 0 0
	Eye Width Pass 570 mUI 570 mUI Post-Cursor2 0 0
	Eye Height Pass 228 mV 227 mV Amplitude 800 mV 377 mV

Figure 61 Stressed Eye Calibration example results table for C2M Host Input

Parameter	Value
Stressed Eye Calibration Result - IEEE 802.3bs NRZ C2M Module TP1a	Pass
---Additional Info---	
Optimum CTLE setting	6.0 dB
Stressed Eye Calibration Screenshot	(See image)
Stressed Eye Calibration Results	Standard Parameter Status Target Measured Instrument Parameter Nominal Actual
	Eye Width Pass 460 mUI 458 mUI PJ1 50.0 mUI 58.3 mUI
	Eye Width Pass 460 mUI 458 mUI RJ 150.00 mUI 840.96 mUI
	Eye Width Pass 460 mUI 458 mUI BUJ 80.0 mUI 102.7 mUI
	Eye Width Pass 460 mUI 458 mUI Pre-Cursor2 0 0
	Eye Width Pass 460 mUI 458 mUI Pre-Cursor1 0 0
	Eye Width Pass 460 mUI 458 mUI Post-Cursor1 0 0
	Eye Width Pass 460 mUI 458 mUI Post-Cursor2 0 0
	Eye Height Pass 95 mV 96 mV Amplitude 800 mV 887 mV

Figure 62 Stressed Eye Calibration example results table for C2M Module Input

Peak to Peak Amplitude Calibration for Voltage Tolerance Test

Overview The Peak to Peak Amplitude Calibration is performed to calibrate the voltage amplitude for the **Voltage Tolerance Test** on page 103.

Connection Diagram Connect the instruments as shown in **Figure 63** to **Figure 72**.

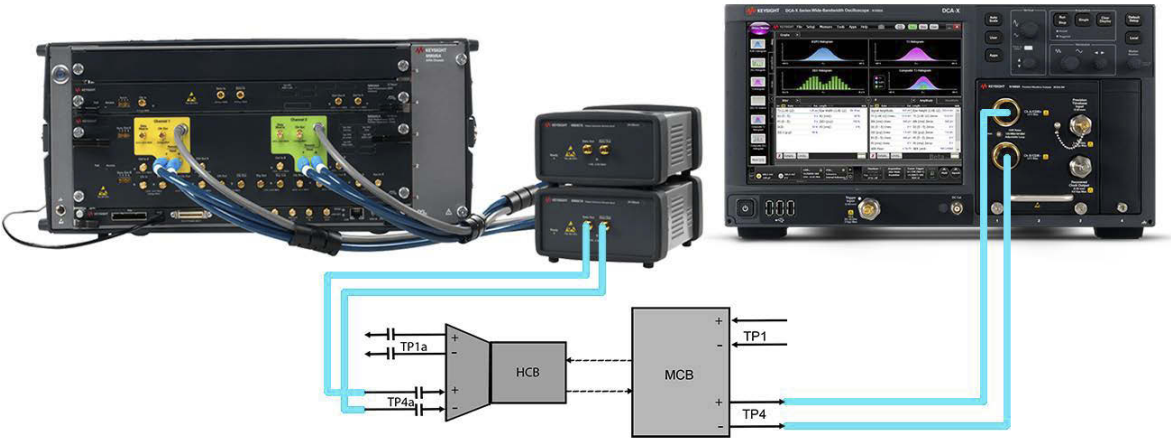


Figure 63 Pk-Pk Amplitude Calibration connections for C2M Host using DCA-X oscilloscope and M8040A

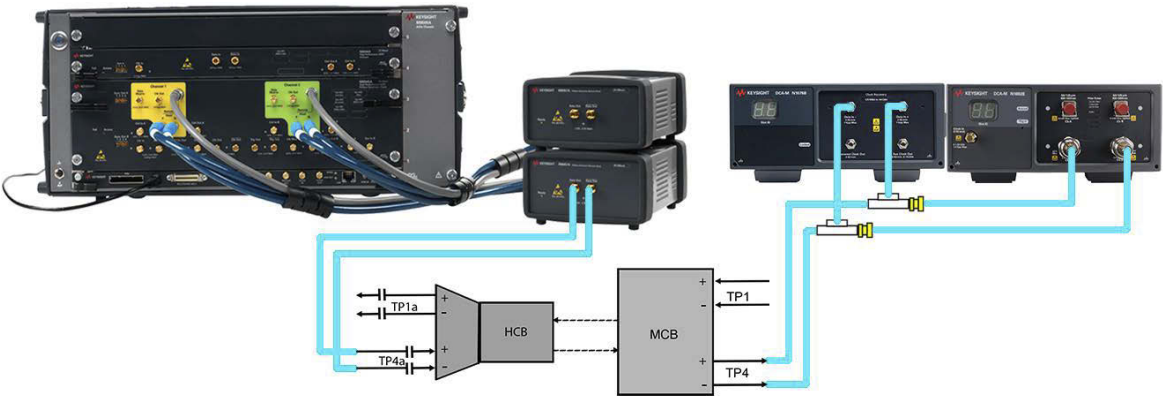


Figure 64 Pk-Pk Amplitude Calibration connections for C2M Host using DCA-M oscilloscope (2 channels) and M8040A

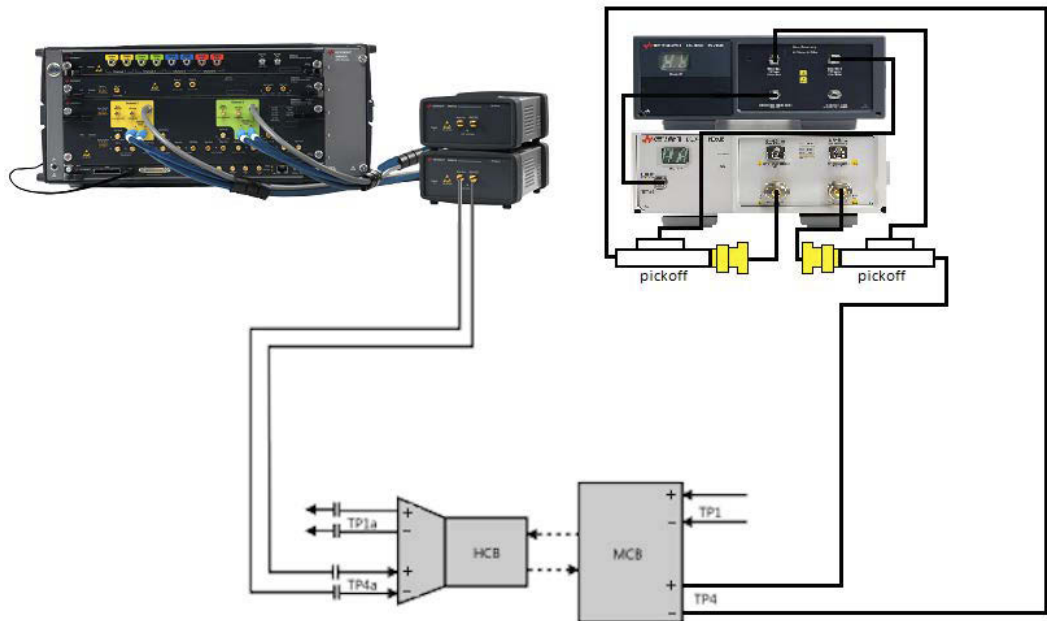


Figure 65 Pk-Pk Amplitude Calibration connections for C2M Host using DCA-M oscilloscope (4 channels) and M8040A

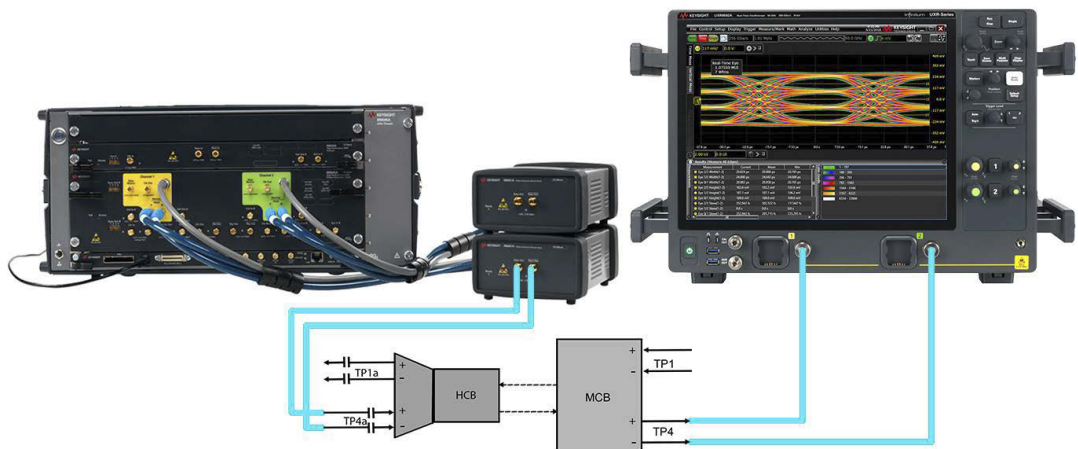


Figure 66 Pk-Pk Amplitude Calibration connections for C2M Host using UXR oscilloscope (2 channels) and M8040A

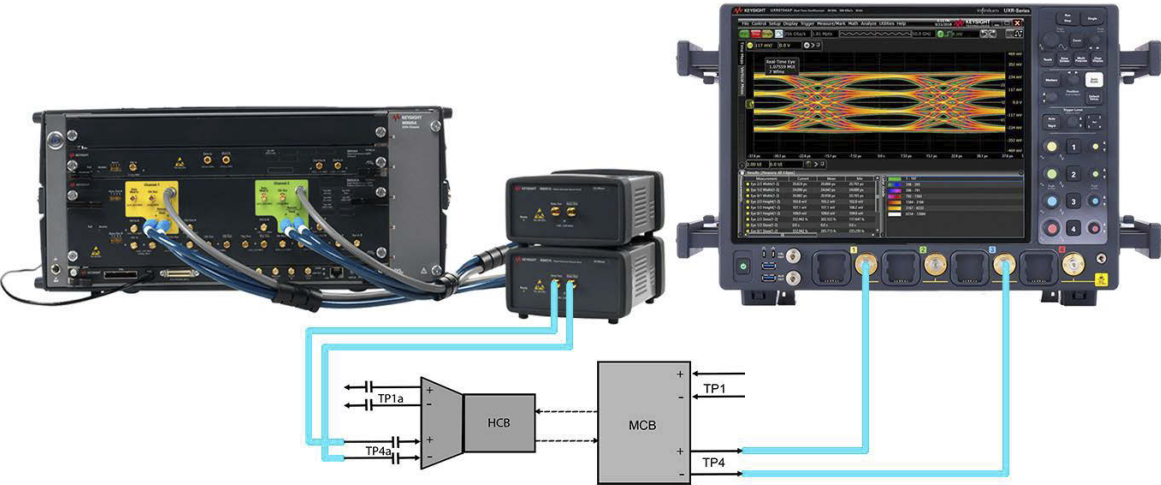


Figure 67 Pk-Pk Amplitude Calibration connections for C2M Host using UXR oscilloscope (4 channels) and M8040A

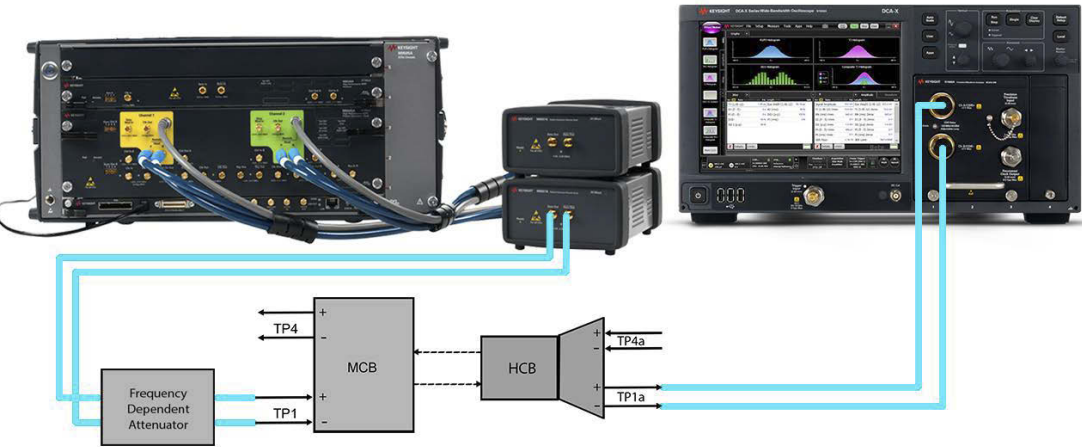


Figure 68 Pk-Pk Amplitude Calibration connections for C2M Module using DCA-X oscilloscope and M8040A

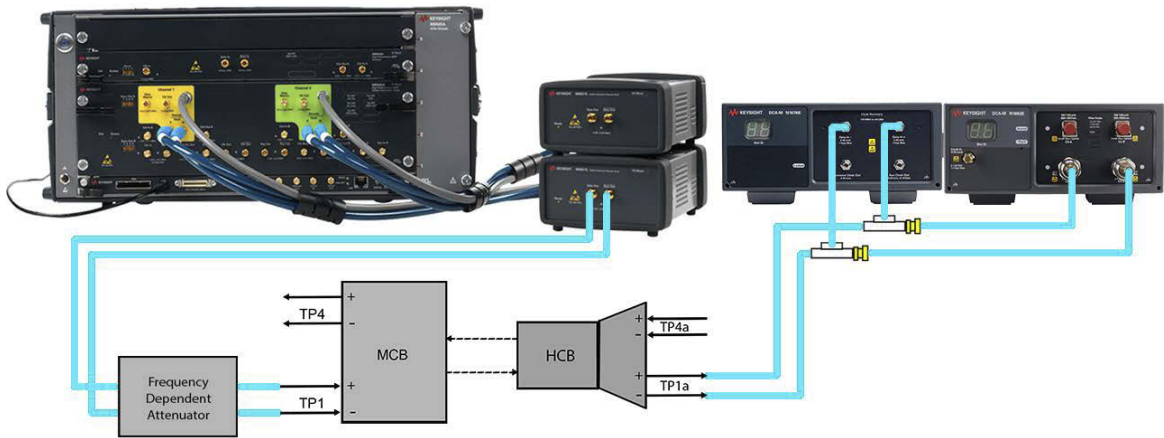


Figure 69 Pk-Pk Amplitude Calibration connections for C2M Module using DCA-M oscilloscope (2 channels) and M8040A

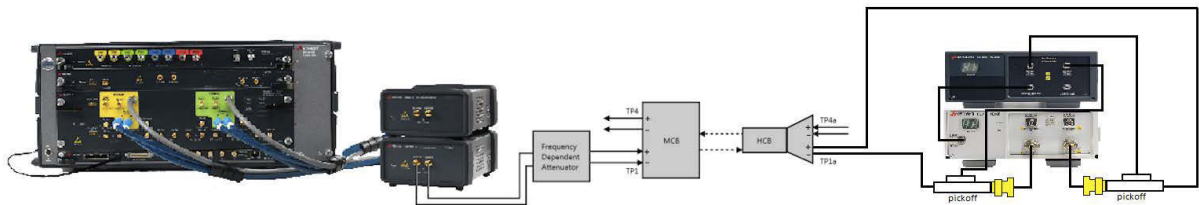


Figure 70 Pk-Pk Amplitude Calibration connections for C2M Module using DCA-M oscilloscope (4 channels) and M8040A

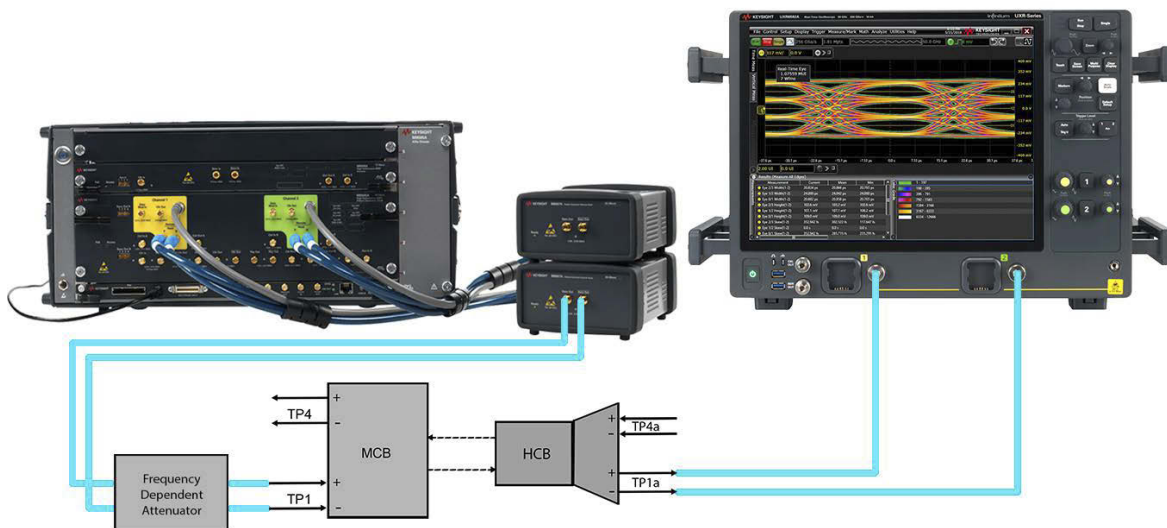


Figure 71 Pk-Pk Amplitude Calibration connections for C2M Module using UXR oscilloscope (2 channels) and M8040A

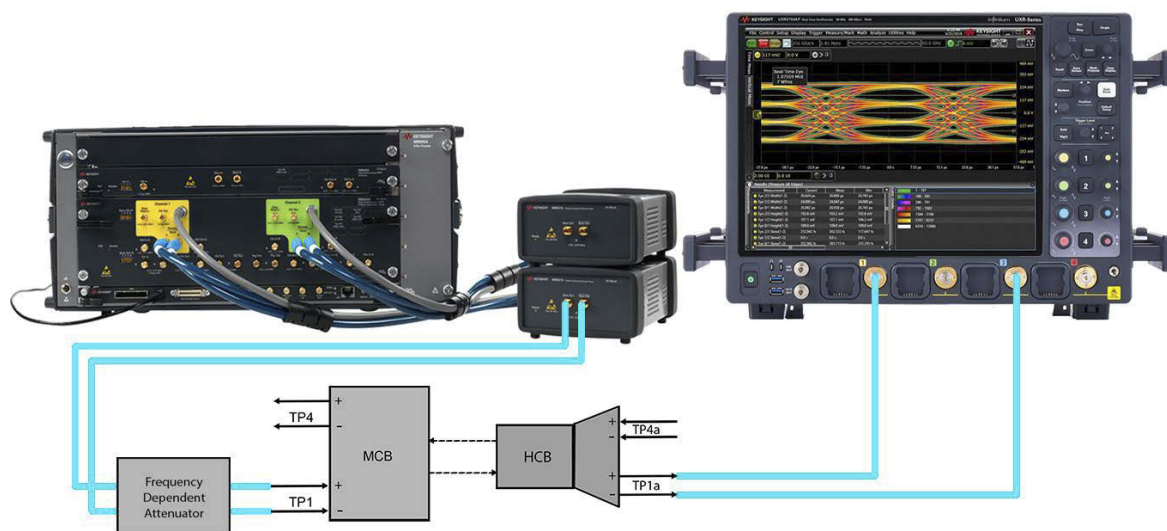


Figure 72 Pk-Pk Amplitude Calibration connections for C2M Module using UXR oscilloscope (4 channels) and M8040A

ID

Standard Name	Test ID
C2M Host	1106
C2M Module	201106

Dependencies None

Parameters Refer to [Calibration Parameters in Debug Mode](#) on page 66.

Procedure This calibration uses the PRBS9 pattern.

The set transmitter amplitude is set to various values until the amplitude measured by the scope reaches the target value (900 mV)

Results The Peak to Peak Amplitude Calibration returns the following results, in tabular format:

- Standard Parameter
 - Minimum Voltage
- Instrument Parameter
 - Amplitude

The C2M Host and C2M Module results look similar.

Parameter	Value
Amplitude Calibration Result - IEEE 802.3bs NRZ C2M Host TP4	Pass
---Additional Info---	
Peak Peak Amplitude Calibration Results	Standard Parameter
	Status
	Target
	Measured
	Instrument Parameter
	Nominal
	Actual
	Minimum Voltage
	Pass
	900 mV
	901 mV
	Amplitude
	800 mV
	927 mV

Figure 73 Peak to Peak Amplitude Calibration example results table for C2M Host Input

5 IEEE-25G C2M Tests

Test Parameters in Debug Mode	96
Multi-lane Stressed Input Test	98
Voltage Tolerance Test	103

This chapter describes the test procedures for the IEEE-25G Rx Tests, which are applicable for both C2M Host and C2M Module standards.

As a prerequisite, run all IEEE-25G C2M Host and Module calibrations before running tests. Ensure that the DUT is properly connected to the BERT modules and to the UXR Infiniium or FlexDCA Oscilloscope.

Test Parameters in Debug Mode

The Debug Mode in the Configure tab of the Test Application includes some parameters in addition to those that can be configured in the Compliance Mode. Besides, for some of the configuration options, you may enter custom values, which provides a greater flexibility in performing calibrations and tests.

For the C2M Host Input standard and the C2M Module Input standard, the parameters listed in [Table 14](#) are available for configuration.

Table 14 Test parameters in debug mode for C2M Host Input and C2M Module Input options

Test Parameters	Description
Parameters Common to All Tests	
Channel 1A Skew	Specify a skew value in seconds for Channel 1A.
Channel 1B Skew	Specify a skew value in seconds for Channel 1B.
Channel 7A Skew	Specify a skew value in seconds for Channel 7A.
Channel 7B Skew	Specify a skew value in seconds for Channel 7B.
Channel 7C Skew	Specify a skew value in seconds for Channel 7C.
Channel 7D Skew	Specify a skew value in seconds for Channel 7D.
Baud Rate	Baud Rate for testing device and for all calibrations.
Channels for N109x	When using the N109x, you may use a 2-channel or 4-channel module and install the module in Slot 7.
CDR Source	Select the source used for clock recovery.
Victim Analyzer Module	Selects the victim analyzer module for testing device. ▪ If 'BERT Analyzer' is selected, manually configure the "Victim Analyzer Clock Source" parameter. ▪ If 'DCI' is selected, manually configure the "DUT Control Interface Script File" and "DUT Control Interface Location" parameters. ▪ If 'RED' is selected, the M8070B must be configured to detect the real-time oscilloscope.
Victim Analyzer Clock Source	Selects the clock source for the victim analyzer module. This parameter is only applicable for the BERT analyzer.
Target Error Ratio	Target Error Ratio for deciding if a test is passed or failed.
Target Confidence Level	Target Confidence Level for Target Error Ratio to decide if a test is passed or failed.

Test Parameters	Description
DUT Control Interface Script File	Select the DCI script file to be loaded for receiver tests.
DUT Control Interface Location	DCI Location to be used for receiver tests.
Pause before starting Receiver tests	Selects whether a pause is made after configuring the error detector modules and before running the alignment to allow for manual changes in the settings.
Parameters for Stressed Input Test	
Test Mode	Select 'Compliance' or 'Characterization'. Test just for predefined SJ Frequencies or measure SJ Frequency.
Jitter Profile Frequency1	Defines the first corner frequency of the jitter profile.
Jitter Profile Amplitude1	Defines the jitter amplitude at first corner frequency of the jitter profile.
Jitter Profile Frequency2	Defines the second corner frequency of the jitter profile.
Jitter Profile Amplitude2	Defines the jitter amplitude at the second corner frequency of the jitter profile.
Jitter Profile Frequency3	Defines the third corner frequency of the jitter profile.
Jitter Profile Amplitude3	Defines the jitter amplitude at the third corner frequency of the jitter profile.
Frequency Mode	Select between Auto and Manual frequency modes.
Start Frequency	Controls the start frequency of the jitter sweep.
Stop Frequency	Controls the stop frequency of the jitter sweep.
Number of Steps	The number of steps within the jitter sweep.
Manual Frequency List	List of Jitter frequencies, separated by commas.
Parameter for Voltage Tolerance Test	
Minimum Voltage	Minimum Voltage that the device must operate with.

Multi-lane Stressed Input Test

Overview The Multi-lane Stressed Input Test validates the ability of the host input to tolerate the sinusoidal jitter with the specified limit. The test signal is applied at TP4a using a Host Compliance Board (HCB).

Connection Diagram For multi-lane tests, connect the instruments as shown in [Figure 74](#) and [Figure 75](#).

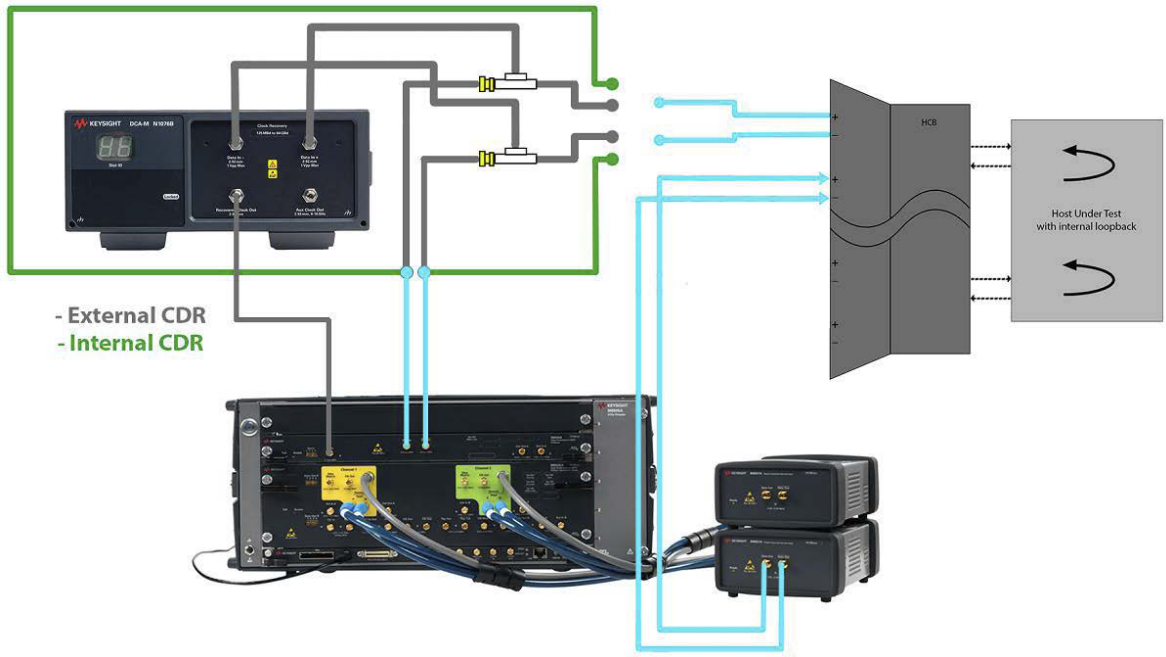


Figure 74 Multi-lane Stressed Input Test connections for C2M Host and M8040A

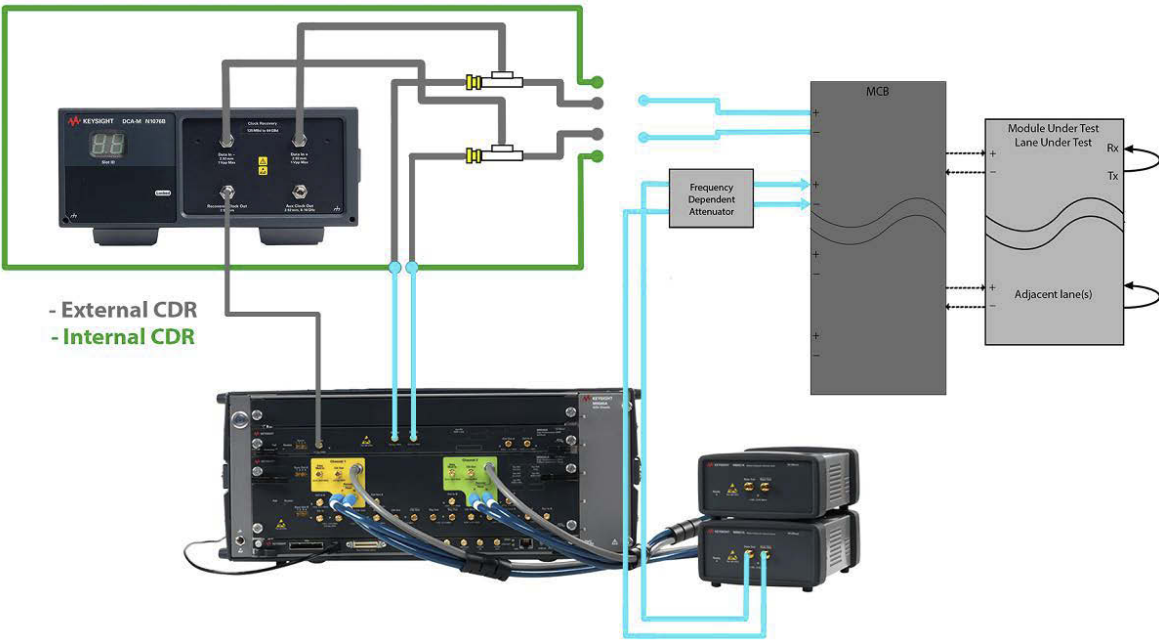


Figure 75 Multi-lane Stressed Input Test connections for C2M Module and M8040A

ID

Standard Name	Test ID
C2M Host Multi-Lane	5100
C2M Module Multi-Lane	205100

Dependencies

- All calibrations performed previously:
- Crosstalk Calibration
 - Amplitude Calibration
 - SJ Calibration
 - RJ Calibration
 - TJ Calibration
 - Stressed Eye Calibration

Parameters

Refer to Test Parameters in Debug Mode on page 96.

Procedure

This test uses the PRBS31 pattern.

Results The Multi-lane Stressed Input Test displays the pass/fail result and additional information in the Results tab.

- Pass/Fail for each SJ Amplitude & Frequency pair point

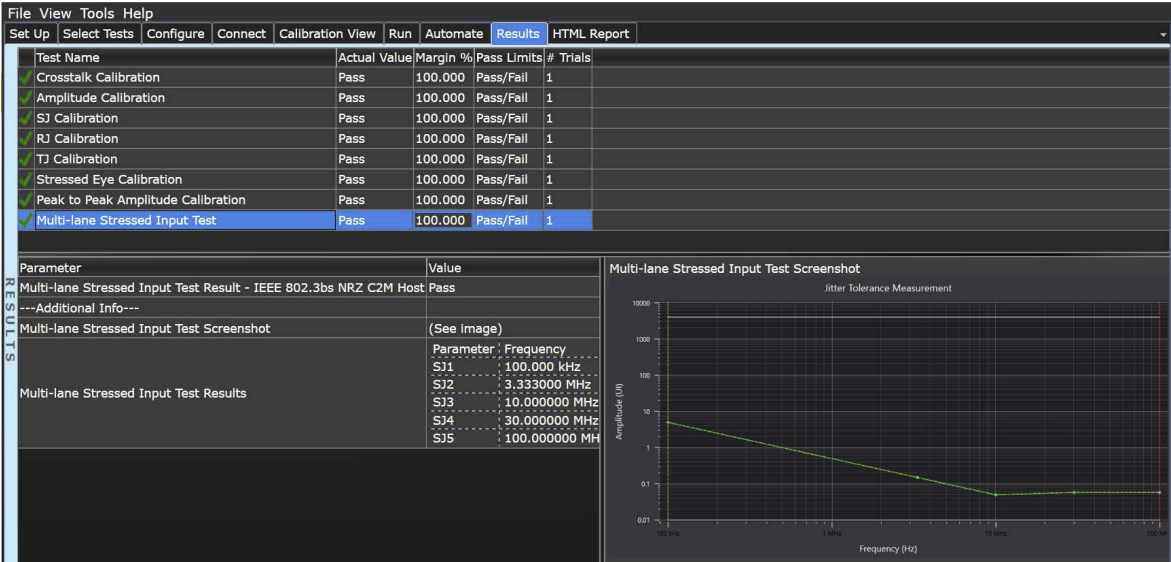


Figure 76 C2M Host Multi-lane Stressed Input Test Result

Parameter	Value			
Multi-lane Stressed Input Test Result - IEEE 802.3bs NRZ C2M Host	Pass			
---Additional Info---				
Multi-lane Stressed Input Test Screenshot	(See image)			
Multi-lane Stressed Input Test Results	Parameter	Frequency	Amplitude	Status
	SJ1	100.000 kHz	5.0000 UI	Pass
	SJ2	3.333000 MHz	150.0 mUI	Pass
	SJ3	10.000000 MHz	50.0 mUI	Pass
	SJ4	30.000000 MHz	50.0 mUI	Pass
	SJ5	100.000000 MHz	50.0 mUI	Pass

Figure 77 C2M Host Multi-lane Stressed Input Test Result (tabular)



Figure 78 C2M Host Multi-lane Stressed Input Test Result (graphical)

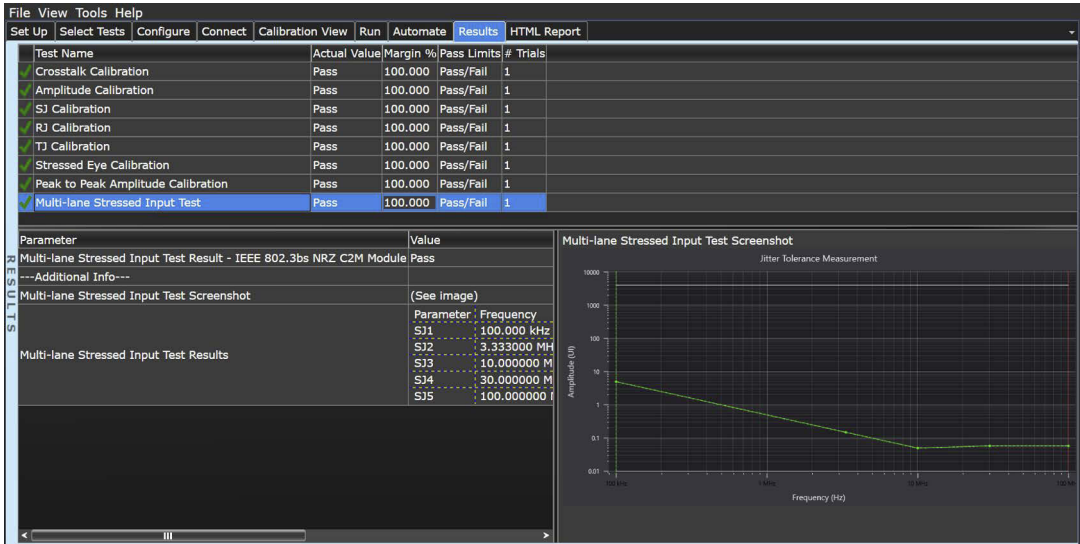


Figure 79 C2M Module Multi-lane Stressed Input Test Result

Parameter	Value			
Multi-lane Stressed Input Test Result - IEEE 802.3bs NRZ C2M Module	Pass			
---Additional Info---				
Multi-lane Stressed Input Test Screenshot	(See image)			
Multi-lane Stressed Input Test Results	Parameter	Frequency	Amplitude	Status
	SJ1	100.000 kHz	5.0000 UI	Pass
	SJ2	3.333000 MHz	150.0 mUI	Pass
	SJ3	10.000000 MHz	50.0 mUI	Pass
	SJ4	30.000000 MHz	50.0 mUI	Pass
	SJ5	100.000000 MHz	50.0 mUI	Pass

Figure 80 C2M Module Multi-lane Stressed Input Test Result (tabular)



Figure 81 C2M Module Multi-lane Stressed Input Test Result (graphical)

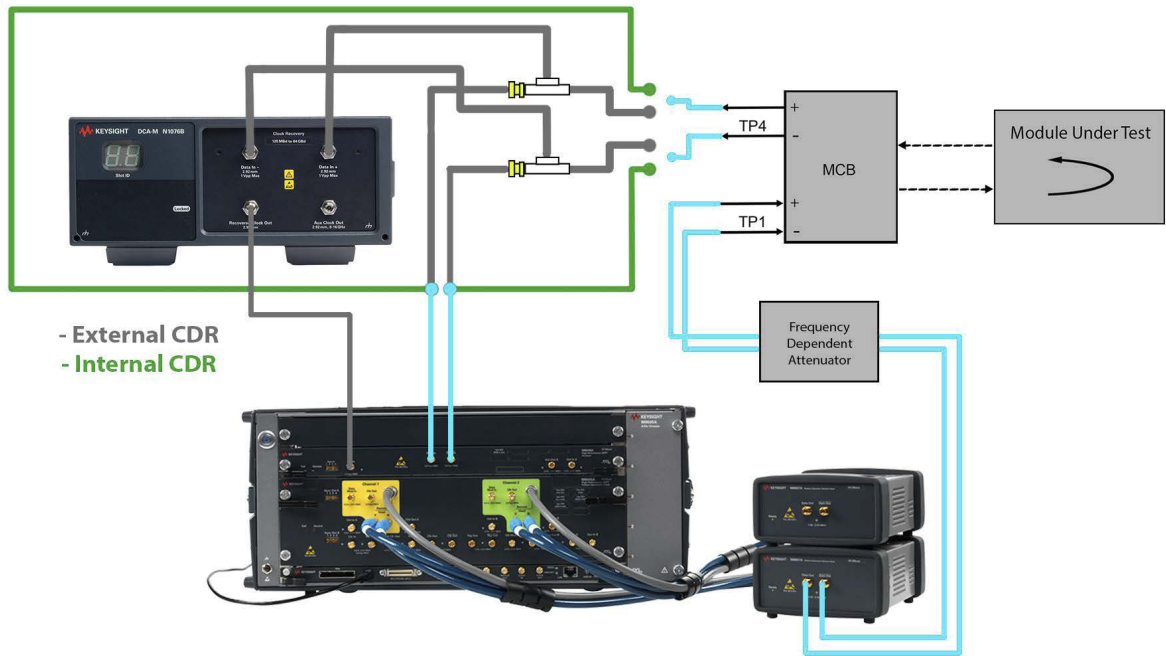


Figure 83 Voltage Tolerance Test connections for C2M Module

ID

Standard Name	Test ID
C2M Host	5101
C2M Module	205101

Dependencies Amplitude Calibration

Parameters Refer to Test Parameters in Debug Mode on page 96.

Procedure This test uses the PRBS31 pattern.

The BER is measured when the minimum voltage amplitude defined in the specification is applied to the DUT.

Results The Voltage Tolerance Test displays the pass/fail result and additional information in the Results tab. The C2M Host and C2M Module results look similar.

- Parameter: Minimum Voltage

Parameter	Value		
Voltage ToleranceTest Result - IEEE 802.3bs NRZ C2M Host	Pass		
---Additional Info---			
Multi-lane Stressed Input Test Results	Parameter	Status	Minimum
	MinimumVoltage	Pass	900 mV

Figure 84 C2M Host Voltage Tolerance Test example result

6 IEEE-25G C2C/KR/CR Calibrations

Calibration Parameters in Debug Mode	108
C2C/KR/CR Configuration in the Test App	111
Calibration Procedure	113
Amplitude Calibration	115
SJ Calibration	119
RJ Calibration	121
BUJ Calibration	123
Broadband Noise Calibration	125
SNDR Calibration	127
Channel Characterization using COM Model	129
Transmitter Measurements for COM Model – Rx ITol	132
Rx Calibration using COM Model	134
Peak to Peak Amplitude Calibration for Amplitude Tolerance Test	136

This chapter describes the test procedures for the IEEE 802.3 (IEEE-25G) Rx Calibrations that are applicable for C2C, KR and CR standards.

Before performing the IEEE-25G C2C/KR/CR tests, you have to calibrate all the related parameters. Perform calibrations in the order displayed in the M8091BMCA Receiver Conformance Test Application.

As mentioned earlier, ensure that the UXR Infiniium or FlexDCA Oscilloscope has been calibrated and the mated Compliance Board is properly connected to the test instruments to perform IEEE-25G Rx Calibrations.

Calibration Parameters in Debug Mode

The Debug Mode in the Configure tab of the Test Application includes some parameters in addition to those that can be configured in the Compliance Mode. Besides, for some of the configuration options, you may enter custom values, which provides a greater flexibility in performing calibrations and tests.

For the C2C, KR and CR standard options, the following parameters are available for configuration.

Table 15 Calibration parameters in debug mode for C2C, KR and CR options

Calibration Parameter	Description
Parameters Common to All Calibrations	
Channel 1A Skew	Specify a skew value in seconds for Channel 1A.
Channel 1B Skew	Specify a skew value in seconds for Channel 1B.
Channel 7A Skew	Specify a skew value in seconds for Channel 7A.
Channel 7B Skew	Specify a skew value in seconds for Channel 7B.
Channel 7C Skew	Specify a skew value in seconds for Channel 7C.
Channel 7D Skew	Specify a skew value in seconds for Channel 7D.
Baud Rate	Baud Rate for testing device and for all calibrations.
Channels for N109x	When using the N109x, you may use a 2-channel or 4-channel module and install the module in Slot 7.
CDR Source	Select the source used for clock recovery.
Target COM	Target COM for deciding if a test is passed or failed.
Test Channel Configuration	Specify test channel configuration that needs to be calibrated to meet COM (3 dB max). Select either 'Low Loss' (corresponds to Test1) or 'High Loss' (corresponds to Test2).
Transmitter Pre-Cursor2	Controls the transmitter equalization coefficient for pre-cursor 2.
Transmitter Pre-Cursor	Controls the pre-cursor equalization coefficient.
Transmitter Main Cursor	Controls the main cursor equalization coefficient.
Transmitter Post-Cursor	Controls the post-cursor equalization coefficient.
Transmitter Post-Cursor2	Controls the transmitter equalization coefficient for post-cursor 2.

Calibration Parameter	Description
Channel EQ Pre-Cursor2 for ITol	Controls the pre-cursor 2 coefficient for channel equalization.
Channel EQ Pre-Cursor1 for ITol	Controls the pre-cursor 1 coefficient for channel equalization.
Channel EQ Main-Cursor2for ITol	Controls the main-cursor coefficient for channel equalization.
Channel EQ Post-Cursor for ITol	Controls the post-cursor 1 coefficient for channel equalization.
Channel EQ Post-Cursor2 for ITol	Controls the post-cursor 2 coefficient for channel equalization.
Channel EQ Pre-Cursor2 for JTol	Controls the pre-cursor 2 coefficient for channel equalization. (Only for KR and CR.)
Channel EQ Pre-Cursor1 for JTol	Controls the pre-cursor 1 coefficient for channel equalization. (Only for KR and CR.)
Channel EQ Main-Cursor2for JTol	Controls the main-cursor coefficient for channel equalization. (Only for KR and CR.)
Channel EQ Post-Cursor for JTol	Controls the post-cursor 1 coefficient for channel equalization. (Only for KR and CR.)
Channel EQ Post-Cursor2 for JTol	Controls the post-cursor 2 coefficient for channel equalization. (Only for KR and CR.)
Loop Bandwidth	Select or enter the Loop BW to be used in the clock recovery. (Only for C2C.)
SIRC Response	Select the SIRC response. This will automatically be applied to any pattern lock waveform. (Only for C2C.)
SIRC Bandwidth	Select or enter the SIRC BW. This will automatically be applied to any pattern lock waveform. (Only for C2C.)
Np	Set the Np value used for linear fit pulse peak and error calculations. (Only for C2C.)
Dp	Set the Dp value used for linear fit pulse peak and error calculations. (Only for C2C.)
Transmitter Replica Trace S-Parameter File	S-Parameters of Transmitter Replica Trace for embedding them into the transmitter measurement. (Only for C2C.)
Noise Generator Channel Selection	Selects the location of the Noise Generator that shall be used for generating broadband noise. (Only for KR and CR.)
Number of Averages for Coefficient Tests	Set the number of averages used for the Coefficient tests.
Parameter for Amplitude Calibration	
Amplitude	Victim Differential Amplitude.

Calibration Parameter	Description
Parameters for Receiver Interference Tolerance	
SJ	Sinusoidal Jitter at 10x receiver loop bandwidth.
RJ	Unbounded Uncorrelated Gaussian Jitter. This is a peak-peak value and is converted to rms value when it is set on the BERT.
BUJ	Controls the amplitude of the BUJ jitter source.

C2C/KR/CR Configuration in the Test App

In order to obtain valid calibration data and test measurements, ensure that the Test Application is using the correct configuration parameters and corresponding values.

To configure the correct S-Parameter File in the **Set Up** tab:

- 1 Select **C2C (CAUI-4)** or **KR (25GBASE-KR)** or **CR (25GBASE-CR)** as the **Standard Option**.

By default, the Test Application displays a certain S-Parameter file corresponding to the C2C/KR/CR standard.

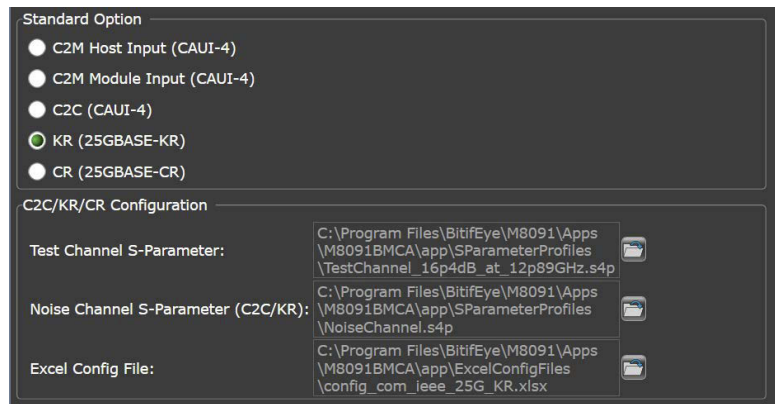


Figure 85 S-Parameter configuration file for C2C/KR/CR standards (KR here)

- 2 To define another Test Channel S-Parameter file or Noise Channel S-Parameter file, or both, click the corresponding folder icon(s)



By default, the Application installer places all S-parameter files in the folder *C:\Program Files\BitifEye\M8091\ Apps\M8091BMCA\app\ SParameterProfiles* for the configuration fields **Test Channel S-Parameter** and **Noise Channel S-Parameter**.

From the default files available in the Test Application, you have to choose the correct Test Channel S-parameter file that correlates with the chosen test channel configuration. **Table 16** shows the correct S-parameter file to select for each standard option.

Table 16 **Selecting Test Channel S-Parameter File**

Standard Option	Test Channel Configuration Setting	Corresponding Rx Interference Tolerance Parameter	S-Parameter file that must be selected
C2C	Low Loss	Test1	TestChannel_9p8dB_at_12p89GHz.s4p
C2C	High Loss	Test2	TestChannel_19p9dB_at_13p28GHz.s4p
KR	Low Loss	Test1	TestChannel_16p1dB_at_12p89GHz.s4p
KR	High Loss	Test2	TestChannel_30p1dB_at_12p89GHz.s4p
CR	Low Loss	Test1	TestChannel_14p4dB_at_12p89GHz.s4p
CR	High Loss	Test2	TestChannel_22p7dB_at_12p89GHz.s4p

- 3 Similarly, to define a different Excel Configuration file, click the corresponding folder icon. By default, the Application installer places all configuration files in the folder *C:\Program Files\BitifEye\M8091\Apps\M8091BMCA\app\ExcelConfigFiles* for the configuration field **Excel Config File**.
- 4 From the **Open** window that appears, select the alternative S-parameter file (factory installed) for C2C/KR/CR and click **Open**.

NOTE

Currently, the Test Application installs a single Noise Channel S-Parameter file for all standards and a different Excel Configuration file for C2C, KR and CR.

While you may also load custom S-parameter files in the Test Application for the Test Channel and Noise Channel, you must ensure that these files contain measurements from exactly the same test setup.

The new file location appears in the **C2C/KR/CR Configuration** area for the corresponding Test/Noise Channel or Excel Configuration File.

NOTE

The S-parameter file for the Test Channel includes the response of the cable or PCB trace and also the transmitter and receiver test fixtures. It is usually not possible to measure this. An S-parameter file combining all can be generated using the individual responses using PLTS.

Calibration Procedure

The IEEE 802.3bm C2C receiver test calibration procedures comprise three steps:

- 1 System calibration: Calibrate the equipment used to generate the victim transmitter and the broadband noise (once per setup configuration).
- 2 Channel characterization: S-parameter measurements using a Network Analyzer for both the low loss and high loss channels. The optimal amount of channel equalization at the transmitter is defined during this stage.
- 3 COM-related calibration: The following steps are performed to complete the COM model:
 - a Verify channel compliance based on S-parameter analysis.
 - b Measure transmitter characteristics (jitter and electrical characteristics).

Finally, the COM-model computes the amount of broadband noise to be injected in the noise path to test the receiver (BER measurement for different levels of noise or jitter) under a specific COM (usually 3 dB).

Two COM-related calibrations are required, one for the low loss channel and one for the high loss channel. As well as choosing the appropriate test channel S-parameter file (see [C2C/KR/CR Configuration in the Test App](#) on page 111), the user should also set the Test Channel Configuration parameter in the **Configure tab** to match the chosen channel loss. The Calibration Persistence function (see [Understanding Calibration Data Persistence](#) on page 41) can be used to save/recall calibration data common to the two tests.

Overview of Calibration Procedures

For more details see [Overview of Channel Operating Margin \(COM\)](#) on page 57, [Table 12](#) on page 58 (a summary) and [Detailed Steps for Calibration Procedures](#) on page 62, which gives a summary of steps that must be performed for each calibration procedure.

NOTE

For the C2C standard option, if you run the **Channel Characterization using COM model** calibration, it will determine the channel de-emphasis taps settings (Channel EQ Pre-cursor2/1 and Channel EQ Post-Cursor1/2) under the **Configure** tab and automatically updates the channel equalization coefficients in the de-emphasis taps. For more information on Channel Characterization using COM model calibration, refer to **Channel Characterization using COM Model** on page 129.

Amplitude Calibration

Overview

The Amplitude Calibration is performed to calibrate the Victim Generator's Amplitude for the Transmitter Measurements for COM model. Note that the de-emphasis configuration resulting from the Transmitter Equalization sequence must be applied during calibration.

Connection Diagram

Connect the instruments as shown in

- Figure 86 to Figure 89 for C2C and KR
- Figure 90 for CR



Figure 86 Amplitude Calibration connections for C2C and KR using DCA-X oscilloscope and M8040A



Figure 87 Amplitude Calibration connections for C2C and KR using DCA-M oscilloscope and M8040A



Figure 88 Amplitude Calibration connections for C2C and KR using UXR oscilloscope (2 channels)



Figure 89 Amplitude Calibration connections for C2C using UXR oscilloscope (4 channels)



Figure 90 Amplitude Calibration connections for CR (M8040A)

ID

Standard Name	Test ID
C2C	401100
KR	601100
CR	801100

Parameters Refer to [Calibration Parameters in Debug Mode](#) on page 108.

Procedure This calibration uses the PRBS9 pattern.
The Victim Generator Amplitude is set and measured for multiple values of Amplitude until the measured value reaches the target value.

Results The Amplitude Calibration returns pass/fail and the Set Amplitude for which the Measured Amplitude was closest to the target value.

File View Tools Help						
Set Up Select Tests Configure Connect Calibration View Run Automate Results HTML Report						
RESULTS	Test Name	Actual Value	Margin %	Pass Limits	#	Trials
	Amplitude Calibration	Pass	100.000	Pass/Fail	1	
	SJ Calibration	Pass	100.000	Pass/Fail	1	
	RJ Calibration	Pass	100.000	Pass/Fail	1	
	BUJ Calibration	Pass	100.000	Pass/Fail	1	
	Broadband Noise Calibration	Pass	100.000	Pass/Fail	1	
	Channel Characterization using COM model	Pass	100.000	Pass/Fail	1	
	Transmitter Measurements for COM Model-Rx ITol	Pass	100.000	Pass/Fail	1	
	Rx Calibration using COM model	Pass	100.000	Pass/Fail	1	
Parameter		Value				
Amplitude Calibration Result - IEEE 802.3bs NRZ C2C TP0a		Pass				
---Additional Info---						
Amplitude Calibration Results		Standard Parameter	Status	Target	Measured	Instrument Parameter
		Amplitude	Pass	800 mV	796 mV	Amplitude
						Nominal
						Actual
						800 mV
						778 mV

Figure 91 Amplitude Calibration results for C2C in the Results tab

NOTE

If any tags are applied to the test results, then the tags will be displayed under the Additional Info section (as highlighted in the above image). To learn more about tags, refer to the *Configuring Result Tags* section in the *Keysight M8091BMCA Rx Test Application for IEEE 802.3bm Online Help*.

SJ Calibration

Overview

The SJ Calibration is performed to calibrate the Sinusoidal Jitter.

Connection Diagram

Same as for Amplitude Calibration connection (refer to [Amplitude Calibration](#) on page 115).

ID

Standard Name	Test ID
C2C	401101
KR	601101
CR	801101

Parameters

Refer to [Calibration Parameters in Debug Mode](#) on page 108.

Procedure

This calibration uses the Clock/8 pattern.

The Victim Generator PJ1 is set until the desired SJ value is measured.

Results

The SJ Calibration returns the results for the set PJ1 versus measured SJ, in graphical and tabular formats.

File View Tools Help

Set UpSelect TestsConfigureConnectCalibration ViewRunAutomateResultsHTML Report

Test Name	Actual Value	Margin %	Pass Limits	# Trials
✓ Amplitude Calibration	Pass	100.000	Pass/Fail	1
✓ SJ Calibration	Pass	100.000	Pass/Fail	1
✓ RJ Calibration	Pass	100.000	Pass/Fail	1
✓ BUJ Calibration	Pass	100.000	Pass/Fail	1
✓ Broadband Noise Calibration	Pass	100.000	Pass/Fail	1
✓ Channel Characterization using COM model	Pass	100.000	Pass/Fail	1
✓ Transmitter Measurements for COM Model-Rx ITol	Pass	100.000	Pass/Fail	1
✓ Rx Calibration using COM model	Pass	100.000	Pass/Fail	1

RESULTS

Parameter	Value
SJ Calibration Result - IEEE 802.3bs NRZ C2C TP0a	Pass

Figure 92 SJ Calibration result for C2C in the Results tab

Parameter	Value						
SJ Calibration Result - IEEE 802.3cd NRZ CR Tx	Pass						
---Additional Info---							
SJ Calibration Results	Standard Parameter	Status	Target	Measured	Instrument Parameter	Nominal	Actual
	SJ	Pass	1.0000 UI	999.8 mUI	PJ1	1.0000 UI	1.0433 UI

Figure 93 SJ Calibration result for CR in the Results tab

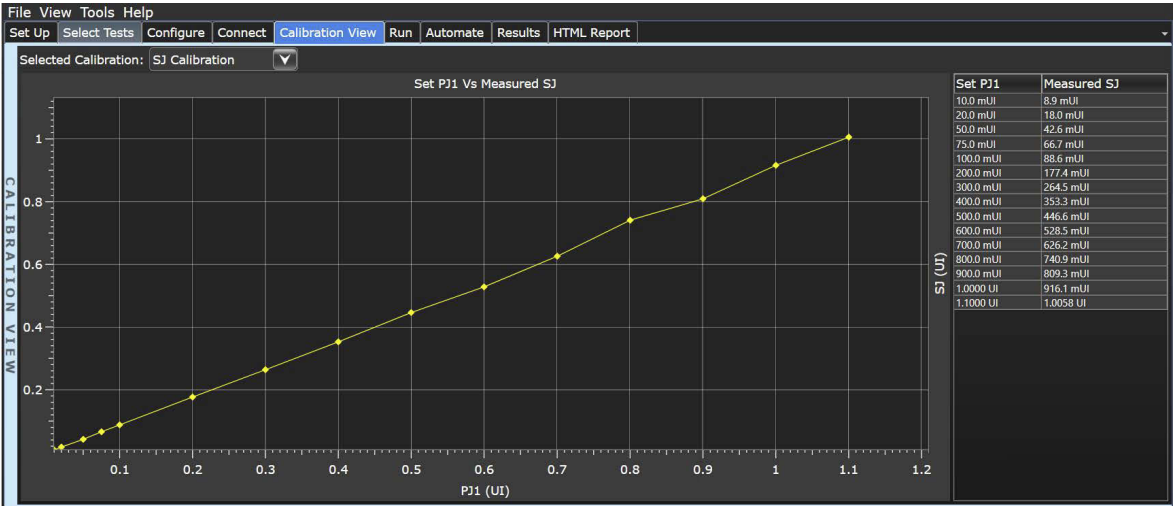


Figure 94 SJ Calibration calibrated data for C2C in Calibration View tab

RJ Calibration

Overview The RJ Calibration is performed to calibrate the Random Jitter (RJ).

Connection Diagram Same as for Amplitude Calibration connection (refer to [Amplitude Calibration](#) on page 115).

ID

Standard Name	Test ID
C2C	401102
KR	601102
CR	801102

Parameters Refer to [Calibration Parameters in Debug Mode](#) on page 108.

Procedure This calibration uses the 1010... toggle (Clock) pattern.

The Victim Generator Random Jitter (RJ) is set until the desired RJ value is measured.

Results The RJ Calibration displays the results for the set RJ versus the measured RJ, in graphical and tabular formats.

File View Tools Help

Set UpSelect TestsConfigureConnectCalibration ViewRunAutomateResultsHTML Report

Test Name	Actual Value	Margin %	Pass Limits	# Trials
Amplitude Calibration	Pass	100.000	Pass/Fail	1
SJ Calibration	Pass	100.000	Pass/Fail	1
RJ Calibration	Pass	100.000	Pass/Fail	1
BUJ Calibration	Pass	100.000	Pass/Fail	1
Broadband Noise Calibration	Pass	100.000	Pass/Fail	1
Channel Characterization using COM model	Pass	100.000	Pass/Fail	1
Transmitter Measurements for COM Model-Rx ITol	Pass	100.000	Pass/Fail	1
Rx Calibration using COM model	Pass	100.000	Pass/Fail	1

RESULTS

Parameter	Value
RJ Calibration Result - IEEE 802.3bs NRZ C2C TP0a	Pass

Figure 95 RJ Calibration result for C2C in the Results tab

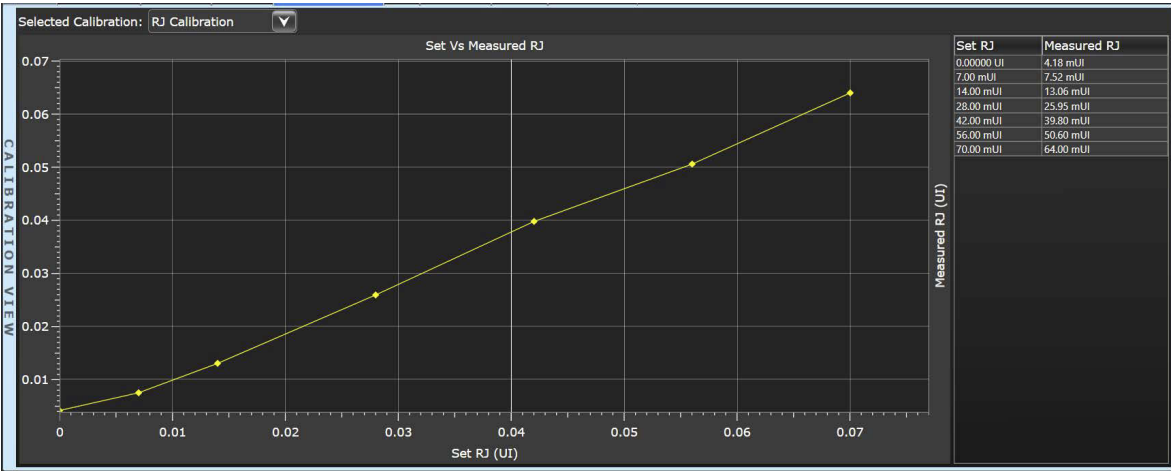


Figure 96 RJ Calibration calibrated data in Calibration View tab

BUJ Calibration

NOTE

The UBHPJ stress component comprises BUJ and SJ components. However, since the SJ component compensates for the UBHPJ component, the BUJ component is not required for calibrations. However, if you wish a BUJ component to be included for calibration, you can set the BUJ parameter and reduce the corresponding SJ component, so that the overall UBHPJ component remains the same.

Overview

The BUJ Calibration is performed to calibrate the Bounded Uncorrelated Jitter.

Connection Diagram

Same as for Amplitude Calibration connection (refer to [Amplitude Calibration](#) on page 115).

ID

Standard Name	Test ID
C2C	401103
KR	601103
CR	801103

Parameters

Refer to [Calibration Parameters in Debug Mode](#) on page 108.

Procedure

This calibration uses the 1010... toggle (Clock) pattern.

The Victim Generator BUJ is set until the desired BUJ value is measured.

Results

The BUJ Calibration returns the results for the set BUJ versus measured BUJ, in tabular format.

File View Tools Help						
Set Up Select Tests Configure Connect Calibration View Run Automate Results HTML Report						
Test Name		Actual Value	Margin %	Pass Limits	# Trials	
✓ Amplitude Calibration		Pass	100.000	Pass/Fail	1	
✓ SJ Calibration		Pass	100.000	Pass/Fail	1	
✓ RJ Calibration		Pass	100.000	Pass/Fail	1	
✓ BUJ Calibration		Pass	100.000	Pass/Fail	1	
✓ Broadband Noise Calibration		Pass	100.000	Pass/Fail	1	
✓ Channel Characterization using COM model		Pass	100.000	Pass/Fail	1	
✓ Transmitter Measurements for COM Model-Rx ITol		Pass	100.000	Pass/Fail	1	
✓ Rx Calibration using COM model		Pass	100.000	Pass/Fail	1	
Parameter		Value				
BUJ Calibration Result - IEEE 802.3bs NRZ C2C TP0a		Pass				
---Additional Info---						
BUJ Calibration Results		Standard Parameter	Status	Target	Measured	Instrument Parameter
		BUJ	Pass	100.00 mUI	99.50 mUI	BUJ
						Nominal
						Actual
						100.0 mUI
						114.3 mUI

Figure 97 BUJ Calibration result for C2C in the Results tab

Broadband Noise Calibration

Overview

The Broadband Noise Calibration is performed to calibrate the broadband noise in the Channel.

Connection Diagram

Connect the instruments as shown in [Figure 98](#) (M8040A).



Figure 98 Broadband Noise Calibration connections for C2C and KR (M8040A)

ID

Standard Name	Test ID
C2C	401104
KR	601104

Parameters Refer to [Calibration Parameters in Debug Mode](#) on page 108.

Procedure A discrete number of points from the minimum to maximum amplitude of the random interference from the Noise Generator are calibrated.

Results The Broadband Noise Calibration returns the results for the measured Broadband Noise amplitude, in graphical and tabular formats.

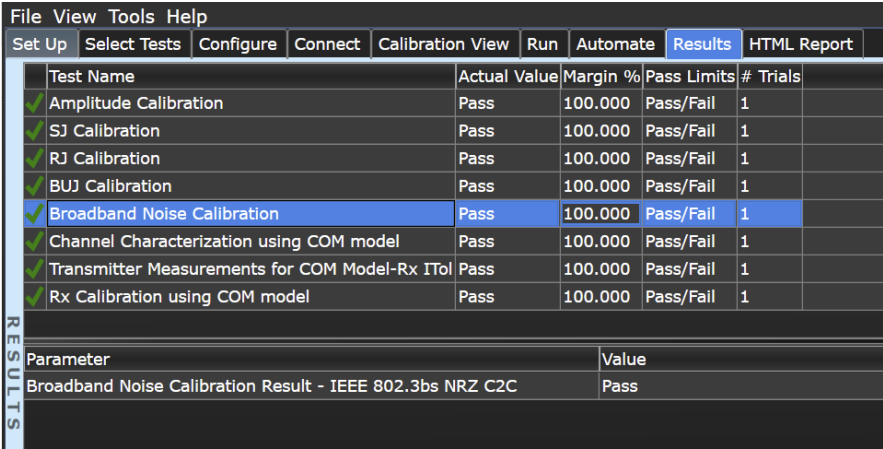


Figure 99 Broadband Noise Calibration result for C2C in the Results tab

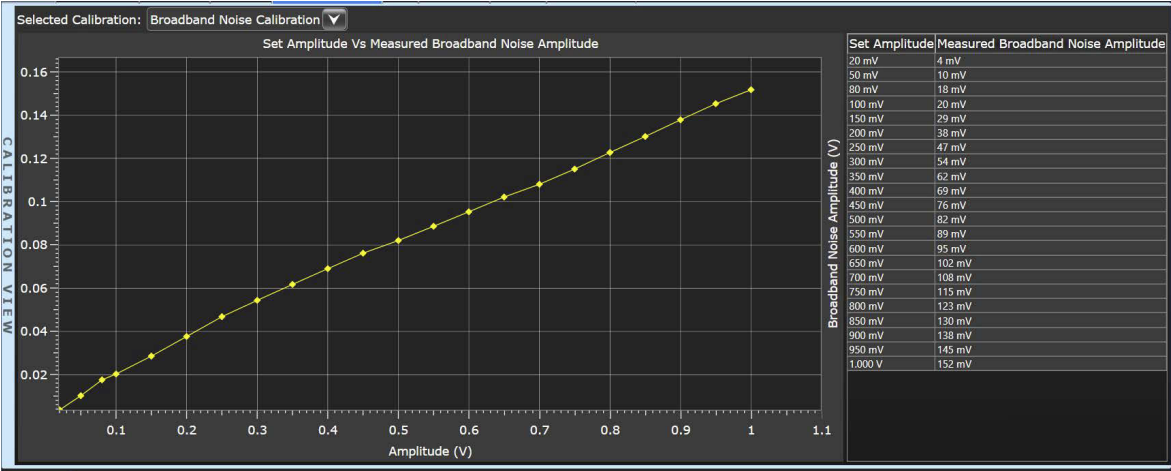


Figure 100 Broadband Noise Calibration calibrated data in Calibration View tab

SNDR Calibration

Overview The SNDR Calibration is performed to calibrate the signal to noise ratio at the Tx test reference.

Connection Diagram Same as for Amplitude Calibration connection (refer to [Amplitude Calibration](#) on page 115).

ID

Standard Name	Test ID
CR	801104

Parameters Refer to [Calibration Parameters in Debug Mode](#) on page 108.

Procedure A discrete number of points from the minimum to maximum amplitude of the random interference from the Noise Generator are calibrated.

Results The SNDR Calibration returns the results for the measured SNDR, in graphical and tabular formats.

File View Tools Help						
Set Up Select Tests Configure Connect Calibration View Run Automate Results HTML Report						
RESULTS	Test Name	Actual Value	Margin %	Pass Limits	# Trials	
	✓ Amplitude Calibration	Pass	100.000	Pass/Fail	1	
	✓ SJ Calibration	Pass	100.000	Pass/Fail	1	
	✓ RJ Calibration	Pass	100.000	Pass/Fail	1	
	✓ BUJ Calibration	Pass	100.000	Pass/Fail	1	
	✓ SNDR Calibration	Pass	100.000	Pass/Fail	1	
	✓ Channel Characterization using COM model	Pass	100.000	Pass/Fail	1	
	✓ Transmitter Measurements for COM Model-Rx ITol	Pass	100.000	Pass/Fail	1	
	✓ Rx Calibration using COM model	Pass	100.000	Pass/Fail	1	
	✓ Transmitter Measurements for COM Model-Rx JTol	Pass	100.000	Pass/Fail	1	
	✓ Rx Verification using COM model	Pass	100.000	Pass/Fail	1	
Parameter		Value				
SNDR Calibration Result - IEEE 802.3cd NRZ CR		Pass				

Figure 101 SNDR Calibration result for CR in the Results tab

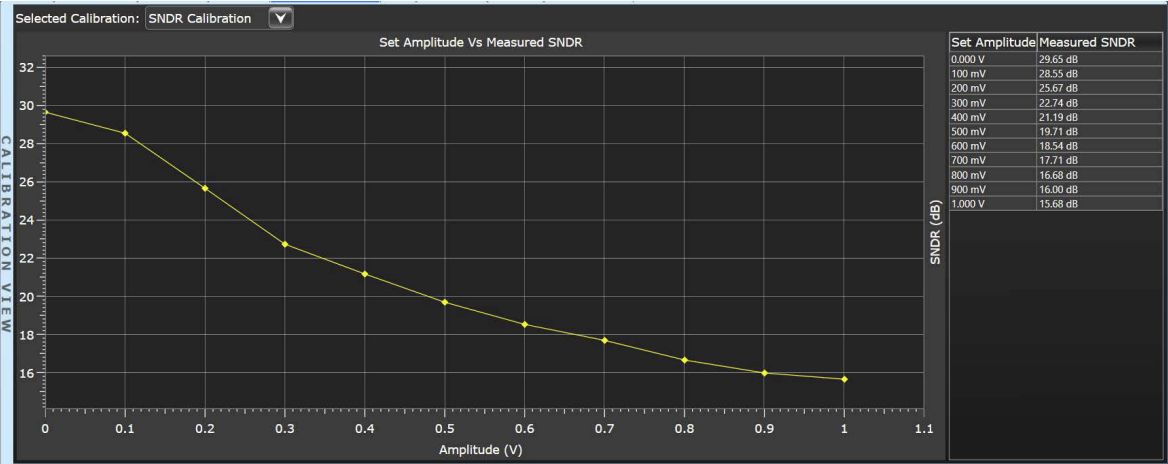


Figure 102 SNDR Calibration calibrated data for CR in the Calibration View tab

Channel Characterization using COM Model

Overview The Channel Characterization using COM Model validates the channel characteristics using COM model as per *Table 83D-5* for C2C, *Table 111-6* for KR and *Table 110-8* for CR of the *IEEE 802.3* specification. This calibration should be performed for both the low and high loss channel test cases.

Connection Diagram Connect the instruments as shown in [Figure 103](#) (C2C/KR) or [Figure 104](#) (CR).

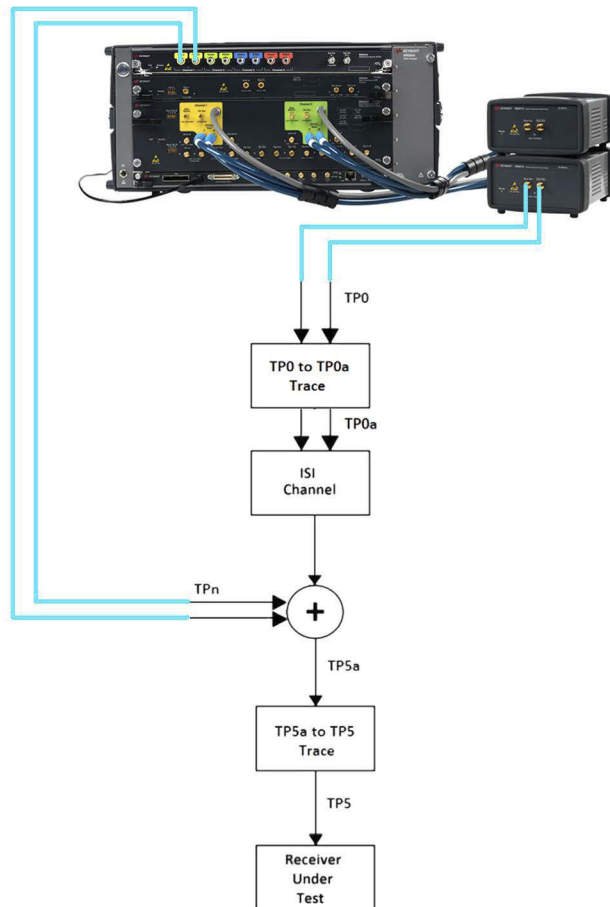


Figure 103 Channel Characterization using COM Model connections for C2C

(M8040A)

NOTE

TP0 to TP0a trace is not required for the calibrated instrument-grade transmitter.

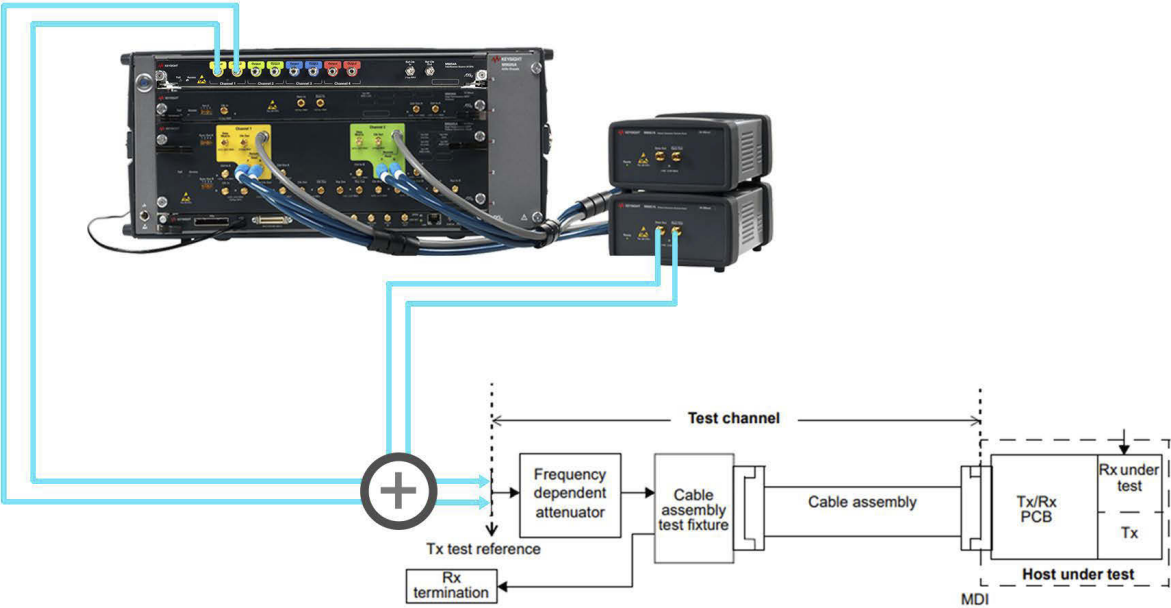


Figure 104 Channel Characterization using COM Model connections for CR (M8040A)

ID

Standard Name	Test ID
C2C	401105
KR	601105
CR	801105

Dependencies

The Channel Characterization using COM Model depends on the values configured for the following settings:

- Test Channel S-Parameter
- Excel Config File – to configure COM parameters

For more information on configuring Test Channel S-Parameter and Excel Config File, refer to [C2C/KR/CR Configuration in the Test App](#) on page 111.

Parameters Refer to [Calibration Parameters in Debug Mode](#) on page 108.

Procedure This calibration uses the PRBS13Q pattern.

Results The Channel Characterization using COM Model contains the results for all the selected Test Channel Configurations, in tabular format.

- COM, including effects of Broadband Noise
- Insertion Loss at Nyquist
- This calibration will determine the channel de-emphasis taps settings (Channel EQ Pre-cursor2/1 and Channel EQ Post-Cursor1/2) under the Configure tab and automatically updates the channel equalization coefficients in the de-emphasis taps.

File View Tools Help

Set UpSelect TestsConfigureConnectCalibration ViewRunAutomateResultsHTML Report

Test Name	Actual Value	Margin %	Pass Limits	# Trials
Amplitude Calibration	Pass	100.000	Pass/Fail	1
SJ Calibration	Pass	100.000	Pass/Fail	1
RJ Calibration	Pass	100.000	Pass/Fail	1
BUJ Calibration	Pass	100.000	Pass/Fail	1
Broadband Noise Calibration	Pass	100.000	Pass/Fail	1
Channel Characterization using COM model	Pass	100.000	Pass/Fail	1
Transmitter Measurements for COM Model-Rx ITol	Pass	100.000	Pass/Fail	1
Rx Calibration using COM model	Pass	100.000	Pass/Fail	1

Results

Parameter	Value				
Channel Characterization Result - IEEE 802.3bs NRZ C2C	Pass				
---Additional Info---					
PassLimit Min (MinInsertionLoss)	9.500 dB				
PassLimit Max (MaxInsertionLoss)	10.500 dB				
Channel Characterization using COM model Results	Measurement Name	Status	Measured Value	Margin %	Pass Limits
	Case 1 COM	Pass	7.160 dB	258.0 %	>= 2.000 dB
	Case 1 Insertion Loss	Pass	9.791 dB	29.1 %	[MinInsertionLoss dB to MaxInsertionLoss dB]
	Case 2 COM	Pass	7.160 dB	258.0 %	>= 2.000 dB
	Case 2 Insertion Loss	Pass	9.791 dB	29.1 %	[MinInsertionLoss dB to MaxInsertionLoss dB]

Figure 105 Channel Characterization using COM Model calibration results

Transmitter Measurements for COM Model – Rx ITol

Overview The Transmitter Measurements for COM Model – Rx ITol procedure measures transmitter parameters for the calculation of test channel COM as per *Table 83D-5* for C2C, *Table 111-6* for KR and *Table 110-8* for CR of the *IEEE 802.3* specification.

Connection Diagram Same as for Amplitude Calibration connection (refer to [Amplitude Calibration](#) on page 115).

ID

Standard Name	Test ID
C2C	401106
KR	601106
CR	801106

Dependencies This test depends on the values configured for the following settings:

- All C2C calibrations performed previously:
 - [Amplitude Calibration](#) on page 115
 - [SJ Calibration](#) on page 119
 - [RJ Calibration](#) on page 121
 - [BUJ Calibration](#) on page 123

Parameters Refer to [Calibration Parameters in Debug Mode](#) on page 108.

Procedure This calibration uses the PRBS9 pattern.

Results Transmitter Measurements for COM Model – Rx ITol procedure returns the results for all Transmitter Electrical Output and Jitter Output parameters for the selected Test Channel Configuration, in tabular format.

Transmitter Electrical Output Specification

- Transition Time
- SNDR

Transmitter Output Jitter Specification

- effective RJ (eRJ)
- effective BUJ (eBUJ)

File

View

Tools

Help

Set Up

Select Tests

Configure

Connect

Calibration View

Run

Automate

Results

HTML Report

Test Name	Actual Value	Margin %	Pass Limits	# Trials
✓ Amplitude Calibration	Pass	100.000	Pass/Fail	1
✓ SJ Calibration	Pass	100.000	Pass/Fail	1
✓ RJ Calibration	Pass	100.000	Pass/Fail	1
✓ BUJ Calibration	Pass	100.000	Pass/Fail	1
✓ Broadband Noise Calibration	Pass	100.000	Pass/Fail	1
✓ Channel Characterization using COM model	Pass	100.000	Pass/Fail	1
✓ Transmitter Measurements for COM Model-Rx ITol	Pass	100.000	Pass/Fail	1
✓ Rx Calibration using COM model	Pass	100.000	Pass/Fail	1

RESULTS

Parameter	Value
Transmitter Measurements - IEEE 802.3bs NRZ C2C TP0a	Pass
---Additional Info---	
Transmitter Measurements for COM Model Results	Measurement Name
	Transition Time
	eRJ
	eBUJ
	Signal-to-noise-and-distortion ratio

Measurement Value
13 ps
20.2 mUI
74.0 mUI
36.65 dB

Figure 106 Transmitter Measurements for COM Model – Rx ITol calibration results in Results tab

Rx Calibration using COM Model

Overview

The Rx Calibration using COM Model prepares the calibration data as a prerequisite to performing the Receiver Interference Tolerance Test. This calibration should be performed for both the low and high loss channel test cases.

Connection Diagram

Same as for Channel Characterization connection (refer to [Channel Characterization using COM Model](#) on page 129).

ID

Standard Name	Test ID
C2C	401107
KR	601107
CR	801107

Dependencies

This test depends on the values measured in [Transmitter Measurements for COM Model – Rx ITol](#) on page 132.

- Test Channel S-Parameters
- Noise Channel S-Parameters (only for C2C and KR)
- Excel Config File – containing COM parameter values after “Transmitter Measurements for COM Model” is performed

For more information on configuring Test Channel S-Parameters, Noise Channel S-Parameters and Excel Config File, refer to [C2C/KR/CR Configuration in the Test App](#) on page 111.

Parameters

Refer to [Calibration Parameters in Debug Mode](#) on page 108.

Procedure

For C2C and KR, the Rx Calibration using COM Model determines the Broadband Noise (RMS) value using COM calibration until the COM value begins to decrease below 3 dB.

For CR, this calibration determines the SNDR value using COM calibration until the COM value begins to decrease below the target COM.

The following parameters are modified automatically in the Excel Config File by the software, without any manual intervention:

- Tr
- Sigma RJ
- Add
- SNDR

- All parameters that are dependent on Baud Rate, such as CTLE and zeros
- RX_CALIBRATION = 1 for C2C and KR
RX_CALIBRATION = 0 for CR
- FORCE_TR = 1

Results The calibrated values are displayed in tabular format in the Results tab.

File View Tools Help						
Set Up Select Tests Configure Connect Calibration View Run Automate Results HTML Report						
RESULTS	Test Name	Actual Value	Margin %	Pass Limits	# Trials	
	✓ Amplitude Calibration	Pass	100.000	Pass/Fail	1	
	✓ SJ Calibration	Pass	100.000	Pass/Fail	1	
	✓ RJ Calibration	Pass	100.000	Pass/Fail	1	
	✓ BUJ Calibration	Pass	100.000	Pass/Fail	1	
	✓ Broadband Noise Calibration	Pass	100.000	Pass/Fail	1	
	✓ Channel Characterization using COM model	Pass	100.000	Pass/Fail	1	
	✓ Transmitter Measurements for COM Model-Rx ITol	Pass	100.000	Pass/Fail	1	
	✓ Rx Calibration using COM model	Pass	100.000	Pass/Fail	1	
Parameter		Value				
COM Rx Calibration Result- IEEE 802.3bs NRZ C2C		Pass				
---Additional Info---						
Rx calibration noise rms voltage		97.5 mV				

Figure 107 Rx Calibration using COM Model calibration results for C2C

File View Tools Help						
Set Up Select Tests Configure Connect Calibration View Run Automate Results HTML Report						
RESULTS	Test Name	Actual Value	Margin %	Pass Limits	# Trials	
	✓ Amplitude Calibration	Pass	100.000	Pass/Fail	1	
	✓ SJ Calibration	Pass	100.000	Pass/Fail	1	
	✓ RJ Calibration	Pass	100.000	Pass/Fail	1	
	✓ BUJ Calibration	Pass	100.000	Pass/Fail	1	
	✓ SNDR Calibration	Pass	100.000	Pass/Fail	1	
	✓ Channel Characterization using COM model	Pass	100.000	Pass/Fail	1	
	✓ Transmitter Measurements for COM Model-Rx ITol	Pass	100.000	Pass/Fail	1	
	✓ Rx Calibration using COM model	Pass	100.000	Pass/Fail	1	
	✓ Transmitter Measurements for COM Model-Rx JTol	Pass	100.000	Pass/Fail	1	
Parameter		Value				
COM Rx Calibration Result- IEEE 802.3cd NRZ CR		Pass				
---Additional Info---						
Rx calibration SNDR		20.9 dB				

Figure 108 Rx Calibration using COM Model calibration results for CR

Peak to Peak Amplitude Calibration for Amplitude Tolerance Test

Overview The Peak to Peak Amplitude Calibration for ATol is only for CR. It is performed to calibrate the peak to peak amplitude for the **Receiver Input Amplitude Tolerance Test** on page 153.

Connection Diagram Connect the instruments as shown in **Figure 109**.



Figure 109 Connections for Peak to Peak Amplitude Calibration for ATol for CR (M8040A)

ID

Standard Name	Test ID
CR	801111

Dependencies None.

Parameters Refer to **Calibration Parameters in Debug Mode** on page 108.

Procedure This calibration uses the PRBS9 pattern.
The Victim Generator Amplitude is set and measured for multiple values of Amplitude until the measured value reaches the target value.

Results The Peak to Peak Amplitude Calibration returns pass/fail and the Set Amplitude for which the Measured Amplitude was closest to the target value.

File View Tools Help										
Set Up		Select Tests	Configure	Connect	Calibration View	Run	Automate	Results	HTML Report	
RESULTS	Test Name	Actual Value	Margin %	Pass Limits	# Trials					
	SJ Calibration	Pass	100.000	Pass/Fail	1					
	RJ Calibration	Pass	100.000	Pass/Fail	1					
	BUJ Calibration	Pass	100.000	Pass/Fail	1					
	SNDR Calibration	Pass	100.000	Pass/Fail	1					
	Channel Characterization using COM model	Pass	100.000	Pass/Fail	1					
	Transmitter Measurements for COM Model-Rx ITol	Pass	100.000	Pass/Fail	1					
	Rx Calibration using COM model	Pass	100.000	Pass/Fail	1					
	Transmitter Measurements for COM Model-Rx JTol	Pass	100.000	Pass/Fail	1					
	Rx Verification using COM model	Pass	100.000	Pass/Fail	1					
	Peak Peak Amplitude Calibration for ATol	Pass	100.000	Pass/Fail	1					
Parameter		Value								
Amplitude Calibration Result - IEEE 802.3cd NRZ CR Tx		Pass								
---Additional Info---										
Peak Peak Amplitude Calibration for VTol Results		Standard Parameter	Status	Target	Measured	Instrument Parameter	Nominal	Actual		
		Maximum Voltage	Pass	1.200 V	1.197 V	Amplitude	1.200 V	1.167 V		

Figure 110 Peak to Peak Amplitude Calibration for ATol calibration results for CR

7 IEEE-25G C2C/KR/CR Tests

Test Parameters in Debug Mode	140
Rx Test Procedures	143
Receiver Interference Tolerance Test	145
Receiver Jitter Tolerance Test	150
Receiver Input Amplitude Tolerance Test	153

This section provides the test procedures for the IEEE 802.3 (IEEE-25G) Rx Tests that are applicable for the C2C, KR and CR standard options.

As a prerequisite, before running C2C/KR/CR tests:

- Run all IEEE 802.3 (IEEE-25G) C2C/KR/CR calibrations.
- Ensure that the DUT is properly connected to the BERT modules and the test channel.

Test Parameters in Debug Mode

The **Debug** mode in the **Configure** tab of the Test Application consists of some parameters in addition to those that can be configured in the **Compliance** mode. Besides, for some of the configuration options, you may enter custom values, which provides a greater flexibility in performing calibrations and tests.

For the **C2C (CAUI-4)**, **KR (25GBASE-KR)** and **CR (25GBASE-CR)** 25G standard options, the following parameters are available for configuration.

Table 17 Test parameters in debug mode for C2C, KR and CR options

Test Parameters	Description
Parameters Common to All Tests	
Channel 1A Skew	Specify a skew value in seconds for Channel 1A.
Channel 1B Skew	Specify a skew value in seconds for Channel 1B.
Channel 7A Skew	Specify a skew value in seconds for Channel 7A.
Channel 7B Skew	Specify a skew value in seconds for Channel 7B.
Channel 7C Skew	Specify a skew value in seconds for Channel 7C.
Channel 7D Skew	Specify a skew value in seconds for Channel 7D.
Baud Rate	Baud Rate for testing device and for all calibrations.
Channels for N109x	When using the N109x, you may use a 2-channel or 4-channel module and install the module in Slot 7.
CDR Source	Select the source used for clock recovery.
Target COM	Target COM for deciding if a test is passed or failed.
Test Channel Configuration	Specify test channel configuration that needs to be calibrated to meet COM (3 dB max).
Transmitter Pre-Cursor2	Controls the transmitter equalization coefficient for pre-cursor 2.
Transmitter Pre-Cursor	Controls the pre-cursor equalization coefficient.
Transmitter Main Cursor	Controls the main cursor equalization coefficient.
Transmitter Post-Cursor	Controls the post-cursor equalization coefficient.
Transmitter Post-Cursor2	Controls the transmitter equalization coefficient for post-cursor 2.
Channel EQ Pre-Cursor2 for ITol	Controls the pre-cursor 2 coefficient for channel equalization.

Test Parameters	Description
Channel EQ Pre-Cursor1 for ITol	Controls the pre-cursor 1 coefficient for channel equalization.
Channel EQ Main-Cursor for ITol	Controls the main-cursor coefficient for channel equalization.
Channel EQ Post-Cursor1 for ITol	Controls the post-cursor 1 coefficient for channel equalization.
Channel EQ Post-Cursor2 for ITol	Controls the post-cursor 2 coefficient for channel equalization.
Channel EQ Pre-Cursor2 for JTol	(Only KR and CR) Controls the pre-cursor 2 coefficient for channel equalization.
Channel EQ Pre-Cursor1 for JTol	(Only KR and CR) Controls the pre-cursor 1 coefficient for channel equalization.
Channel EQ Main-Cursor for JTol	(Only KR and CR) Controls the main-cursor coefficient for channel equalization.
Channel EQ Post-Cursor1 for JTol	(Only KR and CR) Controls the post-cursor 1 coefficient for channel equalization.
Channel EQ Post-Cursor2 for JTol	(Only KR and CR) Controls the post-cursor 2 coefficient for channel equalization.
Noise Generator Channel Selection	(Only KR and CR) Selects the location of the Noise Generator that shall be used for generating broadband noise.
Victim Analyzer Module	Selects the victim analyzer module for testing device.
Victim Analyzer Clock Source	Selects the clock source for the victim analyzer module. This parameter is only applicable for BERT analyzer.
Target Error Ratio	Target Error Ratio for deciding if a test is passed or failed.
Target Confidence Level	Target Confidence Level for Target Error Ratio to decide if a test is passed or failed.
DUT Control Interface Script File	Select the DCI script file to be loaded for receiver tests.
DUT Control Interface Location	DCI Location to be used for receiver tests.
Pause before starting Receiver tests	Selects if a pause is made after configuring the error detector modules and before running the alignment to allow for manual changes in the settings.
Parameters for Receiver Interference Tolerance Test	
Broadband Noise Amplitude	(Only C2C and KR) Broadband Noise Amplitude.
Broadband Noise Selector	(Only C2C and KR) Select between manual or calibrated broadband noise amplitude.
SNDR	(Only CR) Signal to Noise and Distortion Ratio.
SNDR Selector	(Only CR) Select between manual or calibrated SNDR.
Test Mode	(Only C2C) Test just for predefined SJ Frequencies (if you select Compliance) or measure SJ Frequency (if you select Characterization).

Test Parameters	Description
Jitter Profile Frequency1	(Only C2C) Defines the first corner frequency of the jitter profile.
Jitter Profile Amplitude1	(Only C2C) Defines the jitter amplitude at first corner frequency of the jitter profile.
Jitter Profile Frequency2	(Only C2C) Defines the second corner frequency of the jitter profile.
Jitter Profile Amplitude2	(Only C2C) Defines the jitter amplitude at second corner frequency of the jitter profile.
Jitter Profile Frequency3	(Only C2C) Defines the third corner frequency of the jitter profile.
Jitter Profile Amplitude3	(Only C2C) Defines the jitter amplitude at third corner frequency of the jitter profile.
Frequency Mode	(Only C2C) Select between Auto and Manual frequency mode.
Start Frequency	(Only C2C) Controls the start frequency of the jitter sweep.
Stop Frequency	(Only C2C) Controls the stop frequency of the jitter sweep.
Number of Steps	(Only C2C) The number of steps within the jitter sweep.
Manual Frequency List	(Only C2C) List of Jitter frequencies separated by commas.
Parameters for Receiver Jitter Tolerance Test	
Jitter Profile Frequency1	(Only KR and CR) Defines the first corner frequency of the jitter profile.
Jitter Profile Amplitude1	(Only KR and CR) Defines the jitter amplitude at first corner frequency of the jitter profile.
Jitter Profile Frequency2	(Only KR and CR) Defines the second corner frequency of the jitter profile.
Jitter Profile Amplitude2	(Only KR and CR) Defines the jitter amplitude at second corner frequency of the jitter profile.

Rx Test Procedures

Overview of Receiver Tests

Table 18 shows a summary of steps for each procedure that must be performed for Rx tests. The figures mentioned in the table and in the steps in this section are based on those in *Annexure 93C* of IEEE Std 802.3bj-2014, Amendment to IEEE Std 802.3-2012: Ethernet.

Table 18 Rx test procedure step summary

#	Procedure	Test Channel Configuration	Summary of steps to be performed
1	Rx Interference Tolerance Test	Perform Rx Interference Tolerance Test for both the low loss and high loss channel.	Perform Rx interference tolerance test (see setup in Figure 27 on page 60).
2	Rx Jitter Tolerance Test	Perform Rx Jitter Tolerance Test for high loss channel.	Perform Rx jitter tolerance test (see setup in Figure 27 on page 60).

These procedures are broadly described in the following section.

Detailed Steps for Rx Test Procedures

Step#1. Rx Interference Tolerance Test

- 1 Using the test setup in [Figure 27](#) on page 60, the transmitter taps and the channel noise as determined in the calibration procedures, configure the transmitter to transmit the test pattern specified in the PMD clause that invokes this method.
- 2 Configure the transmitters of the device under test to transmit the same test pattern, with their transmitters in the preset condition.
- 3 Measure the BER using the PRBS31 pattern on the receiver under test using the built-in error counter (DCI) or by activating the DUT internal loopback mode and using a short loopback channel (IL < 7 dB @ 26.5625 GHz) to an M8046A error detector.
- 4 The choices of Victim Analyzer Module can be set as shown in Figure xxx.

Step#2. Rx Jitter Tolerance Test

- 1 Using the test setup in [Figure 27](#) on page 60 and the transmitter taps (but without the channel noise) as determined in the calibration

- procedures, configure the transmitter to transmit the test pattern specified in the PMD clause that invokes this method.
- 2 Configure the transmitters of the PMD under test to transmit the same test pattern, with their transmitters in the preset condition.
 - 3 Measure the BER using the PRBS31 pattern on the receiver under test using the built-in error counter (DCI) or by activating the DUT internal loopback mode and using a short loopback channel (IL < 7dB @ 26.5625G Hz) to an M8046A error detector.

For each case listed in Table 19, the receiver under test shall meet the BER measurements as specified in Table 83D-5 for C2C, Table 111-6 for KR and Table 110-8 for CR of the IEEE 802.3 specification.

Table 19 Receiver jitter tolerance parameters

Parameter	Units	Case A	Case B	Case C	Case D	Case E
For C2C						
Jitter frequency	MHz	0.1	3.3	10	30	100
Jitter amplitude (pk-pk)	UI	5	0.15	0.05	0.05	0.05
For KR and CR						
Jitter frequency	kHz	190	940			
Jitter amplitude (pk-pk)	UI	5	1			

NOTE

The BER reported in the standard assume that the error statistics are sufficiently random to result in the required frame loss ratio. Error statistics can be characterized using the M8046A error detector together with the M8070EDAB package.

NOTE

For C2C, only the Interference Tolerance test is performed. In this case, the jitter tolerance parameters are applied in the Interference Tolerance Test.

Receiver Interference Tolerance Test

Overview The Receiver Interference Tolerance Test validates that the receiver on each lane meets the BER requirement with channels matching the Channel Operating Margin (COM) and loss parameters for Test 1 and Test 2. This test should be performed for both the low and high loss channel test cases.

Connection Diagram Connect the instruments as shown in [Figure 111](#) (C2C and KR) and [Figure 112](#) (CR).

For C2C and KR connect:

- Set Device to Loopback.
- Connect the Victim Generator's Data Out 1 P/N to test point T P/N of ISI channel.
- Connect the ISI channel test point T P/N to thru path of matched directional coupler pair.
- Connect the Noise Generator's Data Out 1 P/N to couple path of matched directional coupler pair.
- Connect the Directional coupler's Data Out P/N to Test point T P/N of Receiver test fixture.
- Connect the Receiver test fixture's Test point T P/N to Receiver under test.
- Internal CDR
 - Connect the Victim Analyzer Data In P/N to Test point of looped back signal P/N.
- External CDR
 - Connect the Recovered Clock Out from Clock Recovery to Victim Analyzer's Clk In.
 - Connect the Victim Analyzer's Data In P/N to Test point of looped back signal P/N via Pick-Off.
- Terminate the Crosstalk Generator's Data Out_2 P/N with 50 ohms.

NOTE

TP0 to TP0a trace is not required for the calibrated instrument-grade transmitter.

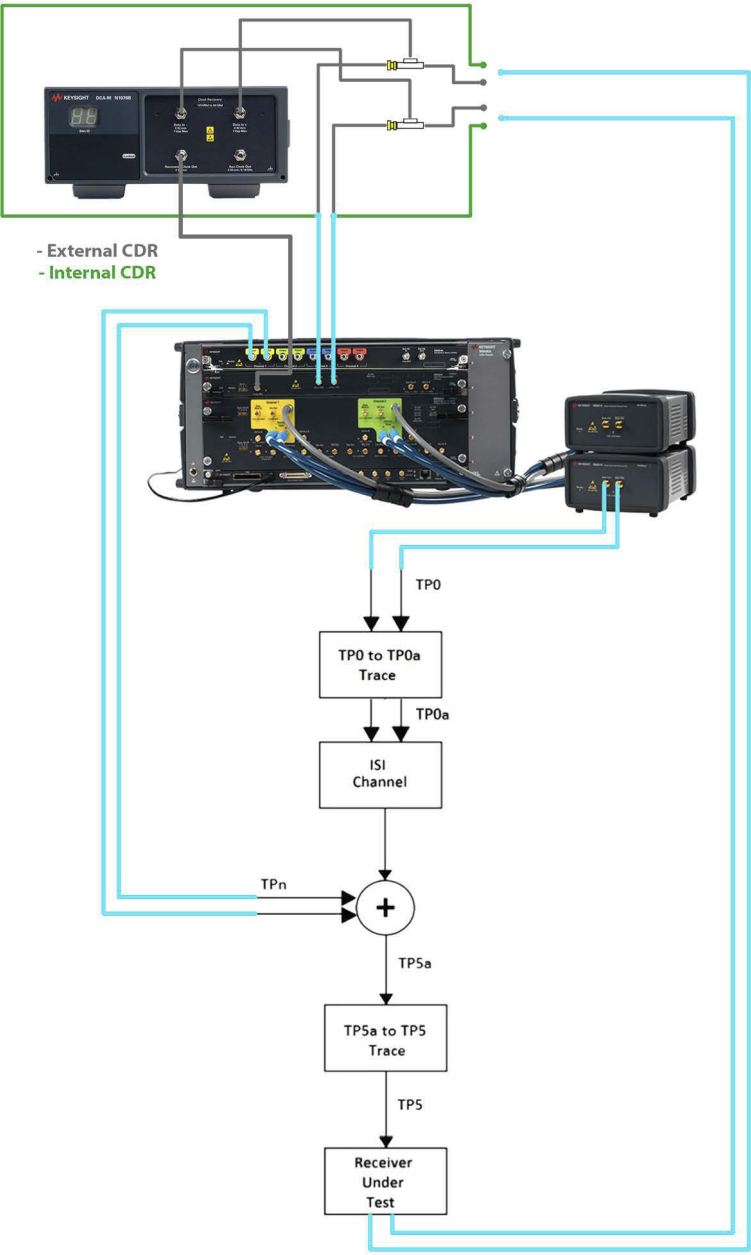


Figure 111 Rx Interference Tolerance Test connections for C2C and KR (M8040A)

For CR connect:

- Host Device and Test channel (frequency-dependent attenuator, test fixture and cable assembly).
- Set Device to Loopback.
- Connect the Victim Generator's Data Out 1 P/N to the power combiners via blocking capacitors.
- Connect the Noise Generator's Data Out 1 P/N to the power combiner of Victim Generator's Data Out P/N.
- Connect the power combiner of Data Out P/N to Tx test reference of Test channel.
- Internal CDR
 - Connect the Victim Analyzer's Data In P/N to Test point of looped back Rx under test signal P/N.
- External CDR
 - Connect the Recovered Clock Out from Clock Recovery to Victim Analyzer's Clk In.
 - Connect the Victim Analyzer's Data In P/N to Test point of looped back Rx under test signal P/N via pick-off.
 - Connect the Data for clock recovery from pick-offs.
- Terminate the Crosstalk Generator's Data Out_2 P/N with 50 ohms.

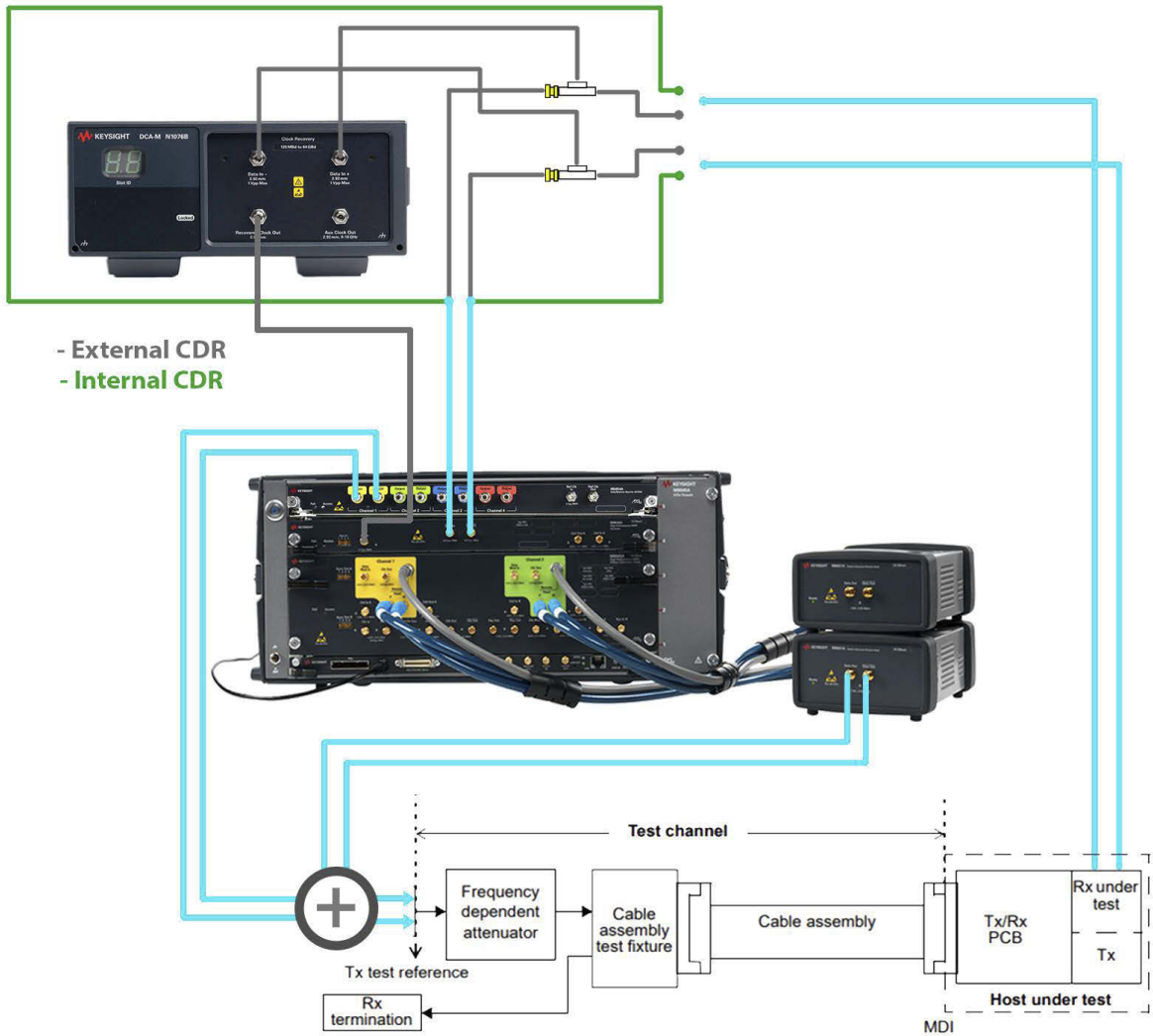


Figure 112 Rx Interference Tolerance Test connections for CR (M8040A)

ID

Standard Name	Test ID
C2C	405100
KR	605100
CR	805100

Dependencies

The Receiver Interference Tolerance Test depends on the values configured for the following calibrations:

- [Broadband Noise Calibration](#) on page 125 (for C2C and KR)
- [SNDR Calibration](#) on page 127 (for CR)
- [Transmitter Measurements for COM Model – Rx ITol](#) on page 132
- [Rx Calibration using COM Model](#) on page 134

Parameters

Refer to [Test Parameters in Debug Mode](#) on page 140.

Procedure

This test uses the PRBS31 pattern.

Results

This test attains 'Pass' value if the Rx BER is less than the target value as per the IEEE 802.3 specifications.

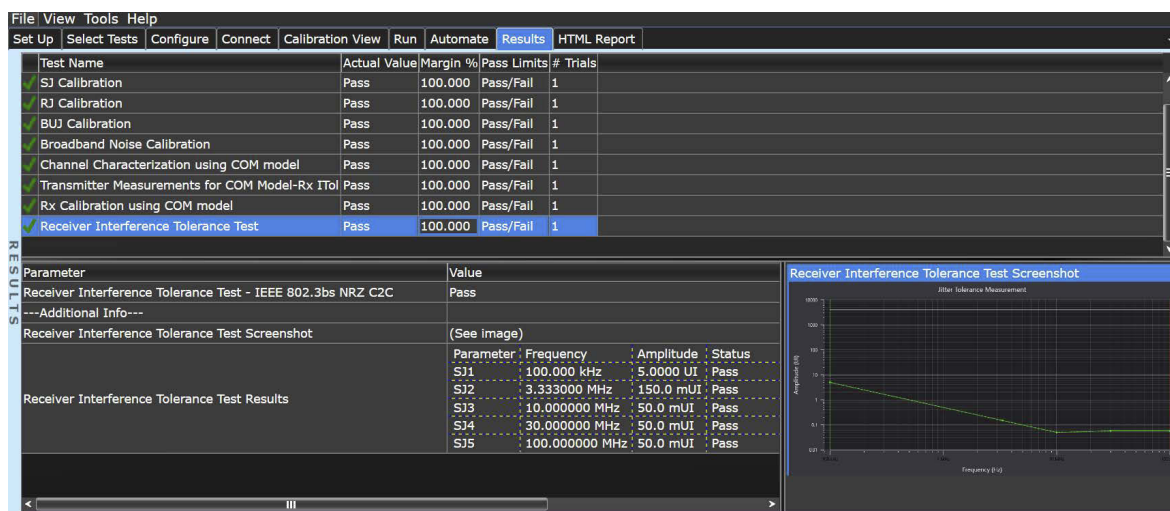


Figure 113 Rx Interference Tolerance Test results in tabular format

Receiver Jitter Tolerance Test

Overview

The Receiver Jitter Tolerance Test validates that the receiver bit error ratio (BER) meets the requirements for each pair of jitter frequency and peak-to-peak amplitude values as per the IEEE 802.3 specification. This test is only required for the high loss channel test case.

Connection Diagram

For KR: Connect the instruments as shown in [Figure 114](#).

For CR: Connect the instruments as for Receiver Interference Tolerance Test ([Figure 111](#) on page 146).

For KR connect:

- Set Device to Loopback.
- Connect the Victim Generator's Data Out 1 P/N to test point T P/N of ISI channel.
- Connect the ISI channel test point T P/N to thru path of matched directional coupler pair.
- Terminate the Noise Generator's Data Out 1 P/N with 50 ohms.
- Connect the Directional coupler's Data Out P/N to Test point T P/N of Receiver test fixture.
- Connect the Receiver test fixture's Test point T P/N to Receiver under test.
- Internal CDR
 - Connect the Victim Analyzer's Data In P/N to Test point of looped back signal P/N.
- External CDR
 - Connect the Recovered Clock Out from Clock Recovery to Victim Analyzer's Clk In.
 - Connect the Victim Analyzer's Data In P/N to Test point of looped back signal P/N via pick-off.
- Terminate the Crosstalk Generator's Data Out 2 P/N with 50 ohms.

NOTE

TP0 to TP0a trace is not required for the calibrated instrument-grade transmitter.

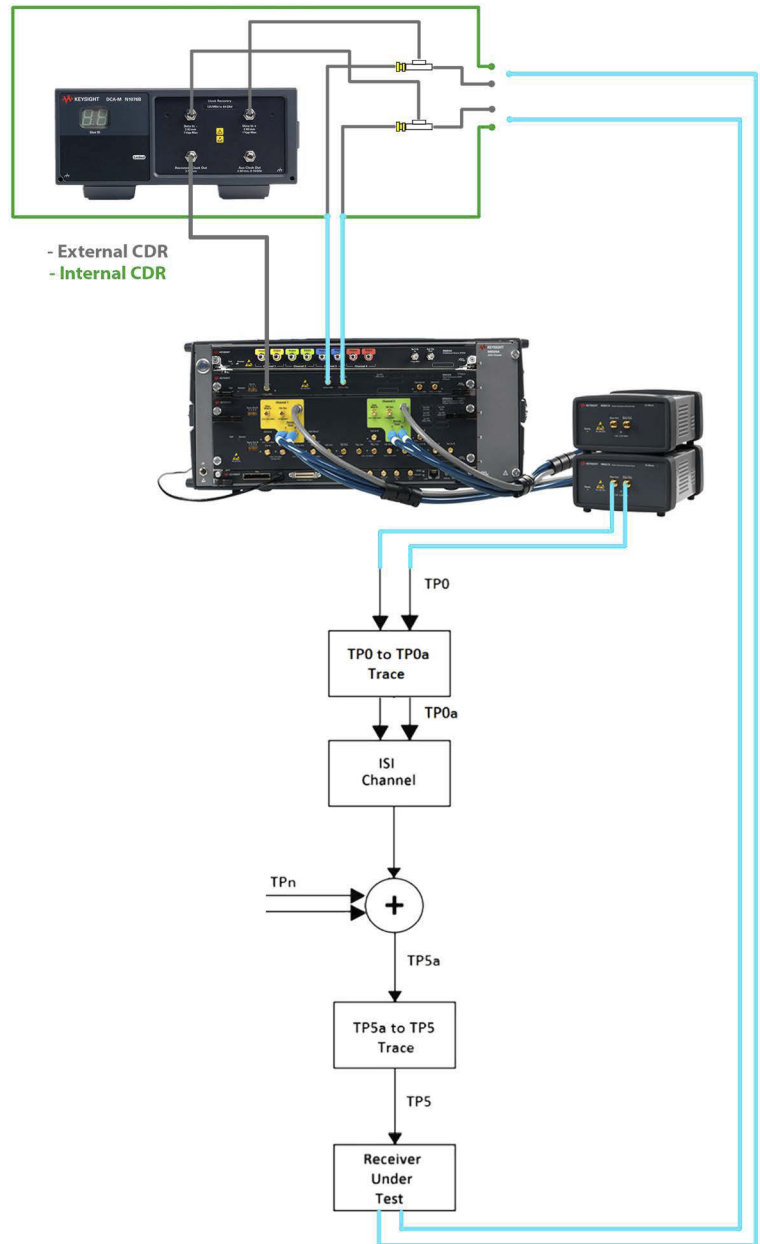


Figure 114 Rx Jitter Tolerance Test connections for KR (M8040A)

ID

Standard Name	Test ID
KR	605101
CR	805101

Dependencies The Receiver Jitter Tolerance Test depends on the values configured for the following calibration:

- [SJ Calibration](#) on page 119

Parameters Refer to [Test Parameters in Debug Mode](#) on page 140.

Procedure This test uses the PRBS31 pattern.

Results This test returns Pass/Fail for each Sinusoidal Jitter Amplitude & Frequency pair point.

Parameter	Value			
Receiver Jitter Tolerance Test - IEEE 802.3cd NRZ CR	Pass			
---Additional Info---				
Receiver Jitter Tolerance Test Results	Parameter	Frequency	Amplitude	Status
	SJ1	190.000 kHz	5.0000 UI	Pass
	SJ2	940.000 kHz	1.0000 UI	Pass

Figure 115 Rx Jitter Tolerance Test results

Receiver Input Amplitude Tolerance Test

Overview The Receiver Input Amplitude Tolerance Test validates the acceptance of the differential input peak-to-peak amplitudes produced by the extreme operating conditions from the transmitter.

Connection Diagram Connect the instruments as shown in [Figure 111](#).

Connect:

- Host Device and Test channel (Frequency dependent attenuator, test fixture and cable assembly).
- Set the Device to Loopback.
- Connect the Victim Generator's Data Out 1 P/N to Tx test reference of Test channel.
- Internal CDR
 - Connect the Victim Analyzer's Data In P/N to Test point of looped back Rx under test signal P/N.
- External CDR
 - Connect the Recovered Clock Out from Clock Recovery to Victim Analyzer's Clk In.
 - Connect the Victim Analyzer's Data In P/N to Test point of looped back Rx under test signal P/N via pick-off.
 - Connect the Data for Clock Recovery from pick-offs.
- Terminate the Crosstalk Generator's Data Out 2 P/N with 50 ohms.

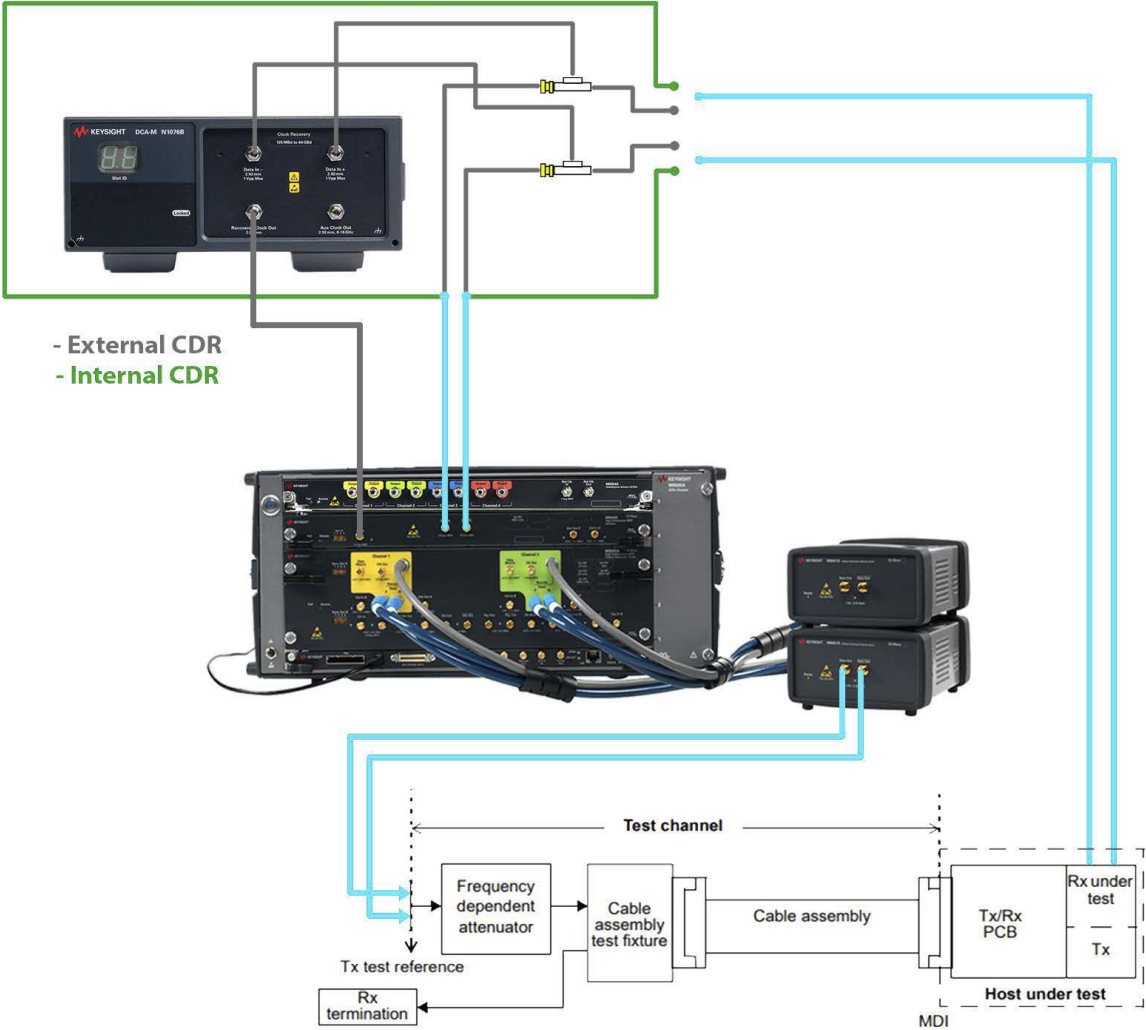


Figure 116 Rx Input Amplitude Tolerance Test connections

ID	
Standard Name	Test ID
CR	805102

Dependencies The Receiver Input Amplitude Tolerance Test depends on the values configured for the following calibration:

- **Peak to Peak Amplitude Calibration for Amplitude Tolerance Test** on page 136

Parameters Refer to **Test Parameters in Debug Mode** on page 140.

Procedure This test uses the PRBS31 pattern.

The maximum voltage is set on the pattern generator and a BER test is performed for that amplitude.

Results The Rx Input Amplitude Tolerance Test displays the pass/fail result and additional information in the Results tab.

- Parameter:
 - Maximum Voltage

File View Tools Help

Set Up	Select Tests	Configure	Connect	Calibration View	Run	Automate	Results	HTML Report	
RESULTS	Test Name	Actual Value	Margin %	Pass Limits	# Trials				
	✓ RJ Calibration	Pass	100.000	Pass/Fail	1				
	✓ BUJ Calibration	Pass	100.000	Pass/Fail	1				
	✓ SNDR Calibration	Pass	100.000	Pass/Fail	1				
	✓ Channel Characterization using COM model	Pass	100.000	Pass/Fail	1				
	✓ Transmitter Measurements for COM Model-Rx ITol	Pass	100.000	Pass/Fail	1				
	✓ Rx Calibration using COM model	Pass	100.000	Pass/Fail	1				
	✓ Transmitter Measurements for COM Model-Rx JTol	Pass	100.000	Pass/Fail	1				
	✓ Rx Verification using COM model	Pass	100.000	Pass/Fail	1				
	✓ Peak Peak Amplitude Calibration for ATol	Pass	100.000	Pass/Fail	1				
	✓ Receiver Input Amplitude Tolerance Test	Pass	100.000	Pass/Fail	1				
	Parameter		Value						
Receiver Input Amplitude Tolerance Test - IEEE 802.3cd NRZ CR		Pass							
---Additional Info---									
Receiver Input Amplitude Tolerance Test Results		Parameter	Status	Maximum					
		MaximumVoltage	Pass	1.200 V					

Figure 117 Rx Input Amplitude Tolerance Test results in Results tab

8 Calibration & Test Results

About Calibration View 158
Exporting Measurement Results to Repository 160

This chapter describes how calibration results can be displayed in the Calibration View tab and how the 'Upload Results To Repository' feature facilitates making results available to collaborators anywhere in the world.

About Calibration View

The **Calibration View** tab displays the results from the calibrations run, in both graphical and tabular format.

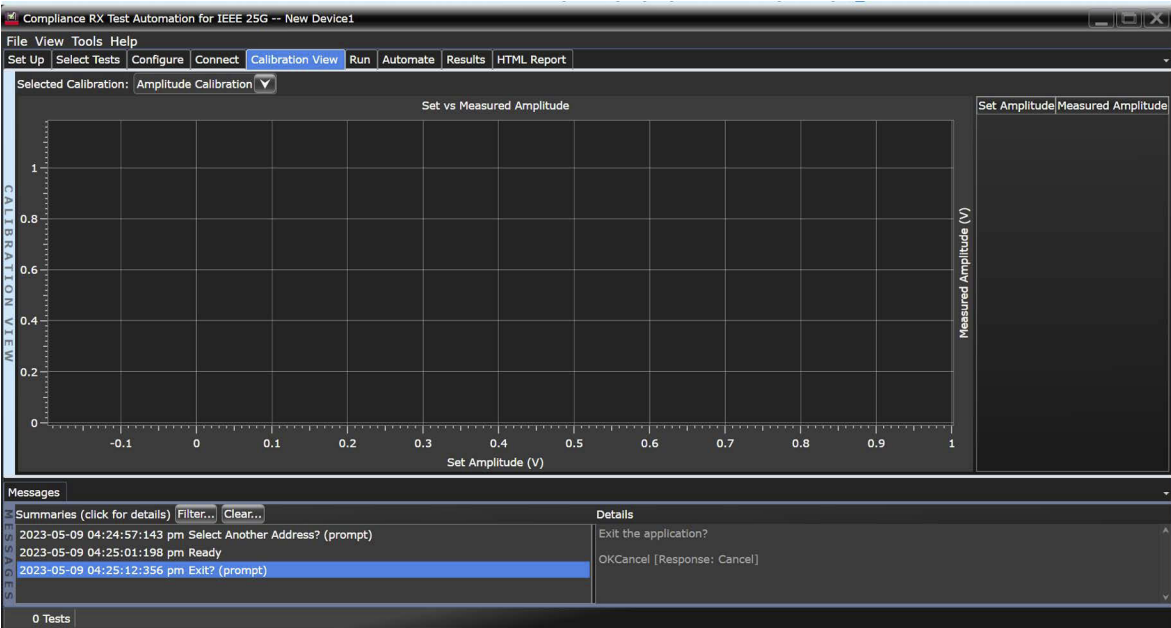


Figure 118 Default display of the Calibration View

After successful completion of the calibration run, the calibration results are reported in the **Calibration View** tab and **Results** tab.

The calibration results under the **Calibration View** tab include the following measurements:

- Set and measured values of the parameters being calibrated in a tabular format.
- Set and measured values of the parameters being calibrated in a graphical format.

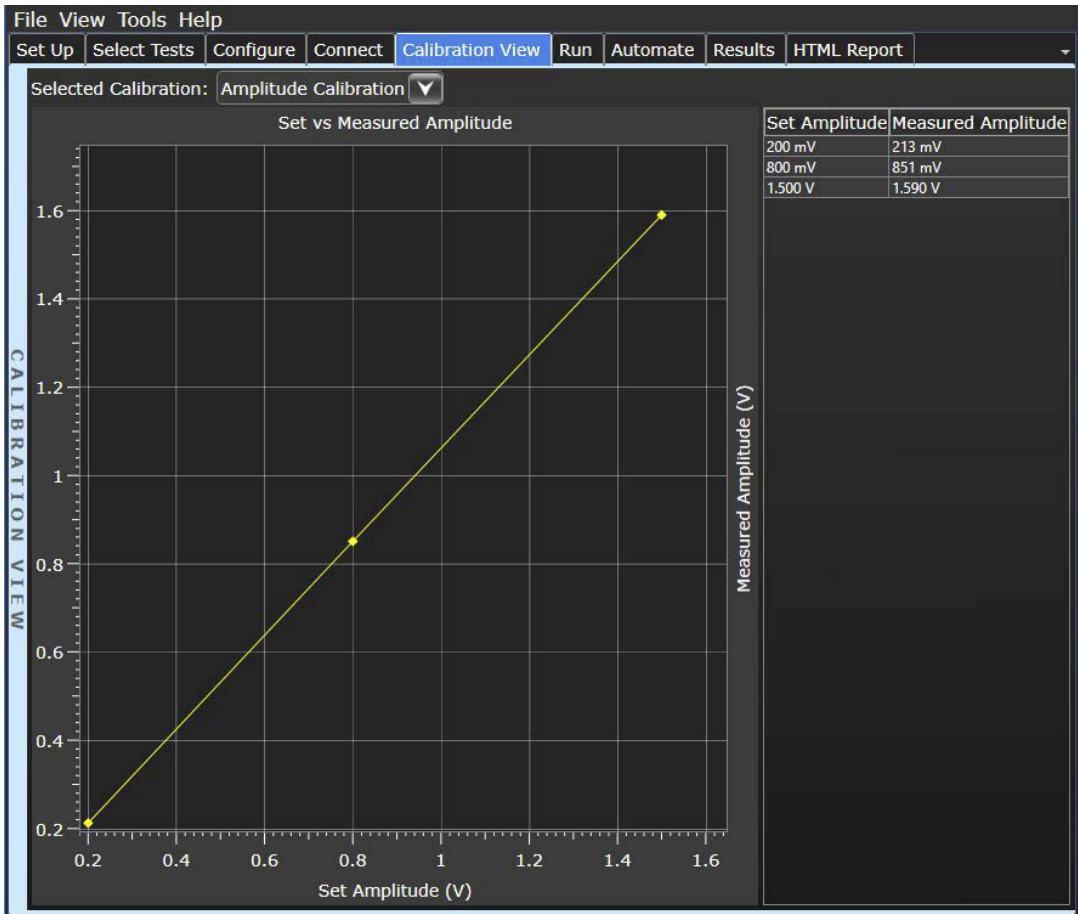


Figure 119 Display of the Calibration View after calibrations have been performed

NOTE

The Calibration View plots graphs only for continuous calibrations (such as Amplitude, SJ, UUGJ and Broadband Noise), not for single-point calibrations.

The Calibration View tab displays information related to calibrations only. All other results and associated information are displayed under the Results tab of the Test Application.

Exporting Measurement Results to Repository

The Upload Results To Repository feature is an add-on to the Keysight Test Application, where it expands the boundaries of storing and analyzing the measurement results to a wider audience, who may be based in multiple sites across various geographical locations. Along with the feature of exporting test results from the Test Application into your local disk in a CSV, HTML or PDF file formats, you have the option to upload the test results to a Dataset on a Web Repository. Based on your requirements, you may either upload only a single measurement trial or upload huge volumes of measurement results to any Dataset.

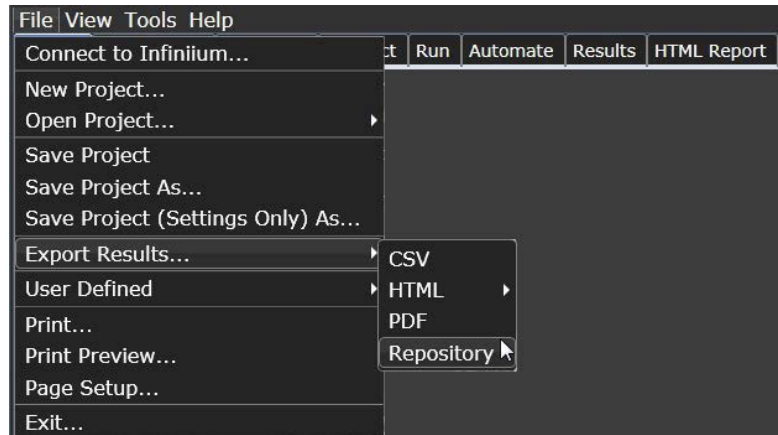
Not only can remote users with an active internet connection access these Datasets and the corresponding test results on the Web Repository, but they have the option to add and delete Datasets on the Web Server. In the Upload Results To Repository feature, you can even modify the Dataset properties, which is helpful especially when performing a graphical analysis of the uploaded data.

In combination with the *Keysight KS6800A Series Data Analytics Software*, the Upload Results To Repository feature provides a comprehensive solution to export, view and perform analysis of the measurement results, thereby resulting in qualitative data to ensure that the Device Under Test (DUT) is compliant to the industry standards.

Refer to the *Keysight KS6800A Series Data Analytics Software Online Help* for more information about the functionality of various features in this software.

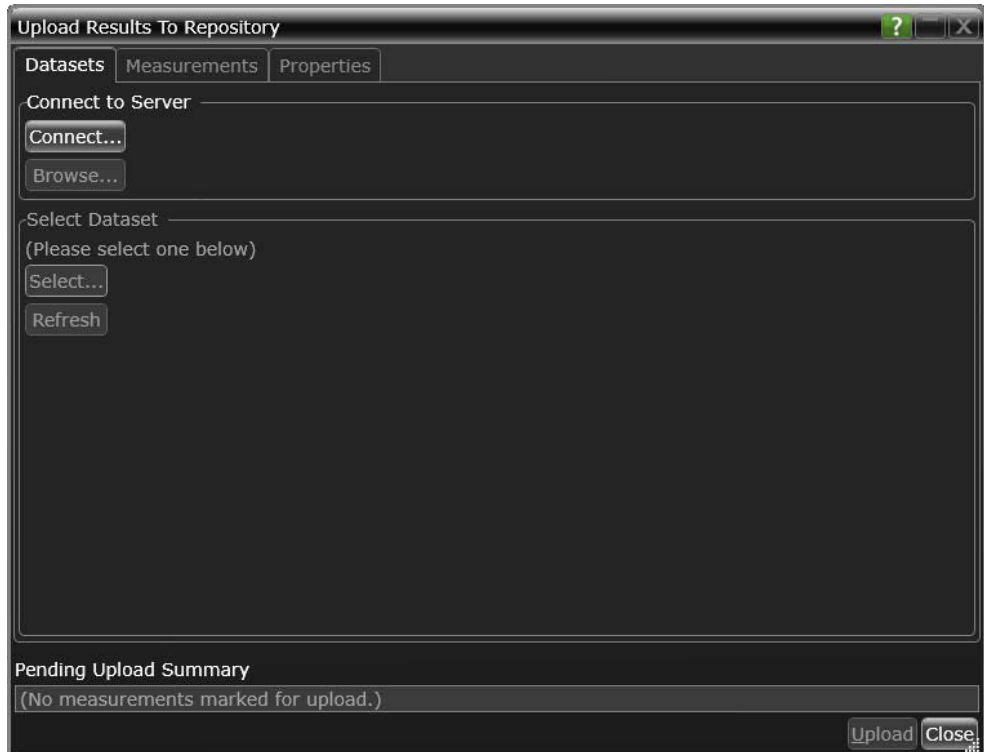
To export measurement results to the Repository after the completion of test runs,

- 1 From the Test Application's main menu, click **File > Export Results... > Repository**.



The **Upload Results to Repository** window appears.

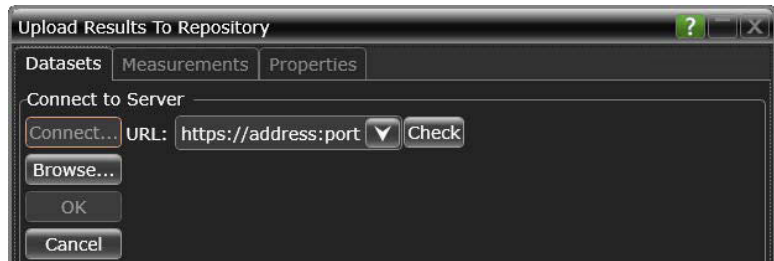
- 2 In the **Connect to Server** pane of the **Datasets** tab, click **Connect...** to login to the Dataset Repository server.



- 3 In the URL: drop-down text field that appears, replace the default text with the actual IP address or the URL along with the port number, if applicable.

You may enter the URL of the Web Repository server, which may be a self-hosted server on your machine (<http://localhost:5000/>), a remote server or an authentication server. Note that all such URLs accessed via this window appear as a drop-down list in the URL: field.

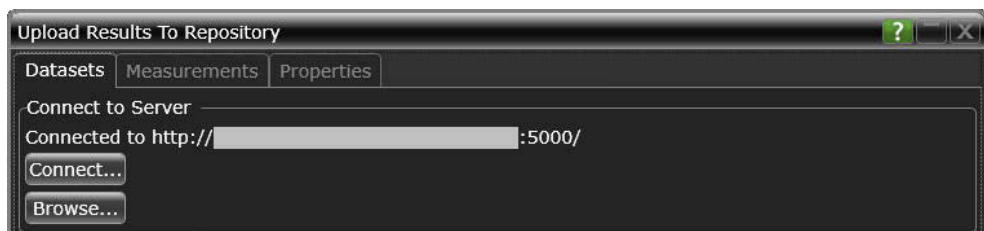
- 4 Click the **Check** button to verify that the KS6800A Series Data Analytics service is available on the specified web address. Repeat this step each time you edit the web address.



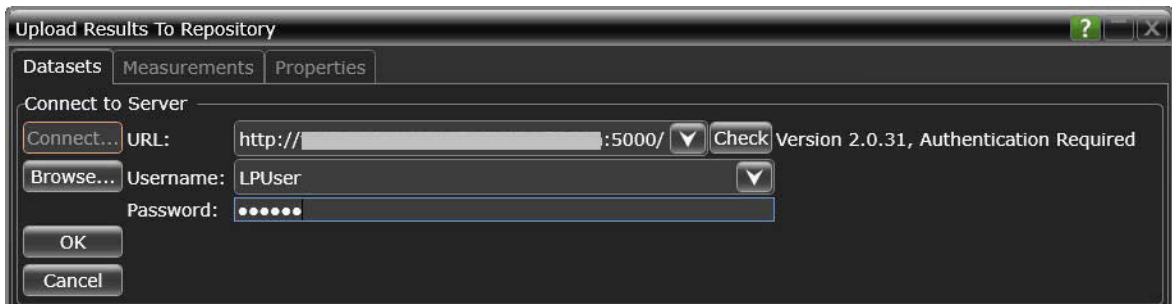
- In the case of unrestricted access to the Repository:
 - a If the server does not require authentication and the KS6800A Series Data Analytics service is found on the specified web address, the version information is displayed adjacent to the Check button.



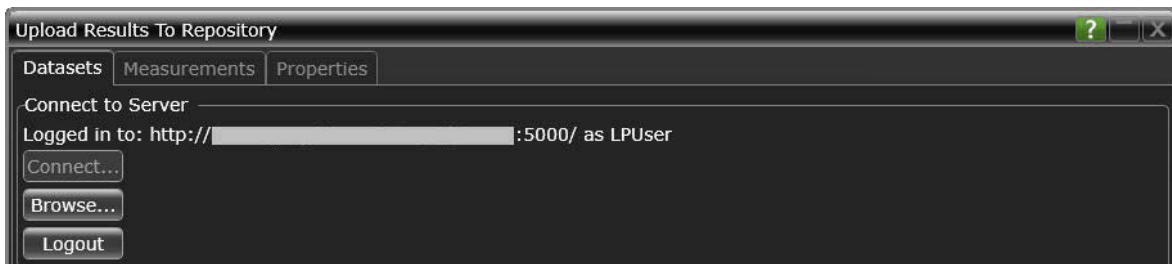
- b If you click **OK**, the Upload Results to Repository window displays the connectivity status to the Dataset Repository.
- c Click **Browse...** to navigate directly to the URL.



- In the case of restricted access to the Repository:
 - a If service is found on the specified URL but access to the web server is restricted based on authentication, the version information is displayed along with the text Authentication Required adjacent to the Check button. Also, the Username: and Password: fields appear. The OK button remains disabled until the authentication credentials are entered.
 - b Enter the user credentials in the respective fields, which are required for authentication to access those Datasets that have been created on the web server you are connecting to. For each URL that you access, the Username: drop-down box keeps a record and displays all user names used to access the respective URL.

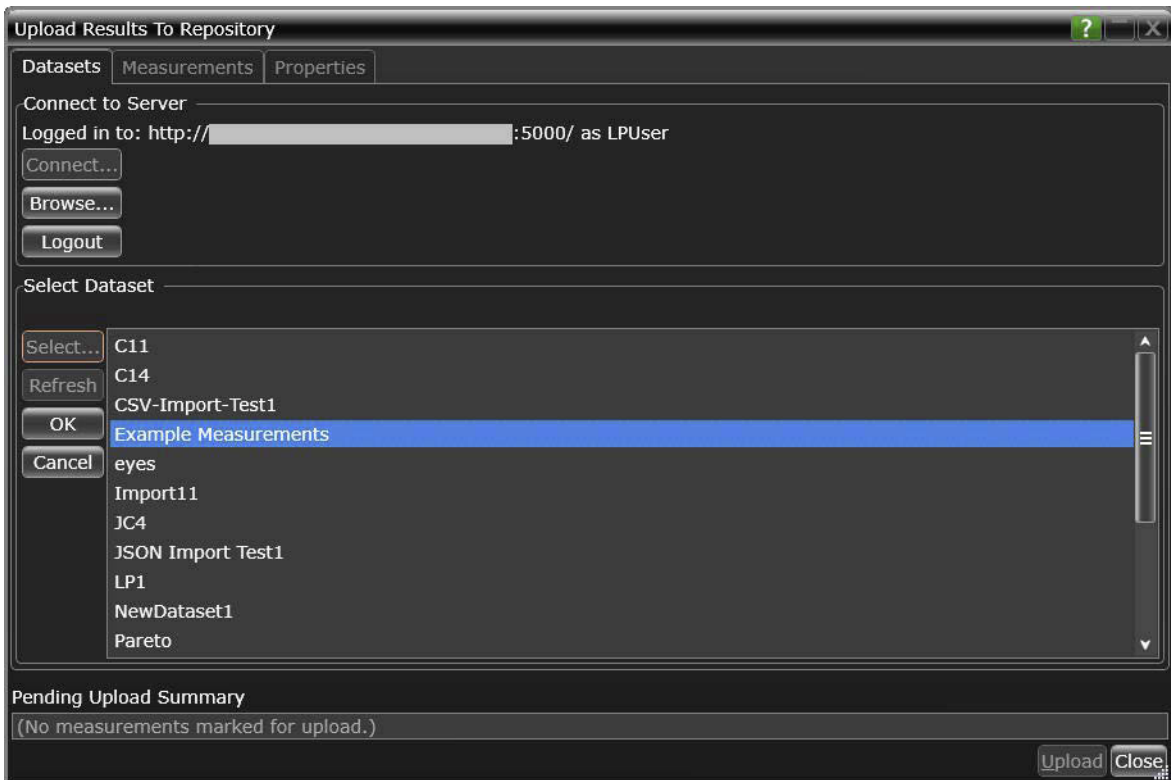


- c Click **OK** to connect to the entered URL/IP address.
The Connect to Server area displays the connection status along with the username.
- d Click **Browse...** to navigate directly to the URL.

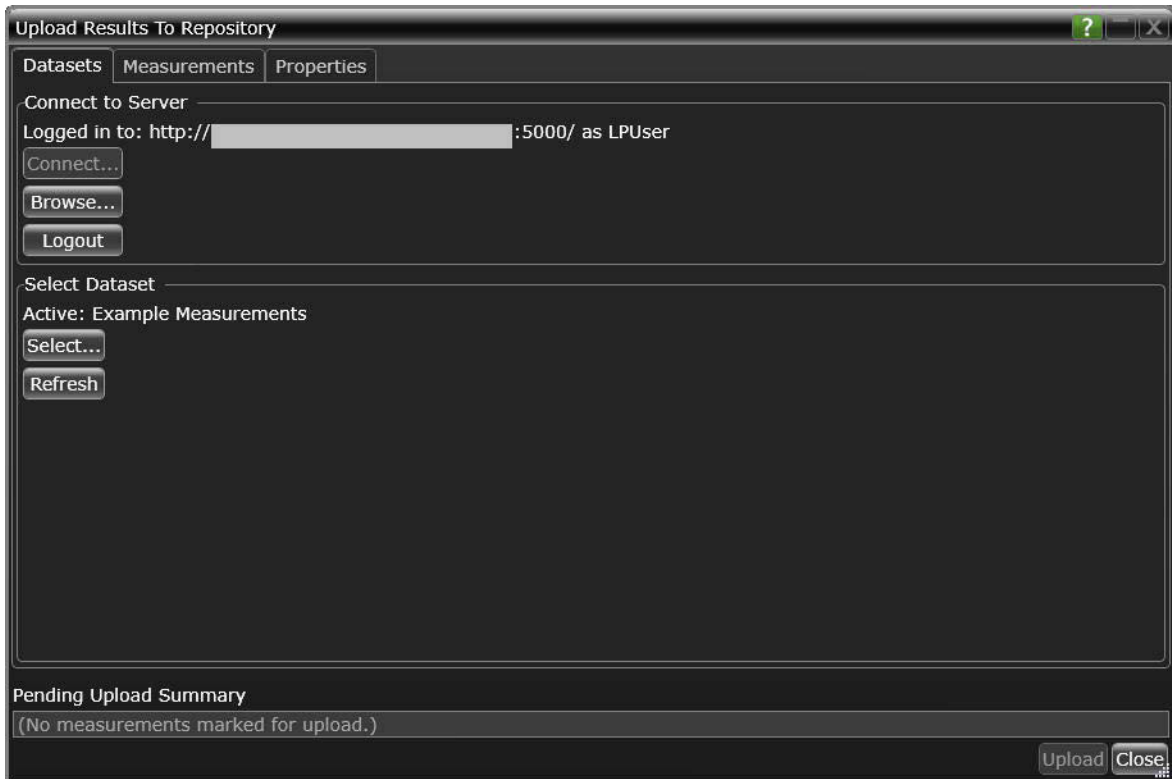


- 5 In the Select Dataset area, click **Select...** to view the list of Datasets created on the connected repository. Click **Refresh** to update the list of Datasets that appear in the Test Application's user interface.

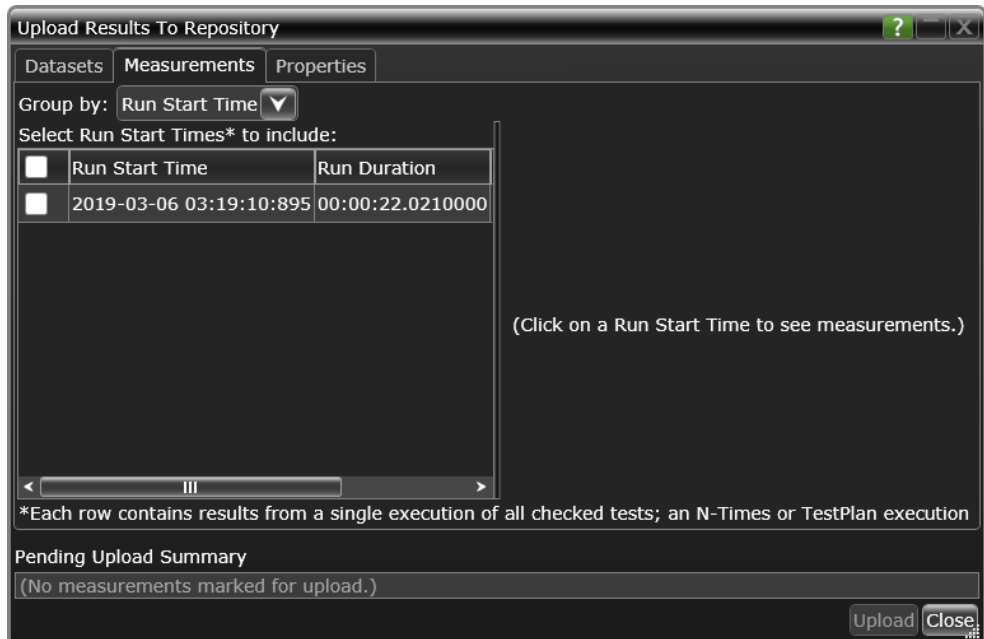
- 6 Select the Dataset name where you wish to upload measurement results to. Click **OK**.



The Select Dataset area displays the selected Dataset as Active. The Measurements and Properties tabs are enabled after a Dataset is selected.

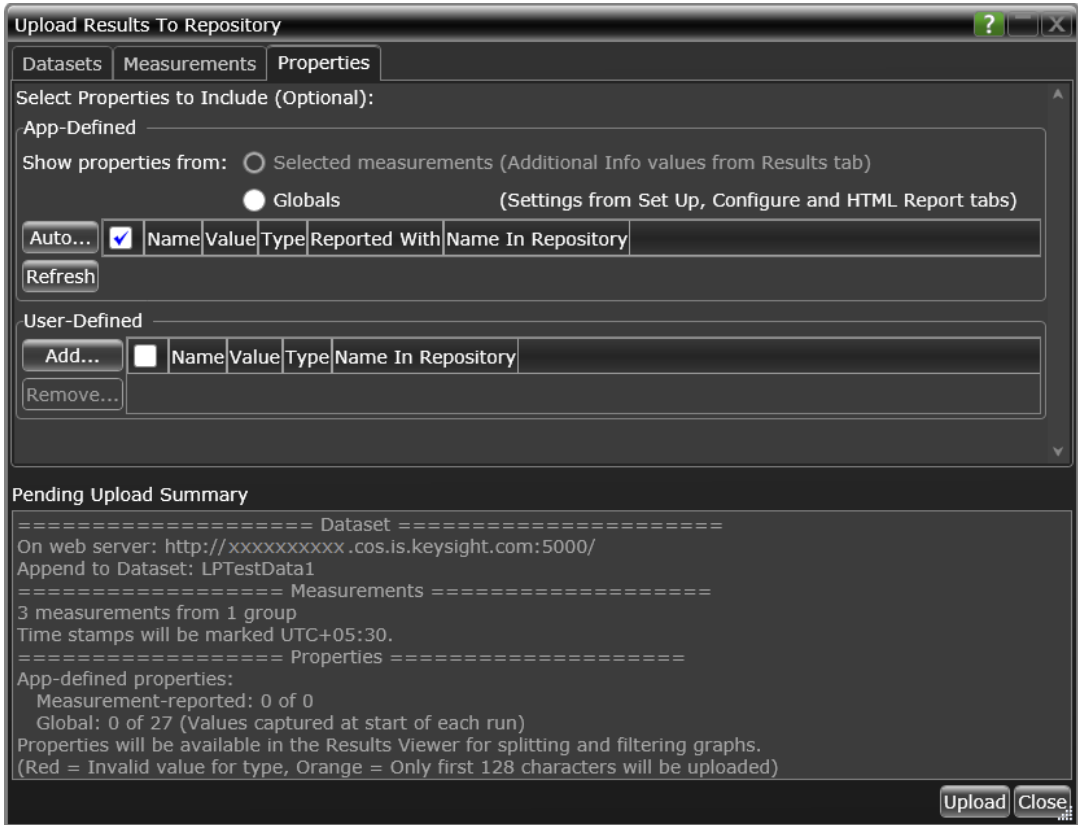


- 7 Click the **Measurements** tab where the test results from the last test run are displayed.
- 8 You may select and export multiple test results to the repository. You may change the format for the display of measurement data using the drop-down options in the **Group by:** field.

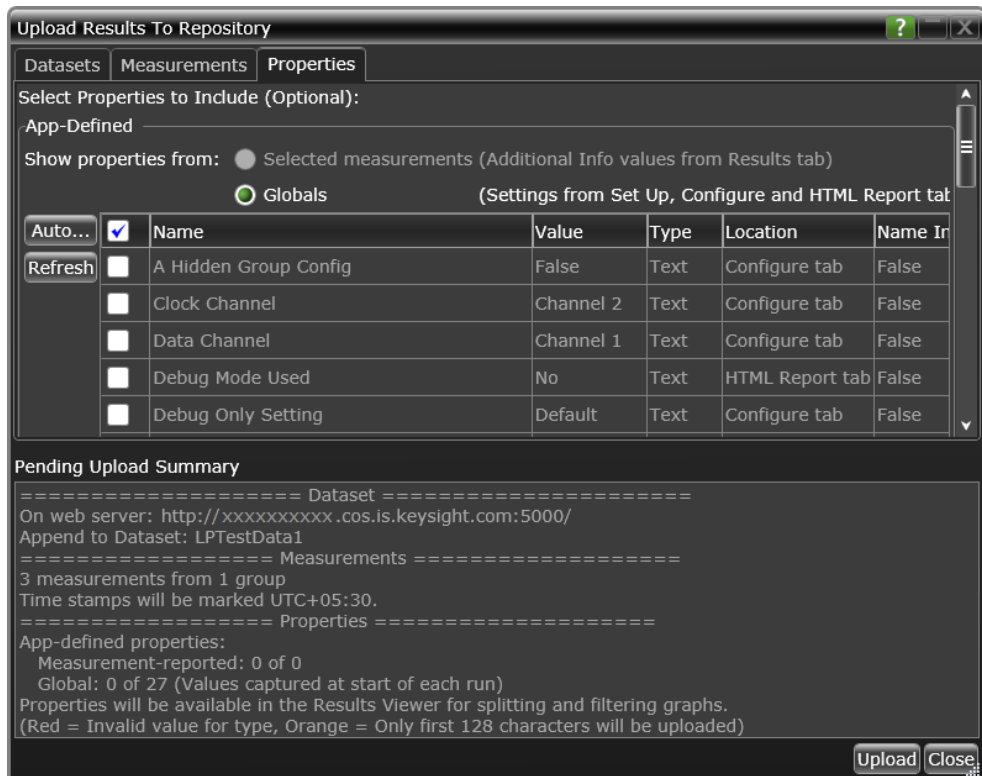


- 9 After selecting one or more measurements, either click **Upload** or switch to the **Properties** tab to associate one or more properties to the measurements that are being uploaded to the Web Server.

To perform an enhanced analysis on the measurement data using the *KS6800A Series Data Analytics Software*, Keysight recommends assigning properties to the measurements.



- 10 Click the **Properties** tab to assign properties for your measurement results that you select to upload. By default, the **App-Defined** properties are selected to be uploaded in association with the measurement data, wherein only certain aspects of the selected measurements are uploaded. However, you may switch to **Globals** to include as properties one or more options configured under the rest of the tabs of the Compliance Test Application or define one or more custom property values to be associated with the selected measurement data.



- 11 Click **Upload** to begin uploading measurement results.
- 12 Click **Close** to exit the **Upload Results to Repository** window and to return to the Compliance Test Application.

You may access the Dataset Repository using the internet browser on your machine to view the measurement results graphically in the *KS6800A Series Data Analytics Software*.

Keysight KS6800A Series Data Analytics Software

The KS6800A Series Data Analytics Software supports multiple data sources and also a wide range of data import clients. This web-based software provides various types of charts, such as Histogram, Box-and-Whisker, Line, Scatter, Eye Diagram and Constellation, each with split capability to enable data analysis. Once you upload the measurement results to a Dataset on the *KS6800A Series Data Analytics Software* via the **Upload Results to Repository** window of the Test Application, the measurement results can be viewed graphically as shown in [Figure 120](#).

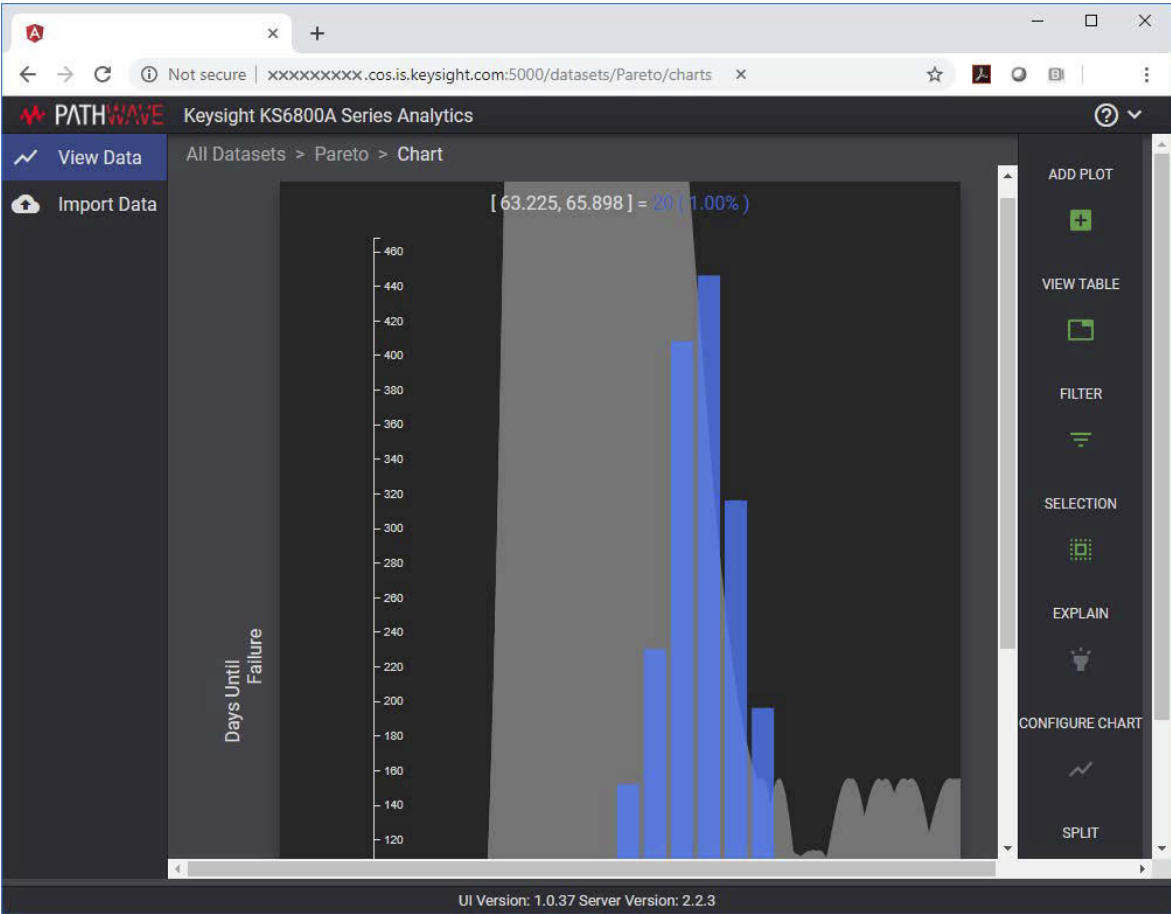


Figure 120 Graphical view of a dataset in the KS6800A Series Data Analytics Software

For more information on the Data Analytics Web Service Software, visit [KS6800A Series Data Analytics Software](#) page on the Keysight website. You may refer to the Help manual provided within the software to understand the functionality of its features.

9 Appendix: Acronyms and Abbreviations

[List of Acronyms](#) / 174

This chapter lists the acronyms and abbreviations used throughout this guide.

List of Acronyms

Acronym	Definition
An	Noise Amplitude
As	Signal Amplitude
AWG	Arbitrary Waveform Generator
BERT	Bit Error Ratio Tester
bps	Bits per second
BUJ	Bounded Uncorrelated Jitter
BW	Bandwidth
C2C	Chip-to-Chip
C2M	Chip-to-Module
CDR	Clock Data Recovery
CH	Channel
COM	Channel Operating Margin
CR	IEEE Copper Cable Interface
CTLE	Continuous Time Linear Equalization
dB	decibel
DC	Direct Current
DCA	Digital Communication Analyzer
DCI	DUT Control Interface
DUT	Device Under Test
ED	Error Detector
FEC	Forward Error Correction
FEXT	Far-End Crosstalk
FOM	Figure of Merit
HCB	Host Compliance Board
I/O	Interface

Acronym	Definition
ISI	Inter-Symbol Interference
ITol	Interference Tolerance
JSA	Jitter Spectrum Analysis
JTol	Jitter Tolerance
KLM	Keysight License Manager
KR	IEEE Backplane Interface
LAN	Local Area Network
MDI	Medium-Dependent Interface
N/A	Not Applicable
nc	Noise Channel
NEXT	Near-End Crosstalk
NRZ	Non-Return-to-Zero
PC	Personal Computer
PHY	Physical Layer
PLTS	Physical Layer Test System
PMD	Physical Medium Dependent
PTB	Precision Timebase
RI	Random Interference
RJ	Random Jitter
Rx	Receiver
SCPI	Standard Commands for Programmable Instruments
SICL	Standard Instrument Control Library
SIRC	System Impulse Response Correction
SNDR	Signal-to-Noise-and-Distortion Ratio
SNR	Signal-to-Noise Ratio
tc	Test Channel
UBHRJ	Uncorrelated Bounded High Probability Jitter

Acronym	Definition
USB	Universal Serial Bus
UUGJ	Uncorrelated Unbounded Gaussian Jitter
VISA	Virtual Instrument Software Architecture
WXGA	Wide Extended Graphics Array
XT	Crosstalk

