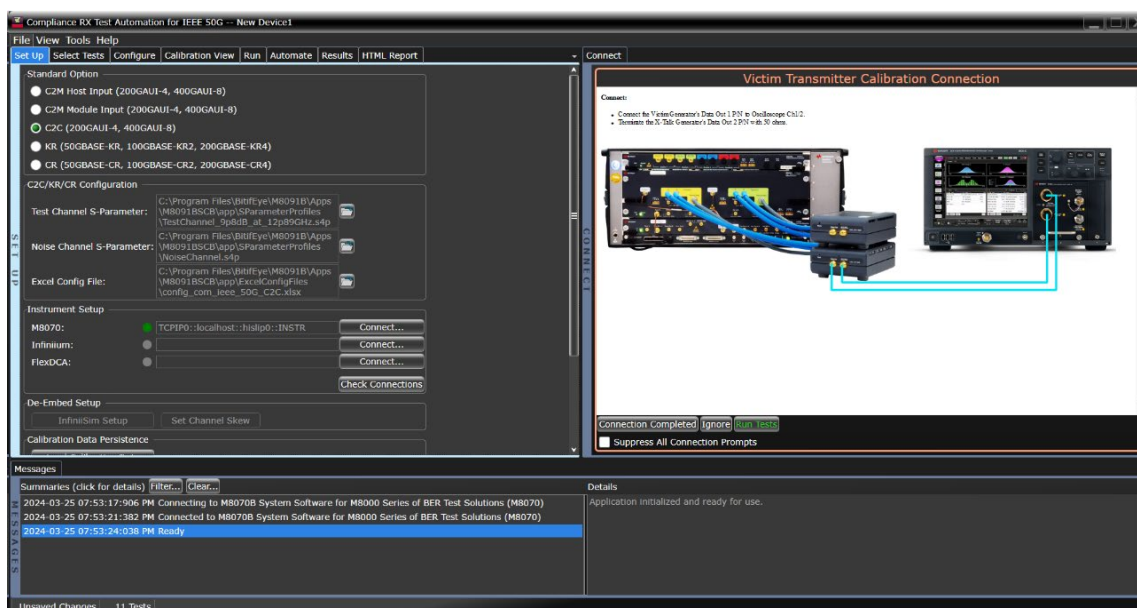


M8091BSCB

Receiver Conformance Test Application for IEEE802.3bs/cd

Introduction

Keysight M8091BSCB is a new conformance receiver test solution for the 50G series that provides wide standard coverage such as Chip-to-Chip (C2C), backplane (KR) and copper cable (CR) interfaces.



Keys Features

Supported standards include the following:

- IEEE 802.3bs 200GAUI-4 & 400GAUI-8 Chip-to-Module (C2M) Annex 120E
 - 120E.3.3.2 Host Stressed Input Test
 - 120E.3.4.1 Module Stressed Input Test
- IEEE 802.3bs 200GAUI-4 & 400GAUI-8 Chip-to-Chip (C2C) Annex 120D
 - 120D.3.2.1 Receiver Interference Tolerance
 - 120D.3.2.2 Receiver Jitter Tolerance
- IEEE 802.3cd 50GBASE-KR, 100GBASE-KR2, 200GBASE-KR4 Backplane (KR) Clause 137.9.3¹
 - 120D.3.2.1 Receiver Interference Tolerance
 - 120D.3.2.2 Receiver Jitter Tolerance
- IEEE 802.3cd 50GBASE-CR, 100GBASE-CR2, 200GBASE-CR4 Copper Cable (CR) Clause 136.9.4
 - 136.9.4.2 Receiver Interference Tolerance
 - 136.9.4.3 Receiver Jitter Tolerance
 - 136.9.4.1 Receiver Input Amplitude Tolerance

Guided setup, automated stress signal calibration and conformance measurement HTML test report.

Choose between Node-locked, Transportable, Network, USB-dongle license types of the Perpetual license term.

1. See limitation on page 6

Description

The M8091BSCB electrical receiver conformance test application is designed to assist and simplify the input test for 200GAUI-4 and 400GAUI-8 PAM4 capable host and module interfaces, as well as chip-to-chip, backplane and copper cable interfaces. It reduces user interaction to a minimum and performs all required calibration routines and conformance testing automatically by remote-controlling all required instruments.

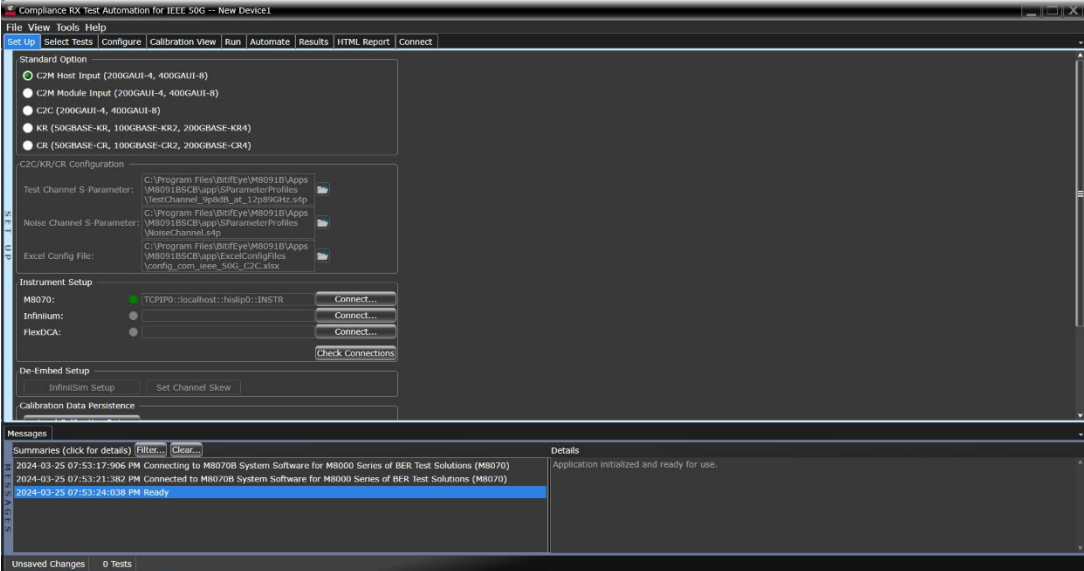


Figure 1. Graphic user interface of the M8091BSCB IEEE 802.3bs Conformance Receiver Test Application

The test application utilizes the same framework for the graphical user interface as most Keysight transmitter test applications, reducing training time by providing a common look and feel. When a user is required to perform setup changes, the user is guided by diagrams as well as text to minimize errors.

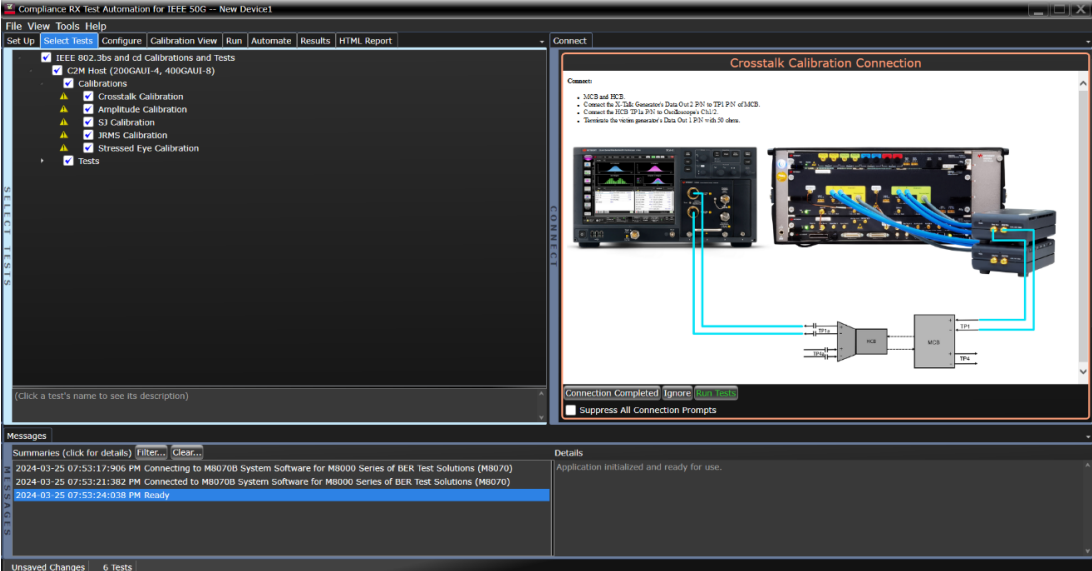


Figure 2. Connection Diagram of the IEEE 802.3bs Crosstalk Calibration for C2M Host Input

The respective clauses and annexes of the IEEE 802.3 specification which were added during the IEEE 802.3 bs project for 200GbE and 400GbE define the stress signal through a mated Host Compliance Board (HCB) and Module Compliance Board (MCB) connection. Both the receiver side and the transmitter side have equalization capabilities. The definition of the stress signal assumes an optimized link. Therefore, the transmitter of the receiver test equipment as well as the receiver of the signal measurement device must be optimized for the given stress channel. This must be done iteratively for each test setup. The standard requires the transmitter equalization (TxEQ) to be kept as small as possible to increase the stress on the device under test's receiver (DUT Rx). This process is very time consuming. The M8091BSCB receiver test application performs this task automatically.

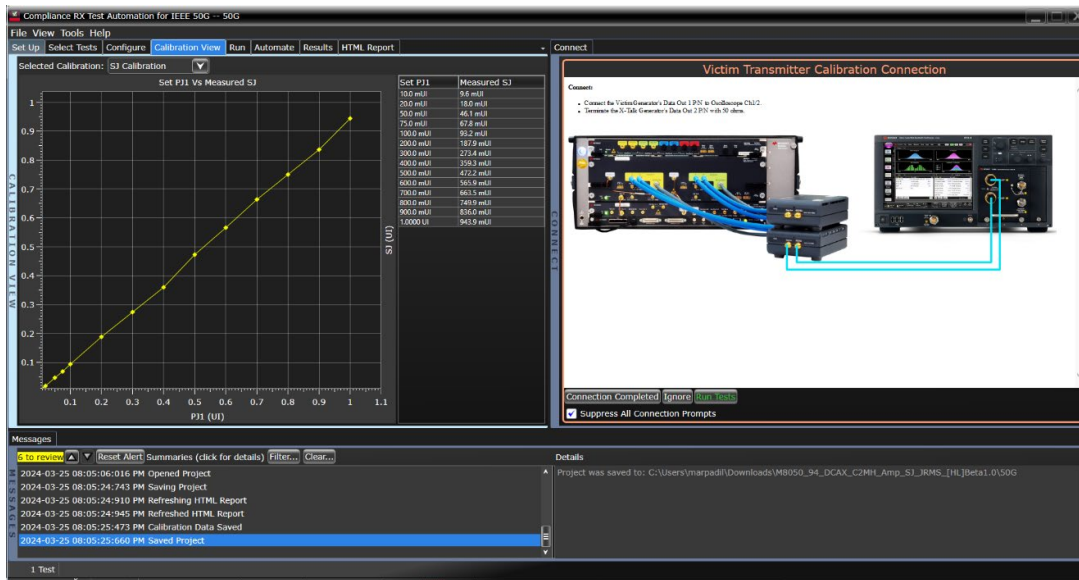


Figure 3. Results of the selected sinusoidal jitter calibration

Results of the individual calibration steps and tests are presented in tabular form as well as graphical form where appropriate. Calibrations and test results can be stored in projects and recalled at a later point in time. The application can also generate an HTML-based test report.

Calibrations and Tests Covered by M8091BSCB Compliance Receiver Test Application

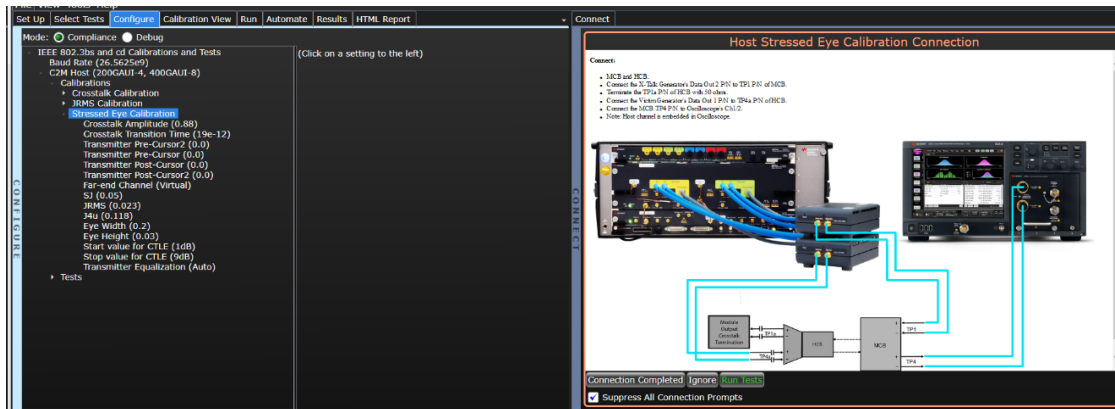


Figure 4. Parameters can be configured in either compliance or debug mode

All calibration steps are automated. The test application prompts the user when user interaction is required for connecting the test setup. Detailed connection diagrams and instructions are provided by the test application when each calibration or test is selected.

- 200GAUI-4 & 400GAUI-8 Chip to Module (C2M)
- Calibrations are implemented according to IEEE 802.3bs Annex 120E:
 - Victim lane amplitude
 - Victim lane JRMS
 - Victim lane SJ
 - Crosstalk amplitude and transition time2
 - Stressed eye
- Test is implemented according to IEEE 802.3bs Annex 120E:
 - Multi-lane Stressed input
 - 200GAUI-4 & 400GAUI-8 Chip to Chip (C2C)
- Calibrations are implemented according to IEEE 802.3bs Annex 120D:
 - Amplitude
 - SJ
 - RJ
- BUJ
 - Broadband Noise
 - Receiver Interference Tolerance
 - Receiver Jitter Tolerance
- Tests are implemented according to IEEE 802.3bs Annex 120D:
 - Receiver Interference Tolerance
 - Receiver Jitter Tolerance

- 50GBASE, 100GBASE & 200GBASE Backplane (KR) ^{1, 2}
- Calibrations are implemented according to IEEE 802.3cd Clause 137.9.3:
 - Amplitude
 - SJ
 - RJ
- BUJ
 - Broadband Noise
- Receiver Interference Tolerance
 - Receiver Jitter Tolerance
- Tests are implemented according to IEEE 802.3cd Clause 137.9.3:
 - Receiver Interference Tolerance
 - Receiver Jitter Tolerance
- 50GBASE-CR, 100GBASE-CR2 & 200GBASE-CR4 Copper Cable (CR)
 - Calibrations are implemented according to IEEE 802.3cd Clause 136.9.4:
 - Amplitude
 - SJ
 - RJ
 - BUJ
 - SNDR
 - Receiver Interference Tolerance
 - Receiver Jitter Tolerance
 - Receiver Input Amplitude Tolerance
 - Tests are implemented according to IEEE 802.3cd Clause 136.9.4
 - Receiver Interference Tolerance
 - Receiver Jitter Tolerance
 - Receiver Input Amplitude Tolerance

1. Transmitter Equalization (TxEq) Auto Negotiation is not supported. The Transmitter Equalization must be adjusted manually.
 2. The standard recommends carrying out the stress signal calibration using an aggressor lane with 19ps 20-80% transition time at 880 mV or 12ps slew time at $\pm 270\text{mV}$ for host and module test respectively. Similarly to the OIF-CEI 56G-VSR standard, the 12ps target cannot be achieved in realistic implementations. Keysight recommends using 15ps.

Configuration Guide

The table below shows the required equipment for each standard option under IEEE 200GAUI-4 & 400GAUI-8 C2M, C2C and backplane KR and CR receiver test setup. Required Instrument configuration and required software options are listed in the following section.

Equipment Type	C2M	C2C, KR, CR
Victim pattern generator	M8042A	
Crosstalk generator	M8042A 2nd channel or 3rd party crosstalk generator	N/A
Interference source	N/A	M8054A or M8195A or M8196A
Victim error detector	M8043A / DCI (DUT control interface)	
Oscilloscope	N1000A + N1060A or UXR-series oscilloscopes with 50GHz bandwidth & above	

Minimum Required Instrument Configuration

M8050A

M8042A M8042A-0G1	Pattern Generator NRZ and PAM4, 1 Channel, 2-slot AXIe Module (requires M8058A Remote Head)
M8042A-0G1	Pattern Generator NRZ and PAM4, 1 Channel, 2-slot AXIe
M8042A-0G2	Pattern Generator NRZ and PAM4, 2 Channel, 3-slot AXIe (only required for C2M)
M8042A-G32	Pattern Generator, 32 GBd for NRZ and PAM4, module-wide License
M8042A-0G4	De-emphasis, module-wide License
M8058A	64 GBd remote head with cable connections to M8042A pattern generator module (one per channel)
M8058A-801	Matched Cable Pair, 1.85 mm (m) to 1.85 mm (m), 2 ps, 0.15 m
M8009A M8009A-061/062	Clock generator module with Jitter Modulation, 60 GHz, 2 slot AXIe
M8009A-0G3	Advanced jitter modulation for up to two channels, license

Configure the Error Analyzer

M8043A	64 GBd error analyzer module, 2-slot AXIe
M8052A	64 GBd analyzer remote head with cable connection to M8043A error analyzer module
M8043A-A32	Analyzer, one channel, data rate up to 32 GBaud, NRZ and PAM4
M8043A-0A3	Equalizer license

Select an Interference Source for C2C, KR and CR Application

M8054A	Interference source 32 GHz (insert M8054A in slot 5, M3)
M8195A-001	Arbitrary waveform generator, 1 channel, 65 GSa/s
M8196A-001	Arbitrary waveform generator, 1 channel, 92 GSa/s

Select DCA Configuration – Select N1000A + N1060A

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

FlexDCA N1000-Series System Software – Choose DCA Options or R&D Package

DCA options	
N1010AT-200	Enhanced jitter analysis SW
N1010AT-201	Advanced waveform analysis
N1010AT-9FP	PAM-N analysis software
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

Select UXR Configuration if DCA Options are not Selected

UXR0502B	50 GHz, 2-CH, 1.85 mm input Infiniium UXR-Series real-time oscilloscope
D9320ASIA	Advanced signal integrity software (EQ, InfiniiSimAdv, crosstalk)
D9320PAMA	Pulse amplitude modulation PAM-N analysis software
D9320JITA	Jitter, vertical and phase noise analysis software for 90000, V-, Z- and UXR-series oscilloscopes

Accessories (Recommended)

M8043A-801	Matched cable pair, 1.85 mm (m) to 1.85 mm (m), 2 ps, 0.15 m
M8043A-802	Termination 50 Ohm, 1.85 mm (m)
M8042A-801	Clock cable semi-rigid for pattern generator M8042A, channel 1
M8195A-810	Cable, 2.92 mm (m) to 2.92 mm (m), length 0.85 m (for combing SI and RI) (2 required, 3 if DCA-X)
M8195A-820	Coaxial termination 50 Ω DC to 26.5 GHz, 3.5 mm (male) (2 required)
SP0606A	Wilder QSFP-DD 112G/800G MCB 1.85 mm receptacle test adapter
SP0607A	Wilder QSFP-DD 112G/800G HCB Plug 1.85 mm 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
M8045A-802	Matched directional coupler pair, 50 GHz, 13 dB, 2.4 mm (for MR and LR)
11636C	Power Divider, DC To 50 GHz, 2.4 mm (2 required for noise injection for CR)
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

Software configuration

M8091BSCB	RX conformance test application for IEEE 802.3bs
M8070ADVB-1xx	Advanced measurement package for M8000 Series of BERT test solutions (node locked, transportable, floating or USB license, revisions 9.1 or later)

Minimum PC Configuration

The PC running the application should meet following requirements:

PC Hardware Requirements

Memory	8 GB RAM minimum
Monitor resolution	WXGA+ (1140 x 900) minimum

PC Software Requirements

Keysight IO Library suite rev 18.1
 Keysight License Manager 5 and Keysight License Manager 6
 M8070B system software for M8000 series

- rev. 10.5.180.6
- M8070ADVB advanced measurement package for M8000 Series Ver. 1.6.180.2

Keysight M8195A firmware and SFP rev. 4.2.20 or Keysight M8196A firmware and SFP rev. 2.1.13.0
 Keysight DCA-X oscilloscope FW A.07.50.258
 Keysight UXR oscilloscope FW rev. 11.52.00001
 MATLAB compiler runtime R2017a (9.2)

Remote Programming

The M8091BSCB IEEE 802.3bs Conformance Test Application is part of Keysight's Digital Test Apps and can be programmed via ARSL or any .NET language. For more information see

www.keysight.com/find/rpi

Related Products

The M809256CB Electrical Receiver Conformance Test Application for OIF-CEI 4.0 is designed to assist and simplify the stress signal calibration used for testing the inputs of OIF-CEI 56G-VSR/-MR/-LR PAM4.

The [N1091BSCB Electrical TX Test SW for IEEE 802.3bs/cd \(50/100/200/400 Gb/s\)](#) for the sampling oscilloscopes offer automated transmitter testing for IEEE PAM4-based electrical outputs.

The [N4917BSCB Optical Receiver Stress Test Application](#) addresses test needs for optical input test of transceiver modules for 400GBASE-LR8/-FR8 as well as 200GBASE-LR4/-FR4/-DR4.

The [M8091CKCA](#) is the industry's first electrical receiver test application for IEEE 802.3ck that assists and simplifies the stress signal calibration used for testing the inputs of IEEE 100G serial interfaces.

The [N1091CKCA Electrical TX Test Software for IEEE 802.3ck \(100/200/400 Gb/s\)](#) for sampling oscilloscopes offers automated transmitted testing for IEEE PAM4-based electrical outputs.

The [D90103CKC Electrical TX Test Software for IEEE 802.3ck \(100/200/400 Gb/s\)](#) for real-time oscilloscopes offers automated transmitter testing for IEEE PAM4-based electrical outputs.

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



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