



PCI Gen3 (8GT/s) Receiver Test

Tektronix MOI for PCIe Gen3 (8GT/s) Receiver Jitter Tolerance Test (Add-In Card and System) using BSX Series BERTScope Bit Error Tester and 'BERTScope PCIE3.0 Receiver Testing' Application.

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Modification Record

Version	Date	Changes done
1.0.0Draft	31-Aug-2017	All

References

The following documents are referenced in this document.

- PCI Express® Architecture PHY Test Specification Revision 3.0
- PCI Express Base Specification Revision 3.1a.

1. INTRODUCTION

This MOI (Method of Implementation) provides the test procedures for testing PCIe Gen3 devices to the PCI Express Architecture PHY Test Specification (Test Specification) using *Tektronix BSX Series BERTScope Bit Error Rate Tester*. The purpose of the document is to provide the approved test equipment, test connections and setup, for the PCI Express Gen3 compliance program.

This MOI reduces the '*PCI Express Architecture PHY Test Specification*' test description to practice using the Tektronix test equipment and procedures.

TABLE 1 Lists the requirements for receiver testing and how Tektronix instruments and software address them.

`	Requirement	Test Instrument	Comment	
	Stressed pattern generation at 8 Gb/s	BSX Series BERTScope	Generates integrated stressed pattern up to 32 Gb/s. Built-in stress includes RJ, SJ, and others.	
	De-emphasis	BSX Series BERTScope	Adds programmable de-emphasis and differential output amplitude to the test signal.	
	SSC	BSX Series BERTScope	Generates up to 5000 ppm of SSC. Use high performance cables between the Analyzer and Clock Recovery to reduce residual SSC presented to the Error Detector on signals with SSC.	
	Asynchronous BER testing	BSX Series BERTScope	Filters out user-designated clock compensation symbols such as SKPs for accurate BER synchronization and measurement of 8b/10b/PCIE compliance pattern when in loopback.	
P	Jitter tolerance testing	BSX Series BERTScope	Performs automated Jitter Tolerance testing.	
enerati	Stressed eye calibration	DSA / DSO / MSO70000 Series	Real-Time Oscilloscope for amplitude and eye calibration using SigTest	
Pattern G	Automated loopback	BSXPCI4	Software automates control of the Instrument PCIE3.0 Add-In Card and System compliance testing, including stressed eye calibration and Loopback training.	

Table 1 : Tektronix BERTScope PCIE3.0 Receiver Test Solution

2. TEST OBJECTIVE

- Receiver Jitter Tolerance test:
 - o Add In Card

This test is run on all card electromechanical form factor add-in cards. The test verifies that the add-in card can function normally in systems with jitter near the specification allowed limits and does not exceed the allowed receiver error rate in loopback mode.

o System

This test is run on all Card Electromechanical (CEM) form factor system boards. The test verifies that the system can function normally with an add-in card with jitter near the specification allowed limits and does not exceed the allowed receiver error rate in loopback mode.

3. OVERVIEW OF TEST STEPS (AS PER CTS)

3.1. Add-in Card Receiver Jitter Tolerance Test

This test is run on all card electromechanical form factor add-in cards. The test verifies that the add-in card can function normally in systems with jitter near the specification allowed limits and does not exceed the allowed receiver error rate in loopback mode.

Overview of the calibration and measurement steps:

BERTScope is connected to the device under test (DUT) via a compliance base board. BERTScope must be able to perform the loopback sequence which is necessary to test Add in card at all the supported data rates.

Note: Refer Appendix A(Getting into Loopback 8GT/s) in *PCI Express Architecture PHY Test Specification* for the loopback training sequence.

Calibration is done by connecting a CLB to a CBB. For add-in cards, the CLB takes the place of the DUT for calibration purposes thus the signal is monitored at the Tx SMP connectors for lane 0 of the CLB.

/ <u>Note</u>: Refer Section 2.8 in '*PCI Express Architecture PHY Test Specification*' for the calibration procedure and test/measurement requirement.

3.2. System Receiver Jitter Tolerance Test

This test is run on all Card Electromechanical (CEM) form factor system boards. The test verifies that the system can function normally with an add-in card with jitter near the specification allowed limits and does not exceed the allowed receiver error rate in loopback mode.

Overview of the calibration and measurement steps:

BERTScope is connected to the device under test (DUT) via a compliance base board. BERTScope must be able to perform the loopback sequence which is necessary to test the system board at all the supported data rates.

- / <u>Note</u>: Refer Appendix A (Getting into Loopback for 8GT/s) in '*PCI Express Architecture PHY Test Specification*' for the loopback training sequence.
- / <u>Note</u>: Refer Section 2.9 in '*PCI Express Architecture PHY Test Specification*' for the calibration procedure and test/ measurement requirement.

4. REQUIRED EQUIPMENT

Below table, contain the list of equipment's required for performing the test.

Equipment	Details/Part Number	Quantity	Remarks
BSX BERT Scope	Tektronix BERTScope BSX125(PCIe3.0), BSX240(PCIe3.0/4.0) or faster with Option STR, TXEQ	1	
Real time Oscilloscope	Tektronix DPO/DSA/MSO71604 or faster with option DJA.	1	
Software	BSXPCI4, Automated calibration, link training, loopback initialization and handshaking (Protocol aware) test software.	1	
Interference combiner	BSXSICOMB	1	

Table 2: Equipment required

4.1. BSX Series BERTScope Bit Error Rate Tester

The BSX Series BERTScope® is the quickest path to compliance. This BERT receiver test solution has unique features that take the complexity out of receiver testing and brings confidence to Gen3/4 designs.

- Single solution for Receiver stress testing, debug and compliance.
- Test Gen3/Gen4 standards PCIe, USB3.1, SAS/SATA, DP + propriety standards.
- Handshaking and link training for devices running up to 32 Gb/s.



4.2. Real Time Oscilloscope

The Tektronix DSA/DSO/MSO70000 Real-Time Oscilloscope with SigTest is used to calibrate de-emphasis and stressed eye, and to perform the transmitter test portion.



4.3. BERTScope® Clock Recovery(Optional)

Enables clock recovery on high ISI signals without impacting the data stream under test. Recovered clock enables other analysis including "clean eye", application of FIR filtering to signal, and BER testing.



4.4. Software

4.4.1. BERTScope Receiver Test Application

This application can be run from BERTScope or Tektronix Real Time Oscilloscope or an external computer.



BSXPCI4 software provides the following:

- Automated calibration, link training, loopback initiation, and testing
- BER Map feature for TXEQ optimization
- Reduces the time and minimizes the skill-set required to perform the calibration and testing
- Increases the reliability and accuracy by removing inconsistencies with manual calibration

BSXPCI4 also provides extensive online help and wizards for cabling, system calibration, and test execution. This MOI depends heavily upon BSXPCI4 features.

4.4.2. Oscilloscope VISA Socket Gateway and SigTest Server

<u>VISA Socket Gateway</u>: This program is intended for installation on a Tektronix 70000series real-time oscilloscope, to allow communication between RX test automation software and real time oscilloscope.

VISA	Listening Sock	et
Resource GPIB8::1::INSTR	- Port	4005
Timeout 60.0	IP Address	134.63.138.159
Stop Gateway 📝 Auto restart		🔲 Show Messages
000 - Starting gateway		
000 - Starting gateway 010 - Gateway is listening to 134.63.138.159 000 - Wailing to accept connection. i.14 - Connection established 448.1 - Exception while reading message: 010 - >> Empty message received from socket 010 - >> Empty message received from socket 000 - Starting gateway 080 - Disconnected 000 - Gateway is listening to 134.63.138.159 000 - Wailing to accept connection.		

Figure 2 : VISA Socket Gateway

<u>SigTest Server</u>: This program is intended for installation on a Tektronix 70000-series realtime oscilloscope, to allow communication between RX test automation software and SigTest.

SigTest Server, 1.	18	
SigTest Executable	•	
Executable File	C:\Program Files (x86)\SigTest 3.2.0\SigTest.exe	Browse
Parameters		
Data File	[Browse
Template File		Browse
Output File	C:\Temp\SigTest Output.txt	Browse
Other Args		
Socket Server		
Socket Port	4006	Hide
Listening on: 13	4.63.138.159	Diagnostics

Figure 3 : SigTest Server

4.4.3. PCISIG SigTest Analysis Software

SIGTEST software is required for CEM stress calibration. It has to be installed on the Real-Time Oscilloscope used for calibration.

SIGTEST software is available directly from the PCISIG, and may be downloaded at:

http://www.pcisig.com/specifications/pciexpress/compliance/compliance_library.

4.5. Test Fixture

Test fixtures are required for compliance testing in order to connect the signal to the test equipment and vice versa.

Below are the PCI-Sig recommended test fixtures.



Description: PCI Express Compliance Load Board (U.2 CLB3) test fixture, revision 3.0. For testing PCI Express Platforms, x1 & x4 PCIe connectors on PCIe devices/add-in cards. **Vendor**: PCI-SIG

www.pcisig.com/specifications/order_form Vendor PN: U.2 CLB3

Tektronix PN: Only available from PCI-SIG

Description: PCI Express Compliance Load Board (U.2 CLB3), Revision 3.0. For testing PCI Express Platforms, x1 & x4 PCIe connectors on PCIe systems/mother boards. **Vendor**: PCI-SIG

www.pcisig.com/specifications/order_form Vendor PN: U.2 CLB3

Tektronix PN: Only available from PCI-SIG



4.6. Cables

1.0.000100	
ltem	Image
Description: DC Block, SMA, 26GHz <u>Vendor</u> : Tektronix <u>Tektronix PN</u> :PSPL5500A, PSPL5501A, or PSPL5508 <u>Note</u> : This is optional accessory and not shown in any of connection diagrams, but can be used if DC offset is encountered in any signal path.	
<u>Description</u> : SMA-to-SMA, Straight, 500mm, 1.5ps phase matched. <u>Vendor</u> : HUBER+SUHNER <u>www.hubersuhner.com/en</u> <u>Vendor PN</u> : 84210099, T+M SF104PE/11PC35/11PCC35/500mm <u>Tektronix PN</u> : 174-6663-xx. <u>Quantity</u> : 2Cable pairs	
<u>Description</u> : SMA-to-SMA, Straight, 1000mm, 1.5ps phase matched. <u>Vendor</u> : HUBER+SUHNER <u>www.hubersuhner.com/en</u> <u>Vendor PN</u> : 84210103, T+M SF104PE/11PC35/11PCC35/1000mm <u>Tektronix PN</u> : PMCABLE1M Quantity : 1Cable pairs	
<u>Description</u> : SMA-to-SMA, Right-Angle, 300mm <u>Vendor</u> : HUBER+SUHNER www.hubersuhner.com/en <u>Vendor PN</u> : 84210131, T+M MF141/16SMA/16SMA/300mm <u>Tektronix PN</u> : 174-6665-00 <u>Quantity</u> : 1Cable pairs	
Description: SMA-to-SMA, Right-Angle, 102mm, 1ps Phase-matched. Vendor: Rosenberger www.rosenberger.com/us_en Vendor PN: 71L-19K2-32K1-00102B Tektronix PN: 174-6657-xx Quantity: 2Cable pairs	

<u>Description</u>: SMA-to-SMP, Right-Angle cable
 Pari, 1m, 1ps Phase-matched.
 <u>Vendor</u>: Rosenberger
 www.rosenberger.com/us_en
 <u>Vendor PN</u>: 71L-19K2-32S1-01000D
 <u>Tektronix PN</u>: 174-6659-xx
 Quantity : 1Cable pairs



5. JITTER TOLERANCE TEST

5.1. Launch the Application

Launch the Multiprotocol Rx test application, Application will open as in FIGURE 4.

Select the appropriate (PCIE3.0) Standard.



Figure 4 : BERTScope Receiver Testing Application (Multi-Protocol Application)

'BERTScope PCIE3.0 Receiver Testing' application will open as in Figure 5





5.2. Connect to the instrument

BERTScope PCIE3.0 Receiver Testing' application communicates with instruments (BERTScope, RT Scope and SigTest Server) using Remote server/client model. Fallow the instructions in Section 6 (Instrument Connectivity) to start the remote servers

5.3. Calibration

Perform the Calibration before staring the Jitter Tolerance test. Two types of calibration needs to be performed.

- 1. Amplitude Calibration: Details are in Section 7.1
- 2. Stressed Eye Calibration: Details are in Section 7.2

Once the calibration step is completed, proceed to the next step.

5.4. Preset Test

Once the system has been calibrated, receiver testing can commence. Make sure that steps 5.1, 5.2, 5.3, are done before running the BER tests.

Preset test allows BER testing of various TX equalization presets (combinations of preshoot and de-emphasis). Another feature of preset testing allows for link equalization auto-negotiation during loopback training. In this case the BERTScope/DPP will respond to TxEQ requests from the DUT. Once the DUT is trained into loopback, the final requested TxEQ value will be used for the BER test.

Press the **Tests Preset Test** navigation button to launch a pop-up wizard to guide you through the process of preset testing. This wizard will automate the complete preset testing.

5.4.1. Select 'Stressed Eye' Values:

Select the '*Stressed Eye*' values using the drop down. All the calibrated values are listed in this dropdown.

Preset Test		
Pr	eset Test	
	This wizard enables you to setup and execute a BER test with specific Preshoot and Deemphasis settings.	
The set of the set	Select the stressed-eye calibration to use:	
	EyeCal_TIPLESQE_TimeCheck	
	< Back	Next > Cancel

5.4.2. Connect Test Equipment and DUT:

Connection diagrams are different for Add-In Card and System testing. (High resolution connection diagram are in Section 8.3.1). Once the connections are done, press 'Next'.

Preset Test	
	Connect Test Equipment and DUT Gen 3 CBB (Riser) →
	IOU MHz reference clock RX Lare 0 IOU MHz reference clock Main UIU MHz reference clock N P N IOU MHz reference clock N I
	< Back Next > Cancel

5.4.3. Initialize the Equipment: Press 'Run'.

Press '*Run*' to initialize the equipment's. Once all the equipment's are initialized, press 'Next'

Preset Test	Initialize BERTScope	
- Sall	Description	Status
10002	Initialize Clocking	
6°0	Initialize SSC	
	Initialize Generator	
	Initialize Detector	
a contraction of the second se	Clear Stresses	
	Set Generator Delay	
	Set DPP	
	Set Stresses	
	Set Deemph/Preshoot	
	Cle	ar All Check All Run
		< Back Next > Cancel

5.4.4. Configure Loopback

•

Below section describes various configuration and debug features available for loopback initialization.

Basic			
Preset Test	Configure Loopback Basic Advanced Block Log V Use Link Equalization		
	Link # 0 🔔 Lane # 0 🔔 FTS 255 🛬	Preset P7 Preshoot 3.50 dB Deemphasis -6.00 dB	
	Find Safe Sampling Point	Preset/Hint P0_0 ✔	
		< Back	Next > Cancel

Use Link Equalization: Determines the loopback training mode used for the test. If this box is checked, the DUT will be trained to loopback through the Recovery state (commonly referred to as 'Loopback through Recovery', with link equalization performed during the Recovery.Equalization substate. If this box is unchecked, the DUT will be trained to loopback through the Config.Linkwidth.Start state (commonly referred to as 'Loopback through the Qualization training is performed.

/ <u>Note 1</u>: For the BER Test, the Use Link Equalization box is disabled; loopback training is always performed using 'Loopback through Config' for this test, since a transmit coefficient sweep is performed to validate DUT receiver performance rather than the link equalization protocol process for this test).

Link #: PCIe link number expected (if DUT is a system) or advertised by the BERTScope (if DUT is an add-in card).

Lane #: PCIe lane number expected (if DUT is a system) or advertised by the BERTScope (if DUT is an add-in card).

FTS: Number of Fast Training Sequence ordered sets advertised as needed by the BERTScope for PCIe L0s -> L0 state transitions. Since the L0s state is not entered at any time during testing, this value may normally be left at its default value.

Preset: Specifies the initial PCIe transmit preset used for the BERTScope transmitter for loopback training. When the Use Link Equalization checkbox is unchecked, this will also be the transmit setting used by the BERTScope when the Loopback state is entered. When the Use Link Equalization checkbox is checked, this will be the transmit setting for Recovery.Equalization phase 1, with the BERTScope's transmit setting modified based on DUT requests during Recovery.Equalization phase 2 or 3.

Preset/Hint: Specifies two values in the form Px_y, where x is the PCIe transmit preset value requested by the BERTScope for the DUT's transmitter during loopback training, and y is a receiver preset hint from the BERTScope to the DUT that may be used for initial receiver equalization tuning. The encoded values for the preset hint field are described in section 4.2.3.2 of the PCIe Base Specification (revision 3.1).

Use Safe Sampling Point: The BERTScope's Detector requires a valid sampling point for incoming Gen3 data from a DUT so that Gen3 protocol data is correctly interpreted by the BERTScope. This sampling point will vary for different DUTs. When the Use Safe Sampling Point box is checked, the BERTScope will perform a quick scan of the incoming data stream after a transition to the Gen3 data rate has occurred in order to set this sampling point. If the Use Safe Sampling Point box is unchecked, the currently set Detector sampling point will be used for loopback training. It is recommended that the Use Safe Sampling Point feature be enabled the first time loopback training is performed for a DUT; subsequent test runs can then be performed with the Use Safe Sampling Point feature either enabled or disabled.

Advanced

Preset Test	
Preset lest	Configure Loopback Basic Advanced Block Log Resync Threshold (# of invalid blocks before resync) 256 - Ignore Timeouts Inhibit Stress during Loopback Initiation Initial Pattern Tune-up: # of sets transmitted in various states
	FS 63 🛣 LF 21 🖈 Idle Duration (uSec) 1000 荣
	< Back Next > Cancel

Resync Threshold: Specifies the number of invalid (incorrectly decoded) PCIe protocol blocks after which the BERTScope's PCIe link training state machine will attempt to reacquire protocol block alignment and resynchronize to the PCIe Gen3 data stream sent from a DUT. This field should normally be left at its default setting.

Ignore Timeouts: If this box is checked, the BERTScope's PCIe link training state machine will not enforce timeout values for each PCIe LTSSM state during loopback training. If this box is unchecked, the BERTScope's PCIe link training state machine will detect a timeout condition if any LTSSM state timeout occurs during loopback training due to a lack of an expected response from a DUT. It is recommended that this box be left checked during normal testing.

Inhibit Stress during Loopback Initiation: If this box is checked, stress (RJ, SJ, DMSI) will not be applied to the data transmitted by the BERTScope during loopback training. If this box is unchecked, calibrated RJ, SJ, and DMSI will be applied to the BERTScope's transmit data during the loopback training process.

FS: Specifies the FS (Full Swing) value advertised by the BERTScope during the link equalization process. The FS value specifies the granularity of the BERTScope transmitter's coefficient tap settings. For normal testing, this setting should be left at its default value of 63 (maximum tap resolution).

LF: Specifies the LF (Low Frequency) value advertised by the BERTScope during the link equalization process. This value corresponds to the minimum differential voltage that can be generated by the BERTScope transmitter. For normal testing, this setting should be left at its default value.

Idle Duration: Specifies the electrical idle transition time for Gen1->Gen3 data rate transitions during loopback training. For normal testing, a value of 1000 microseconds (1 millisecond) is appropriate.

Preset Test		
	Configure Loopback	Trigger Ayte 6 Use Preset RIC EC X XXXX X XXX Avte 7 Resrvd FS or Pre-cursor XX XXXXXX Ayte 8 Resrvd LF or Cursor XX XXXXXX Ayte 9 Par RC LF or Cursor X X XXXXXX
		< Back Next > Cancel

Block Log

During loopback training, the BERTScope's link training state machine can record incoming Gen3 protocol traffic from the DUT based on the detection of a specific protocol block type. When this block type (and for TS1 ordered sets, accompanying link training field values) is detected in the incoming Gen3 protocol stream, subsequent protocol blocks are recorded until the link training state machine's log buffer has filled; these blocks may then be seen in the block log status tab.

Trigger After: Specifies the type of protocol block (data or ordered set) that should be used as a trigger for block capture.

Ignore DC Balance: The block logging mechanism will compress multiple identical blocks into a single log entry in order to extend the amount of block data captured.

When this setting is checked, the block logging mechanism will ignore DC balance symbols (symbols 14 and 15 in TS1 and TS2 ordered sets) when determining whether consecutive TS1/TS2 ordered sets are identical. It is recommended that this setting be enabled for normal testing.

TS1 Trigger Byte 6-9: When the Trigger After block type is set to TS1, these fields may be used to further qualify the block log capture trigger based on the link equalization values present in symbols 6-9 of the TS1 ordered set. An 'X' indicates a don't-care value for the specified bit in these symbols; field values may be set by setting the corresponding bits in the desired fields to '0' or '1'. Only TS1s that exactly match the specified field values in entirety will cause the block log capture to begin.

5.4.5. Configure Test

Test configurat	ions can viewed and updated in this step.
Preset Test	
	Configure Preset Test
- Starry	Sync Timeout B Sec Sync using Grab-n-Go
	Error Limit 1
A LA CONTRACTOR	Test Length
	✓ Duration 125 Sec
	Confidence 26.424 * % at 1E-12
	Stress Values
	RJ 0.00 ★ ps (RMS) DMSI 100.00 ★ mV
	SJ 12.50 ★ ps Amplitude 800 ★ mV
	< Back Next > Cancel

- Sync timeout: Application will try to *Sync* for the specified time. If the *Sync* does not happen then the application will error out.
- Error Limit : Maximum error allowed.
- Sync using Grab-n-Go:
- Test Length

Test length can be specified either as a absolute test 'Duration' or 'Confidence' level.

- Duration : Specify the test duration in Seconds.
- Confidence: Required confidence level at the BER 1e-12.
- Stress Value
 - Calibrated: Takes the stress values which are specified in the specification and uses the calibration curves to find the actual settings to be used on the BERTScope.
 - Manual: Manually specify the stress value. This is useful for doing measurement outside the specification limits. RJ, SJ, DMSI and Amplitude values can be varied.

- Raw: Use the raw stress value. Entered stress values are directly used.
- 5.4.6. Initiate Loopback:

Press Start to initiate the loopback.

	Loopback Request Log	Block Log EQ Status
-	Step	Status
	Set Preshoot/Deemphase	Setting PE to 3.16dB, and DE to -6.39dB OK
DIN	Clear Stresses	Clear Stresses OK
	Configure Loopback	Configure Loopback OK
	Load Sequence	Loaded sequence OK
	Init Loopback	Loopback OK
	Valdate Loopback	Reports OK
	Check Detector Clock	Detector dock is OK
	Autoalign Detector	Detector Autoalign OK
	Check Detector Sync	Detector sync is OK
	Success	DUT is in Loopback mode
		Start

When all the steps in the loopback are successfully performed then press *Next* to proceed to the Preset test.

5.4.7. Run Preset Test

Preset test is run for the specified duration/bits. Number of errors counted are displayed.

- Bits: Total number of bits tested. This depends on the test duration.
- Errors: Show the number of bit errors.

Status: Display the test status.

Preset Test		
114	Run Preset Test	
100	Bts	
100	100000000000	
	Errors	
0	0	
	Status	
	Error Free	
		Start
	-	< Back Next > Cancel

5.4.8. Save Results

Click 'Save' button to save the results to a local database.

Preset Test	
S	ave Results
See	Unique ID
	Creator Name
	Device Description
	Comments
	Save
	< Back Next > Cancel

Below information can be provided while saving the results

- Unique ID: Name of the report.
- Creator Name: Operator name can be entered for future reference.
- Device Description: Enter the device description.
- Comments: Add comments if any.

5.5. BER Test

Once the system has been calibrated, receiver testing can commence. Make sure that steps 5.1, 5.2, 5.3, are done before running the BER tests.

BER Test allows BER testing of various TX equalization presets (combinations of preshoot and de-emphasis). During the BER test, the BERTScope system will step through various combination of preshoot and de-emphasis levels and measures the BER at each setting. Link equalization is not used for BER test.

Press the **Tests**→**BER Test** navigation button to launch a pop-up wizard which will guide you through the process of preset testing. This wizard will automate the complete preset testing.

5.5.1. Select 'Stressed Eye' Values

Select the '*Stressed Eye*' values using the drop down. All the calibrated values are listed in this dropdown. Based on the 'Stressed Eye' selection, either '*Add-In Card*' or '*System*' Test is performed.

BER Test	
BER Test	
at various Preshoot and Deemphasis settings.	
Select the stressed-eye calibration to use:	
< Back Next >	Cancel

5.5.2. Connect Test Equipment and DUT

Connection diagrams are different for Add-In Card and System testing. (High resolution connection diagram are in Section 8.3.1). Once connections are done, press '*Next*'.



Figure 6: Add-In Card Test Connection



Figure 7 : System Test Connection

5.5.3. Initialize BERTScope: Press Run Once all the equipment's are initialized, press 'Next'

BER Test		
TH	Initialize BERTScope	
a start way	Description	Status
	Initialize Clocking	
6 C	✓ Initialize SSC	
	Initialize Generator	
Distance of the second se	Initialize Detector	
	Clear Stresses	
	Set Generator Delay	
	Set DPP	
	Set Stresses	
	Clear Al	Check All Run
		< Back Next > Cancel

5.5.4. Configure Loopback

Configure Loopback' details can be found in section 5.4.4 (Configure Loopback). Press *Next*' once the configuration is done.

BER Test		
	Configure Loopback	
INT	Basic Advanced Block Log	
	Use Link Equalization	
	Link # 0	Preset P7 v
	Lane # 0	Preshoot 3.50 dB
	FTS 255	Deemphasis -6.00 dB
	Tind Cofe Complian Daint	
	Find Safe Sampling Point	Preset/Hint
		< Back Next > Cancel

5.5.5. Configure Test

Review the test configuration and change if required.

BER Test	
	BER Test
- Same	Sync Timeout B Sec Sync using Grab-n-Go
	Error Limit
	Test Length
A CONTRACTOR OF	✓ Duration 125 Sec
	☐ Confidence 26.424 → % at 1E-12
	Stress Values
	Calibrated Manual Raw
	RJ 0.00 + ps (RMS) DMSI 100.00 + mV
	SJ 12.50 ⁺ ps Amplitude 800 ⁺ mV
	< Back Next > Cancel

- Sync timeout: Application will try to *Sync* for the specified time. If the *Sync* does not happen then the application will error out.
- Error Limit: Maximum error allowed.
- Sync using Grab-n-Go:
- Test Length

Test length can be specified either as a absolute test 'Duration' or 'Confidence' level.

- o Duration : Specify the test duration in Seconds
- o Confidence: Required confidence level at the BER 1e-12
- Stress Values
 - Calibrated: Takes the stress values which are specified in the specification and uses the calibration curves to find the actual settings to be used on the BERTScope.
 - Manual: Manually specify the stress value. This is useful for doing measurement outside the specification limits. RJ, SJ, DMSI and Amplitude values can be varied.
 - o Raw: Use the raw stress value. Entered stress values are directly used.

5.5.6. Select BER Sweep Values

Select the required BER Sweep values. The table (sweep matrix) looks as in FIGURE 8. This screen allows selection of the preshoot/de-emphasis combinations to be tested. One of the key challenges setting up the link is tuning or determining the optimal RxEQ settings. The BER Map feature provides an automated way to scan the PCIe TxEQ coefficient matrix to determine the optimal TxEQ settings.

The matrix may be interpreted as follows: Pre-shoot and de-emphasis coefficients are mapped onto the Y-axis and X-axes, respectively. In both cases the maximum granularity of 1/24 is assumed. Each matrix cell corresponding to a valid combination of preshoot and

de-emphasis coefficients has three entries corresponding to preshoot (PS), de-emphasis (DE), and boost (as shown in the upper left hand corner). The table also shows the corresponding preset value where ever applicable.

BER Test																					
	BE	R S	wee	ep																	
	FS		þ	4	В	oost l	.imit			10.	0-	dB	Clic	k indivi	idual c	ells or	row/c	olumn	headers to		
		Se	elect		P0			P1		P	2		P3			P4		P	95		
	PS	DF			_				_		C	+1					_				
		Boost	0/	24	1/	24	2/	24	3/	24	4	/24	5/	24	6/	24	7/	24	8/24		
The Date of the second se		0/2	0.0	0.0	0.0	-0.8	0.0	-1.6	0.0	-2.5	0.0	-3.5	0.0	-4.7	0.0	-6.0	0.0	-7.6	0.0 -9.5		
0		4	P4	0.0		0.8	P3	1.6	P3	2.5	P1	3.5	P2	4.7	PO	6.0		7.6	9.5		
		1/2	0.8	0.0	0.8	-0.8	0.9	-1.7	1.0	-2.8	1.2	-3.9	1.3	-5.3	1.6	-6.8	1.9	-8.8			
		4		0.8		1.6		2.5		3.5		4.7		6.0		7.6		9.5			
		2/2	1.6	0.0	1.7	-0.9	1.9	-1.9	2.2	-3.1	2.5	-4.4	2.9	-6.0	3.5	-8.0					
		4	P5	1.6		2.5		3.5		4.7		6.0	P7	7.6		9.5					
		3/2	2.5	0.0	2.8	-1.0	3.1	-2.2	3.5	-3.5	4.1	-5.1	4.9	-7.0							
	1	4	P6	2.5		3.5		4.7	P8	6.0	P7	7.6		9.5							
		4/2	3.5	0.0	3.9	-1.2	4.4	-2.5	5.1	-4.1	6.0	-6.0									
		4	00	2.5		47		6.0		7.6		0.5									
			P9 4 7	3.5	53	4.7	6.0	-2.9	70	-4.9		9.5									
		5/2		0.0		1.5	0.0														
		Ľ.	6.0	4.7	6.0	6.0		7.6		9.5											
		6/2	6.0	0.0	6.8	-1.6	8.0	-3.5													
	<	4																	>		
																	< Ba	k	Next >	Car	icel

Figure 8: BER Sweep matrix

- FS: Adjust the FS to change the resolution of the table.
- Boost Limit: Maximum boost that needs to be used.
- 5.5.7. Initiate Loopback:

This step initiates the loopback. Once the loopback is done, press 'Next'

Step Status Set Preshoot/Deemphass Setting PE to 3.16dB, and DE to -6.39dB OK Clear Stresses Clear Stresses OK Configure Loopback Configure Loopback OK Load Sequence Loaded sequence OK Init Loopback Loopback OK Valdate Loopback Reports OK Check Detector Clock Detector Autoalgn OK Check Detector Sync Detector sync is OK Success DUT is in Loopback mode	Step Status Set Preshoot/Deemphass Setting PE to 3.16dB, and DE to -6.39dB OK Clear Stresses Clear Stresses OK Configure Loopback Configure Loopback OK Load Sequence Loaded sequence OK Int Loopback Loopback OK Valdate Loopback Reports OK Check Detector Detector Autoalgn OK Check Detector Sync Detector sync is OK Success DUT is in Loopback mode	Trequese cog	mon roy roy onna
Sett Preshoot/Deemphass Setting PE to 3.16dB, and DE to -6.39dB OK Clear Stresses Clear Stresses OK Configure Loopback Configure Loopback OK Load Sequence Loaded sequence OK Int Loopback Loopback OK Valdate Loopback Reports OK Check Detector Coector dock is OK Autoalign Detector Detector Autoalign OK Check Detector Sync Detector sync is OK Success DUT is in Loopback mode	Set: Preshost/Deemphase Setting PE to 3.16dB, and DE to -6.39dB OK Clear Stresses Clear Stresses OK Configure Loopback Configure Loopback OK Load Sequence Loaded sequence OK Int Loopback Loopback OK Valdate Loopback Reports OK Check Detector Clock Detector clock is OK Autoalign Detector Detector sync is OK Success DUT is in Loopback mode	Step	Status
Clear Stresses Clear Stresses OK Configure Loopback Configure Loopback OK Load Sequence Loaded sequence OK Int Loopback Loopback OK Valdate Loopback Reports OK Check Detector Clock Detector dock is OK Autoalign Detector Detector Autoalign OK Check Detector Sync Detector sync is OK Success DUT is in Loopback mode	Clear Stresses Clear Stresses OK Configure Loopback Configure Loopback OK Load Sequence Loaded sequence OK Int Loopback Loopback OK Valdate Loopback Reports OK Check Detector Clock Detector dock is OK Autoalgn Detector Detector Autoalgn OK Check Detector Sync Detector sync is OK Success DUT is in Loopback mode	Set Preshoot/Deempha	Setting PE to 3.16dB, and DE to -6.39dB OK
Configure Loopback Configure Loopback OK Load Sequence Loaded sequence OK Int Loopback Loopback OK Valdate Loopback Reports OK Check Detector Clock Detector Okk is OK Autoalgn Detector Detector Autoalgn OK Check Detector Sync Detector sync is OK Success DUT is in Loopback mode	Configure Loopback Configure Loopback OK Load Sequence Loaded sequence OK Int Loopback Loopback OK Valdate Loopback Reports OK Check Detector Clock Detector clock is OK Autoalign Detector Detector Autoalign OK Check Detector Sync Detector sync is OK Success DUT is in Loopback mode	Clear Stresses	Clear Stresses OK
Load Sequence Loaded sequence OK Int Loopback Loopback OK Valdate Loopback Reports OK Check Detector Clock Detector dok is OK Autoalgn Detector Detector Autoalgn OK Check Detector Sync Detector sync is OK Success DUT is in Loopback mode	Load Sequence Loaded sequence OK Int Loopback Loopback OK Valdate Loopback Reports OK Check Detector Clock Detector dock is OK Autoalgn Detector Detector Autoalgn OK Check Detector Sync Detector sync is OK Success DUT is in Loopback mode	Configure Loopback	Configure Loopback OK
Int Loopback Loopback OK Valdate Loopback Reports OK Check Detector Clock Detector dock is OK Autoalign Detector Detector Autoalign OK Check Detector Sync Detector sync is OK Success DUT is in Loopback mode	Int Loopback Loopback OK Valdate Loopback Reports OK Check Detector Clock Detector dotk is OK Autoalign Detector Detector Autoalign OK Check Detector Sync Detector sync is OK Success DUT is in Loopback mode	Load Sequence	Loaded sequence OK
Valdate Loopback Reports OK Check Detector Clock Detector clock is OK Autoalign Detector Detector Autoalign OK Check Detector Sync Detector sync is OK Success DUT is in Loopback mode	Valdate Loopback Reports OK Check Detector Cock Detector dock is OK Autoalign Detector Detector Autoalign OK Check Detector Sync Detector sync is OK Success DUT is in Loopback mode	Init Loopback	Loopback OK
Check Detector Clock Detector dock is OK Autoalign Detector Detector Autoalign OK Check Detector Sync Detector sync is OK Success DUT is in Loopback mode	Check Detector Clock Detector dock is OK Autoalign Detector Detector Autoalign OK Check Detector Sync Detector sync is OK Success DUT is in Loopback mode	Validate Loopback	Reports OK
Autoalign Detector Detector Autoalign OK Check Detector Sync Detector sync is OK Success DUT is in Loopback mode	Autoalign Detector Detector Autoalign OK Check Detector Sync Detector sync is OK Success DUT is in Loopback mode	Check Detector Clock	Detector dock is OK
Check Detector Sync is OK Success DUT is in Loopback mode	Check Detector Sync Detector sync is OK Success DUT is in Loopback mode	Autoalign Detector	Detector Autoalign OK
Success DUT is in Loopback mode	Success DUT is in Loopback mode	Check Detector Sync	Detector sync is OK
		Success	DUT is in Loopback mode

When all the steps in the loopback are successfully performed then press '*Next*' to go to '*Preset Test*'.

5.5.8. Run BER Test

Run the BER test. The following figure shows the results of a BER test. The BER for each TxEQ setting is shown in the table.

Fallow the onscreen instructions to understand more about the pass and failure cases.



5.5.9. Save Results

Press 'Save' button to save the results in a local database.

BER Test	
Sav	ve Results
- Same	Unique ID
	Creator Name
ALS AND AND AND ADDRESS OF	
	Device Description
	Comments
	Save
	< Back Next > Cancel

Below information can be provided while saving the results

- Unique ID: Name of the report.
- Creator Name: Operator name can be entered for future reference.
- Device Description: Enter the device description.
- Comments: Add comments if any.

6. INSTRUMENT CONNECTIVITY

'BERTScope PCIe Gen3 Receiver Testing' application communicates with instruments (BERTScope, RT Scope and SigTest Server) using Remote server/client model. Before performing any measurements, it is important to start the Remote Servers on respective instruments. Below are the various Remote Servers that needs to be started before connecting to the instrument.

Figure 9 shows the PCIe Gen3 Test solution equipment and Software communication.



Figure 9 PCle Gen3 Test Solution Equipment and Software Communication

/ Note 1: Windows PC is optional. The Receiver test application can be installed either on a Tektronix BERT scope or a Tektronix Real time Oscilloscope.

6.1. Connect to BERTScope

Start the BERTScope Remote Client app by going to *Start* \rightarrow *All Programs* \rightarrow *BERTScope* \rightarrow *BERTScope Remote Client*. After launching the BERTScope Remote client, change the mode to 'TCP/IP' from IEEE488 as in the Figure 10.

🛤 Remote Client	Version: 11.02 Build: 1903.
Trace Messages	
🔽 Scroll Output	
🔲 Timestamp	
🔲 GUI Lockout	
Identity: BSA286CL	
Terminator: None 💌	
C IEEE488	
TCP/IP Settings	
IP Addr: 134.64.245.141	
Port: 23 default	
Connected Disconnect	
Save Log to File Clear	

Figure 10 : BERTScope Remote Client

6.2. Connect to Scope.

Before connecting to the scope, start 'VISA Socket Gateway'. This server will provide the connectivity between '*BERTScope PCIE3.0 Receiver Testing*' and Oscilloscope. (Start \rightarrow All Programs \rightarrow Visa Socket Gateway \rightarrow Visa Socket Gateway)

/15A		Listening Socke	et
Resource	GPIB8::1::INSTR	Port	4005
Timeout	60.0 sec	IP Address	134.63.138.159
Stop Gatewa	ay 🔽 Auto restart		🔲 Show Messages
10 - Gateway)0 - Waiting ti 14 - Connecti	is listening to 134,63,138,159 5 accept connection 5n established 5n while reading message:		

Figure 11: VISA Socket Gateway

6.3. Connect to SigTest Server

SigTest application runs inside the scope, hence SigTest Server also needs to be launched inside the scope. (*Start* \rightarrow *All Programs* \rightarrow *SigTest Server* \rightarrow *SigTest Server*) User can change the SigTest version by browsing a different 'Executable File'.

SigTest Executable	•	
Executable File	C:\Program Files (x86)\SigTest 3.2.0\SigTest.exe	Browse
Parameters		
Data File		Browse
Template File		Browse
Output File	C:\Temp\SigTest Output.txt	Browse
Other Args		
Socket Server		
Socket Port	4006	Hide
Listening on: 13	4 63 138 159	Diagnostic:

6.4. Connect to Devices (BERTScope RX App).

Press '*Start Connect*' to open the '*Connect to Devices*' panel. Enter the IP address of the instrument and then press '*Connect*' (this should be done after doing steps 6.1, 6.2, 6.3). Once the instrument is connected then the button turns to '*Disconnect*' and Instrument ID is displayed at the bottom and it is highlighted with Green color.

BERTScope PCIE3.0 Receive	r Testing, 2.0.0.8		
R	Connect to Device	es	
	- IP Addresses		
Start Connect	BERTScope	134.63.138.158	Disconnect
1 Help	Scope	134.63.138.159	Disconnect
Calibrations	Sigtest Server	134.63.138.159	Disconnect
Stressed Eye			
Tests	Status		
Preset Test			
BER Test			
Results			
BER Test			
	-Download Pattern F	Files to BERTScope	
BSX 280094 cone MSO7	Files		
00/200004 Cope 11007	000 10 Mg(05(4.0.00) 1.		

7. CALIBRATION

Calibration is performed to compensate for cable/fixture losses. Two types of calibration needs to be performed.

- Amplitude Calibration.
- Stressed Eye Calibration.

Calibration wizard automates the calibration procedure. Calibration wizard will walk you through different calibration steps. Once the calibration is done, the results can be stored in a database and re-used later.

7.1. Amplitude Calibration

7.1.1. Press Calibration → Amplitudes to launch the 'Amplitude Calibration' Wizard.

	Name	Croater	Date (Time	Commont
	Name		Date/ nine	
Preferences		IK HIPL_SQE	6/17/2017 1:15:39 A	M Success_12Mins_End/OEnd
Start Connect	[Example AMPL Ca	I] Factory	11/3/2014 3:00:07 P	M
Help				
Calibrations				
Amplitudes				
Stressed Eye				
Tests				
Preset Test				
BER Test				
Results				
BER Test				

From the Amplitude Calibrations view, select the appropriate calibration file or, if an appropriate calibration file does not exist, press *Wizard* to begin the automated step-by-step calibration procedure.

Calibrations stored in the system database may be managed using the controls as in the below list:

Control	Description	
Сору	Copy the selected file as a new database entry	
Edit	Edit the selected file	
Delete	Delete the selected file	
Report	Create an HTML report for the selected file	
Wizard	Open a pop-up wizard dialog to step through making a new Stressed Eye calibration and storing it in the	

7.1.2. Amplitude Calibration Wizard Below is the Amplitude Calibration Wizard. Read the instruction and Press '*Next*'.



7.1.3. Amplitude calibration Cabling Diagram

Application shows the 'Amplitude Calibration Diagram' as in Figure 12. Do the connection as in the figure and then press 'Next'.



Figure 12: Amplitude Calibration Cabling Diagram.

Note: Amplitude Cabling diagram is same for Add-in Card and System Board

7.1.4. Initialize Equipment

Application will initialize the equipment's like, BERTScope and RT scope. It will set the required impairments on the BERTScope and calibrates the signals using the RT Scope. Press '*Run*' to execute the instrument initialization and after initialization press '*Next*'.

🖳 Amplitude Calibration				x
	Ir	itialize Equipment		
man Harris		Description	Status	
And and a second	V	Initialize BERTScope		
e'e.	V	Setup Generator		Ξ
14	V	BERTScope Disable SSC		
	V	BERTScope Disable Stress		
0	V	Load Ampl Test Pattern		
	V	DPP Disable Deemphasis		
	V	RT Scope Reset		- -
		Clear All	Check All Run Back Next > Cance	

7.1.5. Select the Stress Targets

Application will show the stress targets as per the CEM Specification. If user wishes to test the application with different stress targets then they can change the values in this panel.

🖳 Amplitude Calibration			
	Select Stress Targ	jets	
	Preshoot 3.50 dB Amplitude 800 mV RJ 1.50 p5 (RMS) Start all calibrations autor below	Deemphasis -6.00 - c Preset P7 - SJ 12.50 - g natically upon pressing	lB oS I "Next"
		< Back	Next > Cancel

Figure 13 : Select Stress Targets

Check the '*Start all calibration automatically upon pressing "Next" below*', to start the automatic calibration of amplitude, Rj and Sj parameters without having to press 'Next' in each of the panel/Step. If this checkbox is un-checked then user has to manually press 'Next' upon completion of each of the calibration step.

7.1.6. Perform AC-DC Amplitude Balance Calibration

The graph shows black dots representing measurements taken with settings evenly spaced throughout the calibration range. Using the set value and measured value, a straight line is fit. Using the straight line equation (slope and intercept), settings for the target value is calculated. This value is set on the BERTScope and measured value is shown with a red dot.



7.1.7. Perform Deemphasis Calibration







7.1.9. Perform Amplitude calibration Press '*Start*' to start the calibration. Press '*Next*' once the calibration is done.



7.1.10. Perform RJ Calibration

Perform the RJ calibration. Waveform is saved on the oscilloscope and SigTest is used for RJ measurement. Press 'Start' to start the calibration. Press 'Next' once the calibration is done.



7.1.11. Perform SJ calibration

Perform the SJ calibration. Waveform is saved on the oscilloscope and SigTest is used for SJ measurement. Press 'Start' to start the calibration. Press 'Next' once the calibration is done.



7.1.12. Save Calibration results:

Calibrated results can be saved in a data base. To save the values, enter the 'Unique ID', 'Creator Name' and 'Comments' and press 'Save'.

Amplitude Calibrated values can be used for performing the 'Stressed Eye' Calibration and to perform 'Jitter Tolerance' test.

🖳 Amplitude Calibration		
TH	Save Calibration Results	
	Creator Name Operator Comments Save	
	< Back	Next > Cancel

7.2. Stressed Eye Calibration

The Stressed Eye Calibration Wizard automates the calibration as per the CEM Specification. You will be prompted with diagrams to make certain test equipment connections, then begin the automated calibration procedures, and store the results when completed.

7.2.1. Stressed Eye Calibration Wizard

This wizard helps to perform the automated Eye Calibration and also helps to store the results in the Data Base

One of the below configuration can be selected ('Type of Calibration')

- · 'AddInCard
- 'System'

- EYE Calibration	
	Stressed Eye Calibration Wizard This wizard enables you to perform automated Eye Calibration and store the results in the d. This procedure sets the random jitter (RJ) and differential-mode sinusoidal interference (DM: achieve a target eye opening. Make sure to DESKEW the oscilloscope before running this wizard. Select the DUT type to be calibrated and press the Next button to continue. Type of Calibration AddInCard
-	<pre>Back Next > Cancel</pre>

7.2.2. Select the Amplitude calibration values.

For performing the '*Stressed Eye*' calibration, '*Amplitude calibration*' results are required. Use the AMPL drop down to select the required Calibrated Amplitude values. Press '*Next*' once the AMPL selection is done.

🖳 EYE Calibration		
11 a	Select Calibrations	
200	Select the AMPL Calibration to use during the EYE Calibration.	
N N	AMPL	
0	AmpliCal_TimeCheck	
	< Back Next >	Cancel

7.2.3. Eye Calibration Cabling Diagram:

Connect all the equipment as in the below diagram and then press 'Next'.

/ Note: The connection diagram depends on the selection in 7.2.1. The connection diagrams are different for 'Add-In Card' and 'System'. Please refer section 8.2 for hi resolution connection diagrams.







Figure 15: Cabling Diagram: System

7.2.4. Initialize Equipment

Application will initialize the equipment's like, BERTScope and RT scope. It will set the required impairments on the BERTScope and calibrates the signals using the RT Scope. Press 'Run' to execute the instrument initialization and after initialization press '*Next*'.

n Stand	Description	Status
1000	🔽 🗹 Initialize BERTScope	
A	Setup Generator	
	BERTScope Disable SSC	
	BERTScope configure Stress	
Carl D A and and D	🔽 Load Test Pattern	
	DPP Disable Deemphasis	
	🗹 RT Scope Reset	
	🗹 RT Scope Setup Math	
	🗵 RT Scope Setup Ch3/Ch4 Vertical	
	🗹 RT Scope Setup Horizontal	
	🛛 RT Scope Setup Trigger	
	RT Scope Setup Acquisition	
	RT Scope Setup Measurements	

7.2.5. Select Calibration Levels

Application will show the stress targets as per the CEM Specification. If user wishes to test the application with different stress targets then they can change the values in this panel. Press '*Next*' to go to next panel.

🖳 EYE Calibration				
	Select Calibration L Preset Preshoot 3.50 d dB Amplitude 800 mV SJ 12.50 ps	Deemphasis -6.00 DMSI 14.00 RJ 1.50	dB mV ps (RMS)	
		<	Back Next	> Cancel

7.2.6. Select Eye Targets

Application will show the stress targets as per the CEM Specification. If user wishes to test the application with different stress targets then they can change the values in this panel.

🖳 EVE Calibration		
EYE Calibration	Select Eye Targets Eye Height 50.00 mV Eye Width 45.00 p5	
	Start all calibrations automatically upon pressing "Next" below	
	< Back Next >	Cancel

Check the '*Start all calibration automatically upon pressing "Next" below*', to start the automatic calibration without having to press 'Next' in each of the panel/Step. If this checkbox is unchecked then user has to manually press 'Next' upon completion of each of the calibration step.



7.2.7. Perform DMSI Calibration

7.2.8. Perform SigTest Equalizer Selection

Press 'Start' to start the Equalizer selection. Press 'Next' once done.

1 y	Descr	RJ pS (RMS)	Eye Width pS	Eye Height mV	Eye Area	CTLE Index	DFE Tap	RJ Setting %UI	DMSI Settine mV
No. 1	1 Bad	1.5	-19.8	39.8	-789	7	4.6	13.8	61
State 1 1	2	1.5	47.9	49.5	2370	7	4.5	13.8	61
	3 Bad	1.5	42.6	1.0	43	7	4.5	13.8	61
A A A A A A A A A A A A A A A A A A A	AVERAGE	1.5	47.9	49.5	2370	7	4.5	13.8	61
	SELECTED	1.5	47.9	49.5	2370	7	4.5	13.8	61

In this step, application selects the required equalizer. Application performs 3 captures and analyze them. If there are any suspicious results, then that result will be marked as '*Bad*'. Application displays '*Average*' values for each of the setting and displays '*Selected*' setting.

7.2.9. Perform RJ Eye Opening Sweep.

This step sweeps the Rj values and find the Eye area. It shows the impact of Rj on eye area. Press '*Start*' to start the sweep and once the Eye opening sweep is done, press '*Next*'.



7.2.10. Perform DMSI Eye Opening Sweep

This step sweeps the DMSI values and finds the Eye area. It shows the impact of DMSI on eye area. Press '*Start*' to start the sweep and press '*Next*' once it is done.



7.2.11. Review Stressed Eye Results

In this step, application adjusts the Rj and DMSI to achieve the required eye targets. Application captures three waveforms for the analysis. If there are any bad results, they are discarded from the results. Press '*Next*' after the results are reviewd.

	Descr	RJ pS (RMS)	DMSI mV	Eye Width pS	Eye Height mV	Eye Area	CTLE Index	DFE Tap	RJ Setting %UI	DMSI Setting mV	EW Target pS	EH Targe mV
	1 Bad	2.63	13.53	-43.7	2.8	-121	7	4.5	20.9	58	41.25	46.0
	2	2.63	13.53	40.3	43.9	1769	7	4.5	20.9	58	41.25	46.0
	3	2.63	13.53	41.9	46.6	1953	7	4.5	20.9	58	41.25	46.0
and a local distance of the second se	AVER	2.63	13.53	41.1	45.2	1860	7	4.5	20.9	58	41.25	46.0

7.2.12. Save Calibration results:

Calibrated results can be saved in a data base. To save the values, enter the 'Unique ID', 'Creator Name' and 'Comments' and press 'Save'.

Calibrated values can be used for doing the 'Jitter Tolerance' test.

🖳 EYE Calibration		
e EVE Calibration	Save Calibration Results Unique ID I Creator Name Operator Comments Save	
		< Back Next > Cancel

8. CONNECTION DIAGRAM

This section lists all the connection diagrams used for calibrating the instrument and performing the jitter tolerance test.

Below table lists the available connection diagrams. Based on the DUT type, make the connection.

Calibration Type	Device Type	Reference Section
Amplitude Calibration	Add-in Card	8.1
	System Board	8.1
Stressed Eye Calibration	Add-in Card	8.2.1
	System Board	8.2.2
Jitter Tolerance Test	Add-in Card	8.3.1
	System Board	8.3.2

Table 3: Connection Diagrams

8.1. Connection Diagram: Amplitude Calibration (Add-in Card and System Board)



Figure 16 : Amplitude Calibration (Add-in Card and System Board)



8.2. Connection Diagram: Stressed Eye Calibration

Figure 17: Stressed Eye Calibration –Add-in Calibration



Figure 18 : Stressed Eye Calibration-System Board

8.3. Connection Diagram: Jitter Tolerance Test

8.3.1. JTOL – Add-In Card connection diagram.



Figure 19 : JTOL- Add-In Card Connection Diagram

8.3.2. JTOL - System connection diagram.



Figure 20 : JTOL – System Connection Diagram

9. PRE-TEST PROCEDURES

Prior to making the calibration, the following steps must be taken to assure accurate measurements on the Oscilloscope:

- Allow a minimum of 20 minutes warm-up time for oscilloscope.
- Run scope SPC calibration routine. It is necessary to remove all probes from the scope before running SPC.
- Perform deskew to compensate for skew between measurement channels.
- Use a torque wrench to make all SMA connections.