D9010XAUC XAUI Electrical Validation Application

KEYSIGHT

METHODS OF IMPLEMENTATION

Notices

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Keysight Technologies
1900 Garden of the Gods Road
Colorado Springs, CO 80907 USA

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XAUI Automated Testing—At A Glance

The Keysight D9010XAUC XAUI Electrical Validation Application helps you verify that your XAUI devices conform to specifications with the Keysight Infiniium oscilloscopes. The XAUI Electrical Validation Application:

- Lets you select individual or multiple tests to run.
- Lets you identify the device being tested and its configuration.
- Shows you how to make oscilloscope connections to the device under test.
- Automatically checks for proper oscilloscope configuration.
- Automatically sets up the oscilloscope for each test.
- Provides detailed information for each test that has been run and lets you specify the thresholds at which marginal or critical warnings appear.
- Creates a printable HTML report of the tests that have been run.

NOTE

The tests performed by the XAUI Electrical Validation Application are intended to provide a quick check of the electrical health of the DUT. This testing is not a replacement for an exhaustive test validation plan.

Specifications are described in sections 47 and 54 of the *IEEE 802.3-2005 Standard*. The D9010XAUC also allows testing of common tests from the XAUI derived 10Gigabit Fibre Channel XAUI, CPRI, OBSAI, and Serial Rapid IO standards. For more information on XAUI, see the IEEE 802 Standards web site at www.ieee802.org. Also visit www.cpri.info, www.obsai.org and www.rapidio.org for more information on CPRI, OBSAI and Serial Rapid IO standards respectively.

In This Book

This manual describes the tests that are performed by the XAUI Electrical Validation Application in more detail; it contains information from (and refers to) the *IEEE 802.3-2005 Standard*, and it describes how the tests are performed.

- Chapter 1, “Overview" lists the tests performed by the D9010XAUC XAUI Electrical Validation Application as per the IEEE 802.3-2005 standards.
- Chapter 2, “Installing the XAUI Electrical Validation Application" shows how to install and license the automated test application software (if it was purchased separately).
- Chapter 3, “Preparing to Take Measurements" shows how to start the XAUI Electrical Validation Application and gives a brief overview of how it is used.
- Chapter 4, “XAUI Tests" contains more information on the XAUI tests.
- Chapter 5, “10GBASE-CX4 Tests" contains more information on the 10GBASE-CX4 tests.
- Appendix 6, “Calibrating the Infiniium Oscilloscope and Probe describes how to calibrate the oscilloscope in preparation for running the XAUI automated tests.
- Appendix 7, “InfiniiMax Probing describes the InfiniiMax probe amplifiers and probe head recommendations for XAUI testing.

See Also

- The XAUI Electrical Validation Application’s online help, which describes:
  - Starting the XAUI Test Compliance Application
  - Creating or Opening a Test Project
  - Setting Up InfiniiSim
  - Setting Up the Precision Probe/Cable
  - Setting Up the Test Environment
  - Selecting Tests
  - Configuring Tests
  - Connecting the Oscilloscope to the DUT
  - Running Tests
  - Automating the Application
  - Viewing Results
  - Viewing/Exporting/Printing the Report
  - Understanding the Report
  - Saving Test Projects
  - User-Defined Add-Ins
  - Controlling the Application via a Remote PC
  - Using a Second Monitor

Contents

1 Overview

The D9010XAUC XAUI Electrical Validation Application performs the following tests as per the IEEE 802.3-2005 standards.

Table 1 XAUI Tests by Standard Reference

Standard Reference	Description	See
IEEE 802.3-2005, Section 47.3.3	Baud rate tolerance	page 30
IEEE 802.3-2005, Section 47.3.3.2	Differential amplitude maximum	page 31
IEEE 802.3-2005, Section 47.3.3.5	Driver template	page 32
IEEE 802.3-2005, Section 47.3.3.5	Driver transmit jitter	page 33
IEEE 802.3-2005, Section 47.3.3.3	Transition time	page 37

Table 2 10GBASE-CX Tests by Standard Reference

Standard Reference	Description	See
IEEE 802.3-2005, Section 54.6.3.3	Baud rate tolerance	page 44
IEEE 802.3-2005, Section 54.6.3.6	Differential output template	page 45
IEEE 802.3-2005, Section 54.6.3.4	Data amplitude	page 46
IEEE 802.3-2005, Section 54.6.3.7	Transition time	page 48
IEEE 802.3-2005, Section 54.6.3.8	Driver transmit jitter	page 49

2 Installing the XAUI Electrical Validation Application

If you purchased the D9010XAUC XAUI Electrical Validation Application separately, you need to install the software and license key.

Installing the Software

1. Make sure you have the minimum version of Infiniium Oscilloscope software (see the D9010XAUC test application release notes) by choosing **Help>About Infiniium**... from the main menu.
2. To obtain the XAUI Electrical Validation Application, go to Keysight Web site: http://www.keysight.com/en/pc-1152185/oscilloscope-software.
3. Navigate to the XAUI Electrical Validation Application software download.

   Follow the instructions to download and install the application software.

   Be sure to accept the installation of the .NET Framework software; it is required in order to run the XAUI Electrical Validation Application.

Installing the License Key

To procure a license, you require the Host ID information that is displayed in the Keysight License Manager application installed on the same machine where you wish to install the license.

Using Keysight License Manager 5

To view and copy the Host ID from Keysight License Manager 5:

1 Launch Keysight License Manager on your machine, where you wish to run the Test Application and its features.

2 Copy the Host ID that appears on the top pane of the application. Note that x indicates numeric values.

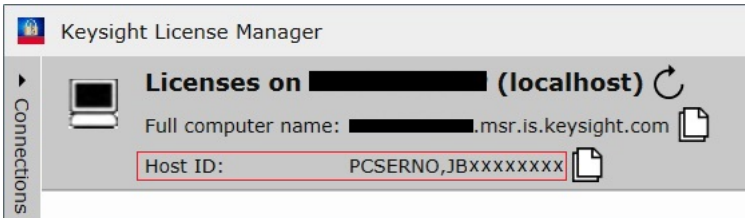

Figure 1 Viewing the Host ID information in Keysight License Manager 5

To install one of the procured licenses using Keysight License Manager 5 application,

1 Save the license files on the machine, where you wish to run the Test Application and its features.

2 Launch Keysight License Manager.

3 From the configuration menu, use one of the options to install each license file.

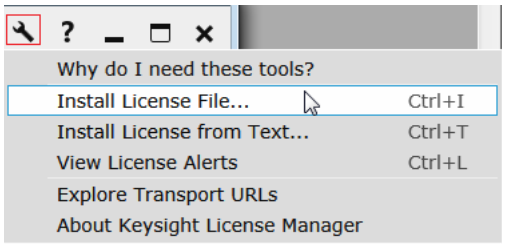

Figure 2 Configuration menu options to install licenses on Keysight License Manager 5

For more information regarding installation of procured licenses on Keysight License Manager 5, refer to Keysight License Manager 5 Supporting Documentation.

Using Keysight License Manager 6

To view and copy the Host ID from Keysight License Manager 6:

1. Launch Keysight License Manager 6 on your machine, where you wish to run the Test Application and its features.
2. Copy the Host ID, which is the first set of alphanumeric value (as highlighted in 3) that appears in the Environment tab of the application. Note that x indicates numeric values.

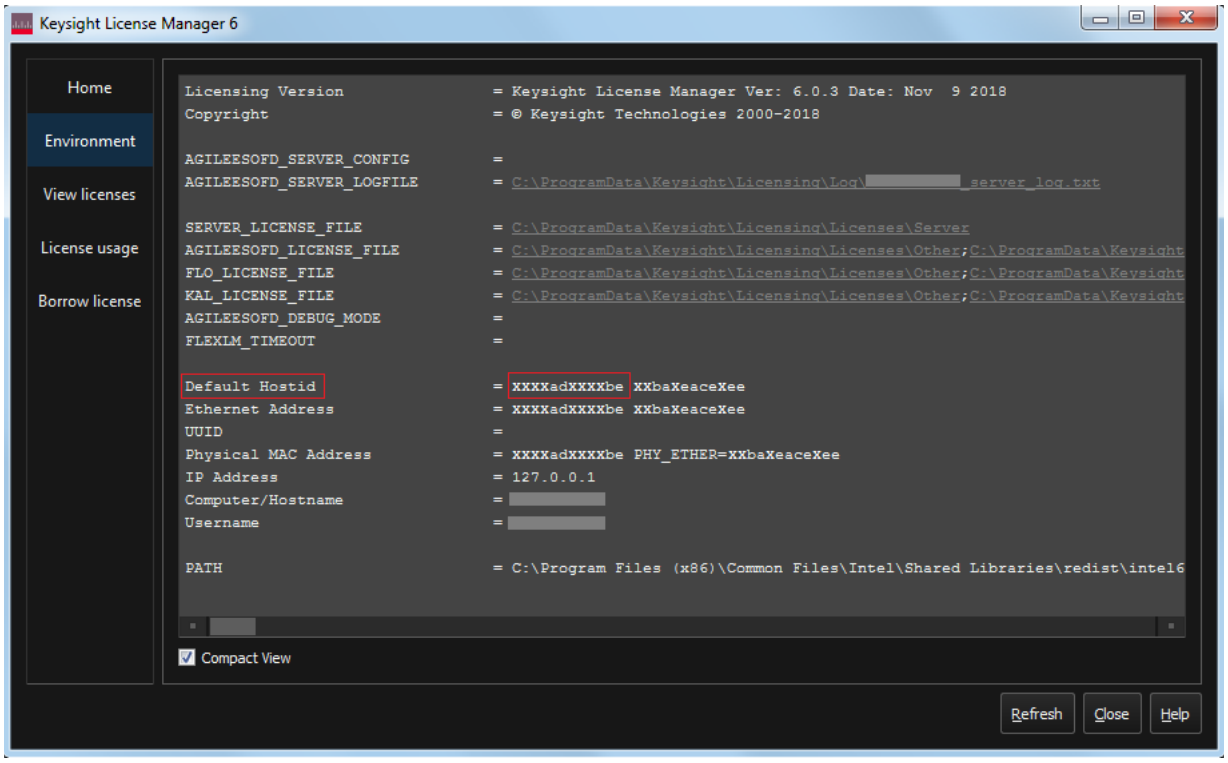

Figure 3 Viewing the Host ID information in Keysight License Manager 6

To install one of the procured licenses using Keysight License Manager 6 application,

1 Save the license files on the machine, where you wish to run the Test Application and its features.

2 Launch Keysight License Manager 6.

3 From the Home tab, use one of the options to install each license file.

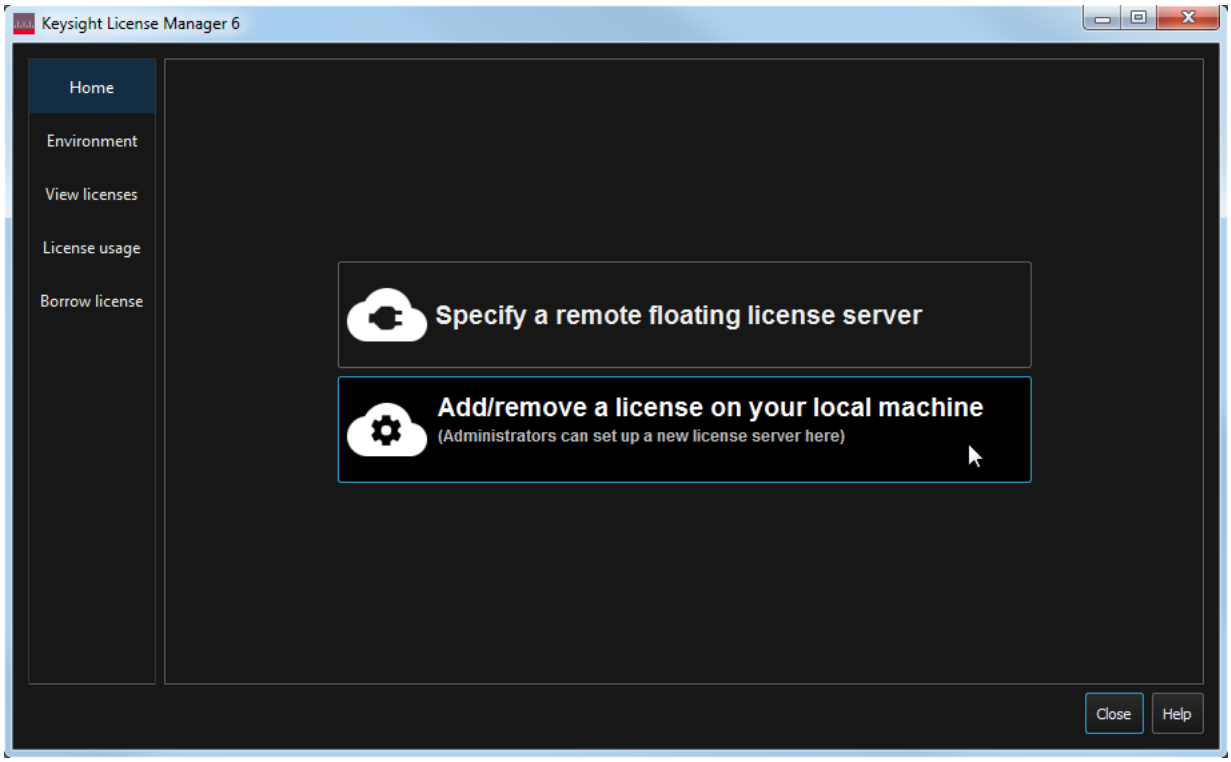

Figure 4 Home menu options to install licenses on Keysight License Manager 6

For more information regarding installation of procured licenses on Keysight License Manager 6, refer to Keysight License Manager 6 Supporting Documentation.

3 Preparing to Take Measurements

Before running the XAUI automated tests, you need to acquire the appropriate test fixtures, and you should calibrate the oscilloscope. After the oscilloscope has been calibrated, you are ready to start the XAUI Electrical Validation Application and perform measurements.

Required and Recommended Equipment

Oscilloscope Compatibility and Recommended Probe Amplifiers

Table 3 Recommended Oscilloscopes and Recommended Probe Amplifiers

Standard	Data Rate	Recommended Oscilloscope	Oscilloscope Bandwidth	Recommended Probe	Probe Bandwidth
XAUI	10 Gigabyte Ethernet (4x3.125 GBaud)	Infiniium	≥ 4 GHz	1134A/B series	≥ 4 GHz

Number of Probes or SMA Cables Required

Table 4 Number of Probes or SMA Cables Required

Probes and BNC Cables	XAUI Measurements
InfiniiMax active differential probe	1
SMA cables	2

Recommended Accessories

Table 5 Recommended Test Accessories

Keysight Part Number	Description
8120-1839	BNC cable (61 cm, 2 ft.)
08760-82382	SMA cable (31 cm, 1 ft.)
08760-82386	SMA cable (62 cm, 2 ft.)

For the recommended Infiniium oscilloscope models and required software, refer to the Release Notes for this application.

Calibrating the Oscilloscope

If you haven't already calibrated the oscilloscope, see Appendix 6, "Calibrating the Infiniium Oscilloscope and Probe".

NOTE If the ambient temperature changes more than 5 degrees Celsius from the calibration temperature, internal calibration should be performed again. The delta between the calibration temperature and the present operating temperature is shown in the Utilities>Calibration menu.

NOTE If you switch cables or probes between channels or other oscilloscopes, it is necessary to perform cable and probe calibration again. Keysight recommends that, once calibration is performed, you label the cables with the channel for which they were calibrated.

Starting the XAUI Electrical Validation Application

1 From the Infiniium oscilloscope's main menu, choose **Analyze>Automated Test Apps>D9010XAUC XAUI Test App.** The **Set Up** tab of the XAUI Test App is displayed.

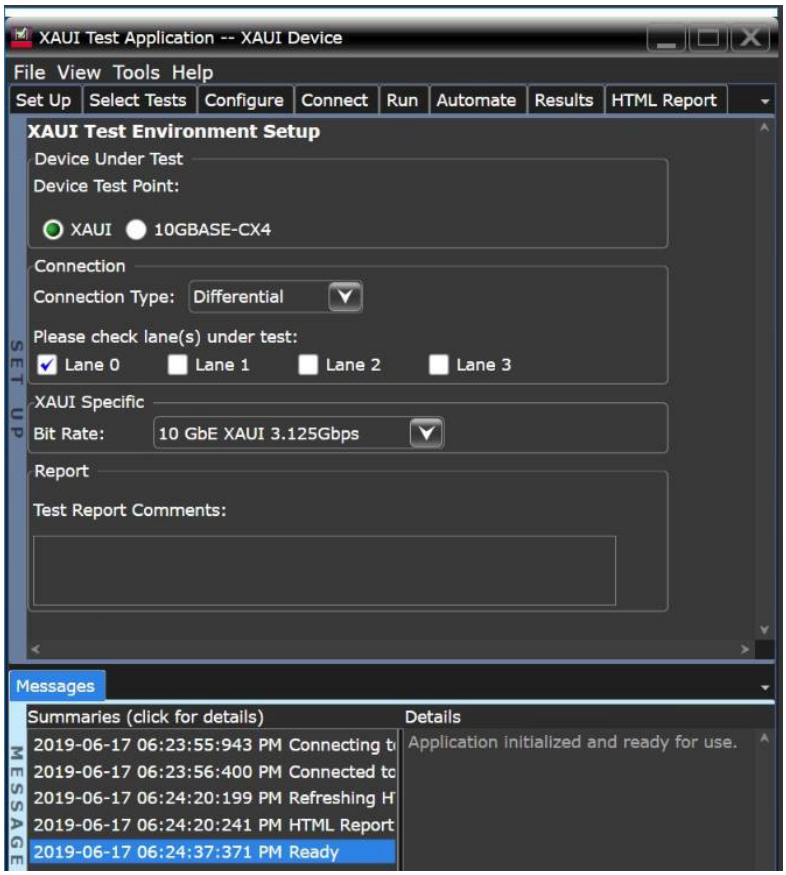

Figure 5 The XAUI Electrical Validation Application

NOTE If XAUI does not appear in the Automated Test Apps menu, the XAUI Electrical Validation Application has not been installed (see Chapter 2, "Installing the XAUI Electrical Validation Application). Alternatively, the required licenses to run the application are missing.

Figure 5 shows the XAUI Electrical Validation Application main window. The tabs in the main pane show the steps you take in running the automated tests:

Tab	Description
Set Up	Lets you select the XAUI device test point being tested. Lets you select the connection type: Differential or Single-ended. If Differential is selected, lets you choose which Lane is being tested.
Select Tests	Lets you select the tests you want to run. The tests are organized hierarchically so you can select all tests in a group. After tests are run, status indicators show which tests have passed, failed, or not been run, and there are indicators for the test groups.
Configure	Lets you enter information about the device being tested and configure test parameters (like memory depth). This information appears in the HTML report.
Connect	Shows you how to connect the oscilloscope to the device under test for the tests to be run.
Run Tests	Starts the automated tests. If the connections to the device under test need to be changed while multiple tests are running, the tests pause, show you how to change the connection, and wait for you to confirm that the connections have been changed before continuing.
Results	Contains more detailed information about the tests that have been run. You can change the thresholds at which marginal or critical warnings appear.
HTML Report	Shows a compliance test report that can be printed. You can choose between a verbose and compact report.

Online Help Topics

For information on using the XAUI Electrical Validation Application, see its online help (which you can access by choosing Help>Contents... from the application's main menu).

The XAUI Electrical Validation Application's online help describes:

- Starting the XAUI Test Compliance Application
- Creating or Opening a Test Project
- Setting Up InfiniiSim
- Setting Up the Precision Probe/Cable
- Setting Up the Test Environment
- Selecting Tests
- Configuring Tests
- Connecting the Oscilloscope to the DUT
- Running Tests
- Automating the Application
- Viewing Results
- Viewing/Exporting/Printing the Report
- Understanding the Report
- Saving Test Projects
- User-Defined Add-Ins
- Controlling the Application via a Remote PC
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4 XAUI Tests

This section provides the Methods of Implementation (MOIs) for the XAUI 10 GBd tests using a Keysight Infiniium oscilloscope, probes, and the XAUI Electrical Validation Application.

Probing for XAUI Tests

Connectivity for XAUI tests depends on the type of connection on the board you are testing. If you are soldering to the DUT you can use the E2677A/B solder-in probe head or the N5425A/B ZIF probe head available for the 1134A/B InfiniiMax probe. If you are connecting to SMA connectors you can use the SMA probe head available for the 1134A/B InfiniiMax probe or you can use two SMA cables. The following figures show the different connection configurations.

Using the E2677A/B Solder-in Probe Head and the 1134A/B InfiniiMax Probe

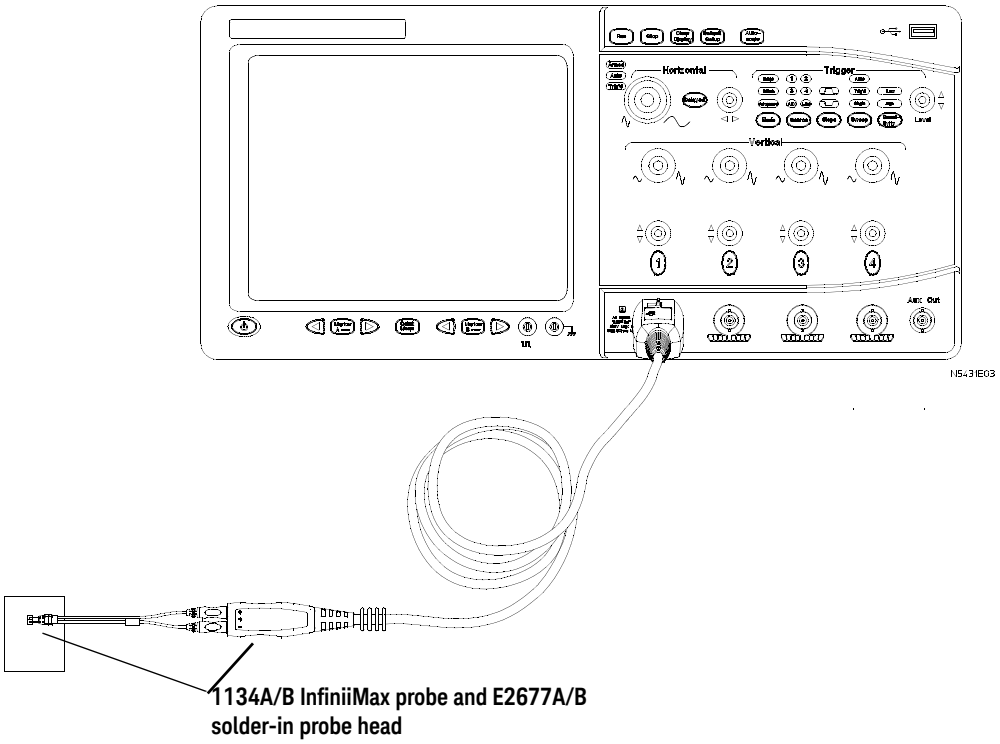

Figure 6 Probing using the solder-in probe head and the 1134A probe.

1 Connect the InfiniiMax probe with solder-in probe head to the XAUI test points and to the oscilloscope.
2 Ensure the correct polarity of the probe head.
3 In the XAUI Automated Test Application's Setup tab, select Differential for the connection type.

You can use any of the oscilloscope channels for probing the test point. You can identify the channel used in the Configure tab of the XAUI Electrical Validation Application. (The channel shown in Figure 8 is just for example.)

Using the D9010XAUC ZIF Probe Head and the 1134A/B InfiniiMax Probe

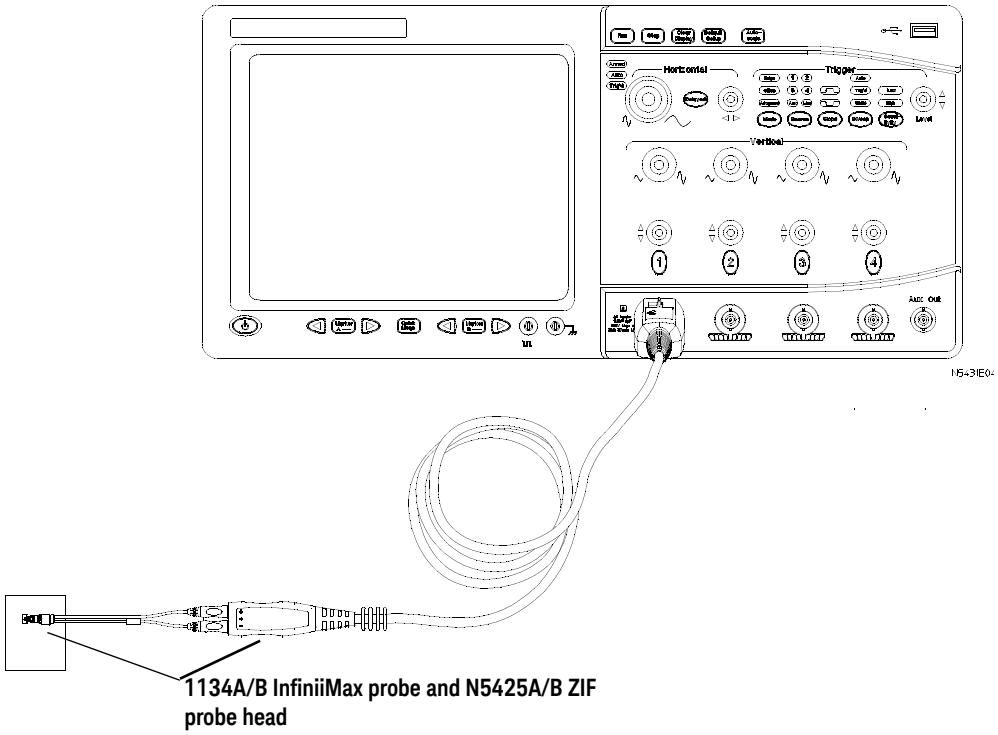

Figure 7 Probing using the ZIF probe head and the 1134A/B probe.

1 Connect an InfiniiMax probe with ZIF probe head to the XAUI test points and to the oscilloscope.
2 Ensure the correct polarity of the probe head.
3 In the XAUI Automated Test Application's Setup tab, select Differential for the connection type.

You can use any of the oscilloscope channels for probing the test point. You can identify the channel used in the Configure tab of the XAUI Electrical Validation Application. (The channel shown in Figure 8 is just for example.)

Using the SMA Probe Head and the 1134A/B InfiniiMax Probe

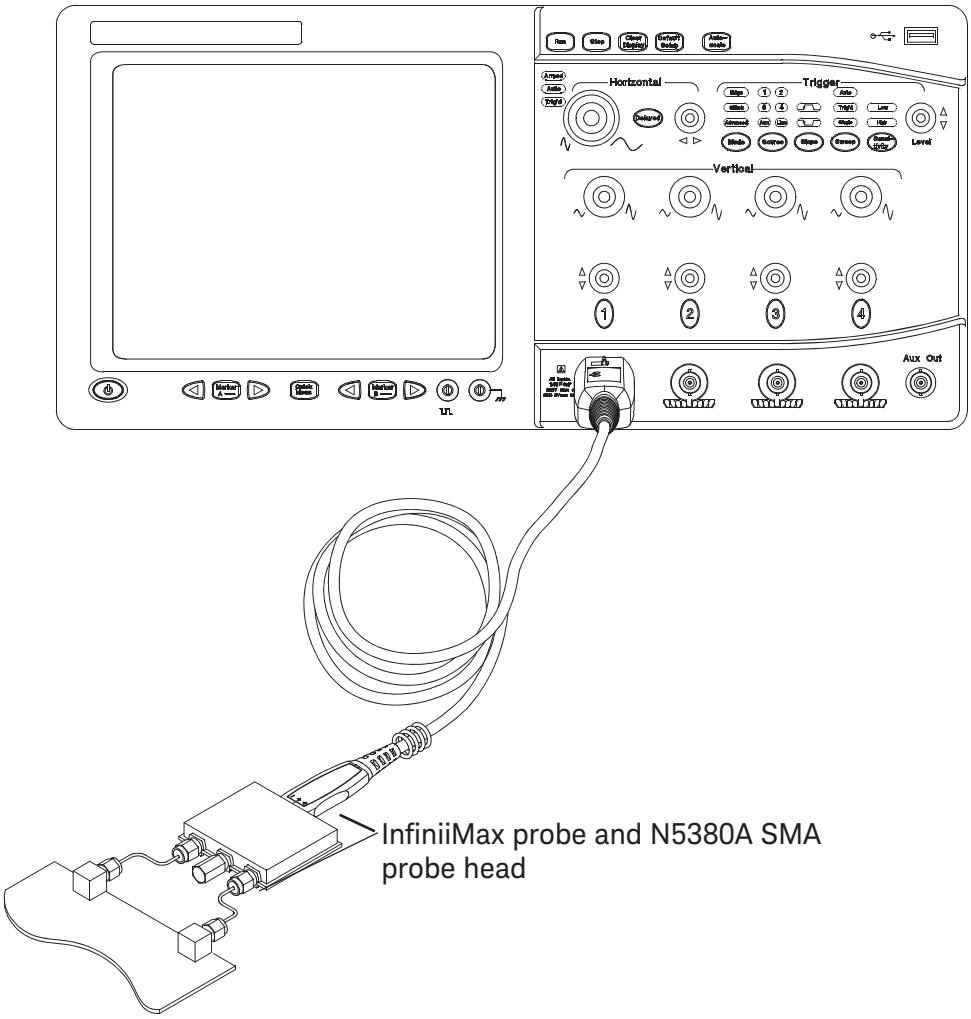

Figure 8 Probing using the SMA probe head and the 1134A/B probe.

1 Connect an InfiniiMax probe with SMA probe head to the XAUI test points and to the oscilloscope.
2 Ensure the correct polarity of the probe head.
3 In the XAUI Automated Test Application's Setup tab, select Differential for the connection type.

You can use any of the oscilloscope channels for probing the test point. You can identify the channel used in the Configure tab of the XAUI Electrical Validation Application. (The channel shown in Figure 8 is just for example.)

Using Two SMA Cables

When you are testing a XAUI waveform that has a dc offset voltage you will need to use two blocking capacitors such as the Keysight 11742A.

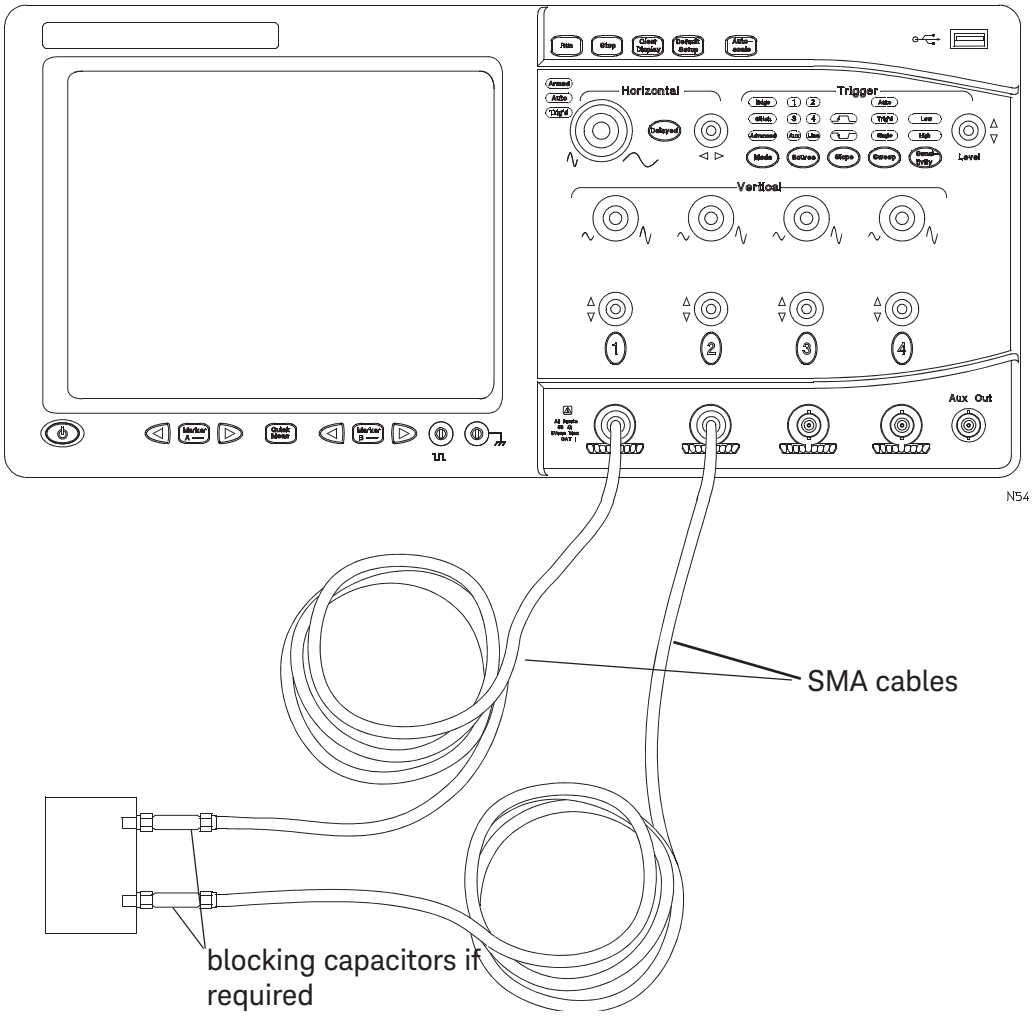

Figure 9 Probing using two SMA cables.

1 Connect the two SMA cables to the XAUI test points.
2 Connect the two SMA cables to the oscilloscope.
3 In the XAUI Automated Test Application's Setup tab, select Single-ended for the connection type.

You can use any of the oscilloscope channels for probing the test point. You can identify the channel used in the Configure tab of the XAUI Electrical Validation Application. (The channel shown in Figure 9 is just for example.)

Baud Rate Test

Baud Rate Test

The Baud Rate tests is to verify that the differential output baud rate of the device under test (DUT) is within the conformance limits.

References

[1] IEEE 802.3-2005, subclause 47.3.3.

Probing Setup

Refer to "Probing for XAUI Tests" on page 26. This probing configuration is used for all XAUI tests.

Device Configuration

1 Configure the DUT for 10 GBd operation using the CJPAT test pattern.

Performing the Test

1 Ensure this test is checked to run in the "Select Tests" tab.
2 Click the "Run Tests" button under the Run tab to start testing.
3 If the system is not physically configured to perform this test, the application will prompt you to change the physical configuration. When you have completed these instructions, click the Connection Completed button near the bottom of this dialog. Then, click the "Run Tests" button to continue testing.
4 The test will:
   - Verify that the correct test signal is present on the configured Data channel.
   - Configure the oscilloscope to capture a 3.125 GBd CJPAT signal.
   - Test the signal against conformance parameters, recording the result.
     i Configure PLL Bandwidth under Configure Tab.
     ii Set the First Order PLL, data rate, and PLL Bandwidth.
     iii Measure the Data Rate and compare the result.

Test Limits

3.125 GBd ±100 ppm

Driver Output Amplitude Test

Driver Output Amplitude Test

The Driver Output Amplitude test is to verify that the differential output voltage of the device under test (DUT) is within the conformance limits.

References

[1] IEEE 802.3-2005, subclause 47.3.3.2.

Probing Setup

Refer to "Probing for XAUI Tests" on page 26. This probing configuration is used for all XAUI tests.

Device Configuration

1 Configure the DUT for 10 GBd operation using the CJPAT test pattern.

Performing the Test

1 Ensure this test is checked to run in the “Select Tests” tab.

2 Click the “Run Tests” button under the Run tab to start testing.

3 If the system is not physically configured to perform this test, the application will prompt you to change the physical configuration. When you have completed these instructions, click the Connection Completed button near the bottom of this dialog. Then, click the “Run Tests” button to continue testing.

4 The test will:

- Verify that the correct test signal is present on the configured Data channel.
- Configure the oscilloscope to capture a 3.125 GBd CJPAT signal.
- Test the signal against conformance parameters, recording the result.
  - **i** Configure PLL Bandwidth under Configure tab.
  - **ii** Configure threshold level under Configure tab.
  - **iii** Set the First Order PLL, data rate, and PLL Bandwidth.
  - **iv** Enable the Mask Test feature and enable the display of the real-time eye.
  - **v** Use Histogram to determine the Vpp.

Test Limits

1600 mV_{p-p}

Driver Eye Template Test

Driver Eye Template Test

The Driver Eye Template test is provided for informative purposes. The specification does not require that this test be run, but it may be useful in providing insight of potential signal quality issues.

References

[1] IEEE 802.3-2005, subclause 47.3.3.5.

Probing Setup

Refer to "Probing for XAUI Tests" on page 26. This probing configuration is used for all XAUI tests.

Device Configuration

1 Configure the DUT for 10 GBd operation using the CJPAT test pattern.

Performing the Test

1 Ensure this test is checked to run in the "Select Tests" tab.
2 Select the “Data Eye Test Mask” to use in the “Configure” tab.
3 Click the “Run Tests” button under the Run tab to start testing.
4 If the system is not physically configured to perform this test, the application will prompt you to change the physical configuration. When you have completed these instructions, click the Connection Completed button near the bottom of this dialog. Then, click the “Run Tests” button to continue testing.
5 The test will:
   - Verify that the correct test signal is present on the configured Data channel.
   - Configure the oscilloscope to capture a 3.125 GBd CJPAT signal.
   - Test the signal against conformance parameters, recording the result.
     i Configure PLL Bandwidth under Configure tab.
     ii Set the First Order PLL, data rate, and PLL Bandwidth.
     iii Enable the Mask Test feature and enable the display of the real-time eye.
     iv Shift the waveform in time for the best fist to the specified mask.
     v Capture a number of waveforms, testing the waveform against the specified mask, recording failures when they occur.

Test Limits

No mask failures.

Driver Transmit Jitter Tests

Total Jitter Test

The Total Jitter test ensures that the total transmit jitter of the signal is within conformance limits.

Probing Setup

Refer to "Probing for XAUI Tests" on page 26. This probing configuration is used for all XAUI tests.

Device Configuration

1 Configure the DUT for 10 GBd operation using the CJPAT test pattern.

Performing the Test

1 Ensure this test is checked to run in the "Select Tests" tab.
2 Select the “Data Eye Test Mask” to use in the “Configure” tab.
3 Click the “Run Tests” button under the Run tab to start testing.
4 If the system is not physically configured to perform this test, the application will prompt you to change the physical configuration. When you have completed these instructions, click the Connection Completed button near the bottom of this dialog. Then, click the “Run Tests” button to continue testing.
5 The test will:
   - Verify that the correct test signal is present on the configured Data channel.
   - Configure the oscilloscope to capture a 3.125 GBd CJPAT signal.
   - Test the signal against conformance parameters, recording the result.
     i Configure PLL Bandwidth under Configure tab.
     ii Set the First Order PLL, data rate, and PLL Bandwidth.
     iii Turn on EZJIT Complete and set the pattern analysis mode to Arbitrary.
     iv Enable RJDJ measurements and measure TJ measurement.

     Final TJ = TJ * 1E+12

References and Test Limits

Table 6 References and test limits for the Total Jitter tests

Bit Rate	References	Test Limits
10Gbe XAUI 3.125Gbps	IEEE 802.3-2005, Clause 47, Section 47.3.3.5	Near-end: <= 0.35 UI Far-end: <= 0.55 UI
10 GFC XAUI 3.1875Gbps	IEEE 802.3-2005, Clause 47, Section 47.3.3.5	Near-end: <= 0.35 UI Far-end: <= 0.55 UI
XAUI Based 3.75Gbps	IEEE 802.3-2005, Clause 47, Section 47.3.3.5	Near-end: <= 0.35 UI Far-end: <= 0.55 UI
OBSAI RP3 768Mbps	OBSAI RP3, Chapter 5	Near-end: < = 0.35 UI Far-end: < = 0.65 UIpp
OBSAI RP3 1.536Gbps	OBSAI RP3, Chapter 5	Near-end: < = 0.35 UI Far-end: < = 0.65 UIpp
OBSAI RP3 3.072Gbps	OBSAI RP3, Chapter 5	Near-end: < = 0.35 UI Far-end: < = 0.65 UIpp
SRIO Short 1.25Gbps	Near-end: Rapid IO Part 6, Section 10.4.1 Table 10-2 Far-end: Rapid IO Part 6, Section 10.4.3 Table 10-10	Near-end: < = 0.35 UIpp Far-end: < = 0.65 UIpp
SRIO Short 2.5Gbps	Near-end: Rapid IO Part 6, Section 10.4.1 Table 10-2 Far-end: Rapid IO Part 6, Section 10.4.3 Table 10-10	Near-end: < = 0.35 UIpp Far-end: < = 0.65 UIpp
SRIO Short 3.125Gbps	Near-end: Rapid IO Part 6, Section 10.4.1 Table 10-2 Far-end: Rapid IO Part 6, Section 10.4.3 Table 10-10	Near-end: < = 0.35 UIpp Far-end: < = 0.65 UIpp
SRIO Long 1.25Gbps	Near-end: Rapid IO Part 6, Section 10.4.2 Table 10-6 Far-end: Rapid IO Part 6, Section 10.4.3 Table 10-10	Near-end: < = 0.35 UIpp Far-end: < = 0.65 UIpp
SRIO Long 2.5Gbps	Near-end: Rapid IO Part 6, Section 10.4.2 Table 10-6 Far-end: Rapid IO Part 6, Section 10.4.3 Table 10-10	Near-end: < = 0.35 UIpp Far-end: < = 0.65 UIpp
SRIO Long 3.125Gbps	Near-end: Rapid IO Part 6, Section 10.4.2 Table 10-6 Far-end: Rapid IO Part 6, Section 10.4.3 Table 10-10	Near-end: < = 0.35 UIpp Far-end: < = 0.65 UIpp
CRPI-LV 614.4Mbps	Near-end: CPRI Spec V3.0 Section 6.2.8 Far-end: CPRI Spec V3.0 Section 6.2.9	Near-end: < = 0.35 UI Far-end: < = 0.65 UI
CRPI-LV 1.2288Gbps	Near-end: CPRI Spec V3.0 Section 6.2.8 Far-end: CPRI Spec V3.0 Section 6.2.9	Near-end: < = 0.35 UI Far-end: < = 0.65 UI
CRPI-LV 2.4576Gbps	Near-end: CPRI Spec V3.0 Section 6.2.8 Far-end: CPRI Spec V3.0 Section 6.2.9	Near-end: < = 0.35 UI Far-end: < = 0.65 UI
CRPI-LV 3.072Gbps	Near-end: CPRI Spec V3.0 Section 6.2.8 Far-end: CPRI Spec V3.0 Section 6.2.9	Near-end: < = 0.35 UI Far-end: < = 0.65 UI
CRPI-HV 614.4Mbps	Near-end: CPRI Spec V3.0 Section 6.2.8 Far-end: CPRI Spec V3.0 Section 6.2.9	Near-end: < = 0.279 UI Far-end: < = 0.66 UI
CRPI-HV 1.2288Gbps	Near-end: CPRI Spec V3.0 Section 6.2.8 Far-end: CPRI Spec V3.0 Section 6.2.9	Near-end: < = 0.279 UI Far-end: < = 0.66 UI
CRPI-HV 2.4576Gbps	Near-end: CPRI Spec V3.0 Section 6.2.8 Far-end: CPRI Spec V3.0 Section 6.2.9	Near-end: < = 0.279 UI Far-end: < = 0.66 UI

Deterministic Jitter Test

The Deterministic Jitter test ensures that the deterministic jitter of the signal is within conformance limits.

Probing Setup

Refer to "Probing for XAUI Tests" on page 26. This probing configuration is used for all XAUI tests.

Device Configuration

1 Configure the DUT for 10 GBd operation using the CJPAT test pattern.

Performing the Test

1 Ensure this test is checked to run in the "Select Tests" tab.
2 Select the “Data Eye Test Mask” to use in the “Configure” tab.
3 Click the “Run Tests” button under the Run tab to start testing.
4 If the system is not physically configured to perform this test, the application will prompt you to change the physical configuration. When you have completed these instructions, click the Connection Completed button near the bottom of this dialog. Then, click the “Run Tests” button to continue testing.
5 The test will:
   - Verify that the correct test signal is present on the configured Data channel.
   - Configure the oscilloscope to capture a 3.125 GBd CJPAT signal.
   - Test the signal against conformance parameters, recording the result.
     i Configure PLL Bandwidth under Configure tab.
     ii Set the First Order PLL, data rate, and PLL Bandwidth.
     iii Turn on EZJIT Complete and set the pattern analysis mode to Arbitrary.
     iv Enable RJDJ measurements and measure DJ measurement.

     Final DJ = (DJ * 1E+12)/UI

References and Test Limits

Table 7 References and test limits for the Deterministic Jitter tests

Bit Rate	References	Test Limits
10Gbe XAUI 3.125Gbps	IEEE 802.3-2005, Clause 47, Section 47.3.3.5	Near-end: <= 0.17 UI Far-end: <= 0.37 UI
10 GFC XAUI 3.1875Gbps	IEEE 802.3-2005, Clause 47, Section 47.3.3.5	Near-end: <= 0.17 UI Far-end: <= 0.37 UI
XAUI Based 3.75Gbps	IEEE 802.3-2005, Clause 47, Section 47.3.3.5	Near-end: <= 0.17 UI Far-end: <= 0.37 UI
OBSAI RP3 768Mbps	OBSAI RP3, Chapter 5	Near-end: < = 0.17 UI Far-end: < = 0.37 UIpp
OBSAI RP3 1.536Gbps	OBSAI RP3, Chapter 5	Near-end: < = 0.17 UI Far-end: < = 0.37 UIpp
OBSAI RP3 3.072Gbps	OBSAI RP3, Chapter 5	Near-end: < = 0.17 UI Far-end: < = 0.37 UIpp
SRIO Short 1.25Gbps	Near-end: Rapid IO Part 6, Section 10.4.1 Table 10-2 Far-end: Rapid IO Part 6, Section 10.4.3 Table 10-10	Near-end: < = 0.17 UIpp Far-end: < = 0.37 UIpp
SRIO Short 2.5Gbps	Near-end: Rapid IO Part 6, Section 10.4.1 Table 10-2 Far-end: Rapid IO Part 6, Section 10.4.3 Table 10-10	Near-end: < = 0.17 UIpp Far-end: < = 0.37 UIpp
SRIO Short 3.125Gbps	Near-end: Rapid IO Part 6, Section 10.4.1 Table 10-2 Far-end: Rapid IO Part 6, Section 10.4.3 Table 10-10	Near-end: < = 0.17 UIpp Far-end: < = 0.37 UIpp

Bit Rate	References	Test Limits
SRIO Long 1.25Gbps	Near-end: Rapid IO Part 6, Section 10.4.2 Table 10-6 Far-end: Rapid IO Part 6, Section 10.4.3 Table 10-10	Near-end: < = 0.17 UIpp Far-end: < = 0.37 UIpp
SRIO Long 2.5Gbps	Near-end: Rapid IO Part 6, Section 10.4.2 Table 10-6 Far-end: Rapid IO Part 6, Section 10.4.3 Table 10-10	Near-end: < = 0.17 UIpp Far-end: < = 0.37 UIpp
SRIO Long 3.125Gbps	Near-end: Rapid IO Part 6, Section 10.4.2 Table 10-6 Far-end: Rapid IO Part 6, Section 10.4.3 Table 10-10	Near-end: < = 0.17 UIpp Far-end: < = 0.37 UIpp
CRPI-LV 614.4Mbps	Near-end: CPRI Spec V3.0 Section 6.2.8 Far-end: CPRI Spec V3.0 Section 6.2.9	Near-end < = 0.17 UI Far-end: < = 0.37 UI
CRPI-LV 1.2288Gbps	Near-end: CPRI Spec V3.0 Section 6.2.8 Far-end: CPRI Spec V3.0 Section 6.2.9	Near-end: < = 0.17 UI Far-end: < = 0.37 UI
CRPI-LV 2.4576Gbps	Near-end: CPRI Spec V3.0 Section 6.2.8 Far-end: CPRI Spec V3.0 Section 6.2.9	Near-end: < = 0.17 UI Far-end: < = 0.37 UI
CRPI-LV 3.072Gbps	Near-end: CPRI Spec V3.0 Section 6.2.8 Far-end: CPRI Spec V3.0 Section 6.2.9	Near-end: < = 0.17 UI Far-end: < = 0.37 UI
CRPI-HV 614.4Mbps	Near-end: CPRI Spec V3.0 Section 6.2.8 Far-end: CPRI Spec V3.0 Section 6.2.9	Near-end: < = 0.14 UI Far-end: < = 0.40 UI
CRPI-HV 1.2288Gbps	Near-end: CPRI Spec V3.0 Section 6.2.8 Far-end: CPRI Spec V3.0 Section 6.2.9	Near-end: < = 0.14 UI Far-end: < = 0.40 UI
CRPI-HV 2.4576Gbps	Near-end: CPRI Spec V3.0 Section 6.2.8 Far-end: CPRI Spec V3.0 Section 6.2.9	Near-end: < = 0.14 UI Far-end: < = 0.40 UI

Transition Time Tests

Rise and Fall Time Tests

The Transition Time tests ensure that the rise time and fall time of the signal are within the conformance requirements.

Probing Setup

Refer to "Probing for XAUI Tests" on page 26. This probing configuration is used for all XAUI tests.

Device Configuration

1 Configure the DUT for 10 GBd operation using the CJPAT test pattern.

Performing the Test

1 Ensure this test is checked to run in the "Select Tests" tab.
2 Click the “Run Tests” button under the Run tab to start testing.
3 If the system is not physically configured to perform this test, the application will prompt you to change the physical configuration. When you have completed these instructions, click the Connection Completed button near the bottom of this dialog. Then, click the “Run Tests” button to continue testing.
4 The test will:
   - Verify that the correct test signal is present on the configured Data channel.
   - Configure the oscilloscope to capture a 3.125 GBd CJPAT signal.
   - Test the signal against conformance parameters, recording the result.
     - The rising edge transition time is measured at the 20% and 80% levels of the signal.
     - The falling edge transition time is measured at the 80% and 20% levels of the signal.

References and Test Limits

Table 8 shows the references and test limits corresponding to various bit rates for the Rise and Fall Time tests.

Table 8 References and test limits for the Rise and Fall Time tests

Bit Rate	References	Test Limits
10Gbe XAUI 3.125Gbps	IEEE 802.3-2005, Clause 47, Section 47.3.3.3	30 ps < T_{rise} < 130 ps 30 ps < T_{fall} < 130 ps
10 GFC XAUI 3.1875Gbps	IEEE 802.3-2005, Clause 47, Section 47.3.3.3	30 ps < T_{rise} < 130 ps 30 ps < T_{fall} < 130 ps
XAUI Based 3.75Gbps	IEEE 802.3-2005, Clause 47, Section 47.3.3.3	30 ps < T_{rise} < 130 ps 30 ps < T_{fall} < 130 ps
OBSAI RP3 768Mbps	IEEE 802.3-2005, Clause 47, Section 47.3.3.3	30 ps < T_{rise} < 130 ps 30 ps < T_{fall} < 130 ps
OBSAI RP3 1.536Gbps	IEEE 802.3-2005, Clause 47, Section 47.3.3.3	30 ps < T_{rise} < 130 ps 30 ps < T_{fall} < 130 ps
OBSAI RP3 3.072Gbps	IEEE 802.3-2005, Clause 47, Section 47.3.3.3	30 ps < T_{rise} < 130 ps 30 ps < T_{fall} < 130 ps
SRIO Short 1.25Gbps	Rapid IO Part 6, Chapter 10.4.1 Table 10-1	60 ps < T_{rise} 60 ps < T_{fall}
SRIO Short 2.5Gbps	Rapid IO Part 6, Chapter 10.4.1 Table 10-1	60 ps < T_{rise} 60 ps < T_{fall}
SRIO Short 3.125Gbps	Rapid IO Part 6, Chapter 10.4.1 Table 10-1	60 ps < T_{rise} 60 ps < T_{fall}
SRIO Long 1.25Gbps	Rapid IO Part 6, Chapter 10.4.2 Table 10-5	60 ps < T_{rise} 60 ps < T_{fall}
SRIO Long 2.5Gbps	Rapid IO Part 6, Chapter 10.4.2 Table 10-5	60 ps < T_{rise} 60 ps < T_{fall}
SRIO Long 3.125Gbps	Rapid IO Part 6, Chapter 10.4.2 Table 10-5	60 ps < T_{rise} 60 ps < T_{fall}
CRPI-LV 614.4Mbps	- CPRI Spec V3.0 Section 4.2.2 - IEEE 802.3-2005, Clause 47, Section 47.3.3.3	60 ps < T_{rise} < 130 ps 60 ps < T_{fall} < 130 ps
CRPI-LV 1.2288Gbps	- CPRI Spec V3.0 Section 4.2.2 - IEEE 802.3-2005, Clause 47, Section 47.3.3.3	60 ps < T_{rise} < 130 ps 60 ps < T_{fall} < 130 ps
CRPI-LV 2.4576Gbps	- CPRI Spec V3.0 Section 4.2.2 - IEEE 802.3-2005, Clause 47, Section 47.3.3.3	60 ps < T_{rise} < 130 ps 60 ps < T_{fall} < 130 ps
CRPI-LV 3.072Gbps	- CPRI Spec V3.0 Section 4.2.2 - IEEE 802.3-2005, Clause 47, Section 47.3.3.3	60 ps < T_{rise} < 130 ps 60 ps < T_{fall} < 130 ps
CRPI-HV 614.4Mbps	- CPRI Spec V3.0 Section 4.2.2 - IEEE 802.3-2005, Clause 39, Section 39.3.1, Table 39-2	85 ps < T_{rise} < 327 ps 85 ps < T_{fall} < 327 ps
CRPI-HV 1.2288Gbps	- CPRI Spec V3.0 Section 4.2.2 - IEEE 802.3-2005, Clause 39, Section 39.3.1, Table 39-2	85 ps < T_{rise} < 327 ps 85 ps < T_{fall} < 327 ps
CRPI-HV 2.4576Gbps	- CPRI Spec V3.0 Section 4.2.2 - IEEE 802.3-2005, Clause 39, Section 39.3.1, Table 39-2	85 ps < T_{rise} < 327 ps 85 ps < T_{fall} < 327 ps

5 10GBASE-CX4 Tests

This section provides the Methods of Implementation (MOIs) for the 10GBASE-CX4 tests using a Keysight Infiniium oscilloscope, probes, and the XAUI Electrical Validation Application.

Probing for 10GBASE-CX4 Tests

Connectivity for 10GBASE-CX4 tests depends on the type of connection on the board you are testing. If you are soldering to the DUT you can use the E2677A/B solder-in probe head or the N5425A/B ZIF probe head available for the 1134A/B InfiniiMax probe. If you are connecting to SMA connectors you can use the SMA probe head available for the 1134A/B InfiniiMax probe or you can use two SMA cables. The following figures show the different connection configurations.

Using the E2677A/B Solder-in Probe Head and the 1134A/B InfiniiMax Probe

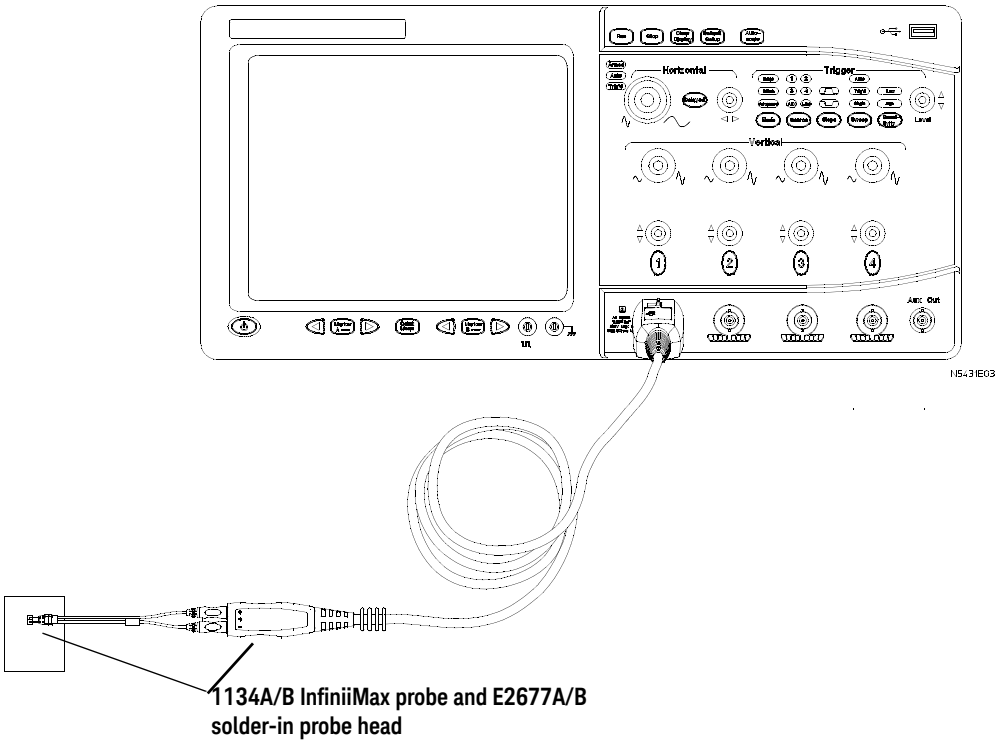

Figure 10 Probing using the solder-in probe head and the 1134A probe.

1 Connect the InfiniiMax probe with solder-in probe head to the 10GBASE-CX4 test points and to the oscilloscope.
2 Ensure the correct polarity of the probe head.
3 In the 10GBASE-CX4 Automated Test Application's Setup tab, select Differential for the connection type.

You can use any of the oscilloscope channels for probing the test point. You can identify the channel used in the Configure tab of the XAUI Electrical Validation Application. (The channel shown in Figure 12 is just for example.)

Using the D9010XAUC ZIF Probe Head and the 1134A/B InfiniiMax Probe

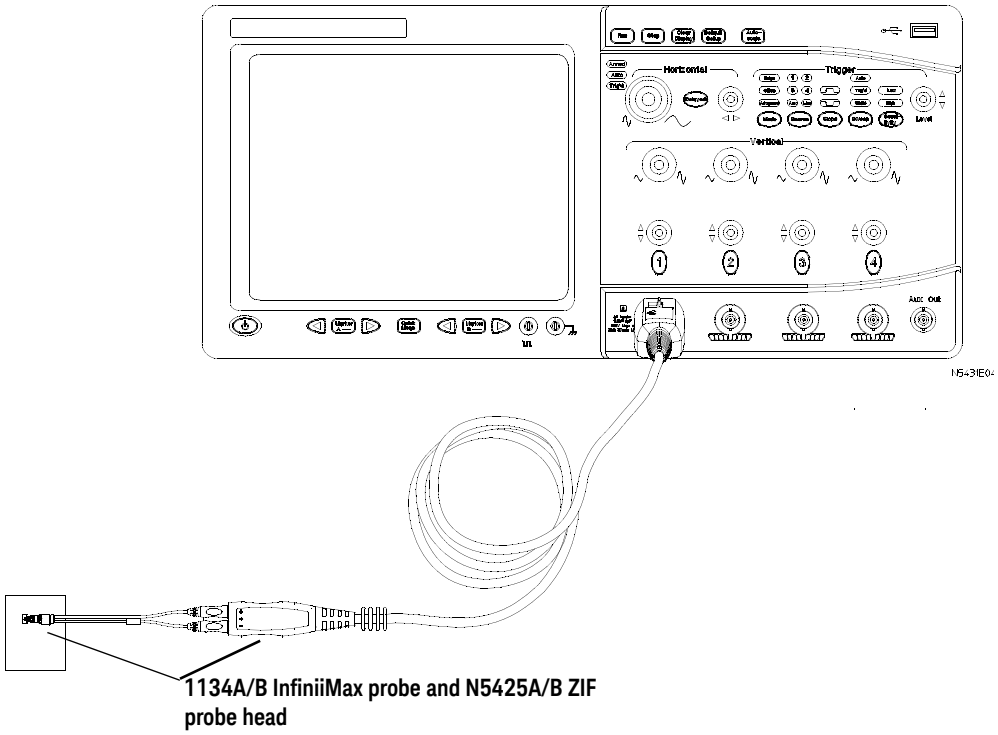

Figure 11 Probing using the ZIF probe head and the 1134A/B probe.

1 Connect an InfiniiMax probe with ZIF probe head to the 10GBASE-CX4 test points and to the oscilloscope.
2 Ensure the correct polarity of the probe head.
3 In the 10GBASE-CX4 Automated Test Application's Setup tab, select Differential for the connection type.

You can use any of the oscilloscope channels for probing the test point. You can identify the channel used in the Configure tab of the XAUI Electrical Validation Application. (The channel shown in Figure 12 is just for example.)

Using the SMA Probe Head and the 1134A/B InfiniiMax Probe

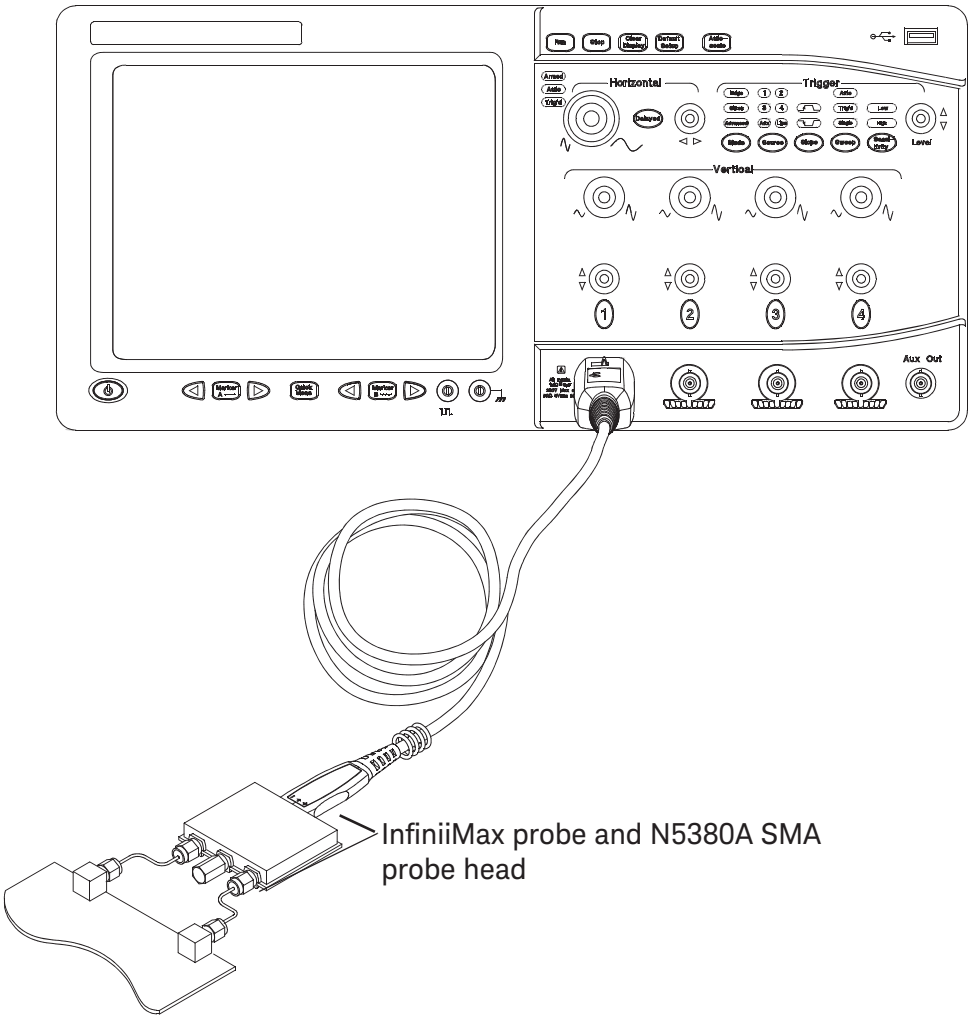

Figure 12 Probing using the SMA probe head and the 1134A/B probe.

1 Connect an InfiniiMax probe with SMA probe head to the 10GBASE-CX4 test points and to the oscilloscope.
2 Ensure the correct polarity of the probe head.
3 In the 10GBASE-CX4 Automated Test Application's Setup tab, select Differential for the connection type.

You can use any of the oscilloscope channels for probing the test point. You can identify the channel used in the Configure tab of the XAUI Electrical Validation Application. (The channel shown in Figure 12 is just for example.)

Using Two SMA Cables

When you are testing a 10GBASE-CX4 waveform that has a dc offset voltage you will need to use two blocking capacitors such as the Keysight 11742A.

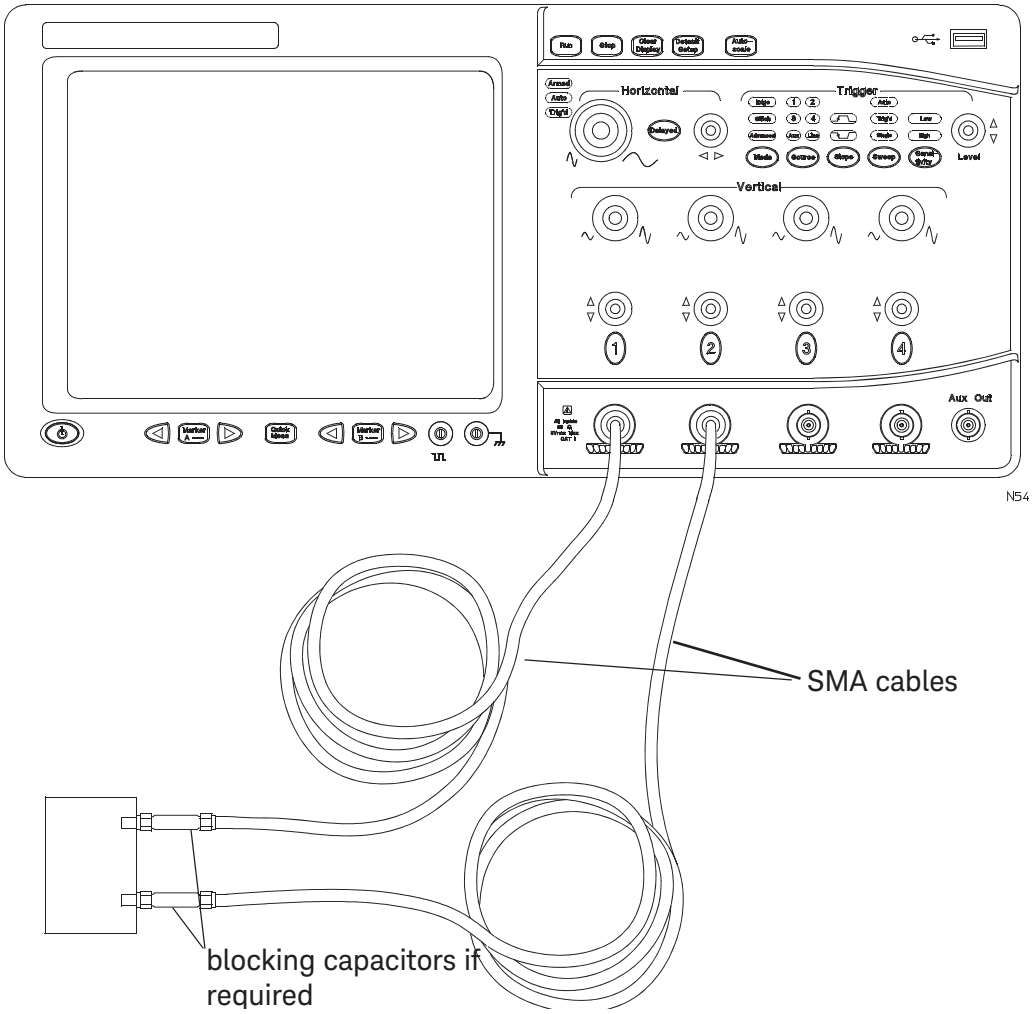

Figure 13 Probing using two SMA cables.

1 Connect the two SMA cables to the 10GBASE-CX4 test points.

2 Connect the two SMA cables to the oscilloscope.

3 In the 10GBASE-CX4 Automated Test Application's Setup tab, select Single-ended for the connection type.

You can use any of the oscilloscope channels for probing the test point. You can identify the channel used in the Configure tab of the XAUI Electrical Validation Application. (The channel shown in Figure 13 is just for example.)

Baud Rate Test

Baud Rate Test

The Baud Rate tests is to verify that the differential output baud rate of the device under test (DUT) is within the conformance limits.

References

[1] IEEE 802.3-2005, subclause 54.6.3.3.

Probing Setup

Refer to "Probing for 10GBASE-CX4 Tests" on page 40. This probing configuration is used for all 10GBASE-CX4 tests.

Device Configuration

1 Configure the DUT for 10 GBd operation using the CJPAT test pattern.

Performing the Test

1 Ensure this test is checked to run in the “Select Tests” tab.
2 Click the “Run Tests” button under the Run tab to start testing.
3 If the system is not physically configured to perform this test, the application will prompt you to change the physical configuration. When you have completed these instructions, click the Connection Completed button near the bottom of this dialog. Then, click the “Run Tests” button to continue testing.
4 The test will:
   - Verify that the correct test signal is present on the configured Data channel.
   - Configure the oscilloscope to capture a 3.125 GBd CJPAT signal.
   - Test the signal against conformance parameters, recording the result.
     i Configure PLL Bandwidth under Configure Tab.
     ii Set the First Order PLL, data rate, and PLL Bandwidth.
     iii Measure the Data Rate and compare the result.

Test Limits

3.125 GBd ±100 ppm

Differential Output Template Test

Differential Output Template Test

The Differential Output Template test is provided for informative purposes. The specification does not require that this test be run, but it may be useful in providing insight of potential signal quality issues.

References

[1] IEEE 802.3-2005, subclause 54.6.3.6.

Probing Setup

Refer to "Probing for 10GBASE-CX4 Tests" on page 40. This probing configuration is used for all 10GBASE-CX4 tests.

Device Configuration

1 Configure the DUT for 10 GBd operation using the low-frequency test pattern.

Performing the Test

1 Ensure this test is checked to run in the "Select Tests" tab.
2 Click the “Run Tests” button under the Run tab to start testing.
3 If the system is not physically configured to perform this test, the application will prompt you to change the physical configuration. When you have completed these instructions, click the Connection Completed button near the bottom of this dialog. Then, click the “Run Tests” button to continue testing.
4 The test will:
- Verify that the correct test signal is present on the configured Data channel.
- Configure the oscilloscope to capture a 3.125 GBd low-frequency signal.
- Based on the procedure discussed in IEEE 802.3-2005, subclause 54.6.3.6, the signal will be tested against conformance parameters, and the result will be recorded.
  - **i** Configure PLL Bandwidth under Configure tab.
  - **ii** Configure threshold level under Configure tab.
  - **iii** Set the First Order PLL, data rate, and PLL Bandwidth.
  - **iv** Enable the Mask Test feature and enable the display of the real-time eye.
  - **v** Shift the waveform in time for the best fist to the specified mask.
  - **vi** Capture a number of waveforms, testing the waveform against the specified mask, recording failures when they occur.

Test Limits

No mask failures.

Data Amplitude Tests

The Data Amplitude tests are to verify that the differential output voltage of the device under test (DUT) is within the conformance limits.

Data Amplitude Test

References

[1] IEEE 802.3-2005, subclause 54.6.3.4.

Probing Setup

Refer to "Probing for 10GBASE-CX4 Tests" on page 40. This probing configuration is used for all 10GBASE-CX4 tests.

Device Configuration

1 Configure the DUT for 10 GBd operation using the low-frequency test pattern.

Performing the Test

1 Ensure this test is checked to run in the "Select Tests" tab.
2 Click the "Run Tests" button under the Run tab to start testing.
3 If the system is not physically configured to perform this test, the application will prompt you to change the physical configuration. When you have completed these instructions, click the Connection Completed button near the bottom of this dialog. Then, click the "Run Tests" button to continue testing.
4 The test will:
   - Verify that the correct test signal is present on the configured Data channel.
   - Configure the oscilloscope to capture a 3.125 GBd low-frequency test signal.
   - Test the signal against conformance parameters, recording the result.
     i Configure PLL Bandwidth under Configure tab.
     ii Set the First Order PLL, data rate, and PLL Bandwidth.
     iii Enable the Mask Test feature and enable the display of the real-time eye.
     iv Use Histogram to measure V_{Top} and V_{Base}.

     $V_{pp} = V_{Top} - V_{Base}$

Test Limits

Minimum = 800 mV_{p-p}

Maximum = 1200 mV_{p-p}

Lane-to-Lane Amplitude Difference Test

References

[1] IEEE 802.3-2005, subclause 54.6.3.4.

Probing Setup

For this test, only the differential probing configurations can be used and not the single-ended probing configuration. Refer to "Probing for 10GBASE-CX4 Tests" on page 40. This probing configuration is used for all 10GBASE-CX4 tests.

Device Configuration

1 Configure the DUT for 10 GBd operation using the low-frequency test pattern.

Performing the Test

1 Ensure this test is checked to run in the “Select Tests” tab.

2 Click the “Run Tests” button under the Run tab to start testing.

3 If the system is not physically configured to perform this test, the application will prompt you to change the physical configuration. When you have completed these instructions, click the Connection Completed button near the bottom of this dialog. Then, click the “Run Tests” button to continue testing.

4 The test will:

- Verify that the correct test signal is present on the configured Data channel.
- Configure the oscilloscope to capture a 3.125 GBd low-frequency test signal.
- Test the signal against conformance parameters, recording the result.

i Configure PLL Bandwidth under Configure tab.

ii Set the First Order PLL, data rate, and PLL Bandwidth.

iii Enable the Mask Test feature and enable the display of the real-time eye.

iv Use Histogram to measure V_{Top} and V_{Base} of the first data lane.

$V_{pp} = V_{Top} - V_{Base}$

v Connect the second data lane to the scope.

vi Enable the Mask Test feature and enable the display of the real-time eye.

vii Use Histogram to measure V_{Top} and V_{Base} of the second data lane.

$V_{pp} = V_{Top} - V_{Base}$

viii Compare the Vpp of each lane and get the highest and lowest value

V_{diff} = Highest V_{pp} – Lowest V_{pp}

Test Limits

150 mV_{p-p}

Transition Time Tests

Rise and Fall Time Tests

The Transition Time tests ensure that the rise time and fall time of the signal are within the conformance requirements.

References

[1] IEEE 802.3-2005, subclause 54.6.3.7.

Probing Setup

Refer to "Probing for 10GBASE-CX4 Tests" on page 40. This probing configuration is used for all 10GBASE-CX4 tests.

Device Configuration

1 Configure the DUT for 10 GBd operation using the high-frequency test pattern.

Performing the Test

1 Ensure this test is checked to run in the "Select Tests" tab.
2 Click the “Run Tests” button under the Run tab to start testing.
3 If the system is not physically configured to perform this test, the application will prompt you to change the physical configuration. When you have completed these instructions, click the Connection Completed button near the bottom of this dialog. Then, click the “Run Tests” button to continue testing.
4 The test will:
   - Verify that the correct test signal is present on the configured Data channel.
   - Configure the oscilloscope to capture a 3.125 GBd high-frequency test signal.
   - Test the signal against conformance parameters, recording the result.
     - The rising edge transition time is measured at the 20% and 80% levels of the peak-to-peak differential value of the waveform using the high-frequency test pattern.
     - The falling edge transition time is measured at the 80% and 20% levels of the peak-to-peak differential value of the waveform using the high-frequency test pattern.

Test Limits

60 ps < T_{rise} < 130 ps

60 ps < T_{fall} < 130 ps

Driver Transmit Jitter Tests

Random Jitter Test

The Random Jitter test ensures that the random transmit jitter of the signal is within conformance limits.

References

[1] IEEE 802.3-2005, subclause 54.6.3.8.

Probing Setup

Refer to "Probing for 10GBASE-CX4 Tests" on page 40. This probing configuration is used for all 10GBASE-CX4 tests.

Device Configuration

1 Configure the DUT for 10 GBd operation using the CJPAT test pattern.

Performing the Test

1 Ensure this test is checked to run in the "Select Tests" tab.
2 Click the “Run Tests” button under the Run tab to start testing.
3 If the system is not physically configured to perform this test, the application will prompt you to change the physical configuration. When you have completed these instructions, click the Connection Completed button near the bottom of this dialog. Then, click the “Run Tests” button to continue testing.
4 The test will:
- Verify that the correct test signal is present on the configured Data channel.
- Configure the oscilloscope to capture a 3.125 GBd CJPAT signal.
- Test the signal against conformance parameters, recording the result.
  - **i** Configure PLL Bandwidth under Configure tab.
  - **ii** Set the First Order PLL, data rate, and PLL Bandwidth.
  - **iii** Turn on EZJIT Complete and set the pattern analysis mode to Arbitrary.
  - **iv** Enable RJDJ measurements and measure RJ measurement.

    Final RJ = RJ * 1E+12

Test Limits

0.27 UI

Deterministic Jitter Test

The Deterministic Jitter test ensures that the deterministic jitter of the signal is within conformance limits.

References

[1] IEEE 802.3-2005, subclause 54.6.3.8.

Probing Setup

Refer to "Probing for 10GBASE-CX4 Tests" on page 40. This probing configuration is used for all 10GBASE-CX4 tests.

Device Configuration

1 Configure the DUT for 10 GBd operation using the CJPAT test pattern.

Performing the Test

1 Ensure this test is checked to run in the "Select Tests" tab.
2 Click the “Run Tests” button under the Run tab to start testing.
3 If the system is not physically configured to perform this test, the application will prompt you to change the physical configuration. When you have completed these instructions, click the Connection Completed button near the bottom of this dialog. Then, click the “Run Tests” button to continue testing.
4 The test will:
   - Verify that the correct test signal is present on the configured Data channel.
   - Configure the oscilloscope to capture a 3.125 GBd CJPAT signal.
   - Test the signal against conformance parameters, recording the result.
     i Configure PLL Bandwidth under Configure tab.
     ii Set the First Order PLL, data rate, and PLL Bandwidth.
     iii Turn on EZJIT Complete and set the pattern analysis mode to Arbitrary.
     iv Enable RJDJ measurements and measure DJ measurement.

     Final DJ = DJ * 1E+12

Test Limits

0.17 UI

Total Jitter Test

The Total Jitter test ensures that the total transmit jitter of the signal is within conformance limits.

References

[1] IEEE 802.3-2005, subclause 54.6.3.8.

Probing Setup

Refer to “Probing for 10GBASE-CX4 Tests" on page 40. This probing configuration is used for all 10GBASE-CX4 tests.

Device Configuration

1 Configure the DUT for 10 GBd operation using the CJPAT test pattern.

Performing the Test

1 Ensure this test is checked to run in the "Select Tests" tab.
2 Click the “Run Tests” button under the Run tab to start testing.
3 If the system is not physically configured to perform this test, the application will prompt you to change the physical configuration. When you have completed these instructions, click the Connection Completed button near the bottom of this dialog. Then, click the “Run Tests” button to continue testing.
4 The test will:
   - Verify that the correct test signal is present on the configured Data channel.

- Configure the oscilloscope to capture a 3.125 GBd CJPAT signal.
- Test the signal against conformance parameters, recording the result.
  - **i** Configure PLL Bandwidth under Configure tab.
  - **ii** Set the First Order PLL, data rate, and PLL Bandwidth.
  - **iii** Turn on EZJIT Complete and set the pattern analysis mode to Arbitrary.
  - **iv** Enable RJDJ measurements and measure TJ measurement.

    Final TJ = TJ * 1E+12

Test Limits

0.35 UI

6 Calibrating the Infiniium Oscilloscope and Probe

This section describes the calibration procedures for Keysight Infiniium Oscilloscopes other than the MXR-series and UXR-series oscilloscopes. For the calibration information related to the MXR-series or UXR-series oscilloscopes, refer to the respective User's Guide:

- Keysight Infiniium MXR Real-Time Oscilloscopes User's Guide
- Keysight Infiniium UXR Real-Time Oscilloscopes User's Guide

Additionally, probe calibration and de-skew steps have been described in this section. To get more information, you can refer to the respective probes documentation.

Required Equipment for Calibration

To calibrate the Infiniium oscilloscope in preparation for running the XAUI automated tests, you need the following equipment:

All Infiniium Oscilloscopes

- Keyboard, qty = 1, (provided with the Keysight Infiniium oscilloscope).
- Mouse, qty = 1, (provided with the Keysight Infiniium oscilloscope).

80000 Series Infiniiums

- Calibration cable.
- Use a good quality 50 Ω BNC cable, that you provide.
- Precision 3.5 mm BNC to SMA male adapter, Keysight p/n 54855-67604, qty = 2.

Figure 14 below shows a drawing of the above connector items.

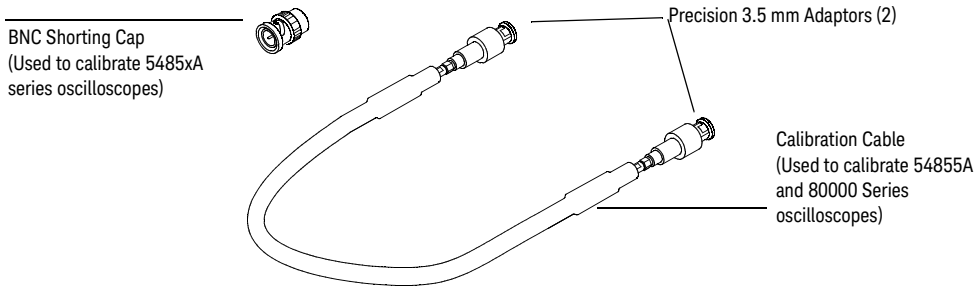

Figure 14 Accessories Provided with the Keysight Infiniium Oscilloscope

5485xA Series Infiniiums

- BNC shorting cap.
- Calibration cable (54855A only).
- Precision 3.5 mm BNC to SMA male adapter, Keysight p/n 54855-67604, qty = 2 (54855A only).
- Use a good quality 50 Ω BNC cable, that you provide.

Internal Calibration

This will perform an internal diagnostic and calibration cycle for the oscilloscope. For the Keysight oscilloscope, this is referred to as Calibration. Perform the following steps:

1 Set up the oscilloscope with the following steps:

a Connect the keyboard, mouse, and power cord to the rear of the oscilloscope.

b Plug in the power cord.

c Turn on the oscilloscope by pressing the power button located on the lower left of the front panel.

d Allow the oscilloscope to warm up at least 30 minutes prior to starting the calibration procedure in step 2 below.

2 Referring to Figure 15 below, perform the following steps:

a Click on the Utilities>Calibration menu to open the Calibration dialog box.

Figure 15 Accessing the Calibration Menu.

b Uncheck the Cal Memory Protect checkbox.

c Click the Start button to begin the calibration.

d Follow the on-screen instructions.

e Early during the calibration of channel 1, if you are prompted to perform a Time Scale Calibration, as shown in Figure 16 below.

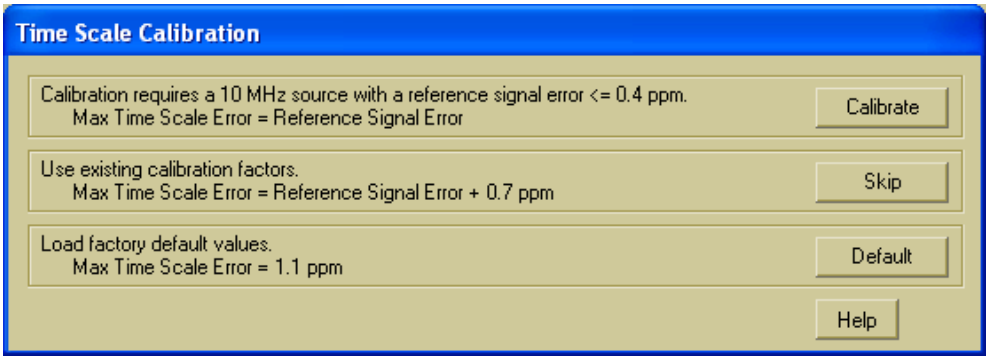

Figure 16 Time Scale Calibration Dialog box

f Click on the Default button to continue the calibration, using the Factory default calibration factors.

g When the calibration procedure is complete, you will be prompted with a Calibration Complete message window. Click the OK button to close this window.

h Confirm that the Vertical and Trigger Calibration Status for all Channels passed.

i Click the Close button to close the calibration window.

j The internal calibration is completed.

k Read NOTE below.

NOTE

These steps do not need to be performed every time a test is run. However, if the ambient temperature changes more than 5 degrees Celsius from the calibration temperature, this calibration should be performed again. The delta between the calibration temperature and the present operating temperature is shown in the Utilities>Calibration menu.

Required Equipment for Probe Calibration

Before performing XAUI tests you should calibrate the probes. Calibration of the solder-in probe heads consist of a vertical calibration and a skew calibration. The vertical calibration should be performed before the skew calibration. Both calibrations should be performed for best probe measurement performance.

The calibration procedure requires the following parts.

- BNC (male) to SMA (male) adaptor
- Deskew fixture
- 50 Ω SMA terminator

Probe Calibration

Connecting the Probe for Calibration

For the following procedure, refer to Figure 17 below.

1. Connect BNC (male) to SMA (male) adaptor to the deskew fixture on the connector closest to the yellow pincher.
2. Connect the 50 Ω SMA terminator to the connector farthest from yellow pincher.
3. Connect the BNC side of the deskew fixture to the Aux Out BNC of the Infiniium oscilloscope.
4. Connect the probe to an oscilloscope channel.
5. To minimize the wear and tear on the probe head, it should be placed on a support to relieve the strain on the probe head cables.
6. Push down on the back side of the yellow pincher. Insert the probe head resistor lead underneath the center of the yellow pincher and over the center conductor of the deskew fixture. The negative probe head resistor lead or ground lead must be underneath the yellow pincher and over one of the outside copper conductors (ground) of the deskew fixture. Make sure that the probe head is approximately perpendicular to the deskew fixture.
7. Release the yellow pincher.

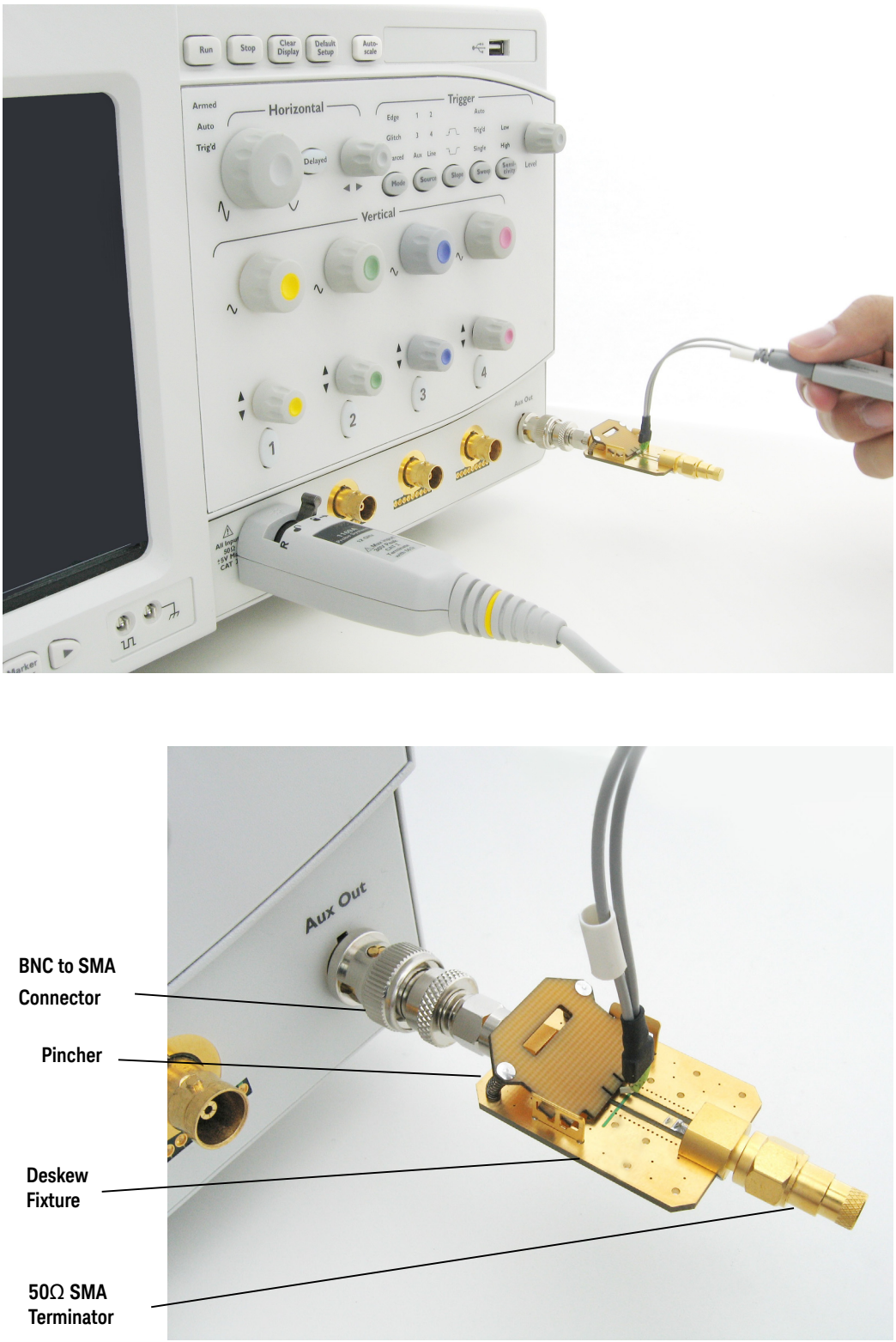

Figure 17 Solder-in Probe Head Calibration Connection Example

Verifying the Connection

1 On the Infiniium oscilloscope, press the autoscale button on the front panel.
2 Set the volts per division to 100 mV/div.
3 Set the horizontal scale to 1.00 ns/div.
4 Set the horizontal position to approximately 3 ns. You should see a waveform similar to that in Figure 18 below.

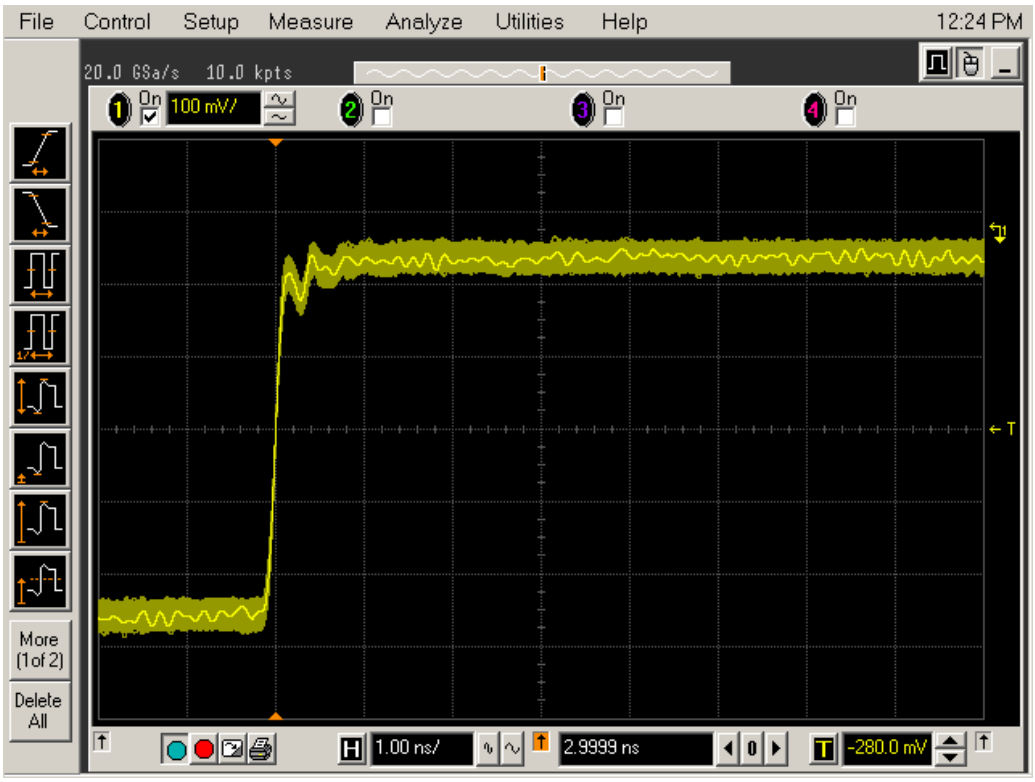

Figure 18 Good Connection Waveform Example

If you see a waveform similar to that of Figure 19 below, then you have a bad connection and should check all of your probe connections.

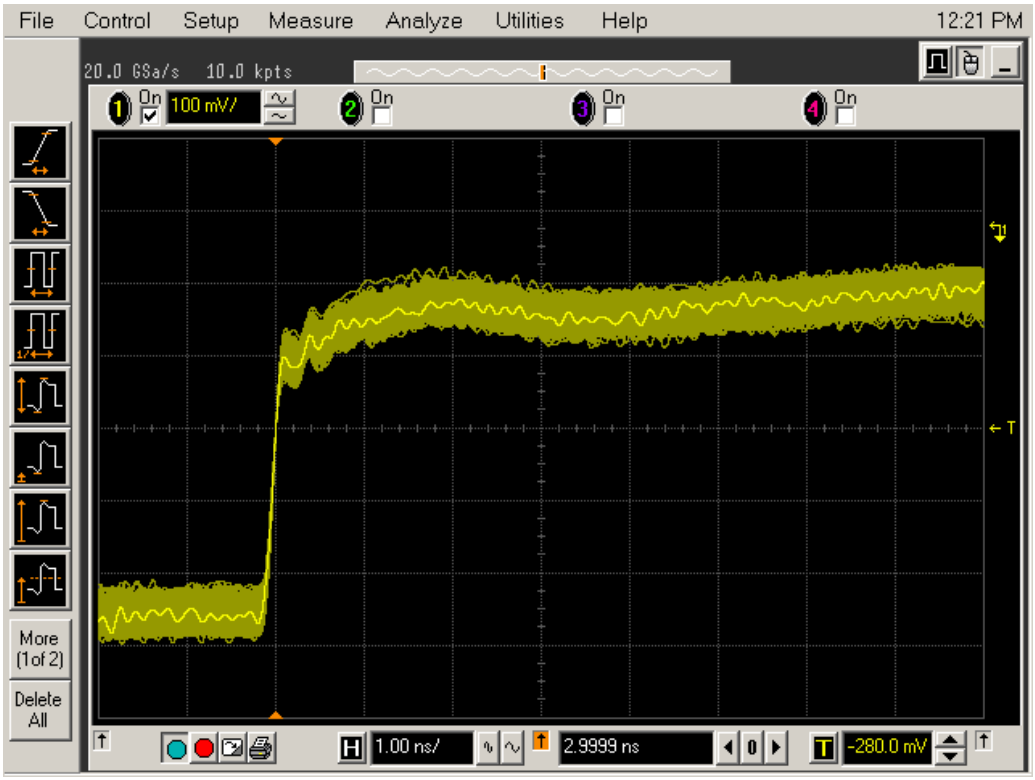

Figure 19 Bad Connection Waveform Example

Running the Probe Calibration and Deskew

1 On the Infiniium oscilloscope in the Setup menu, select the channel connected to the probe, as shown in Figure 20.

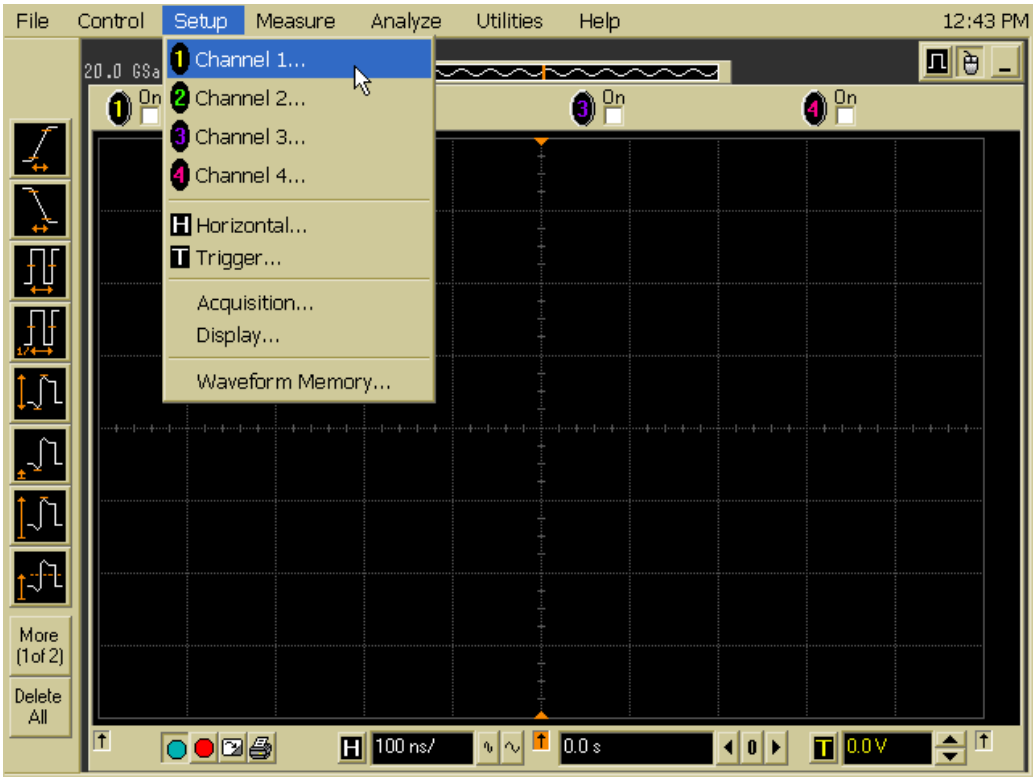

Figure 20 Channel Setup Window.

2 In the Channel Setup dialog box, select the Probes... button, as shown in Figure 21.

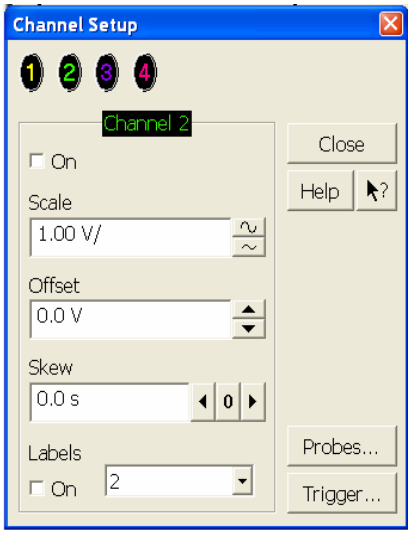

Figure 21 Channel Dialog Box

3 In the Probe Setup dialog box, select the Calibrate Probe... button.

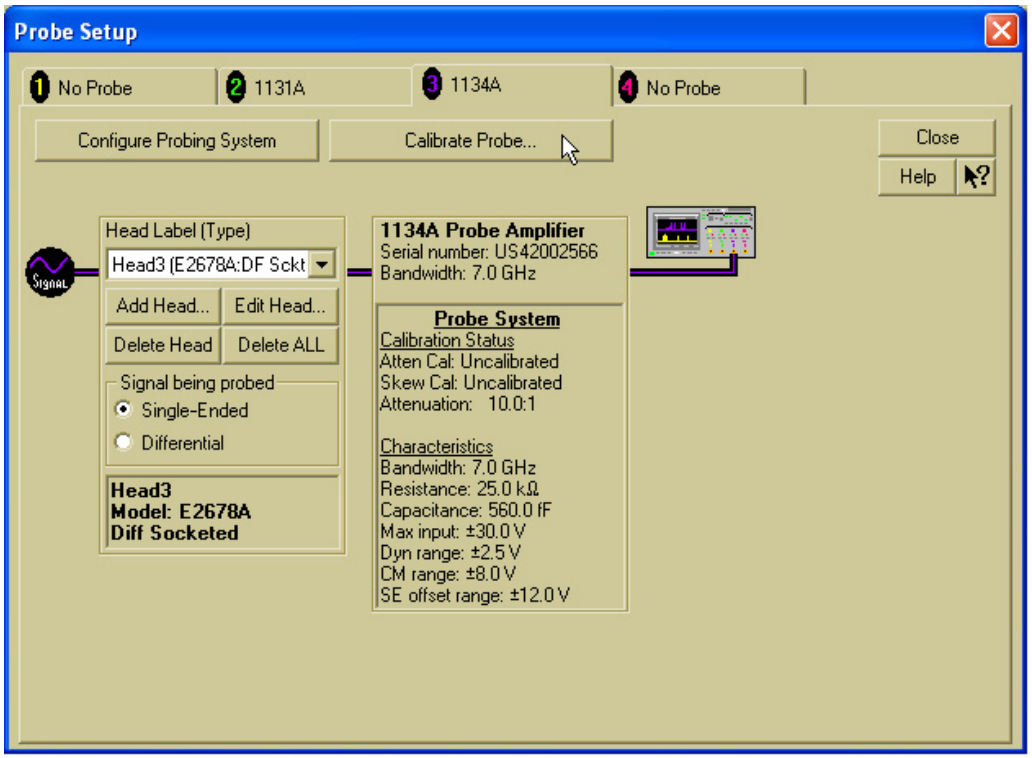

Figure 22 Probe Setup Window.

4 In the Probe Calibration dialog box, select the Calibrated Atten/Offset radio button.

5 Select the Start Atten/Offset Calibration... button and follow the on-screen instructions for the vertical calibration procedure.

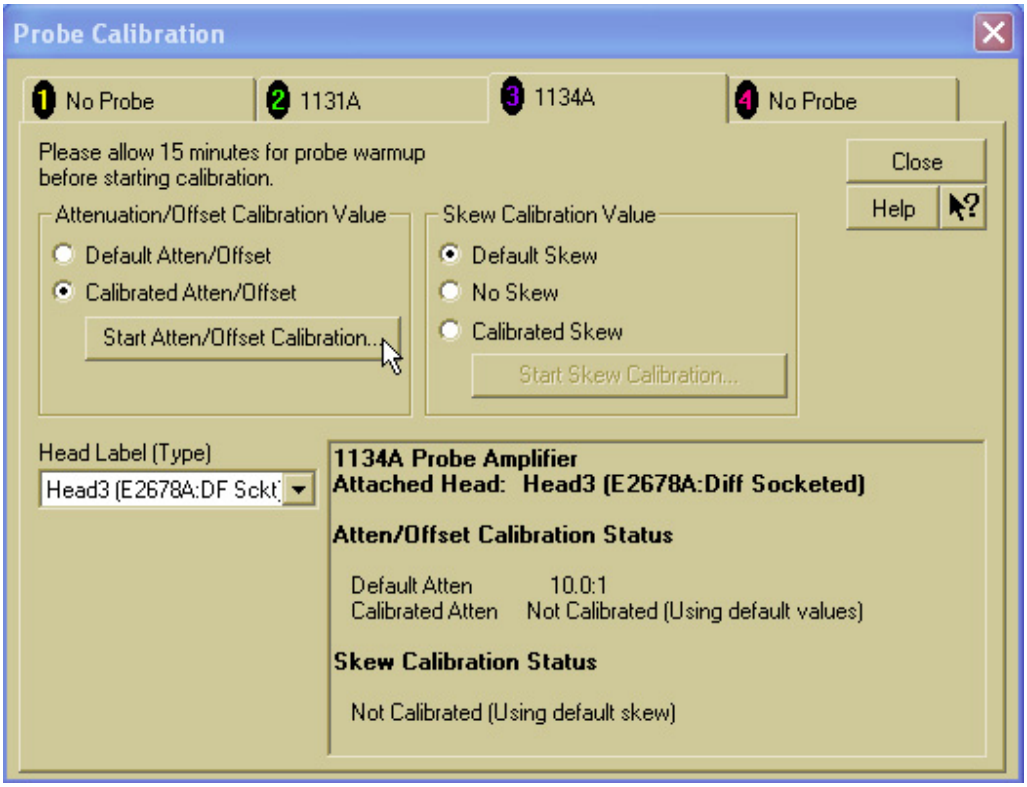

Figure 23 Probe Calibration Window.

6 Once the vertical calibration has successfully completed, select the Calibrated Skew... button.

7 Select the Start Skew Calibration... button and follow the on-screen instructions for the skew calibration.

At the end of each calibration, the oscilloscope will prompt you if the calibration was or was not successful.

Verifying the Probe Calibration

If you have successfully calibrated the probe, it is not necessary to perform this verification. However, if you want to verify that the probe was properly calibrated, the following procedure will help you verify the calibration.

The calibration procedure requires the following parts:

- BNC (male) to SMA (male) adaptor
- SMA (male) to BNC (female) adaptor
- BNC (male) to BNC (male) 12 inch cable such as the Keysight 8120-1838
- Keysight 54855-61620 calibration cable (Infiniium oscilloscopes with bandwidths of 6 GHz and greater only)
- Keysight 54855-67604 precision 3.5 mm adaptors (Infiniium oscilloscopes with bandwidths of 6 GHz and greater only)
- Deskew fixture

For the following procedure, refer to Figure 24.

1. Connect BNC (male) to SMA (male) adaptor to the deskew fixture on the connector closest to the yellow pincher.
2. Connect the SMA (male) to BNC (female) to the connector farthest from the yellow pincher.
3. Connect the BNC (male) to BNC (male) cable to the BNC connector on the deskew fixture to one of the unused oscilloscope channels. For infiniium oscilloscopes with bandwidths of 6 GHz and greater, use the 54855-61620 calibration cable and the two 54855-64604 precision 3.5 mm adaptors.
4. Connect the BNC side of the deskew fixture to the Aux Out BNC of the Infiniium oscilloscope.
5. Connect the probe to an oscilloscope channel.
6. To minimize the wear and tear on the probe head, it should be placed on a support to relieve the strain on the probe head cables.
7. Push down on the back side of the yellow pincher. Insert the probe head resistor lead underneath the center of the yellow pincher and over the center conductor of the deskew fixture. The negative probe head resistor lead or ground lead must be underneath the yellow pincher and over one of the outside copper conductors (ground) of the deskew fixture. Make sure that the probe head is approximately perpendicular to the deskew fixture.
8. Release the yellow pincher.
9. On the oscilloscope, press the autoscale button on the front panel.
10. Select Setup menu and choose the channel connected to the BNC cable from the pull-down menu.
11. Select the Probes... button.
12. Select the Configure Probe System button.
13. Select User Defined Probe from the pull-down menu.
14. Select the Calibrate Probe... button.
15. Select the Calibrated Skew radio button.
16. Once the skew calibration is completed, close all dialog boxes.

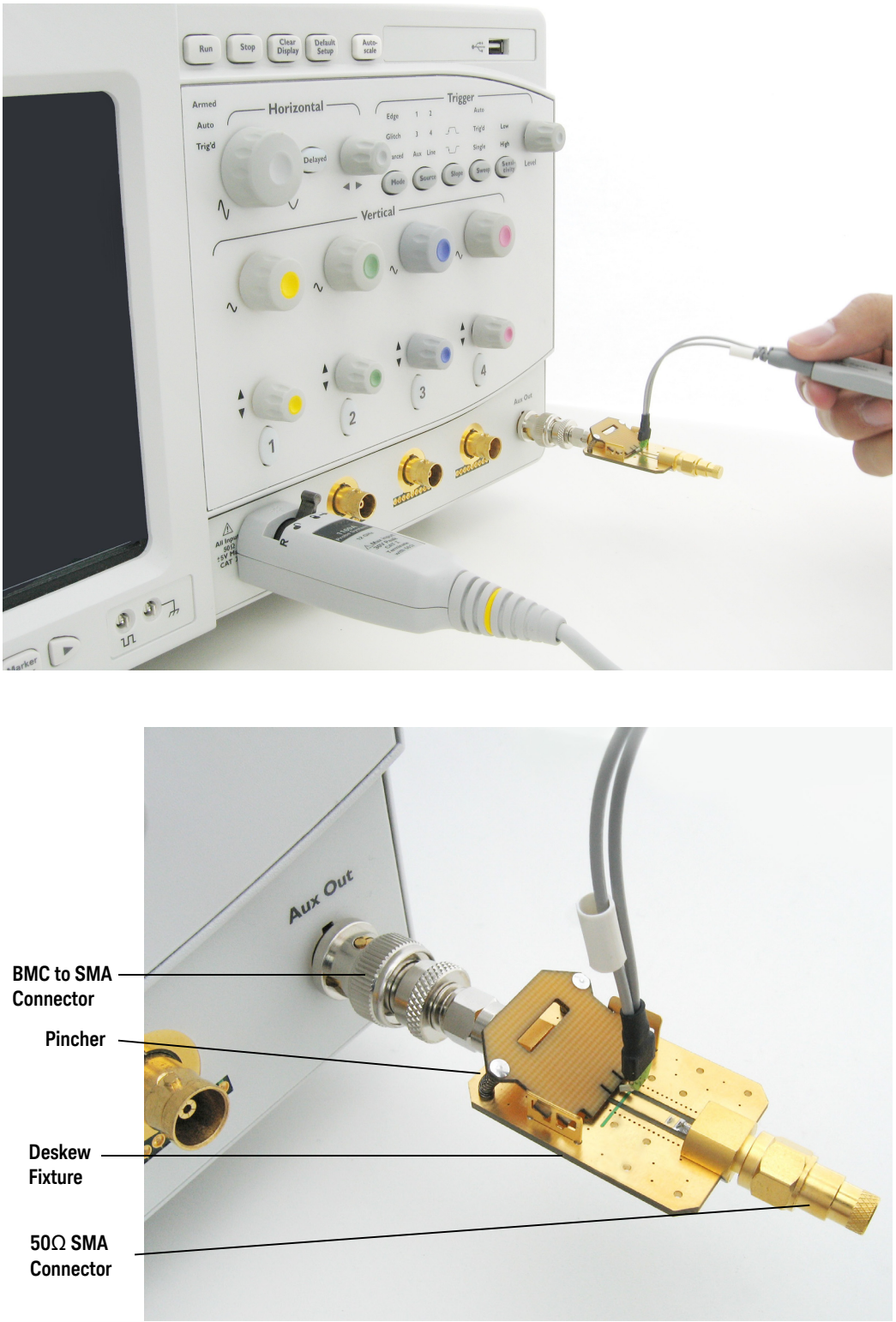

Figure 24 Probe Calibration Verification Connection Example

17 Select the Start Skew Calibration... button and follow the on-screen instructions.

18 Set the vertical scale for the displayed channels to 100 mV/div.

19 Set the horizontal range to 1.00 ns/div.

20 Set the horizontal position to approximately 3 ns.

21 Change the vertical position knobs of both channels until the waveforms overlap each other.

22 Select the Setup menu choose Acquisition... from the pull-down menu.

23 In the Acquisition Setup dialog box enable averaging. When you close the dialog box, you should see waveforms similar to that in Figure 25.

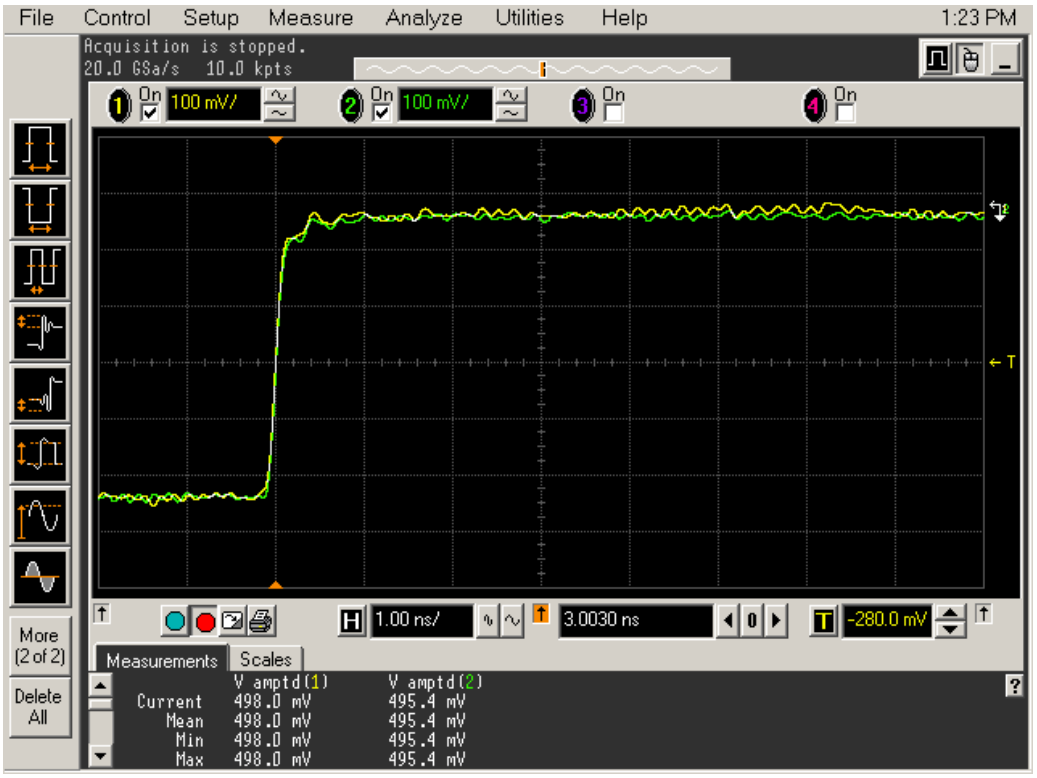

Figure 25 Calibration Probe Waveform Example

NOTE

Each probe is calibrated with the oscilloscope channel to which it is connected. Do not switch probes between channels or other oscilloscopes, or it will be necessary to calibrate them again. It is recommended that the probes be labeled with the channel on which they were calibrated.

7 InfiniiMax Probing

Figure 26 Example of InfiniiMax Probe Amplifier

Keysight recommends the E2677A/B differential soldier-in probe head, the E2695A SMA probe head, or the N5425A/B ZIF probe head. Recommended probe heads include 1134A/B, 1168A/B and 1169A/B.

Figure 27 Recommended E2677A/B Soldier-in Probe Head for XAUI Testing

Figure 28 Example of SMA Probe Head for XAUI Testing

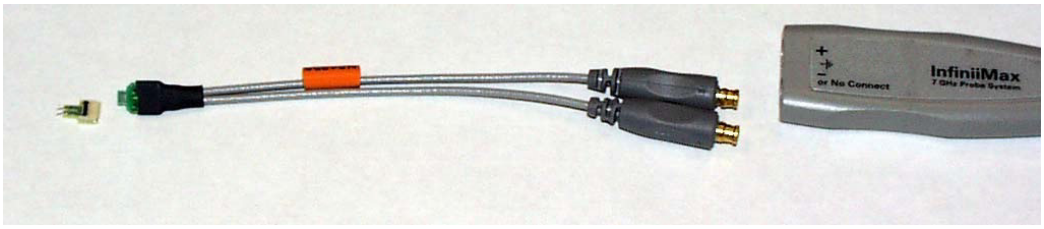

Figure 29 Recommended N5425A/B ZIF Probe Head for XAUI Testing

Table 9 Probe Head Characteristics (when used with DSO81304B and 1168A/69A probe amplifiers)

Probe Head	Model Number	Differential Measurement (BW, input C, input R)	Single-Ended Measurement (BW, input C, input R)
Differential soldier-in	E2677A/B	12 GHz, 0.27 pF, 50 kOhm	12 GHz, 0.44 pF, 25 kOhm
Differential soldier-in	N5381A/B	12 GHz, 0.21 pF, 50 kOhm	12 GHz, 0.35 pF, 25 kOhm
SMA	N5380A/B	12 GHz	12 GHz
SMA	E2695A	8 GHz	8 GHz
ZIF	N5425A/B	12 GHz, 0.33 pF, 50 kOhm	12 GHz, 0.53 pF, 25 kOhm

Index