Tektronix, Inc.

DisplayPort™ Standard

September 29, 2014

Tektronix MOI for DisplayPort PHY CTS 1.2b Source Testing Using DSA/DPO/MSO70000 Series Oscilloscopes with TekExpress™ DisplayPort Software

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MODIFICATION RECORD

May 26, 2012 Version 0.8 (Draft1) – Initial draft submitted to VESA Test Implementation Group
Dec 28, 2012 Draft 2 – Updated with Dual Mode and changes due to DP1.2b CTS release.
Sep 29, 2014 Draft 3 – Updated with AUX Eye Tests.

INTRODUCTION

These Methods of Implementations describe the step-by-step calibration and procedures to perform DP 1.2 Source tests of the VESA DisplayPort Logo Compliance Program using the DSA/DPO/MSO 70000 Series Oscilloscopes by Tektronix in conformance with the DP1.2b Compliance Test Specification (CTS). Source tests are required to qualify a Sink product or silicon building block for Logo certification and listing on the DP Integrators List.

Formally, each test description in the CTS contains the following sections:

Test Objective

Interoperability statement

Test conditions

Measurement requirements and

Pass/fail criteria

1) This MOI reduces the CTS test description to practice using the specified test equipment and procedures.

REFERENCES

The following specification is referenced in this document:

- DP PHY CTS1.2b, October, 2012

The most current version of above document is available to VESA members at the following website: http://www.vesa.org/join-vesamemberships/member-downloads/

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FIGURES

Source PHY Tests (CTS1.2b Section 3)

1. Introduction

This MOI (Method of Implementation) provides the test procedures for testing DisplayPort Source to the DP1.2b Compliance Test Specification (CTS). The purpose of the document is to provide the approved test equipment, test connections and setup, and procedures for the DP1.2 compliance program. Review and approval of compliance test procedures for DisplayPort is the responsibility of VESA's DisplayPort Test Implementation Subgroup.

The test procedures in this document are only the Normative (or required) tests in the DP 1.2b PHY CTS. For informational tests, refer to the test equipment vendor's documentation.

2. Test Pre-test Procedures

Prior to making any measurements, the following steps must be taken to assure accurate measurements:

- 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.
- If using probes, perform the probe calibration defined for the specific probes being used.
- Perform deskew to compensate for skew between measurement channels.
- Make sure you use a torque wrench to make all SMA connections.

3. PHY CTS 1.2b Source Testing Overview

This section describes the procedure for testing the DisplayPort Source electrical parameters. This testing is required for all ports on a device under test. The DP electrical parameters are as specified by Section 3 of the CTS. The PHY CTS 1.2b is available to VESA members at www.vesa.org.

Tektronix offers probing and automation software used for testing DisplayPort, which is used for this procedure.

This document covers the following PHY CTS1.2b tests:

3.1. EYE Diagram Testing
3.2. Non Pre-Emphasis Level Verification Testing
3.3. Pre-Emphasis Level Verification and Maximum Differential Pk-Pk Output Voltage
3.4. Inter-Pair Skew Test
3.11. Non ISI Jitter
3.12. Total Jitter (TJ) and Random Jitter (RJ/DJ)
3.14. Main Link Frequency
3.15. Spread Spectrum Modulation Frequency (If DUT supports SSC)
3.16. Spread Spectrum Modulation Deviation (If DUT supports SSC)
3.18. Dual-mode TMDS Clock (If DUT supports Dual-mode)
3.19. Dual-mode EYE Diagram (If DUT supports Dual-mode)

4. Test Objective

Refer to the DisplayPort PHY CTS 1.2b for detailed test objectives for each test. Each section of the CTS links back to the DisplayPort 1.2 Standard.

5. Test Conditions

The PHY CTS describes in detail the test requirements and algorithms required for meeting the specification. The following table summarizes the test conditions for the tests in CTS 1.2b.

Test ID	RBR (1.62Gb/s)	HBR (2.7Gb/s)	HBR2 (5.4Gb/s)
3.1 Eye Diagram Test			
Test Point	TP2	TP2	TP3_Eq
Pattern	PRBS-7	PRBS-7	2520 Bit HBR2 Compliance Eye Pattern
Swing/Pre-Emphasis /PostCursor2	2/0/0	2/0/0	Provided by DUT Owner for Passing Condition
SW Channel	NA	NA	0 Length & Worst Case
SSC	On and Off if DUT Supports	On and Off if DUT Supports	On and Off if DUT Supports
3.2 Non-Pre-Emphasis Level			
Test Point	TP2	TP2	TP2
Pattern	PRBS-7	PRBS-7	80 Bit PLTPAT
Swing/Pre-Emphasis /PostCursor2	All/0/0	All/0/0	All/0/0
SSC	Both On/Off if DUT Supports	Both On/Off if DUT Supports	Both On/Off if DUT Supports
3.3.1 Pre-Emphasis Level Maximum Differential Pk-Pk Output Voltage			
Test Point	TP2	TP2	TP2
Pattern	PRBS-7	PRBS-7	80 Bit PLTPAT
Swing/Pre-Emphasis /PostCursor2	All/All/0	All/All/0	All/All/0
SSC	On and Off if DUT Supports	On and Off if DUT Supports	On and Off if DUT Supports
3.4 Inter-pair Skew			
Bit Rate	Highest Bit Rate Supported		

Test Point	TP2		
Pattern	PRBS-7 or DUT dependent custom pattern		
Swing/Pre-Emphasis /PostCursor2	2/0/0		
SSC	On and Off if DUT Supports	On and Off if DUT Supports	On and Off if DUT Supports
3.11 Non-ISI Jitter			
Test Point	TP2	TP2	NA
Pattern	PRBS-7	PRBS-7	NA
Swing/Pre-Emphasis /PostCursor2	All/All/0	All/All/0	NA
SSC	On and Off if DUT Supports	On and Off if DUT Supports	NA
3.12.1 Total (TJ) and Deterministic (DJ) Jitter			
Test Point	TP2	TP2	TP3_Eq
Pattern	PRBS-7	PRBS-7	2520 Bit HBR2 Compliance Eye Pattern
Swing/Pre-Emphasis /PostCursor2	2/0/0	2/0/0	Provided by DUT Owner for Passing Condition
SW Channel	NA	NA	0 Length & Worst Case
SSC	On and Off if DUT Supports	On and Off if DUT Supports	On and Off if DUT Supports
3.12.2 HBR2 D10.2 TJ/RJ/DJ			
Test Point	NA	NA	TP3_Eq
Pattern	NA	NA	D10.2
Swing/Pre-Emphasis /PostCursor2	NA	NA	Same Setting as Passing Eye/Jitter
SW Channel	NA	NA	0 Length & Worst Case
SSC	NA	NA	On and Off if DUT Supports
3.14 Main Link Frequency			
Test Point	TP2	TP2	TP2
Pattern	D10.2	D10.2	D10.2
Swing/Pre-Emphasis /PostCursor2	2/0/0	2/0/0	2/0/0
SSC	On and Off if DUT Supports	On and Off if DUT Supports	On and Off if DUT Supports
3.15 SSC Modulation Frequency 3.16 SSC Modulation Deviation	NA if SSC not supported	NA if SSC not supported	NA if SSC not supported
Test Point	TP2	TP2	TP3_Eq
Pattern	D10.2	D10.2	D10.2
Swing/Pre-Emphasis /PostCursor2	2/0/0	2/0/0	2/0/0
SSC	On	On	On
3.18 Dual Mode TMDS Clock 3.19 Dual Mode Eye Diagram			
Test Point	TP2		
Pattern	TMDS		
TMDS Clock Rate	Maximum TMDS Frequency Supported		

Table 1: PHY CTS 1.2b Source Test Conditions

6. Required Equipment for DP1.2b PHY CTS Source Testing

The Following Equipment is required for DisplayPort Source Testing:

- 1 ea. Tektronix DSA/MSO/DPO70000 Series Oscilloscope (8GHz and above) with the following software:
  - DPOJET (Jitter and Eye Analysis Tools) software
  - TekExpress™ DisplayPort automation Software – Opt. DP12

  Note: For testing RBR (1.62 Gb/sec) and HBR (2.7 Gb/sec) a minimum bandwidth of 8Ghz is required. For testing HBR2 (5.4 Gb/sec) a minimum 12.5GHz BW is required which also covers RBR and HBR testing.
- 4 ea. pairs of 1 meter, phase-matched SMA cables for a four lane Source. The number of phase-matched cables is equivalent to the number of lanes the Source supports.
- 1 ea. pair of SMA cables, phase matching not required.
- 4 ea. P7380SMA or P7313SMA Differential Probes.

    - Alternatively, lanes can be tested one at a time using direct SMA input to the Oscilloscope or automated with an RF Switch.
- 1 ea. Wilder, LUXSHARE-ICT, or equivalent VESA approved DP test fixture.
    - Note: If the DUT supports Dual Mode, then a 6-pin Low Speed Connector is required on the fixture. For Example: Wilder DPI-TPA Adapter. This will be used for Dual Mode testing later in this MOI.
- 1 ea. DP-AUX Controller if the Source DUT supports automated testing using DPCD-based control.

6.1. DSA/MSO/DPO70000 Series Oscilloscope (8GHz or above)

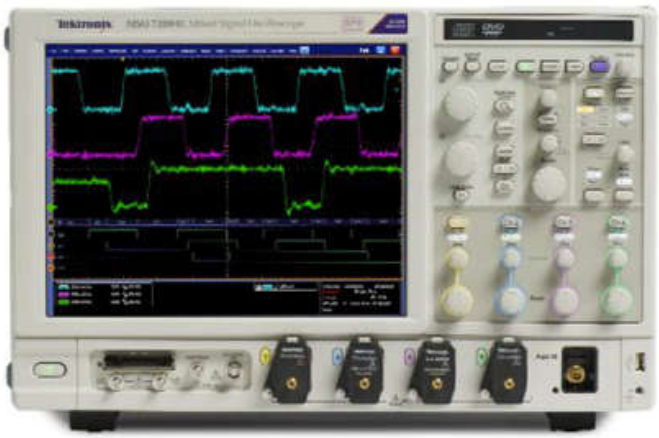


Figure 1: DSA/MSO/DPO70000 Series Oscilloscope

6.2. TekExpress DP Automation SW and DPOJET

The TekExpress DP SW-DP12 automates all the measurements in the CTS. In two port TBT devices, Reduced Bit Rate (RBR – 1.62Gb/s) and High Bit Rate (HBR – 2.7Gb/s) 'tunneling' is supported. The TekExpress DP automation software –DP12 also supports High Bit Rate 2 (HBR2 – 5.4Gb/s), which is not supported by Thunderbolt.

6.3. P7313SMA Differential Probes

The P7313SMA or P7380SMA probe provides differential SMA input to the Tektronix 70000 Series scope. Either probe can be used for DisplayPort and DP++ testing. However, if you intend on testing HDMI sources as well, the P7313SMA probe is required as it provides the 3.5V termination voltage required for HDMI signals. An alternative to differential probes is to use a RF Switch to automatically switch between acquisition channels. The TekExpress SW supports differential probes or Keithley RF Switch for Automation.

Figure 2: P7313SMA Probe

6.4. VESA Approved Test Fixtures

The following diagram shows approved test fixtures for DP Source testing as of the writing of this document. Refer to the following website for a full list of approved fixtures:
http://www.vesa.org/displayport-developer/certified-components/

Approved Mini-DP Fixtures:

- Wilder: mDP-TPA-P or RevA DPI-TPA-P with DPI-TPA-A Aux Control Board
- LUXSHARE-ICT: TFD-3P38

Approved Standard DP Fixtures:

- Wilder: DP-TPA-P or RevA mDPI-TPA-P with DPI-TPA-A Aux Control Board
- LUXSHARE-ICT: TFP-13P3

mDP-TPA-P **DPI-TPA-P**

Figure 3: Wilder DP Plug Adapters with 6-pin Low Speed Connectors

Figure 4: LUXSHARE-ICT DP Plug Adapters

6.5. TekExpress DP Automation SW and DPOJET

The TekExpress DP SW-DP12 automates all the measurements in the DP1.2 CTS Specification. In two port TBT devices, Reduced Bit Rate (RBR – 1.63Gb/s) and High Bit Rate (HBR – 2.7Gb/s) 'tunneling' is supported. The TekExpress DP automation software –DP12 also supports High Bit Rate 2 (HBR2 – 5.4Gb/s), which is not supported by Thunderbolt.

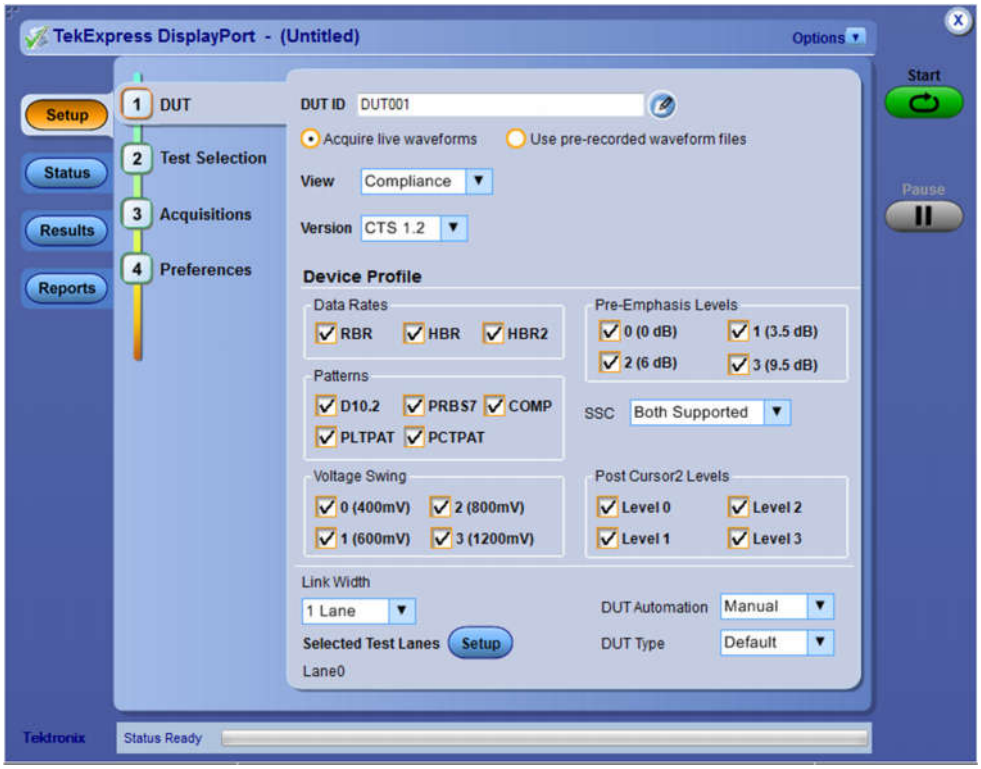


Figure 5: TekExpress DisplayPort Software-DP12

6.6. DP-AUX Controller and SW Utility

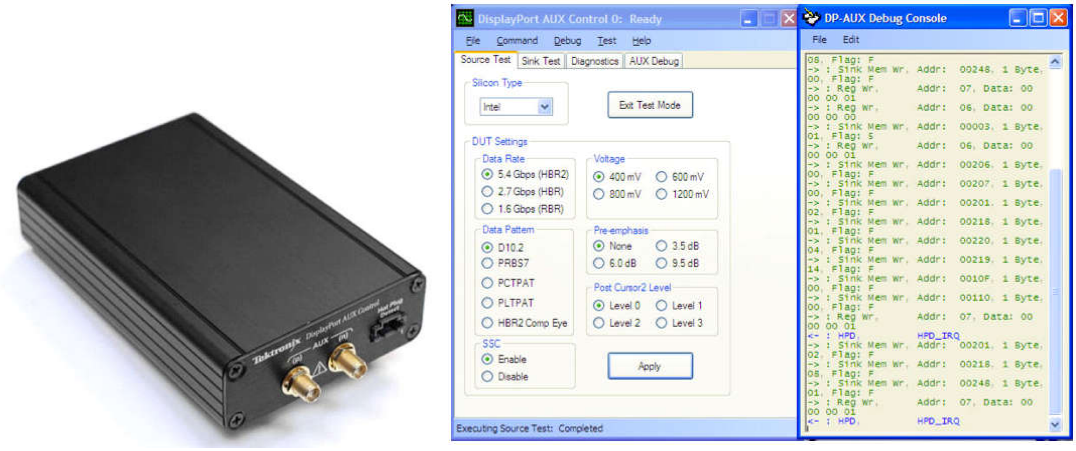


Figure 6: DP-AUX Controller and SW Utility

7. DP Source Test Setup

The following diagram shows the connections for mini-DP DUT, Fixture, Oscilloscope, and AUX controller for automated testing. Connection for standard DP testing will follow the same connection diagram only with the appropriate adapter.

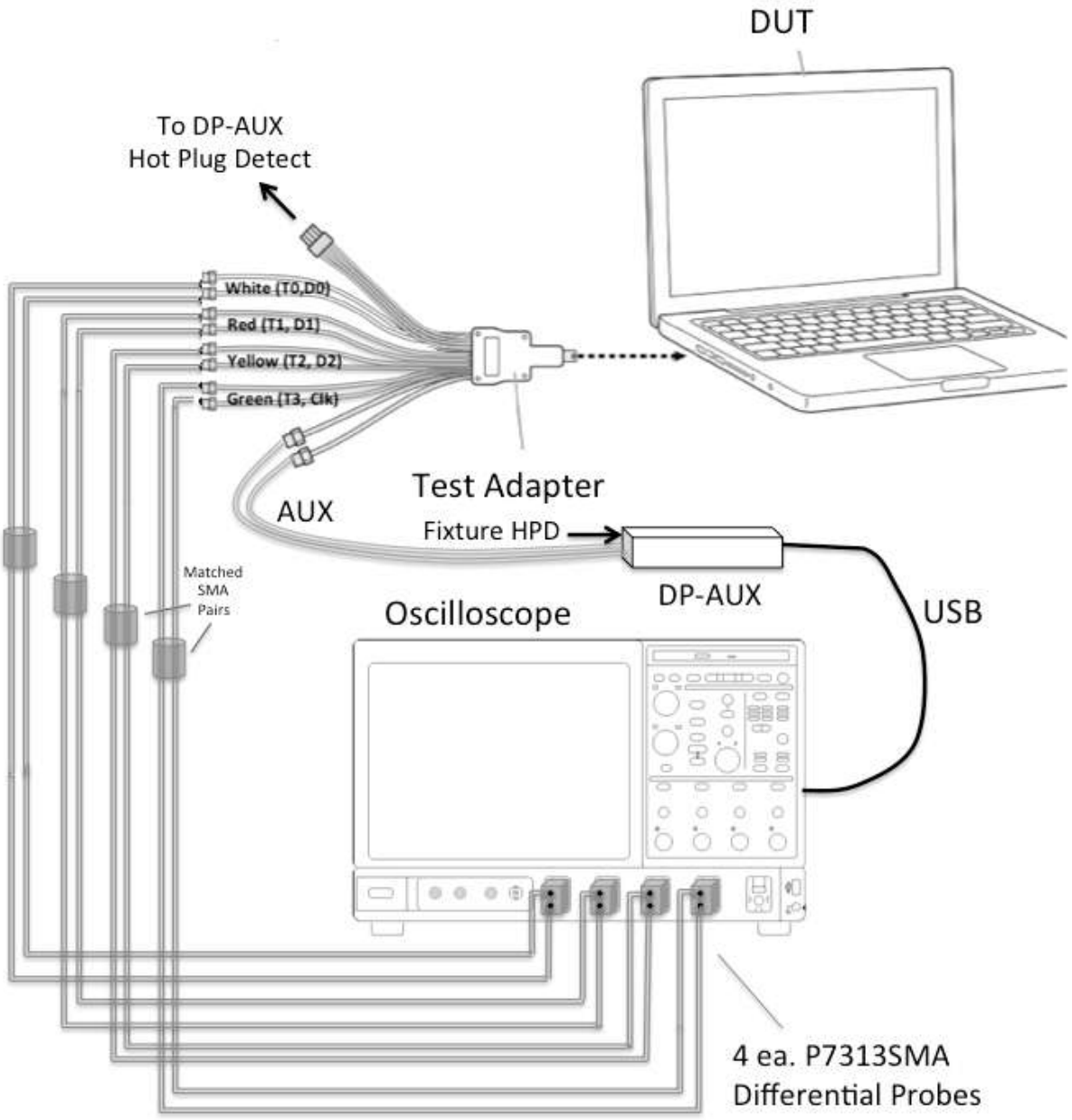


Figure 7: DUT Connection Example for DP Testing

8. Connecting to the DUT for testing

1. Plug HPD Connection from DP test adapter (Wilder as an example) into the Hot Plug Detect connector on DP-Aux controller.
2. Connect the differential SMA pairs on the DP test adapter to the oscilloscope using SMA cables as in the following table:

Oscilloscope Connection	Oscilloscope Probe SMA Connection	Wilder Adapter Cable/Connection Pairs
Channel 1	Channel 1 – '+'	T0_P/R3_N – Positive White
	Channel 1 – '-'	T0_N/R3_P – Negative White
Channel 2	Channel 2 – '+'	T1_P/R2_N – Positive Red
	Channel 2 – '-'	T1_N/R2_P– Negative Red
Channel 3	Channel 3 – '+'	T2_P/R1_N – Positive Yellow
	Channel 3 – '-'	T2_N/R1_P– Negative Yellow
Channel 4	Channel 4 – '+'	T3_P/R0_N – Positive Blue
	Channel 4 – '-'	T3_N/R0_P– Negative Blue
USB Connected DP-AUX	AUX(p)	AUX_P – Positive Green
	AUX(n)	AUX_N – Negative Green

3. Ensure the DUT is powered.
4. Attach USB cable from Oscilloscope USB port to DP-AUX controller.
5. Use DP-AUX SW utility on the scope to ensure that DPCD commands are properly controlling the DUT.

9. Running the DisplayPort Compliance Tests

The following is the recommended test flow for a 4 lane Source that supports all swing and pre-emphasis levels. The testing is broken up into the following sub-sections.

1. **RBR/HBR Measurements** – this section takes advantage of the DPCD Control over the AUX channel to capture all waveforms and performs all the required tests for RBR and HBR.
2. **HBR2 Measurements -** this section takes advantage of the DPCD Control over the AUX channel to capture all waveforms and performs all the required tests for HBR2 except for EYE and Jitter tests, which require a separate setup.
3. **HBR2 Eye and Jitter Measurements –** this section uses the automation software to choose the Swing Level, Pre-Emphasis setting and PostCursor2 setup that is known by the DUT owner to pass the HBR2 Eye and Jitter Compliance limits.
4. **Dual Mode Measurements –** this section describes how to put the DUT in a TMDS signaling mode at the proper resolution in order to make the Dual Mode (DP++) compliance measurements.

9.1. RBR/HBR Measurements

This section takes advantage of the DPCD Control over the AUX channel to capture all waveforms and performs all the required tests for RBR and HBR. It is highly desirable to perform these tests with automation due to the number of test conditions that need to be performed. Full automation takes of an engineer's time to execute and removes human error from the DUT setup during testing. However, not all Sources support full automation. Thus, both automated and non-automated procedures are outlined below.

9.1.1. RBR/HBR Measurements if the DUT supports Automation

If using full automation, execute the RBR/HBR/HBR2 tests as follows:

1. Connect the DUT as in Figure 5 above.
2. Select **Analyze > TekExpress DisplayPort** from the oscilloscope main menu.
3. From the **(1) TekExpress DUT** menu's default configuration, make the following selections:
   a. Give the DUT an ID number, eg: **DUT ID:** HBR2_DP_DUT001
   b. Under Data Rates, **Deselect HBR2**. HBR2 will be tested in the next sections.
   c. Under Patterns, **Deselect COMP, PLTPAT,** and **PCTPAT**. These are the patterns associated with HBR2 testing; so do not need to be selected.
   d. **Deselect PostCursor2 Levels** (all accept Level0).
   e. Select **Both Supported** under **SSC** if the device supports SSC.
   f. Select **Link Width** that the Device supports, e.g. if the device supports 4 lanes then select 4
   g. Select DUT **Automation** to be **DPAUX**
   h. Select DUT Type e.g. Intel, AMD or Default

The TekExpress DUT menu should look like the following diagram.

Figure 8: TekExpress DP DUT Setup For RBR/HBR Automated Tests

4. **Select (2) Test Selection** from the **TekExpress DisplayPort** menu and make the following selections:

   a. **Deselect Test 3.17 dF/dT SSC.** This test is not required by the PHY CTS 1.2b.

b. **Deselect DisplayPort++.** This test will be made later in the procedure.
c. **Deselect Aux Channel Test.** This test will be made later in the procedure.

Note: If HBR2 is the highest supported rate then deselect test 3.4, 3.15 and 3.16 these test will be done at the HBR2 rate.

The TekExpress Test Selection menu should look like the following diagram.

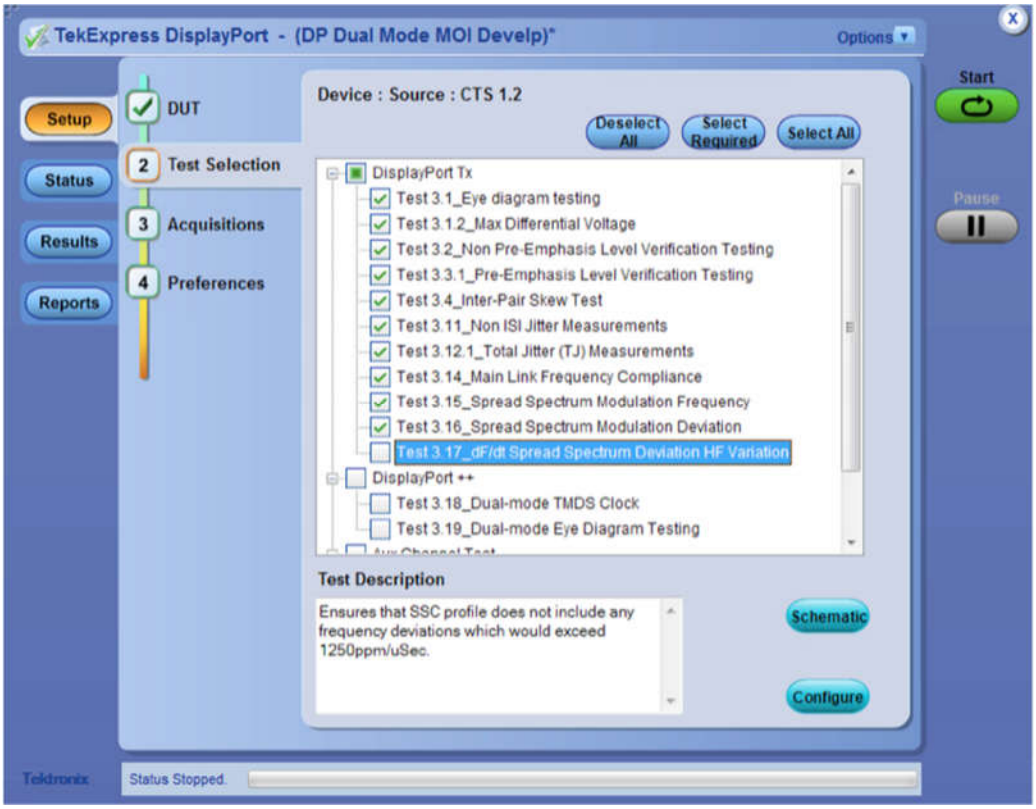


Figure 9: TekExpress Test Selection Menu for RBR/HBR Tests

5. Press the Start button in TekExpress. This starts the automated testing.

Figure 10: TekExpress Start Button

6. Click ok after verifying user action required is completed (lane to channel connections).

Figure 11 - User action required

7. From this point on, all the waveforms and measurements will be made automatically.
8. Skip to Section 9.1.3 to save and report results.

9.1.2. RBR/HBR Measurements without Automation

If using the DP-AUX controller with manual control or DUT vendor specific tool for controlling Data Rate, Swing, and Pre-Emphasis Levels, follow this procedure:

1. Follow all the steps in the previous section up to Step 6 with the exception of in Step 3, Select **Manual** under DUT Automation in the **(1) DUT** menu.

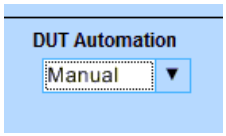


Figure 12: Select Manual under DUT Automation in the DUT Menu

2. After the Start Button is pressed, and the SW initializes, the following dialog will appear.
3. Ensure that the probes are connected as described in the following figure.
4. Press **OK**

Figure 13: TekExpress Probe Connection Dialog

NOTE: Make sure that the proper polarity is observed between the fixture and the probes, otherwise the SW will not recognize the proper pattern for testing.

5. Set DisplayPort DUT's *Bit rate, Swing, Pre-emphasis,* and *Test Pattern* values as requested in the *TekExpress: User action required* pop-up dialog shown in the following figure:

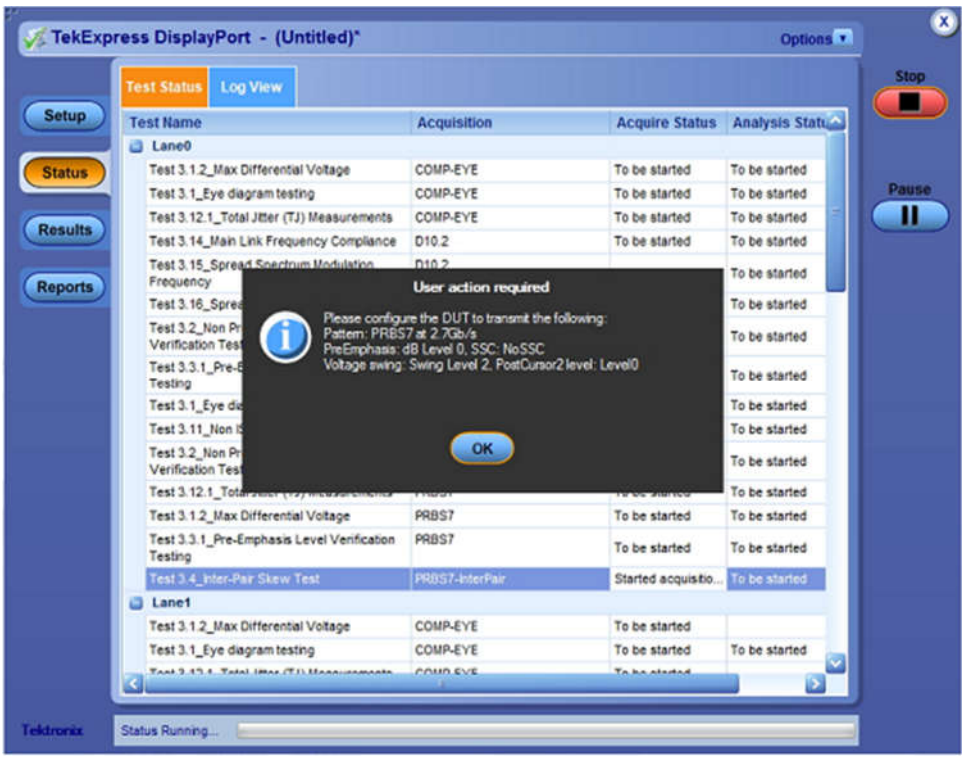


Figure 14: User Action Required Dialog Box

NOTE: The TekExpress SW uses DP1.1 Standard language to describe the signal to be sent to the scope while the Calibrator software uses DP1.2 Standard language. The following figure shows how to translate DP1.1 to DP1.2 language:

DP1.1 Language (Used by TekExpress prompts)	**DP1.2 Language (Used by ThunderBolt Calibrator prompts)**
Patterns: D10.2 PRBS7	 D10.2 PRBS7
Data Rate: RBR HBR	 1.6G 2.7G
PreEmphasis dB: 0 dB 3.5 dB 6 dB 9 dB	**PreEmphasis Level:** 0 1 2 3
Voltage Swing Voltage: 400 mV 600 mV 800 mV 1.2 V	**Voltage Swing Level:** 0 1 2 3

Figure 15: User Prompts TekExpress vs. PHY CTS 1.2b

6. After entering the proper setting on the DUT Control SW, Press **OK** on the TekExpress Dialog.

7. After the first set of waveforms is captured on all channels, another ‘User Action Required’ dialog will appear asking you to setup the DUT for the next waveform.
8. Alternate between the DUT Control SW and the TekExpress dialog until all requested waveforms are captured. It will take approximately 30min. to capture all the waveforms needed for RBR/HBR.
9. From this point on, all the measurements will be made automatically.
10. Continue to Section 9.1.3 to save and report results.

9.1.3. Saving and Reporting RBR/HBR Measurement Results

1. When all tests are completed, the Report will appear in the MS Explorer window on the oscilloscope.

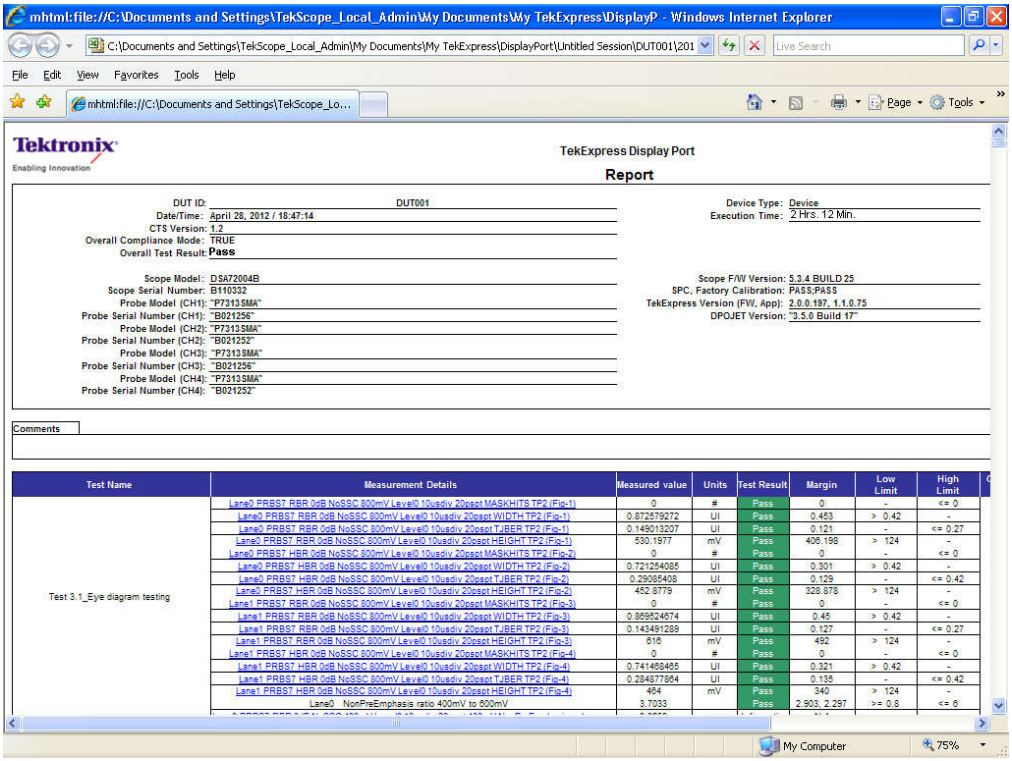


Figure 16: DP Source Results Report Example

2. Save the DP source test results:
   d. In the TekExpress menu, select **Options**.
   e. Select **Save Test Setup As**
   f. Give the file a name appropriate to the test being performed on the device.
   g. Results will appear in the folder **My Documents > My TekExpress > DisplayPort** folder on the oscilloscope.
3. Record the Pass/Fail results for each measurement in the PHY section of the VESA CDF for the DUT.

Note: TekExpress also saves the waveforms from the testing for future reference.

9.2. HBR2 Measurements

This section takes advantage of the DPCD Control over the AUX channel to capture all waveforms and performs all the required tests for HBR2 except for EYE and Jitter tests which require a separate setup and are made in the following section.

1. After Saving the RBR/HBR data from Section 9.1.3, return to the TekExpress **(1) DUT** menu.
   a. Under Data Rates, **Deselect RBR/HBR** and **Select HBR2**.
   b. Under Patterns, **Select PLTPAT** and **PCTPAT**. These are the patterns associated with all HBR2 testing except HBR2 EYE and Jitter that will be measured in the next section.
      c. **Select All PostCursor2 Levels**.
      d. **Select DPAUX under DUT automation**

   The TekExpress DUT menu should look like the following figure.

Figure 17: TekExpress DP DUT Setup For HBR2 Measurements

2. **Select (2) Test Selection** from the **TekExpress DisplayPort** menu and make the following selections:
   a. **Verify test 3.3.2 Post Cursor2 Verification testing is not selected**. This test is not required by the PHYCTS 1.2b.
   b. **Verify Test 3.12.2_Random Jitter (RJ) Measurements is not selected**. This test will be made in the following section.
   c. **Verify Test 3.17 dF/dT SSC is not selected.** This test is not required by the PHYCTS 1.2b.

d. **Deselect test 3.18 Dual Mode TMDS Clock.** This test will be made in the following section.
e. **Deselect test 3.18 Dual Mode Eye Diagram Testing.** This test will be made in the following section.
f. **Deselect Test 8.1 Aux Manchester Channel Eye test.** This test will be made in the following section.
g. **Deselect test 8.2 Aux Manchester Channel Sensitivity test.** This test will be made in the following section.

The TekExpress Test Selection menu should look like the following figure.

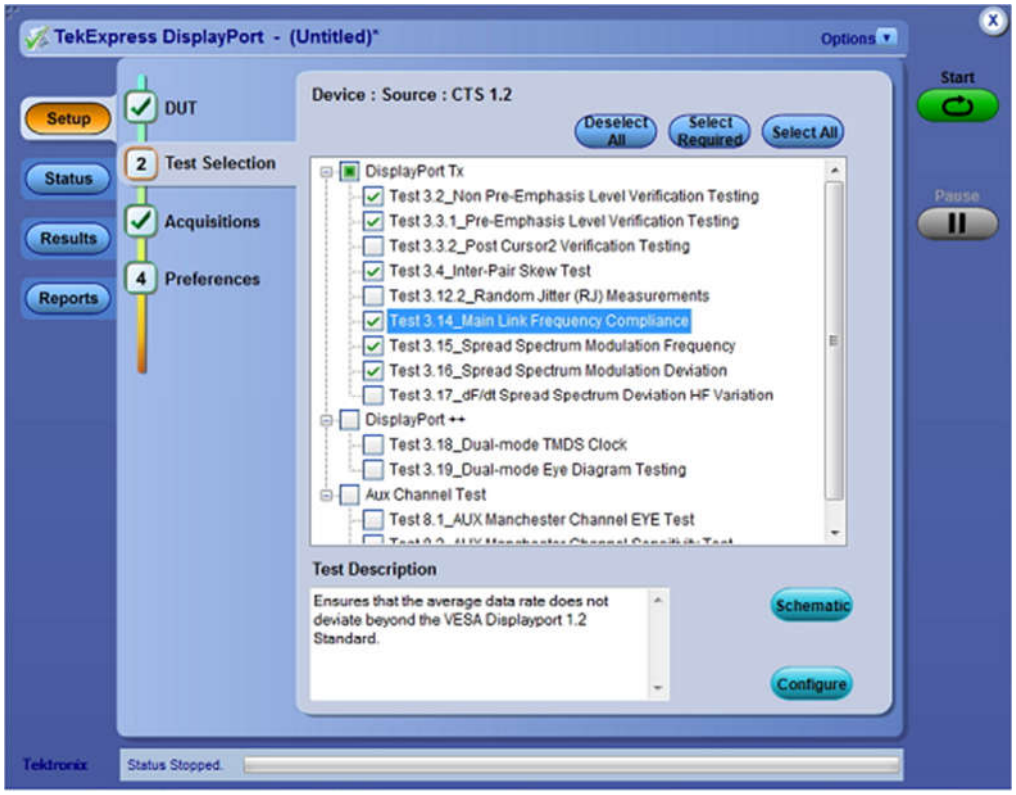


Figure 18: TekExpress Test Selection Menu for HBR2 Measurements

3. Press the Start button in TekExpress.
4. Click ok after verifying user action required is completed (lane to channel connections).
5. This starts the automated testing. From this point on, all the waveforms and measurements will be made automatically.
6. If the DUT does not support automation follow the same steps as outlined in Section 9.1.2.
7. After HBR2 Measurements are complete, follow the steps as outlined in Section 9.1.3 to save the results.

9.3. HBR2 Eye and Jitter Measurements

This section uses the automation software to choose the Swing Level, Pre-Emphasis setting and PostCursor2 setup that is known by the DUT owner to pass the HBR2 Eye and Jitter Compliance limits.

For this example, the following setting were provided by the DUT Owner:

Swing Level:	Level 2
Pre-Emphasis Level:	Level 1
PostCursor2 Level:	Level 0

1. After Saving the HBR Measurement data, return to the TekExpress **(1) DUT** menu.
   a. Under Patterns, **Deselect PRBS7, PLTPAT, and PCTPAT**. **Select COMP**. This is the pattern associated with HBR2 EYE and Jitter that will be measured in the next section.
   b. Select only the Voltage Swing Level, Pre-Emphasis Level, and Post Cursor2 Level that is known to pass the HBR2 EYE test.

   The TekExpress DUT menu should look like the following figure.

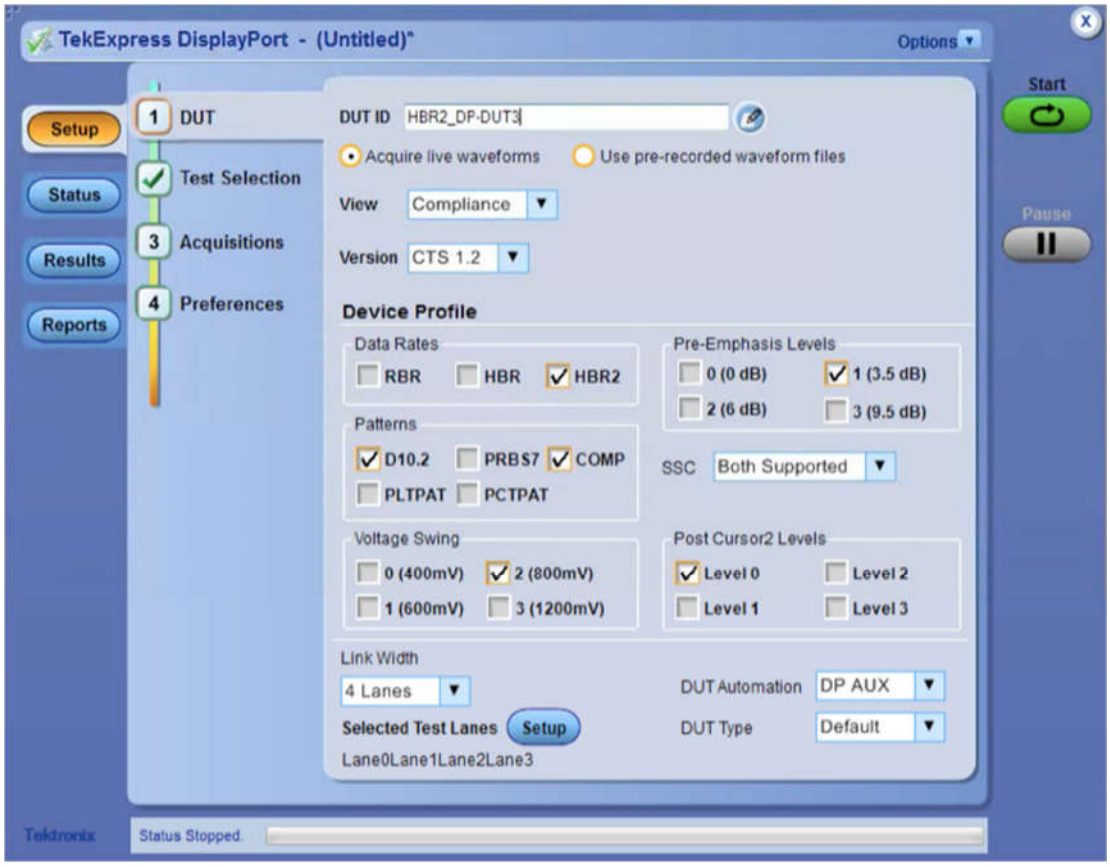


Figure 19: TekExpress DP DUT Setup for HBR2 EYE and Jitter

2. **Select (2) Test Selection** from the **TekExpress DisplayPort** menu and make the following selections:
   Deselect all measurements except the following:
   a. 3.1_Eye Diagram Test
   b. 3.1.1 Zero Cable Test
   c. 3.12.1_Total Jitter (TJ) Measurements
   d. 3.12.2_Random Jitter (RJ) Measurements

The TekExpress Test Selection menu should look like the following figure.

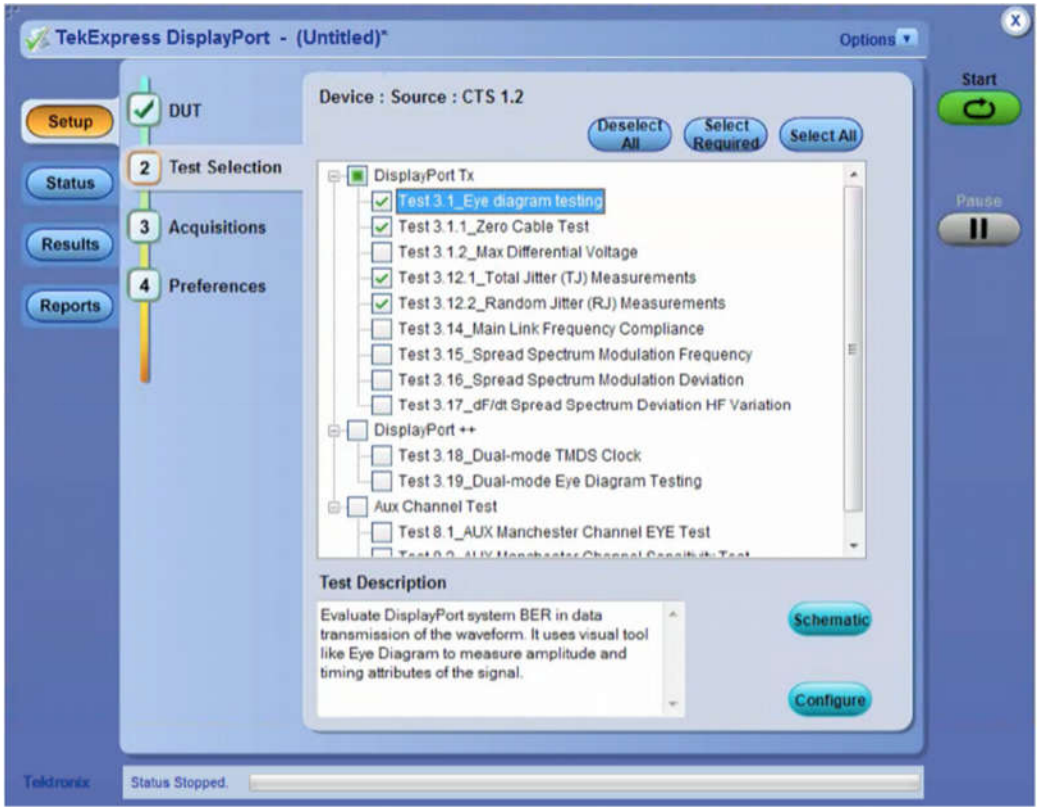


Figure 20: TekExpress Test Selection Menu for HBR2 EYE and Jitter

3. Press the Start button in TekExpress.
4. Click ok after verifying user action required is completed (lane to channel connections).
5. This starts the automated testing. From this point on, all the waveforms and measurements will be made automatically.
6. If the DUT does not support automation follow the same steps as outlined in Section 9.1.2.
7. After HBR2 EYE and Jitter Measurements are complete, follow the steps as outlined in Section 9.1.3 to save the results.

Note: the complete DP Signaling test results for DUT HBR2_DP_DUT are the combination of the reports saved in Sections 9.1, 9.2 and 9.3.

9.4. Dual Mode Measurements (if the DUT supports Dual-Mode)

This section describes the procedure for running Dual Mode Display Port (DP++) tests as called out in Sections 3.18 and 3.19 of the DP1.2b CTS.

9.4.1. Dual Mode (D++ Test Setup)

For Dual Mode testing, the DP-AUX Controller shown in Figure 7 is replaced by a Wilder AUX Control Board. The DP plug adapter must have a 6-wire sideband connector available so that Config1,2 can be properly configured by the EDID chip on the Aux board. The Wilder AUX Control board emulates a downstream Dual Mode Sink device and will present itself as such on system under test.

The setup is shown in the following figure.

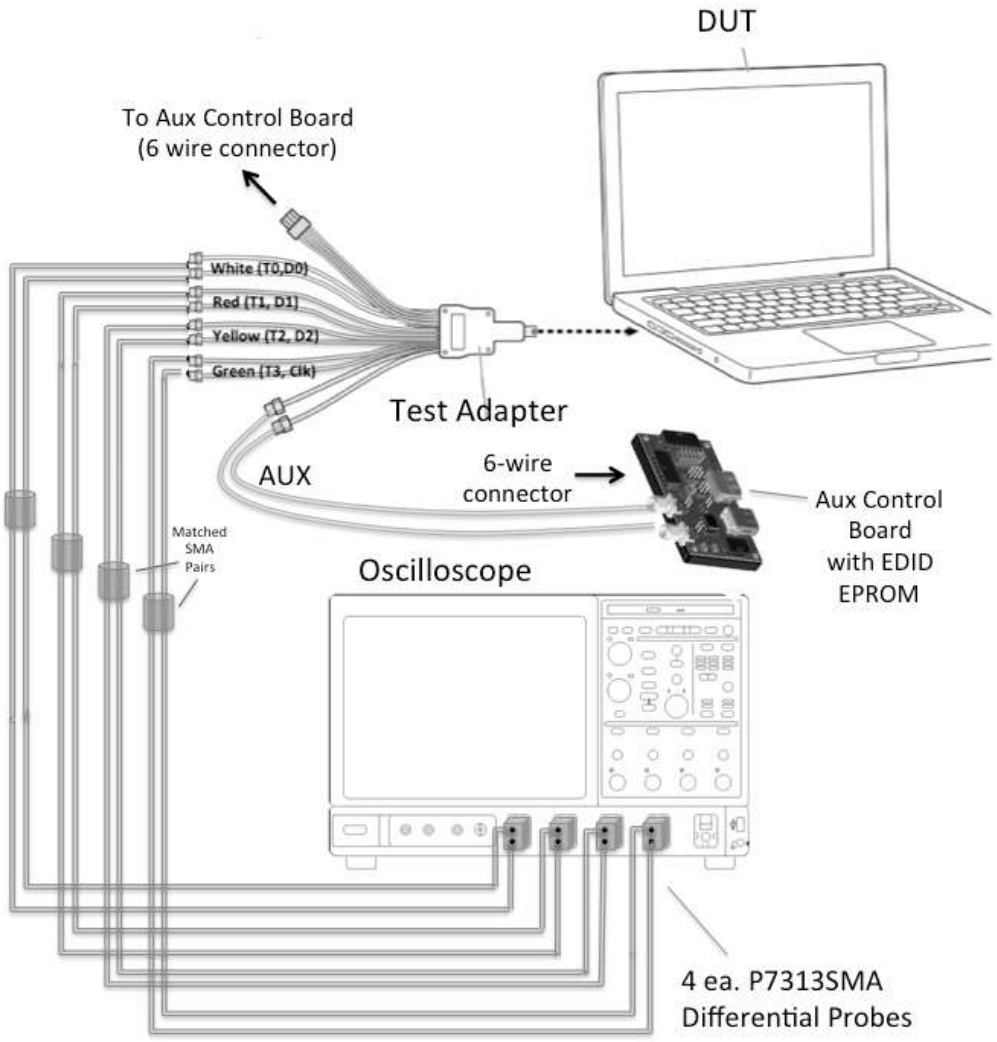
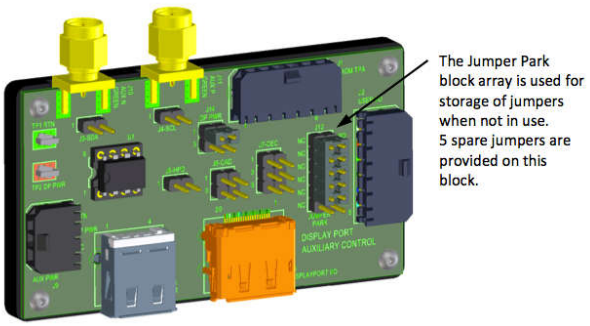
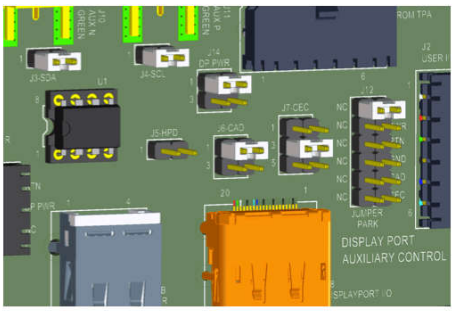


Figure 21: Dual Mode Test Setup

In this example, the Wilder AUX adapter needs to be changed to the correct jumper settings for Dual Mode testing. The following figure shows the correct jumper settings.



Wilder AUX Controller Board



Dual Mode Test Jumper Location

Figure 22: Wilder AUX Control Board configured for Dual Mode Testing

9.4.2. Tek Express Dual Mode Setup (If supported by DUT)

1) After saving the HBR2 data return to TekExpress (1) DUT
   a) Select rate of HBR2
   b) Select Pattern COMP
   c) Select Voltage 2 (800mV)
   d) Select 0 pre-emphasis
   e) De-select all Post Cursor
   f) Select 4 lanes

Note: 4 Lanes selection is required for test 3.19. All other selections do not impact the signaling for DP++ testing.

2) Next (2) Test Selection
   a) Click on the Deselect all Button
   b) Select Test 3.18_Dual-mode TMDS Clock
   c) Select Test 3.19_Dual-mode Eye Diagram Testing

9.4.3. Dual Mode (D++) Test Procedure

The following procedure is to be used for Dual Mode testing using TekExpress DisplayPort. Connect the DUT, fixtures, and probes as shown in Figure 21.

1. Press the Start button. This will start the automation testing process.
2. Connect Differential clock signal to Ch. 4 then press OK

Figure 23: Connecting Clock signal to Ch4

3. Connect D0 Signal to Ch3, D1 to Ch2 and D2 to Ch1 Then press OK

Figure 24 - Connecting D0-D2 to Ch3-CH1

4. After Dual Mode Clock and Eye diagram tests are complete, follow the steps as outlined in Section 9.1.3 to save the results.

9.5 *AUX Manchester - Channel EYE Test*

This section describes the procedure for running Aux Manchester Channel EYE tests as called out in Sections 8.1 of the DP1.2b CTS.

9.5.1 *AUX Manchester - Channel EYE Test Setup*

The setup is shown in the following figure.

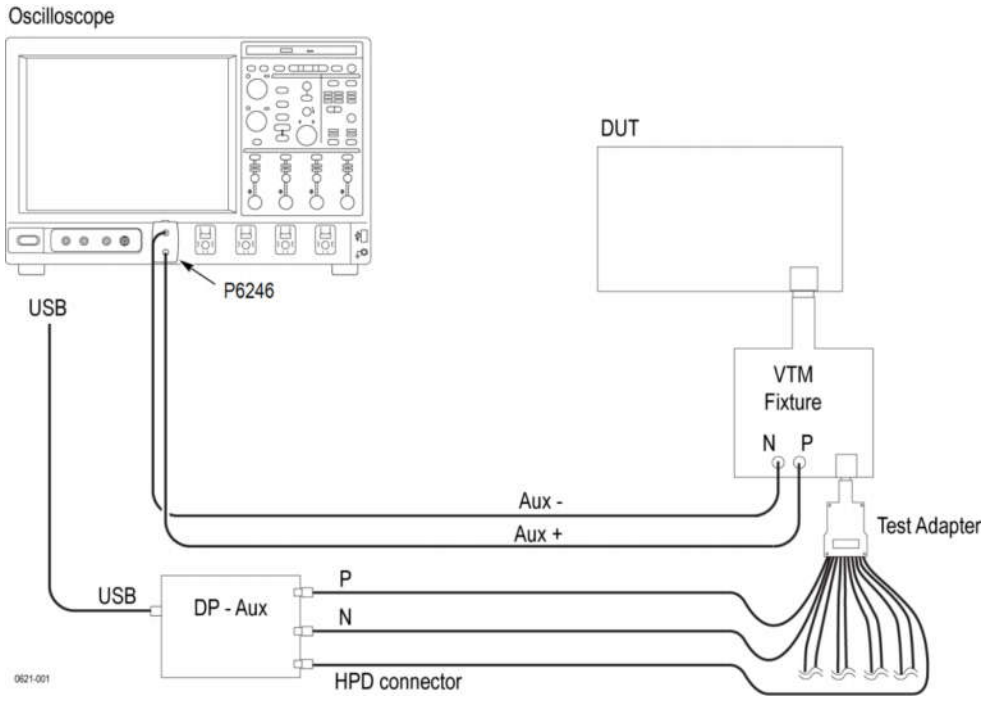


Figure 25 – Connection Setup for AUX Manchester – Channel EYE Test

9.5.2 *AUX Manchester - Channel EYE Test Procedure*

1) After saving the Dual Mode data, return to the Test Selection Menu.
2) Next Test Selection
   a) Click on the Deselect all Button
   b) Select Test 8.1_AUX Manchester Channel EYE Test
3) Press the Start button. This will start the automation testing process.
4) Connect AUX+ Signal to Ch1 and AUX- Signal to Ch2 then press OK.

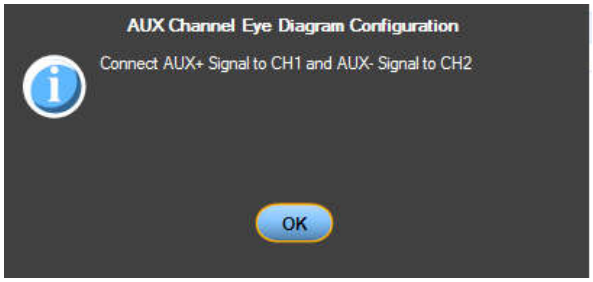


Figure 26 – Connecting AUX Signal to Ch1 and Ch2

5) After AUX Manchester – Channel EYE tests are complete, follow the steps as outlined in Section 9.1.3 to save the results.