

Granite River Labs

Addendum

GRL-C2-DP-AUX-SNIF Addendum For Hardware & Software Setup with GRL-C2-DP-AUX-SNIF DisplayPort Auxiliary Sniffer Board and GRL USB Type-C[®] Power Delivery Tester and Analyzer (GRL-USB-PD-C2 / C2-EPR)



This material is provided as a reference to set up the hardware and software and perform DisplayPort Auxiliary (DP-AUX) transactions using the Granite River Labs DisplayPort Auxiliary Sniffer Board (GRL-C2-DP-AUX-SNIF) and GRL-USB-PD-C2 / C2-EPR test controller as main equipment via the GRL USB Type-C Power Delivery Tester and Analyzer (GRL-USB-PD-C2 / C2-EPR) Browser Application.

For user support or information, contact support@graniteriverlabs.com.

Published on 06 February 2023



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TABLE OF CONTENTS

1	SCO	PE OF THIS ADDENDUM	5
2	TES	I/EQUIPMENT REQUIREMENTS	5
3	DISF	PLAYPORT AUXILIARY (DP-AUX) CHANNEL TEST SETUP	5
	3.1 C	ONNECT AND SET UP GRL-USB-PD-C2 / C2-EPR BROWSER APP	6
	3.2 S	et Up Hardware Connections	8
	3.2.1	DisplayPort Source and Sink Test Setup	8
	3.2.2	DisplayPort Source and Sink with DisplayPort/Thunderbolt Dock Test Setup	. 11
4	DP-A	AUX CHANNEL TEST PROCEDURE	11



LIST OF FIGURES

Figure 3.1: Connection Configuration Screen After Successful Connection Between GRL-USB-PD- C2 / C2-EPR Browser App and GRL-USB-PD-C2 / C2-EPR Test Controller
Figure 3.2: Check DP-AUX Sniffer Licensing6
Figure 3.3: Set and Apply DP-AUX Configuration7
Figure 3.4: Start Signal Capture in Results Screen Example8
Figure 3.5: DisplayPort Source & Sink Test Setup Connection Diagram8
Figure 3.6: Close-Up of GRL-C2-DP-AUX-SNIF Board Test Fixture9
Figure 3.7: Display Extended Without Connecting GRL-C2-DP-AUX-SNIF Board Test Fixture9
Figure 3.8: Display Extended with GRL-C2-DP-AUX-SNIF Board Test Fixture Connected to the Source Side
Figure 3.9: Display Extended with GRL-C2-DP-AUX-SNIF Board Test Fixture Connected to the Source Side and GRL-USB-PD-C2 / C2-EPR Test Controller Using GRL-SPL-EPR Cable10
Figure 3.10: DisplayPort Source & Sink with DisplayPort/Thunderbolt Dock Test Setup Connection Diagram11
Figure 4.1: Initial Display of DP-AUX Test Execution on Results Screen
Figure 4.2: Viewing More Details on DP-AUX Test Results13



1 Scope of this Addendum

This Addendum serves as a supplementary documentation to connect the GRL-C2-DP-AUX-SNIF Board to the GRL-USB-PD-C2 / C2-EPR USB Type-C Test Controller and DisplayPort Source & Sink devices for decoding of DisplayPort sideband AUX messages. This will be followed by procedures to perform automated testing using the GRL-USB-PD-C2 / C2-EPR Browser Application.

Below describes the GRL-C2-DP-AUX-SNIF Board test fixture:



• **GRL-C2-DP-AUX-SNIF Board** – Extension fixture for the GRL-USB-PD-C2 / C2-EPR test controller, used for sniffing DisplayPort Standard Auxiliary traffic.

2 Test/Equipment Requirements

For purchase or information of the following items, contact info@graniteriverlabs.com.

- GRL-C2-DP-AUX-SNIF Board test fixture
- GRL-USB-PD-C2 / C2-EPR USB Type-C test controller
- USB Type-C based DisplayPort Sink device
- USB Type-C based DisplayPort Source device
- DisplayPort or Thunderbolt dock
- GRL Special (GRL-SPL / GRL-SPL-EPR) Type-C VCONN passthrough test cable (GRL-USB-PD-STC)
- 2 x Full featured USB Type-C cable

3 DisplayPort Auxiliary (DP-AUX) Channel Test Setup

This section describes the connection diagrams and procedures to set up the equipment and fixture for decoding DP-AUX channel communication between the DisplayPort Source and Sink. Below are two different types of test setups:

- DisplayPort Source and Sink test setup
- DisplayPort Source and Sink with DisplayPort/Thunderbolt Dock test setup

Make sure to follow all the steps as described below before running tests using these setups.

For details on using the GRL-USB-PD-C2 / C2-EPR Browser App, refer to the GRL-USB-PD-C2 / C2-EPR Browser App user documentation in <u>http://graniteriverlabs.com/download-center/</u>.



3.1 Connect and Set Up GRL-USB-PD-C2 / C2-EPR Browser App

1. Open the GRL-USB-PD-C2 / C2-EPR Browser App and connect to the GRL-USB-PD-C2 / C2-EPR test controller.

GRL GRANITE RIVER	Labs	USB Power Delivery and USB Type-C [™] Test Software (1.4.63.0) GRL-USB-PD-C2				
	Ethernet Connection Settings	Tester Status		Connecte	d	
Connection	Soon Network	Serial Number		022.045.0	22.009.031.	
Setup	Scar Network	Firmware Version		1.3.52 / 9.	4/9.4	
	C2 IP Address	Port Info		5002		
	192.168.4.152 x = Connect	Tester IP Address Info		192.168.4	152	
Product	Setup Diagram	Last Calibration Date		2018-05-3	0	
Capability	Tool Updates	Next Calibration Due Date		2019-05-29 Calibrated		
	Undate Firmware Firmware Update Instructions	Test Cable Calibration Status				
		C2 Tester Calibration		Calibratio	n Expired	
Test Config			License Info			
Results		Module Name	License	е Туре	License Period	
6 20		BC1.2 DCP Sink Tests	PEF	RM	-	
=×		C2	PEF	RM	-	
Report		C2 Starter	PEF	RM	-	
~~~		DP AUX Sniffer	PEF	RM	-	
202		F1	PEF	RM	-	
Options		M1	PEF	RM	-	
•		MFi Charger Tests	PEF	RM	-	
(?)		Quick Charge 3 Plus Tests	PEF	RM	-	
Help		Quick Charge 3 Tests	PEF	RM	-	
		Quick Charge 4 - IOP Tests	PEF	RM	-	
		Quick Charge 4 Tests	PEF	RM	-	
		Thunderbolt 3 Power Tests	PEF	RM	-	
		USB-C Functional Tests	PEF	RM	-	

FIGURE 3.1: CONNECTION CONFIGURATION SCREEN AFTER SUCCESSFUL CONNECTION BETWEEN GRL-USB-PD-C2 / C2-EPR BROWSER APP AND GRL-USB-PD-C2 / C2-EPR TEST CONTROLLER

2. Check the "License Info" panel in the *Connection Setup* screen to make sure that the "DP AUX Sniffer" license is active on the GRL-USB-PD-C2 / C2-EPR test controller.

GRL GRANITE RIVER	Labs	USB Power Delivery and USB Type-C [™] Test Soft GRL-USB-PD-C2	ware (1.4.63.0)	
$\odot$	Ethernet Connection Settings	Tester Status	Conn	ected
Connection Setup	Scan Network C2 IP Address	Firmware Version	1.3.52	2/9.4/9.4
	192.168.4.152 x * Connect	Tester IP Address Info	192.1	68.4.152
Product Capability	<u>Setup Diagram</u> Tool Updates	Last Calibration Date Next Calibration Due Date	2018-2019-	05-29
	Update Firmware Eirmware Update Instructions	C2 Tester Calibration	Calib	rated ration Expired
Test Config	Update Eload Firmware		License Info	
Ð		Module Name	License Type	License Period
Results		BC1.2 DCP Sink Tests	PERM	-
Report		C2 C2 Starter	PERM	-
		DP AUX Sniffer F1	PERM	· · · · ·

FIGURE 3.2: CHECK DP-AUX SNIFFER LICENSING



3. Go to the *Options* screen and select the **Config Controller** tab at the top of screen. Set the configuration as shown in the Configure panel below. Once configured, click on the **Apply** button.

$\overline{\bullet}$		Five Port Testing	C	Config Controller
Connection Setup		Configure		
	App Mode	DP AUX	•	Sop Туре
Product	Fixture Selection	C2 DP AUX Sniffer	•	Message Type
Capability	Port Type	PortB	•	SVID(0X0000) 0X
	Controller Mode	UFP/Sink	•	ĺ
Test Config	Test Cable Type	GRL-SPL Test Cable 1	•	
æ	PD Spec Type	Spec Rev2	•	
Results	Cable Emulation	Ra in CC2	•	
	Rp Level	Rp 900mA	•	
۲۲.	(	Apply		
Report	Emulate Cable	Attach Detach		
र्देह	Channels	🗸 VBUS 🗹 CC1 🔽 CC2		
Options	Signal Capture	Start Stop		
	Capture File			
(?)		Download Capture		

FIGURE 3.3: SET AND APPLY DP-AUX CONFIGURATION

4. At the "Signal Capture" field, click on the **Start** button Signal Capture Start to start running signal acquisition in the *Results* screen as shown in Figure 3.4 example.



Step Description         Description           © 00         00         00         00           UDP Aux Read	
© 00 ⊙ 09 © 00 <00 ∪ DP Aux Read	
U DP Aux Read	
U DP Aux Read	
90	
2 60	
- 00	
50	
3 S 3 J 2010 E 1 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2	
9	
50	
25 11	

FIGURE 3.4: START SIGNAL CAPTURE IN RESULTS SCREEN EXAMPLE

#### 3.2 Set Up Hardware Connections

After setting up the GRL-USB-PD-C2 / C2-EPR Browser App as described in Section 3.1, proceed to set up the following hardware connections.

#### 3.2.1 DisplayPort Source and Sink Test Setup

Note: The DisplayPort Source and Sink connection in this setup are interchangeable.



FIGURE 3.5: DISPLAYPORT SOURCE & SINK TEST SETUP CONNECTION DIAGRAM

GRL-C2-DP-AUX-SNIF Addendum



As shown in Figure 3.5 above, connect the equipment as follows:

- 1. Connect Port 1 of the GRL-USB-PD-C2 / C2-EPR test controller using the GRL-SPL / GRL-SPL-EPR cable to the "Port1" connector on the GRL-C2-DP-AUX-SNIF Board test fixture.
- 2. Connect a USB Type-C based DisplayPort Source device using a full-featured USB Type-C cable to the "Device" connector on the GRL-C2-DP-AUX-SNIF Board test fixture.
- 3. Finally, attach the USB Type-C plug of the GRL-C2-DP-AUX-SNIF Board test fixture to a USB Type-C based DisplayPort Sink device.
- 4. If the Browser App screen does not extend or if the DisplayPort AUX packets are not captured, flip the USB Type-C standard cable connected to the DisplayPort Source of the DisplayPort Sink side (or) interchange the DisplayPort Source and Sink connected to the test fixture sides.



FIGURE 3.6: CLOSE-UP OF GRL-C2-DP-AUX-SNIF BOARD TEST FIXTURE

The following photos show some samples of the actual equipment connection for extending the screen's display with and without the GRL-C2-DP-AUX-SNIF Board test fixture connected:



FIGURE 3.7: DISPLAY EXTENDED WITHOUT CONNECTING GRL-C2-DP-AUX-SNIF BOARD TEST FIXTURE





FIGURE 3.8: DISPLAY EXTENDED WITH GRL-C2-DP-AUX-SNIF BOARD TEST FIXTURE CONNECTED TO THE SOURCE SIDE



FIGURE 3.9: DISPLAY EXTENDED WITH GRL-C2-DP-AUX-SNIF BOARD TEST FIXTURE CONNECTED TO THE SOURCE SIDE AND GRL-USB-PD-C2 / C2-EPR TEST CONTROLLER USING GRL-SPL-EPR CABLE



#### 3.2.2 DisplayPort Source and Sink with DisplayPort/Thunderbolt Dock Test Setup

Note: The DisplayPort Source and Sink connection in this setup are interchangeable.



FIGURE 3.10: DISPLAYPORT SOURCE & SINK WITH DISPLAYPORT/THUNDERBOLT DOCK TEST SETUP CONNECTION DIAGRAM

As shown in Figure 3.10 above, connect the equipment as follows:

- 1. Connect Port 1 of the GRL-USB-PD-C2 / C2-EPR test controller using the GRL-SPL / GRL-SPL-EPR cable to the "Port1" connector on the GRL-C2-DP-AUX-SNIF Board test fixture.
- 2. Attach the USB Type-C plug of the GRL-C2-DP-AUX-SNIF Board test fixture to a USB Type-C based DisplayPort Source device.
- 3. Connect a DisplayPort/Thunderbolt dock using a full-featured USB Type-C cable to the "Device" connector on the GRL-C2-DP-AUX-SNIF Board test fixture.
- 4. Finally, connect a USB Type-C based DisplayPort Sink device using a full-featured USB Type-C cable to the DisplayPort/Thunderbolt dock.

## 4 DP-AUX Channel Test Procedure

The following procedure explains how to perform DP-AUX channel test automation using the GRL-USB-PD-C2 / C2-EPR Browser App.

 Once the equipment for the test setups as described in Figure 3.5 and Figure 3.10 (whichever applies) have been connected, and connection has been established between the DisplayPort Source and Sink devices, the USB Power Delivery protocol communication followed by the DP-AUX transactions can be seen initially on the *Results* screen of the GRL-USB-PD-C2 / C2-EPR Browser App, as shown in below examples.



Data Davador         Description           1456 1529 43         WHI DOLCARD, Suit (Down C) Shiler,         Head (State)           1456 1529 43         WHI DOLCARD, Suit (Down C) Shiler,         Head (State)           1456 1529 43         WHI DOLCARD, Suit (Down C) Shiler,         Head (State)           1456 1529 43         WHI DOLCARD, Suit (Down C)         Head (Down C)           1456 1529 43         WHI DOLCARD, Suit (Down C)         Head (Down C)           1456 1529 43         WHI DOLCARD, Suit (Down C)         Head (Down C)           1456 1529 43         WHI DOLCARD, SUIT (Down C)         Head (Down C)           1456 1529 150 HEAD (Down C)         YA (A)         HEAD (DOWN C)           1458 150 HEAD (DOWN C)         YA (A)         HEAD (DOWN C)           155 150 HEAD (DOWN C)         YA (A)         HEAD (DOWN C)           155 150 HEAD (DOWN C)         YA (A)         HEAD (DOWN C)           155 150 HEAD (DOWN C)         YA (A)         HEAD (DOWN C)           155 150 HEAD (DOWN C)         YA (A)         HEAD (DOWN C)           155 150 HEAD (DOWN C)         YA (A)         HEAD (DOWN C)           155 150 HEAD (DOWN C)         HEAD (DOWN C)         HEAD (DOWN C)           155 150 HEAD (DOWN C)         HEAD (DOWN C)         HEAD (DOWN C)           155 150 HEAD (DOWN	et accode       Time Same       Description         90°       0 0°       00°       7.555 (250 30 0° 0° 0° 0° 0° 0° 0° 0° 0° 0° 0° 0° 0°	Test Results		🗄 📂 Q	õ iQ			X Y 🕈	10 III
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Test Reachs <ul> <li></li></ul>	11       15       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10       10 <td< td=""><td>0/0 🖸 0/0 📮 0/0</td><td>0/0</td><td>74.946.580.550 UUT#</td><td>2 SOP1/CablePlug</td><td>2:GoodCRC</td><td>0.000</td><td></td><td></td></td<>	0/0 🖸 0/0 📮 0/0	0/0	74.946.580.550 UUT#	2 SOP1/CablePlug	2:GoodCRC	0.000		
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Test Results         Image: Stamp	at Results       Image: Stamp       Description         if Beschin       Image: Stamp       Description         if Description       Telescolute       Telescolute         if Description       Telescolute       Telescolute       Telescolute </td <td></td> <td></td> <td>0.2</td> <td></td> <td></td> <td></td> <td></td> <td></td>			0.2					
Ivest Resolute         Ivest R	at Results       Image: Stamp       Description         76:06:22:04       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       <			33					
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Test Results         Image: Control of the second sec	at Results         bit State         bit State <td></td> <td></td> <td>ORI</td> <td></td> <td></td> <td></td> <td></td> <td></td>			ORI					
10         10           50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50<	10       60         60       60         61       60         62       60         62       60         63       60         64       60         65       60         65       60         65       60         65       60         65       60         65       60         75       60         75       60         75       60         75       60         75       60         75       60         75       60         75       60         75       60         75       60         75       60         75       60         75       60         75       75         75       75         75       75         75       75         75       75         75       75         75       75         75       75         75       75         75       75         75       75 <td></td> <td></td> <td><u>с</u> 0.0</td> <td></td> <td></td> <td></td> <td></td> <td></td>			<u>с</u> 0.0					
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Test Results         Image Stamp         Description           00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00	Image: Control (Control (Contro) (			8.2					
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00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00         00	000       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       00       <		ر. ا	76.086:290:450	65 : Nat. Req. RdA	Addr: 0x00000 Lon: 11			
76 06 552 - 410       Hold - Mak Reg Hold & Mol200 Lon: 0         76 06 552 - 700       Hold - Mak Reg Hold & Mol200 Lon: 0         76 154 154 560       Hold - Mak Reg Hold & Mol200 Lon: 0         76 156 757 064 400       Hold - Mak Reg Hold & Mol200 Lon: 0         76 75 757 064 740       Hold - Mak Reg Hold & Mol200 Lon: 0         76 757 064 740       Hold - Mak Reg Hold & Mol200 Lon: 0         76 757 064 740       Hold - Mak Reg Hold & Mol200 Lon: 0         76 757 064 740       Hold - Mak Reg Hold & Mol200 Lon: 0         76 757 064 740       Hold - Mak Reg Hold & Mol200 Lon: 0         76 757 064 740       Hold - Mak Reg Hold & Mol200 Lon: 0         76 757 064 740       Hold - Mak Reg Hold & Mol200 Lon: 0         76 757 064 740       Hold - Mak Reg Hold & Mol200 Lon: 0         76 757 076 740 000 Lon: 0       Trainer, ACK, A         76 757 056 740 000 Lon: 0       Hold - Mak Reg Hold & Mol200 Lon: 0         76 757 056 740 000 Lon: 7 - Mak Reg Hold & Mol200 Lon: 0       Trainer         76 757 056 740 000 Lon: 7 - Mak Reg Hold & Mol200 Lon: 0       Trainer         76 757 056 740 000 Lon: 7 - Mak Reg Hold & Mol200 Lon: 0       Trainer         76 757 056 740 000 Lon: 7 - Mak Reg Hold & Mol200 Lon: 0       Trainer         76 757 056 740 000 Lon: 7 - Mak Reg Hold & Mol200 Lon: 0       Trainer         70 0000 Lon: 7 - Mak Reg Hold & Ma	76 006 552 418       Web 7 SHatt Ree; KMA44: 000/2001 km 0         76 006 552 418       Web 7 SHatt Ree; XMA44: 000/2001 km 0         76 154 154 550       M60 SHatt Ree; XMA44: 000/2001 km 0         76 154 154 550       M60 SHatt Ree; XMA44: 000/2001 km 0         76 156 154 440       M61 SUC Ree; XMA44: 000/2001 km 0         76 706 758 900       M62 SHatt Ree; XMA44: 000/2001 km 0         76 706 758 900       M62 SHatt Ree; XMA44: 000/2001 km 0         76 770 753 900       M65 SHatt Ree; XMA44: 000/2001 km 0         76 770 753 9100       M65 SHatt Ree; XACX, A         76 770 753 9100       M65 SHatt Ree; XACX, A         76 770 750 9100       M65 SHatt Ree; XACX, A         76 770 750 9100       M65 SHatt Ree; XACX, A         76 770 950 900       M65 SHatt Ree; XACX, A         76 770 950 900       M65 SHatt Ree; XACX, A         76 770 950 900       M65 SHatt Ree; XACX, A         76 770 950 900       M65 SHatt Ree; XACX, A         76 770 950 900       M65 SHatt Ree; XACX, A         90       M65 SHatt Ree; XACX, A         91       33         92       33         93       34         94       95         95       33         96       10         97       10<	0/0 😋 0/0 😋 0/0	0/0	76.086:365:460	56 : Nat. Res: ACK	(_A			
76.056/24/96     mid-1mix resk AOX,A       76.194154.560     mid-95/3-kit Rey KAOX,A       76.194154.500     mid-1mix resk AOX,A       76.194754.600     mid-1mix resk Resk AOX,A       76.19454.600     mid-1mix resk Resk AOX,A       90     mid-1mix resk Resk AOX,A       91     mid-1mix resk Resk AOX,A       92     mid-1mix resk Resk AOX,A       93     mid-1mix resk Resk AOX,A       93     mid-1mix resk Resk AOX,A       93     mid-1mix resk Resk AOX,A       94     mid-1mix resk Resk AOX,A	76,006.627 (10)       = 003 - Net, Year, Yanok A, Year, Yanok Y, Yanok X, Yanok	nutr		76.086.552.410	57 : Nat Reg: RdA	4ddr: 0x00200 Len: 0			
10     151     152     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150     150 <td>16. 132. 13. 1300       = 0.7 Mik Holf Hindlaw Abbodie Link u         17. 15. 132. 13. 1300       = 0.7 Mik Holf Hindlaw Abbodie Link u         17. 15. 152. 1300       = 0.7 Mik Holf Hindlaw Abbodie Link u         17. 15. 152. 1300       = 0.7 Mik Holf Hindlaw Abbodie Link u         17. 15. 152. 1300       = 0.7 Mik Holf Hindlaw Abbodie Link u         17. 15. 152. 1300       = 0.7 Mik Holf Hindlaw Abbodie Link u         17. 15. 152. 1300       = 0.7 Mik Holf Hindlaw Abbodie Link u         17. 15. 152. 1300       = 0.7 Mik Holf Hindlaw Abbodie Link u         17. 15. 152. 1301       = 0.6 Mik Hindlaw Abbodie Link u         17. 15. 152. 1301       = 0.6 Mik Hindlaw Abbodie Link u         17. 15. 152. 1301       = 0.6 Mik Hindlaw Abbodie Link u         17. 15. 152. 1301       = 0.6 Mik Hindlaw Abbodie Link u         17. 152. 152. 1301       = 0.7 Mik Hindlaw Abbodie Link u         17. 152. 152. 1301       = 0.7 Mik Hindlaw Abbodie Link u         17. 152. 152. 1301       = 0.7 Mik Hindlaw Abbodie Link u         17. 152. 152. 1302       = 0.7 Mik Hindlaw Abbodie Link u         17. 152. 152. 152. 152. 152. 152. 152. 152</td> <td></td> <td></td> <td>76 086 624 780</td> <td>68 Nat Res ACK</td> <td>(_A</td> <td></td> <td></td> <td></td>	16. 132. 13. 1300       = 0.7 Mik Holf Hindlaw Abbodie Link u         17. 15. 132. 13. 1300       = 0.7 Mik Holf Hindlaw Abbodie Link u         17. 15. 152. 1300       = 0.7 Mik Holf Hindlaw Abbodie Link u         17. 15. 152. 1300       = 0.7 Mik Holf Hindlaw Abbodie Link u         17. 15. 152. 1300       = 0.7 Mik Holf Hindlaw Abbodie Link u         17. 15. 152. 1300       = 0.7 Mik Holf Hindlaw Abbodie Link u         17. 15. 152. 1300       = 0.7 Mik Holf Hindlaw Abbodie Link u         17. 15. 152. 1300       = 0.7 Mik Holf Hindlaw Abbodie Link u         17. 15. 152. 1301       = 0.6 Mik Hindlaw Abbodie Link u         17. 15. 152. 1301       = 0.6 Mik Hindlaw Abbodie Link u         17. 15. 152. 1301       = 0.6 Mik Hindlaw Abbodie Link u         17. 15. 152. 1301       = 0.6 Mik Hindlaw Abbodie Link u         17. 152. 152. 1301       = 0.7 Mik Hindlaw Abbodie Link u         17. 152. 152. 1301       = 0.7 Mik Hindlaw Abbodie Link u         17. 152. 152. 1301       = 0.7 Mik Hindlaw Abbodie Link u         17. 152. 152. 1302       = 0.7 Mik Hindlaw Abbodie Link u         17. 152. 152. 152. 152. 152. 152. 152. 152			76 086 624 780	68 Nat Res ACK	(_A			
10     0.023.402     0.011     0       16     1002     0001     0       16     1002     0001     0       17     1002     0001     0       17     1000     0001     0       17     1000     0001     0       17     1000     0001     0       17     1000     0001     0       17     1000     0001     0       17     1000     0001     0       17     1000     0001     0       17     1000     0001     0       17     1000     0001     0       17     1000     0001     0       17     1000     0001     0       17     1000     0001     0       17     1000     0001     0       17     1000     0001     0       17     1000     0001     0       18     1000     0001     0       19     0     0       10     0     0       10     0     0       10     0     0       10     0     0       10     0       10     0  <	10     0.022264     0.05     0.05       17     16     0.05     100     100       16     16     0.05     100     100       16     10     100     100     100       17     10     100     100     100       16     100     100     100     100       17     10     100     100     100       16     10     100     100     100       17     10     100     100     100       17     10     100     100     100       16     10     10     100     100       17     10     100     100     100       16     10     10     10     10       10     10     10     10     10       10     10     10     10     10       10     10     10     10     10       10     10     10     10     10       10     10     10     10     10       10     10     10     10     10       10     10     10     10     10       10     10     10     10     10       10 <td></td> <td></td> <td>76.194.154.560</td> <td>60 Nat Res ACK</td> <td>C A</td> <td></td> <td></td> <td></td>			76.194.154.560	60 Nat Res ACK	C A			
76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     76     <	76 700 788 590     M62 - 10C: Res: ACK, I       76 700 798 590     M63 - Net Req RAM46 / b00200 Lon: 0       76 707 695 400     M65 - Net Req RAM46 / b00200 Lon: 0       76 707 695 400     M65 - Net Req RAM46 / b00201 Lon: 0       76 707 695 400     M65 - Net Req RAM46 / b00201 Lon: 0       76 707 695 400     M65 - Net Req RAM46 / b00201 Lon: 0       76 707 695 400     M65 - Net Req RAM46 / b00201 Lon: 0       76 707 695 400     M65 - Net Req RAM46 / b00201 Lon: 0       76 707 695 400     M65 - Net Req RAM46 / b00201 Lon: 0       76 707 695 400     M65 - Net Req RAM46 / b00201 Lon: 0       76 708 560 699     M65 - Net Req RAM46 / b00201 Lon: 0       76 708 560 699     M65 - Net Req RAM46 / b00201 Lon: 0       76 708 560 699     M65 - Net Req RAM46 / b00201 Lon: 0       76 708 560 699     M65 - Net Req RAM46 / b00201 Lon: 0       76 708 560 699     M65 - Net Req RAM46 / b00201 Lon: 0       76 708 560 699     M65 - Net Req RAM6 / b00201 Lon: 0       76 708 560 699     M65 - Net Req RAM6 / b00201 Lon: 0       76 708 560 699     M65 - Net Req RAM6 / b00201 Lon: 0       76 708 560 699     M65 - Net Req RAM6 / b00201 Lon: 0       70 700 600     Ja       00     Ja       01     Ja       02     Ja       03     Ja       04     Ja       05			76 706 708 440	61 IZC Reg WtA	Addr: 0x10000 Len: 0 MOT: 0			
76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76       76 <td< td=""><td>76: 706 593.680       ING. 3-Matt. Res.; ACX_A         76: 707 507 106 7-140       ING. 3-Matt. Res.; ACX_A         76: 707 507 106 7-140       ING. 3-Matt. Res.; ACX_A         76: 707 507 106 7-140       ING. 3-Matt. Res.; ACX_A         76: 707 507 106 7-140       ING. 3-Matt. Res.; ACX_A         76: 707 507 106 7-140       ING. 3-Matt. Res.; ACX_A         76: 707 506 7-000       ING. 7-Matt. Res.; ACX_A         76: 707 506 500       ING. 7-Matt. Res.; ACX_A         76: 707 506 500       ING. 7-Matt. Res.; ACX_A         76: 707 507 100       ING. 7-Matt. Res.; ACX_A         76: 708 500 500       ING. 7-Matt. Res.; ACX_A         76: 708 500 500 500 500 500 500 500 500 500 5</td><td></td><td></td><td>76.706.788.900</td><td>62 :: 12C: Res: ACK</td><td><u>(</u>]</td><td></td><td></td><td></td></td<>	76: 706 593.680       ING. 3-Matt. Res.; ACX_A         76: 707 507 106 7-140       ING. 3-Matt. Res.; ACX_A         76: 707 507 106 7-140       ING. 3-Matt. Res.; ACX_A         76: 707 507 106 7-140       ING. 3-Matt. Res.; ACX_A         76: 707 507 106 7-140       ING. 3-Matt. Res.; ACX_A         76: 707 507 106 7-140       ING. 3-Matt. Res.; ACX_A         76: 707 506 7-000       ING. 7-Matt. Res.; ACX_A         76: 707 506 500       ING. 7-Matt. Res.; ACX_A         76: 707 506 500       ING. 7-Matt. Res.; ACX_A         76: 707 507 100       ING. 7-Matt. Res.; ACX_A         76: 708 500 500       ING. 7-Matt. Res.; ACX_A         76: 708 500 500 500 500 500 500 500 500 500 5			76.706.788.900	62 :: 12C: Res: ACK	<u>(</u> ]			
76:707:007:415     INFG: 1-MAR. Rear, RAVAS. A       76:707:007:415     INFG: 1-MAR. Rear, RAVAS. A       76:707:509:700     INFG: 1-MAR. RAVAS. A       76:707:000:700     INFG: 1-MAR. RAVAS. A       90     INFG: 1-MAR. Rear, RAVAS. A       90     INFG: 1-MAR. Rear, RAVAS. A       91     INFG: 1-MAR. Rear, RAVAS. A       92     INFG: 1-MAR. Rear, RAVAS. A       93     INFG: 1-MAR. Rear, RAVAS. A       94     INFG: 1-MAR. Rear, RAVAS. A       95     INFG: 1-MAR. Rear, RAVAS. A       97     INFG: 1-MAR. Rear, RAVAS. A	76:707:507:415 - Mid: Field Res: AOC(A 76:707:304:52.449 Mid: S-Mid: Reg: RAMAd: 0x000001 Los: 0 76:707:509:509 Mid: S-Mid: Reg: RAMAd: 0x000001 Los: 0 76:708:609 669 Mid: S-Mid: Reg: AOC(A 99 6.0 10 10 10 10 10 10 10 10 10 1			76.706 934 880	63 ::Nat: Req: RdA	Addr: 0x00200 Lon: 0			
76:071366240     MK6: Hat Res, KAXA       76:071356240     MK6: Hat Res, KAXA       9:0     MK8: Hat Res, KAXA       9:0     MK	76.707.862.248       M65       Met Rest AddX double0 Len 0         76.707.9529       100       M66       Met Rest AddX double0 Len 0         76.707.9529       100       M66       Met Rest AddX double0 Len 0         76.707.9529       100       M67       Met Rest AddX double0 Len 0         76.708.650.650       105.5       Het Rest AddX double0 Len 0       Met Rest AddX double0 Len 0         76.708.650.650       105.5       Het Rest AddX double0 Len 0       Met Rest AddX double0 Len 0         9.9       0.0       0.0       0.0       Met Rest AddX double0 Len 0         9.9       0.0       0.0       0.0       Met Rest AddX double0 Len 0         9.9       0.0       0.0       0.0       Met Rest AddX double0 Len 0         9.9       0.0       0.0       0.0       Met Rest AddX double0 Len 0         9.9       0.0       0.0       0.0       Met Rest AddX double0 Len 0         9.9       0.0       0.0       0.0       Met Rest AddX double0 Len 0         9.0       0.0       0.0       0.0       Met Rest AddX double0 Len 0         9.0       0.0       0.0       0.0       Met Rest AddX double0 Len 0         9.0       0.0       0.0       0.0       Met Rest AddX doube0 Len 0			76.707:007:410	64 : Nat Res ACK	(A			
76.705507400     BMC Hat Res ACK A       76.705507400     BMC Hat Res ACK A       76.705507400     BMC Hat Res ACK A       76.705600.000     BMC Hat Res ACK A	76.701530 100     INKE - Nat. Rev. ACX_A       76.701520     INKI - Nat. Rev. RAXA& budd0211 an 0       76.7016000 050     INKI - Nat. Rev. ACX_A       90     INKI - Nat. Rev. ACX_A       91     INKI - Nat. Rev. ACX_A       92     INKI - Nat. Rev. ACX_A       93     INKI - Nat. Rev. ACX_A       94     INKI - Nat. Rev. ACX_A       95     INKI - Nat. Rev. ACX_A       96     INKI - Nat. Rev. ACX_A       97     INKI - Nat. Rev. ACX_A       98     INKI - Nat. Rev. ACX_A       99     INKI - Nat. Rev. ACX_A       90     INKI - Nat. Rev. ACX_A       91     INKI - Nat. Rev. ACX_A       92     INKI - Nat. Rev. ACX_A       93     INKI - Nat. Rev. ACX_A       94     INKI - Nat. Rev. ACX_A       95     INKI - Nat. Rev. ACX_A       96     INKI - Nat. Rev. ACX_A       97     INKI - Nat. Rev. ACX_A       98     INKI - Nat. Rev. ACX_A       99     INKI - Nat. Rev. ACX_A       90     INKI - Nat. Rev. ACX_A <td></td> <td></td> <td>76.707.466.240</td> <td>65 : Nat: Req: RdA</td> <td>Addr: 0x00000 Len: 0</td> <td></td> <td></td> <td></td>			76.707.466.240	65 : Nat: Req: RdA	Addr: 0x00000 Len: 0			
1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1 <td>76/07/56/400     Infr. Thirt. Reg. FAMAde Buddor Lon. 6       76/07/56/56/500     Infr. Thirt. Reg. ACK_A</td> <td></td> <td></td> <td>76.707:539:190</td> <td>66 Nat Res ACK</td> <td><u>(</u>A</td> <td></td> <td></td> <td></td>	76/07/56/400     Infr. Thirt. Reg. FAMAde Buddor Lon. 6       76/07/56/56/500     Infr. Thirt. Reg. ACK_A			76.707:539:190	66 Nat Res ACK	<u>(</u> A			
				76.707:587:480	67 Nat Reg RdA	Addr: 0x00021 Len: 0			
90 90 90 90 90 90 90 90 90 90				76 708 060 050	oo . Nat Kes. ACK				
M 60 30 00 00 00 00 00 00 00 00 00 00 00 00				9.0					
				83					
A 100 00 -10 -10 -10 -10 -10 -10 -	A         13           00         00           -10         50           50         33           17         17           00         -10           60         -10			22					
40 -10 50 50 50 50 50 17 17 10 10 10 10 10 10 10 10 10 10	60         63           50         50           50         10           50         10           50         10           60         10			30					
W         00           50         50           State         50           Vision         10           State         10           State         10	4 00 -19 59 50 50 50 50 50 50 50 50 50 50			5 8					
-16 50 50 17 17 17 10 10 10 10 10 10 10 10 10 10	-18 50 50 50 50 50 50 50 50 50 50 50 50 50			0.0					
5 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	50 50 50 50 50 50 50 50 50 50			-1.0					
S 133 1000 LDC 107	Image: Second			5.0					
				83 33					
	12 17 00 00 00 00 00 00 00 00 00 00 00 00 00								
	2 00 -10 60			8					
				11-00					
	60			00-117 17					
-13	0.9			0.0 0.1 0.0					
				00011100 1.7 1.9					
	- <u>53 a</u>			000+12004 -1.0 6.0					

FIGURE 4.1: INITIAL DISPLAY OF DP-AUX TEST EXECUTION ON RESULTS SCREEN

2. More details on the DP-AUX test protocol and Pass/Fail descriptions can be seen by expanding the test results drop down as shown in Figure 4.2 example.



Test Results	1	D D D D D D D D D D D D D D D D D D D
Start Execution	TimeStamp 75.7193357/10	Description
	76.719:753:660	#113 ::12C: Req: WrAddr: 0x00050 Len: 0 MOT: 1
🥑 0/0 🛛 🕲 1/0 💭 0/0 🔶 0/0	76 719 833 540	#114 ::120: Res: ACK
	76.700-004-040	#115 -: 12C: Reg: RdAddr: 0x00050 Leg: 0 MOT
✓ ■ Decode	76.720:221:040	
<ul> <li>DP Aux Test Result</li> </ul>	76.720:285:460	#10::I22; R65; AUA_
<ul> <li>Sequence#1: Set Lane count: 4 Bandwidth: 2.7G</li> </ul>	76.720:688:450	#117 ::I2C: Req: RdAddr: 0x00050 Len: 15 MOT: 1
Protocol: #0 - 199	76.720:766:350	#118 ::I2C: Res: ACK_I
✓ ■ Read Capabilities	76.721:291:930	#119 ::I2C: Req: RdAddr: 0x00050 Len: 15 MOT: 1
MinRev: 1	76 721-368-930	#120 ::120; Res: ACK
MaxRev: 1	76.721.805.440	#121 ::12C: Reg: RdAddr: 0x00050 Len: 15 MOT: 1
LR: 2.7G	76.721.695.410	#102:1207 Res ACK
LC: 4	76.721:972:460	
Protocol: #55 - 197	76.722:498:890	#123 ::I2C: Req: RdAddr: 0x00050 Len: 15 MOT: 1
Phase 1: IPS1-Clock Recovery CP-1((0)(1)(2)(2)) CP-0()	9.0	····
Protocol: #185 - 193	3.5	
Voltage Swing	<u>6.0</u>	
Try: VSwing:L0. PreEm:L0	88	
Try: VSwing:L1 , PreEm:L0		
Try: VSwing:L1, PreEm:L0		
Phase2: TPS2-Channel EQ/ Symbol Lock/ Interlane Align Done	-1.0	
Protocol: #195 - 197	5.0	
Clock Recovery	25	
Channel Equalization		
Symbol lock	<b>Ŏ</b> Ŏ	
Interlane Align		
PD alternate mode transaction		
	-1.0	
	6.0	
	25	Pagh- 4060
	0.4 VX 4.0	
	o o o o o o o o o o o o o o o o o o o	
	2.0	
	-1.0	

FIGURE 4.2: VIEWING MORE DETAILS ON DP-AUX TEST RESULTS

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