Granite River Labs Addendum

For Hardware Setup and USB Type-C High-Speed Functional Test Methods with GRL-USB-PD-FCB Type-C Functional Compliance Board and GRL USB Type-C[®] Power Delivery Tester and Analyzer (GRL-USB-PD-C2)



This material is provided as a reference to set up the hardware and perform USB Type-C High-Speed Functional compliance testing using the Granite River Labs Type-C Functional Compliance Board (GRL-USB-PD-FCB) and GRL-USB-PD-C2 test controller as main equipment.

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

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1 Scope of this Addendum

This Addendum serves as the supplementary documentation to connect the GRL-USB-PD-FCB Type-C Functional Compliance Board to the GRL-USB-PD-C2 USB Type-C Test Controller and unit-under-test (UUT) for USB Type-C High-Speed Functional compliance testing. This will be followed by Methods of Implementation (MOI) procedures to perform both manual and automated testing using the GRL-USB-PD-C2 Browser application and test setups.

Below describes the GRL-USB-PD-FCB Type-C Functional Compliance Board, which comprises the following test fixture, boards and cable:



• **GRL-HS-EXT Fixture** – Extension fixture for GRL-USB-PD-C2 test controller, used to control VBUS and CC lines between connected devices without interfering the high-speed lines between Type-C input/output connectors.



• **GRL-C2-Functional-BRD** – Functional board for GRL-USB-PD-C2 test controller, used to support the latest CTS functional requirements.



• **GRL-C2-IO-EXT6** – Extension board for GRL-USB-PD-C2 test controller, used to provide signal triggering for GRL-C2-Functional-BRD functional board.



• **EXT6-IO-Cable** – Input/output test cable, used for connecting GRL-C2-IO-EXT6 extension board with GRL-C2-Functional-BRD functional board.

2 Test/Equipment Requirements

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

- GRL-USB-PD-FCB Type-C Functional Compliance Board package (GRL-HS-EXT test fixture, GRL-C2-Functional-BRD functional board, GRL-C2-IO-EXT6 extension board and EXT6-IO-Cable test cable)
- GRL-USB-PD-C2 USB Type-C test controller
- 2 x GRL Special (GRL-SPL) Type-C VCONN passthrough test cables (GRL-USB-PD-STC) [Note: GRL mandates using 3 x GRL-SPL cables for setup of UUT without captive cable.]
- Golden Device with USB Type-C Power Delivery Data port (computer or phone, USB-IF compliant) [Note: GRL recommends using the Google Pixel 3 phone as a Golden Device.]
- CV tool software (USB Gen3) installed and run on a Host laptop PC. [Note: This software can be downloaded from USB-IF website.]
- GRL USB Viewer Android mobile application installed and run on the Golden Device. [Note: This application can be downloaded from Google Play Store.]

3 Test Modes

This section describes how to set up the **Informational** test mode (using the UUT Type selection and querying the Capabilities of the UUT) or the **Compliance** test mode (using a VIF File) on the GRL-USB-PD-C2 Browser App for USB Type-C High-Speed Functional compliance testing.

- 1. Open the GRL-USB-PD-C2 Browser App and connect to the GRL-USB-PD-C2 test controller. For details on using the Browser App, refer to the GRL-USB-PD-C2 Browser App user documentation in <u>http://graniteriverlabs.com/download-center/</u>.
- 2. Go to the "Product Capability" screen and enter the Project Name of the current test session.
- 3. If a VIF File is not provided or available, select the Informational (No VIF) test mode.
- 4. If a VIF File is provided, select the Compliance test mode.

[Note: More details on these test modes are provided in the Product Capability section in the GRL-USB-PD-C2 Browser App user documentation.]

3.1 Compliance Test Mode Configuration

The Compliance test mode is used for test certification run. In this mode, a VIF file is required to ensure proper execution for all test cases, which otherwise most test runs may render incomplete without a VIF file.

1. Select the **Compliance** Test Mode radio button as shown in Figure 3.1 below.

Connection Setup	Project Name Select Test Mode	Compliance Informational (No VIF)
Product	Load VIF	VIF Data Operation Load XML VIF File
Capability		Port 1
Test Config	Cable Selection	GRL-SPL Test Cable 1

FIGURE 3.1: SELECTING COMPLIANCE TEST MODE

- 2. Load the VIF file of the UUT by selecting the Load XML VIF File button.
- 3. Select the type of Cable that connects the UUT to the specific USB Port on the GRL-USB-PD-C2 Test Controller from the **Cable Selection** drop-down menu.
- 4. Go to the "Test Config" screen and select the "USB-C Functional Tests" radio button to access the functional compliance tests. Select the checkbox(s) of the test cases to be run.
- 5. The test cases have additional inputs that can be configured as follows (Figure 3.2):

USB-C Functional Test Configuration		
	Enable USB Data Validation	
	Automate USB Data Validation	
Device URL		
Number of USB Type-C ports	0	
Number of USB Type-B/Micro-B receptacle or Type- A plug	0	
	✓ Is connected Hub is embedded	
	✓ Is Battery Connected to DUT	

FIGURE 3.2: USB-C FUNCTIONAL TESTS CONFIGURATION (COMPLIANCE TEST MODE)

- Enable data validation at high USB speeds through automation.
- Enter the UUT URL address.
- Enter the number of USB Type-C ports on the UUT.

- Enter the number of USB Type-B/Micro-B or Type-A ports on the UUT (if available).
- Select if the UUT is an embedded USB hub.
- Select if the UUT is connected to a battery.

[Note: The "Enable USB Data Validation" checkbox is selected by default which will be updated with the information from the loaded VIF file.]

6. Make sure to select <u>Setup Image</u> to verify that the equipment connection has been set up correctly before starting test execution.

3.2 Informational Test Mode Configuration

The Informational test mode is used when a VIF file is not available. In this mode, multiple options can be configured to execute tests without a VIF file by selecting the UUT type, reading the UUT capabilities and generating a VIF file from the configuration.

1. Select the Informational (No VIF) Test Mode radio button as shown in Figure 3.3 below.

	Project Name	
Setup	Select Test Mode	○ Compliance
		VIF Data Operation
Product Capability	Load VIF	Load XML VIF File
		Create New Clear VIF Data
Test Config		Generate VIF(VIF Data) Edit VIF Off
۵ <u>ک</u>		Port 1
Results	DUT Type	Consumer Only
Ē	Cable Selection	Captive Cable
Report		Get Device Clear Device Data
<u></u>		Port 2
Options	DUT Type	Provider Only
?	Cable Selection	GRL-SPL Test Cable 1

FIGURE 3.3: SELECTING INFORMATIONAL TEST MODE

- 2. Select the **DUT Type** drop-down menu to select the UUT type for both Port 1 and Port 2.
- 3. Select the type of Cable that connects the UUT to the specific USB Port on the GRL-USB-PD-C2 Test Controller from the **Cable Selection** drop-down menu.
- 4. Click on the **Get Device Data** button to read the UUT capabilities from the UUT connected to each respective GRL-USB-PD-C2 Test Controller port.

- 5. If required, click on the **Create New VIF** button to create a new VIF File from the configuration. The current configuration can also be saved to a VIF data file by clicking on the **Generate VIF (VIF Data)** button.
- 6. Once the UUT has been defined as above, go to the "Test Config" screen and select the "USB-C Functional Tests" radio button to access the functional compliance tests. Select the checkbox(s) of the test cases to be run.
- 7. The test cases have additional inputs that can be configured as follows (Figure 3.4):

USB-C Functional Test Configuration				
Enable USB Data Validation				
	Automate USB Data Validation			
Device URL	•			
Number of USB Type-C ports	0			
Number of USB Type-B/Micro-B receptacle or Type- A plug	0			
	☐ Is connected Hub is embedded			
	Is Battery Connected to DUT			

FIGURE 3.4: USB-C FUNCTIONAL TESTS CONFIGURATION (INFORMATIONAL TEST MODE)

- Enable manual data validation at high USB speeds.
- Enable data validation at high USB speeds through automation.
- Enter the UUT URL address.
- Enter the number of USB Type-C ports on the UUT.
- Enter the number of USB Type-B/Micro-B or Type-A ports on the UUT (if available).
- Select if the UUT is an embedded USB hub.
- Select if the UUT is connected to a battery.
- 8. Make sure to select <u>Setup Image</u> to verify that the equipment connection has been set up correctly before starting test execution.

4 USB Type-C High-Speed Functional Test Setup

This section describes the connection diagrams and procedures to set up the equipment and fixture for USB Type-C High-Speed Functional compliance testing. Below are the different types of test setups:

- General test setup Applicable for all Dual Role Powered (DRP), Provider and Consumer UUT's
- Voltage Regression test setup *Applicable only for DRP UUT's*
- USB Data Validation test setup *Applicable only when High-Speed mode is enabled*

Make sure to follow all the steps as described below before testing the UUT's using these test setups.

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

4.1 General Test Setup

4.1.1 For Source/Sink/DRP Receptacle UUT Not Capable of USB Communication

Connect the UUT directly to Port 1 of the GRL-USB-PD-C2 test controller using the GRL-SPL cable, as shown in Figure 4.1 below.



 $\label{eq:Figure 4.1: General Test Connection Setup-For Source/Sink/DRP Receptacle UUT Not Capable of USB Communication$

4.1.2 For Source/Sink/DRP UUT with Captive Cable Not Capable of USB Communication

Connect the UUT directly to Port 1 of the GRL-USB-PD-C2 test controller using a captive cable, as shown in Figure 4.2 below.

POWER			GRL GRANITE	River Labs
USB Type-C [®] Power Delivery Tester CPU-USB-FD-C2	Port 1	Port 2	Extension	There
(aptive ca	ble	

 $\label{eq:source} Figure \ 4.2: \ General \ Test \ Connection \ Setup - For \ Source/Sink/DRP \ UUT \ with \ Captive \ Cable \ Not \ Capable \ of \ USB \ Communication$

4.2 Voltage Regression Test Setup

The Voltage Regression test setup is applicable for the following test cases:

- TD 4.5.4 DRP Connect DRP Test
- TD 4.6.3 Try.SRC DRP Connect Try.SRC DRP Test
- TD 4.7.2 Try. SNK DRP Connect DRP Test

Figure 4.3 below shows the connection setup diagram for the following steps.

- 1. Connect the plug side (marked as "*CN1_TO_port1*") of the GRL-C2-Functional-BRD to Port 1 of the GRL-USB-PD-C2 test controller. Connect the UUT (marked as "*DUT*") to the Receptacle port of the GRL-C2-Functional-BRD.
- 2. Connect the GRL-C2-IO-EXT6 to the Extension port of the GRL-USB-PD-C2 test controller.
- 3. Connect both the GRL-C2-Functional-BRD and GRL-C2-IO-EXT6 with the EXT6-IO-Cable.



FIGURE 4.3: VOLTAGE REGRESSION TEST CONNECTION SETUP

4.3 USB Data Validation Test Setup

Figure 4.4 below shows an example hardware connection setup for USB data validation test.

Note: Make sure to place the GRL logo on every GRL-SPL cable in the upward position to maintain the same cable orientation.

- 1. Connect Port1 and Port2 of the GRL-HS-EXT fixture to Port 1 and Port 2 of the GRL-USB-PD-C2 test controller respectively using the GRL-SPL cable.
- 2. Connect the golden device to the plug side of the GRL-HS-EXT fixture.
- 3. Connect the UUT (if without captive cable) to the Receptacle port of the GRL-HS-EXT fixture using the GRL-SPL cable. If the UUT comes with captive cable, connect the UUT directly to the receptacle port of the GRL-HS-EXT fixture.



FIGURE 4.4: USB DATA VALIDATION TEST CONNECTION SETUP EXAMPLE

4.4 USB Data Validation & Voltage Regression Test Setup

Figure 4.5 below shows an example hardware connection setup for USB data validation & voltage regression test.

Note: Make sure to place the GRL logo on every GRL-SPL cable in the upward position to maintain the same cable orientation.

- 1. Connect the plug side (marked as "*CN1_TO_port1*") of the GRL-C2-Functional-BRD to Port 1 of the GRL-USB-PD-C2 test controller. Connect Port1 of the GRL-HS-EXT fixture to the Receptacle port of the GRL-C2-Functional-BRD.
- 2. Connect the GRL-C2-IO-EXT6 to the Extension port of the GRL-USB-PD-C2 test controller.
- 3. Connect both the GRL-C2-Functional-BRD and GRL-C2-IO-EXT6 with the EXT6-IO-Cable.
- 4. Connect Port2 of the GRL-HS-EXT fixture to Port 2 of the GRL-USB-PD-C2 test controller using the GRL-SPL cable.
- 5. Connect the golden device to the plug side of the GRL-HS-EXT fixture.
- 6. Connect the UUT (if without captive cable) to the Receptacle port of the GRL-HS-EXT fixture using the GRL-SPL cable. If the UUT comes with captive cable, connect the UUT directly to the receptacle port of the GRL-HS-EXT fixture.



FIGURE 4.5: USB DATA VALIDATION & VOLTAGE REGRESSION TEST CONNECTION SETUP EXAMPLE

5 USB Type-C High-Speed Functional Test Procedure

This section describes how to perform USB Type-C High-Speed Functional compliance testing based on the latest revision of the ver0.87 specification. For detailed test information, please refer to the specification document.

The following test methods are used to perform the USB Type-C High-Speed Functional compliance tests:

- USB Type-C functional test validation without USB data support
- Manual & automated USB 2.0/3.1 data validation.

5.1 USB Type-C Functional Test Validation Without USB Data Support

The following procedure explains how to perform functional compliance testing only by using USB Power Delivery negotiation without USB data support. All functional compliance tests are applicable for all types of DRP, Provider and Consumer only UUT's.

- 1. Connect the equipment for General Test setup as shown in Figure 4.1 or Figure 4.2 whichever applies.
- 2. Open the GRL-USB-PD-C2 Browser App and connect to the GRL-USB-PD-C2 test controller. For details on using the Browser App, refer to the GRL-USB-PD-C2 Browser App user documentation in http://graniteriverlabs.com/download-center/.
- 3. Go to the "Product Capability" screen and load the VIF file of the UUT. [Note: A VIF file is required to ensure proper execution for all test cases, which otherwise most test runs may render incomplete without a VIF file.]
- 4. After loading the VIF file, go to the "Test Config" screen and select the "USB-C Functional Tests" radio button (Figure 5.1 below) to access the functional compliance tests. Select the checkbox(s) of the test cases to be run as shown in below example (Figure 5.1).



FIGURE 5.1: ACCESSING & SELECTING FUNCTIONAL COMPLIANCE TESTS WITHOUT USB DATA SUPPORT

Note: In the **Compliance** Test Mode, the "**Enable USB Data Validation**" checkbox on the right pane (USB-C Functional Test Configuration) will be disabled in the Browser App interface if the UUT is not capable of supporting USB Host or Device. To enable this checkbox, select the **Informational** Test Mode (figure below).

USB-C Functional Test Configuration		
Enable USB Data Validation		
	Automate USB Data Validation	

5. After selecting the test cases, select the **Start Execution** button (Figure 5.2 below) to begin execution for the selected test cases.



FIGURE 5.2: SELECTING START EXECUTION BUTTON FOR FUNCTIONAL COMPLIANCE TEST CASES WITHOUT USB DATA SUPPORT

6. As tests are running, the "Results" screen will display the progress and status of the test runs along with the PDO communications exchange protocol and live signal trace plot as shown in Figure 5.3 below.



FIGURE 5.3: RUNNING FUNCTIONAL COMPLIANCE TEST CASES WITHOUT USB DATA SUPPORT

7. To stop the test run while in progress, select the **Stop Execution** button (Figure 5.4 below) at the top of the Results screen.



FIGURE 5.4: SELECTING STOP EXECUTION BUTTON FOR FUNCTIONAL COMPLIANCE TEST CASES WITHOUT USB DATA SUPPORT

To jump to the current running test case, click on the "Scroll To Current Test Result" checkbox (Figure 5.5 below) above the Stop Execution button.



FIGURE 5.5: SELECTING SCROLL TO CURRENT TEST RESULTS CHECKBOX FOR FUNCTIONAL COMPLIANCE TEST CASES WITHOUT USB DATA SUPPORT

8. After all test runs have completed, go to the "Report" screen to view or download the full report of the test results (Figure 5.6 below).

Connection	View Report Download Current HTML Report Download Current DUT Report Data Report Data Management Test Reports Location C:/GRL!USBPD-C2-Browser-App\ReportTempReport C:/GRL!USBPD-C2-Browser-App\ReportTempReport
Setup Product Capability	GRANITE RIVER LABS
Test Config	Test Summary - Overall
	Total PASS FAIL PASS Rate(%) INCOMPLETE NA WARNING NOT_SELECTED 60 12 0 100% 0 48 0 0
Results	Test Summary - All MOI
	MOI Name Total PASS FAIL INCOMPLETE NOT_SELECTED OTHERS
=×	USB-C Functional Tests 60 12 0 0 0 48
Report	USB-C Functional Tests- Result Summary
<u> </u>	All the test results in this report are Informational only cannot be considered for certification SI No Test ID Test Name Test Name Test Result
Options	1 TD.4.11.2 TD.4.11.2 Sink Dead Battery Test PASS
	2 TD.4.1.1 TD.4.1.1 Initial Voltage Test PASS
0	3 TD.4.2.1 <u>TD.4.2.1 Source Connect Sink Test</u> PASS
$\mathbf{\Theta}$	4 TD.4.2.2 TD.4.2.2 Source Connect SNKAS Test PASS
Help	5 TD.4.2.3 <u>TD.4.2.3 Source Connect DRP</u> PASS

FIGURE 5.6: ACCESSING TEST REPORTS FOR FUNCTIONAL COMPLIANCE TEST CASES WITHOUT USB DATA SUPPORT

For more details on managing test reports, refer to the "Test Report View" section in the GRL-USB-PD-C2 Browser App user documentation.

5.2 USB 2.0/3.1 Data Validation

The following procedure explains how to perform functional compliance testing with USB data test validation. All functional compliance tests are applicable for all types of DRP and Consumer only UUT's if *USB_Comms_Capable* is set to "YES" in the VIF (Figure 5.7 below).

USB_Comms_Capable	YES •	

 $\label{eq:source} Figure 5.7: Enable USB_Comms_Capable for Functional Compliance Tests With USB \\ Data Support$

- 1. Connect the equipment for USB Data Validation Test setup as shown in Figure 4.4.
- 2. Open the GRL-USB-PD-C2 Browser App and connect to the GRL-USB-PD-C2 test controller. For details on using the Browser App, refer to the GRL-USB-PD-C2 Browser App user documentation in <u>http://graniteriverlabs.com/download-center/</u>.
- 3. Go to the "Product Capability" screen and load the VIF file of the UUT (Figure 5.8). [Note: A VIF file is required to ensure proper execution for all test cases, which otherwise most test runs may render incomplete without a VIF file.]

Connection Setup	Project Name Select Test Mode	 Compliance 	O Informational (No VIF)
		VIF Data Ope	ration
Product	Load VIF	Loa	ad XML VIF File
Capability		Port 1	
	Cable Selection	GRL-SI	PL Test Cable 1
Test Config		USB-IF VIF Gene	erator Download Link
(A)			
Results			

FIGURE 5.8: LOAD VIF FILE IN COMPLIANCE TEST MODE FOR FUNCTIONAL COMPLIANCE TESTS WITH USB DATA SUPPORT

4. After loading the VIF file, go to the "Test Config" screen and select the "USB-C Functional Tests" radio button (as shown in Figure 5.9 below) to access the functional compliance tests.

Connection	Test Selection			
Setup	Filter Selection 🥑 🔕 🕒 🔸 🚡			
Product	Start Execution			
Capability	Q Search			
Test Config	All Supported Certifications			
Ð	 			
	 ■ USB-C Functional Tests ■ Source Power Tests ■ PD Merged Tests (Beta) 			
Report	 ■ Quick Charger 3.0 Tests ■ Quick Charge 4 Tests ■ Thunderbolt Power Tests 			
Options	 DisplayPort Alternate Mode Tests BC1.2 DCP Sink Tests 			



FIGURE 5.9: ACCESSING FUNCTIONAL COMPLIANCE TESTS WITH USB DATA SUPPORT

5. After selecting the test cases, select the **Start Execution** button (Figure 5.10 below) to begin execution for the selected test cases.

	Test Selection
Setup	Filter Selection 🥑 🔕 🖨 🔶 🌄
Product Capability	C Start Execution
Test Config	All Supported Certifications

FIGURE 5.10: SELECTING START EXECUTION BUTTON FOR FUNCTIONAL COMPLIANCE TEST CASES WITH USB DATA SUPPORT

Tests should be executed in the **Compliance** test mode only, where the USB data validation will get updated automatically based on the VIF. Note: USB Data Validation options will only be available for the UUT with USB data support, otherwise the options will be disabled as shown in Figure 5.11 below.

USB-C Functional Test Configuration	USB-C Functional Test Configuration
Enable USB Data Validation	Enable USB Data Validation
Automate USB Data Validation <u>Setup Image</u>	Automate USB Data Validation

USB Data Validation **enabled** for UUT **with** USB data support

USB Data Validation **disabled** for UUT **without** USB data support

FIGURE 5.11: USB DATA VALIDATION OPTIONS FOR FUNCTIONAL COMPLIANCE TEST CASES WITH USB DATA SUPPORT

Functional compliance testing with USB data validation can be performed through the following test methods:

- Manual USB 2.0/3.1 data validation [Note: This will require the user to check enumeration manually.]
- Automated USB 2.0/3.1 data validation [Note: This is only applicable for the 4.3.2, 4.3.3, 4.3.4, 4.10.1 and 4.10.2 MOI test cases.]

These test methods will be described in the following sections of this document.

5.2.1 Manual Data Validation (For DFP, UFP and DRP UUT's)

1. After selecting the "USB-C Functional Tests" test cases to be run (see Figure 5.9), in the USB-C Functional Test Configuration pane by default the "Enable USB Data Validation" checkbox should be enabled to run the USB Type-C High-Speed Functional tests (Figure 5.12 below). *Note: Do not enable the "Automate USB Data Validation" checkbox*.

USB-C Functional Test Configuration			
	Enable USB Data Validation		
	Automate USB Data Validation <u>Setup Image</u>		

FIGURE 5.12: USB DATA VALIDATION ENABLED FOR HIGH-SPEED FUNCTIONAL TESTS

- 2. Select the Start Execution button to begin execution for the selected test cases.
- 3. As tests are running, the "Results" screen will display the progress and status of the test runs along with the PDO communications exchange protocol and live signal trace plot.
- 4. To stop the test run while in progress, select the **Stop Execution** button at the top of the Results screen.
- 5. As tests are running, the following screen will appear (Figure 5.13) to check for Enumeration status of the golden device.

GRANITE RIVE	R LABS		TD.4.6	USB-C I 5.5 DRP Cor Enume	Functional Test nnect Try SRC DRP Test eration status	Set App Mode : CTS API
Product Capability	Stop Execution	1:07 ←	USB Preferences	० ♥₽ Q (0)	USB Status USB Status Number of devices found : 1 Connection Status: Success /Abulanakit/1922 INF URB WIP	1A; MaxCurrent = 0.1A
Test Config Results		0 0 0 0	This device ust Use FOR File transfer / Androld Auto USB tethering MIDI DTD		72:5123 to acquire remotely	R_State
Report		0	No data transfer Charge connected device Charge profile the second device Verify enumeration Preferences	• status in Golde	en Device using GRL USB Viewer application or USB	
Help		1	Click Yes if the enur	meration is suc	ccess, else Click No Yes No	 22.40 25.60 28.80 32.00

FIGURE 5.13: VERIFY ENUMERATION STATUS OF GOLDEN DEVICE #1

- 6. If the UUT is a Source device, the enumeration needs to be validated in the UUT's Device Manager, and if the UUT is a Sink device the enumeration needs to be validated in the golden device. If so, click "Yes" to proceed or otherwise click "No".
- If the golden device is enumerating correctly, the next following screen will appear (Figure 5.14) to verify if the enumeration has been ceased. If so, click "Yes" to proceed or otherwise click "No".

GRL GRANITE RIVE	r Labs	TD.4.5.5	USB-C Functional Test DRP Connect Try SRC DRP Test	Set App Mode : CTS API
Connection Setup	Stop Execution	12-30	Enumeration status	
Product Capability	♥ 0/1 ♥ 0/1 ♥ 0/1 ↓ ♥ USB-C Functional Tests UTD.4.5.5 DRP Connect Try Si	USB Preferences USB USB USB USB USB USB USB USB Commented derives	USB Status Number of devices found::0 Connection Status: USB device is not detected acrues zero Please connect via browser to http://192.168.43	State_Transition:FSM_State_Attached_SNK ch: Execution_State:Test_Exe_To_Hit_Val_Cease
Test Config		This device vee use ron	.72:5123 to acquire remotely	Detected_Disabled:Rp detected - CC1 FP; _State_Transition:FSM_State_Unattached_S
Results		File transfer / Android Auto USB tethering MID1		
Report		PTP No data transfer Charge connected device	•	
Options		Verify enumeration cea USB Preferences Click Yes if the enumer	ase status in Golden Device using GRL USB Viewer application or ration is ceased, else Click No	
Help	E1	Time Left(sec):393	Yes No	179.90 205.60 231.30 257.00

FIGURE 5.14: VERIFY ENUMERATION STATUS OF GOLDEN DEVICE #2

5.2.2 Automated Data Validation (For UFP UUT's)

[Note: Automation is enabled for Test Case 4.3.2, 4.3.3, 4.3.4, 4.10.1 and 4.10.2 only. The rest of the available test cases would run as manual testing.]

To perform automated data validation, the user needs to download and install the "GRL USB Viewer" application from the Google Play Store (Figure 5.15 below).



FIGURE 5.15: DOWNLOAD AND INSTALL GRL USB VIEWER APP

- 1. Before starting the validation, first make sure that the control PC and golden device are connected to the same network. If connected to a different network or the GRL-USB-PD-C2 Browser App is unable to communicate with the golden device, the user is advised to first disconnect and then re-connect the control PC and golden device to the same network.
- 2. After selecting the "USB-C Functional Tests" test cases to be run (see Figure 5.9), in the USB-C Functional Test Configuration pane select the "Automate USB Data Validation"

checkbox (Figure 5.16 below) to enable automation for the USB Type-C High-Speed Functional tests.



FIGURE 5.16: ENABLE AUTOMATION FOR USB DATA VALIDATION

- 3. The user will then need to verify the equipment setup that is required to perform the data validation by clicking on Setup Image.
- 4. On the GRL USB Viewer application, take note of the URL as shown in the below example (Figure 5.17).

	000 010100	
Number	of devices found : 0	
Connect	tion Status: USB device is not detec	ted
	GET USB INFO	
Please o 108:512	connect via browser to http://192.16 23 to acquire remotely	8.0

FIGURE 5.17: GRL USB VIEWER APPLICATION URL EXAMPLE

5. Enter the URL (as shown on the GRL USB Viewer application) in to the GRL-USB-PD-C2 Browser App as indicated in Figure 5.18 below.

USB-C Functional Test Configuration			
	Enable USB Data Validation		
	Automate USB Data Validation		
	Setup Image		
Device URL	http://192.168.0.108:5123		

FIGURE 5.18: AUTOMATION SETUP CONFIGURATION

- 6. Once all configuration has been made as indicated in Figure 5.18 above, select the **Start Execution** button to begin execution for the selected test cases.
- 7. As tests are running, the "Results" screen will display the progress and status of the test runs along with the PDO communications exchange protocol and live signal trace plot.
- 8. To stop the test run while in progress, select the **Stop Execution** button at the top of the Results screen.

9. As tests are running, enumeration checks will occur automatically. (*Note this only applies for specific test cases*– *Test Case 4.3.1, 4.3.2, 4.3.3, 4.3.4, 4.10.1 & 4.10.2.*) Other test cases will need to be validated manually by the user as described in Section 5.2.1.

6 Test Case Prompts/Messages

When running functional compliance tests, certain test cases will require user input to proceed further. User input will be prompted through pop-up messages for the following test cases:

6.1 Test Case TD.4.1.1 Initial Voltage Test

If the "Enable USB Data Validation" checkbox is selected, the pop-up message and setup diagram (Figure 6.1 below) for this test case requires the user to connect the UUT directly to Port 1 of the GRL-USB-PD-C2 test controller without any fixture or extension board attached. After the test case has been executed, another pop-up message/setup diagram will appear (Figure 6.2 below) which requires the user to set up the hardware connection as displayed. Select "OK" to continue when confirmed for each pop up.



FIGURE 6.1: USER PROMPTS TO CONNECT UUT TO GRL-USB-PD-C2 TEST CONTROLLER



FIGURE 6.2: USER PROMPT TO CONNECT UUT TO FIXTURE OR BOARD IF REQUIRED

6.2 Test Case TD.4.1.2 Unpowered CC Voltage Test

While test is running, the user will be required to remove the UUT power (Figure 6.3 below). After the test run has completed, the user will then need to re-connect power supply to the UUT (Figure 6.4 below).



Figure 6.3: User Prompt to Remove External Power from UUT $% \mathcal{A}$



FIGURE 6.4: USER PROMPT TO RE-CONNECT EXTERNAL POWER TO UUT

6.3 Test Case TD.4.5.4 DRP Connect DRP Test, TD.4.6.3 Try SRC DRP Connect Try SRC DRP Test and TD.4.7.2 Try SNK DRP Connect Try SNK DRP Test

These test cases are categorized under Voltage Regression Tests. The user will need to connect the VBUS Extension board (GRL-C2-Functional-BRD functional board, GRL-C2-IO-EXT6 extension board and EXT6-IO-Cable test cable) based on the Voltage Regression Test setup (as shown in Figure 4.3 or Figure 6.5 below). After the test run has completed, the user will be required to remove only the GRL-C2-Functional-BRD board from the setup and to proceed with the General Test setup (as shown in Figure 4.1 or Figure 4.2) to continue testing (Figure 6.6 below).



FIGURE 6.5: USER PROMPT TO SET UP VBUS EXTENSION BOARD BASED ON VOLTAGE REGRESSION TEST SETUP



FIGURE 6.6: USER PROMPT TO REMOVE VBUS EXTENSION BOARD AND PROCEED WITH GENERAL TEST SETUP

6.4 Test Case TD.4.9.1 Source Suspend Test

After successful enumeration in compliance to CTS requirements, the user will be required to suspend the UUT data link using CV tool on the UUT. A pop-up message will provide instructions to the user to suspend the UUT data link (Figure 6.7 below). When done, select "Yes" to proceed or "No" if otherwise. After the test run has completed, the user will then be required to resume the UUT high-speed link (Figure 6.8 below). Again select "Yes" when done or otherwise select "No".



FIGURE 6.7: USER PROMPT WITH INSTRUCTIONS TO SUSPEND UUT DATA LINK



FIGURE 6.8: USER PROMPT TO RESUME UUT HIGH-SPEED LINK

6.5 Test Case TD.4.11.2 Sink Dead Battery Test

This test case checks if the battery of the UUT is dead or 0% charged. The user will first need to verify if a battery is connected to the UUT at the Test Config screen and make sure to select the checkbox (Figure 6.9 below). If a battery is attached, a pop-up message will request the user to check if a dead battery is connected to the UUT (Figure 6.10 below). Select "Yes" to proceed with the verification test or "No" if otherwise. Once a dead battery has been verified, the user will then be required to remove the dead battery and replace with a charged battery for testing to continue (Figure 6.11 below).

	USB-C Functional Test Configuration	
	Enable USB Data Validation	
	Automate USB Data Validation	
		Setup Image
Device URL		0
	✓ Is Battery Connected to DUT ●	
	<u> </u>	

FIGURE 6.9: VERIFY CHECKBOX IS SELECTED IF BATTERY IS CONNECTED TO UUT



FIGURE 6.10: USER PROMPT TO CHECK IF DEAD BATTERY IS CONNECTED TO UUT



FIGURE 6.11: USER PROMPT TO REMOVE DEAD BATTERY AND RECONNECT CHARGED BATTERY TO UUT

6.6 Test Case TD.4.12.2 Hub Port Type Test

This test case is only applicable when the UUT $Type_C_Port_On_Hub$ is set to "YES" in the VIF. The user will first need to verify if the UUT hub port is embedded at the Test Config screen (Figure 6.12 below). The user is required to enter the number of USB Type-C ports and USB Type-B/Micro-B receptacle or Type-A plug (if applicable) of the UUT hub. If the UUT hub port is embedded, select the corresponding checkbox.

USB-	C Functional Test Configuration
	□ Enable USB Data Validation
	Automate USB Data Validation
	Setup Image
Device URL	
Prerequisite : Please Install (CV tool in DUT
Number of USB Type-C ports	1
Number of USB Type-B/Micro-B receptacle or Type-A plug	1
	✓ Is connected Hub is embedded ()

FIGURE 6.12: VERIFY UUT HUB PORT EMBEDDING BEFORE TESTING

7 CV Tool Usage

This section describes how to use the CV Tool for the following three test cases which require a Host PC with CV tool software.

- TD 4.10.1 Sink Power Sub-States Test
- TD 4.10.2 Sink Power Precedence Test
- TD 4.10.3 Sink Suspend Test

Follow the steps below on using the CV Tool:

1. Open the USB 3 Gen x CV and the "Command Verifier" pop-up message will appear (Figure 7.1 below). Select the required host controller from the list to load the test stack switch and then select "Continue". Wait until the stack switch is loaded. Where necessary the user may also need to reboot the golden device if prompted.

USB 3 Gen X Command Verifier
Select host controller to load Compliance Driver Stack on.
Intel(R) USB 3.1 eXtensible Host Controller - 1.10 (Microsoft) - [PCI bus 0, device 20, function 0] Intel(R) USB 3.1 eXtensible Host Controller - 1.10 (Microsoft) - [PCI bus 45, device 0, function 0]
Continue Exit

FIGURE 7.1: USER PROMPT TO SELECT HOST CONTROLLER IN CV TOOL

- 2. If rebooting the golden device, open the USB 3 Gen x CV again after reboot and repeat step 1.
- 3. When the "USB 3 Gen X Command Verifier" window appears (Figure 7.2 below), perform the following steps for the selected test case:

7.1 TD 4.10.1 Sink Power Sub-States Test CV Tool Procedure

- 1. Refer to Figure 7.2 below on the following:
 - a. In the Select Test Suite field, select "Chapter 9 Tests [USB 2 devices]".
 - b. In the **Select Test Mode** field, select the "Debug" radio button and the "Prompt for Test Parameters" checkbox.
 - c. In the **Select Test** field, select the "TD 9.1: Device Descriptor Test" and "TD 9.2: Configuration Descriptor Test" checkboxes.
 - d. Finally, select the bottom "Yes" button to execute the tests.



Figure 7.2: Select and Execute TD 4.10.1 Tests in CV Tool

2. While test is running, the "USB Command Verifier (xHCI- USB 3)" pop-up message will display a list of FS Devices (Figure 7.3 below). Select the FS Device as supported by the UUT and select "OK".

😴 USB 3 Gen X Command Verifier - Running: Initia	ize Test Suite		>
Select Test Suite Billboard Tests Chapter 9 Tests [USB 3 Gen X Connector Type Tests Current Measurement Test [USB 2 devices] Current Measurement Test [USB 3 Gen X devices] Device Summary HID Tests Link Lever Testing for Gon1 Select Test Mode Compliance Test Debug	ank Area	Test log initialized. Log Level: Normal User Input module initialized Windows 10 Pro (Build 18362.1.amd6 CVApp.exe ver 4.0.0 BaseUtilities.dll ver 4.0.0 GuilHelper.dll ver 4.0.0 GuilHelper.dll ver 4.0.0 TestUtilities.dll ver 4.0.0 TestSuiteEngine.dll ver 4.0.0 xhci_TestServices.dll ver 2.1.16.1 LISBUtilities.dll ver 1.4.5 1	4fre.19h1_release.190318-1202)
Test Passed Test Failed Select Test Right-click of Chapter 9 Tests - USB 2 Chapter 9 Tests For Each Configuration: Default State VTD 9.1: Device Descriptor Test TD 9.2: Configuration Descriptor Test TD 9.3 Interface Association Descriptor Test TD 9.5: Endpoint Descriptor Test TD 9.5: Endpoint Descriptor Test TD 9.3: Ocnfiguration Summary Descriptor TD 9.3: Ocnfiguration Summary Descriptor TD 9.3: Addressed State	USB Command Verifier (: Please select USB 2 Device FS Device (HID) addr=1: FS Device (HID) addr=2: HS Device (UVC) addr=4: FS Device addr=5: VID= FS Device addr=6: VID=	xHCI - USB 3) 20 to test VID=413C, PID=301B VID=056A, PID=51B7 :2CB7, PID=0210 : VID=13D3, PID=56BA 06CB, PID=00BD 8087, PID=0AAA OK	1.16.1 II ver 2.1.16.1 .16.1)x8086, PID=0x9DED (PCI bus 0, device 20,
Optional Test Optional Test	st Test		
Abort Launch Report Viewer	Open Reports Directory		Update Display Exit

Figure 7.3: User Prompt to Select FS Device in CV Tool for TD 4.10.1 Tests

3. In the next pop-up message (Figure 7.4 below), the user will need to enter the appropriate Configuration Index value in hex for Debug mode and then select "DONE".

😴 USB 3 Gen X Command Verifier - Running: TD 9.	1: Device Descriptor Test		—
USB 3 Gen X Command Verifier - Running: TD 9. Select Test Suite Billboard Tests Chapter 9 Tests [USB 3 Gen X devices] Connector Type Tests Current Measurement Test [USB 2 devices] Current Measurement Test [USB 3 Gen X devices] Device Summary HID Tests Link Lawor Testing for Gen1 Select Test Mode Compliance Test Prompt for	1: Device Descriptor Test	Test log initialized. Log Level: Normal User Input module initia Windows 10 Pro (Build 1 CVApp.exe ver 4.0.0 BaseUtilities.dll ver 4.0.0 GuiHelper.dll ver 4.0.0 TestUtilities.dll ver 4.0 TestSuiteEngine.dll ver xhci TestServices.dl ve	Lized 18362.1.amd64fre.19h1_release.190318-1202) 0.0 1 Ver 4.0.00 0 4.0.00 1.16.1 1.16.1
Test Passed Test Failed Select Test Right-click of Chapter 9 Tests - USB 2 Chapter 9 Tests Port P Tests To 9 Tests Port D 9 Tests To 9 1: Device Descriptor Test TD 9 1: Device Descriptor Test TD 9 3: Interface Association Descriptor Test TD 9 3: Interface Association Descriptor Test TD 9 5: Endpoint Descriptor Test TD 9 7: BOS Descriptor Test TD 9 3: Onfiguration Descriptor Test TD 9 1: Device Descriptor Test TD 9 3: Interface Association Descriptor Test TD 9 3: Interface Association Descriptor Test TD 9 3: Onfiguration Summary Descriptor Test TD 9 3: Interface Association Descriptor Test TD 9 3: Interface Association Descriptor Test TD 9 3: Interface Association Descriptor Test TD 9 3: Interface Association Descriptor Test TD 9 3: Interface Association Descriptor Test TD 9 3: Configuration Summary Descriptor TD 9 3: Device Descriptor Test TD 9 3: Device Descriptor Test TD 9 3: Device Descriptor Test TD 9 3: Device Descriptor Test TD 9 3: Device Descriptor Test TD 9 3: Device Descriptor Test TD 9 1: Device Descriptor Test TD 9 3: Device Descriptor Test TD 9 3: Device Descriptor Test TD 9 3: Device Descriptor Test TD	USB Command Verifier (x Debug Mode : Enter Config Configuration Index 0x 0 Test t test v	NUSRI Hilities all ver 1.4.5 (HCI - USB 3) guration Index in hex.	<pre>set.dll ver 2.1.16.1 restrices.dll ver 2.1.16.1 rdll ver 2.1.16.1 st: VID=0x8086, PID=0x9DED (PCI bus 0, device 20, Device (HID) addr=1: VID=413C, PID=301B" ce to test operating at Full Speed. ce: 2.00 rconfigurations: 0.</pre>
Abort Launch Report Viewer	Open Reports Directory		Update Display Exit

FIGURE 7.4: USER PROMPT TO ENTER DEBUG MODE CONFIGURATION INDEX IN CV TOOL FOR TD 4.10.1 TESTS

4. The next pop-up message (Figure 7.4 below) will require the user to enter the number of bytes to be verified in hex for Debug mode and then select "DONE".

USB Co	ommand Verifier (xHCI - USB 3)		
Debug Mode : Enter No. of bytes to check in hex.			
	No. of bytes to check:		
Ox	12		
	DONE		

FIGURE 7.5: USER PROMPT TO ENTER DEBUG MODE NUMBER OF BYTES IN CV TOOL FOR TD 4.10.1 TESTS

5. The test results will be updated in the CV tool once the test execution is completed (Figure 7.6 below).

🛱 USB 3 Gen X Command Verifier		$ \Box$ \rangle	<
Select Test Suite			
Billboard Tests	^	^	
Chapter 9 Tests [USB 2 devices]			
Connector Type Tests			
Current Measurement Test [USB 2 devices]		Now Starting Test: TD 9.2 - Configuration Descriptor Test (Configuration Index	
Current Measurement Test [USB 3 Gen X devices]		0) - default	
Device Summary		Start time: Mar 17, 2021 - 22:38:02	
HID Tests	\sim	Configuration descriptor contains descriptor of type : 0x4 (Interface Descriptor)	
		Configuration descriptor contains descriptor of type : 0x2 I (HID Descriptor)	
Select Test Mode		Configuration descriptor contains descriptor of type : 0x3 (Encipion Descriptor)	
○ Compliance Test	Test Parameters	Configuration descriptor contains descriptor of type : 0x21 (HID Descriptor)	
Debug		Configuration descriptor contains descriptor of type : 0x5 (Endpoint Descriptor)	
U		Configuration descriptor contains descriptor of type : 0x4 (Interface Descriptor)	
		Configuration descriptor contains descriptor of type : 0x21 (HID Descriptor)	
Test Passed Test Failed		Configuration descriptor contains descriptor of type : 0x5 (Endpoint Descriptor)	
Select Test Right-click	n tests for more information	Number of alternate interface descriptors found : 0x0	
Chapter 9 Tests - USB 2		Number of endpoint descriptors found : 0x3	
Chapter 9 Tests	~	Configuration descriptor length : 0x9	
For Each Configuration:		Configuration descriptor type : 0x2	
Default State		Configuration descriptor I otalLength : 0x54	
TD 9.1: Device Descriptor Test		Configuration descriptor ConfigurationValue: 0x1	
TD 9.2: Configuration Descriptor Test		Checking iConfiguration String Descriptor: index = 0x00.	
TD 9.3 Interface Association Descriptor Te	st 🛛	The device omits this string descriptor.	
TD 9.4: Interface Descriptor Test		Configuration descriptor bmAttributes : 0xA0	
TD 9.5: Endpoint Descriptor Test		Device supports remote wake up	
TD 9.7: BOS Descriptor Test		MaxPower = 50 PowerMultiplier = 2	
TD 9.30 Configuration Summary Descripto	lest	Device is BUS POWERED	
Addressed State		bollo is boot offeneb	
TD 9.1: Device Descriptor Test		Stop time: Mar 17, 2021 - 22:38:07	
TD 9.2: Conliguration Descriptor Test	at	Duration: 5 seconds.	
TD 9.4: Interface Descriptor Test	31	Stopping Test [TD 9.2 - Configuration Descriptor Test (Configuration Index 0) -	
TD 9.5: Endpoint Descriptor Test		default: Number of: Eaile (0): Aborte (0): Warnings (0) 1	
TD 9.7: BOS Descriptor Test		Number of. Fails (0), Aborts (0), Warnings (0) j	
TD 9.30 Configuration Summary Descripto	Test	Informed user: run Connector Type Tests on this device.	
Configured State		Informed user: run HID Tests on this device.	
TD 9.1: Device Descriptor Test	\sim	TEST SUITE SUMMARY:	
		[Fails (0); Aborts (0); Warnings (2)]	
		I Passed (2): Failed (0) 1	
Optional Test Description		~ ~	
Run Launch Report Viewer	Open Reports Directory	Update Display Exit	

FIGURE 7.6: TEST RESULTS GENERATION IN CV TOOL FOR TD 4.10.1 TESTS

6. The following pop-up message (Figure 7.7 below) will then appear to ask the user to close the USB 3 Gen X CV application in the golden device.



Figure 7.7: User Prompt to Close USB 3 Gen X CV App in Golden Device

7.2 TD 4.10.2 Sink Power Precedence Test CV Tool Procedure

- 1. When the "USB 3 Gen X Command Verifier" window appears, perform the following steps:
 - a. In the Select Test Suite field, select "Chapter 9 Tests [USB 2 devices]".
 - b. In the **Select Test Mode** field, select the "Debug" radio button and the "Prompt for Test Parameters" checkbox.
 - c. In the Select Test field, select the "TD 9.16: Enumeration Test" checkbox.
 - d. Select the bottom "Run" button to execute the enumeration test.
- 2. While test is running, the "USB Command Verifier (xHCI- USB 3)" pop-up message will display a list of FS Devices (Figure 7.8 below). Select the FS Device as supported by the UUT and select "OK".

😴 USB 3 Gen X Command Verifier - Running: Initialize Test Suite	- 🗆 X
Select Test Suite	
Select Test Suite Bilboard Tests Chapter 9 Tests [USB 3 Gen X devices] Current Measurement Test [USB 2 devices] Current Measurement Test [USB 3 Gen X devices] Device Summary HID Tests Link Lawor Tocting for Con1 Select Test Mode Compliance Test Debug Test Passed Test Falled Select Test Debug Test Passed Test Falled Select Test Debug Test Passed Test Passed Test Falled Select Test Debug To 9.4: Interface Descriptor Test TD 9.5: Endpoint Descriptor Test TD 9.7: BOS Descriptor Test TD 9.13: Set Configuration Test TD 9.13: Set Configuration Test TD 9.13: Set Configuration Summary Descriptor Test TD 9.12: Remote Wakeup Test - Enabled TD 9.12: Remote Wakeup Test - Enabled TD 9.12: LPM L1 Suspend Resume Test For Each Other Speed Configuration: D 9.17: Other Speed Configuration Test - Addressed State TD 9.18: Device Quali	Test log initialized. Log Level: Normal User Input module initialized Windows 10 Pro (Build 18362.1 amd64fre.19h1_release.190318-1202) CVApp.exe ver 4.0.0.0 BaseUtilities dli ver 4.0.0.0 CommandVerifierLog.dli ver 4.0.0.0 GuilHelper.dli ver 4.0.0.0 TestSuiteEngine.dli ver 2.1.16.1 USBUtitities.dli ver 1.4.5.1 StackSwitcher.dli ver 1.4.5.1 StackSwitcher.dli ver 1.4.5.1 VIFReader.dli ver 4.0.0.0 USB2_USBCommandVerifierServices.dli ver 2.1.16.1 USB2_USBCommandVerifierServices.dli ver 2.1.16.1 USB2_USBCommandVerifier.dli ver 2.1.16.1 USB2_USBCommandVerifier (xHCI - USB 3) VIEAected: xHCI Host: VID=0x8086, PID=0x9DED (PCI bus 0, device 20, function 0) USB Command Verifier (xHCI - USB 3) Please select USB 2 Device to test FS Device (HID) addr=1: VID=413C, PID=301B FS Device (HID) addr=2: VID=056A, PID=51B7 HS Device addr=3: VID=2CB7, PID=001 HS Device addr=5: VID=06CB, PID=00B FS Device addr=5: VID=06CB, PID=00BD
- TD 9.4: Other Speed Interface Descriptor Test - Configured State - TD 9.4: Other Speed Interface Descriptor Test - Configured State - TD 9.5: Other Speed Endpoint Descriptor Test - Configured State	ОК
Optional Test Description	
Abort Launch Report Viewer Open Reports Directory	Update Display Exit

FIGURE 7.8: USER PROMPT TO SELECT FS DEVICE IN CV TOOL FOR TD 9.16 ENUMERATION TEST

3. In the next pop-up message (Figure 7.9 below), the user will need to enter the required enumeration loop count for Debug mode and select "DONE" [*Note: 10 is the preferred count*]. The user will also need to update the status in the GRL-USB-PD-C2 Browser application pop-up screen.

USB Command Verifier (xHCI - USB 3)				
Debug Mode : Enter Enumeration Loop Count.				
Enumeration Loop Count:				
150				
DONE				

FIGURE 7.9: USER PROMPT TO ENTER DEBUG MODE ENUMERATION LOOP COUNT IN CV TOOL

4. The test results will be updated in the CV tool once the test execution is completed (Figure 7.10 below).



FIGURE 7.10: TEST RESULTS GENERATION IN CV TOOL FOR TD 9.16 ENUMERATION TEST

5. In the following pop-up message (Figure 7.11 below), select "Yes" if the test passes or "No" if fails. Select "Cancel" if the CV tool is not used to run the enumeration test.



FIGURE 7.11: USER PROMPT TO CONFIRM CTS "9.16 ENUMERATION TEST" STATUS IN CV TOOL

6. The following pop-up message (Figure 7.12 below) will then appear to ask the user to execute CTS "TD 9.13 Set Configuration Test" in the CV Tool for all configuration found during the enumeration test run.



- 7. When the "USB 3 Gen X Command Verifier" window appears, perform the following steps:
 - a. In the Select Test Suite field, select "Chapter 9 Tests [USB 2 devices]".
 - b. In the **Select Test Mode** field, select the "Debug" radio button and the "Prompt for Test Parameters" checkbox.
 - c. In the **Select Test** field, select the "TD 9.13: Set Configuration Test" checkbox.
 - d. Finally, select the bottom "Run" button to execute the Set Configuration test.
- 8. While test is running, the "USB Command Verifier (xHCI- USB 3)" pop-up message will display a list of FS Devices. Select the FS Device as supported by the UUT and select "OK".
- 9. In the next pop-up message, the user will need to enter the appropriate Configuration Index value in hex for Debug mode and then select "DONE". The user will also need to update the status in the GRL-USB-PD-C2 Browser application pop-up screen.
- 10. The test results will be updated in the CV tool once the test execution is completed (Figure 7.13 below).

😴 USB 3 Gen X Command Verifier		- 0	×
Select Test Suite			
Billboard Tests	^	CVApp.exe ver 4.0.0.0	^
Chapter 9 Tests [USB 2 devices]		BaseUtilities.dll ver 4.0.0.0	
Chapter 9 Tests [USB 3 Gen X devices]		CommandVerifierLog.dll ver 4.0.0.0	- N
Connector Type Tests		GuiHelper.dll ver 4.0.0.0	
Current Measurement Test [USB 2 Gen X devices]		TestSuiteEngine dll ver 4 0 0 0	
Device Summary		xhci DevlOCTL.dll ver 2.1.16.1	
HID Tests	<u> </u>	xhci_TestServices.dll ver 2.1.16.1	
Link Lover Testing for Con1	•	USBUtilities.dll ver 1.4.5.1	
Select Test Mode		StackSwitcher.dll ver 1.4.5.1	
○ Compliance Test	t Parameters	xnci_CommandVentierServices.dli Ver 2.1.16.1	
		VIFReduel.ull ver 4.0.0.0 USR2_USRCommandVerifierServices dll ver 2.1.16.1	
Debug		USB2_USBCommandVerifier.dll ver 2.1.16.1	
Test Passed Test Failed		Host 1 selected: xHCI Host: VID=0x8086, PID=0x9DED (PCI bus 0, device 20,	
Salaat Tast Bight aliak on to	cts for more information	Tunction U)	
	sts for more information	Please select USB 2 Device to test	
TD 9.1: Device Descriptor Test	^	USB 2 Device Under Test is operating at Full Speed.	
TD 9.2. Configuration Descriptor Test		Topology: XHCI HC DUT	
TD 9.5 Interface Descriptor Test		USB Version number of device: 2.00	
TD 9.5: Endpoint Descriptor Test		Number of configurations: 1.	
TD 9 7: BOS Descriptor Test		Number of Other Speed configurations: 0.	
TD 9.30 Configuration Summary Descriptor Tes	it 👘		
Configured State			
TD 9.1: Device Descriptor Test		Now Starting Test: TD 9.13 - SetConfiguration Test (Configuration Index 0)	
TD 9.2: Configuration Descriptor Test		Start time: Mar 17, 2021 - 22:54:12	
TD 9.3 Interface Association Descriptor Test		SetConfiguration with configuration value : 0x1	
TD 9.4: Interface Descriptor Test		Unconfigured the device	
TD 9.5: Endpoint Descriptor Test		Seconiguration with configuration value . 0x1	
TD 9.7: BOS Descriptor Test		Stop time: Mar 17, 2021 - 22:54:14	
TD 9.9: Halt Endpoint Test		Duration: 2 seconds.	
TD 9.13: Set Configuration Test		Stopping Test [TD 9.13 - SetConfiguration Test (Configuration Index 0):	
TD 9.30 Configuration Summary Descriptor Test		Number of: Fails (0); Aborts (0); Warnings (0)]	
TD 9.14: Suspend Resume Test		Informed user: run Connector Tune Tests on this device	
TD 9.12. Remote Wakeup Test - Ellabled		Informed user: run HID Tests on this device.	
TD 9.12. LPM 1 Suspend Resume Test		TEST SUITE SUMMARY:	
	¥	[Fails (0); Aborts (0); Warnings (0)]	
		TEST RESULTS:	
		[Passed (1); Failed (0)]	
Optional Test Description			~
) and Descerte Direct		
Launch Report Viewer	ppen Reports Directory	Update Display Exit	

FIGURE 7.13: TEST RESULTS GENERATION IN CV TOOL FOR TD 9.13 SET CONFIGURATION TEST

11. If the test Fails or the user selects "Cancel" in the pop-up message, the user will be required to perform CTS "TD 7.40 Warm Reset" test as prompted by the following pop-up message (Figure 7.14 below) on the GRL-USB-PD-C2 test controller. The user will also need to update the status in the GRL-USB-PD-C2 Browser application pop-up screen.



FIGURE 7.14: USER PROMPT TO EXECUTE CTS "TD 7.40 WARM RESET" IN CV TOOL

12. When the "USB 3 Gen X Command Verifier" window appears, perform the following steps:

- a. In the Select Test Suite field, select "Link Layer Testing for Gen2".
- b. In the **Select Test Mode** field, select the "Debug" radio button and the "Prompt for Test Parameters" checkbox.
- c. In the Select Test field, select the "TD 7.40 Warm Reset" checkbox.
- d. Finally, select the bottom "Run" button to execute the Warm Reset test.
- 13. While test is running, the user will be asked to confirm warm reset to be carried out on the UUT (Figure 7.15 below). Select "OK" to proceed. The user will also need to update the status in the GRL-USB-PD-C2 Browser application pop-up screen.

😴 USB 3 Gen X Command Verifier - Running: TD	7.40 Warm Reset		- 0	\times
Select Test Suite Current Measurement Test [USB 3 Gen X devices] Device Summary HID Tests Link Layer Testing for Gen1 MSC Tests PHDC Tests Link 2 0 Tests PHDC Tests Link 2 0 Tests PHDC Tests UAC 3 0 Tests PHDC T	for Test Parameters	Test log initialized. Log Level: Normal User Input module initialized Windows 10 Pro (Build 18362.1.amd64fre.1 CVApp.exe ver 4.0.0 BaseUtilities dII ver 4.0.0 GommandVerfierLog dII ver 4.0.0 Guil+elper dII ver 4.0.0 TestSuiteEngine.dII ver 4.0.0 thci_DevIOCTL.dII ver 2.1.16.1 xhci_TestServices.dII ver 2.1.16.1	19h1_release.190318-1202)	
Test Passed Test Fellow Select Test Right-dit Link Layer Tests LVS Helpers D 7.06 Data Packet Framing Robustness T TD 7.07 Link RX Header Packet Retramsmiss TD 7.07 Link RX Header Packet Retramsmiss TD 7.10 CREDIT_HP_TIMER Deadline Help TD 7.15 Wrong LGRD_X Sequence Helper TD 7.18 Low Power Initiation for U1 Test TD 7.19 Low Power Initiation for U2 Test TD 7.20 PM_LC_TIMER Deadline Test TD 7.21 PM_LC_TIMER Timeout Test TD 7.31 Hot Reset Failure Test TD 7.34 Exit Compliance Mode Test TD 7.34 Exit Compliance Mode Test TD 7.35 Exit U3 by Reset Test TO 7.35 Exit U3 by Reset Test	USB Command Verifier (xHC Press OK to send Warm Rese	StackSwitcher dliver 1 4 5 1 StackSwitcher dliver 1 4 5 1 Cl - USB 3) t to PUT.	6.1 086, PID=0x9DED (PCI bus 0, device 20,	
Optional Test Description Abort Launch Report Viewe	ar Open Reports Directory		Update Display Exit	

FIGURE 7.15: USER PROMPT TO CONFIRM WARM RESET EXECUTION IN CV TOOL

14. The test results will be updated in the CV tool once the test execution is completed (Figure 7.16 below).

😴 USB 3 Gen X Command Verifier	- 🗆 X
Select Test Suite Current Measurement Test [USB 3 Gen X devices] Device Summary HID Tests Link Layer Testing for Gen1 Ink Layer Testing for Gen2 MSC Tests OTG Tests PHDC Tests Link Cayer Testing for Gen2 MSC Tests OTG Tests PHDC Tests UAC 3.0 Tack Debug Test Failed Select Test Mode Compliance Test Prompt for Test Parameters Debug Test Failed Select Test Right-click on tests for more information Link Layer Tests LVS Helpers TD 7.06 Data Packet Framing Robustness Test TD 7.10 CREDIT_HP_TIMER Timeout Helper TD 7.10 CREDIT_HP_TIMER Timeout Helper TD 7.13 Low Power Initiation for U1 Test TD 7.20 PM_LC_TIMER Timeout Test TD 7.20 PM_LC_TIMER Timeout Test TD 7.20 PM_LC_TIMER Timeout Test TD 7.21 PM_LC_TIMER Timeout Test TD 7.22 PM_LC_TIMER Timeout Test TD 7.31 Hot Reset Failure Test	Test log initialized. Log Levei: Normal User Input module initialized Windows 10 Pro (Build 18362.1.amd64fre.19h1_release.190318-1202) CVApp.exe ver 4.0.00 BaseUtilities dli ver 4.0.00 GuilHelper dli ver 4.0.00 TestSutteEngine dli ver 4.0.00 thic_DevIOCTL.dli ver 2.1.16.1 xhci_TestServices.dli ver 2.1.16.1 VISBUilties dli ver 1.4.5.1 StackSwitcher dli ver 4.0.0 LinkTests dli ver 2.1.16.1 VIFReader.dli ver 4.0.0 LinkTests dli ver 2.1.16.1 Host 1 selected: xHCI Host: VID=0x8086, PID=0x9DED (PCI bus 0, device 20, function 0) LinkTests will run on Host Ports. Setting the parent port of the device to initiate PORT_RESET. TEST SU/TE SU/MARY: <i>[Fails (0); Aborts (0); Warnings (0)]</i> TEST RESUITS: <i>[Passed (1); Failed (0)]</i>
TD 7.18 Low Power Initiation for U1 Test TD 7.19 Low Power Initiation for U2 Test TD 7.20 PM_LC_TIMER Deadline Test TD 7.21 PM_LC_TIMER Timeout Test TD 7.29 Hot Reset Initiation in U0 Test TD 7.31 Hot Reset Failure Test TD 7.34 Exit Compliance Mode Test TD 7.35 Exit U3 by Reset Test TD 7.40 Warm Reset	[Passed (1); Failed (0)]
TD 7.42 Symbol to Block Alignment Helper	
Optional Test Description Run Launch Report Viewer Open Reports Directory	Update Display Exit

FIGURE 7.16: TEST RESULTS GENERATION IN CV TOOL FOR TD 7.40 WARM RESET TEST

15. The following pop-up message (Figure 7.17 below) will then appear to ask the user to close the USB 3 Gen X CV application in the golden device.

USB Type-C Functional			
*	Please close the USB 3 Gen X CV Application in Golden Device(Host PC)		
	Ok		

FIGURE 7.17: USER PROMPT TO CLOSE USB 3 GEN X CV APP IN GOLDEN DEVICE

7.3 TD.4.10.3 Sink Suspend Test CV Tool Procedure

For the TD 4.10.3 test case, define the USB spec supported by the UUT as USB 3.0 based or USB 2.0 based.

When the test is running, the user will be required to suspend UUT link using the CV Tool (USB 3 Gen x CV) in the golden device (Figure 7.18 below).



FIGURE 7.18: USER PROMPT TO SUSPEND UUT LINK USING CV TOOL

When the "USB 3 Gen X Command Verifier" window appears (Figure 7.19 below), perform the following steps:

- a. In the Select Test Suite field, select "Current Measurement Test [USB 3 Gen X devices]".
- b. In the **Select Test Mode** field, select the "Debug" radio button and the "Prompt for Test Parameters" checkbox.
- c. In the **Select Test** field, select the "Enter Suspend (U3)" checkbox.
- d. Finally, select the bottom "Run" button to execute the Suspend UUT Link test.

😴 USB 3 Gen X Command	Verifier	
Select Test Suite		
Current Measurement Test [U	SB 3 Gen X devices]	^
HID Tests		
Link Layer Testing for Gen1		
MSC Tests		
OTG Tests		
PHDC Tests		~
Select Test Mode		
O Compliance Test	✓ Prompt for	Test Parameters
Debug		
Test F	Passed Test Failed	
Select Test	Right-click or	n tests for more information
Current Measurement Tes	t - USB 3 Gen X	
Group	unconfigured state	
Display Check Uncor	figured Current Message	
For each Configuration		
Config Descriptor Tes	st - Device Configured irrent	
Enter U1		
Check U1 Current		
Enter U2		
Check U2 Current		
Resume to U0		
Check Suspend (U3)	ent	
Resume to U0		
Optional Test Description		
Run	Launch Report Viewer	Open Reports Directory

FIGURE 7.19: SELECT AND EXECUTE SUSPEND UUT LINK TEST IN CV TOOL

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