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.

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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 http://graniteriverlabs.com/download-center/.
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.

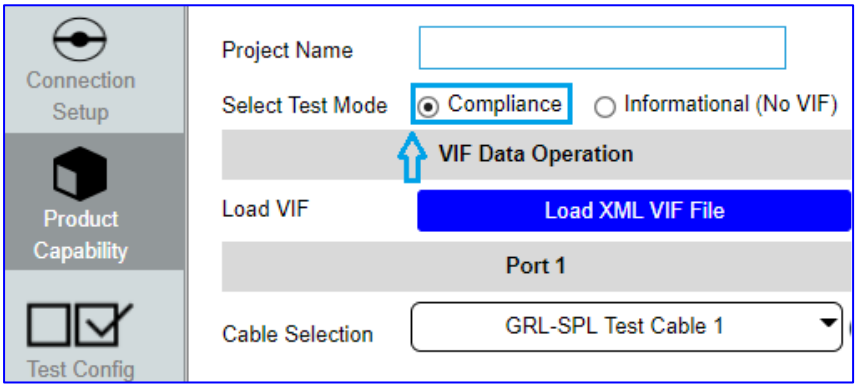


FIGURE 3.1: SELECTING COMPLIANCE TEST MODE

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):

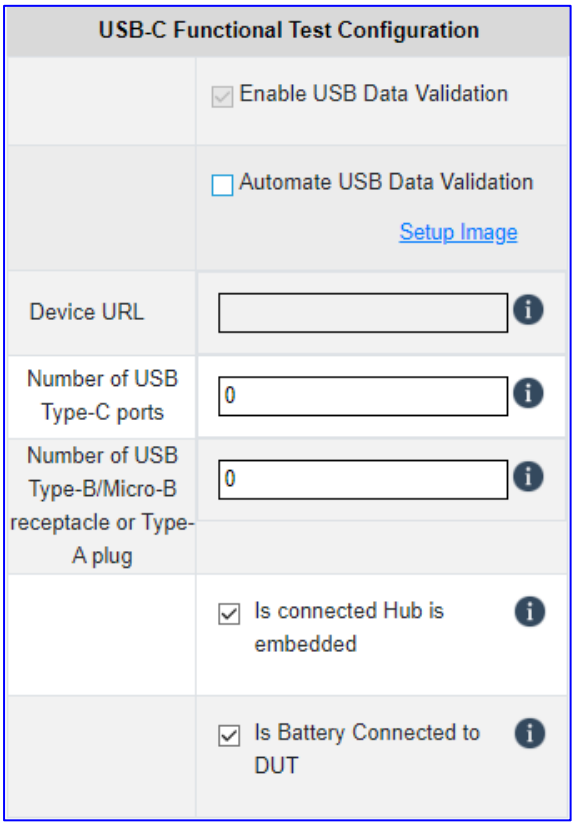


FIGURE 3.2: USB-C FUNCTIONAL TESTS CONFIGURATION (COMPLIANCE TEST MODE)

- 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 Setup Image 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.

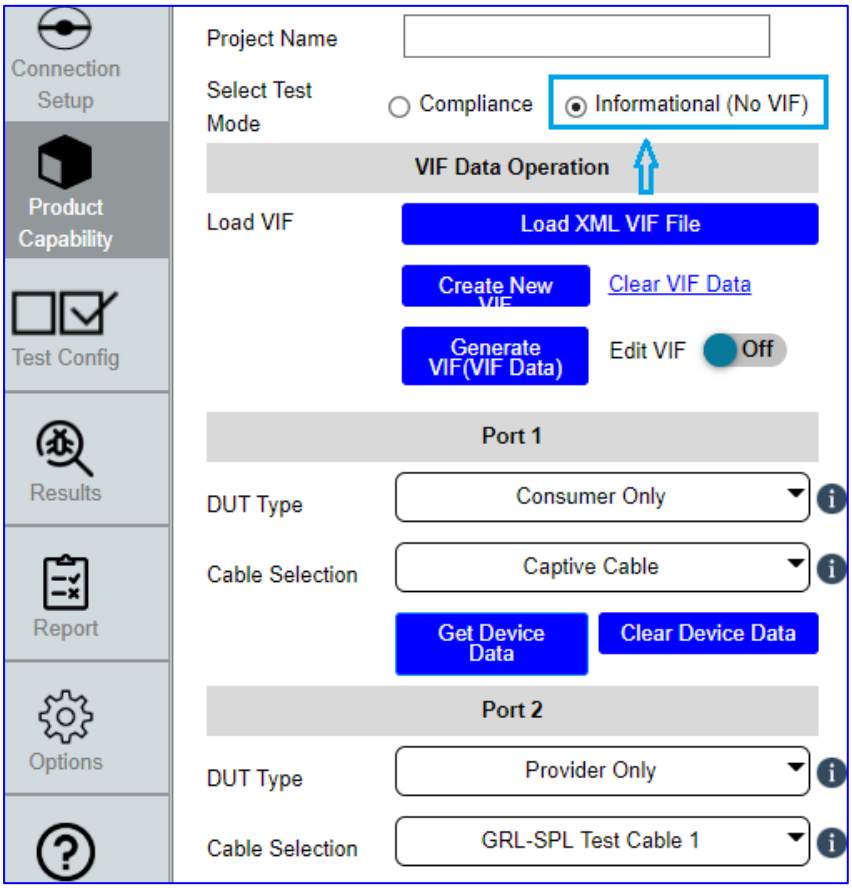


FIGURE 3.3: SELECTING INFORMATIONAL TEST MODE

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):

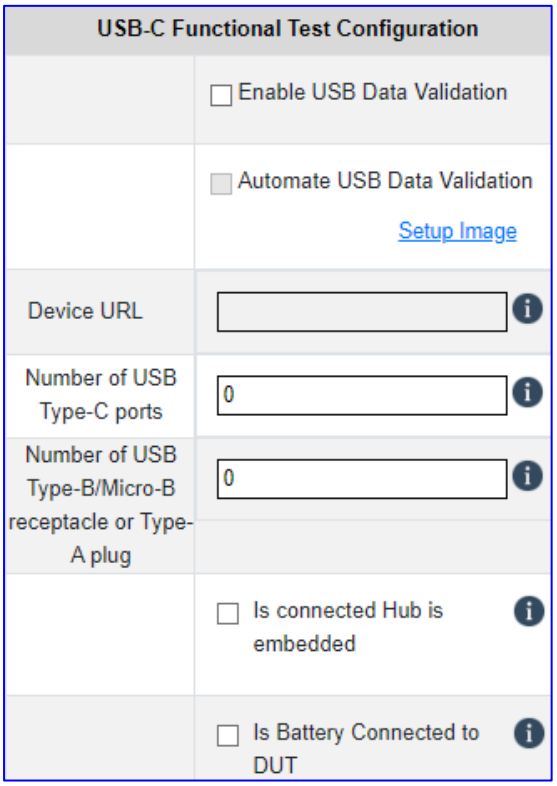


FIGURE 3.4: USB-C FUNCTIONAL TESTS CONFIGURATION (INFORMATIONAL TEST MODE)

- 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 Setup Image 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 http://graniteriverlabs.com/download-center/.

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.

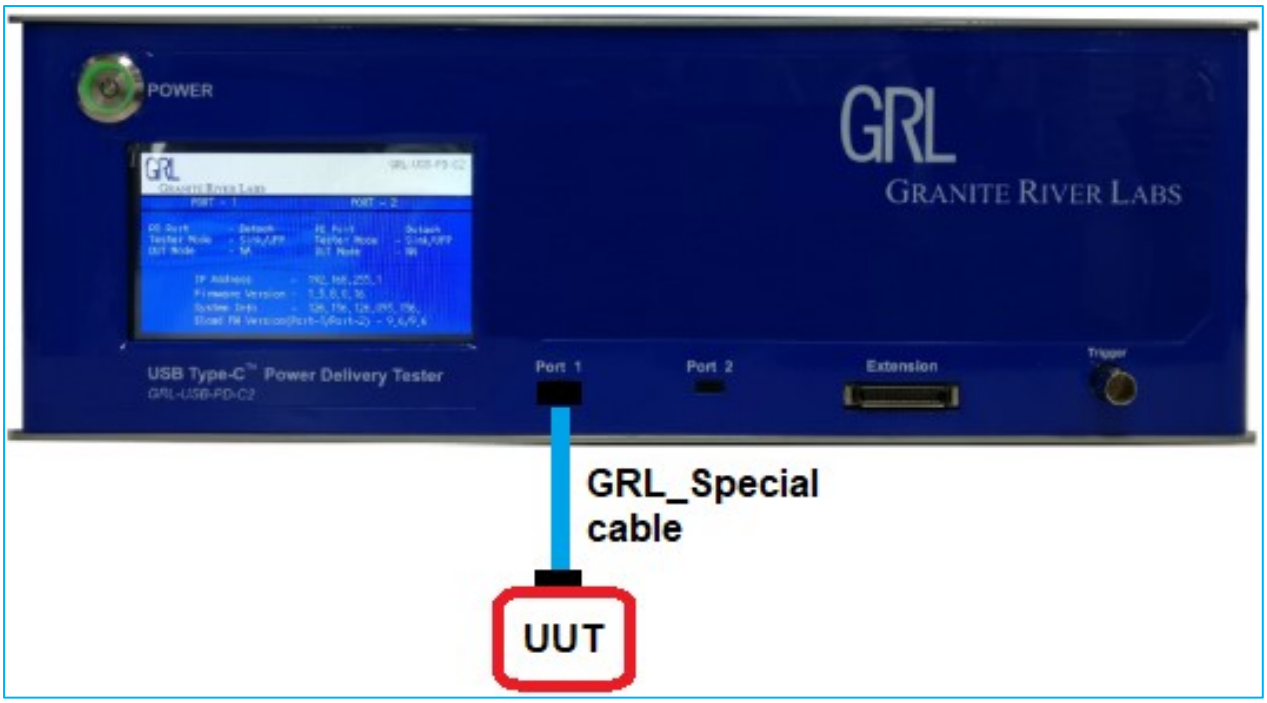


FIGURE 4.1: GENERAL TEST CONNECTION SETUP – FOR SOURCE/SINK/DRP RECEPTACLE UUT NOT CAPABLE OF USB COMMUNICATION

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.

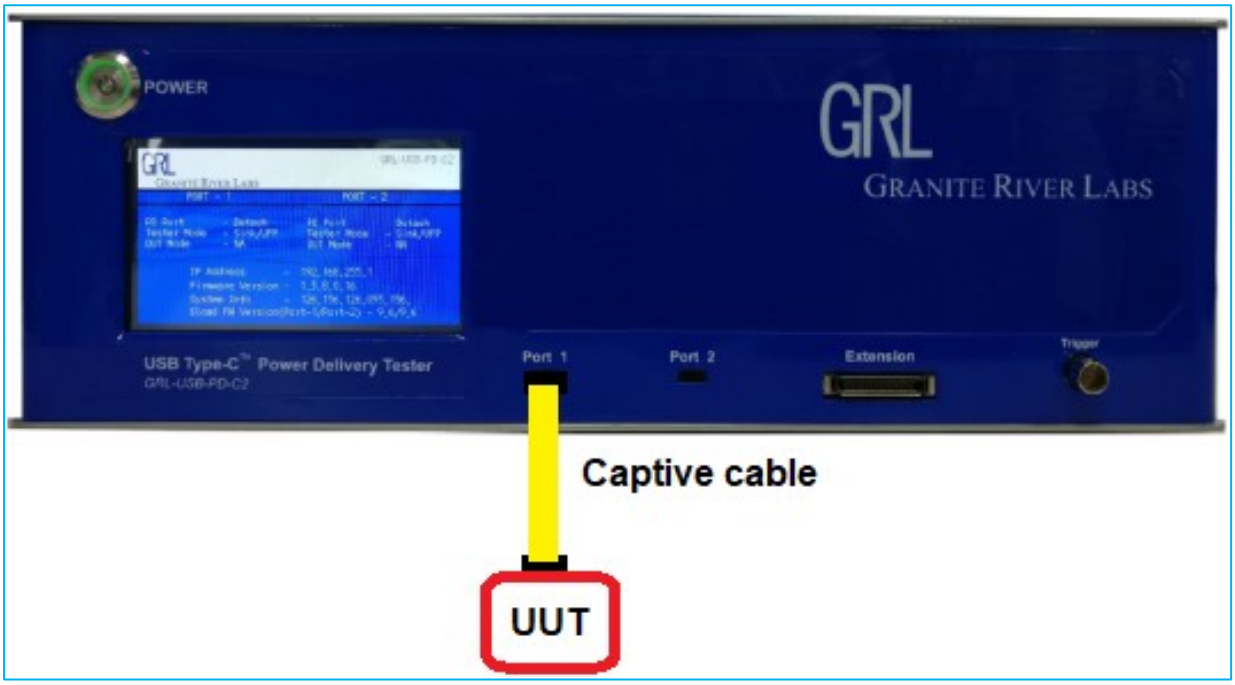


FIGURE 4.2: GENERAL TEST CONNECTION SETUP – FOR SOURCE/SINK/DRP UUT WITH CAPTIVE CABLE NOT CAPABLE OF USB COMMUNICATION

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.

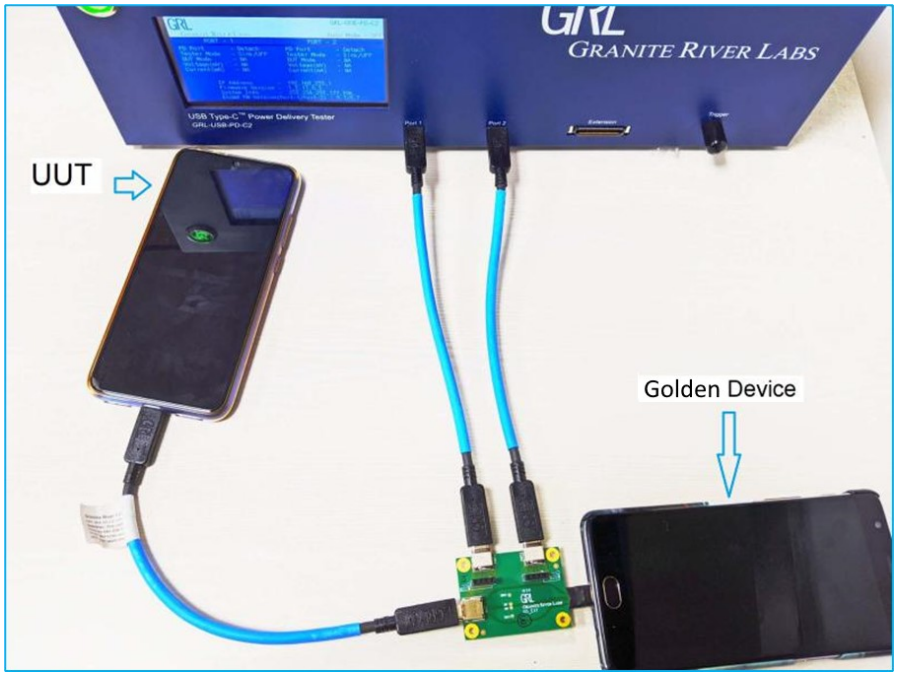


FIGURE 4.4: USB DATA VALIDATION TEST CONNECTION SETUP EXAMPLE

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).

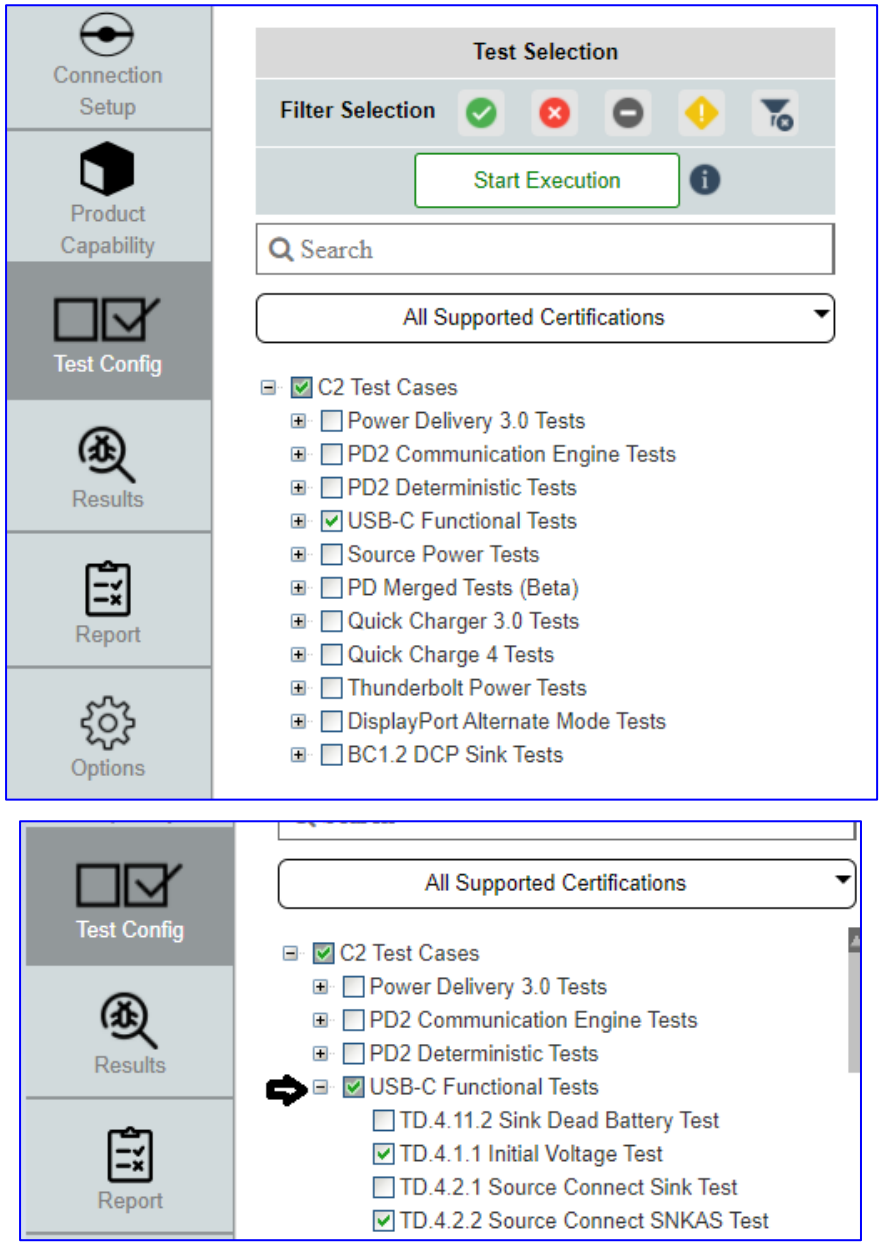
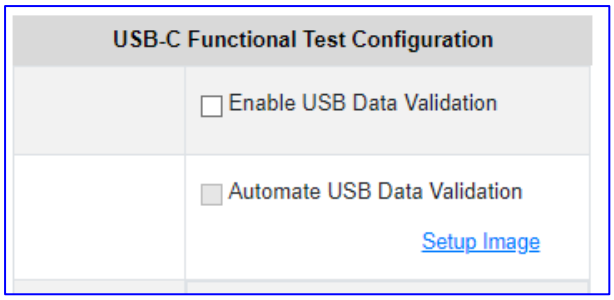


FIGURE 5.1: ACCESSING & SELECTING FUNCTIONAL COMPLIANCE TESTS WITHOUT USB DATA SUPPORT

*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).*



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

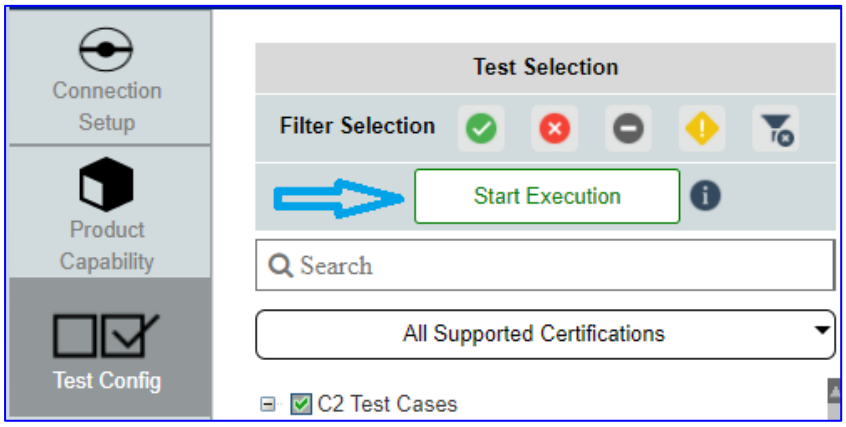


FIGURE 5.2: SELECTING START EXECUTION BUTTON FOR FUNCTIONAL COMPLIANCE TEST CASES WITHOUT USB DATA SUPPORT

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.

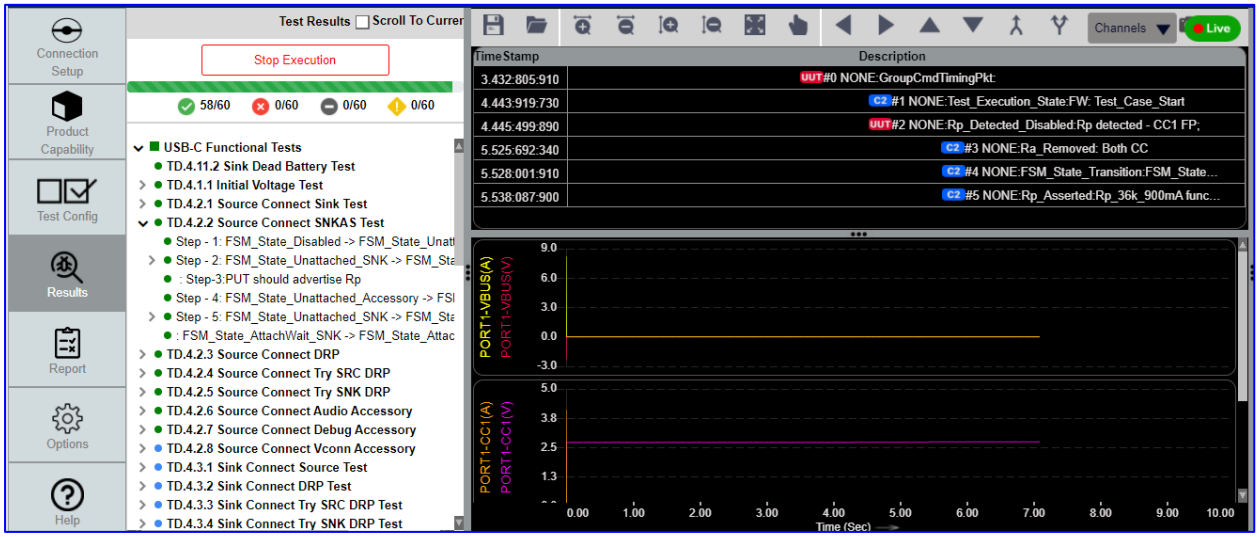


FIGURE 5.3: RUNNING FUNCTIONAL COMPLIANCE TEST CASES WITHOUT USB DATA SUPPORT

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.

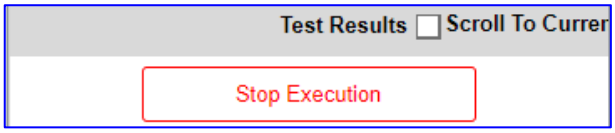


FIGURE 5.4: SELECTING STOP EXECUTION BUTTON FOR FUNCTIONAL COMPLIANCE TEST CASES WITHOUT USB DATA SUPPORT

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.

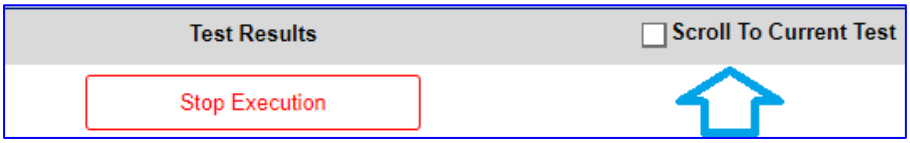


FIGURE 5.5: SELECTING SCROLL TO CURRENT TEST RESULTS CHECKBOX FOR FUNCTIONAL COMPLIANCE TEST CASES WITHOUT USB DATA SUPPORT

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).

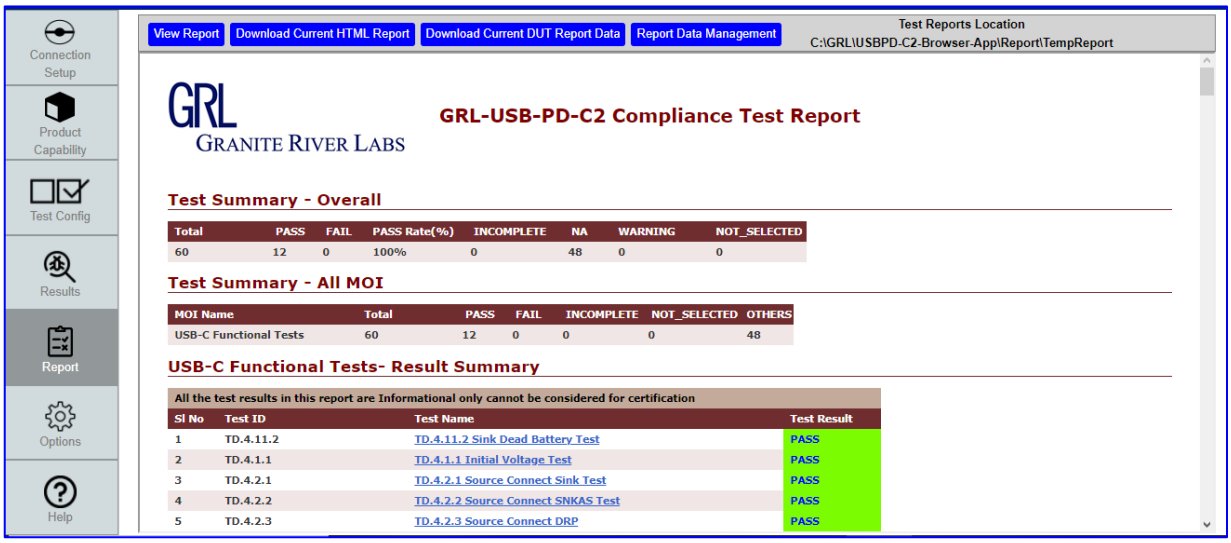


FIGURE 5.6: ACCESSING TEST REPORTS FOR FUNCTIONAL COMPLIANCE TEST CASES WITHOUT USB DATA SUPPORT

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).

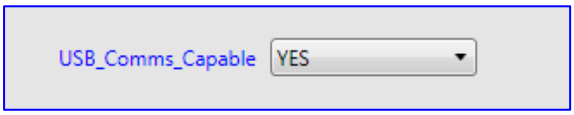


FIGURE 5.7: ENABLE USB_COMMS_CAPABLE FOR FUNCTIONAL COMPLIANCE TESTS WITH USB DATA SUPPORT

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 http://graniteriverlabs.com/download-center/.
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.]*

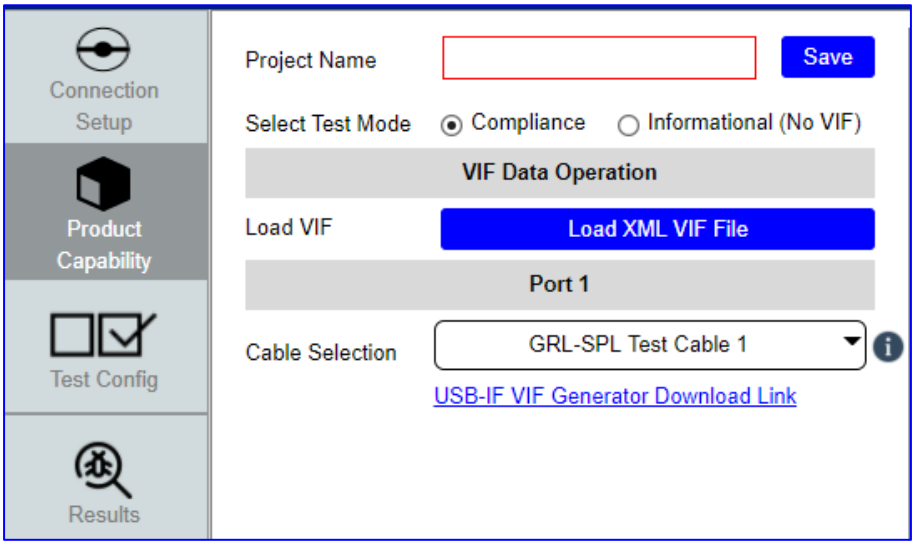
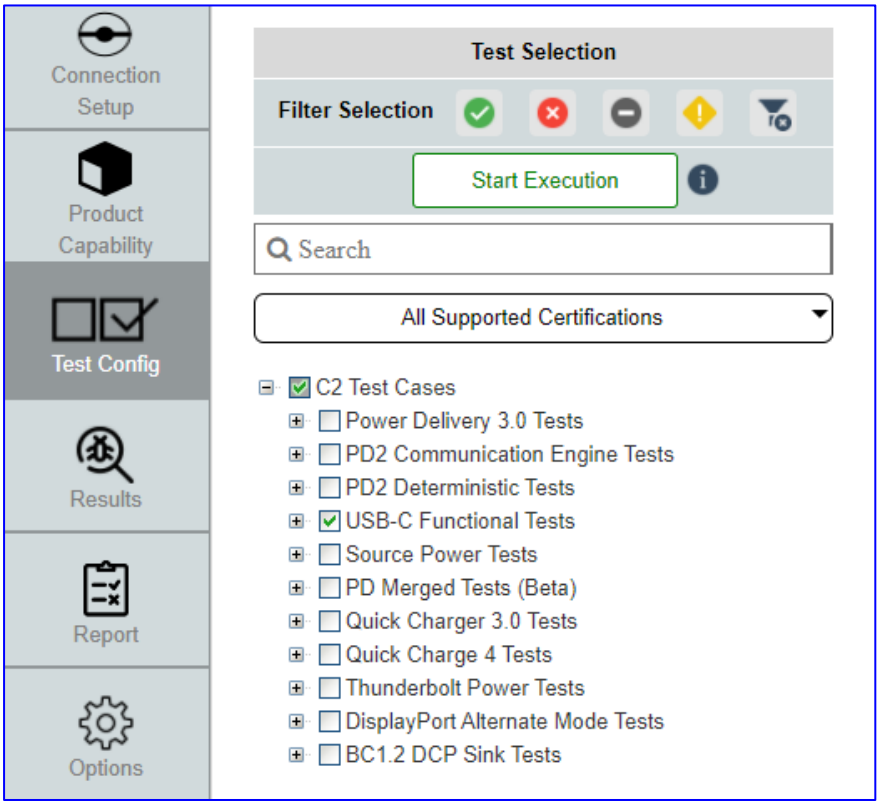


FIGURE 5.8: LOAD VIF FILE IN COMPLIANCE TEST MODE FOR FUNCTIONAL COMPLIANCE TESTS WITH USB DATA SUPPORT

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.



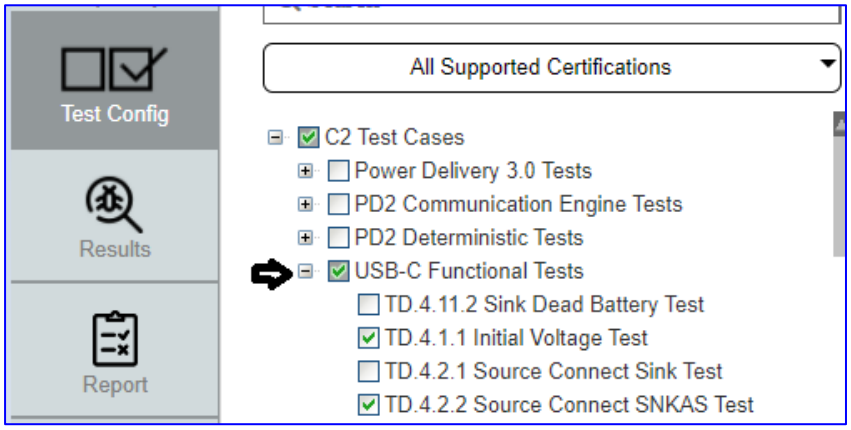


FIGURE 5.9: ACCESSING FUNCTIONAL COMPLIANCE TESTS WITH USB DATA SUPPORT

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

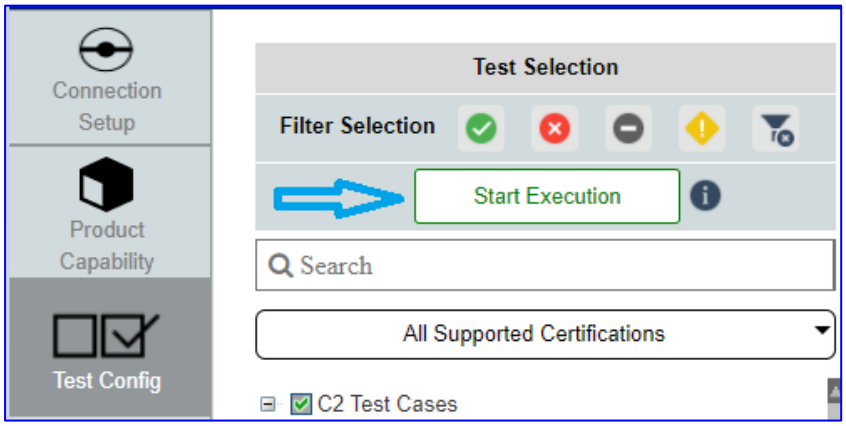
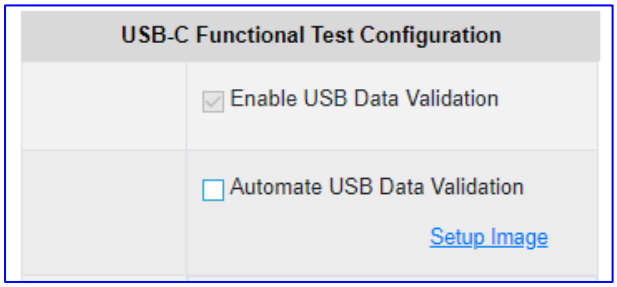
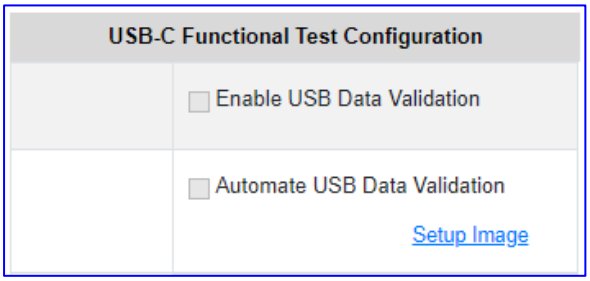


FIGURE 5.10: SELECTING START EXECUTION BUTTON FOR FUNCTIONAL COMPLIANCE TEST CASES WITH USB DATA SUPPORT

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 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.*

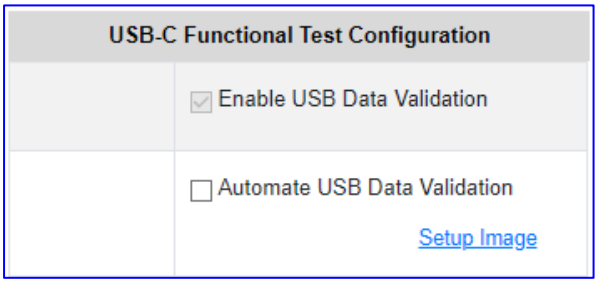


FIGURE 5.12: USB DATA VALIDATION ENABLED FOR HIGH-SPEED FUNCTIONAL TESTS

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.

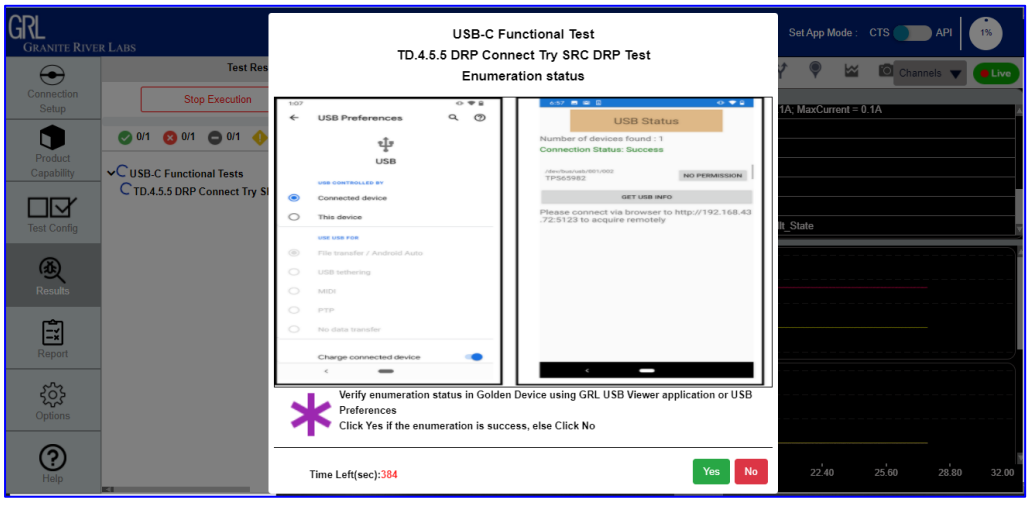


FIGURE 5.13: VERIFY ENUMERATION STATUS OF GOLDEN DEVICE #1

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".
7. 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".

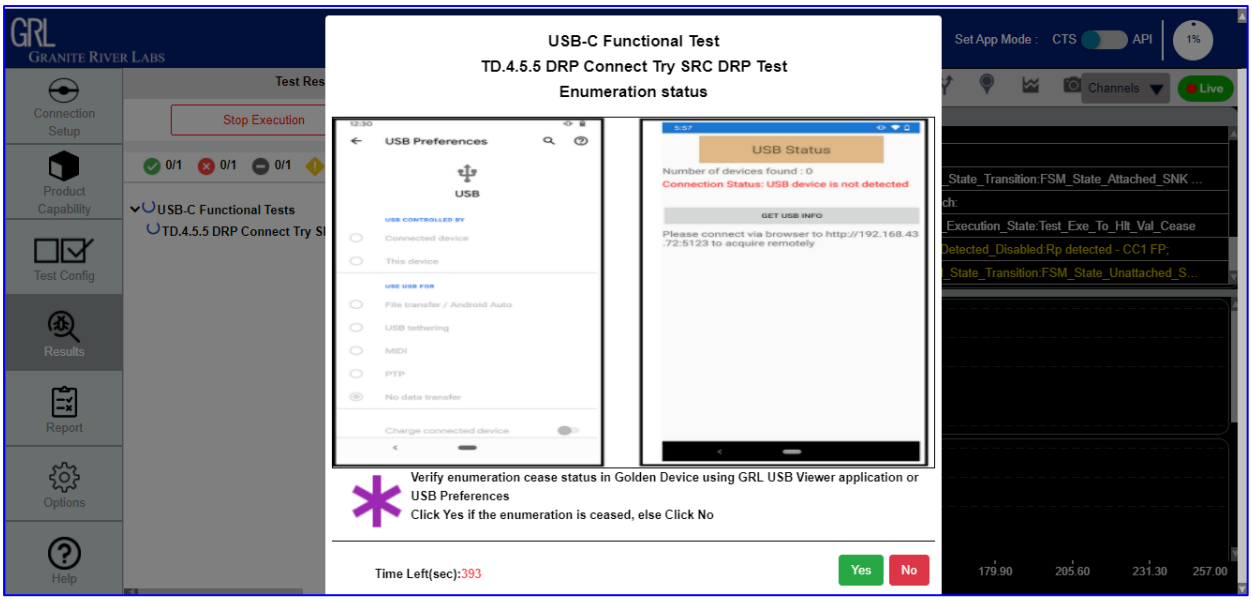


FIGURE 5.14: VERIFY ENUMERATION STATUS OF GOLDEN DEVICE #2

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).

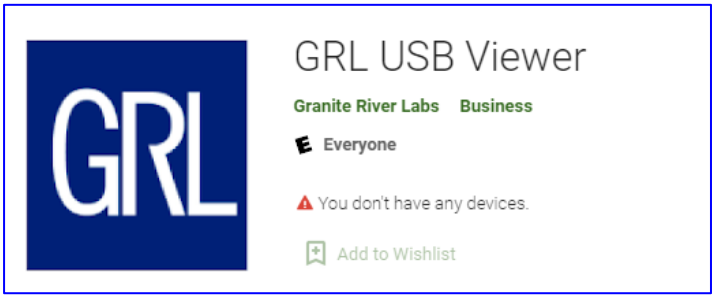


FIGURE 5.15: DOWNLOAD AND INSTALL GRL USB VIEWER APP

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.

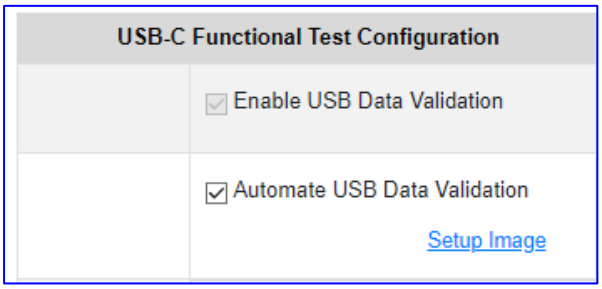


FIGURE 5.16: ENABLE AUTOMATION FOR USB DATA VALIDATION

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).

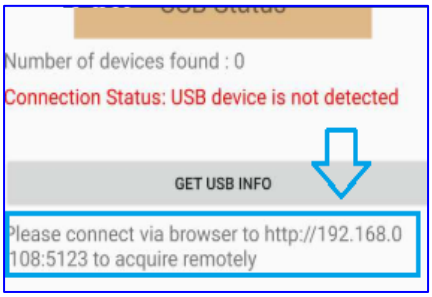


FIGURE 5.17: GRL USB VIEWER APPLICATION URL EXAMPLE

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.

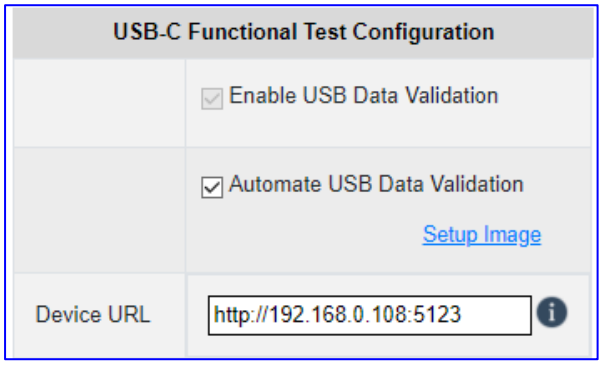


FIGURE 5.18: AUTOMATION SETUP CONFIGURATION

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.

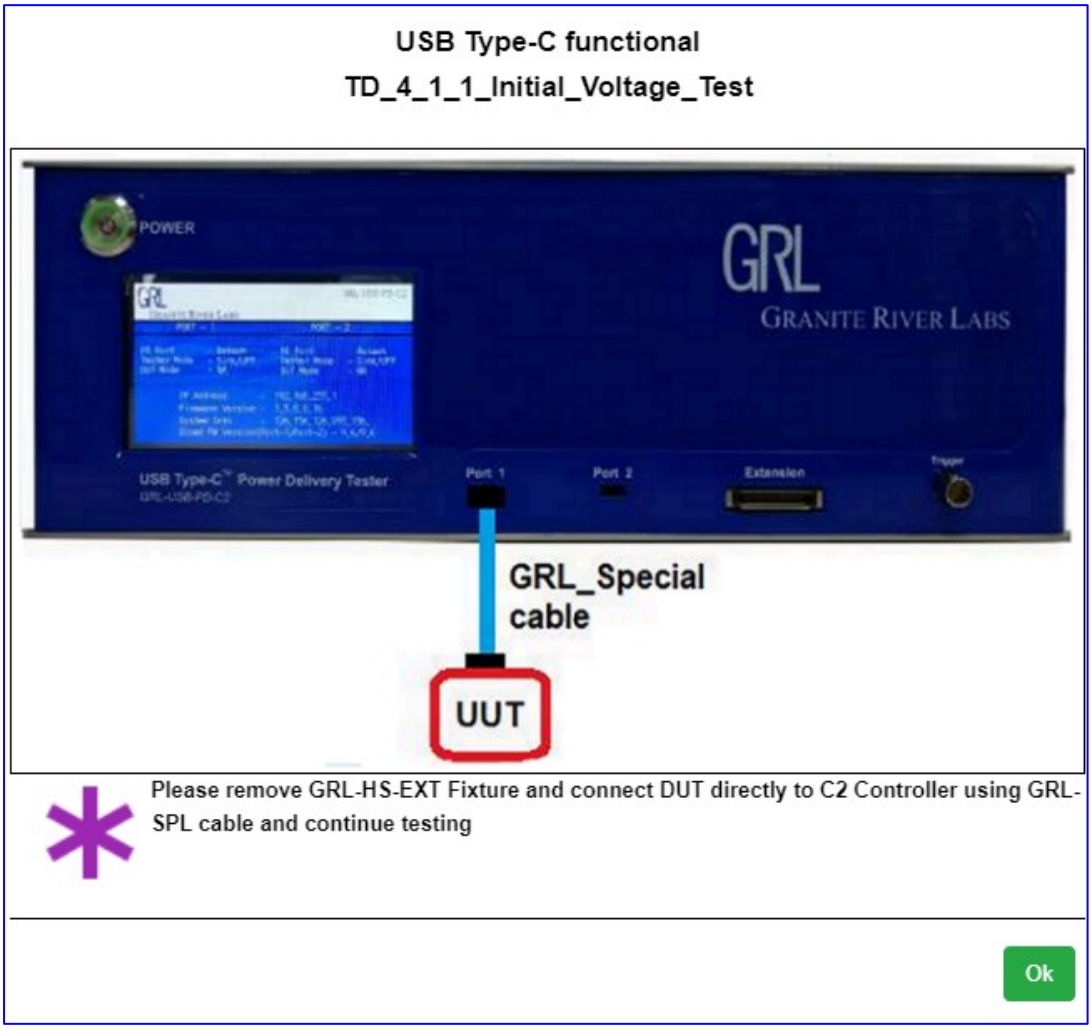


FIGURE 6.1: USER PROMPTS TO CONNECT UUT TO GRL-USB-PD-C2 TEST CONTROLLER

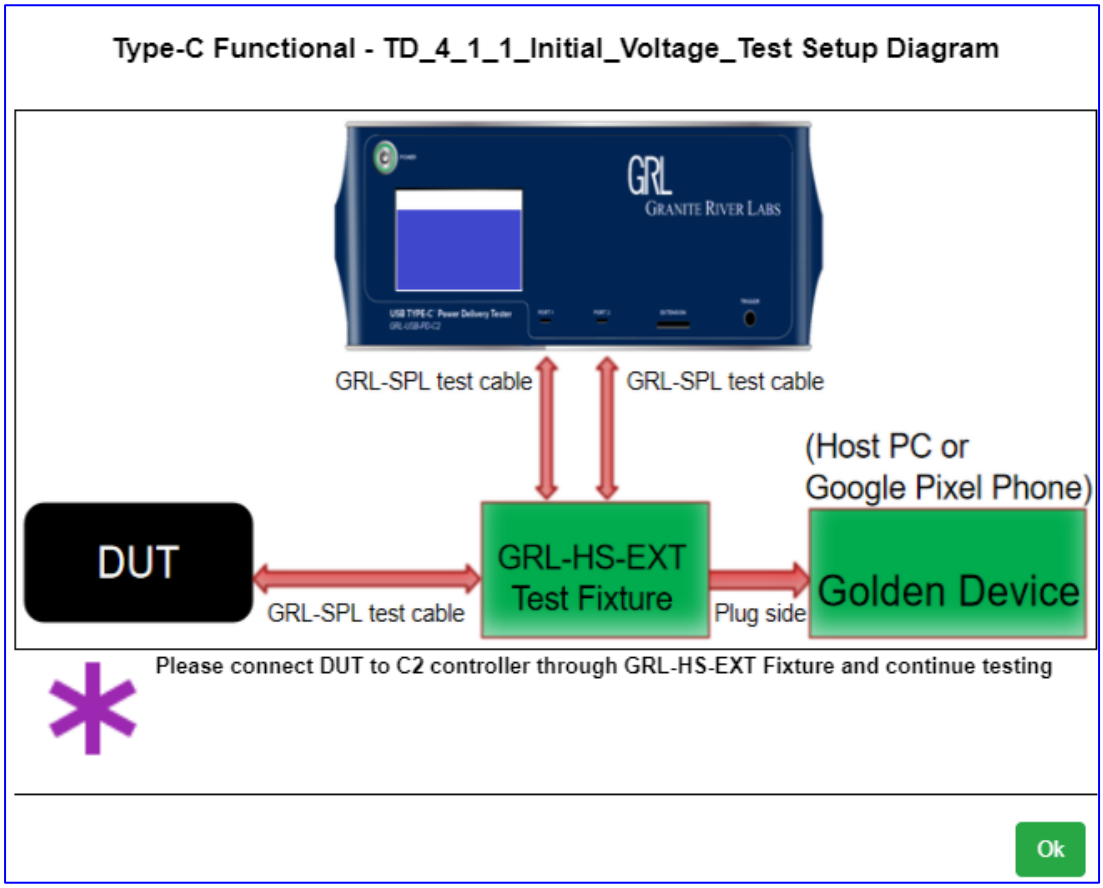


FIGURE 6.2: USER PROMPT TO CONNECT UUT TO FIXTURE OR BOARD IF REQUIRED

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).

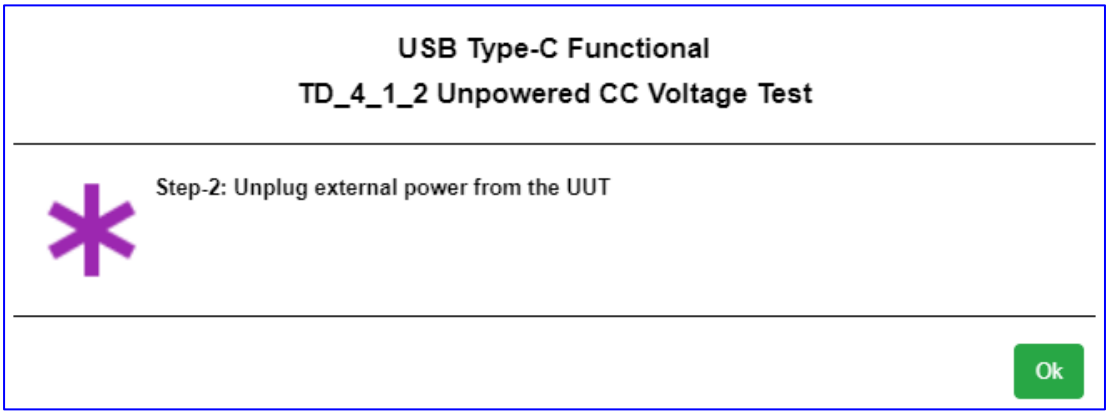


FIGURE 6.3: USER PROMPT TO REMOVE EXTERNAL POWER FROM UUT

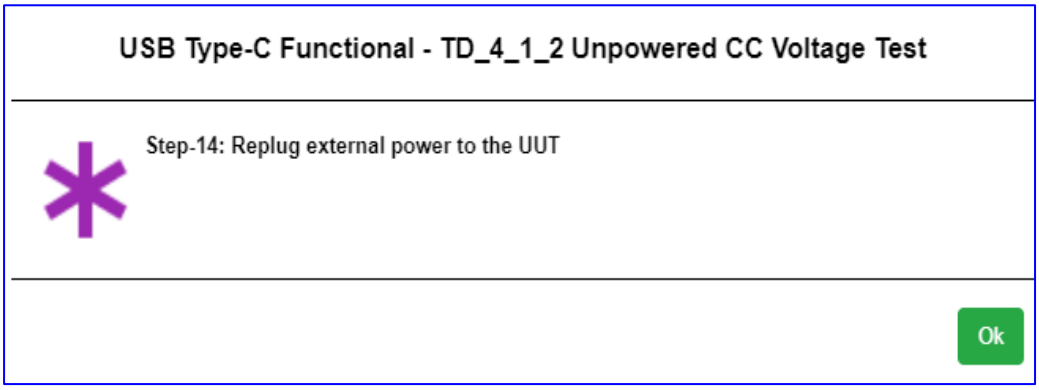


FIGURE 6.4: USER PROMPT TO RE-CONNECT EXTERNAL POWER TO UUT

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).

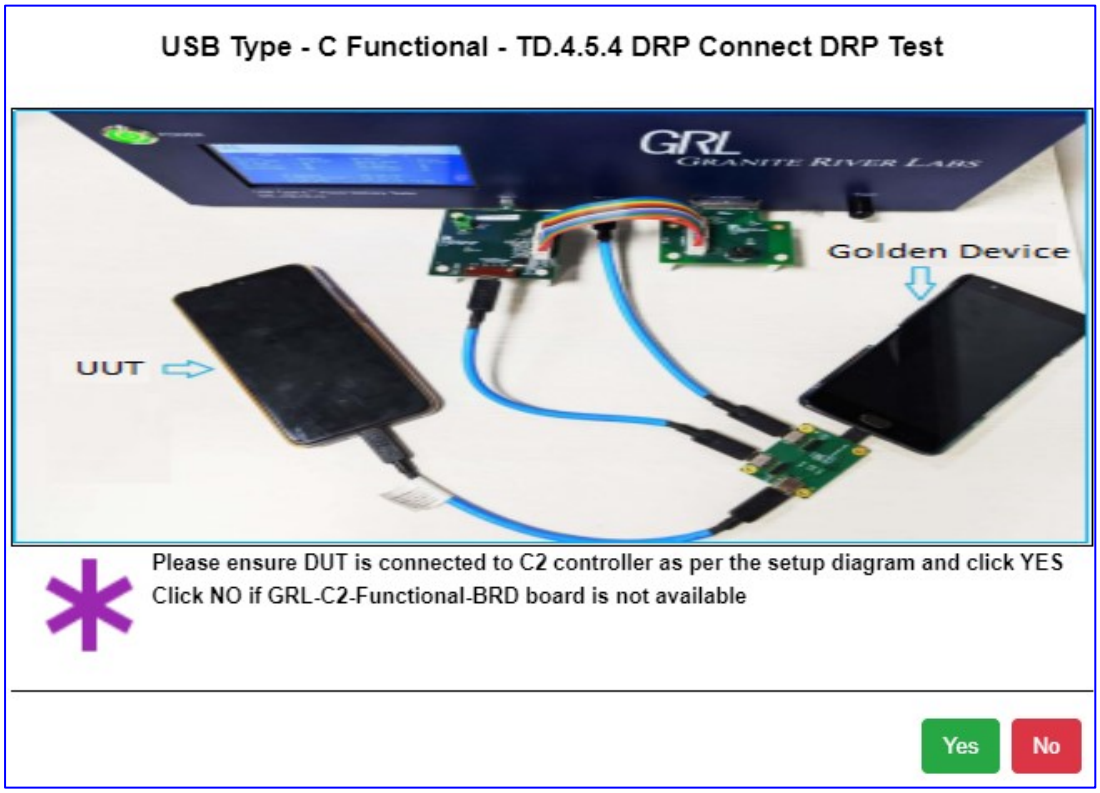


FIGURE 6.5: USER PROMPT TO SET UP VBUS EXTENSION BOARD BASED ON VOLTAGE REGRESSION TEST SETUP

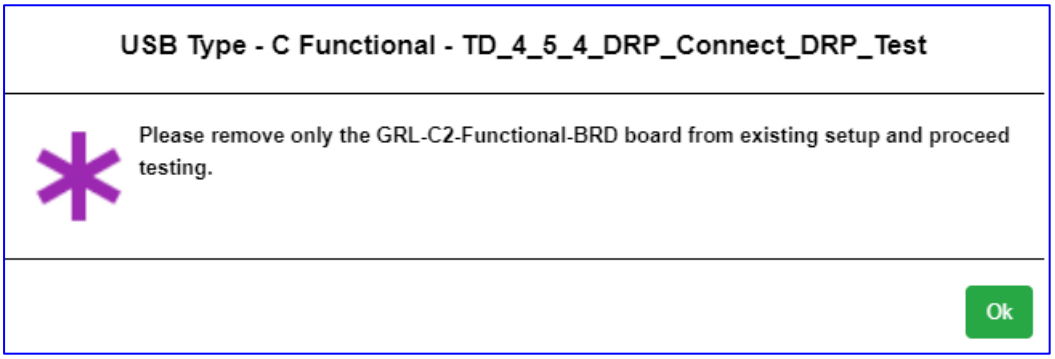


FIGURE 6.6: USER PROMPT TO REMOVE VBUS EXTENSION BOARD AND PROCEED WITH GENERAL TEST SETUP

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".

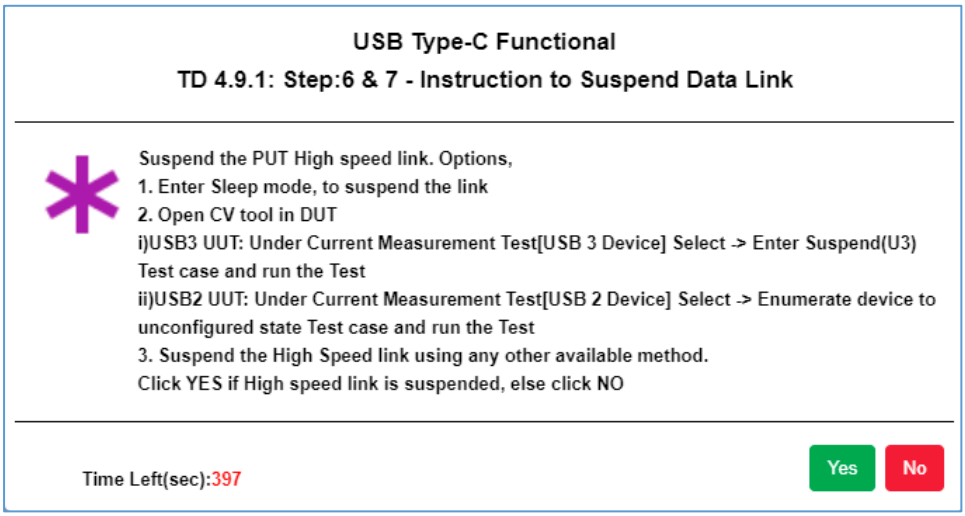


FIGURE 6.7: USER PROMPT WITH INSTRUCTIONS TO SUSPEND UUT DATA LINK

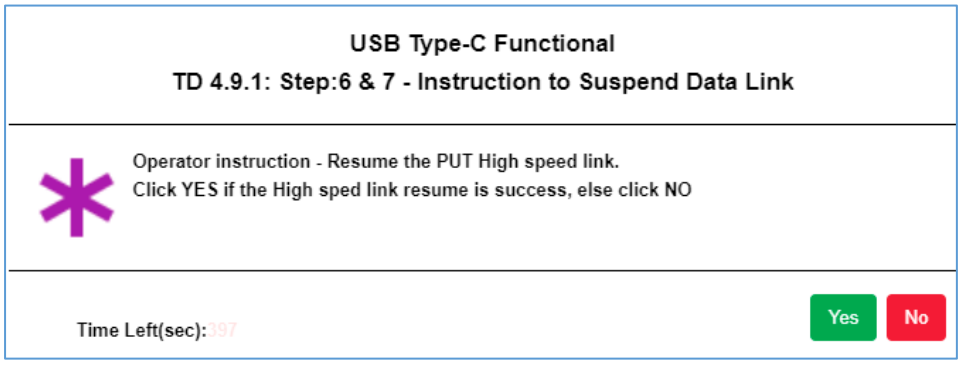


FIGURE 6.8: USER PROMPT TO RESUME UUT HIGH-SPEED LINK

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).

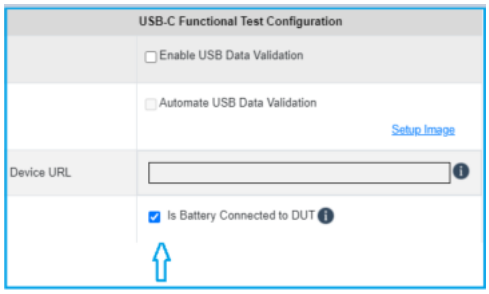


FIGURE 6.9: VERIFY CHECKBOX IS SELECTED IF BATTERY IS CONNECTED TO UUT

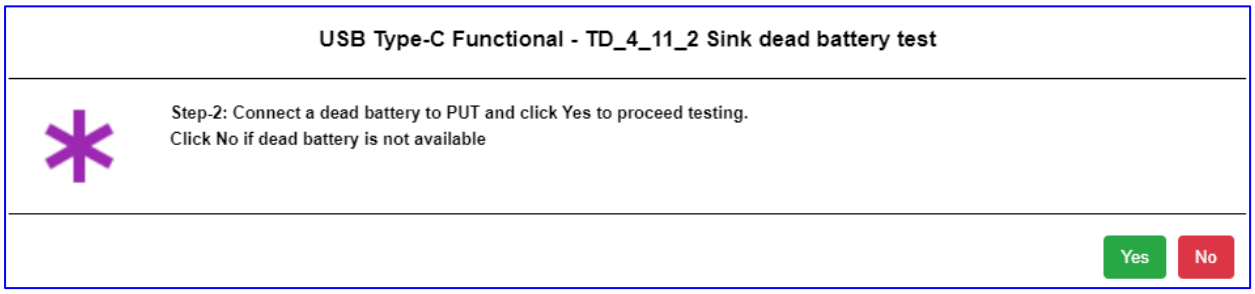


FIGURE 6.10: USER PROMPT TO CHECK IF DEAD BATTERY IS CONNECTED TO UUT

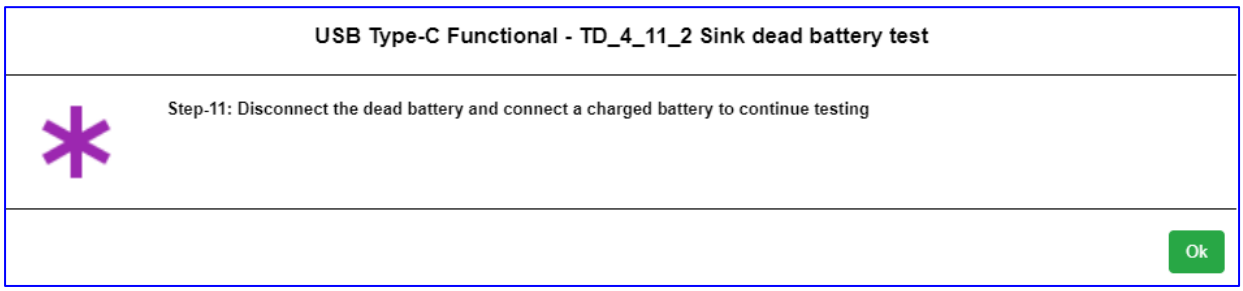


FIGURE 6.11: USER PROMPT TO REMOVE DEAD BATTERY AND RECONNECT CHARGED BATTERY TO UUT

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.

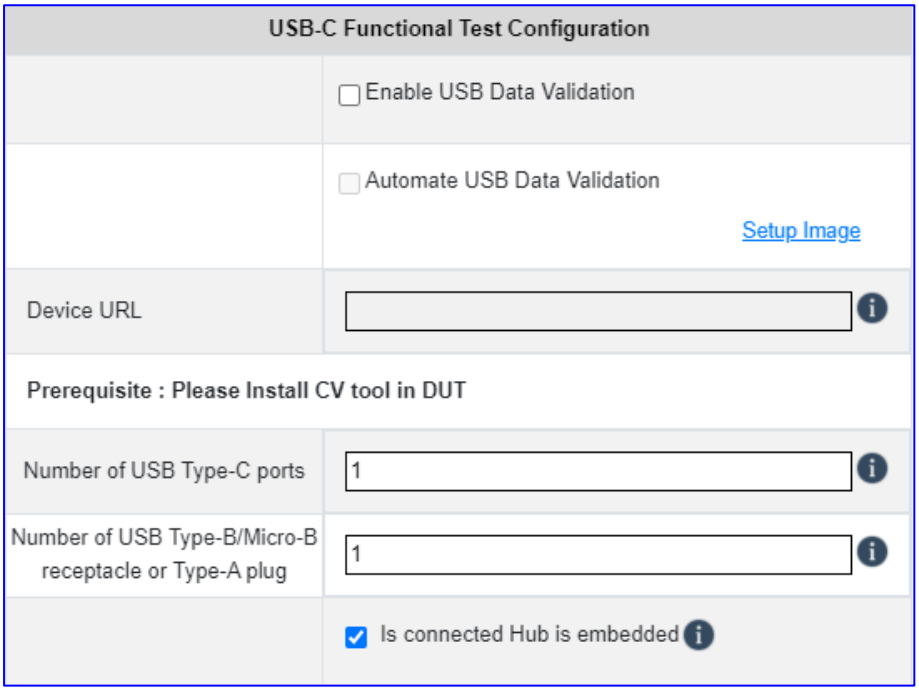


FIGURE 6.12: VERIFY UUT HUB PORT EMBEDDING BEFORE TESTING

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.

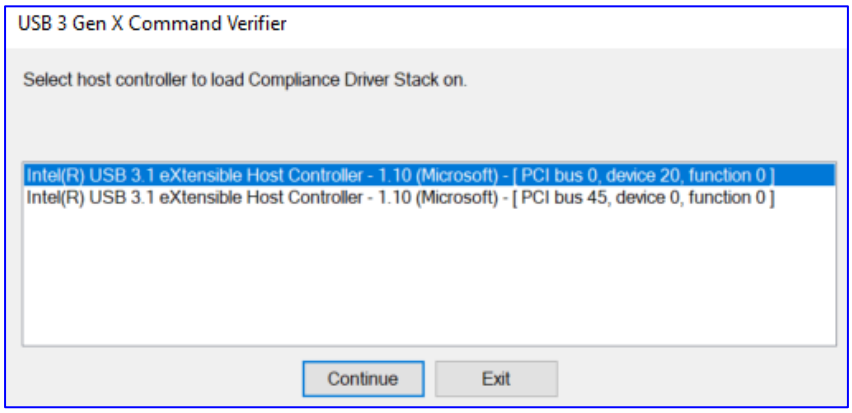


FIGURE 7.1: USER PROMPT TO SELECT HOST CONTROLLER IN CV TOOL

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.

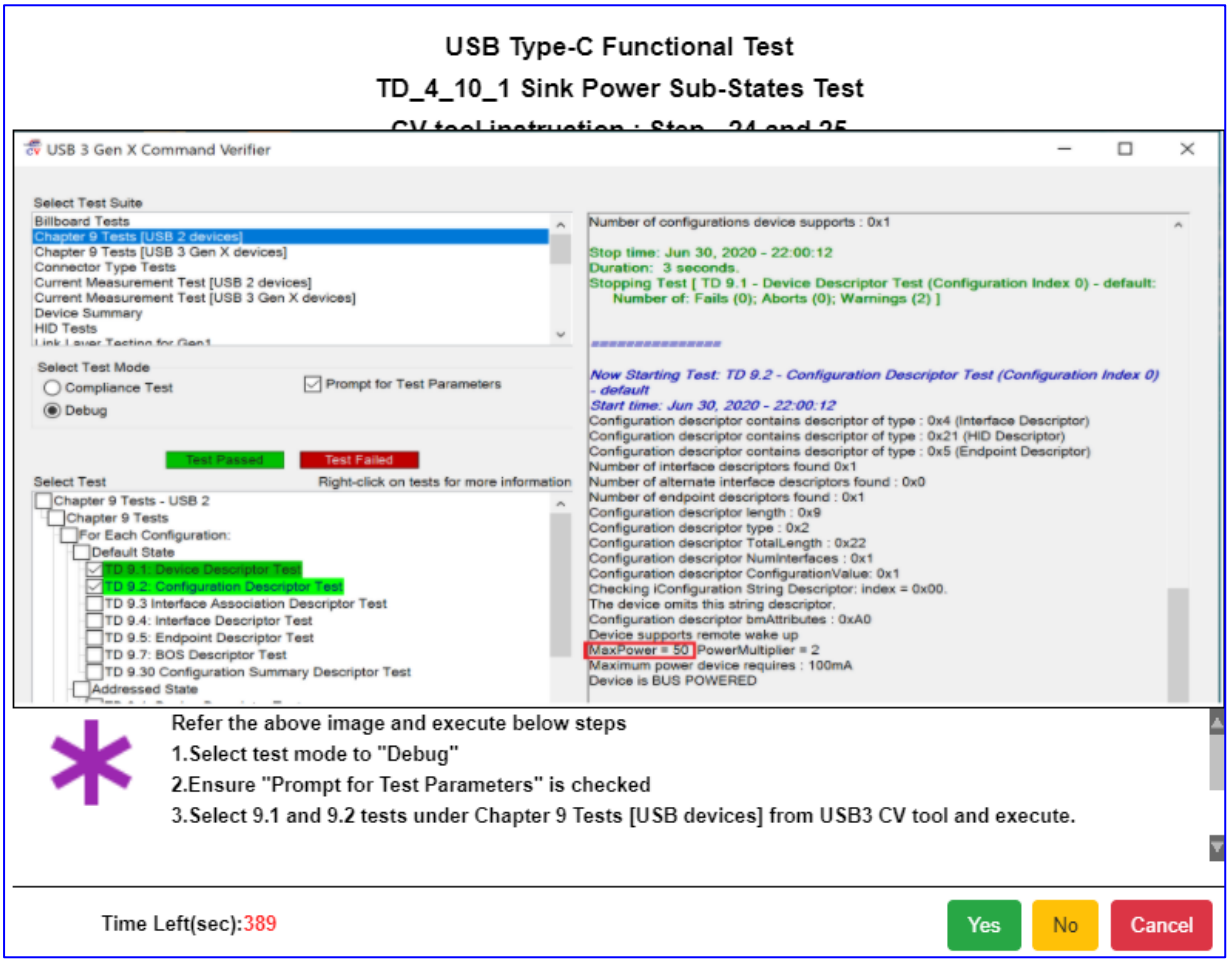


FIGURE 7.2: SELECT AND EXECUTE TD 4.10.1 TESTS IN CV TOOL

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”.

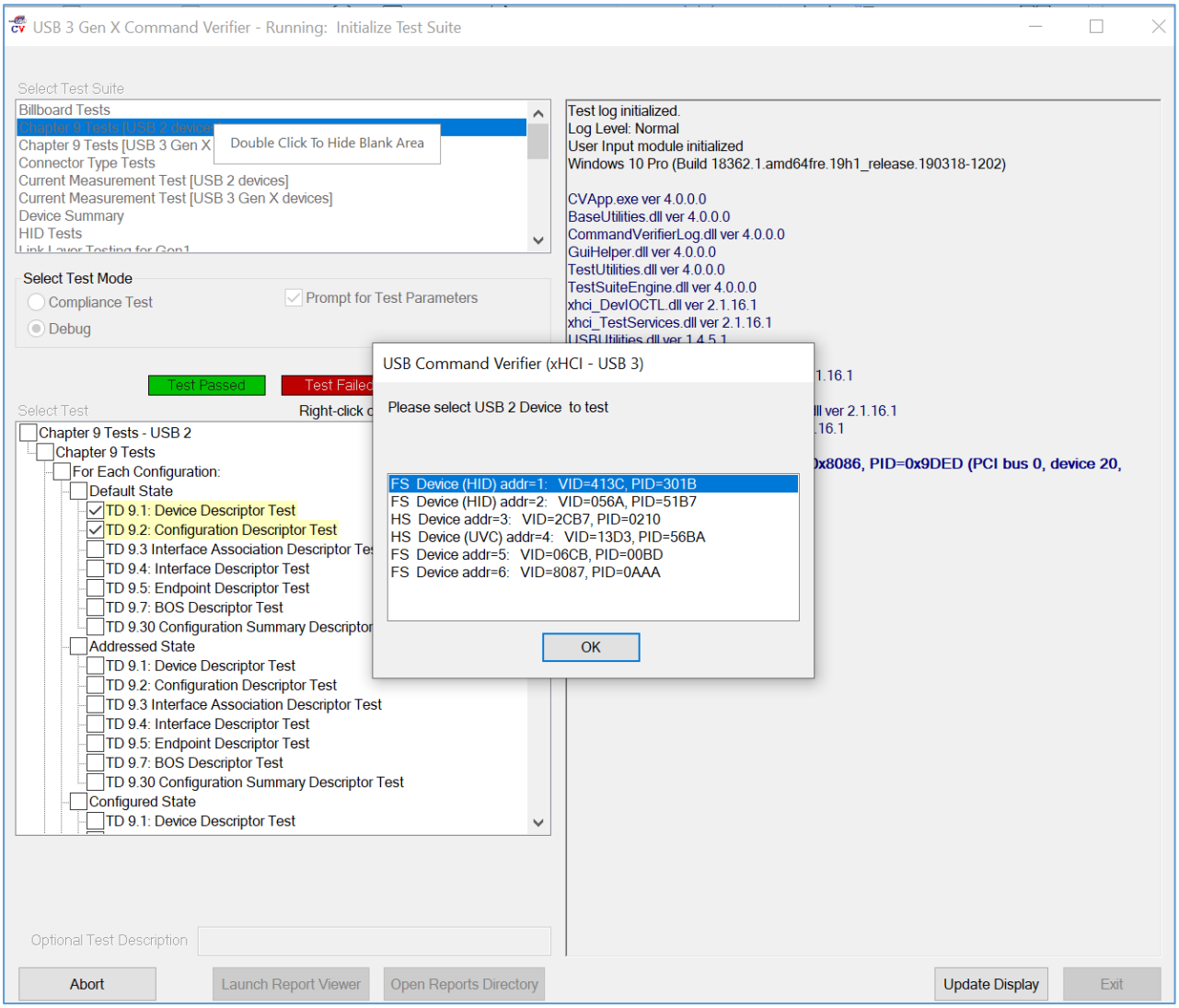


FIGURE 7.3: USER PROMPT TO SELECT FS DEVICE IN CV TOOL FOR TD 4.10.1 TESTS

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”.

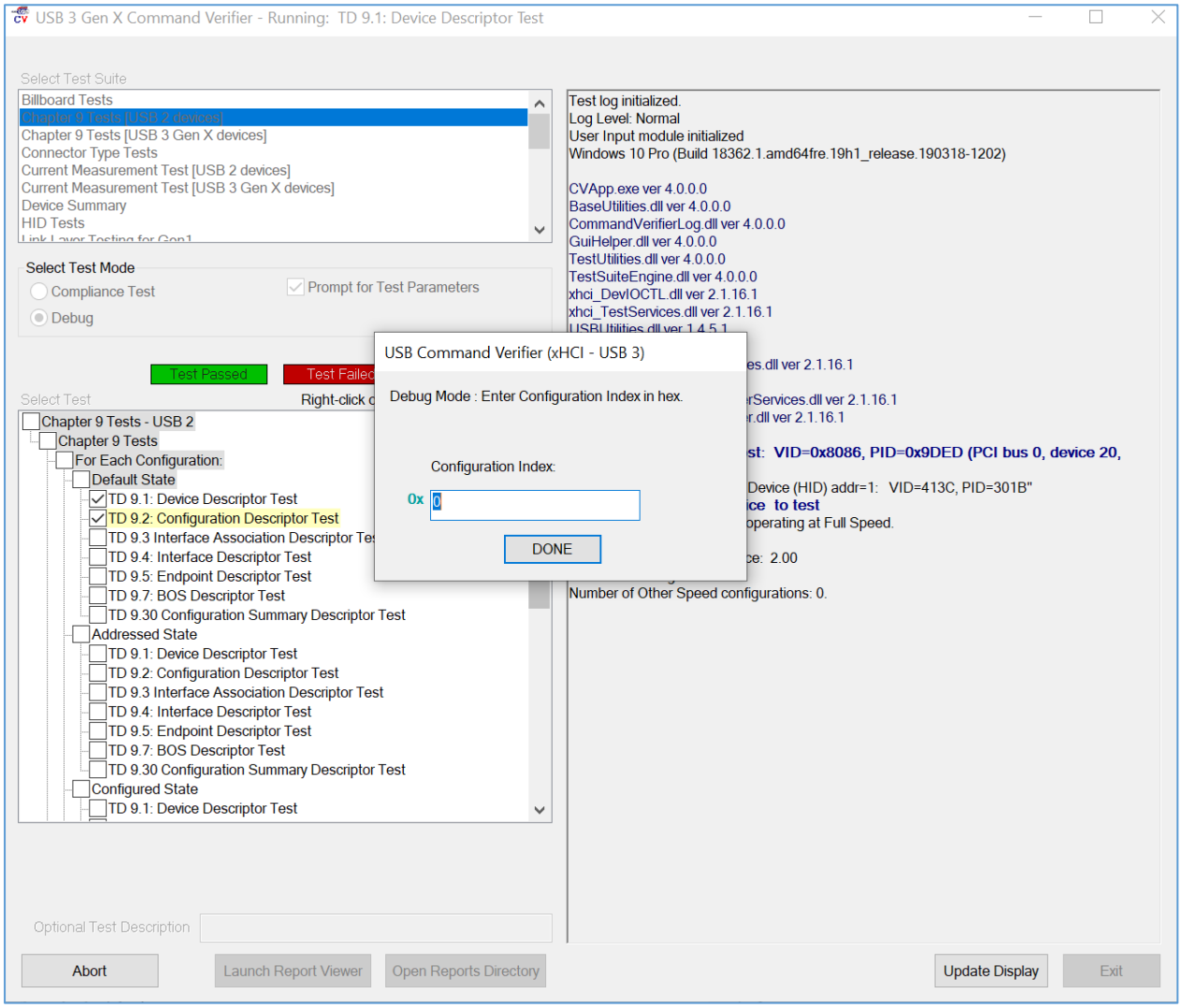


FIGURE 7.4: USER PROMPT TO ENTER DEBUG MODE CONFIGURATION INDEX IN CV TOOL FOR TD 4.10.1 TESTS

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”.

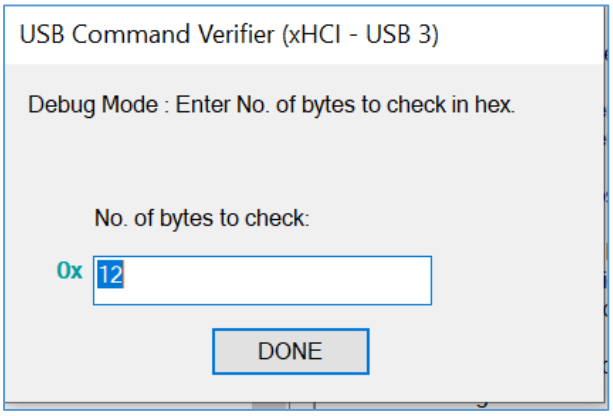


FIGURE 7.5: USER PROMPT TO ENTER DEBUG MODE NUMBER OF BYTES IN CV TOOL FOR TD 4.10.1 TESTS

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

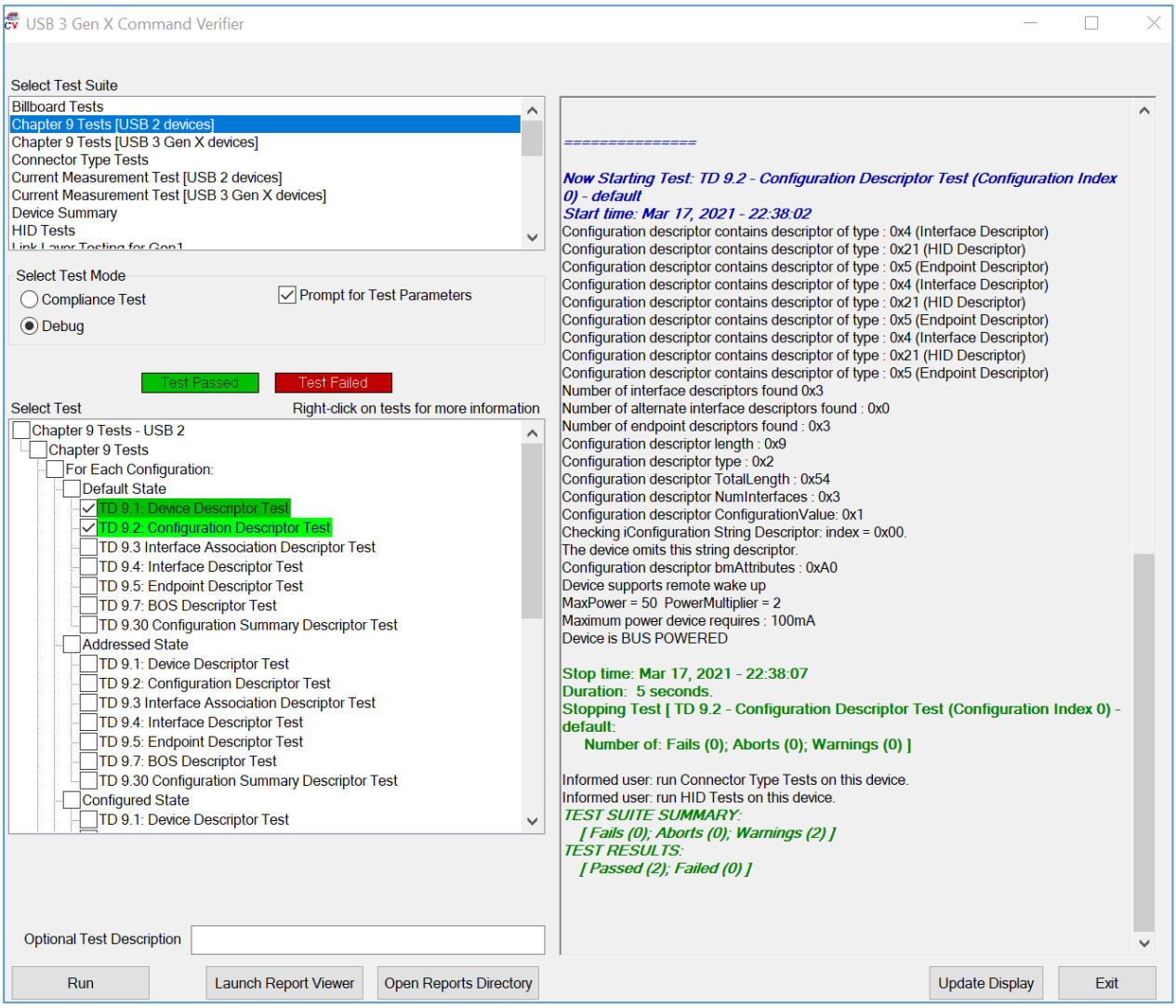


FIGURE 7.6: TEST RESULTS GENERATION IN CV TOOL FOR TD 4.10.1 TESTS

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.

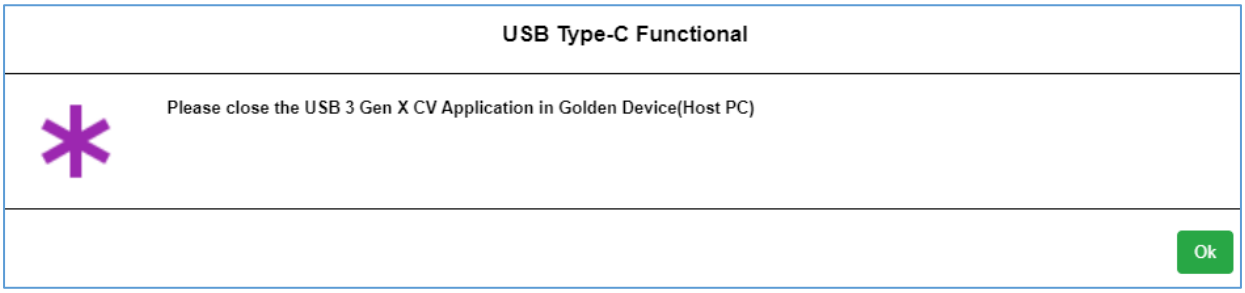


FIGURE 7.7: USER PROMPT TO CLOSE USB 3 GEN X CV APP IN GOLDEN DEVICE

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".

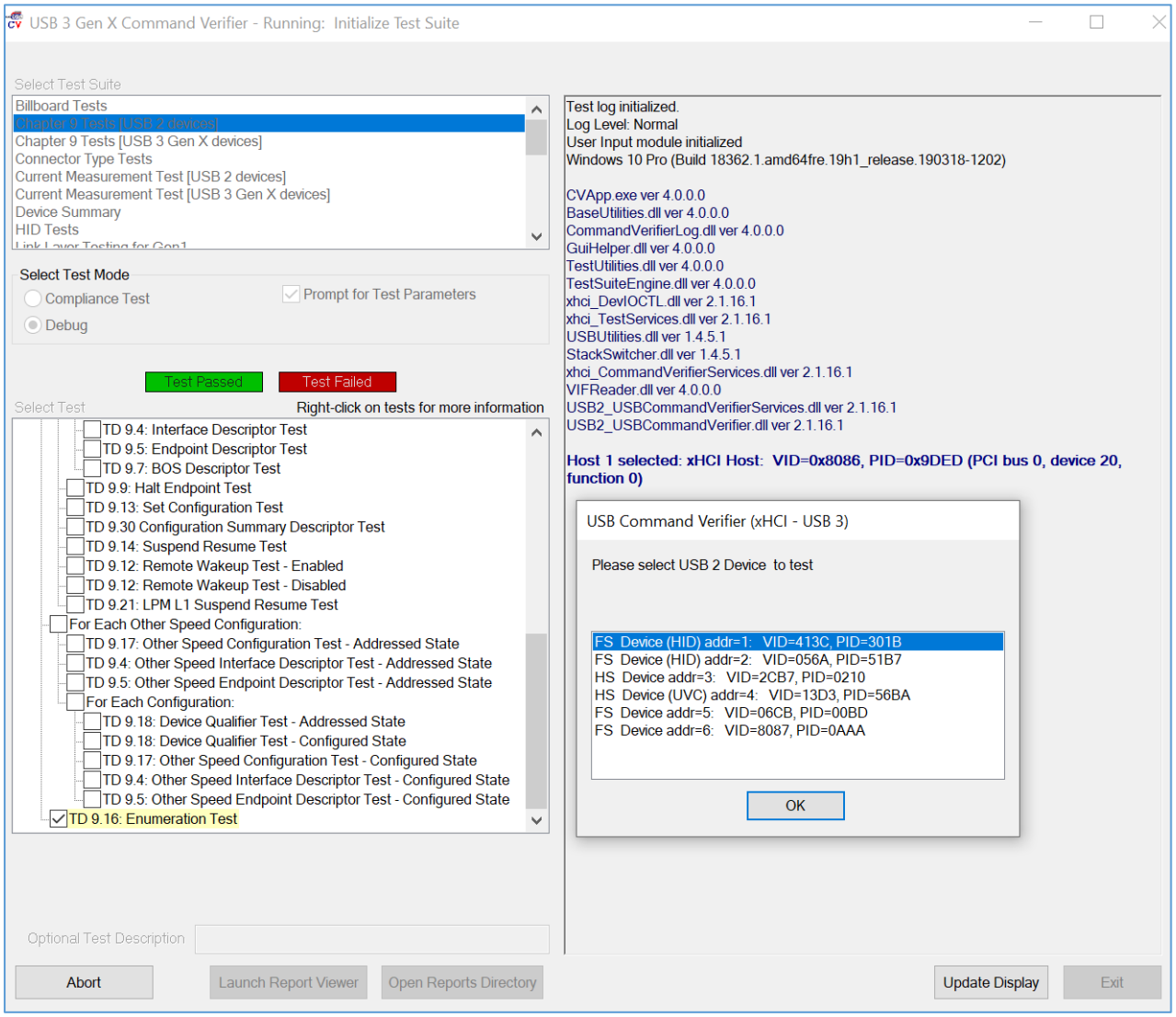


FIGURE 7.8: USER PROMPT TO SELECT FS DEVICE IN CV TOOL FOR TD 9.16 ENUMERATION TEST

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.

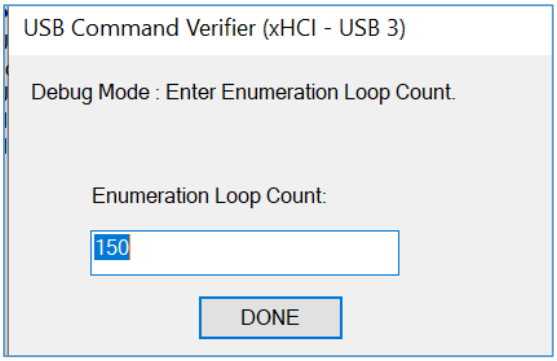


FIGURE 7.9: USER PROMPT TO ENTER DEBUG MODE ENUMERATION LOOP COUNT IN CV TOOL

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

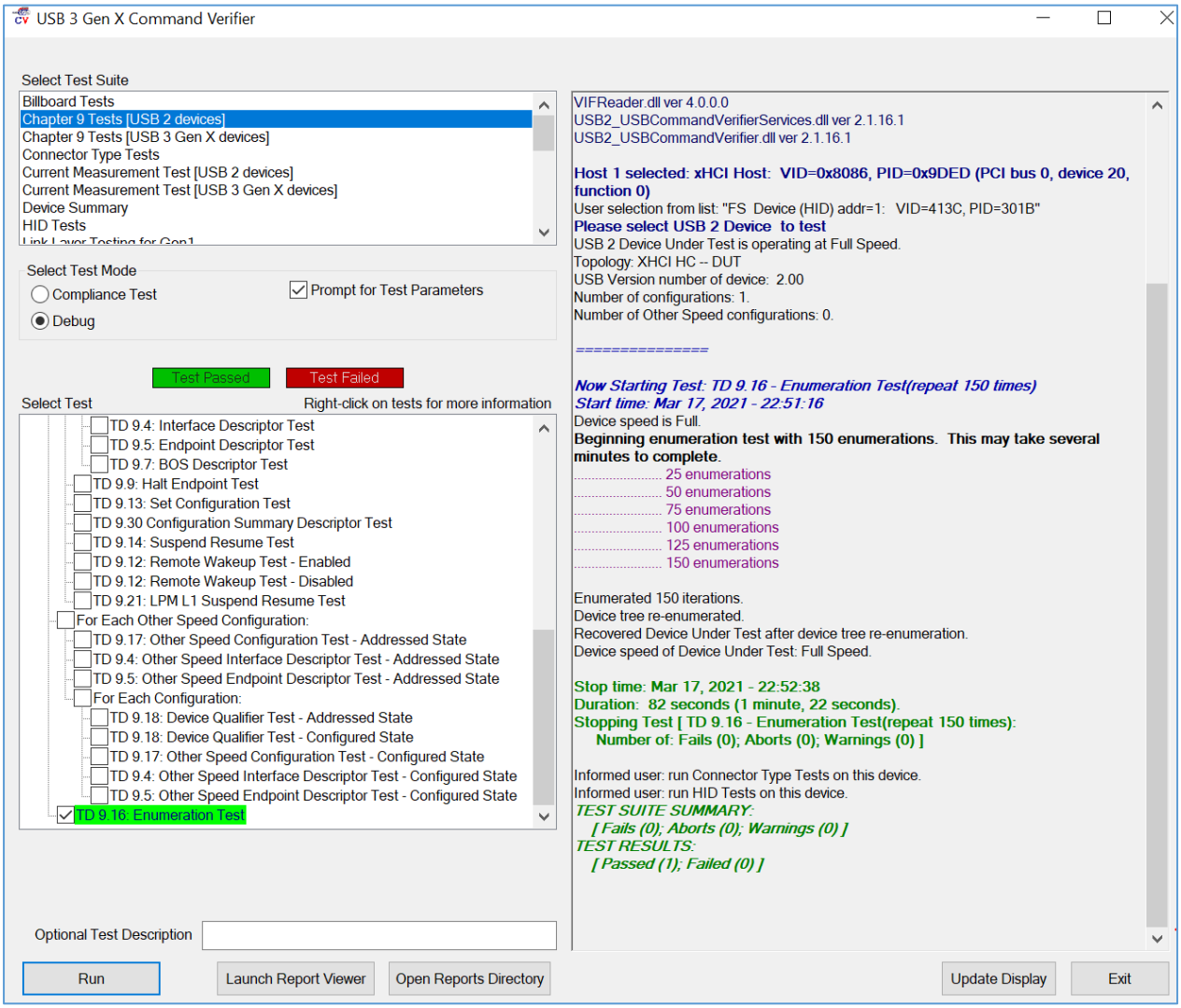


FIGURE 7.10: TEST RESULTS GENERATION IN CV TOOL FOR TD 9.16 ENUMERATION TEST

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.

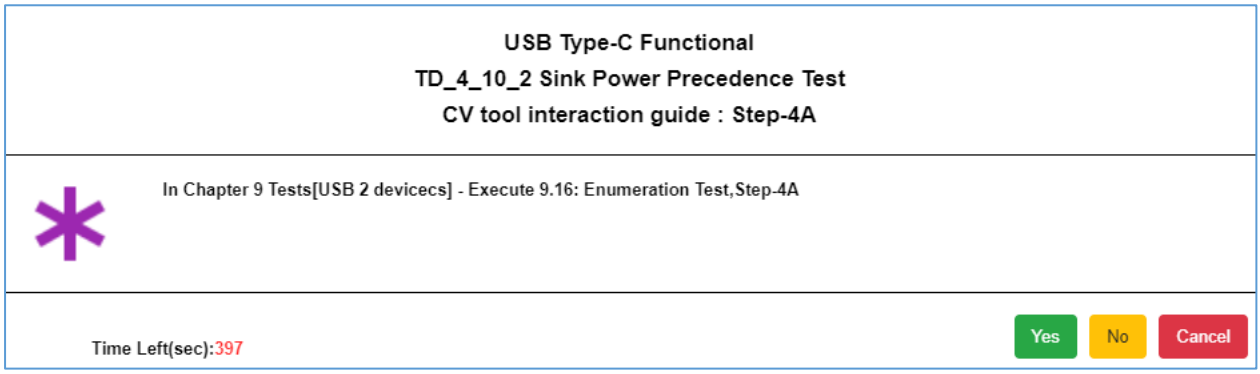


FIGURE 7.11: USER PROMPT TO CONFIRM CTS "9.16 ENUMERATION TEST" STATUS IN CV TOOL

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.

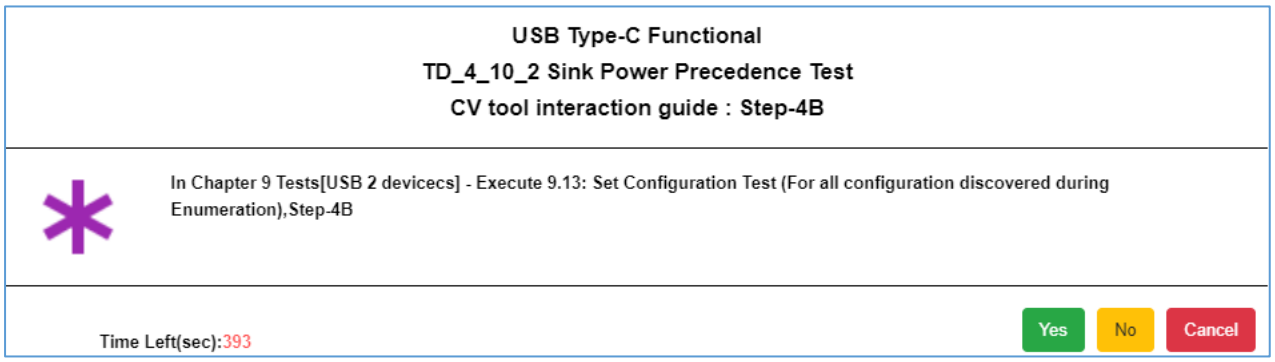


FIGURE 7.12: USER PROMPT TO EXECUTE CTS "TD 9.13 SET CONFIGURATION TEST" IN CV TOOL

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).

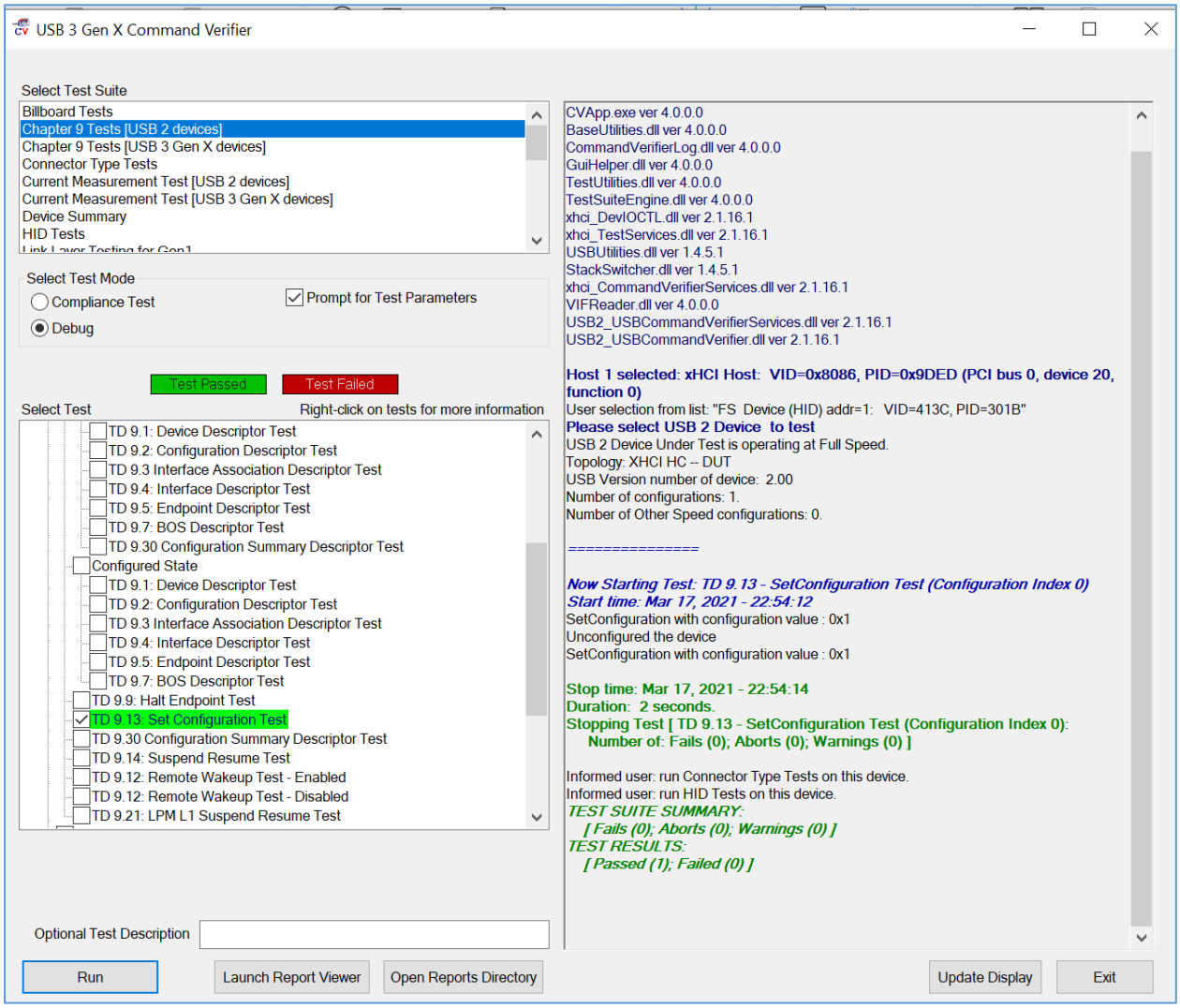


FIGURE 7.13: TEST RESULTS GENERATION IN CV TOOL FOR TD 9.13 SET CONFIGURATION TEST

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.

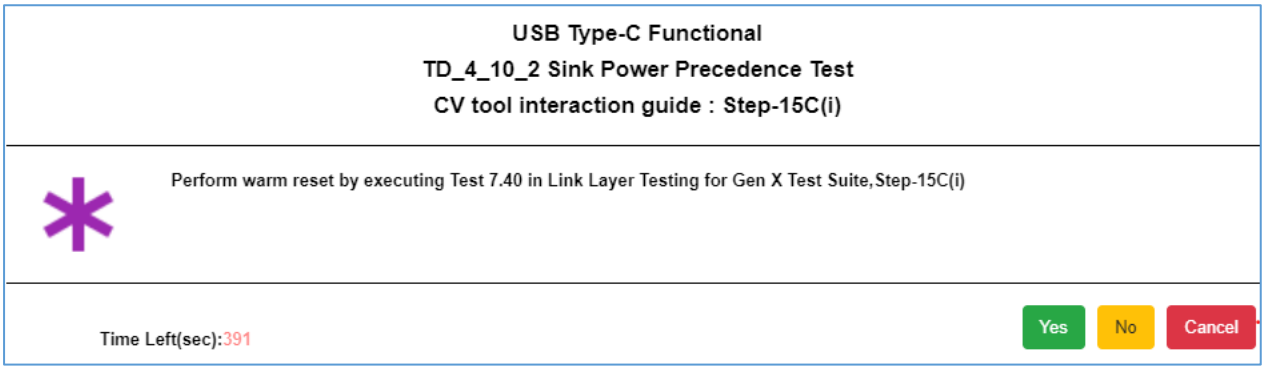


FIGURE 7.14: USER PROMPT TO EXECUTE CTS "TD 7.40 WARM RESET" IN CV TOOL

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.

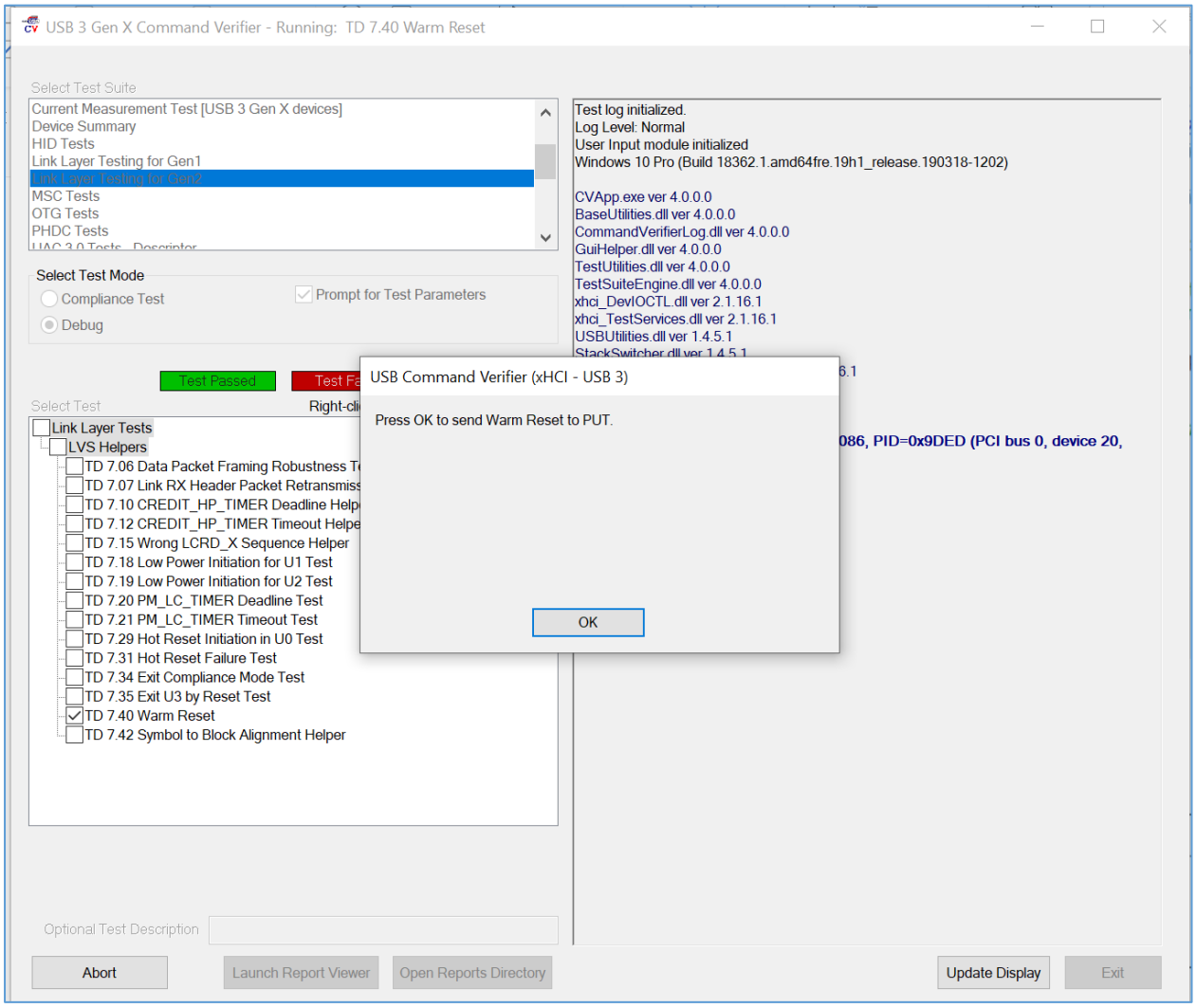


FIGURE 7.15: USER PROMPT TO CONFIRM WARM RESET EXECUTION IN CV TOOL

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

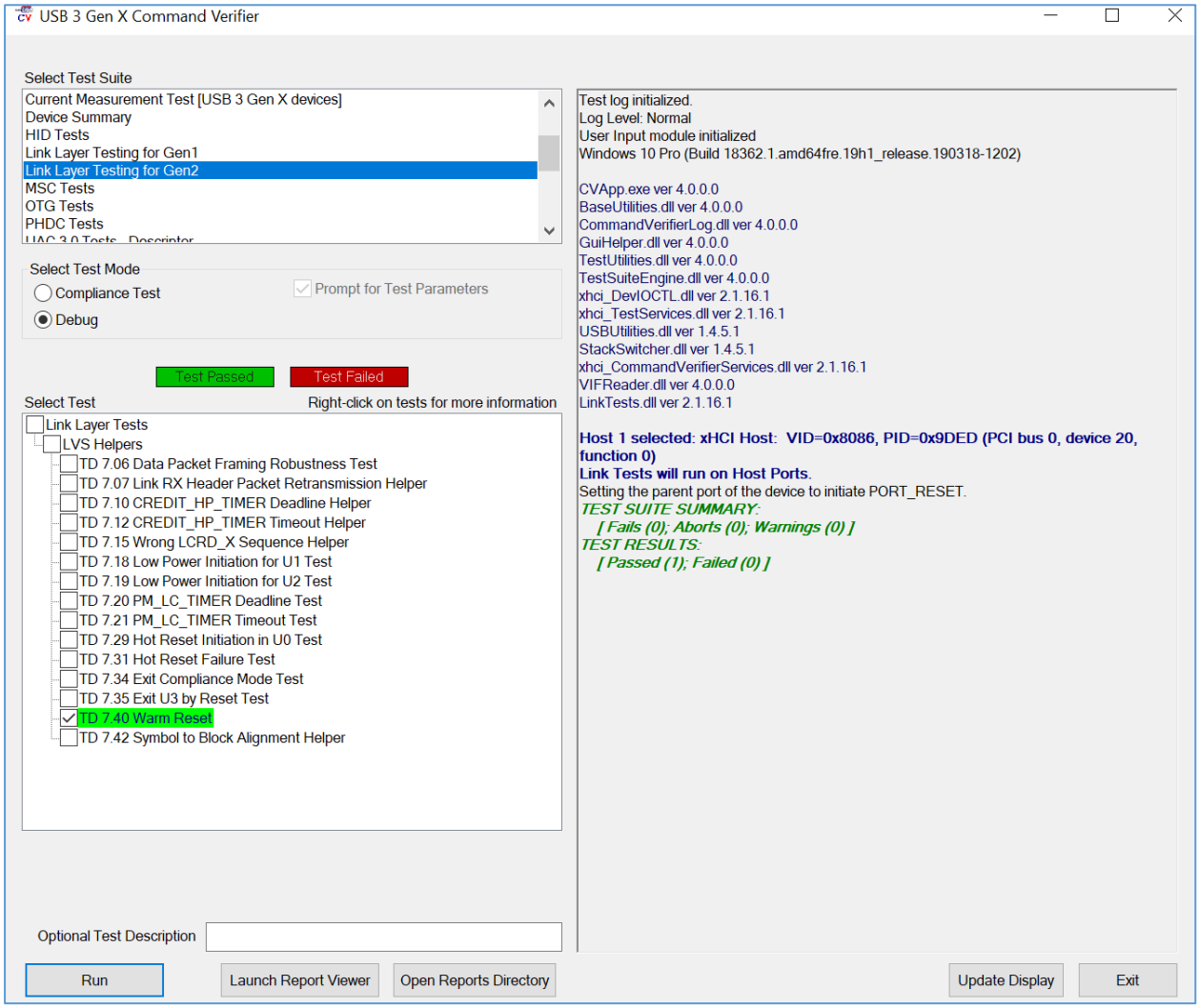


FIGURE 7.16: TEST RESULTS GENERATION IN CV TOOL FOR TD 7.40 WARM RESET TEST

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.

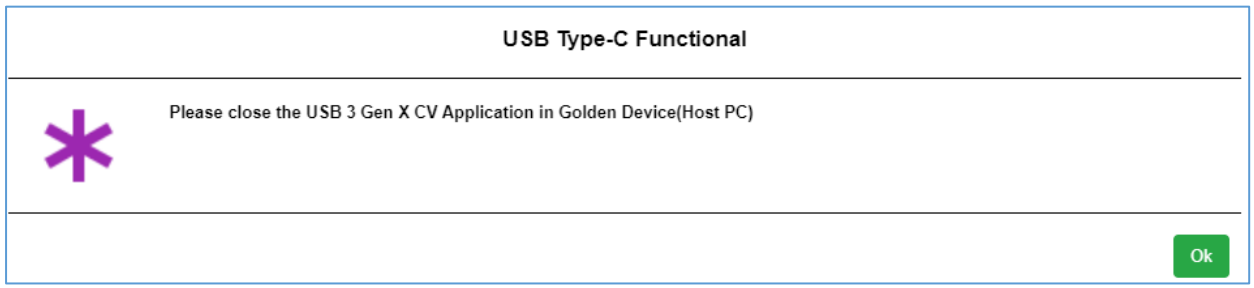


FIGURE 7.17: USER PROMPT TO CLOSE USB 3 GEN X CV APP IN GOLDEN DEVICE

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).

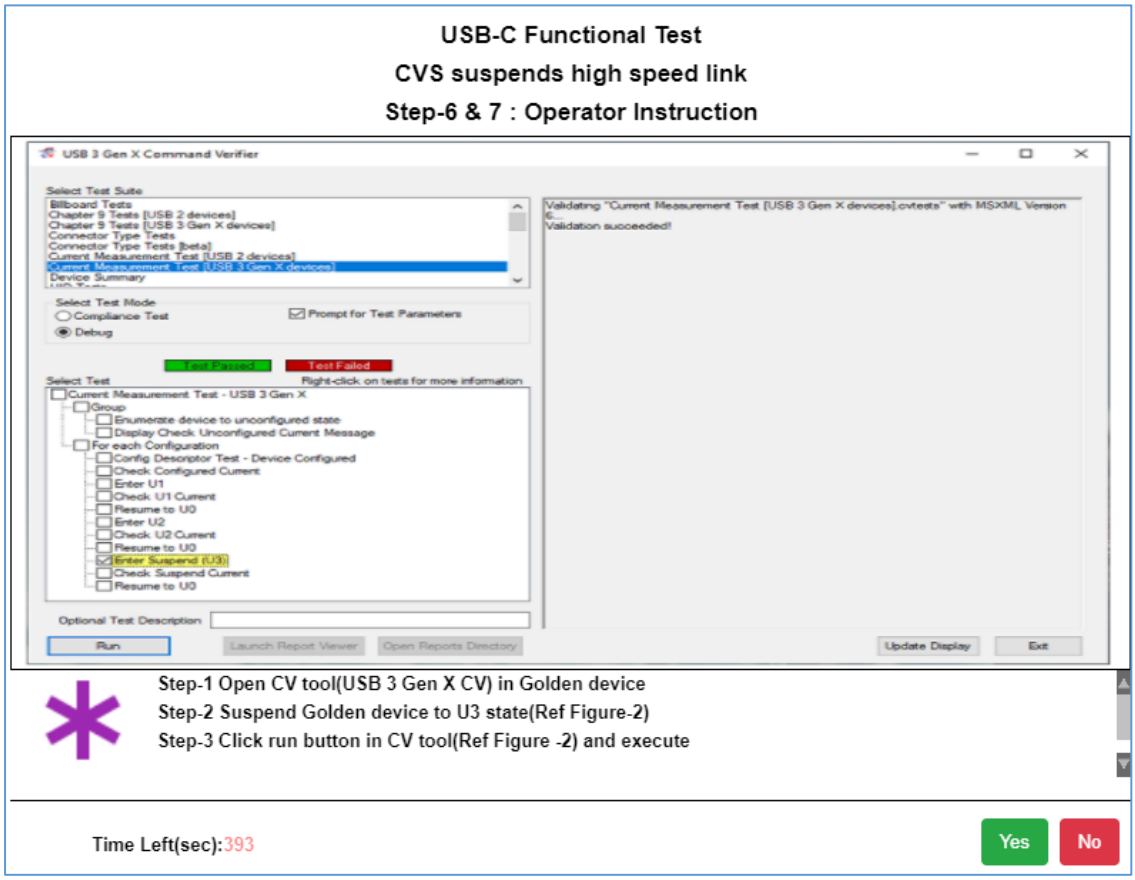


FIGURE 7.18: USER PROMPT TO SUSPEND UUT LINK USING CV TOOL

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.

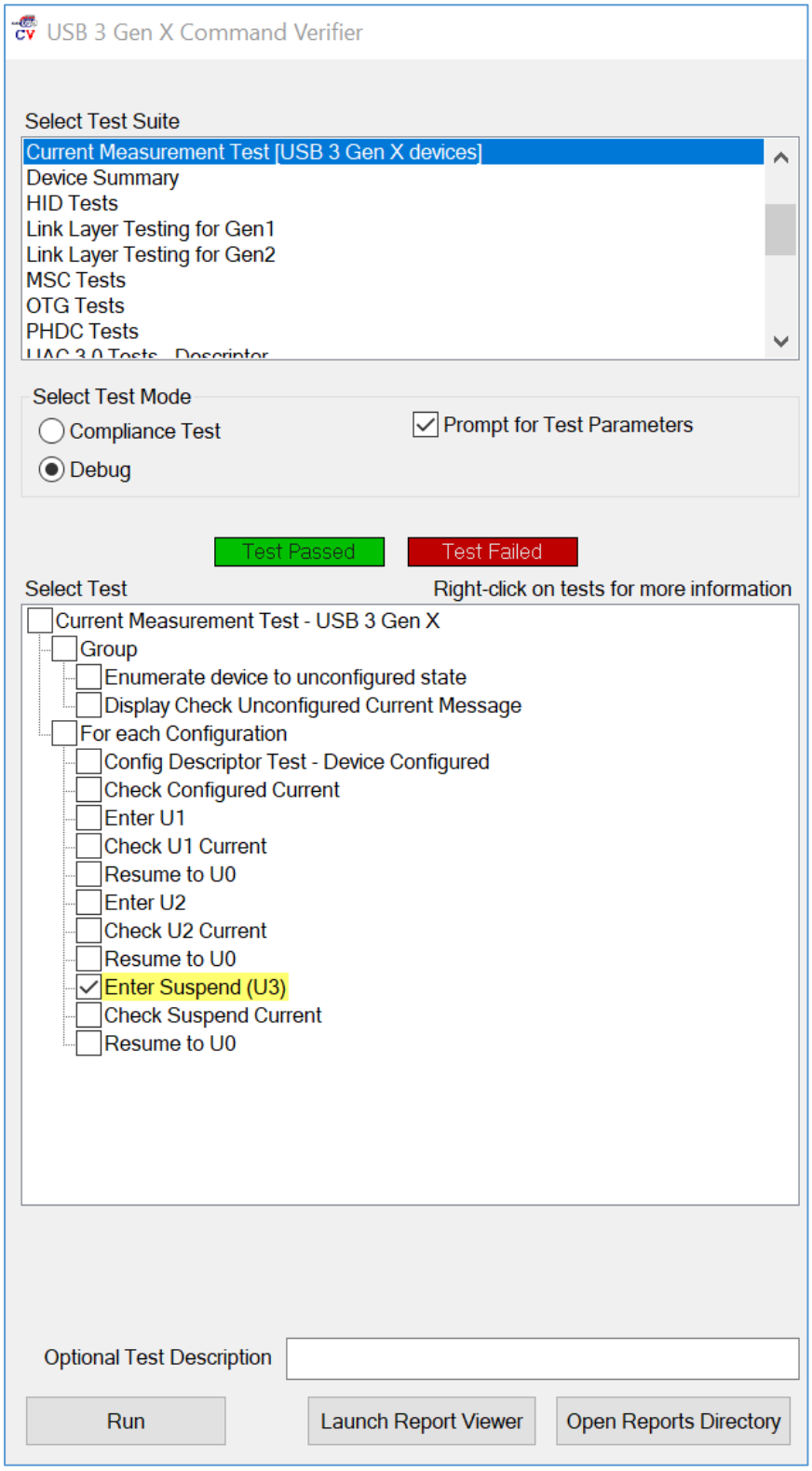


FIGURE 7.19: SELECT AND EXECUTE SUSPEND UUT LINK TEST IN CV TOOL

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