



Granite River Labs

Quick Start Guide

For GRL-V-UP API Test Software Using GRL USB Power Delivery & Data Loopback Volume Tester (GRL-V-UP)

This material is provided as a reference to get started with the Granite River Labs (GRL) GRL-V-UP API Test Software for controlling the GRL USB Power Delivery & Data Loopback Volume Tester (GRL-V-UP).

For customer support, contact support@graniteriverlabs.com.

DISCLAIMER

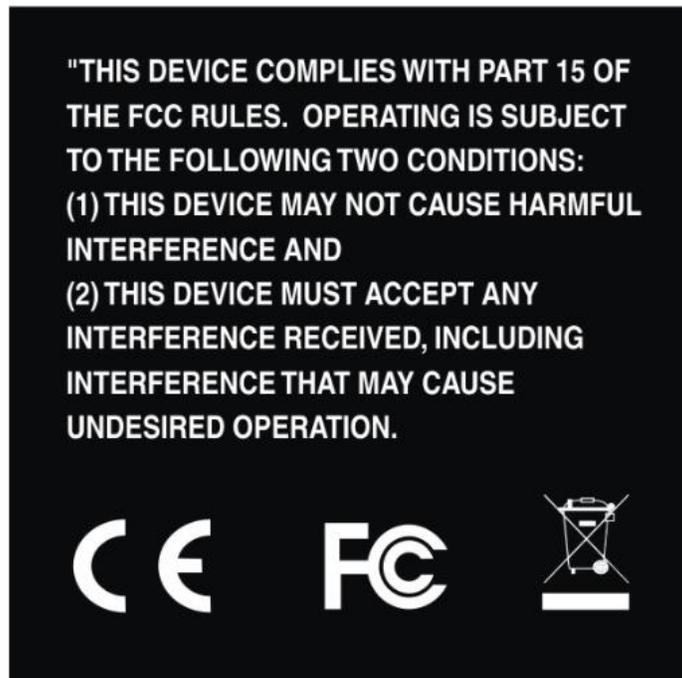
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This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense. Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.



 This symbol indicates that the product should not be discarded as unsorted waste but must be sent to separate collection facilities for recovery and recycling.



Exclamatory mark for 100W consumption.

Warning: The maximum rating for each Tester card in GRL-V-UP is 100W (20V,5A) through Type-C Port. Please do not load beyond the limit.

Safety precautions:

- Care must be taken while lifting and carrying the GRL-V-UP tester.
- There are no serviceable parts inside the GRL-V-UP tester. Unauthorized access to internal parts can lead to safety hazard and void warranty.
- Check power cord for any damages periodically.
- Check power rating before connecting the GRL-V-UP tester to mains.
- Ensure proper earthing of the GRL-V-UP tester.

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1 Product Overview

GRL-V-UP addresses the needs of test engineers with demanding test requirements for their USB Type-C®/PD hosts, hub modules, docks, monitors, and chargers.

Modular and scalable, the V-UP can add up to 10 test cards in a single 3U rack unit chassis. Each test card supports loading of a single 100W USB-C port, or dual 60W USB-C ports. Users can start with any number of test cards and add more cards based on increased testing volume. Additional 3U rack units can be fitted to the same rack to add even greater test capacity.

The GRL-V-UP has an open API which allows test engineers to use their own software (C#, NI Test Stand, Python, etc.) for control or take advantage of easy-to-use software developed by GRL.

Perfect for reliability and environmental chamber testing as well as high volume production testing requirements. Strong thermal airflow design allows for 1000W max to be continuously run per rack unit. USB test times can be designed to be less than a few seconds with a single setup.

2 Acronym/Abbreviation Glossary

USB	Universal Serial Bus
PD	Power Delivery
API	Application Programming Interface
LED	Light Emitting Diode
PPS	Programmable Power Supply
PC	Personal Computer
PD-N	Power Delivery Negotiation
DT-LK	Data Loopback
DUT	Device Under Test

3 Features

- Supports USB PD 2.0 & PD 3.1 PPS negotiation
- Supports USB 2.0 & USB 3.2 Gen 1 (5Gbs) data loopback
- Capable of supporting up to 1000W continuous loading using ten 100W VBUS test cards
- Single 100W VBUS USB-C and Dual 60W VBUS USB-C test cards available
- Add and remove test cards as needed
- Save time by concurrently testing USB PD, VBUS and VCONN (7.5W Max) power, and data with one setup

- Automatic data throughput level monitoring LED's to show USB interface link behavior
- USB control from rack mounted or external PC
- Open API allows hardware control from customer's existing software
- GRL production and validation software can also be used to control the hardware
- All detailed test results saved in database to be reviewed later
- Supports USB Type-C and Type-A ports
- Battery Charging 1.2 and Qualcomm Quick Charge detection and testing
- Voltage sense line available to compensate for IR drop
- Includes calibration board if voltage sense line is not used
- Supports screw based connectors to mechanically latch test cables to test cards

4 Shipping Box Contents

In Box #1:



GRL-V-UP – GRL USB Power Delivery & Data Loopback Volume Tester



Power Cord

In Box #2:

**2x L-Clamp (Big)****2x L-Clamp (Small)**

- 8x M4 X 6 Philips Pan Head Screws
- 12x M4 X 6 Countersunk Screws

In Box #3:

**GRL-USB-PD-TC – GRL Tester Card**

5 Setup of GRL-V-UP Unit

Below is the procedure to set up and attach the GRL Tester Card (GRL-USB-PD-TC) into the GRL-V-UP tester.

1. First loosen the two thumb screws on a dummy face plate slot of the GRL-V-UP tester as shown below.

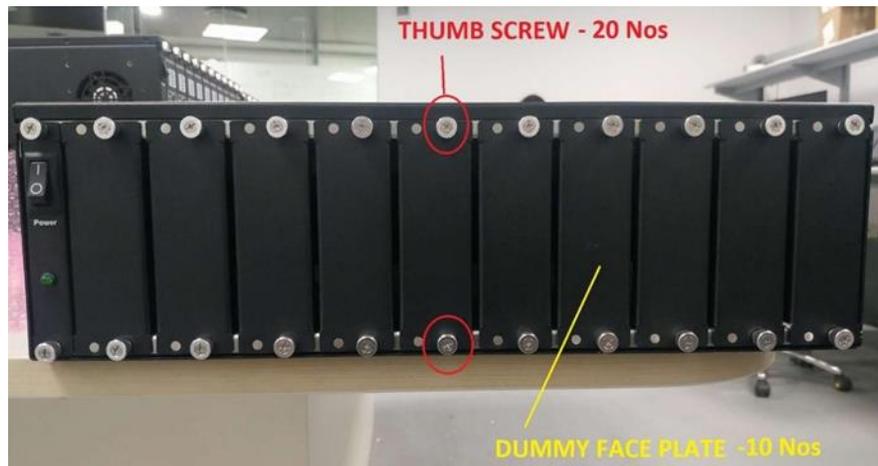


Figure 1. Unscrew GRL-V-UP Tester Dummy Face Plate

2. By holding both the thumb screws, carefully remove the dummy face plate from the tester.
3. Remove the GRL Tester Card from its packaging. Before inserting the tester card into the GRL-V-UP tester, ensure correct orientation using the top and bottom guide pins on the tester card as shown below.



Figure 2. Check Orientation of GRL Tester Card Before Insertion

4. Gently insert the tester card by attaching it firmly to the groove guide as indicated below.



Figure 3. Insert GRL Tester Card Into Tester

5. After inserting the tester card, fasten the thumb screws on the tester card to lock it in.
6. Follow the same procedure as above to add in more tester cards to the other tester slots.

6 GRL-V-UP Power ON and Start Up

Below is the procedure to switch on and start using the GRL-V-UP tester.

1. Plug in the supplied power cord accessory to the AC input power inlet on the back of the GRL-V-UP tester as shown below.

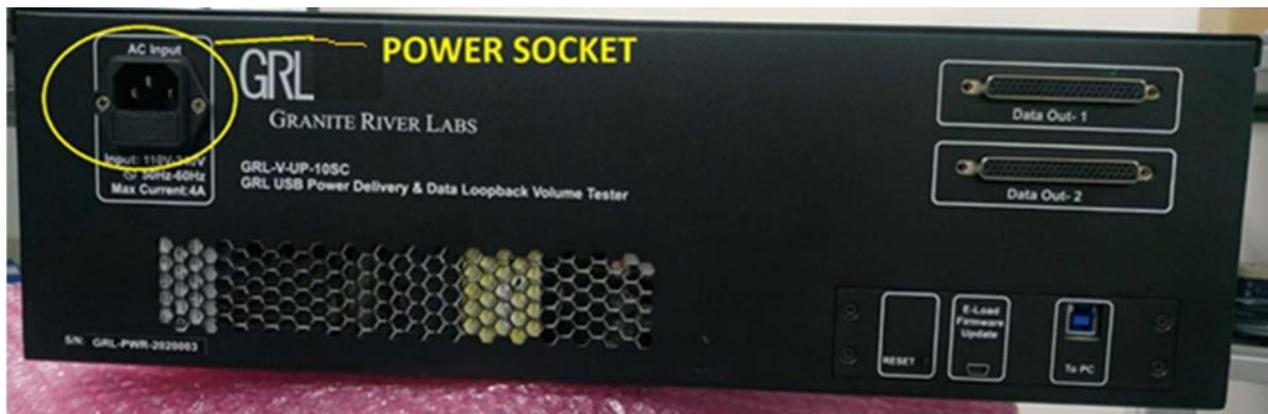


Figure 4. Attach Power Cord to GRL-V-UP Tester

2. Turn ON the power switch on the front of the GRL-V-UP tester as shown below.



Figure 5. Power On GRL-V-UP Tester

3. Make sure that after power ON the Power (Green) LED on each attached tester card is glowing.
4. Check the following to verify proper bootup of each tester card:
 - a. The DT-LK (Green) LED should turn ON initially and then turn OFF.
 - b. After the DT-LK LED has turned off, check that the PD-N (Red) LED blinks twice before it turns OFF.

7 Connection Setup of GRL-V-UP

Figure 6 shows an example hardware setup for testing a USB Type-C/Power Delivery host, hub module, dock, monitor or charger using the GRL-V-UP API Test software running on a control computer and connected via USB to the GRL-V-UP tester that is attached to the USB device to be tested through the tester USB Type-C test port.

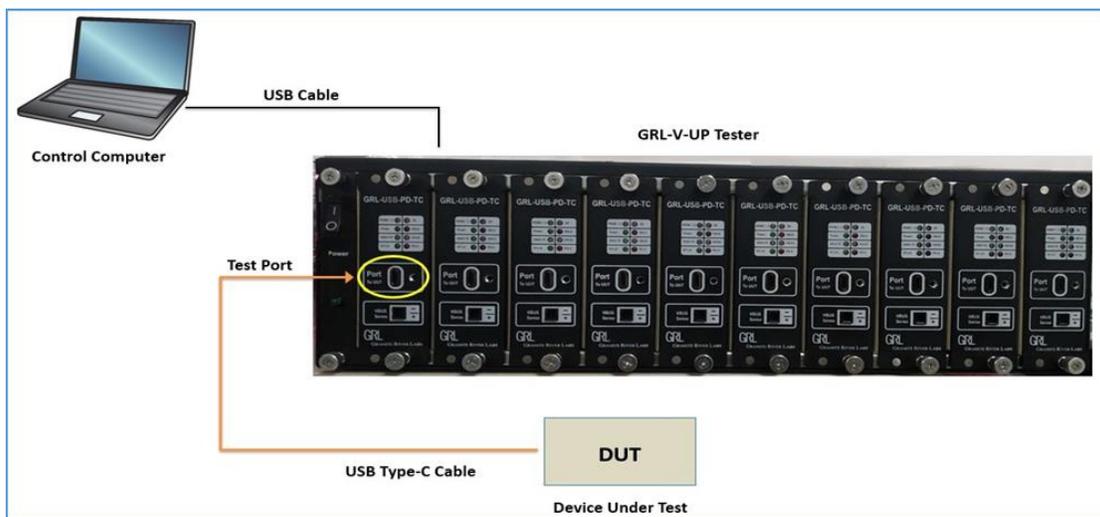


Figure 6. Hardware Connection Setup for GRL-V-UP API Test Software And Device Under Test

The GRL-V-UP API Test software loaded on a Windows 10 computer (note this will be referred to as the control computer here onwards) allows the user to control the operation of the GRL-V-UP tester using API commands. Below is a procedure for connecting the hardware and verifying proper hardware connections.

1. Connect a Power Supply to the GRL-V-UP Tester Power Interface using the power cord accessory included with the tester.
2. Connect the GRL-V-UP Tester to the control computer using a physical USB Type-A to Type-B cable.

Note:

For detailed list of API commands and custom test cases creation, refer to the GRL-V-UP API Help documentation in <http://graniteriverlabs.com/download-center/>.

Procedure:

1. Turn on the GRL-V-UP tester using the Power button on the front of the tester.



Figure 7. Power On GRL-V-UP

2. Make sure the GRL-V-UP tester is powered on and completely booted up, and then connect a USB Type-A to Type-B cable from the GRL-V-UP tester’s USB (To PC) connector to one of the control computer’s USB ports.
3. To make sure the USB connection is set up properly, on the control computer open the Device Manager window from the Control Panel.
4. In Device Manager, from the top menu select “View” → “Devices by connection”. The GRL- V-UP tester should appear in the list if connected properly to the control computer.

8 Getting Started with GRL-V-UP API Test Software

This section describes how to get started with the GRL-V-UP API Test software. If you are installing for the first time, please make sure to follow all the steps in this section to verify your setup prior to testing a DUT (device under test). The procedure is as follows:

1. Download and install the latest version of GRL-V-UP API Test software on the control computer (laptop or desktop) connected to the GRL-V-UP tester hardware. (Note: All the necessary drivers, API libraries and helper functions will also be installed along with the software. The software can also be downloaded and installed from <http://graniteriverlabs.com/download-center/>.)

2. Make sure the GRL-V-UP tester hardware has been updated to the latest firmware version.

If this procedure is followed and any issues arise, please contact support@graniteriverlabs.com.

8.1 Install GRL-V-UP API Test Software

1. Download the GRL-V-UP API Test software from: <http://graniteriverlabs.com/download-center/>.

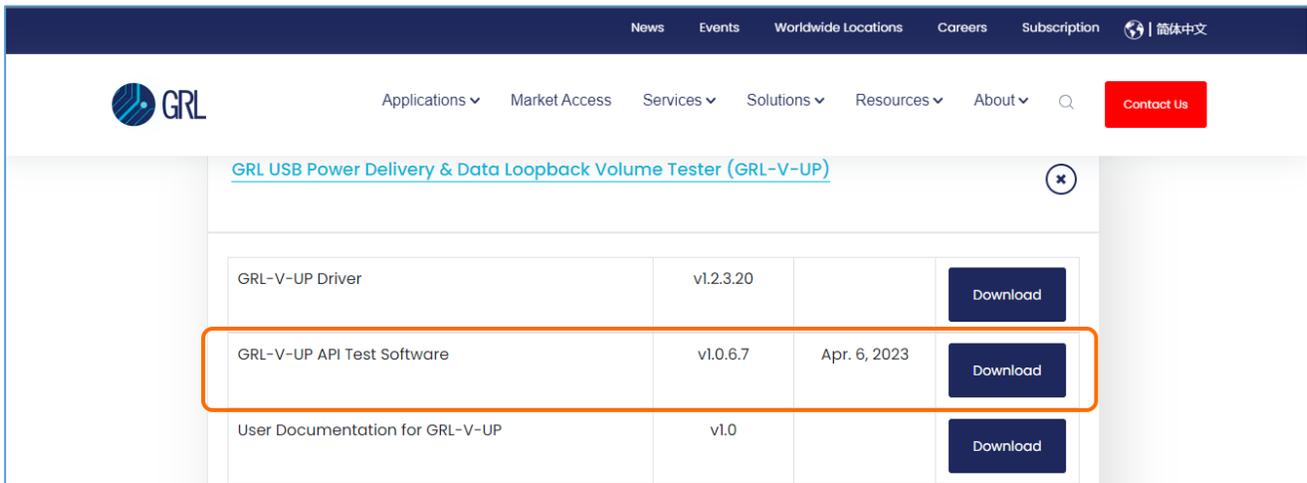


Figure 8. GRL Support Download Center Page

2. On the Windows 10 control computer to be used for running the GRL-V-UP API Test software, create a folder and download the software installer compressed archive (ZIP file).
3. On the Download Center page, select the “Download” button associated with the latest GRL- V-UP-API Test software version.
4. Save the ZIP archive in a convenient folder and extract the GRL-V-UP API Test software installer by right-clicking the downloaded archive and selecting “Extract All”.
5. Run the installer by double-clicking the extracted executable.

- Make sure to click “Yes” when the system prompt asks if you want to allow the installer to make changes to your system. Then follow the on-screen instructions to run installation for the GRL-V-UP API Test software.

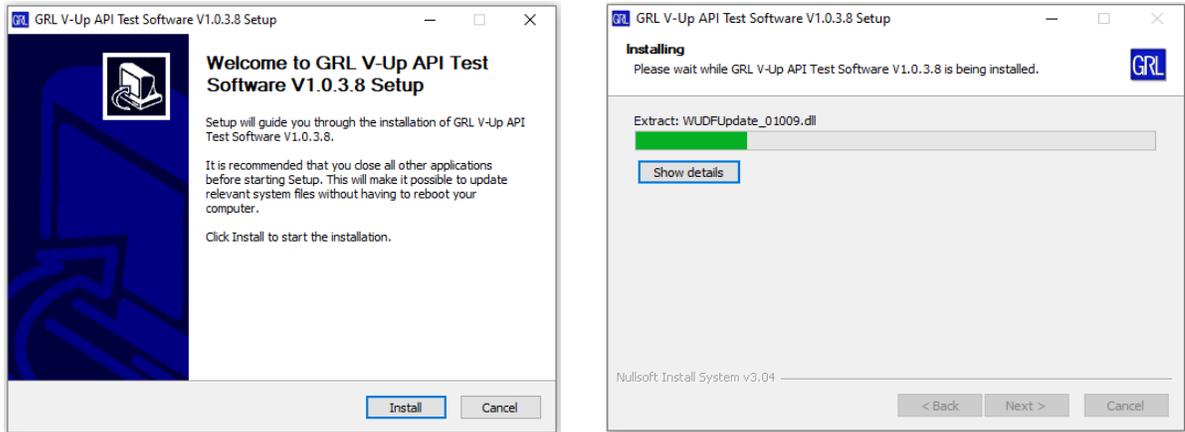


Figure 9. GRL-V-UP API Test Software Installation In Progress

- While installation is running, a Command prompt window for GRL-V-UP USB driver installation will pop up as shown in Figure 10 below. Type “YES” and press the “Enter” key to install the USB drivers. Once the drivers have been installed, the user will be asked to press any key as shown in Figure 11. This will complete the driver installation and will proceed to begin installation for GRL-V-UP Arduino drivers.

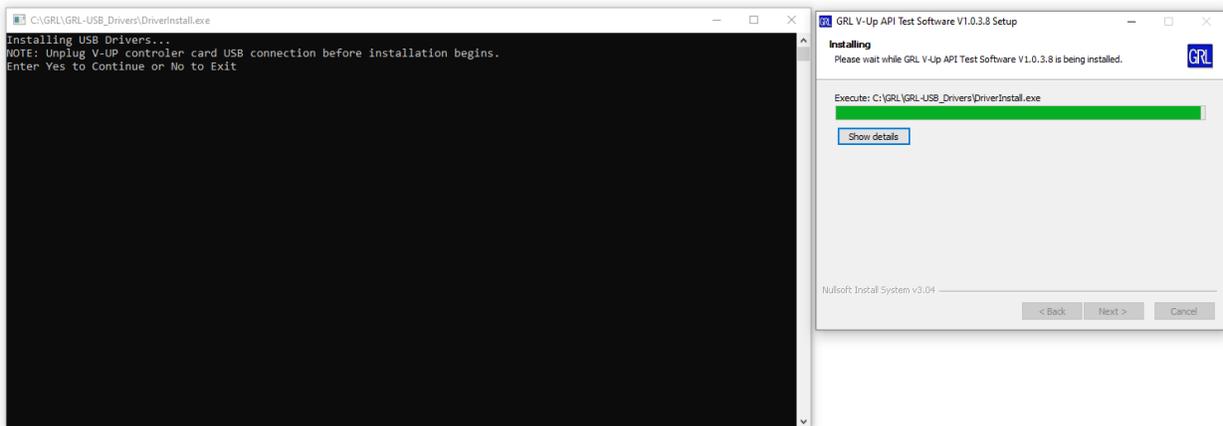


Figure 10. GRL-V-UP USB Drivers Installation in Progress #1

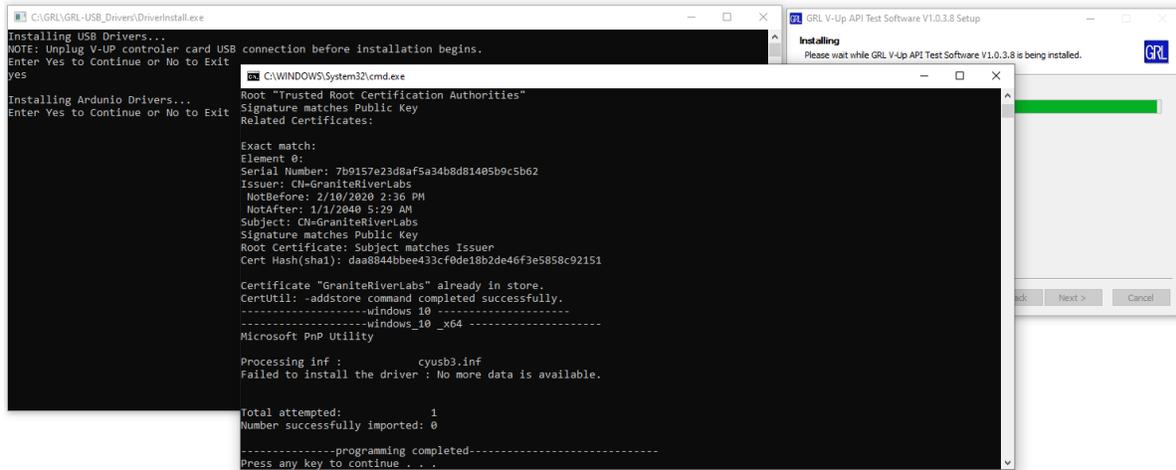


Figure 11. GRL-V-UP USB Drivers Installation in Progress #2

8. When prompted for GRL-V-UP Arduino driver installation as shown in Figure 12 below, type “YES” and press the “Enter” key to install the drivers.

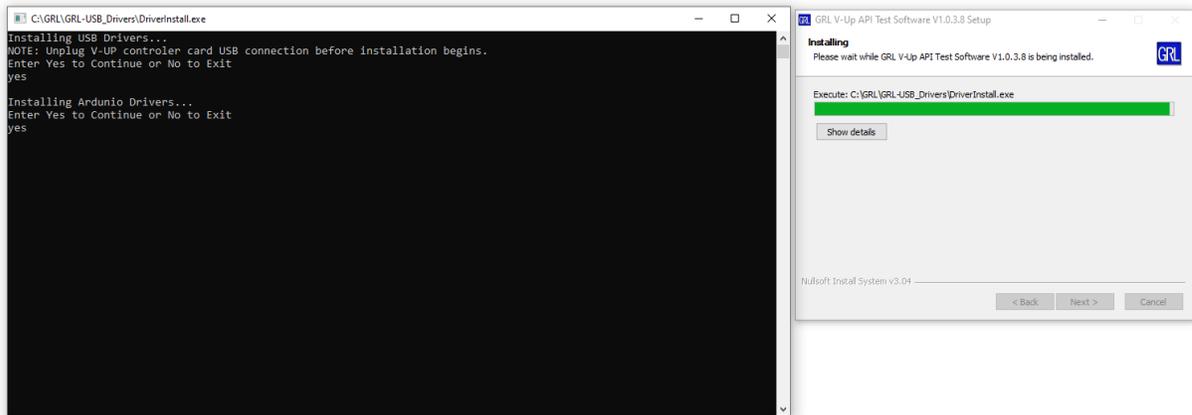


Figure 12. GRL-V-UP Arduino Drivers Installation in Progress

9. Once the driver installation has completed, click on the “Finish” buttons to complete the GRL-V-UP API Test software installation as shown in Figure 13.

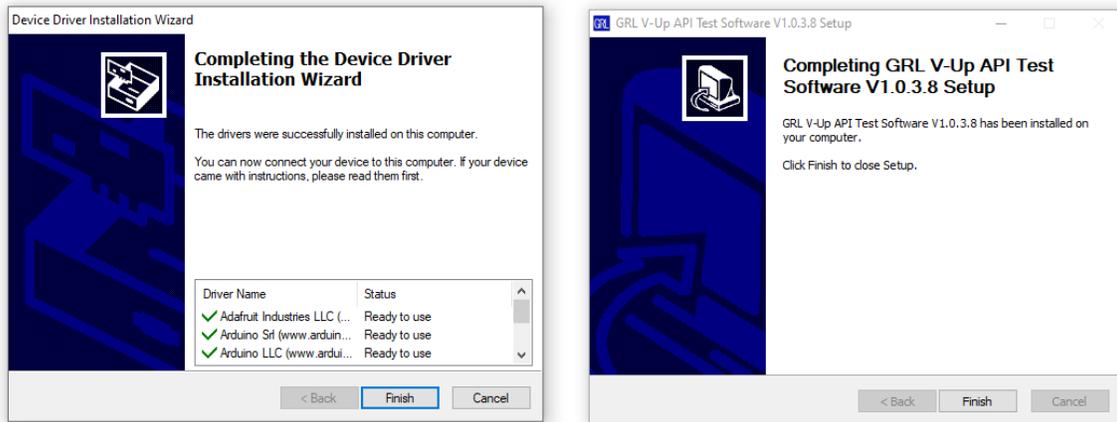


Figure 13. GRL-V-UP API Test Software Installation Completed

9 Start Up and Navigate GRL-V-UP API Test Software

Once installed, launch the GRL-V-UP API Test software as described below.

9.1 Connect & Start Up GRL-V-UP API Test Software

Follow the steps below to connect and start using the GRL-V-UP API test software:

1. Open the GRL-V-UP API test software and connect the GRL-V-UP tester to the control computer using a USB Type-A to Type-B cable. Figure 14 below shows no connection has yet to be established with the tester.

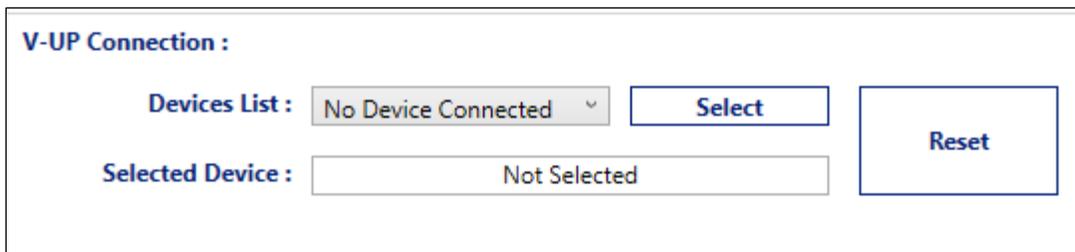


Figure 14. GRL-V-UP API Test Software Showing No Connection Establishment with Tester

2. Check the connection establishment between the Host and Device as shown in Figure 15 below.

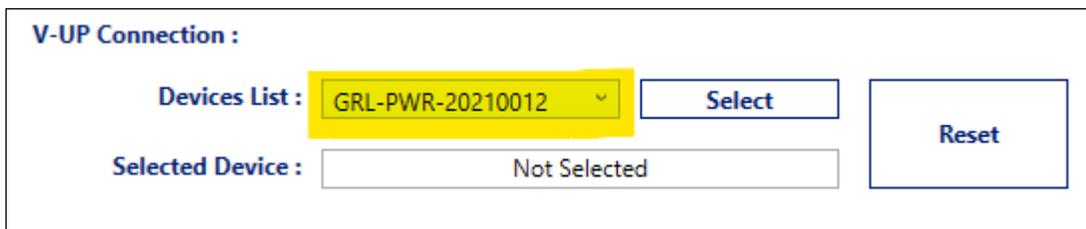


Figure 15. Check Connection Establishment Between Host and Device

3. Select the Device by clicking on the **Select** button as shown in Figure 16 below.

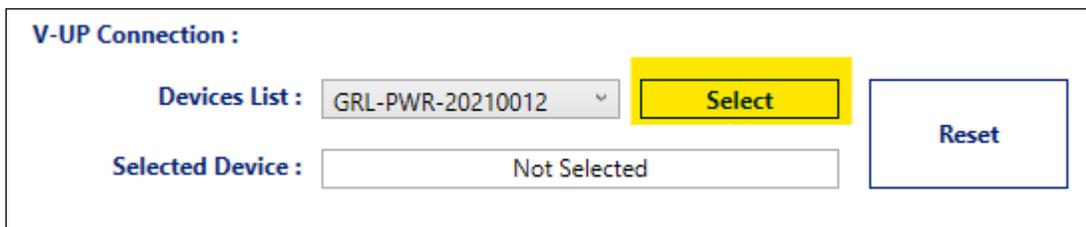


Figure 16. Select Device

4. Check the Device status after clicking on the Select button to verify whether the detected device is selected or not as shown in Figure 17 below.



Figure 17. Check Selected Device Status

- Observe the LED's in the GRL-USB-PD-TC tester card after connecting the Device as shown in Figure 18 below.

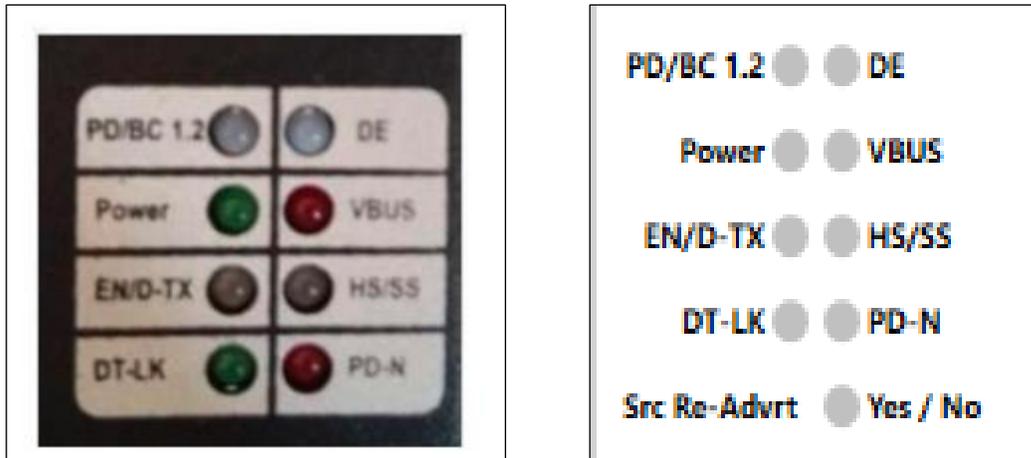


Figure 18. Observe LED's in GRL-USB-PD-TC Tester Card

- Power LED** should turn **ON** for all attached GRL-USB-PD-TC tester cards.
- DT-LK LED** should turn **ON** and then turn **OFF**.
- After the DT-LK LED turns off, check that the **PD-N (Red) LED** blinks twice and then turns OFF.
- LED specifications:

LED Type	LED Name	Functionality	Indication
Dual Color	PD/BC 1.2	USB Power Delivery or USB BC 1.2 mode indication	Red for USB Power Delivery mode
			Green for USB BC 1.2 mode
Dual Color	DE	Data error indication	Red indicates data error in data loopback and firmware update
			Green indicates no error in data loopback and firmware update
Single Color	Power	Tester card power on indication	Green indicates that the tester card is powered on
Single Color	VBUS	VBUS status indication	Red indicates that VBUS is present

Dual Color	EN/D-TX	Main link communication indication	Red indicates that enumeration is successful for data loopback
			Green indicates that data transmission is in progress for data loopback
Dual Color	HS/SS	Link speed indication	Red indicates High Speed for the USB Type-C 2.0 cable
			Green indicates Super Speed for the USB Type-C 3.0 cable
Single Color	DT-LK	Data loopback indication	Green with blinking indicates that data transmission is happening during firmware update
Single Color	PD-N	USB Power Delivery negotiation indication	Red indicates that USB Power Delivery negotiation is successful

Virtual indication on the GRL-V-UP API software user interface:

Indication Type	Indication Name	Functionality	Indication
Single Color	Src Re-Advrt	Source capabilities re-advertise indication	Green indicates when the DUT Source capabilities re-advertise from actual

There are four main tabs on the left of the GRL-V-UP API software screen as follows:

- API
- Graph
- Loopback
- Help

Each of these tabs will display its respective functional screen when selected.

9.2 API Tab

Select this tab to access all API components for controlling the GRL-V-UP tester hardware.

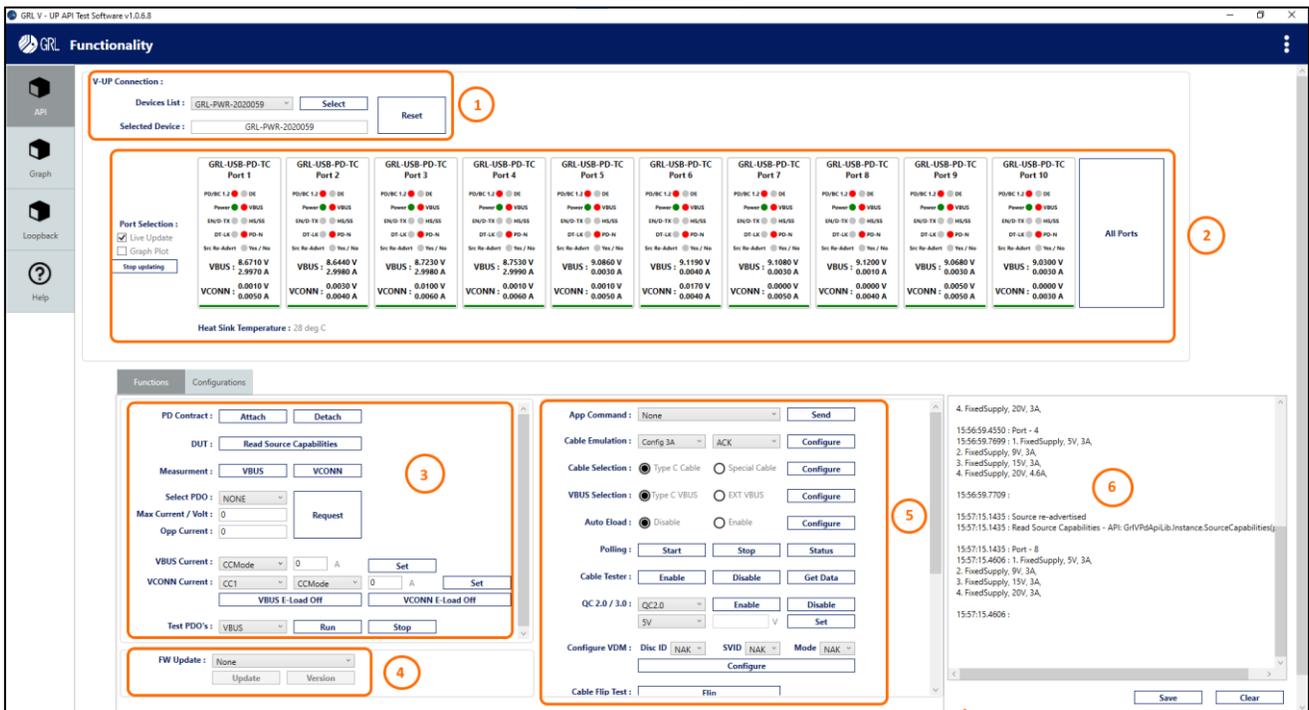


Figure 19. GRL-V-UP API Test Software API Tab Screen

Below describes each pane (as numbered in Figure 19 above) on the API tab screen:

9.2.1 (1) GRL-V-UP Connection Pane

In this pane the user can select to control a GRL-V-UP tester unit connected to the control computer from the **Devices List** drop-down menu. Click on the **Select** button and the selected tester unit will be displayed in the **Selected Device** field. The user can also perform a reset for the selected tester unit by clicking on the **Reset** button.

9.2.2 (2) GRL-V-UP Port Selection & Live Data Update Pane

In this pane the user can select active tester card port(s) on the GRL-V-UP tester or all ports (by clicking on the **All Ports** button) to perform live data update and plot graphs.

- Select the **Live Update** checkbox and click on the **Update Data** button to perform live updates of all LED components on the tester cards, VBUS voltage & current, VCONN voltage & current, Source Re-Advertise and Heat Sink Temperature data of the tester for the selected port(s).
- Select the **Graph Plot** checkbox and click on the **Update Data** button to plot live graph traces for the selected port(s). The graph trace plots can be viewed in the Graph tab (see Section 9.3).

9.2.3 (3) GRL-V-UP USB Power Delivery Programming Pane

In this pane the user can perform USB Power Delivery (PD) related operations such as Attach / Detach the DUT during PD contract negotiation, read the Source Capabilities of the DUT, request PDO's, set Load current and test PDO's.

9.2.4 (4) GRL-V-UP Firmware Update Pane

In this pane the user can select from the **FW Update** drop-down menu to perform firmware updates for the controller card, tester card, USB Power Delivery controller and E-Load on the GRL-V-UP tester. Click on the **Update** button to start updating the firmware for the selected component.

The user can also click on the **Version** button to verify the current firmware version on the GRL-V-UP tester. Alternatively, the user can access through the Help tab screen as shown in Figure 4.2 below.

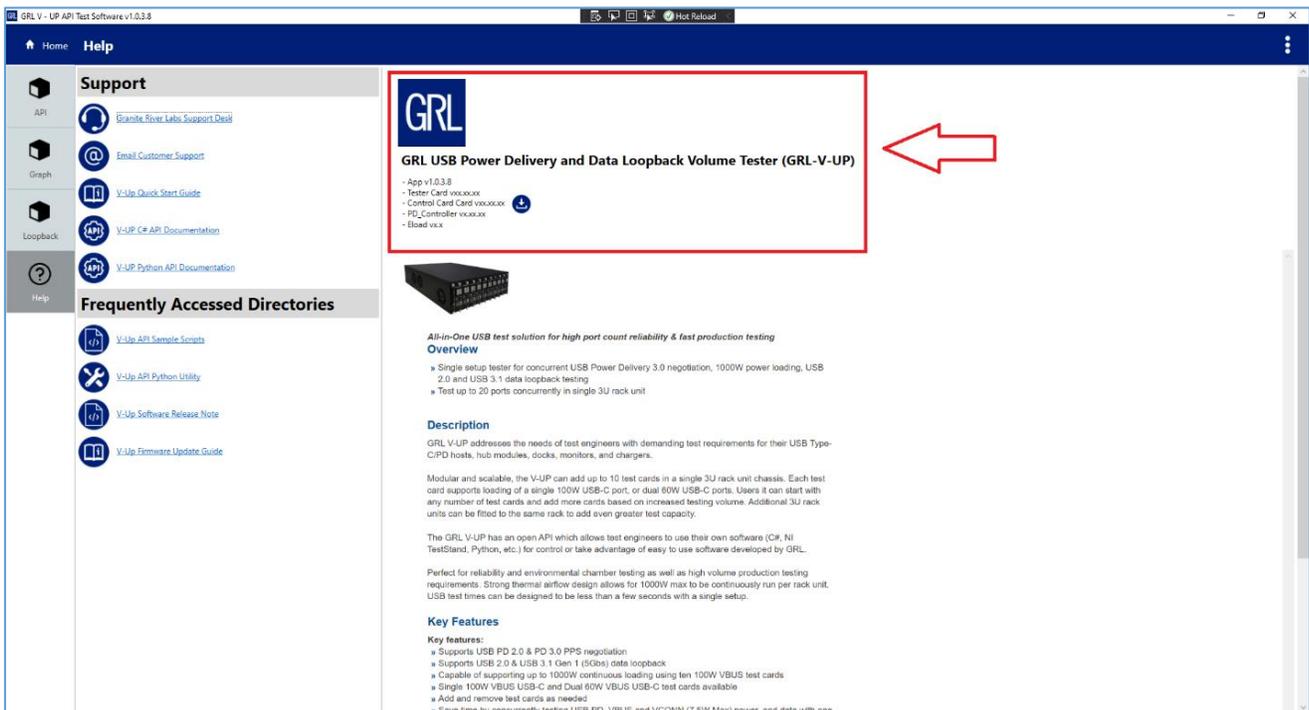


Figure 20. Check Firmware Version on GRL-V-UP API Test Software Help Tab Screen

9.2.5 (5) GRL-V-UP Miscellaneous API Configuration Pane

In this pane the user can configure and apply various API controls / functionalities such as controller fan switch, tester card power, USB cable selection, VCONN switch and so on.

9.2.6 (6) GRL-V-UP API Activity Log Pane

This pane will display a log of all user activity carried out through the API Tab screen.

9.3 Graph Tab

Select this tab to view a graphical representation of the VBUS voltage & current for all active ports on the GRL-V-UP tester hardware. The user can also select to view traces for specific ports using the checkboxes at the top right of each graph plot.

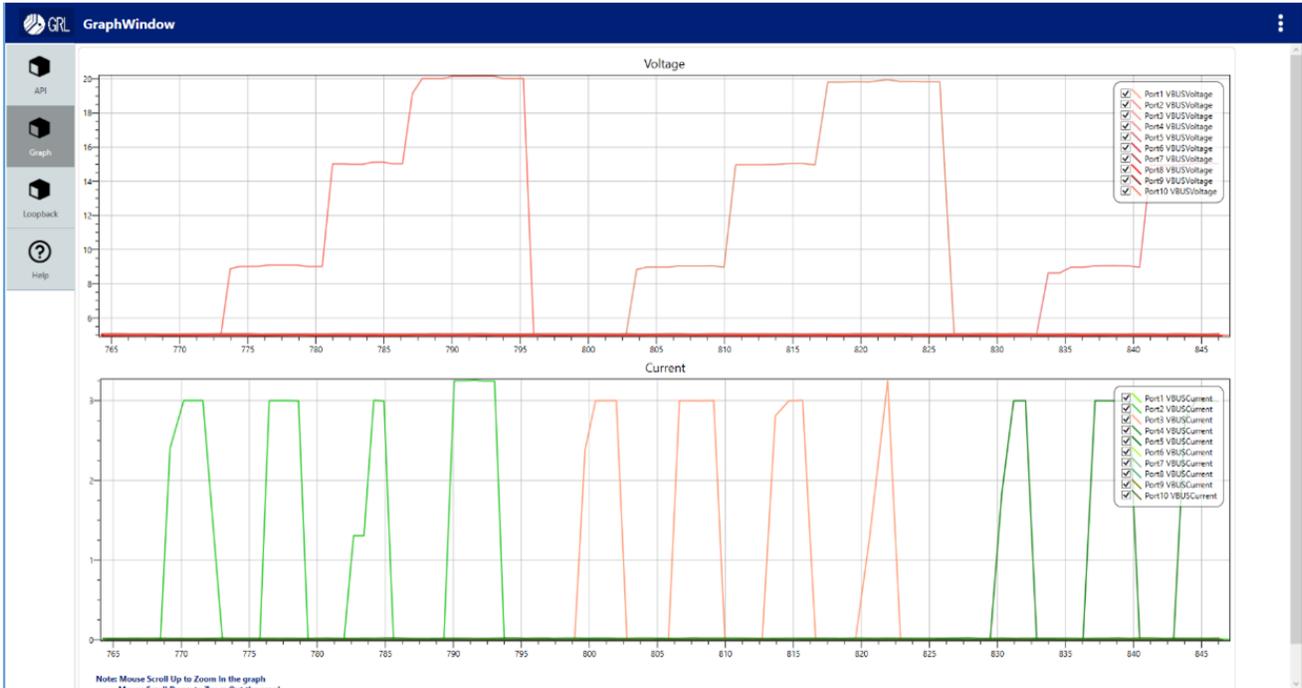


Figure 21. GRL-V-UP API Test Software Graph Tab

9.4 Loopback Tab

- a. Select this tab to perform data loopback testing.
- b. The user can select from the **Devices List** drop-down menu the DUT's with loopback capability that are connected to the tester cards on the GRL-V-UP tester.
- c. Click on the **Select** button and the selected loopback device will be displayed in the **Selected Device** field.
- d. Click on the **Start** button to run the loopback testing and **Stop** button to terminate the process.
- e. The data transfer, speed and status will be updated continuously as the loopback test is running.

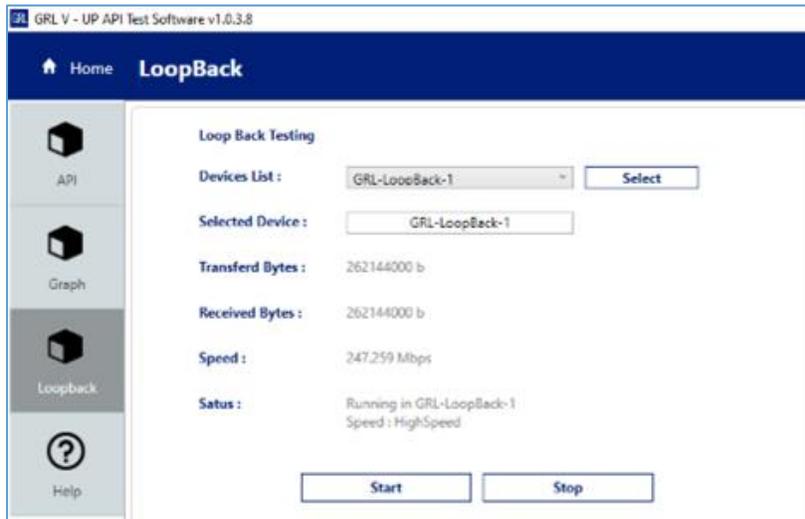


Figure 22. GRL-V-UP API Test Software Loopback Tab Screen

Refer to Section 9.23 for more details on how to perform loopback testing in this tab.

9.5 Help Tab

Select this tab access GRL support information as well as related documentation, C# & Python API user documentation, sample scripts, software release notes, firmware update documentation and latest firmware released version.

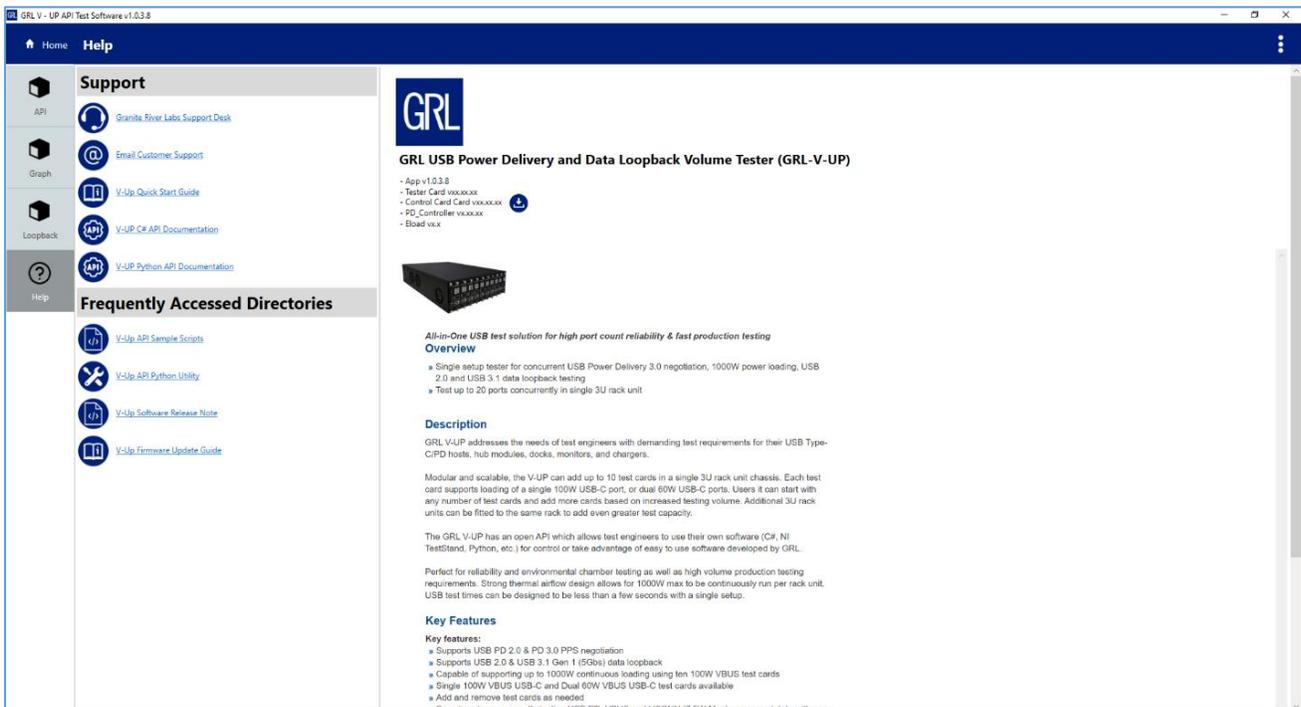


Figure 23. GRL-V-UP API Test Software Help Tab Screen

9.6 API Tab Functions

9.6.1 Attach/Detach Unit-Under-Test (DUT) and Device

1. Check the USB Power Delivery contract between the DUT and Device (connect any USB Type-C power charger that supports multiple PDO's and APDO's if available).
2. Select the Port connected with the USB Type-C charger.
3. In the "PD Contract" field, click on the **Detach** button to terminate the connection between the DUT and Device. See Figure 24 and Figure 25 below.



Figure 24. API Tab Functions Attach/Detach Functions

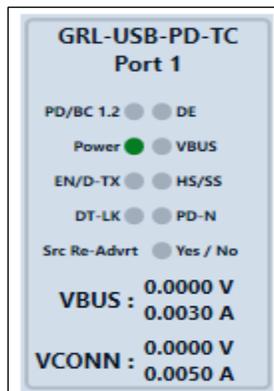


Figure 25. Port in Detach Mode

4. Click on the **Attach** button to establish the connection between the DUT and Device. See Figure 26 below.

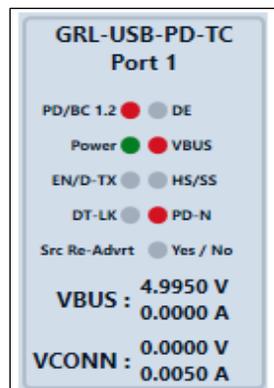


Figure 26. Port in Attach Mode

9.6.2 Read DUT Source Capabilities

1. Select any Port and connect the USB Type-C charger.
2. In the “DUT” field, click on the **Read Source Capabilities** button as shown in Figure 27 below and check the output window/ API activity log pane.



Figure 27. API Tab Functions Read Source Capabilities of DUT

3. The Source Capabilities are read from the DUT and observed in the output window/ API activity log pane as shown in Figure 28 example below.

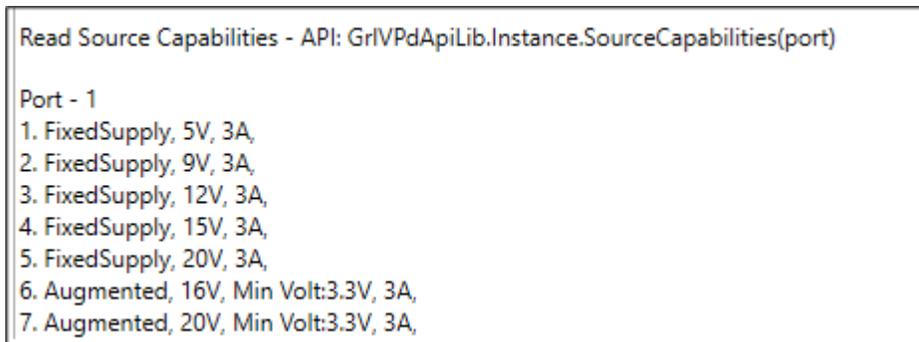


Figure 28. DUT Source Capabilities Detected and Read Example

9.6.3 Select PDO's

1. Select the PDO's one by one using the **Select PDO** drop-down field and request for voltage by clicking on the **Request** button, as shown in Figure 29 below.

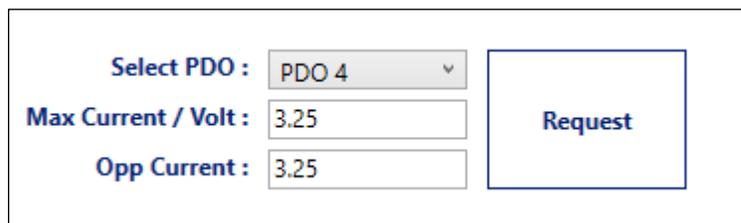


Figure 29. Select PDO and Request for Voltage

2. Observe that the requested values are displaying the output power properly as shown in Figure 30 below.

Note: If you have selected multiple ports, the last selected port source capabilities will be displayed in the drop-down box.

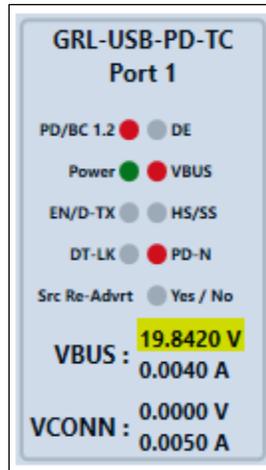


Figure 30. Observe Output Power

9.6.4 Check VBUS Current

1. Check the VBUS current by requesting the input current DUT provided capability (max current should be within 6 A) and click on the **Set** button. See Figure 31 below.



VBUS Current : CCMode A

Figure 31. Set VBUS Current

2. Observe the input current being displayed in the polling as shown in Figure 32.

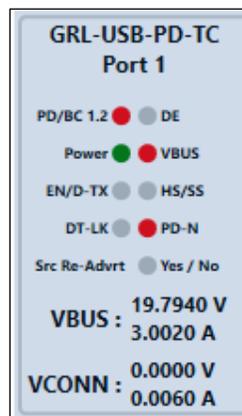


Figure 32. Check VBUS Current

9.6.5 Check VCONN Current

Note: The GRL-SPL-CABLE passthrough cable is required to check the VCONN voltage and current loading.

1. Set VCONN current by requesting the current, for example within 1 A and click on the **Set** button.
2. Observe the requested current being displayed in the polling as shown in Figure 33 example below.

Figure 33. Check VCONN Current

Note: Before performing this function, check for the Active CC line by sending the PD_Contract_Negotiation_Status command. Based on that, draw the E-Load in CC1 or CC2.

3. After verifying the VBUS and VCONN current, set the VBUS and VCONN current to 0 and turn off both the VBUS and VCONN E-Load's by clicking on the **VBUS E-Load Off** and **VCONN E-Load Off** buttons respectively as shown in Figure 34 below.

Figure 34. Turn Off VBUS and VCONN E-Loads

9.6.6 Check VBUS and VCONN Measurements

Check the VBUS and VCONN measurements by clicking on the VBUS and VCONN buttons respectively (as shown in Figure 35) to ensure the polling current and voltage values are measured accordingly. The measurement results will be displayed in the output window/API activity log pane.

Figure 35. Check VBUS and VCONN Measurements

9.7 PDO Testing

9.7.1 VBUS Load Test

The following procedure describes how to test VBUS load for each port of the attached GRL-V-UP GRL-USB-PD-TC tester cards.

1. Select the port which you are going to perform the VBUS load test (as shown in Figure 36 below) and connect the USB Power Delivery source DUT with a USB Type-C cable to the GRL-USB-PD-TC tester cards.
2. Then, verify that the PD-N, VBUS & PD/BC1.2 LED's are turned ON and glowing red, as shown in Figure 37 below.
3. Under the “Port Selection” field, select the **Live Update** checkbox and click on the **Update Data** button. This enables you to view the live polling data in each port and Graph plot as well.

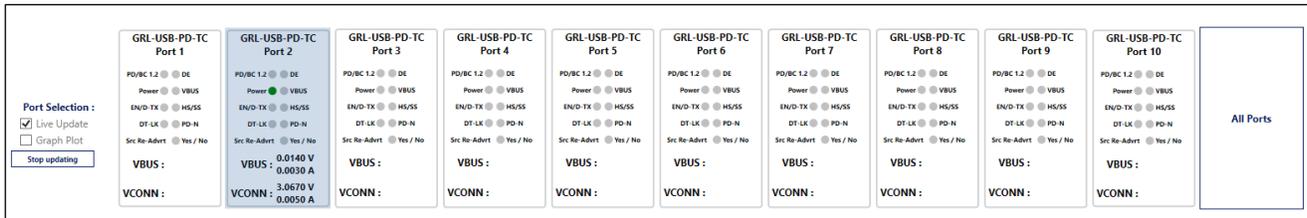


Figure 36. Select Port for VBUS Load Test

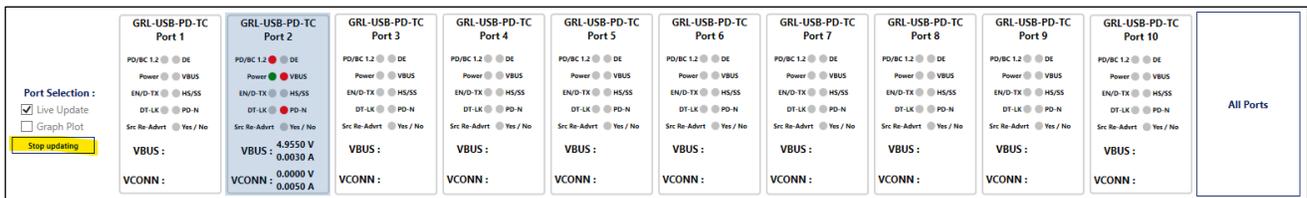


Figure 37. Check PD-N, VBUS & PD/BC1.2 LED's

4. Then, click on the **Run** button as shown in Figure 38 below and observe the measurements in the output window/API activity log pane.



Figure 38. Run and Observe Measurements

5. After the test run has completed successfully, check that the measurements are recorded and saved to the following path— `C:\GRL\GRL-VSeries\Reports`.
6. Repeat the above steps for all the 10 GRL-USB-PD-TC tester cards and at the same time, check that the **Stop** button is working properly as well.

Note: In the Reports folder, you can find the latest generated report file with date and time.

9.7.2 VCONN Load Test Using GRL-SPL Cable

The following procedure describes how to test VCONN load using the GRL-SPL cable.

1. Select **Special Cable** in the Cable Selection field and click on the **Configure** button as shown in Figure 39 below.



Figure 39. Select Special Cable

1. Select the port which you are going to use for the VCONN load test, as shown in Figure 40.
2. Connect the USB Power Delivery source DUT with the GRL-SPL cable to the GRL-USB-PD-TC tester cards and verify that the PD-N, VBUS & PD/BC1.2 LED's are turned ON and glowing red, as shown in Figure 41 below.

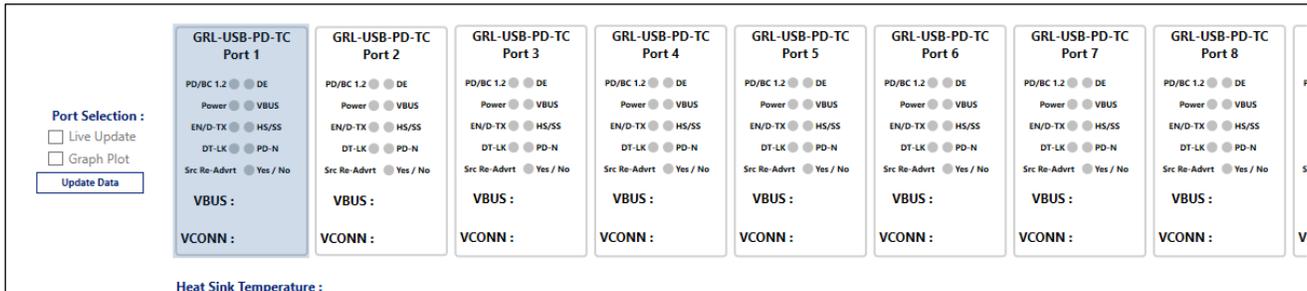


Figure 40. Select Port for VCONN Load Test

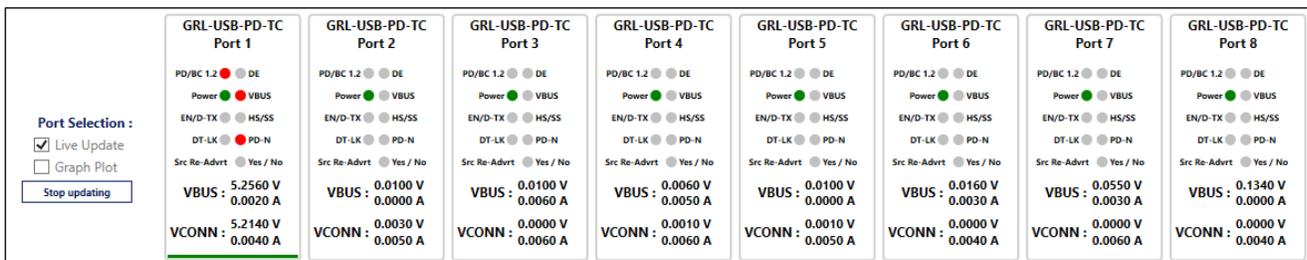


Figure 41. Check PD-N, VBUS & PD/BC1.2 LED's

3. After the test run has completed successfully, check that the measurements are recorded and saved to the following path— `C:\GRL\GRL-VSeries\Reports`.

Note: In the Reports folder, you can find the latest generated report file with date and time.

4. Repeat the above steps for all the 10 GRL-USB-PD-TC tester cards.

9.8 App Command



Figure 42. App Command

The App Command function is used to verify the various checkpoints by selecting and clicking on the **Send** button. It comprises the following functions:

- a. Turn ON fan
- b. Turn OFF fan
- c. Tester card fan ON
- d. Tester card fan OFF
- e. Loopback Information
- f. Control card SI no
- g. Tester card SI no
- h. PD Contract negotiation status
- i. Physical Link error count
- j. Error count reset
- k. USB 3.0 & 2.0 De-emphasis
- l. Get Heat sink temperature
- m. Source Caps extended
- n. Get PDC event Log
- o. PDC clear event log
- p. Change E-Load port
- q. DUT Firmware version

- a. **Turn_ON_Fan:** Select the **Turn ON Fan** command and click on the **Send** button. Observe that the E-Load fans are turned ON.
- b. **Turn_OFF_Fan:** Select the **Turn OFF Fan** command and click on the **Send** button. Observe that the E-Load fans are turned OFF.
- c. **TC_FAN_ON:** Select any Port that you want to turn ON the GRL-USB-PD-TC tester card fan and click on the **Send** button. Observe whether or not the selected port for the tester card fan is turned ON.
- d. **TC_FAN_OFF:** Select any Port that you want to turn OFF the GRL-USB-PD-TC tester card fan and click on the **Send** button. Observe whether or not the selected port for the tester card fan is turned OFF or not.
- e. **LoopBack_Info:** Select any Port and connect the data-shared DUT and then select the LoopBack Information command and click on the **Send** button. Observe the output window for the loopback information.

- f. **Control_card_SIno**: Select this command and click on the **Send** button. Observe the output window for the Control card SI number, revision number & Backplane board SI number.
- g. **Tester_card_SIno**: Select this command and click on the **Send** button. Observe the output window for the Tester card SI number and revision number. Also make sure to select the ports.
- h. **PD Contract_negotiation_status**: Select any Port and connect the charger and select the PD contract negotiation command and click on the **Send** button. The USB Power Delivery contract negotiation details will be updated in the output window.
- i. **Physical_Link_error_count**: Select any Port and check for data error count between the GRL-V-UP tester and host by sending this command and clicking on the **Send** button. Observe the output window for the error count.
- j. **Error_count_reset**: Select any Port and the **ErrorCountReset** command and click on the **Send** button. Observe the output window for the error count to reset to zero.
- k. **USB 3.0/20 De-emphasis**: USB de-emphasis is commonly used to compensate for loss occurring along the transmission path within the cables. *[This is for debug purposes.]*
- l. **Get_Heat_sink_temperature**: Select this command and click on the **Send** button. Observe the measured Heat sink temperature in the output window.
- m. **Source_Caps_extended**: Select this command to request additional information about a Port's (DUT) source capabilities.
- n. **Get_PDC_event_Log**: Select this command and click on the **Send** button, which will generate the PDC event log file. *[This is for debug purposes.]*
- o. **PDC_clear_event_log**: Select this command and click on the **Send** button. Check whether or not the PDC event Log has cleared the bits. *[This is for debug purposes.]*
- p. **Change_Eload_port**: This command is used for specific tester port E-Load debug purposes.
- q. **DUT_Firmware_version**: Select this command to view the Firmware version of the DUT. *Note that this feature will only be accessible for specific DUT's.*

9.9 Cable Emulation

Configure the GRL-V-UP tester as a cable emulator (not applicable for the E-marker cable) between the 3 A to 5 A range. Click on the **Configure** button. Refer Figure 43 below.

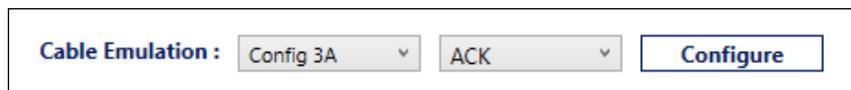


Figure 43. Cable Emulation

9.10 Cable Selection

Use this command to switch the cable type between the USB Type-C cable and the GRL-SPL cable for VCONN testing and loading. Select the cable type and click on the **Configure** button. Refer Figure 44 below.

Note: The USB Type-C cable will be configured by default whenever the GRL-V-UP tester is restarted.



Figure 44. Cable Selection

9.11 VBUS Selection

Use this command to configure the VBUS input as USB Type-C or EXT VBUS and click on the **Configure** button. Refer Figure 45 below.

Note: This feature is used to avoid cable IR drops.

Note: The USB Type-C VBUS will be the default configuration.



Figure 45. VBUS Selection

9.12 Auto E-Load

The Auto E-Load function is used to pre-configure the ports based on their capabilities to draw the VBUS E-Load automatically. Use this command to Enable or Disable the auto E-Load function. Then click on the **Configure** button. Refer Figure 46 below.

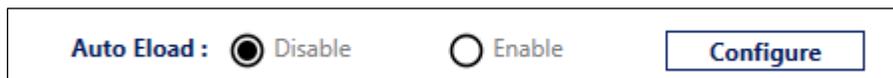


Figure 46. Auto E-Load Selection

9.13 Polling

Polling is the live data updated in the UI of all the voltage/current measurements and LED status. Clicking on the **Stop** button will disable data polling and clicking on the **Start** button will enable data polling.

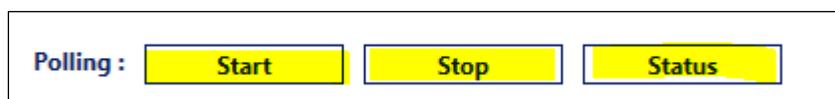


Figure 47. Check Data Polling

9.14 Cable Tester

Use this command to check the USB Type-C E-marker cable data that is connected to the GRL-V-UP tester. Make sure to connect the VCONN sourcing DUT.

Click on the **Enable** button to acquire the SOP_prime data from the cable. Click on the **Get Data** button to read the data acquired from the cable. Refer Figure 48 below.



Figure 48. Check USB Type-C Cable Connected to GRL-V-UP Tester

9.15 QC 2.0/3.0

The GRL-V-UP tester can act as a QC sink for both revision 2.0 & 3.0. Use this command to verify QC performance when connected with a DUT supporting QC charging.

If the DUT supports QC charging, select **QC2.0** or **QC3.0** and click on the **Enable** button. You can also check the voltage transitions by changing it to the derived voltage levels and click on the **Set** button. Refer Figure 49 below.



Figure 49. Check QC 2.0/3.0

9.16 VDM Configuration

If the DUT sends VDM packets and you want to see/read the VDM packets data details, select the required VDM and configure ACK for the selected VDM. Once done, click on the **Configure** button. Refer Figure 50 below.



Figure 50. Configure VDM

9.17 Cable Flip Test

Connect the GRL-SPL cable to any port on the GRL-V-UP tester, (*do not configure the cable type*) and then select the port and click on the **Flip** button to change the cable CC mode. Refer Figure 51 below.

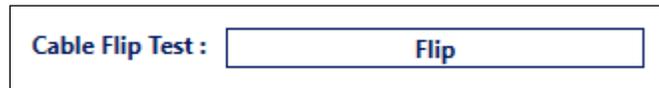


Figure 51. Cable Flip Test

9.18 Calibration Details

This command allows you to view calibration expiry details of tester cards. Click on the **Get** button and the calibration details will be displayed in the output window/API activity log pane of the GRL-V-UP API software.



Figure 52. View Calibration Details

9.19 Tester Card Power

When the GRL-V-UP tester is turned ON, you can turn off the GRL-USB-PD-TC tester cards manually using this command. Select the particular port which you want to turn off and turn on.

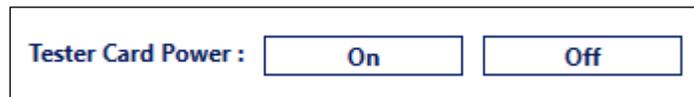


Figure 53. Turn On or Off Tester Card Power

9.20 VCONN Switch

This feature is applicable only for debug purposes.

9.21 API Tab Ra Assert

Ra Assert is a command for CC lines in current drawing which is controlled by the GRL-SPL cable. The following lists the different types of Ra Assert commands:

- **RaDisable:** When you apply this command, no CC lines will be active and no current will be drawn.
- **RaAssert_CC1:** When you apply this command, the CC1 line will become Ra asserted and current will be drawn in CC1.
- **RaAssert_CC2:** When you apply this command, the CC2 line will become Ra asserted and current will be drawn in CC2.
- **RaAssert_ActiveCC:** When you select this command, any one CC line will become active and with other CC lines can be used to draw load.

Select any of the above commands and click on the **Apply** button. Refer Figure 54 below.

Note: Make sure to disable this function after using it.



Figure 54. Select and Apply Ra Assert Command

9.22 API Tab Heat Sink Temperature Limit

While running the Load test for all the ports, the temperature may go beyond the limit. Once it hits the maximum temperature limit, it cuts off all the VBUS load and it will go to the cooling process. The temperature limit can be set in between 60 °C to 95 °C, and then click on the **Set** button. Refer Figure 55 below.

Note: The default heat sink temperature is 90 °C.

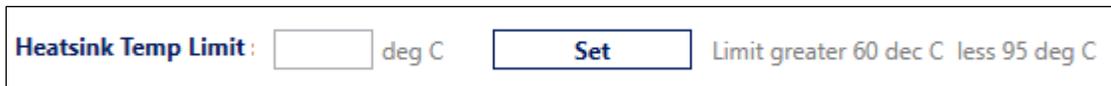


Figure 55. Set Heat Sink Temperature Limit

9.23 Loopback Tab – Loopback Testing

The following procedure describes how to perform loopback testing using the GRL-V-UP API software:

1. Select the **Loopback** tab on the left of the GRL-V-UP API software to open the “Loop Back Testing” screen as shown in Figure 56 below.

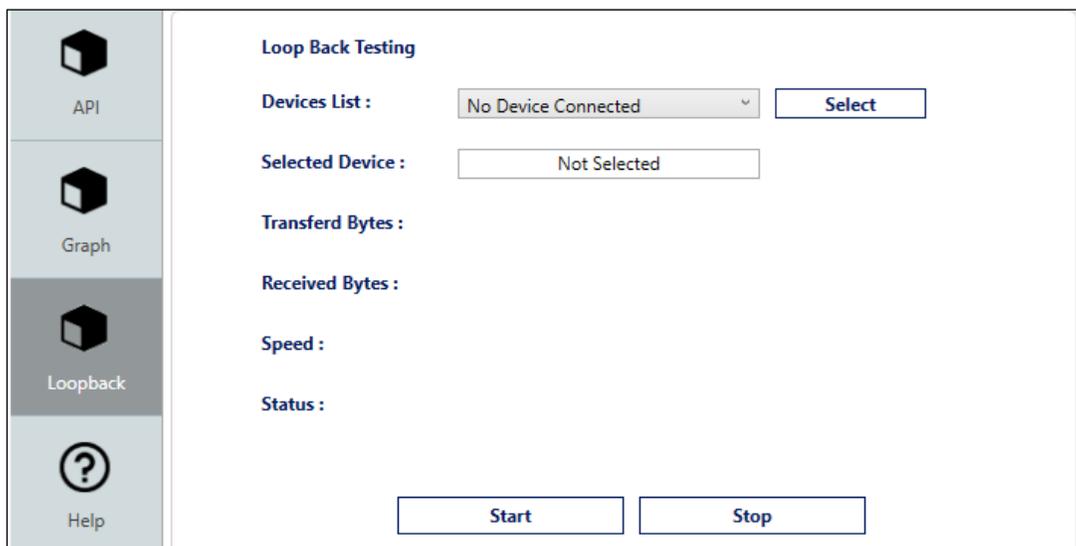


Figure 56. Loopback Testing Tab

2. Connect any USB Type-C cable to any Port on the GRL-V-UP tester and check the enumeration status; i.e, DT-LK, HS/SS & DE LED's (as shown in Figure 57 below) are turned ON or not. If the LED's are not turned ON, try detaching and attaching the cable or change the cable. Once the LED's are turned ON, the loopback test is ready to execute.

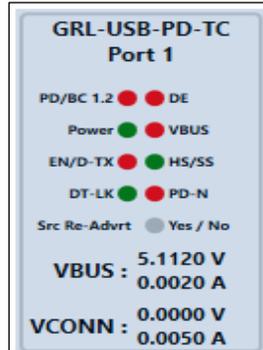


Figure 57. LED Enumeration Status

3. On the Loop Back Testing screen, check whether or not the port loopback test is detected and then verify the status of the port loopback test, as shown in Figure 58 example below.

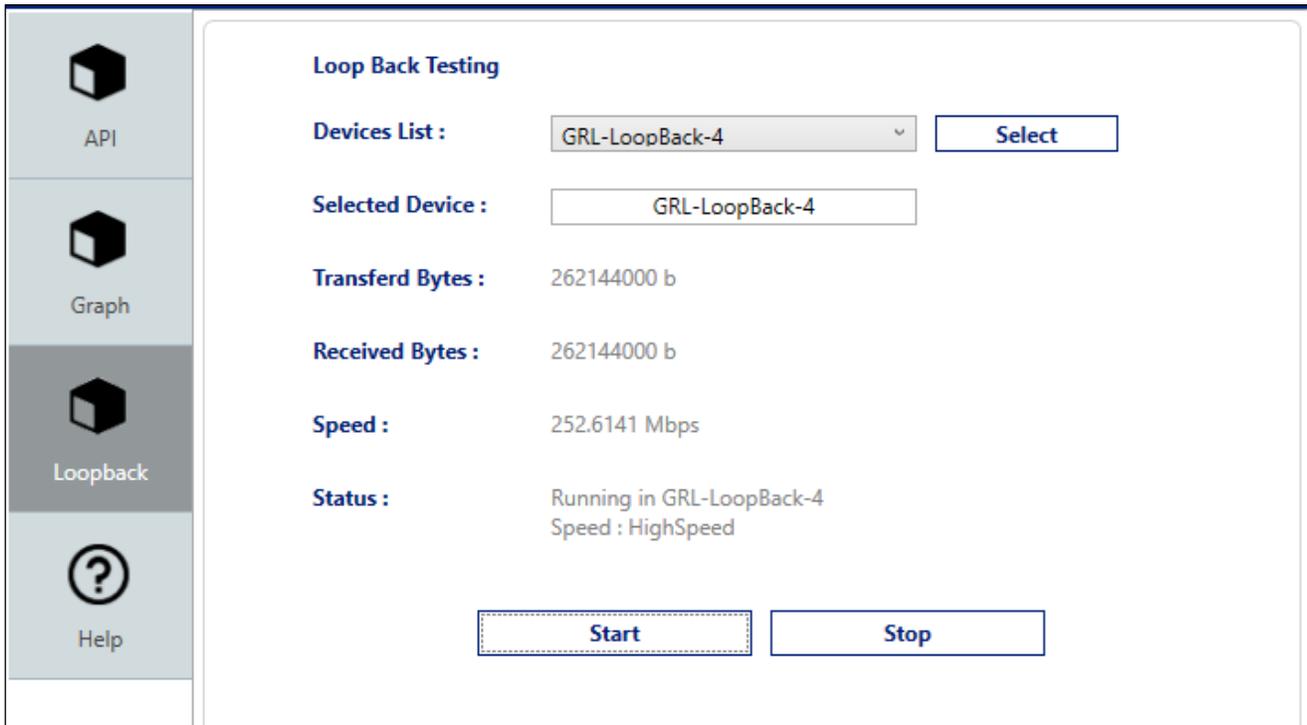


Figure 58. Verify Port Loopback Test Status

4. Click on the **Start** button and observe the following:

- Transferred Bytes
 - Received Bytes
 - Speed
 - Status
5. Once the test is started, verify all the above steps and stop the test by clicking on the **Stop** button.

Note: Loopback testing should be performed for the USB Type-C 2.0, USB Type-C 3.0, GRL-SPL cable, USB Type-A 2.0 and USB Type-A 3.0 cables.

10 Specifications

This section lists the specifications for the GRL-V-UP.

Note: Specifications are subject to change without notice.

10.1 Physical Specifications

Size	486 mm × 660 mm × 131.20 mm (19.13 inch × 25.98 inch × 5.165 inch)
Weight	20 kg (44.09 lbs)

10.2 Electrical Specifications

Rated Input Voltage	110-240 V AC, 1P
Rated AC Current	4 A
Rated Input Frequency	50 Hz-60 Hz
Protection Class	I
Ingress Protection	IPX0

10.3 Operating Specifications

Operating Temperature	15°C to 40°C
Operating Humidity	40% to 95% RH
Operating Altitude	2000 m

10.4 Storage Specifications

Storage Temperature	10°C to 50°C
Storage Humidity	40% to 95% RH

10.5 Transportation Specifications

Transportation Temperature	5°C to 60°C
Transportation Humidity	25% to 95% RH

11 Maintenance and Repair

This section describes how to maintain, service, and repair a GRL-V-UP unit.

Caution: *All disassembly and reassembly of this unit should be performed at an electrostatic discharge (ESD) protective workstation. Wear proper electrostatic grounding equipment at all times. Damage to electrical components could occur without proper ESD control.*

11.1 General Maintenance and Care

11.1.1 Inspection and Cleaning

Inspect and/or clean the following on the GRL-V-UP whenever it is required:

- Check the connectors for dirty/corroded or damaged contacts.
- Clean the GRL-V-UP with any standard brushes to remove the dirt.

Caution: *Do not use solvents such as alcohol, acetone, de-greasers, paint thinners, or other hydrocarbon-based type solvents to clean the CB40.*

11.1.2 Mechanical Maintenance

The GRL-V-UP unit does not require periodic mechanical maintenance other than cleaning the external surfaces.

11.1.3 Electrical Maintenance

The GRL-V-UP unit does not require periodic electrical maintenance.

11.1.4 Calibration Maintenance and Intervals

The GRL-V-UP requires periodic calibration for the interval of 12 months.

11.1.5 Tools

M3*8 Star screwdriver

END_OF_DOCUMENT