



Granite River Labs

User Guide

GRL HDMI®, DisplayPort™ and USB Power Delivery Analyzer (NOVA-S03) with Automation Test Browser Application

The screenshot displays the NOVA-S03 Automation Test Browser Application interface. The top navigation bar includes tabs for SINK, SOURCE, EDID, and DPCD. The central EDID Byte Editor section shows a search bar and a list of parameters with their corresponding field data. The right-hand EDID Register Grid displays a table of hexadecimal values. The bottom section shows a photograph of the NOVA-S03 hardware device, which is a blue rectangular unit with a power switch, a DisplayPort connector, an HDMI connector, and two USB ports labeled Port 1 and Port 2.

Address	0x00	0x01	0x02	0x03	0x04	0x05	0x06	0x07
0x00	0x00	0xFF	0xFF	0xFF	0xFF	0xFF	0xFF	0x00
0x08	0x06	0xB3	0x4A	0x16	0xB6	0x73	0x01	0x00
0x10	0x25	0x1A	0x01	0x04	0xA5	0x22	0x13	0x78
0x18	0x3A	0xBA	0x25	0xA3	0x56	0x50	0xA0	0x28
0x20	0x0E	0x50	0x54	0xBF	0xEF	0x00	0xD1	0xC0
0x28	0xB3	0x00	0x96	0x00	0xB1	0x80	0xB1	0x40
0x30	0xB1	0xC0	0x71	0x4F	0x01	0x01	0x02	0x3A
0x38	0x00	0x18	0x71	0x38	0x2D	0x40	0x58	0x2C
0x40	0x45	0x00	0x58	0xC2	0x10	0x00	0x00	0x1E
0x48	0x00	0x00	0x00	0xFF	0x00	0x47	0x39	0x4C
0x50	0x4D	0x54	0x46	0x30	0x39	0x35	0x31	0x31
0x58	0x30	0x0A	0x00	0x00	0x00	0xFD	0x00	0x32
0x60	0x4B	0x18	0x53	0x11	0x00	0x0A	0x20	0x20
0x68	0x20	0x20	0x20	0x20	0x00	0x00	0x00	0xFC
0x70	0x00	0x47	0x52	0x4C	0x5F	0x44	0x50	0x5F
0x78	0x53	0x49	0x4E	0x4B	0x0A	0x20	0x01	0xFB
0x80	0x02	0x03	0x0A	0x31	0x65	0x03	0x0C	0x00

This material is provided as a reference to get started with the Granite River Labs (GRL) HDMI, DisplayPort and USB Power Delivery Analyzer (NOVA-S03) Hardware and NOVA-S03 Automation Test Browser Application.

For software support, contact support@graniteriverlabs.com.

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1 Reference Documents

The test methods outlined in this document are tests required by various technology adoptions of the HDMI, DisplayPort and USB Type-C Cables and Connectors. Specifications that have adopted these technologies and may be referenced in this document include, but are not limited to, the following specification versions.

Note: In order to have access to all specifications, it may be required that you are a member of an industry group and have attained the proper permissions.

1.1 USB-IF

USB-IF Compliance Documents are available for download at:

<http://www.usb.org/developers/docs/>

1.2 VESA - DisplayPort

Download the DisplayPort document from the VESA web site:

<http://www.vesa.org/join-vesamemberships/member-downloads/>

1.3 HDMI

Download the HDMI document from the HDMI Licensing web site:

<https://www.hdmi.org/spec/index>

2 Scope of this User Guide

This user guide serves as a primary document for NOVA-S03 product usage which can help the Oscilloscope vendors, tester and developers to emulate the side band communication that is required to exercise the main link of display protocol such as HDMI, DisplayPort (Legacy) and DisplayPort Over USB Type-C. Apart from the side band emulation, it acts as an Analyzer and in this mode NOVA-S03 helps the users to sniff the USB Power Delivery packets between two USB Type-C link partner for debugging purpose. Some of the unique features like the live DDC data transaction between the Sink and Source display devices can give more clarity and precise information about the side band communication between the link partners.

3 Overview of NOVA-S03 Standard Purchase Items and Orderable Accessories

3.1 NOVA-S03 Shipping Box Contents



NOVA-S03 – HDMI, DisplayPort and USB Power Delivery Analyzer



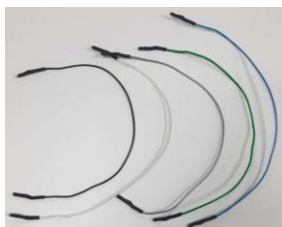
Power Supply



GRL-HDMI Cable Test Fixture – Connects to the Expansion IO connector at the rear of the NOVA-S03 analyzer hardware through the HDMI-IO-Cable. The user can connect the low-speed lines coming from the other end of the GRL-HDMI Cable Test Fixture to the HDMI port in front of the NOVA-S03 analyzer hardware through jumper wires.



HDMI-IO-Cable – Input/Output test cable to connect the Expansion IO connector at the rear of the NOVA-S03 analyzer hardware with the GRL-HDMI Cable Test Fixture.



Jumper Wires – Connect the low-speed lines coming from the GRL-HDMI Cable Test Fixture to the HDMI port in front of the NOVA-S03 analyzer hardware.



Firmware Update Cable – Standard USB Type-A to USB Type-B Programming cable used to update the NOVA-S03 firmware. Connects to the firmware update USB port at the rear of the NOVA-S03 analyzer hardware.



Ethernet Cable – 3m Cat 5 cable to connect the NOVA-S03 analyzer hardware to the control computer.

4 Getting Started with NOVA-S03

This section describes how to get started with the NOVA-S03 test solution for HDMI/DisplayPort/USB Power Delivery testing. Whether you are installing for the first time or doing an upgrade, please make sure to follow all the steps in this section to verify your setup prior to testing a Device Under Test (DUT). The procedure is as follows:

1. Install the latest version of NOVA-S03 automation test browser application (Browser App) on the host computer (laptop or desktop) connected to the NOVA-S03 analyzer hardware. For best system operation using the NOVA-S03 Browser App, GRL recommends that the host computer supports the Intel Core i7 processor and 8GB RAM with Google Chrome version 105.0.5195.127 or above (64-bit). Make sure to clear the browser cache before launching the GRL-C3 Browser App.
2. Install the Microsoft .NET 6.0 SDK (v6.0.x) for Windows x64 from the following link—<https://dotnet.microsoft.com/download/dotnet/6.0>
3. Make sure the NOVA-S03 analyzer firmware has been updated to the latest version. *Refer to Section 6 for the automated firmware update procedure or Appendix of this User Guide for the manual firmware update procedure.*

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

4.1 Install NOVA-S03 Browser App

1. Download the NOVA-S03 Browser App from <http://graniteriverlabs.com/download-center/>.
2. Run the installer by double clicking the extracted executable (NOVA-S03_V1.x.x.exe) and then click on the 'Next' button.

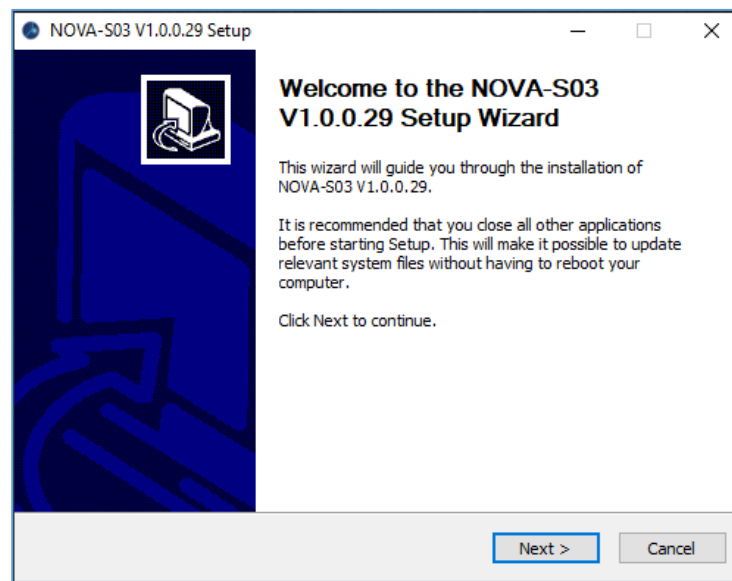


FIGURE 4.1: START NOVA-S03 BROWSER APP INSTALLATION

- Read and accept the license agreement by clicking on the 'I Agree' button.

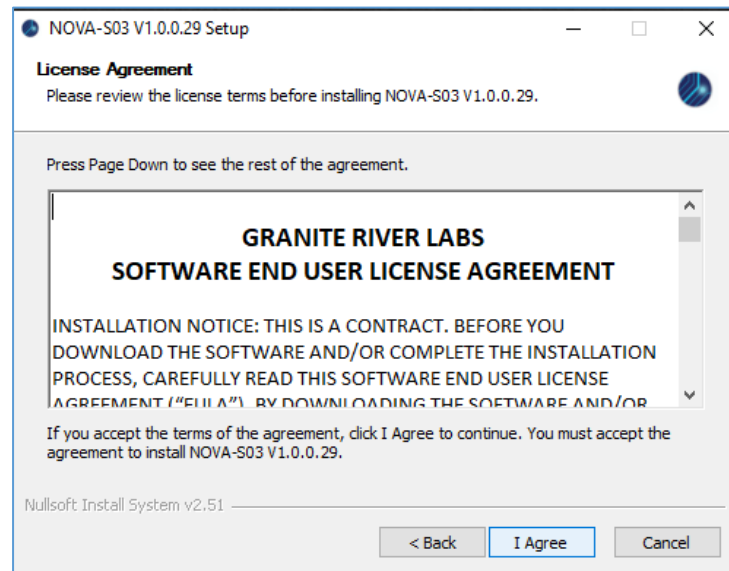


FIGURE 4.2: ACCEPT NOVA-S03 BROWSER APP LICENSE AGREEMENT

- The software installation will then proceed.

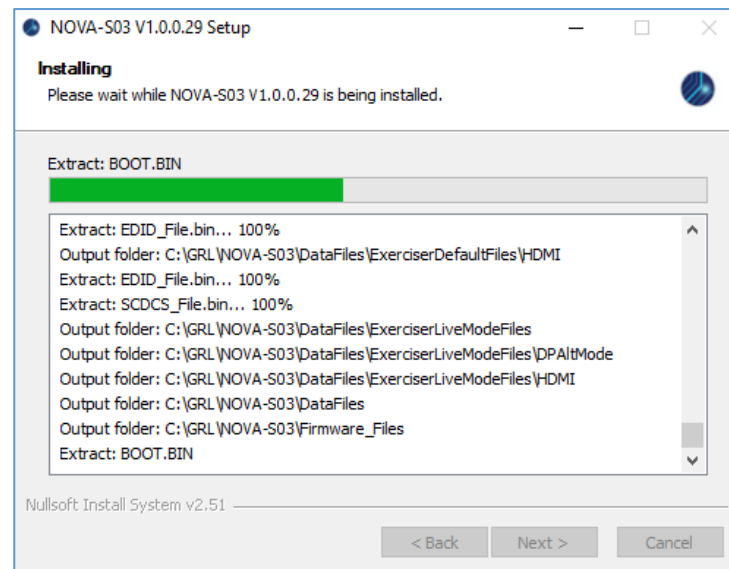


FIGURE 4.3: NOVA-S03 BROWSER APP INSTALLATION IN PROGRESS

- Click on the 'Finish' button to complete the software installation.

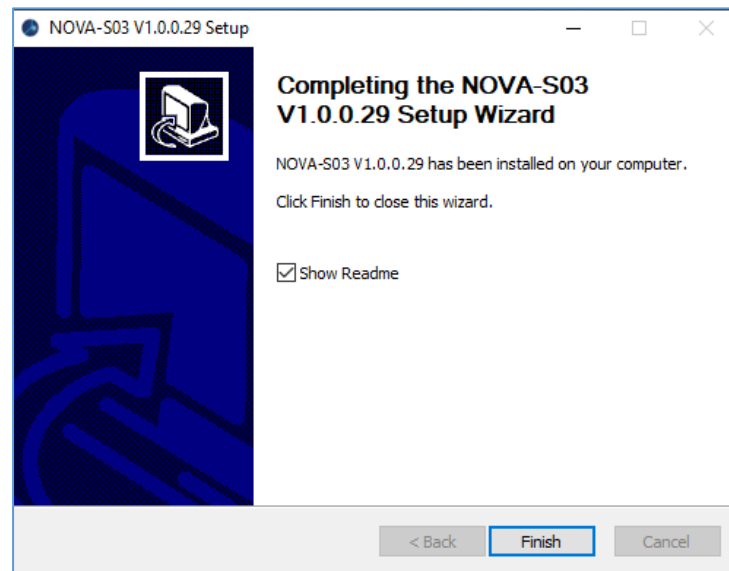


FIGURE 4.4: NOVA-S03 BROWSER APP INSTALLATION COMPLETED

6. The NOVA-S03 Browser App is now ready for use.

4.2 Start Up and Navigate NOVA-S03 Browser App

1. Once installed, you can directly open the NOVA-S03 Browser App using the “**NOVA-S03**” Browser App desktop shortcut. This will initiate the App server to run backend operations before launching the NOVA-S03 Browser App.

Note: Do not close this window except when you need to exit from the NOVA-S03 Browser App.

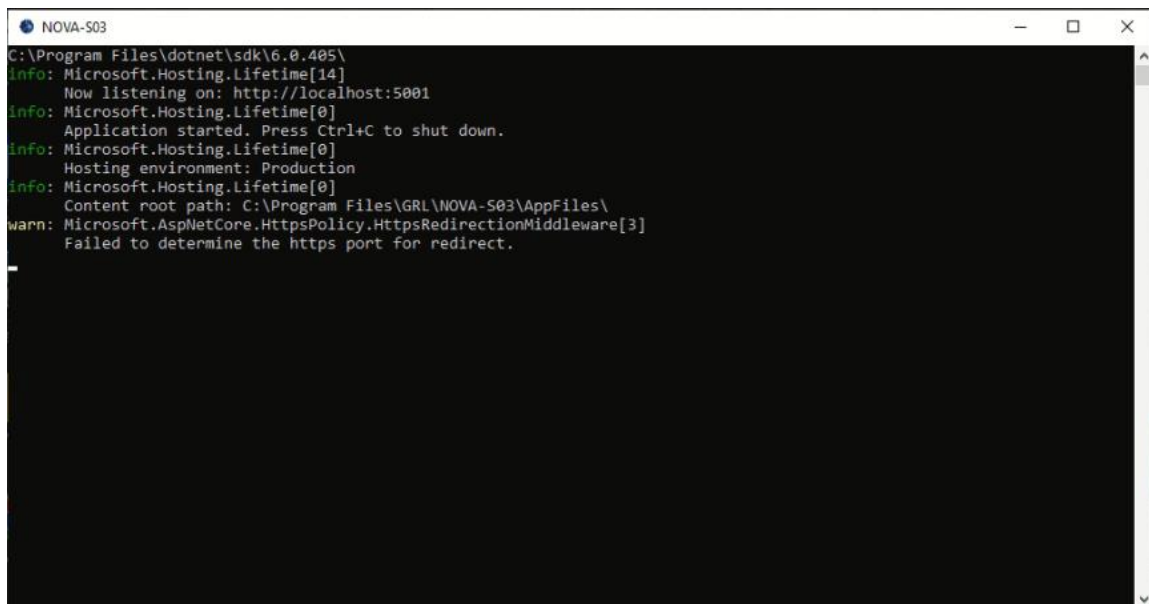


FIGURE 4.5: APP SERVER SCREEN RUNNING BACKEND OPERATIONS

2. The NOVA-S03 Browser App should launch after a few seconds on a browser window with the appropriate port number. If for some reason the browser window does not appear after a few minutes, open a new browser tab and navigate to *http://IP address of windows software host PC:5001/* (for example, *http://192.168.3.241:5000/*).
3. The NOVA-S03 Browser App when launched will display “Connection Setup” as the landing screen as follows:

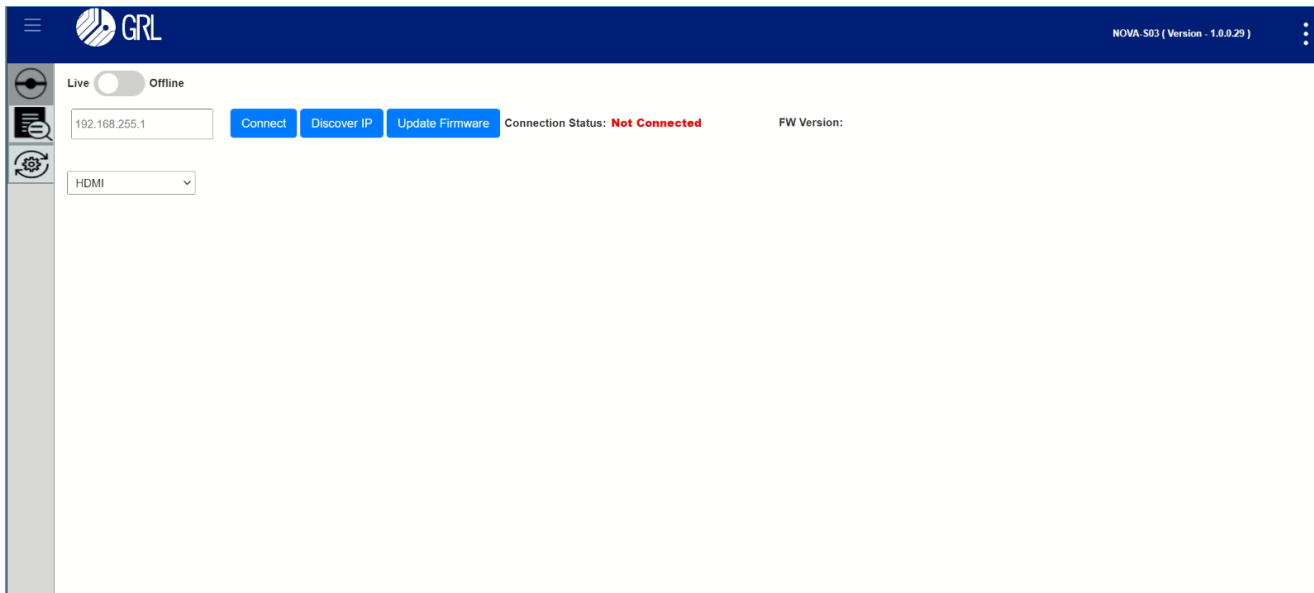


FIGURE 4.6: NOVA-S03 BROWSER APP LANDING SCREEN

This screen allows you to set up connection between the NOVA-S03 Browser App and the NOVA-S03 analyzer hardware as well as selecting the test mode. More details are provided in Section 6.

4.2.1 Using NOVA-S03 Browser App in Chrome OS

Note: Make sure that the NOVA-S03 analyzer hardware is connected to a control PC running Windows 10.

1. Install the NOVA-S03 Browser App on a Windows 10 control PC connected to the NOVA-S03 analyzer hardware.
2. Once installed, open the NOVA-S03 Browser App using the **NOVA-S03** Browser App desktop shortcut.
3. Open a new Chrome browser tab in Chrome OS and navigate to *http://IP address of host PC Windows software:5001/* (for example, *http://192.168.3.241:5001/*).

Note: Make sure that both the Windows 10 control PC and Google Chromebook are connected to the same Ethernet network (wired or wireless).

See Figure 4.7 below for an illustration of the above steps.

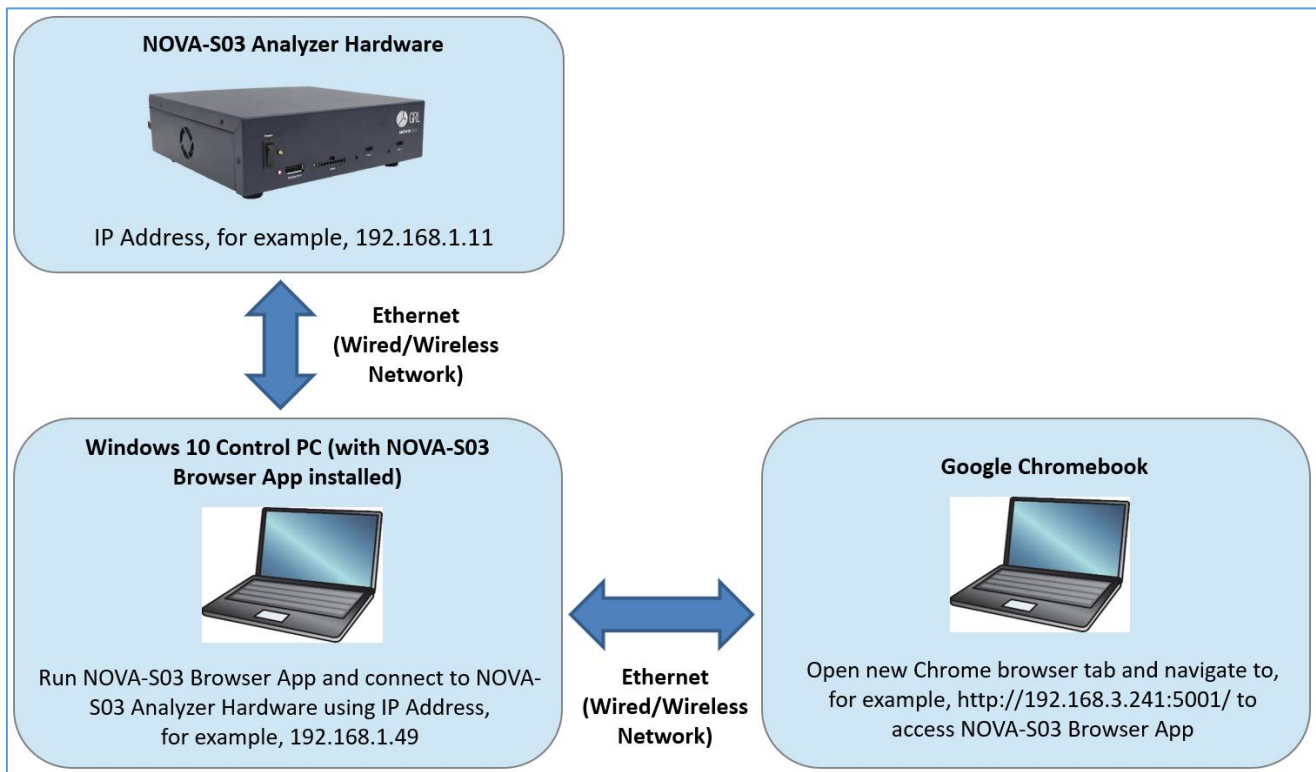


FIGURE 4.7: USING NOVA-S03 BROWSER APP IN CHROME OS

5 Connection and Setup of NOVA-S03 Analyzer Hardware

Figure 5.1 below shows how to connect the NOVA-S03 analyzer hardware with the host computer (control computer/PC) for testing a HDMI based DUT.

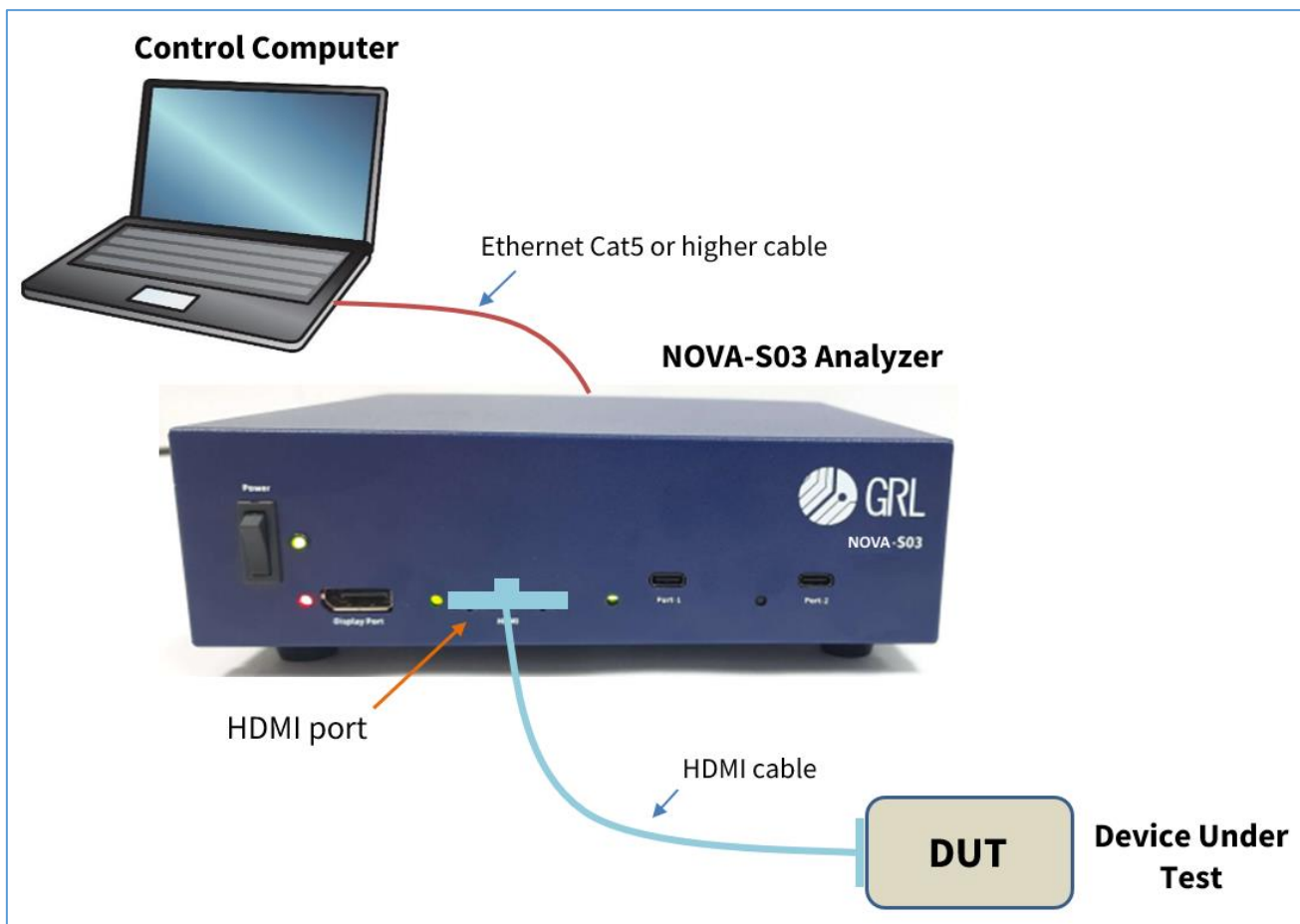


FIGURE 5.1: NOVA-S03 HARDWARE CONNECTION SETUP FOR DUT TESTING

The NOVA-S03 Browser App installed on a Windows 10 (or higher) computer automates the testing process. Below is a procedure for connecting the hardware and verifying proper hardware connections.

1. Connect power supply to the NOVA-S03 analyzer hardware.
2. Connect the NOVA-S03 analyzer hardware using a physical Ethernet connection between the control computer and the analyzer.

5.1 Connect Power Supply to NOVA-S03 Analyzer Hardware

Connect the NOVA-S03 Power interface using the Power Brick included with the analyzer hardware.

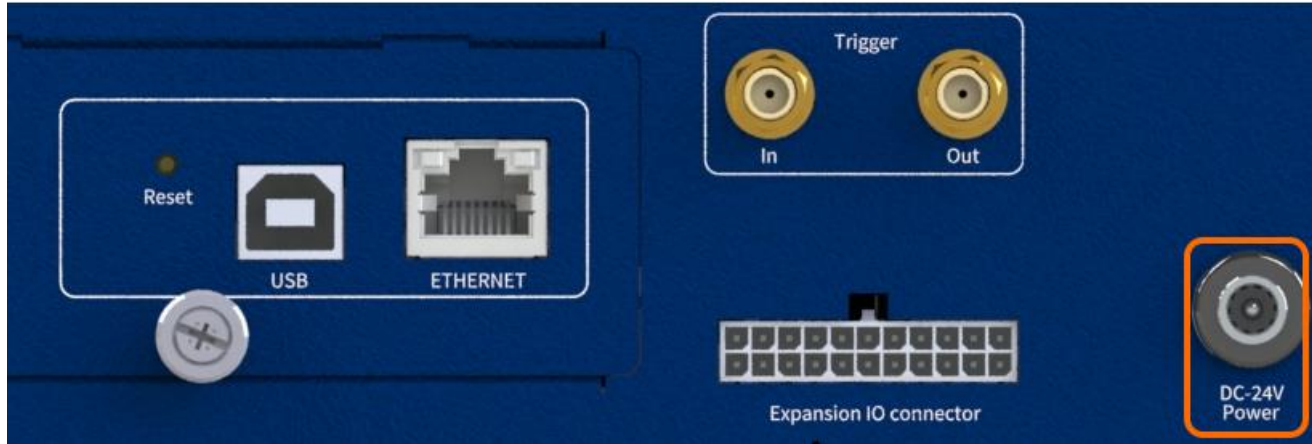


FIGURE 5.2: NOVA-S03 POWER INTERFACE

5.2 Connect Ethernet Cable and Turn On NOVA-S03 Analyzer Hardware

Connect the Ethernet (RJ-45) connector to one of the control computer's Ethernet ports. A USB to Ethernet adapter can be used if there are no native Ethernet ports on the control computer.

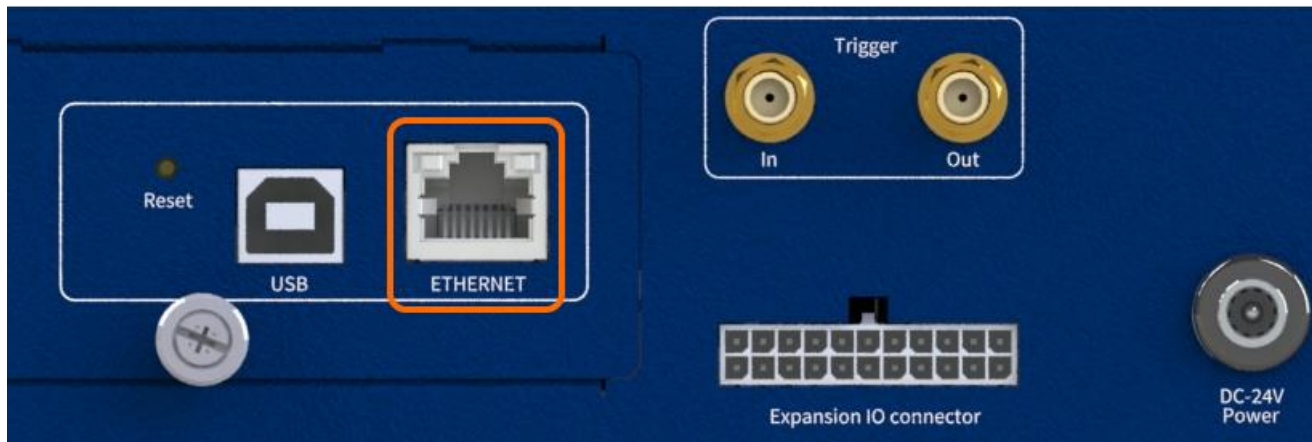


FIGURE 5.3: NOVA-S03 ETHERNET CONNECTOR

Turn on the NOVA-S03 analyzer hardware using the Power On/Off switch on the front of the analyzer as shown in Figure 5.4.



FIGURE 5.4: NOVA-S03 POWER SWITCH

5.2.1 Verify NOVA-S03 Analyzer Hardware Ethernet Connection

The Ethernet port on the control computer needs to be configured correctly for the NOVA-S03 analyzer hardware to recognize the control computer and vice versa.

To make sure the network connection is set up correctly, open the Network Connections panel from the Control Panel.

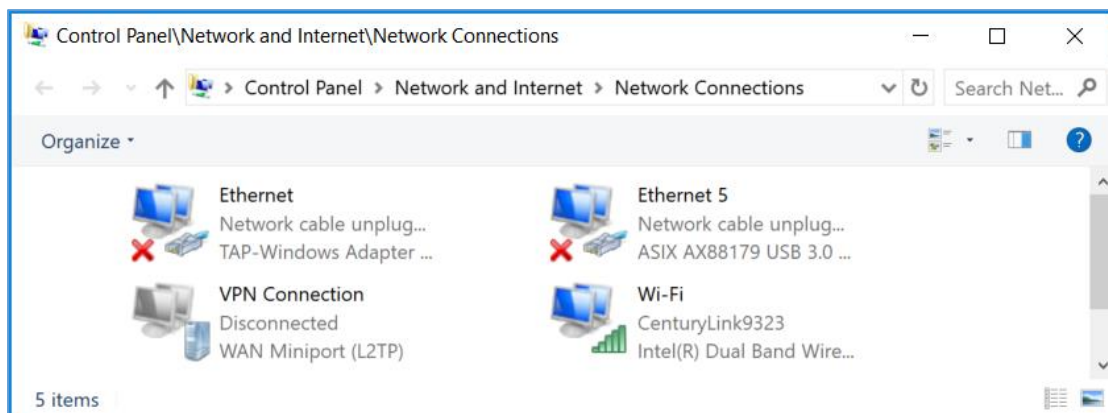


FIGURE 5.5: NETWORK CONNECTIONS BEFORE CONNECTING NOVA-S03

Open the Ethernet panel for the Ethernet port that will connect to the NOVA-S03 analyzer hardware, select “Internet Protocol Version 4 (TCP/IPv4)” and click on the “Properties” button below and to the right.

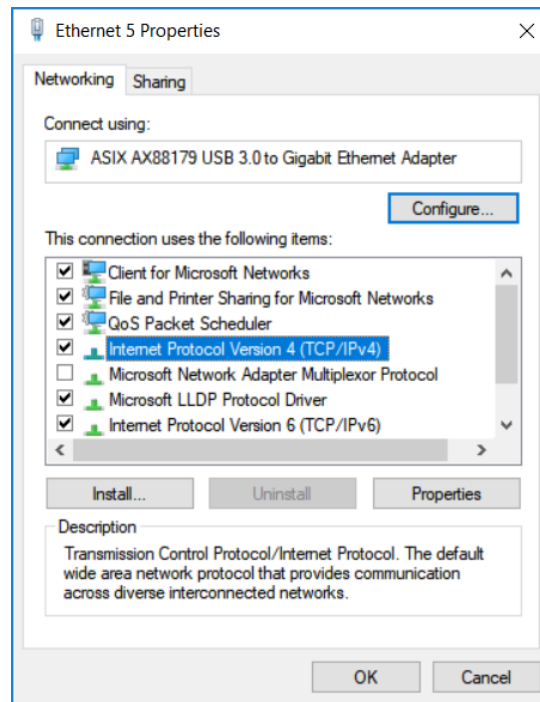


FIGURE 5.6: ETHERNET PROPERTIES

Set up the TCP/IPv4 properties as shown below.

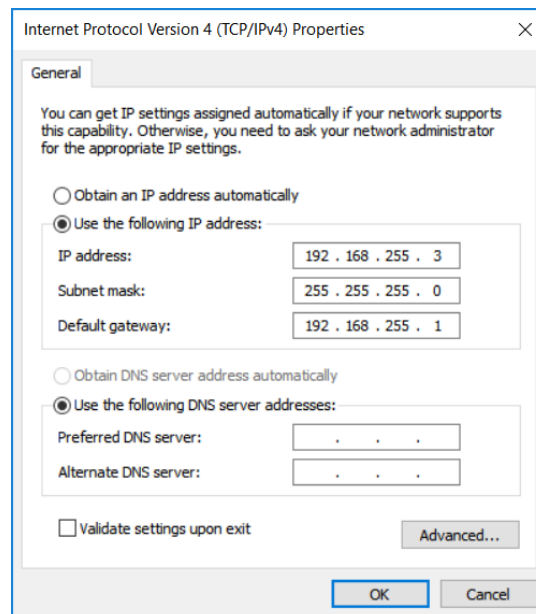


FIGURE 5.7: ETHERNET PROPERTIES WITH TCP/IPv4 SELECTED

Select a static IP address (“Use the following IP address:”) which should be 192.168.255.*n* where *n* is any number between 2 and 255. The subnet mask should be 255.255.255.0 and the default gateway should be 192.168.255.1. The rest of the items should remain unchanged.

Click on the “OK” button on the Internet Protocol Properties and close the Ethernet Properties.

To prevent the Ethernet communication from dropping when using the NOVA-S03 analyzer hardware, GRL recommends setting up the following Ethernet configuration:

1. In the Control Panel → Network and Internet, click on “View Network Status & Tasks” under Network and Sharing Center as shown below.

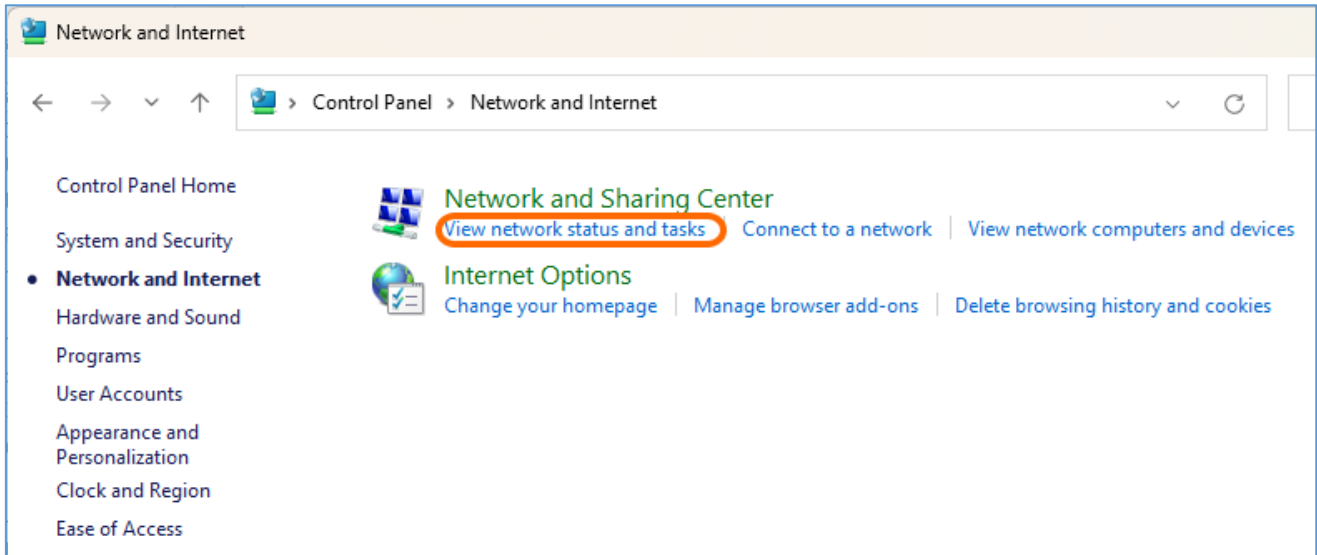


FIGURE 5.8: VIEW NETWORK STATUS AND TASKS

2. Click on the “Change Adapter Settings” on the side panel as shown below.

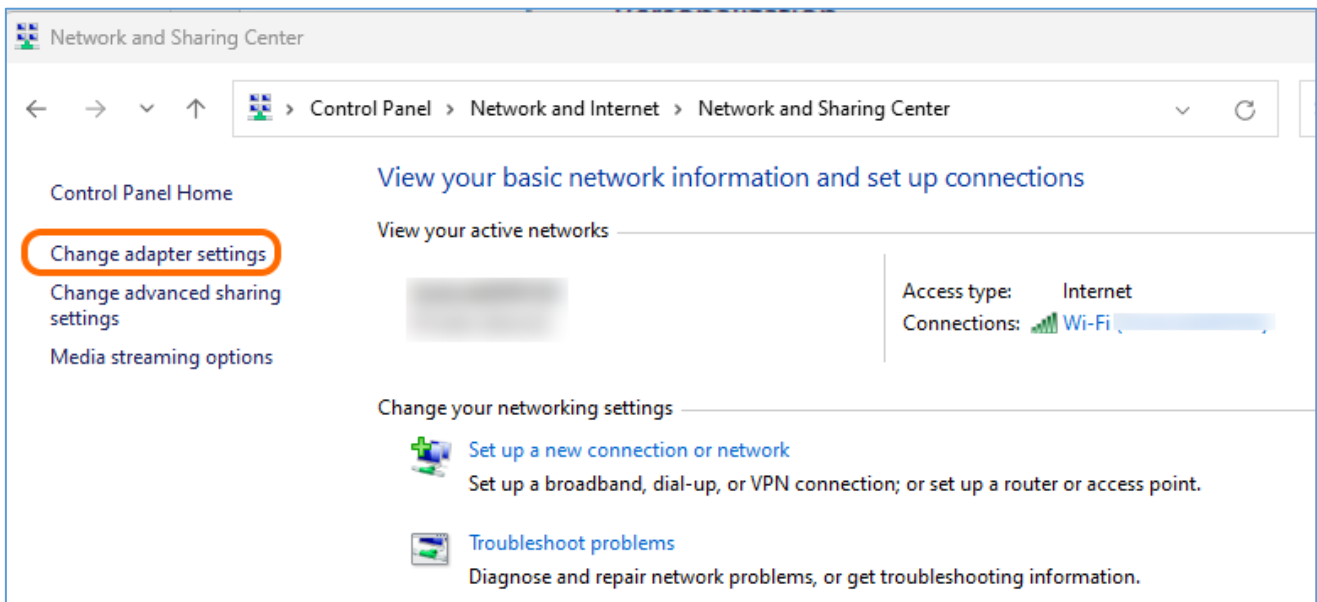


FIGURE 5.9: CHANGE ADAPTER SETTINGS

3. Go to the properties of the required Ethernet network by right-clicking on the network as shown below.

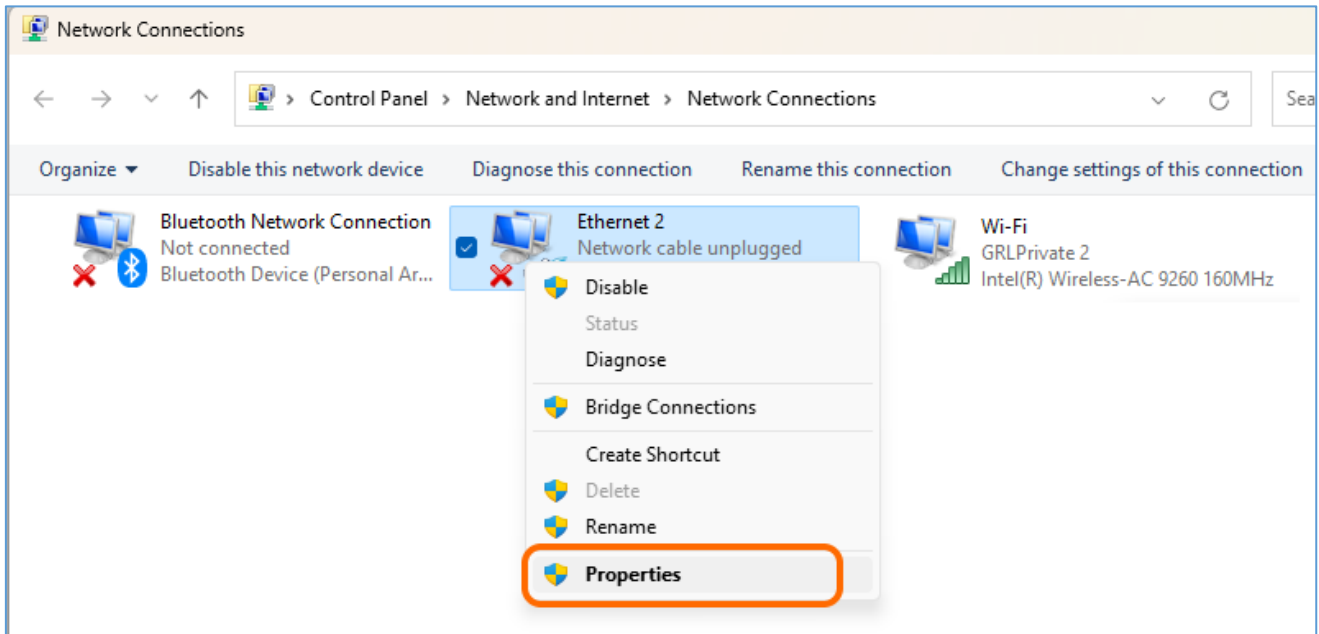


FIGURE 5.10: ETHERNET PROPERTIES

4. Click on the “Configure” option and navigate to the “Advanced” tab as shown below. Select the “Speed & Duplex” option under “Property”. Select “100 Mbps Full Duplex” in the drop-down list under “Value”. Click “OK”.

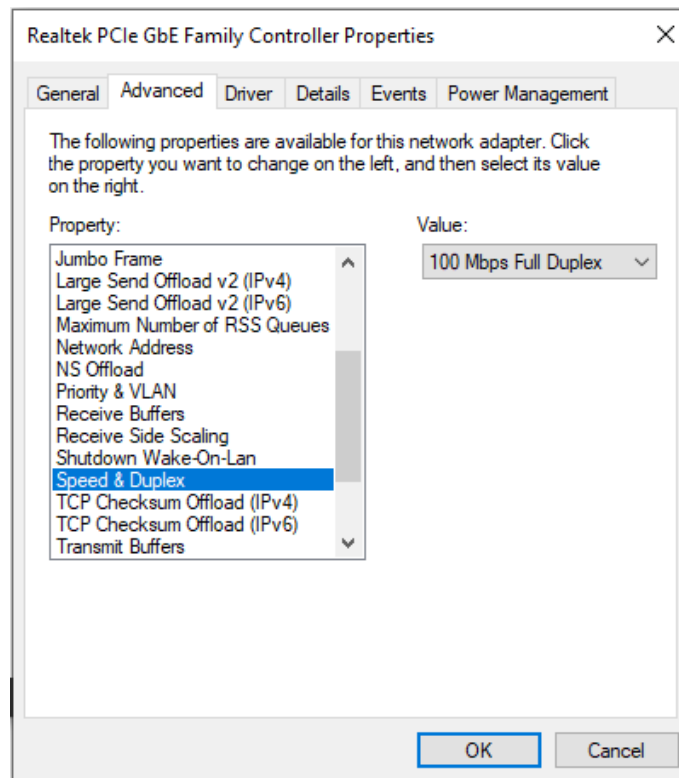


FIGURE 5.11: ETHERNET PROPERTIES WITH SPEED & DUPLEX AND 100 MBPS FULL DUPLEX SELECTED

Make sure the NOVA-S03 analyzer hardware is powered on and completely booted up (front panel green LED near the HDMI connector glows) and then connect the Ethernet cable from the NOVA-S03 analyzer hardware to the computer's Ethernet port that was just set up. The network connections window should now look as pictured in Figure 5.12 below:

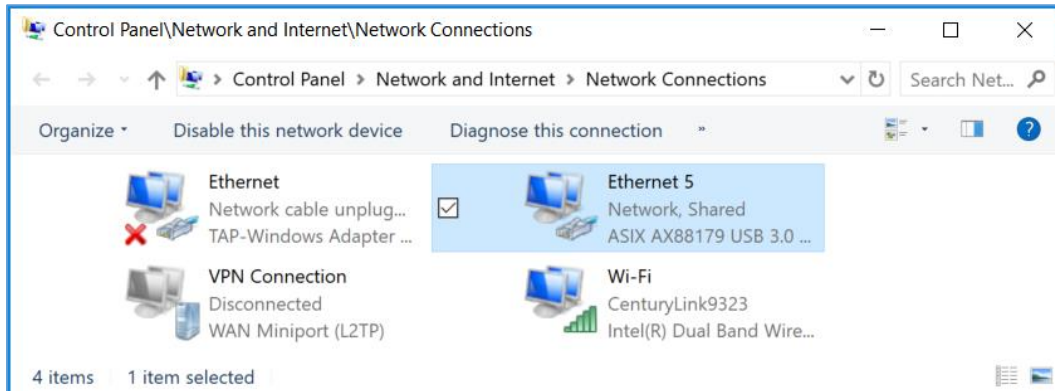


FIGURE 5.12: NETWORK CONNECTIONS AFTER SETUP AND CONNECTION OF NOVA-S03

The NOVA-S03 analyzer hardware is now set up and ready for use.

Before running any tests, it is recommended that you verify that the control computer and the NOVA-S03 are communicating by going to the “Connection Setup” screen on the NOVA-S03 Browser App and clicking on the “Connect” button. The analyzer status should display “Connected”. Refer to Section 6 for more information.

5.3 Connect GRL-HDMI Cable Test Fixture to NOVA-S03 Analyzer Hardware

Figure 5.13 shows how to connect the GRL-HDMI Cable Test Fixture accessory to the NOVA-S03 analyzer hardware (acting as a Sink):

- Using the supplied HDMI-IO-Cable, connect the GRL-HDMI Cable Test Fixture to the Expansion IO connector at the rear of the NOVA-S03 analyzer hardware.
- Connect the low-speed lines coming from the other end of the GRL-HDMI Cable Test Fixture to the HDMI port in front of the NOVA-S03 analyzer hardware using the supplied jumper wires. The jumper wires should be connected to the following pins — GND, SCL, SDA, 5V and HPD respectively.
- Use a HDMI 2.1 cable to connect in between the jumper wires.

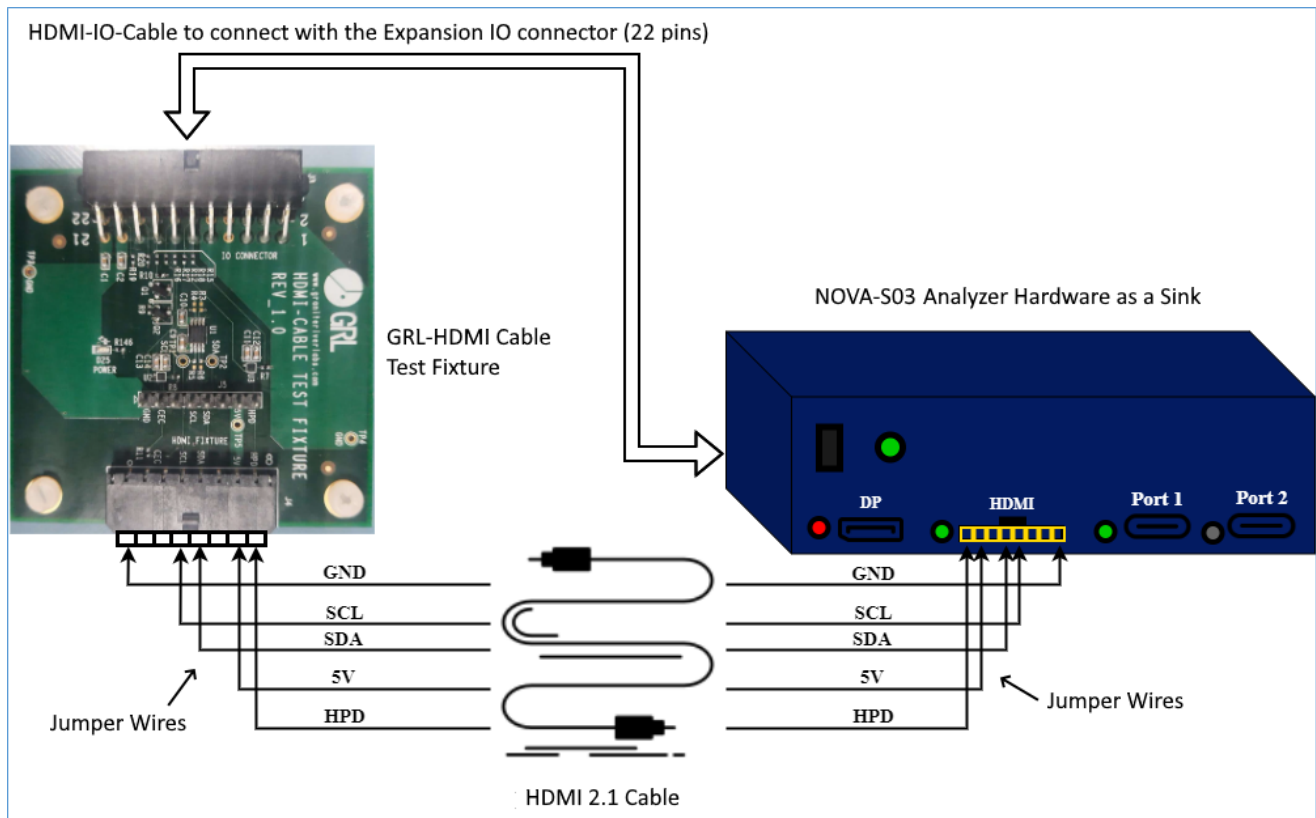


FIGURE 5.13: GRL-HDMI CABLE TEST FIXTURE CONNECTION

6 Connection and Setup of NOVA-S03 Browser App

Note: The following procedure assumes that the NOVA-S03 analyzer hardware has been properly set up as described above.

To connect the NOVA-S03 Browser App with the NOVA-S03 analyzer hardware, do the following:

1. On the NOVA-S03 Browser App landing page (“Connection Setup” screen), enter the IP address and click on the **Connect** button.

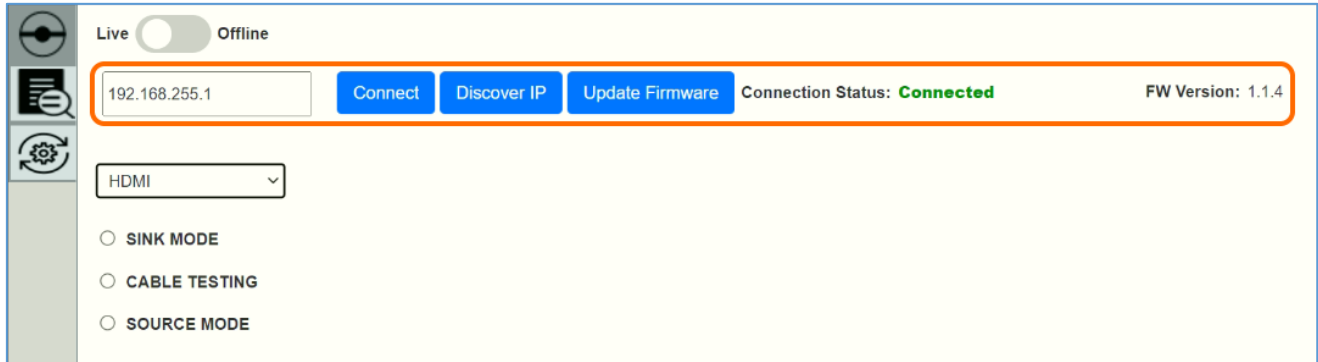


FIGURE 6.1: CONNECTION CONFIGURATION SCREEN AFTER SUCCESSFUL CONNECTION

2. The NOVA-S03 analyzer hardware and Browser App are now connected as indicated by the Connection Status and Firmware Version.
3. If unable to establish connection, click on the **Discover IP** button to search for available IP addresses.
4. You can choose between **Live** mode and **Offline** mode when using the Browser App. The Live mode is applied by default while you can optionally select to use the App in the Offline mode. Use the  slider at the top left of screen to set the required mode.
5. Click on the **Update Firmware** button to update the NOVA-S03 firmware. The firmware update process will start and when completed, click “Ok” for the NOVA-S03 analyzer hardware to power cycle and reboot.



FIGURE 6.2: UPDATE NOVA-S03 FIRMWARE

6. After the NOVA-S03 analyzer hardware has rebooted, it will auto-establish connection with the Browser App.

7 Protocol Compliance Testing with NOVA-S03

The various screens presented by the NOVA-S03 Browser App allow the user to select, configure, run and verify from the Source/Sink tests for a variety of Devices Under Tests or DUT's that support HDMI, DisplayPort and USB Type-C Power Delivery technology. There are additional controls that allow the user to perform offline analysis and debug specific DUT features and capabilities using saved waveforms.

7.1 Test Type Selection

You can select to verify HDMI, DisplayPort Over USB Type-C ("DP Over Type-C"), Standard DisplayPort (Legacy) ("Standard DP") and USB Power Delivery ("USB-PD") capabilities of the DUT from the following drop-down menu:

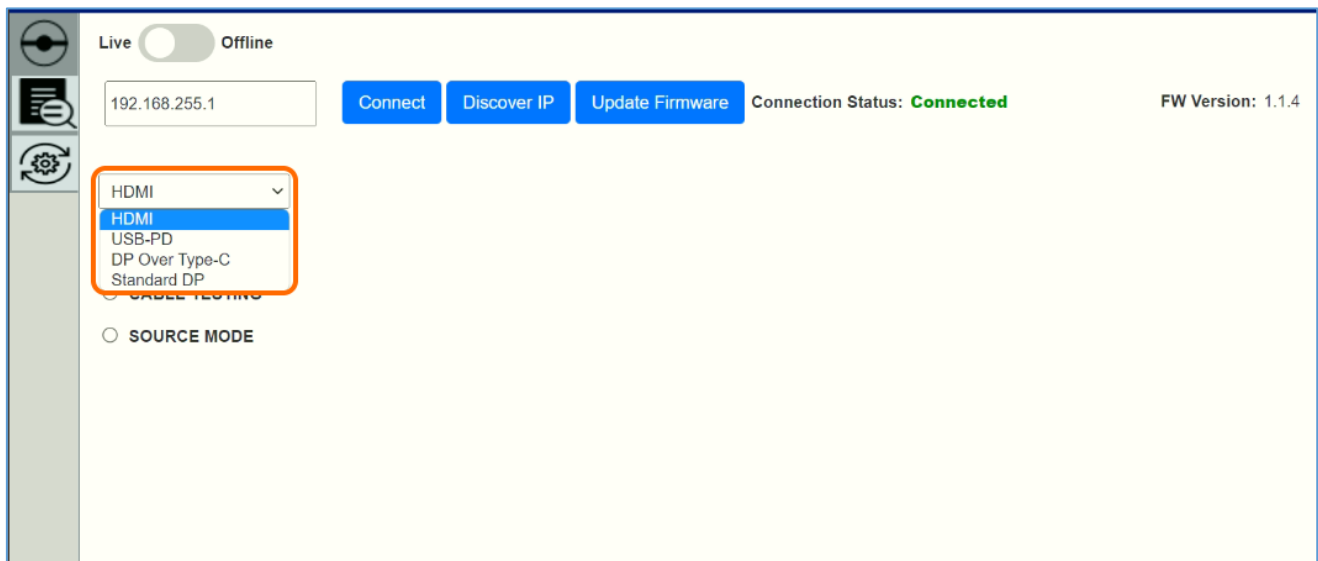


FIGURE 7.1: TEST TYPE SELECTION

7.1.1 If HDMI is selected:

Set up the test equipment as shown in the connection diagram. Select **SINK MODE** or **SOURCE MODE** as the test mode as supported by the DUT or **CABLE TESTING** if testing a cable DUT that acts as both a Sink and a Source. Refer to Section 7.2 to proceed with setup and testing.

7.1.2 If DP Over Type-C / Standard DP is selected:

Refer to Section 7.3 on how to set up and run simulation and tests for the DUT.

7.1.3 If USB-PD is selected:

Refer to Section 7.4 on how to set up and run simulation and tests for the DUT.

7.2 Exerciser Tab (for the HDMI DUT)

The NOVA-S03 Browser App *Exerciser* screen works as a Source/Sink Emulator for the HDMI Source, Sink or cable DUT. This interface provides an EDID/SCDCS editor that enables users to read and write required register values while testing and debugging.

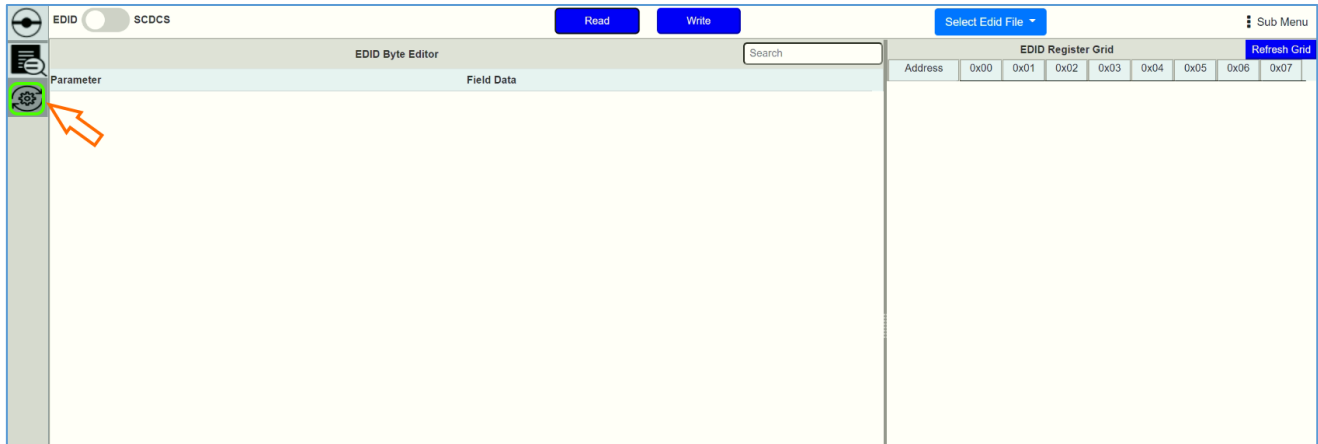


FIGURE 7.2: EXERCISER SCREEN (FOR SOURCE MODE OR SINK MODE)

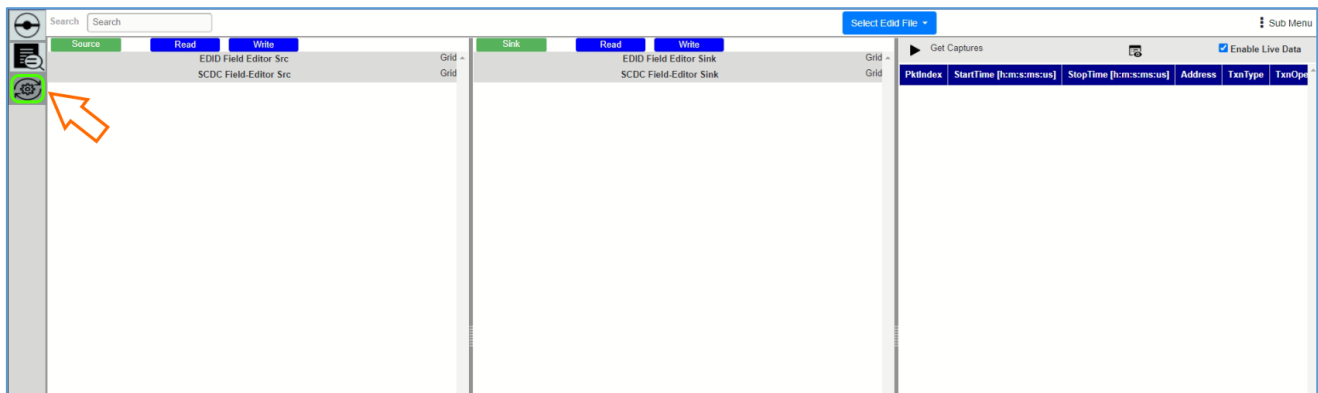


FIGURE 7.3: EXERCISER SCREEN (FOR CABLE TESTING)

7.2.1 Select EDID/SCDCS Editor for Source/Sink Test Mode

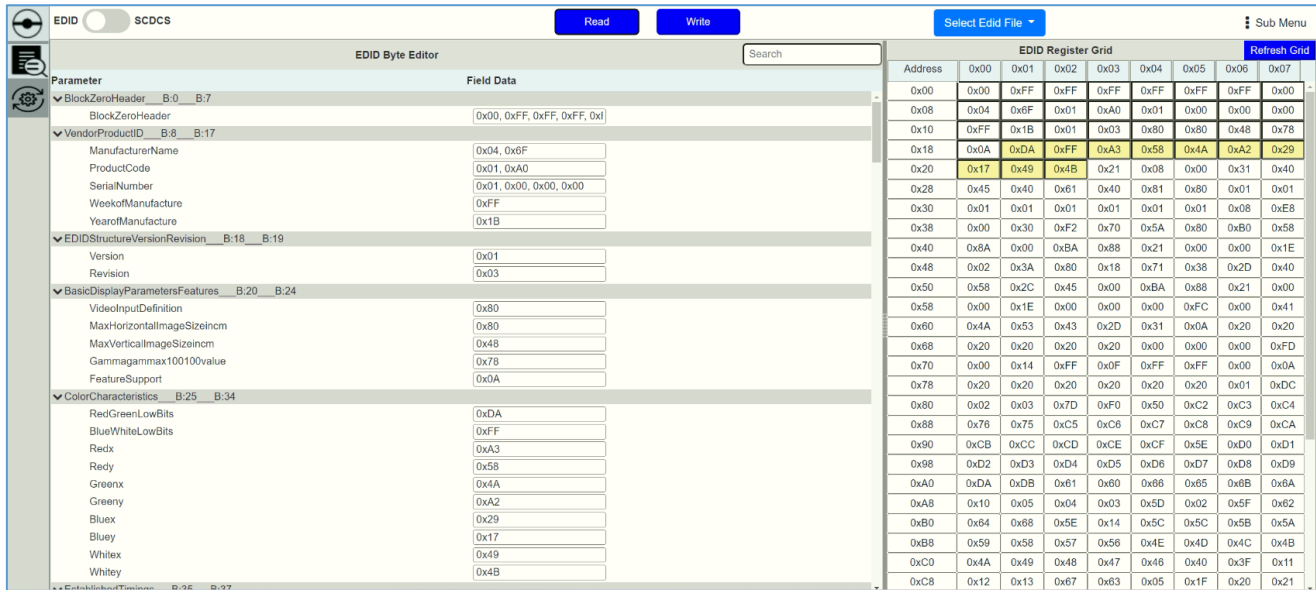
If testing only the Source or Sink mode, use the  slider at the top of screen to select between the EDID and SCDCS editors. The Browser App emulates the Sink EDID and SCDCS registers in the Source test mode or reads EDID and SCDCS registers from the Sink DUT.

Note by default the EDID editor is selected; move the slider to the SCDCS editor if the user wants to select the SCDCS editor and vice versa.

7.2.2 Read/Write EDID/SCDCS for Source/Sink/Cable Test Mode

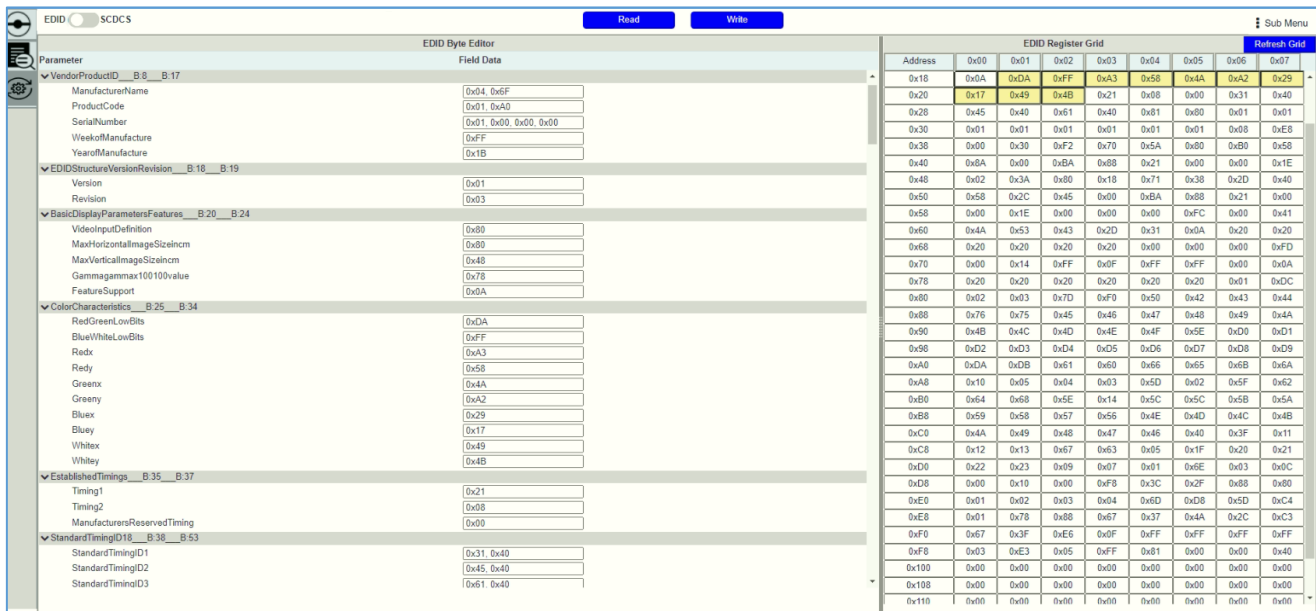
Select the **Read** button at the top of screen to read EDID and SCDCS registers from the Sink DUT or read EDID registers from a file and keep them in the EDID registers.

When the Read button is selected, a detailed view of the EDID/SCDCS registers will appear to allow you to configure the values as shown in the following examples. The EDID/SCDCS register grid will display the respective binary values.



Address	0x00	0x01	0x02	0x03	0x04	0x05	0x06	0x07
0x00	0x00	0xFF	0xFF	0xFF	0xFF	0xFF	0xFF	0x00
0x08	0x04	0x6F	0x01	0xA0	0x01	0x00	0x00	0x00
0x10	0xFF	0x1B	0x01	0x03	0x80	0x80	0x48	0x78
0x18	0x0A	0xDA	0xFF	0xA3	0x58	0x4A	0xA2	0x29
0x20	0x17	0x49	0x4B	0x21	0x08	0x00	0x31	0x40
0x28	0x45	0x40	0x61	0x40	0x81	0x80	0x01	0x01
0x30	0x01	0x01	0x01	0x01	0x01	0x01	0x08	0xE8
0x38	0x00	0x30	0xF2	0x70	0x5A	0x80	0xB0	0x58
0x40	0x8A	0x00	0xBA	0x88	0x21	0x00	0x00	0x1E
0x48	0x02	0x3A	0x80	0x18	0x71	0x38	0x2D	0x40
0x50	0x58	0x2C	0x45	0x00	0xBA	0x88	0x21	0x00
0x58	0x00	0x1E	0x00	0x00	0x00	0xFC	0x00	0x41
0x60	0x4A	0x53	0x43	0x2D	0x31	0x0A	0x20	0x20
0x68	0x20	0x20	0x20	0x00	0x00	0x00	0x00	0xFD
0x70	0x00	0x14	0xFF	0x0F	0xFF	0xFF	0x00	0x0A
0x78	0x20	0x20	0x20	0x20	0x20	0x20	0x01	0xDC
0x80	0x02	0x03	0x7D	0xF0	0x50	0xC2	0xC3	0xC4
0x88	0x76	0x75	0xC5	0xC6	0xC7	0xC8	0xC9	0xCA
0x90	0xCB	0xCC	0xCD	0xCE	0xCF	0xD0	0xD1	0xD2
0x98	0xD2	0xD3	0xD4	0xD5	0xD6	0xD7	0xD8	0xD9
0xA0	0xDA	0xDB	0xDC	0xDD	0xDE	0xDF	0xE0	0xE1
0xA8	0x10	0x05	0x04	0x03	0x5D	0x02	0x5F	0x62
0xB0	0x64	0x68	0x5E	0x14	0x5C	0x5C	0x5B	0x5A
0xB8	0x59	0x58	0x57	0x56	0x4E	0x4D	0x4C	0x4B
0xC0	0x4A	0x49	0x48	0x47	0x46	0x40	0x3F	0x11
0xC8	0x12	0x13	0x67	0xB3	0x05	0x1F	0x20	0x21

FIGURE 7.4: READ EDID EDITOR VIEW FOR SINK TEST MODE



Address	0x00	0x01	0x02	0x03	0x04	0x05	0x06	0x07
0x18	0x6A	0xDA	0xFF	0xA3	0x58	0x4A	0xA2	0x29
0x20	0x17	0x49	0x4B	0x21	0x08	0x00	0x31	0x40
0x28	0x45	0x40	0x61	0x40	0x81	0x80	0x01	0x01
0x30	0x01	0x01	0x01	0x01	0x01	0x01	0x08	0xE8
0x38	0x00	0x30	0xF2	0x70	0x5A	0x80	0xB0	0x58
0x40	0x8A	0x00	0xBA	0x88	0x21	0x00	0x00	0x1E
0x48	0x02	0x3A	0x80	0x18	0x71	0x38	0x2D	0x40
0x50	0x58	0x2C	0x45	0x00	0xBA	0x88	0x21	0x00
0x58	0x00	0x1E	0x00	0x00	0x00	0xFC	0x00	0x41
0x60	0x4A	0x53	0x43	0x2D	0x31	0x0A	0x20	0x20
0x68	0x20	0x20	0x20	0x00	0x00	0x00	0x00	0xFD
0x70	0x00	0x14	0xFF	0x0F	0xFF	0xFF	0x00	0x0A
0x78	0x20	0x20	0x20	0x20	0x20	0x20	0x01	0xDC
0x80	0x02	0x03	0x7D	0xF0	0x50	0xC2	0xC3	0xC4
0x88	0x76	0x75	0xC5	0xC6	0xC7	0xC8	0xC9	0xCA
0x90	0xCB	0xCC	0xCD	0xCE	0xCF	0xD0	0xD1	0xD2
0x98	0xD2	0xD3	0xD4	0xD5	0xD6	0xD7	0xD8	0xD9
0xA0	0xDA	0xDB	0xDC	0xDD	0xDE	0xDF	0xE0	0xE1
0xA8	0x10	0x05	0x04	0x03	0x5D	0x02	0x5F	0x62
0xB0	0x64	0x68	0x5E	0x14	0x5C	0x5C	0x5B	0x5A
0xB8	0x59	0x58	0x57	0x56	0x4E	0x4D	0x4C	0x4B
0xC0	0x4A	0x49	0x48	0x47	0x46	0x40	0x3F	0x11
0xC8	0x12	0x13	0x67	0xB3	0x05	0x1F	0x20	0x21
0xD0	0x22	0x23	0x09	0x07	0x01	0x6E	0x03	0x0C
0xD8	0x00	0x10	0x00	0xF8	0x3C	0x2F	0xB8	0x80
0xE0	0x01	0x02	0x03	0x04	0x0D	0x08	0x5D	0xC4
0xE8	0x01	0x78	0xB8	0x67	0x37	0x4A	0x2C	0xC3
0xF0	0x67	0x3F	0xE6	0x0F	0xFF	0xFF	0xFF	0xFF
0xF8	0x03	0xE3	0x05	0xFF	0x81	0x00	0x00	0x40
0x100	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00
0x108	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00
0x118	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00

FIGURE 7.5: READ EDID EDITOR VIEW FOR SOURCE TEST MODE



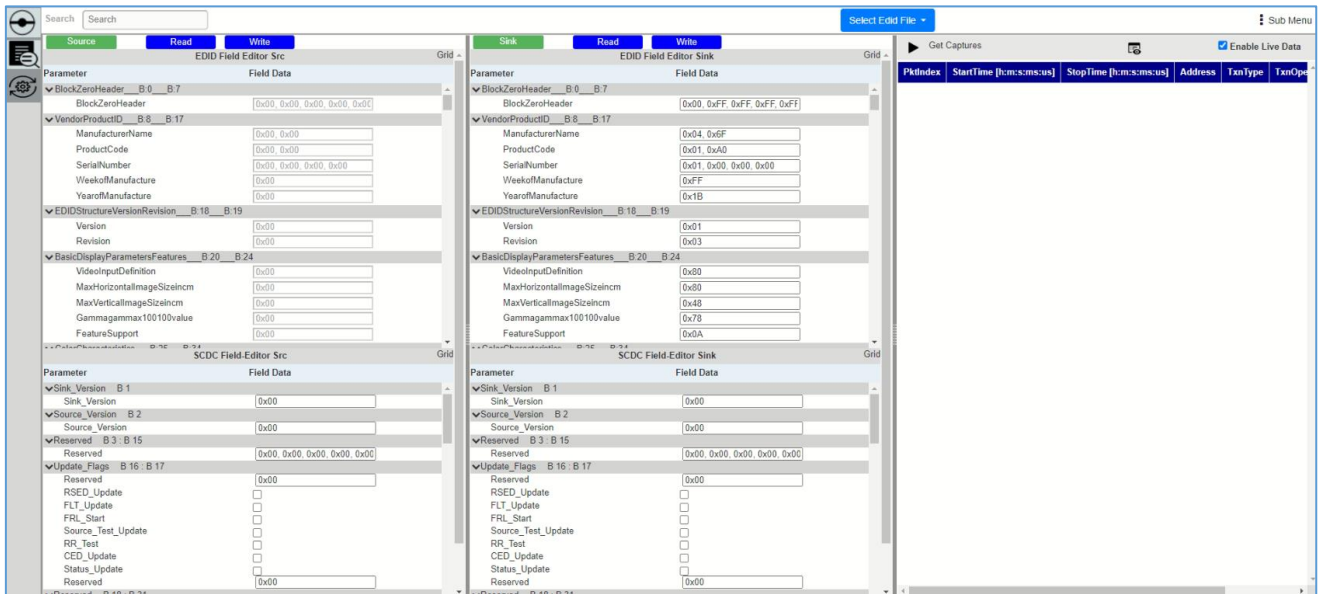


FIGURE 7.8: READ EDID & SDCS EDITOR VIEW FOR CABLE TEST MODE

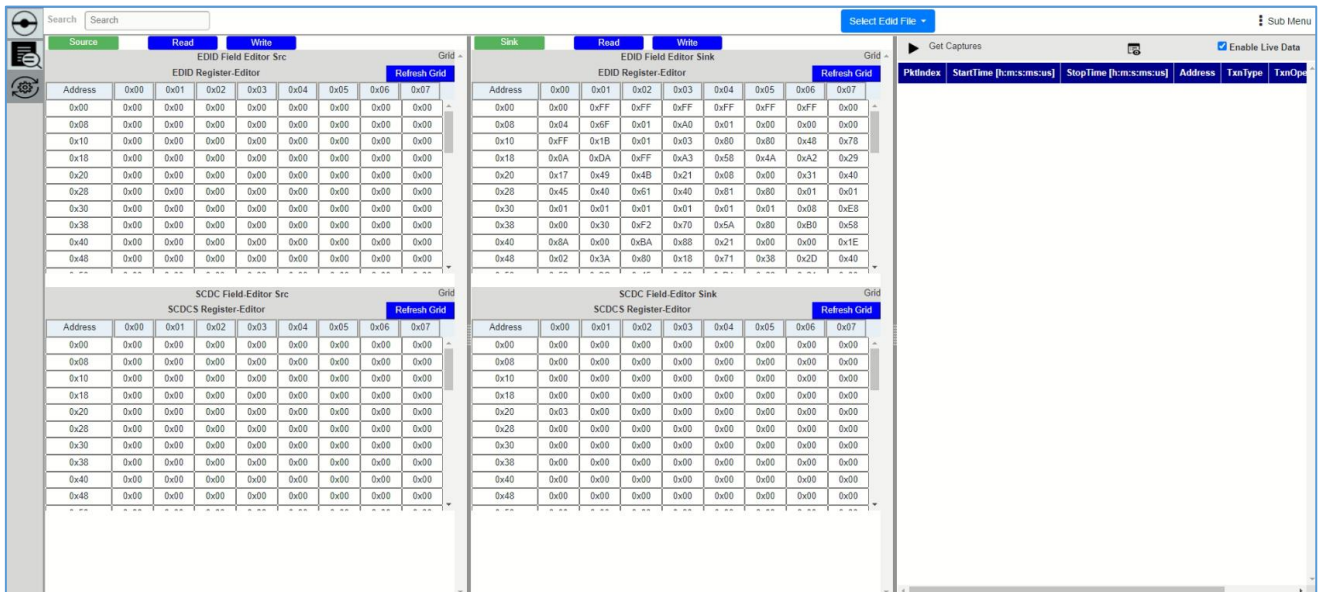


FIGURE 7.9: REGISTER GRID VIEW FOR CABLE TEST MODE

After configuring the EDID/SCDCS registers, select the **Write** button to write the SDCS registers to the Sink DUT or write binary EDID files into the EDID registers.

You can save the registers to a file by clicking on the **Save** option from the **Sub Menu** drop-down menu. The files will be saved in the following location— "C:\GRL\NOVA-S03\AppData". *Note: The file name will be "EDID_File"/"SCDCS_File".*

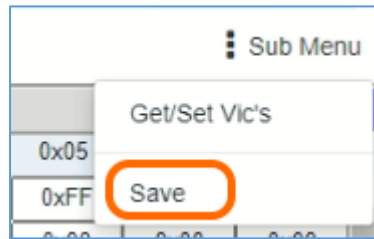


FIGURE 7.10: SAVE REGISTER TO A FILE

7.2.3 Read EDID from Files

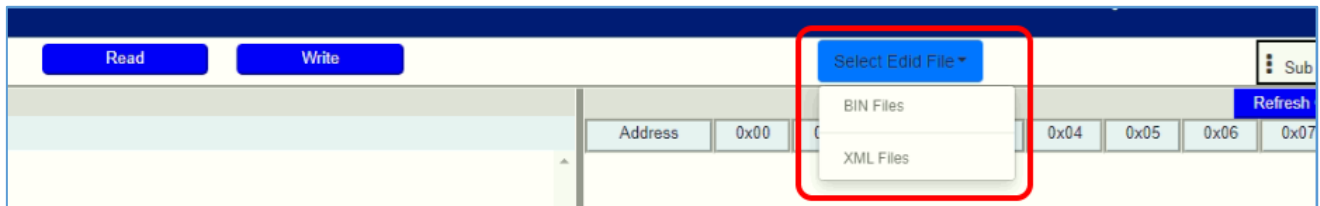
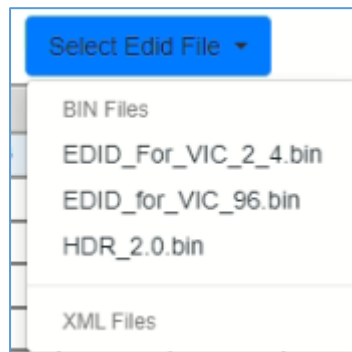


FIGURE 7.11: SELECT EDID FILES

Use the **Select EDID File** drop-down menu to read EDID registers from BIN or XML files and keep them in the EDID registers.

Note: For the EDID files to appear in the drop-down menu, you will need to place the EDID files in the following location— "C:\GRL\NOVA-S03\EDID_FILES".

Select and load the specific EDID file from the **Select EDID File** drop-down menu.



7.2.4 Get/Set Video Identification Codes (VIC's) and Hot Plug Detection (HPD) for Sink Test Mode

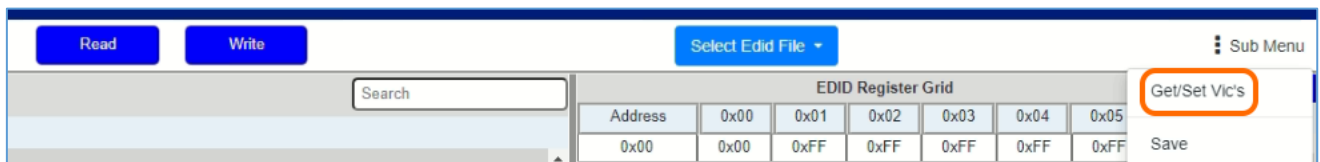


FIGURE 7.12: GET/SET VIC'S

Use the **Sub Menu** drop-down menu to get and edit VIC's (**Get/Set Vic's**) in the Sink test mode.

When **Get/Set Vic's** is selected, select the **Get VICs from EDID** button. Edit the list of VIC's or remove all and enter only the required VIC's in the pop-up dialog as shown in the following example:

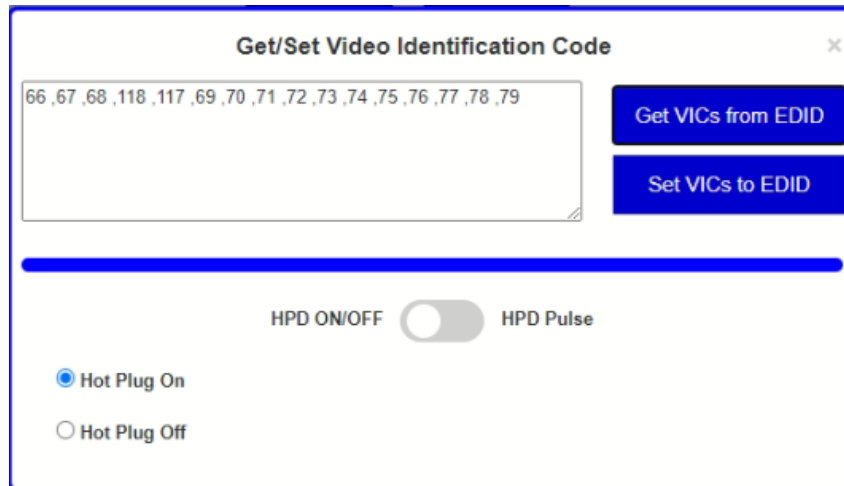


FIGURE 7.13: GET, EDIT AND SET VIC'S

Select the **Set VICs to EDID** button to apply the new VIC configuration. If required, set the **Hot Plug On** or **Off** by selecting the respective option.

To enable the **HPD Pulse** signal, slide the toggle to “HPD Pulse”. When HPD Pulse is selected, the Hot Plug is set to ON and the Sink should be able to read the EDID data and send the appropriate signal. Set the time duration and click on the **Set Pulse** button. *Note: The time duration will default to 100 ms if not specified after clicking on the Set Pulse button.*

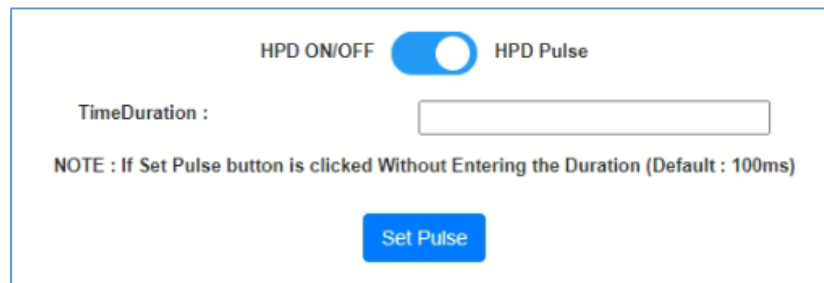


FIGURE 7.14: SET HPD PULSE

7.2.5 Run Analyzer Tests for Source/Sink DUT's

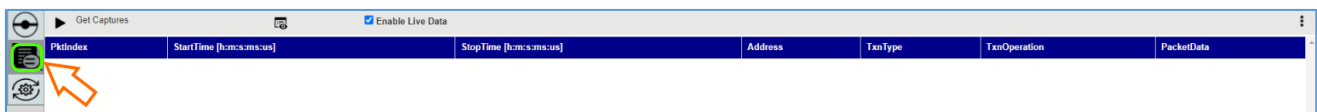
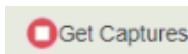
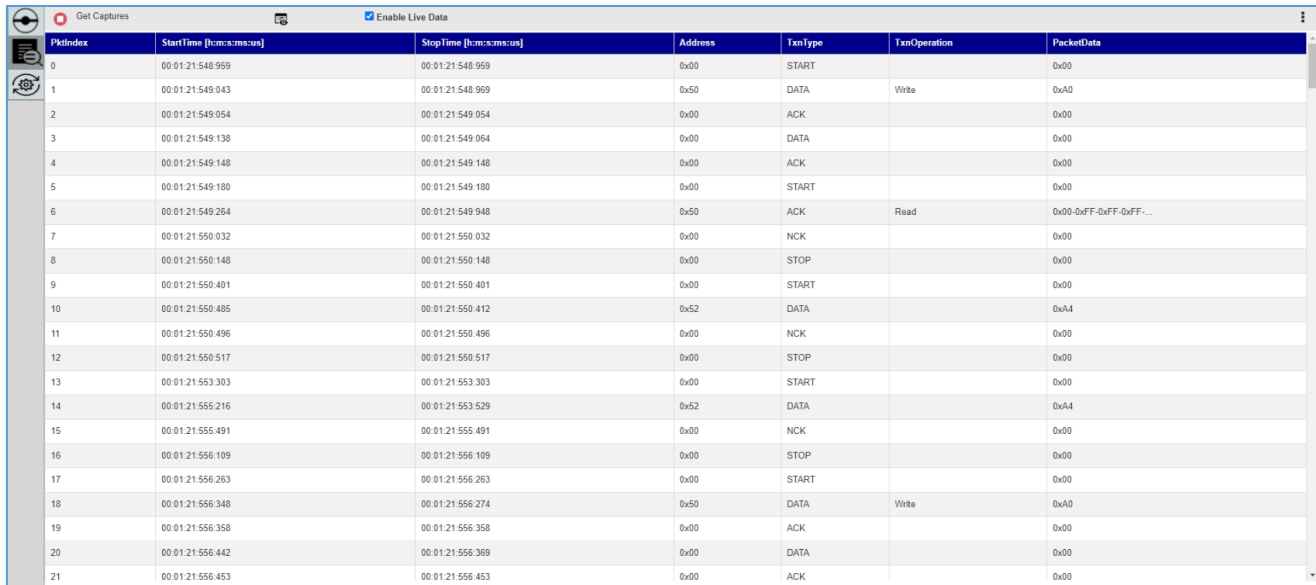


FIGURE 7.15: ANALYZER SCREEN (FOR CAPTURING HDMI PACKET TRANSACTION)

Select the Analyzer  tab on the left of the screen to capture the packet transaction details when HDMI testing is performed by connecting a DUT with the NOVA-S03 analyzer hardware.

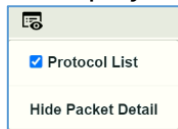
- In the Analyzer screen, select  before activating HPD or connecting the DUT to obtain the packet transaction.
- Once the packet capture has completed, select  and the packet transaction details will be automatically saved in the following location — “C:\GRL\NOVA-S03\Report\HDMICapture_files”.



PktIndex	StartTime [h:m:s:ms:us]	StopTime [h:m:s:ms:us]	Address	TxnType	TxnOperation	PacketData
0	00:01:21:548:959	00:01:21:548:959	0x00	START		0x00
1	00:01:21:549:043	00:01:21:548:969	0x50	DATA	Write	0xA0
2	00:01:21:549:054	00:01:21:549:054	0x00	ACK		0x00
3	00:01:21:549:138	00:01:21:549:064	0x00	DATA		0x00
4	00:01:21:549:148	00:01:21:549:148	0x00	ACK		0x00
5	00:01:21:549:180	00:01:21:549:180	0x00	START		0x00
6	00:01:21:549:264	00:01:21:549:948	0x50	ACK	Read	0x00-0xFF-0xFF-0xFF...
7	00:01:21:550:032	00:01:21:550:032	0x00	NCK		0x00
8	00:01:21:550:148	00:01:21:550:148	0x00	STOP		0x00
9	00:01:21:550:401	00:01:21:550:401	0x00	START		0x00
10	00:01:21:550:485	00:01:21:550:412	0x52	DATA		0xA4
11	00:01:21:550:496	00:01:21:550:496	0x00	NCK		0x00
12	00:01:21:550:517	00:01:21:550:517	0x00	STOP		0x00
13	00:01:21:553:303	00:01:21:553:303	0x00	START		0x00
14	00:01:21:555:216	00:01:21:553:529	0x52	DATA		0xA4
15	00:01:21:555:491	00:01:21:555:491	0x00	NCK		0x00
16	00:01:21:556:109	00:01:21:556:109	0x00	STOP		0x00
17	00:01:21:556:263	00:01:21:556:263	0x00	START		0x00
18	00:01:21:556:348	00:01:21:556:274	0x50	DATA	Write	0xA0
19	00:01:21:556:358	00:01:21:556:358	0x00	ACK		0x00
20	00:01:21:556:442	00:01:21:556:369	0x00	DATA		0x00
21	00:01:21:556:453	00:01:21:556:453	0x00	ACK		0x00

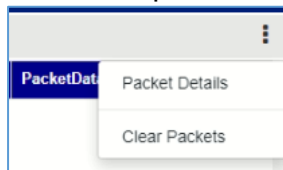
FIGURE 7.16: RESULTS OF PACKET CAPTURE EXAMPLE

To manage the results display views, select  above the results pane. Select



from these options to enable or disable display of the protocol/packet details. You

can select to enable/disable real-time data acquisition  as well as view acquired



packet details or clear the packets.

7.2.6 Run Analyzer Tests for Cable DUT's

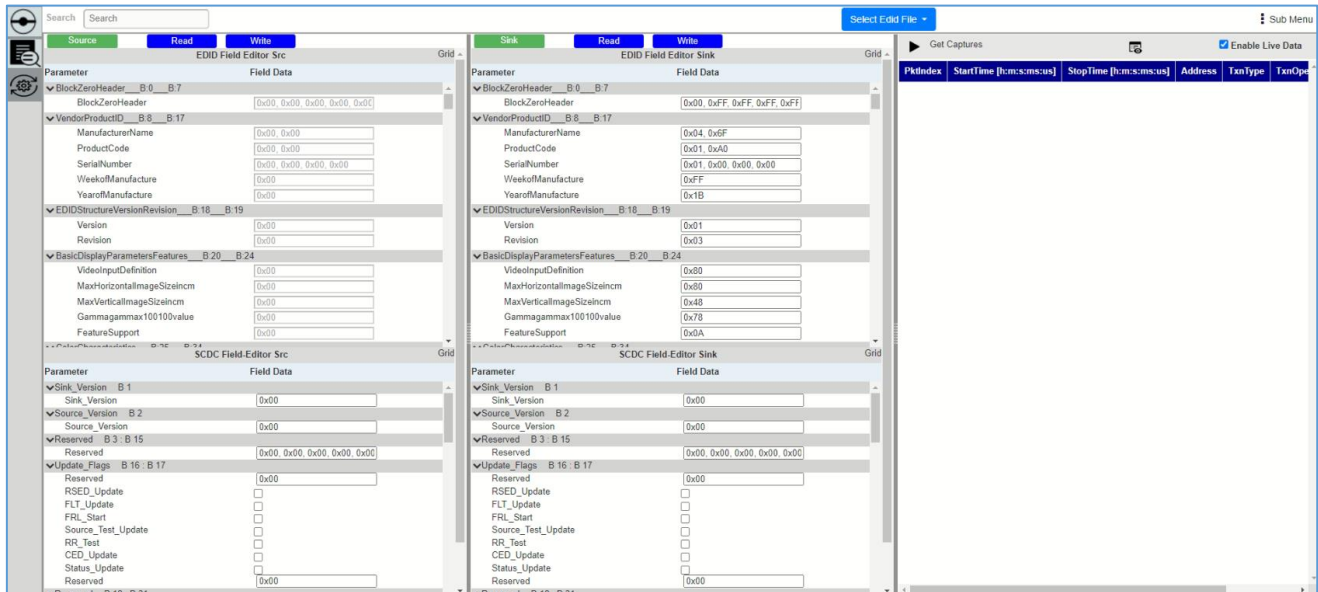


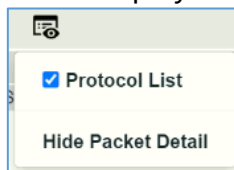
FIGURE 7.17: RUN PACKET SIMULATION TEST AND MANAGE CONFIGURATION

In the Cable Testing mode, once Source/Sink register configuration has been made, you can automate HDMI protocol compliance testing for the cable DUT.

Select to start test execution which will display the protocol and packet details along with the test summary in the Results pane on the right of the screen.

To terminate the test run, select .

To manage the test result display views, select above the results pane. Select



from these options to enable or disable display of the protocol / packet details.

You can also select to enable/disable real-time data acquisition .

Alternatively, you can select the Analyzer tab on the left of the screen to view a larger display of the test results.

7.2.7 Perform Fixed Rate Link (FRL) Testing (For HDMI 2.1)

The following procedure describes how to perform HDMI 2.1 FRL testing:

- a. Step 1 (refer to Figure 7.18):
 1. Go to *Exerciser* tab and make sure that the **EDID** editor is selected from the  slider at the top of screen.
 2. Select the  button at the top of screen.
 3. In the EDID Byte Editor Field Data pane, navigate to the “**The level of FRL support that sink is capable of**” field and select the required link rate.

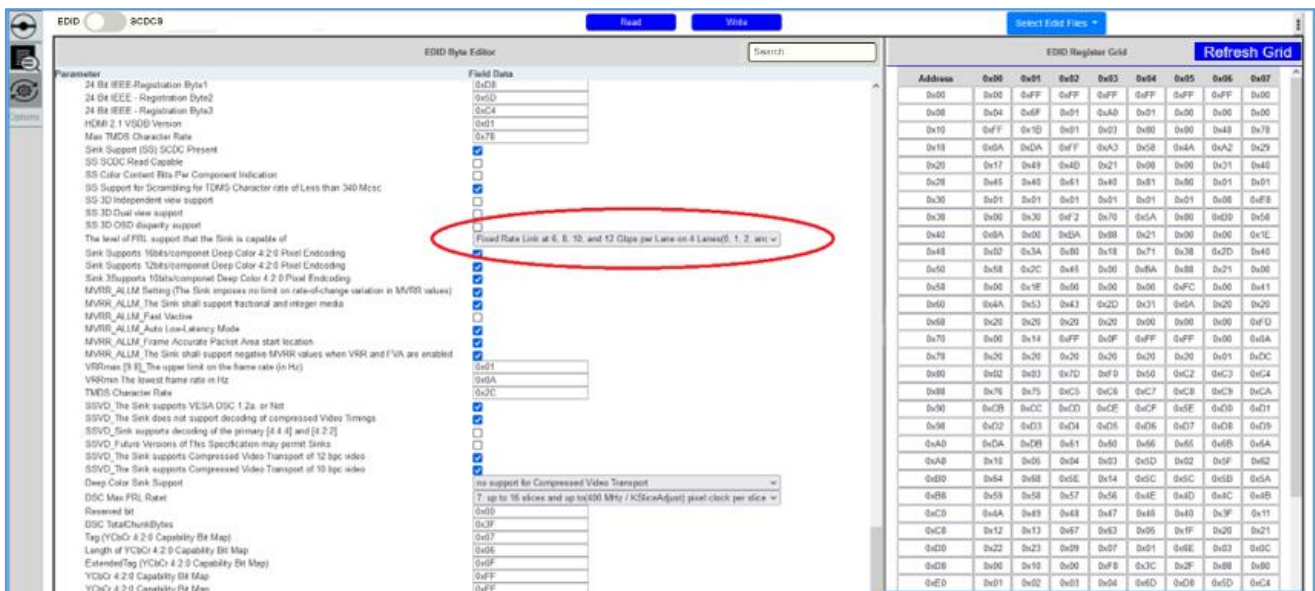
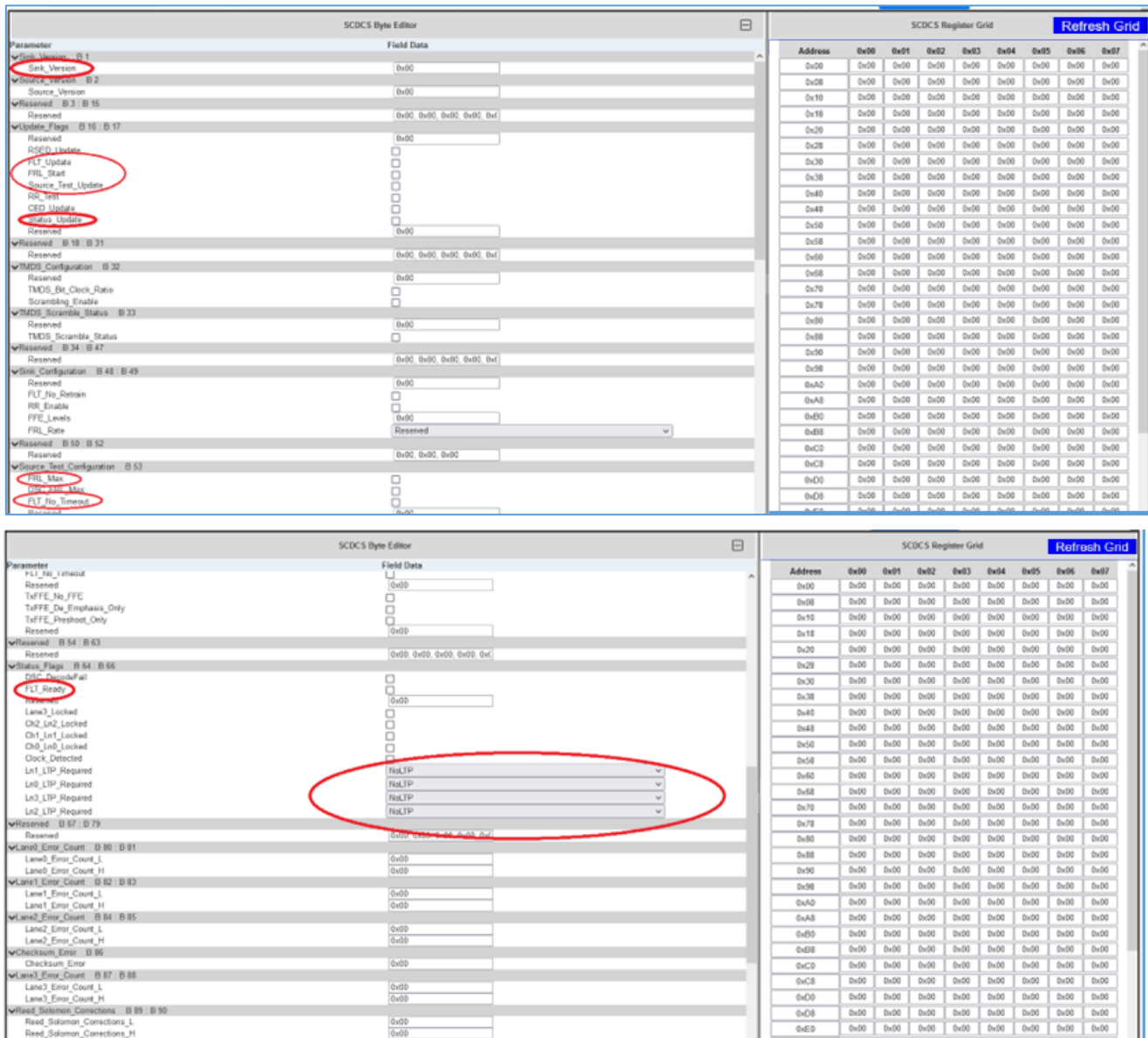


FIGURE 7.18: FRL TESTING — SET EDID FRL LINK RATE

- b. Step 2 (refer to Figure 7.19):
 1. Select the **SCDCS** editor using the  slider at the top of screen.
 2. Select the  button at the top of screen.
 3. In the SCDCS Byte Editor Field Data, set the following configuration data as indicated in red:



The image shows two screenshots of the SDCS configuration interface. The top screenshot displays the 'SDCS Byte Editor' with various parameters. Red circles highlight the following parameters: 'Sink_Version' (set to 1), 'FLT_Update' (checked), 'FRL_Start' (checked), 'Source_Test_Update' (checked), 'Status_Update' (checked), 'FRL_Max' (set to 0x00), 'FRL_Min' (set to 0x00), and 'FRL_No_Timeout' (checked). The bottom screenshot shows the 'SDCS Register Grid' with a table of registers. The table has columns for Address, 0x00, 0x01, 0x02, 0x03, 0x04, 0x05, 0x06, and 0x07. The registers are listed from 0x00 to 0x0F.

FIGURE 7.19: FRL TESTING — SET SDCS FRL PARAMETERS

- Sink Version: **1** (Sink device version)
- FLT_Update: **Enable** (When updating LTP request values, this flag is the indication for the Source that a new LTP request is updated on the Sink)
- FRL_Start: **Enable** (After link training is completed, the Source will check this flag before sending video/audio mainstream data)
- Source_Test_Update: **Enable** (If any value in the Source test configuration (0x35) is updated, then this flag should be enabled)
- Status_Update: **Enable** (If the status flag (sdcscs 0x40) is updated, then this flag should be enabled)

- FRL_Max: **Enable** (For max FRL rate)
- FLT_No_Timeout: **Enable** (The test equipment acting as a Sink should enable this flag)
- FLT_Ready: **Enable** (The reference sink should enable this flag to make the sink ready for link training.)
 - Ln_0_LTP_Required: **LTP 6** (Link Training Pattern request for Lane 0)
 - Ln_1_LTP_Required: **LTP 5** (Link Training Pattern request for Lane 1)
 - Ln_2_LTP_Required: **LTP 8** (Link Training Pattern request for Lane 2)
 - Ln_3_LTP_Required: **LTP 7** (Link Training Pattern request for Lane 3)

c. Step 3:

Connect the device to a FRL supported DUT.

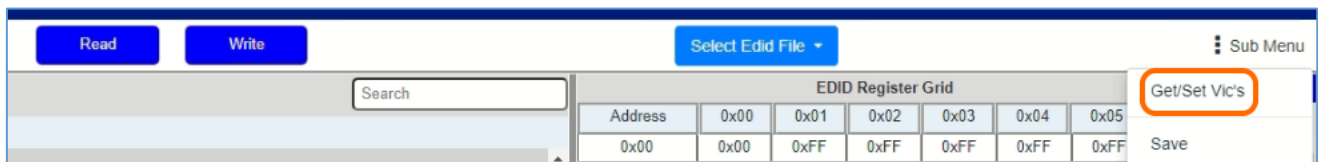
d. Step 4:

You should start retrieving the data at the link rate that has been set from the EDID editor.

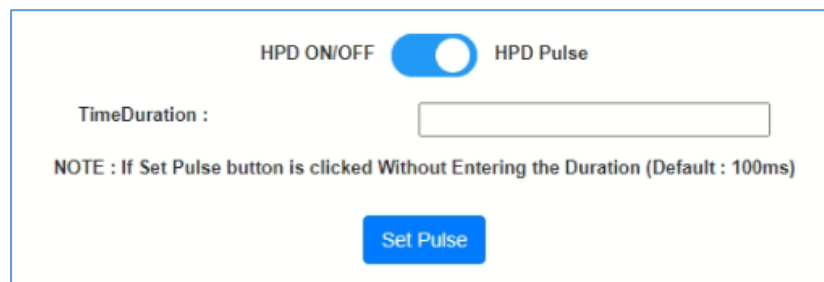
- If you want to change training patterns:

In the SCDCS editor, you can edit the **LTP_Required** field and after setting the pattern, ensure that the **FLT_Update** flag is enabled and then select the **Write** button.

- If you want to test at different link rates, then repeat Steps 1 and 2 as above. In Step 3, if the DUT is connected, you can pass HPD from the Browser App. From the “Sub Menu” drop-down, select **Get/Set Vic's** as shown below:



To enable the **HPD Pulse** signal, slide the toggle to “HPD Pulse”. Set the time duration and click on the **Set Pulse** button. *Note: The time duration will default to 100 ms if not specified after clicking on the Set Pulse button.*



In case you are not able to pass HPD from the Browser App, simply disconnect the DUT and follow Steps 1, 2 and 3 as above and re-connect the DUT.

7.3 Exerciser Tab (for the DisplayPort DUT)

The NOVA-S03 Browser App *Exerciser* screen works as a Source/Sink Emulator for the DisplayPort Over USB Type-C or Standard DisplayPort (Legacy) Source / Sink DUT. This interface provides an DPCD/EDID editor that enables users to read and write required register values while testing and debugging.

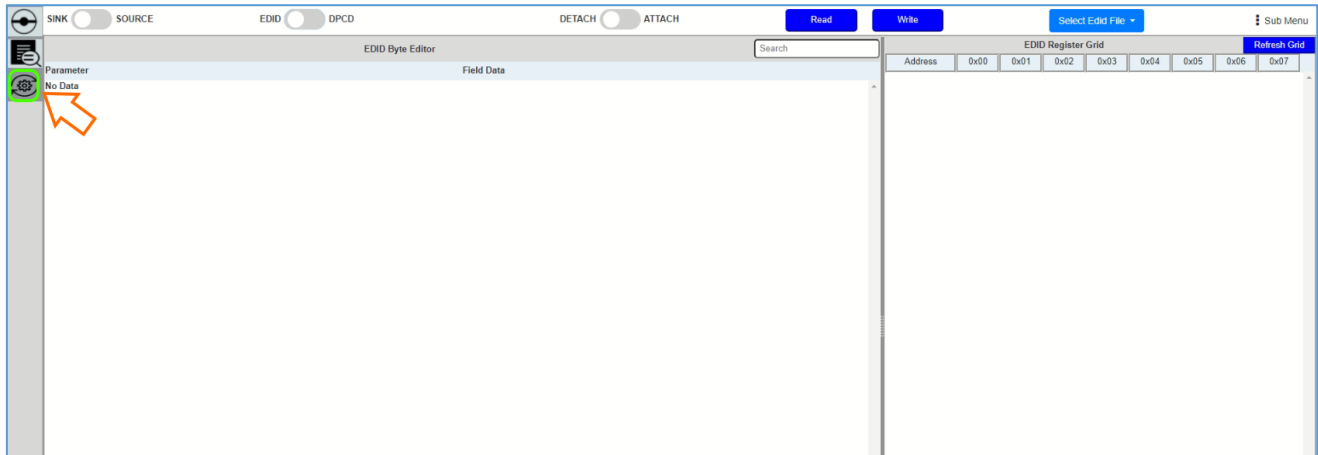


FIGURE 7.20: EXERCISER SCREEN (FOR DISPLAYPORT OVER USB TYPE-C MODE)

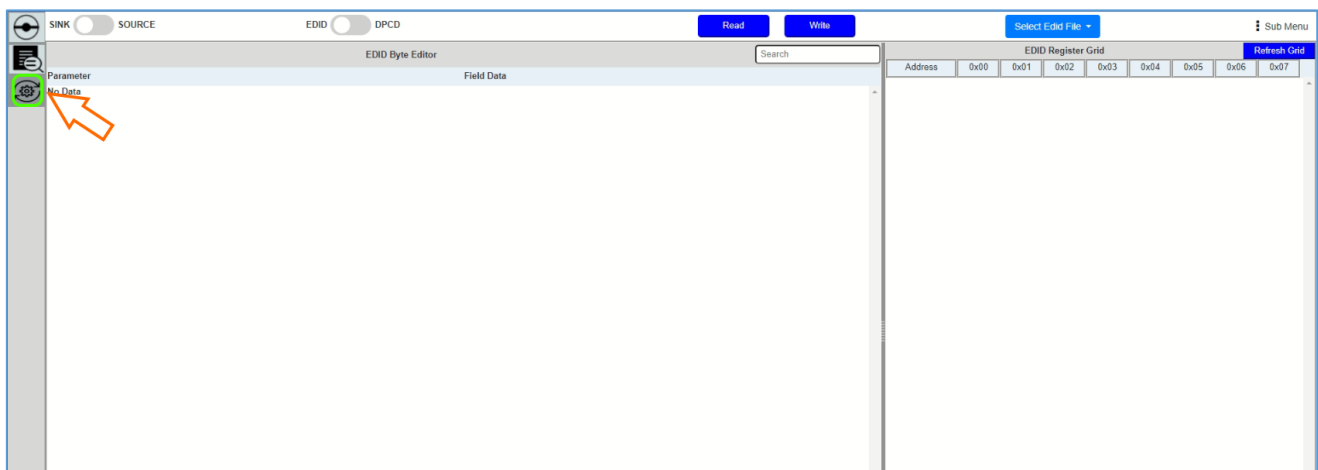


FIGURE 7.21: EXERCISER SCREEN (FOR STANDARD LEGACY DISPLAYPORT MODE)

7.3.1 DisplayPort Over USB Type-C Mode

7.3.1.1 Run Exerciser Mode for Source/Sink DUT's

1. In the Connection Setup screen, select **DP Over Type-C** from the drop-down list and click on the **Exerciser** button. Set up the test equipment as shown in the connection diagram.

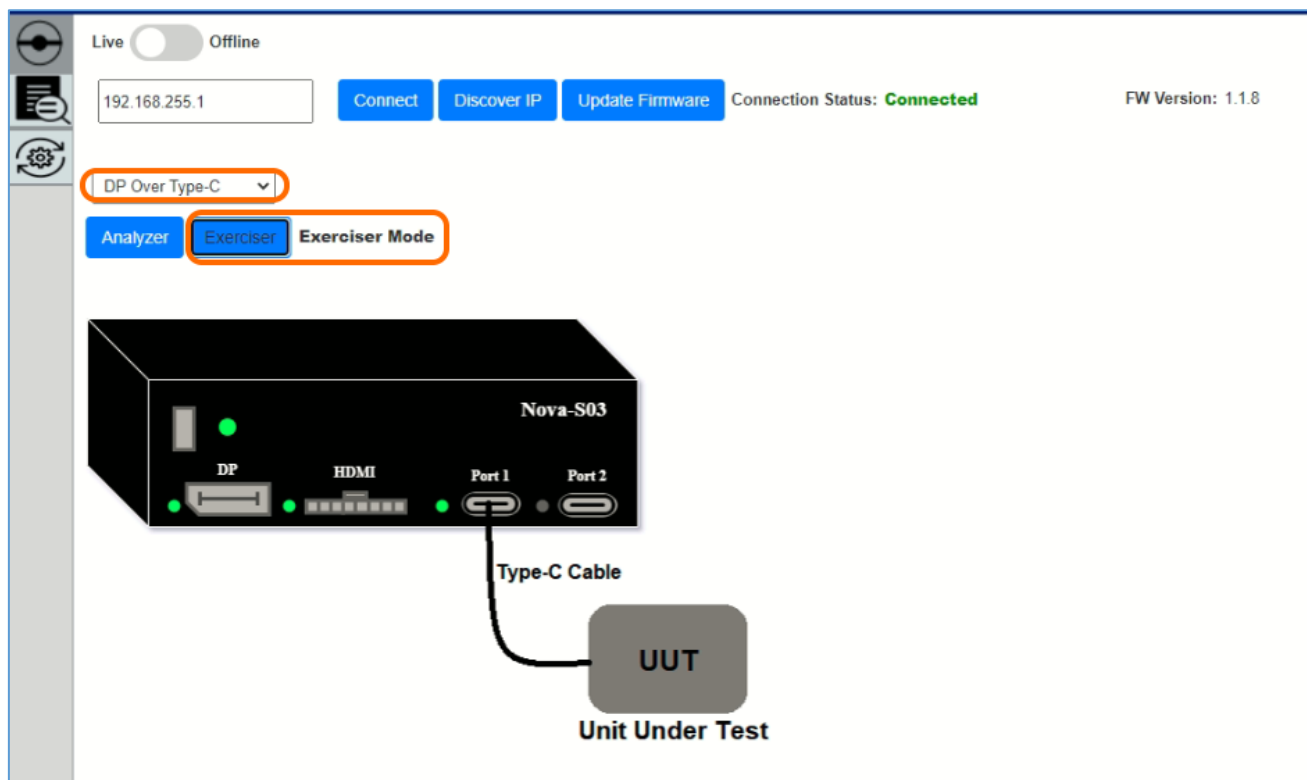


FIGURE 7.22: SELECT AND SET UP EXERCISER MODE FOR DISPLAYPORT OVER TYPE-C

2. Navigate to the Exerciser tab and select the role of the DUT (**Sink** or **Source**). *Note by default the Sink mode is selected; move the slider to the Source mode if the user wants to set the NOVA-S03 tester as a Sink and vice versa.*

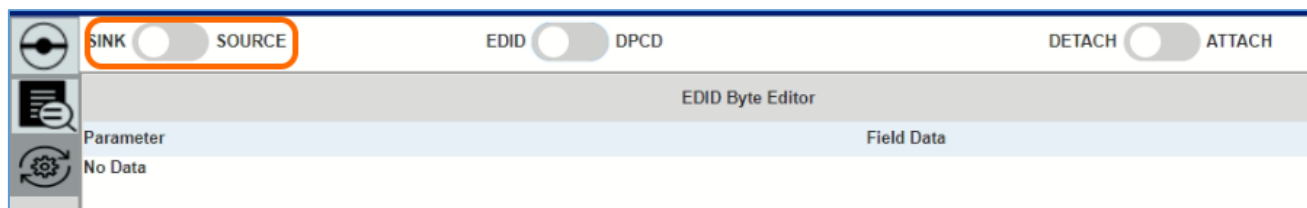


FIGURE 7.23: SELECT SINK OR SOURCE ROLE OF DUT IN EXERCISER SCREEN

3. Navigate to the Analyzer tab and click on the **Get Captures** button.

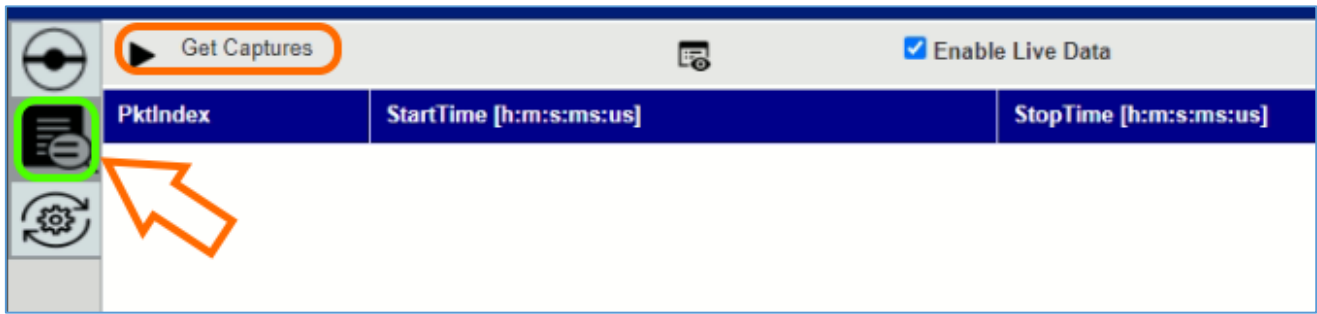


FIGURE 7.24: SELECT GET CAPTURES IN ANALYZER SCREEN

4. Navigate back to the Exerciser tab and select the DUT **Attach** or **Detach** function by toggling the slider. *Note by default the Detach function is selected; move the slider to the Attach function to attach the DUT to the NOVA-S03 tester and vice versa.*

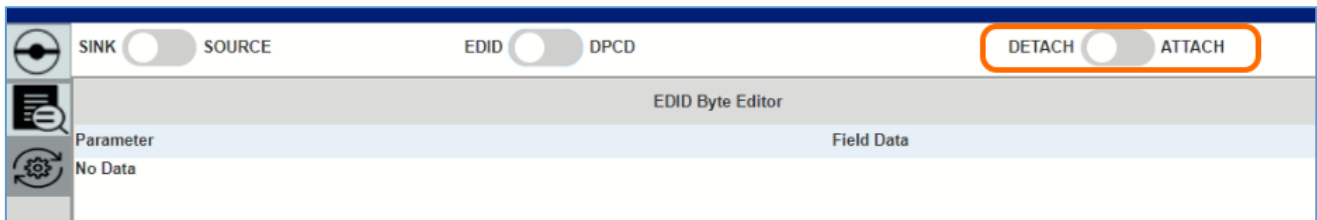
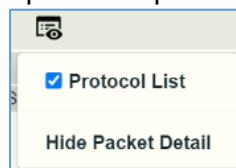


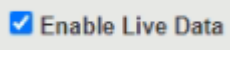
FIGURE 7.25: SELECT DUT ATTACH OR DETACH FUNCTION IN EXERCISER SCREEN

5. The Analyzer tab will then capture and display the USB Power Delivery/DisplayPort Alt Mode/Standard DisplayPort (Legacy) packet transaction details.

To manage the packet capture data view, select  above the data pane. Select from



these options to enable or disable display of the protocol/packet details.

You can select to enable/disable real-time data acquisition using .

To clear the data display, click on **Clear Packets** from the sub menu on the top right of the screen as shown below.



PktIndex	StartTime [h:m:s.ms:us]	StopTime [h:m:s.ms:us]	TesterMessage	Message Type	MsgPowerRole	MsgDescription
0	00:00:03.417.115	00:00:03.417.115	DUT	Attach	NONE	Rp_36k_900mA_Detec...
1	00:00:03.421.915	00:00:03.421.915	T	FSM_State_Transition	NONE	FSM_State_Unattache...
2	00:00:03.421.915	00:00:03.421.915	T	FSM_State_Transition	NONE	FSM_State_Unattache...
3	00:00:03.632.013	00:00:03.632.013	T	FSM_State_Transition	NONE	FSM_State_AttachWait...
4	00:00:03.632.013	00:00:03.632.013	T	FSM_State_Transition	NONE	FSM_State_AttachWait...
5	00:00:03.631.075	00:00:03.631.075	DUT	Rp_Detected	NONE	Rp_4_7k_3A_Detected
6	00:00:03.631.075	00:00:03.631.075	DUT	Rp_Detected	NONE	Rp_4_7k_3A_Detected
7	00:00:03.708.306	00:00:03.708.937	DUT	VendorDefined	DFF_UFP	Discover ID Initiator.
8	00:00:03.709.046	00:00:03.709.549	CAB	GoodCRC	CablePlug	
9	00:00:03.710.512	00:00:03.711.686	CAB	VendorDefined	CablePlug	Discover ID ACK.
10	00:00:03.711.730	00:00:03.712.228	DUT	GoodCRC	DFF_UFP	
11	00:00:03.716.317	00:00:03.716.947	DUT	SourceCap	Source	FS 5V 3A.
12	00:00:03.716.993	00:00:03.717.462	T	GoodCRC	Sink	
13	00:00:03.720.298	00:00:03.720.896	T	Request	Sink	PDO#1, OpCurrent = 0...
14	00:00:03.720.958	00:00:03.721.456	DUT	GoodCRC	Source	
15	00:00:03.725.543	00:00:03.726.041	DUT	Accept	Source	
16	00:00:03.726.087	00:00:03.726.557	T	GoodCRC	Sink	
17	00:00:03.759.707	00:00:03.760.205	DUT	PS_RDY	Source	
18	00:00:03.760.254	00:00:03.760.723	T	GoodCRC	Sink	
19	00:00:03.762.559	00:00:03.762.559	DUT	Rp_Detected	NONE	Rp_12k_1_5A_Detected
20	00:00:03.762.559	00:00:03.762.559	DUT	Rp_Detected	NONE	Rp_12k_1_5A_Detected
21	00:00:03.779.600	00:00:03.780.231	DUT	VendorDefined	Source	Discover ID Initiator.

FIGURE 7.26: RESULTS OF PACKET CAPTURE EXAMPLE IN ANALYZER SCREEN

7.3.1.2 Read DPCD/EDID Data for Source/Sink DUT's

Select the **Read** button at the top of the Exerciser screen to read DPCD and EDID registers from the Sink DUT or read EDID registers from a file and keep them in the EDID registers.

When the Read button is selected, a detailed view of the DPCD/EDID registers will appear to allow you to configure the values as shown in the following examples. The DPCD and EDID register grids will display the respective binary values.

SINK

SOURCE

EDID

DPCD

DETACH

ATTACH

Read

Write

Select Edid File...

Sub Menu

EDID Byte Editor

Search

Parameter

Field Data

BlockZeroHeader_B 0_B 7

BlockZeroHeader

VendorProductID_B 8_B 17

ManufacturerName

ProductCode

SerialNumber

WeekOfManufacture

YearOfManufacture

EDIDStructureVersionRevision_B 18_B 19

Version

Revision

BasicDisplayParametersFeatures_B 20_B 24

VideoInputDefinition

MaxHorizontalImageSizeIncm

MaxVerticalImageSizeIncm

GammaMax100100value

FeatureSupport

ColorCharacteristics_B 25_B 34

RedGreenLowBits

BlueWhiteLowBits

Redx

Redy

Greenx

Greeny

Blux

Bluy

Whitex

Whitay

EstablishedTimings_B 35_B 37

Timing1

Timing2

ManufacturersReservedTiming

StandardTimingID18_B 38_B 53

StandardTimingID1

EDID Register Grid

Refresh Grid

Address	0x00	0x01	0x02	0x03	0x04	0x05	0x06	0x07
0x00	0x00	0xFF	0xFF	0xFF	0xFF	0xFF	0xFF	0x00
0x08	0x06	0xB3	0x4A	0x16	0x86	0x73	0x01	0x00
0x10	0x25	0x1A	0x01	0x04	0xA5	0x22	0x13	0x78
0x18	0x3A	0xBA	0x25	0xA3	0x56	0x50	0xA0	0x28
0x20	0x0E	0x50	0x54	0xBF	0xEF	0x00	0xD1	0xC0
0x28	0xB3	0x00	0x95	0x00	0x81	0x00	0x81	0x00
0x30	0x81	0xC0	0x71	0x4F	0x01	0x01	0x02	0x3A
0x38	0x80	0x18	0x71	0x38	0x2D	0x00	0x58	0x2C
0x40	0x45	0x00	0x58	0xC2	0x10	0x00	0x00	0x1E
0x48	0x00	0x00	0x00	0xFF	0x00	0x47	0x39	0x4C
0x50	0x4D	0x54	0x46	0x30	0x39	0x35	0x31	0x31
0x58	0x30	0xA0	0x00	0x00	0x00	0xFD	0x00	0x32
0x60	0x4B	0x18	0x53	0x11	0x00	0x0A	0x20	0x20
0x68	0x20	0x20	0x20	0x20	0x00	0x00	0x00	0xFC
0x70	0x00	0x47	0x52	0x4C	0x5F	0x44	0x50	0x5F
0x78	0x53	0x49	0x4E	0x4B	0x0A	0x20	0x01	0xFB
0x80	0x02	0x03	0x0A	0x31	0x65	0x03	0x0C	0x00
0x88	0x10	0x00	0x8C	0x0A	0xD0	0x8A	0x20	0xE0
0x90	0x2D	0x10	0x10	0x3E	0x96	0x00	0x58	0xC2
0x98	0x10	0x00	0x00	0x18	0x01	0x1D	0x00	0x72
0xA0	0x51	0x00	0x1E	0x20	0x6E	0x28	0x55	0x00
0xA8	0x58	0xC2	0x10	0x00	0x00	0x1E	0x01	0x1D
0xB0	0x00	0xBC	0x52	0xD0	0x1E	0x20	0xB8	0x28
0xB8	0x55	0x40	0x58	0xC2	0x10	0x00	0x00	0x1E
0xC0	0x0C	0x0A	0x00	0x90	0x20	0x40	0x31	0x20
0xC8	0x0C	0x40	0x55	0x00	0x58	0xC2	0x10	0x00
0xD0	0x00	0x18	0x00	0x00	0x00	0x00	0x00	0x00
0xD8	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00
0xE0	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00
0xE8	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00
0xF0	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00
0xF8	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00

FIGURE 7.27: READ EDID EDITOR VIEW FOR SINK TEST MODE

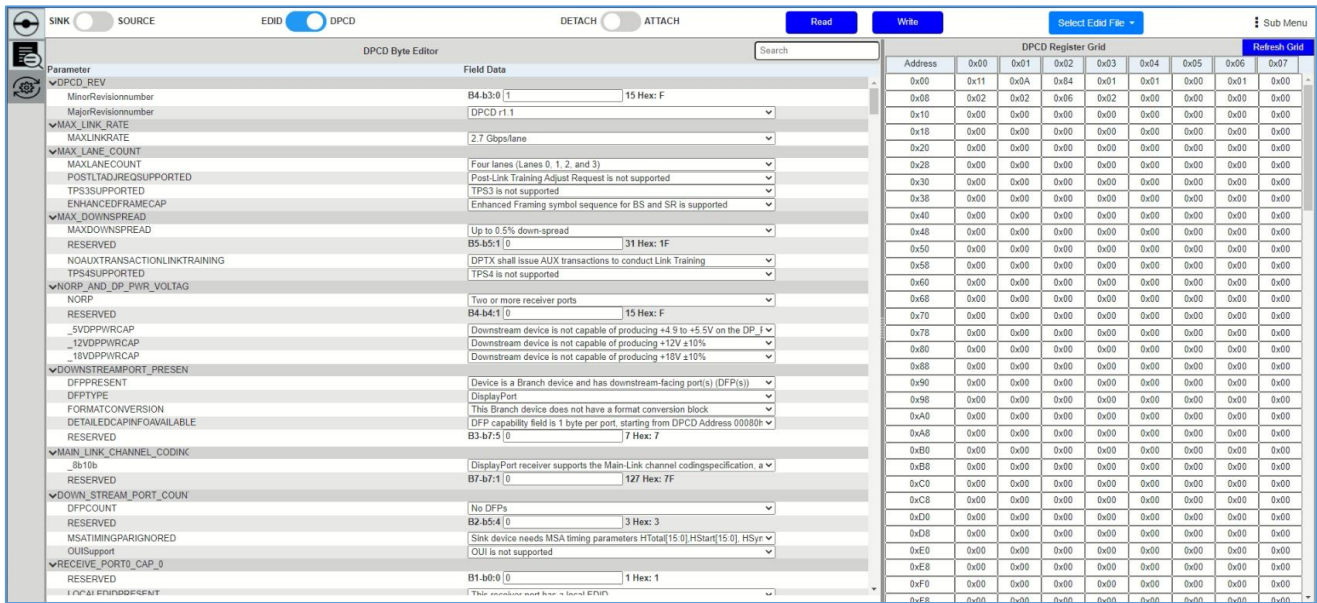


FIGURE 7.28: READ DPCD EDITOR VIEW FOR SINK TEST MODE

The following procedure describes how to read DPCD or EDID registers from the DUT:

1. In the Connection Setup screen, select **DP Over Type-C** from the drop-down list and click on the **Exerciser** button. Set up the test equipment as shown in the connection diagram.

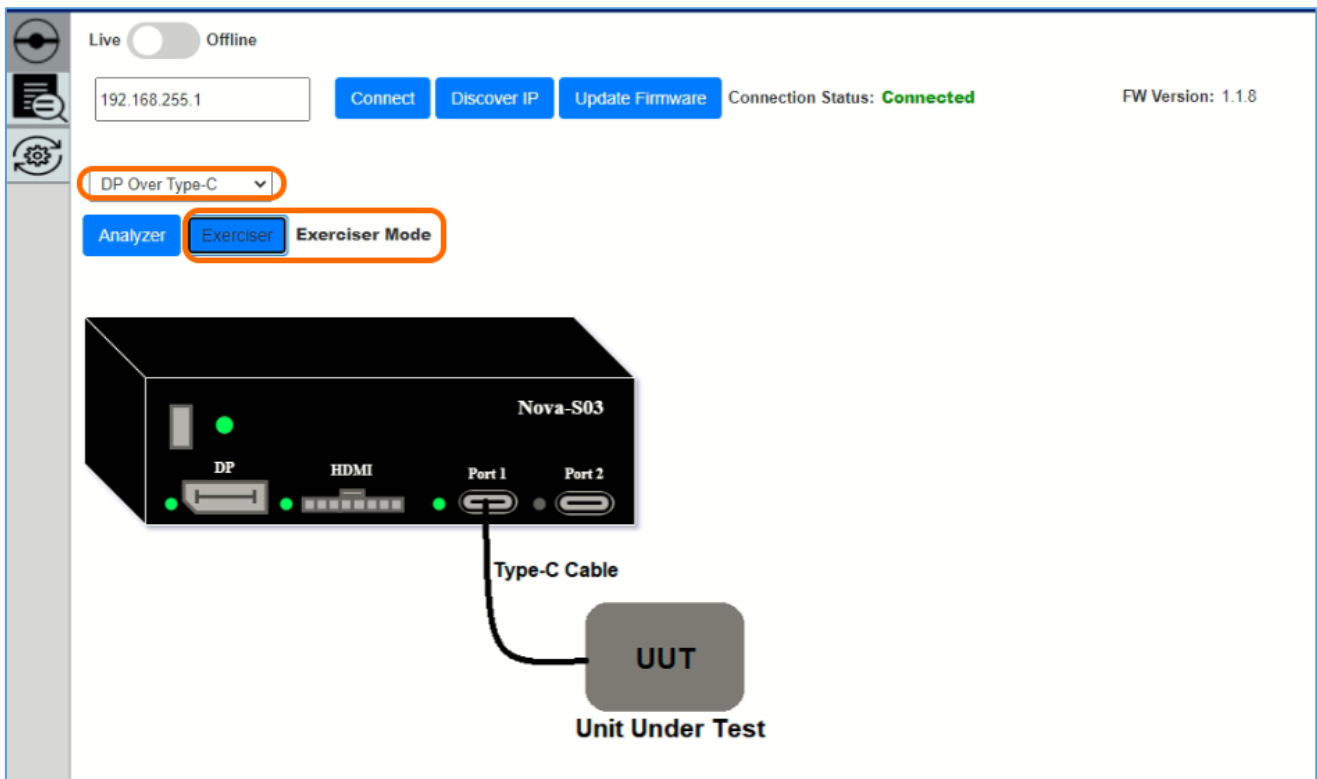


FIGURE 7.29: SELECT AND SET UP EXERCISER MODE FOR DISPLAYPORT OVER TYPE-C

2. Navigate to the Exerciser tab and select the role of the DUT (**Sink** or **Source**). *Note by default the Sink mode is selected; move the slider to the Source mode if the user wants to set the NOVA-S03 tester as a Sink and vice versa.*

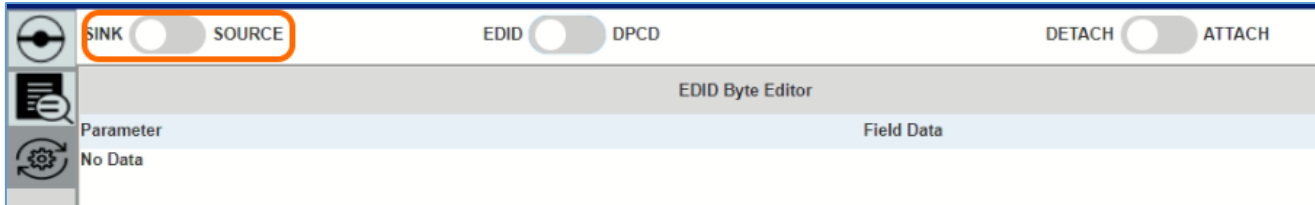


FIGURE 7.30: SELECT SINK OR SOURCE ROLE OF DUT IN EXERCISER SCREEN

3. Select the **EDID** or **DPCD** register mode by toggling the slider. *Note by default the EDID register mode is selected; move the slider to the DPCD mode for the DPCD register to be read and vice versa.*

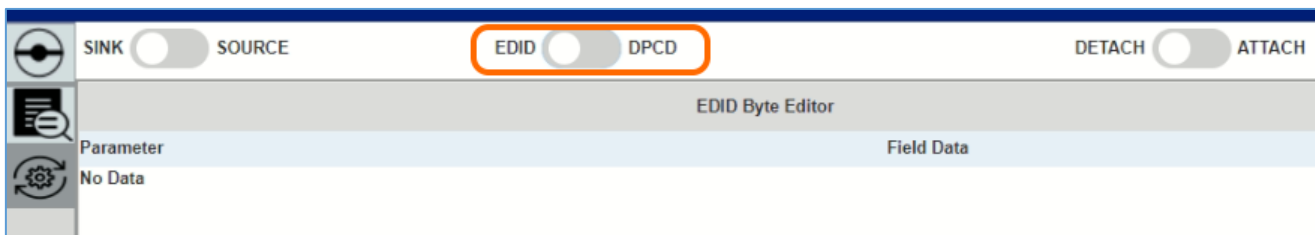


FIGURE 7.31: SELECT EDID OR DPCD REGISTER MODE IN EXERCISER SCREEN

4. Select the DUT **Attach** or **Detach** function by toggling the slider. *Note by default the Detach function is selected; move the slider to the Attach function to attach the DUT to the NOVA-S03 tester and vice versa.*

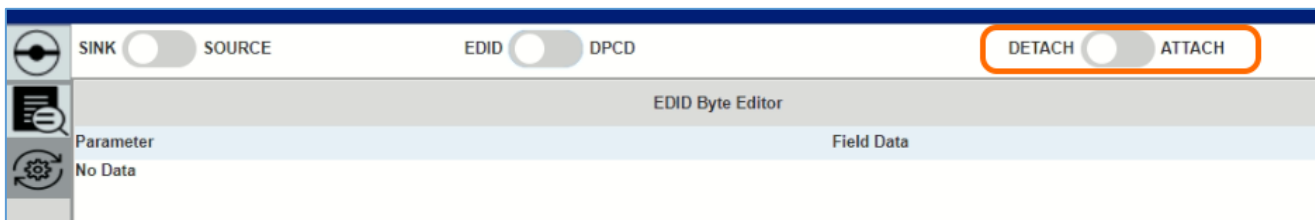


FIGURE 7.32: SELECT DUT ATTACH OR DETACH FUNCTION IN EXERCISER SCREEN

5. Click on the  button. Wait for approximately 20 seconds and the DPCD/EDID register data will be updated on the screen.

7.3.1.3 Read EDID from Files

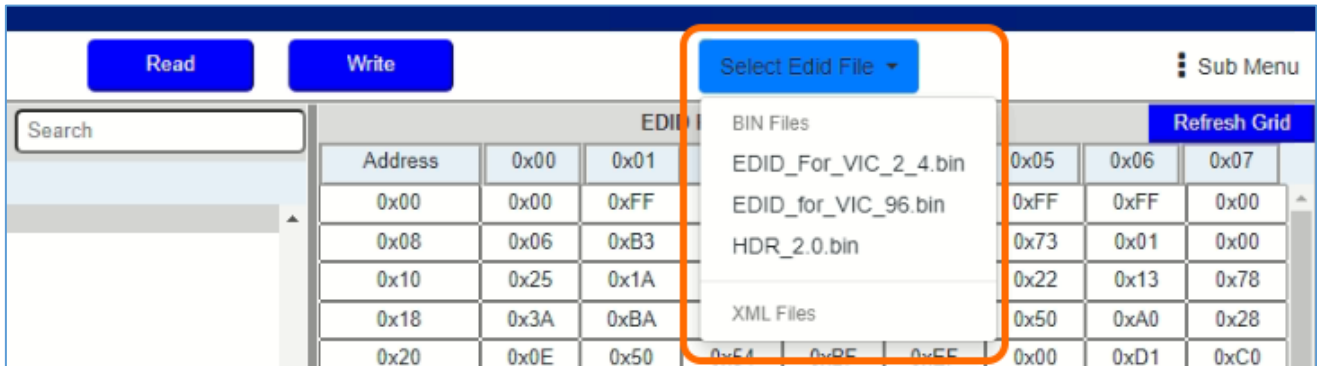


FIGURE 7.33: SELECT EDID FILE

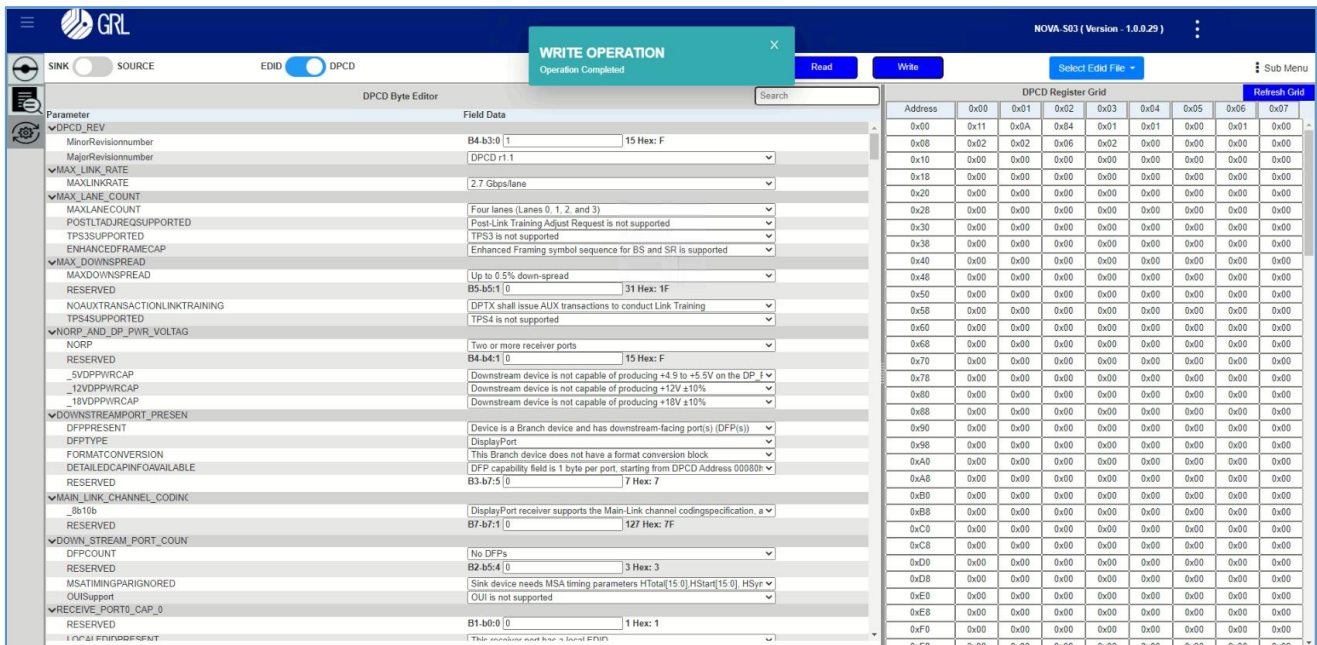
Use the **Select EDID File** drop-down menu to read EDID registers from BIN or XML files and keep them in the EDID registers.

Note: For the EDID files to appear in the drop-down menu, you will need to place the EDID files in the following location— "C:\GRL\NOVA-S03\EDID_FILES".

Select and load the specific EDID file from the **Select EDID File** drop-down menu.

7.3.1.4 Write DPCD/EDID Data for Source/Sink DUT's

After configuring the DPCD/EDID registers, select the **Write** button to write the DPCD registers to the Sink DUT or write binary EDID files into the EDID registers.



You can save the registers to a file by clicking on the **Save** option from the **Sub Menu** drop-down menu. The files will be saved in the following location— "C:\GRL\NOVA-S03\AppData". *Note: The file name will be "EDID_File"/"DPCD_File".*

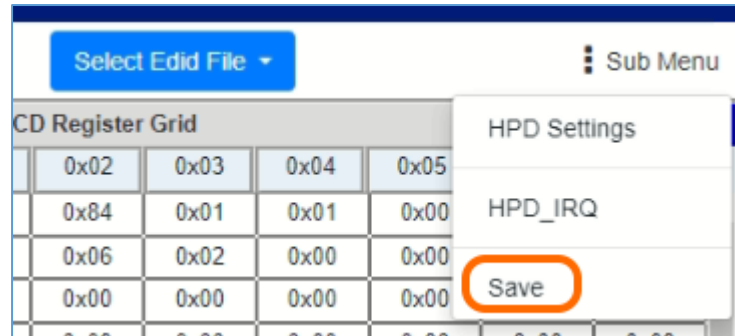


FIGURE 7.34: SAVE REGISTER TO A FILE

7.3.1.5 Set Up Hot Plug Detection (HPD) for Sink Test Mode

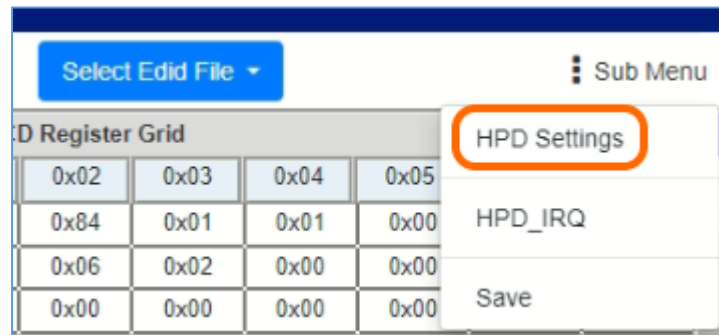


FIGURE 7.35: ACCESS HPD SETTINGS

Use the **Sub Menu** drop-down menu to set up HPD (**HPD Settings**) in the Sink test mode. Set the **Hot Plug On** or **Off** by selecting the respective option.

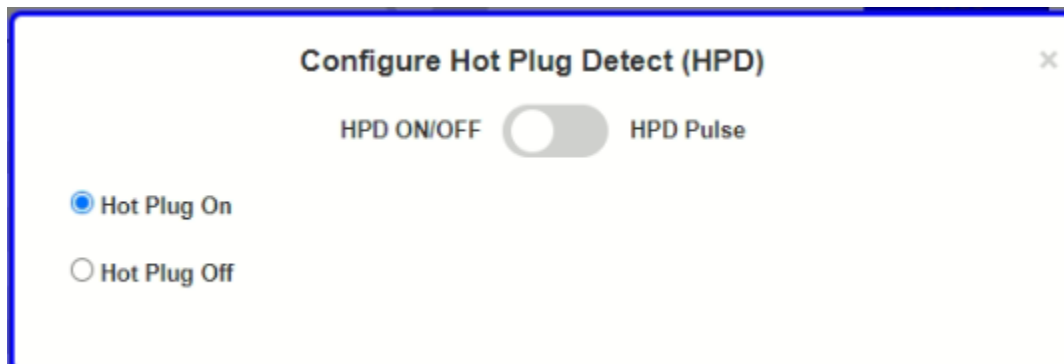


FIGURE 7.36: ENABLE/DISABLE HOT PLUG

To enable the **HPD Pulse** signal, slide the toggle to “HPD Pulse”. When HPD Pulse is selected, the Hot Plug is set to ON and the Sink should be able to read the EDID data and send the appropriate signal. Set the time duration and click on the **Set Pulse** button.

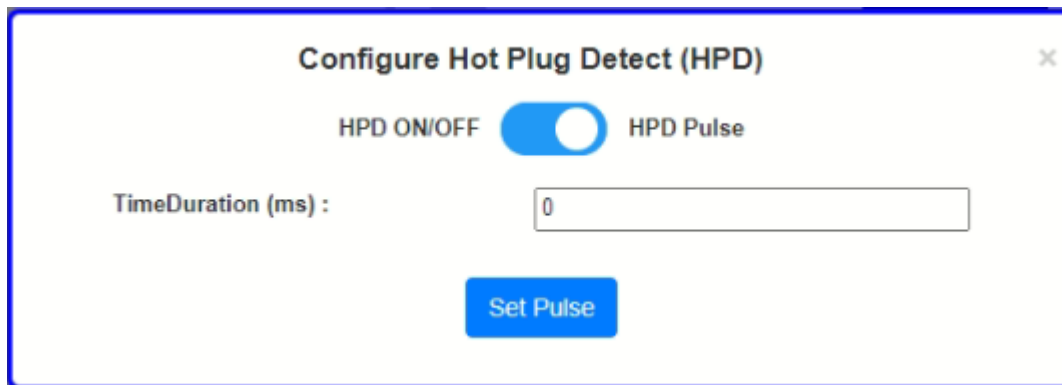


FIGURE 7.37: SET HPD PULSE

7.3.1.6 Enable HPD / IRQ Signaling

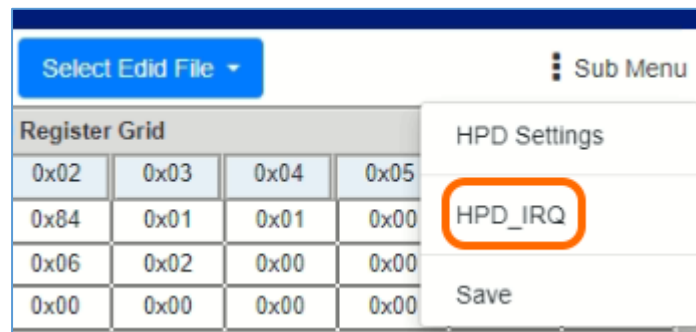


FIGURE 7.38: ENABLE HPD / IRQ SIGNALING

In the Exerciser screen, use the **Sub Menu** drop-down menu to select **HPD_IRQ**. This will allow the HPD / IRQ pulse to be transmitted from the NOVA-S03 analyzer hardware's end.

7.3.1.7 Run Analyzer Tests for Source/Sink DUT's

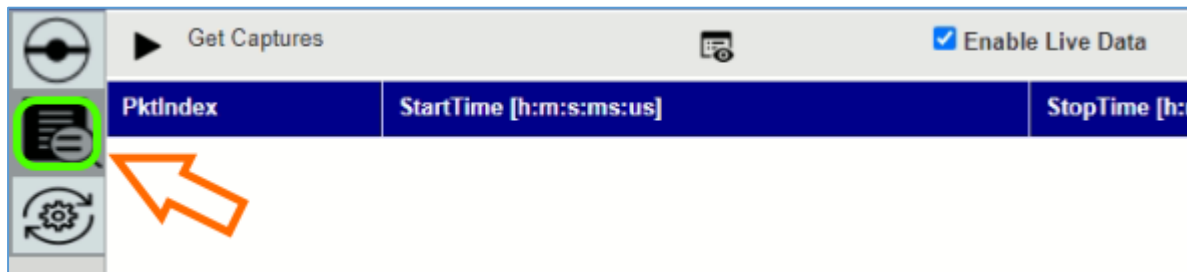


FIGURE 7.39: ANALYZER SCREEN (FOR CAPTURING DISPLAYPORT OVER TYPE-C PACKET TRANSACTION)

Select the Analyzer  tab on the left of the screen to capture the packet transaction details when DisplayPort Over USB Type-C testing is performed by connecting a DUT with the NOVA-S03 analyzer hardware.

1. In the Connection Setup screen, select **DP Over Type-C** from the drop-down list and click on the **Analyzer** button. Set up the test equipment as shown in the connection diagram.

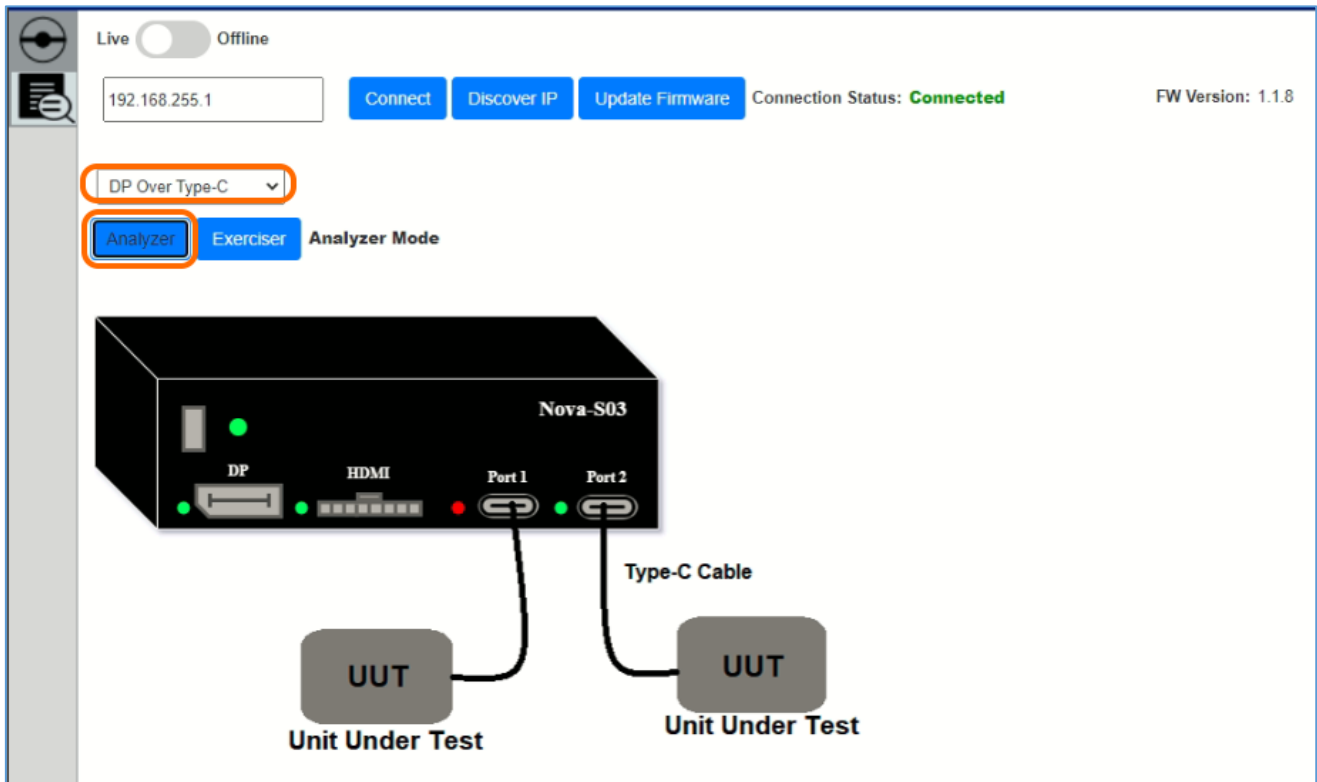
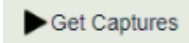


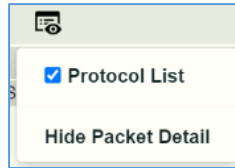
FIGURE 7.40: SELECT AND SET UP ANALYZER MODE FOR DISPLAYPORT OVER TYPE-C

2. In the Analyzer screen, select  before connecting the DUT to obtain the packet transaction.
3. Connect the Source DUT to Port 1 and Sink DUT to Port 2 of the NOVA-S03 analyzer hardware.
4. The packet transaction details will be updated in the Analyzer screen as shown in the following example:

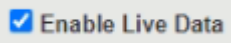
PkIndex	StartTime [h:m:s.ms:us]	StopTime [h:m:s.ms:us]	Message Type	MsgPowerRole	MsgDescription
0	00:00:03.417.115	00:00:03.417.115	Attach	NONE	Rp_36k_900mA_Detec...
1	00:00:03.421.915	00:00:03.421.915	FSM_State_Transition	NONE	FSM_State_Unattache...
2	00:00:03.421.915	00:00:03.421.915	FSM_State_Transition	NONE	FSM_State_Unattache...
3	00:00:03.632.013	00:00:03.632.013	FSM_State_Transition	NONE	FSM_State_AttachWait...
4	00:00:03.632.013	00:00:03.632.013	FSM_State_Transition	NONE	FSM_State_AttachWait...
5	00:00:03.631.075	00:00:03.631.075	Rp_Detected	NONE	Rp_4_7k_3A_Detected
6	00:00:03.631.075	00:00:03.631.075	Rp_Detected	NONE	Rp_4_7k_3A_Detected
7	00:00:03.708.306	00:00:03.708.937	VendorDefined	DFF_UFP	Discover ID Initiator.
8	00:00:03.709.046	00:00:03.709.549	GoodCRC	CablePlug	
9	00:00:03.710.512	00:00:03.711.686	VendorDefined	CablePlug	Discover ID ACK.
10	00:00:03.711.730	00:00:03.712.228	GoodCRC	DFF_UFP	
11	00:00:03.716.317	00:00:03.716.947	SourceCap	Source	FS: 5V 3A.
12	00:00:03.716.993	00:00:03.717.462	GoodCRC	Sink	
13	00:00:03.720.298	00:00:03.720.896	Request	Sink	PDO#1: OpCurrent = 0...
14	00:00:03.720.958	00:00:03.721.456	GoodCRC	Source	

FIGURE 7.41: RESULTS OF PACKET CAPTURE EXAMPLE

To manage the packet capture data view, select  above the data pane. Select from



these options to enable or disable display of the protocol/packet details.

You can select to enable/disable real-time data acquisition using .

To clear the data display, click on **Clear Packets** from the sub menu on the top right of the screen as shown below.



7.3.2 Standard DisplayPort (Legacy) Mode

7.3.2.1 Run Exerciser Mode for Source/Sink DUT's

1. In the Connection Setup screen, select **Standard DP** from the drop-down list and click on the **Exerciser** button. Set up the test equipment as shown in the connection diagram.

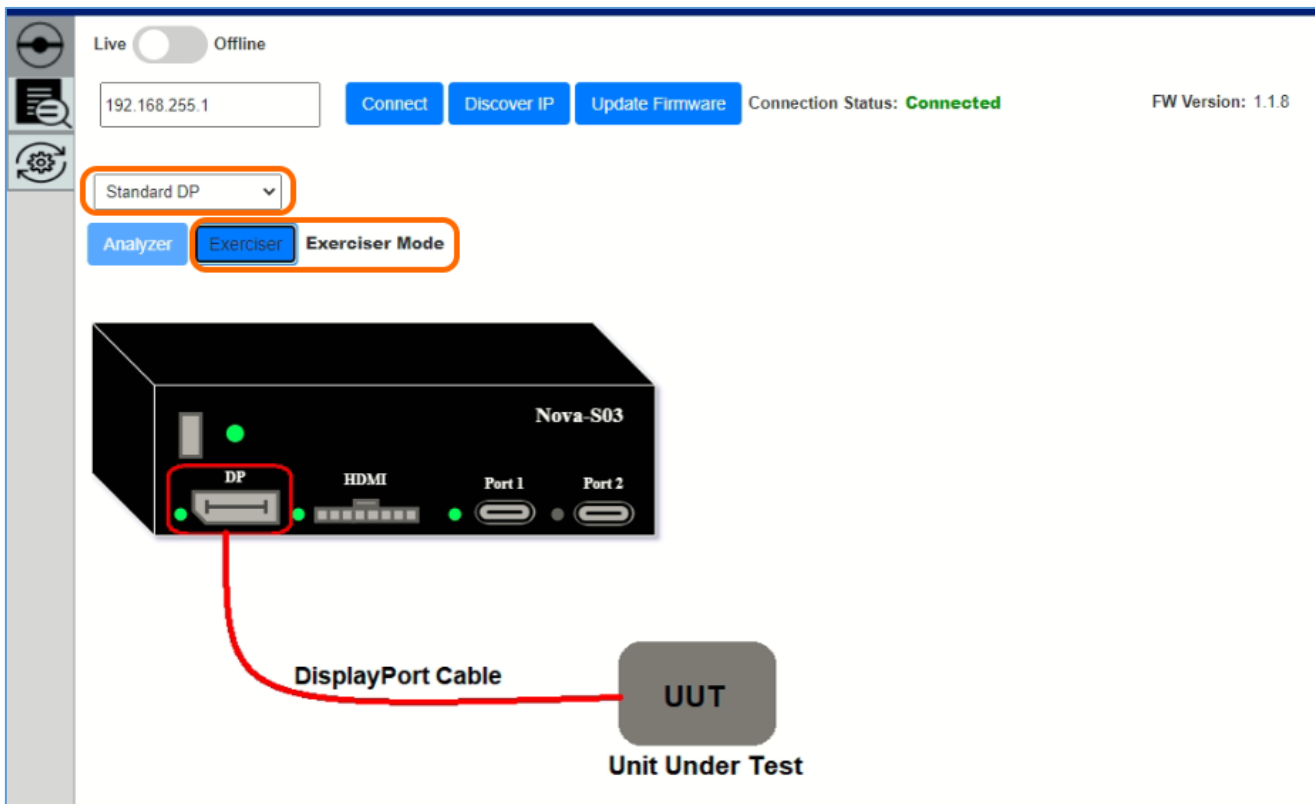


FIGURE 7.42: SELECT AND SET UP EXERCISER MODE FOR STANDARD DISPLAYPORT

2. Navigate to the Exerciser tab and select the **Sink** or **Source** role of the DUT. *Note by default the Sink mode is selected; move the slider to the Source mode if the user wants to set the NOVA-S03 tester as a Sink and vice versa.*

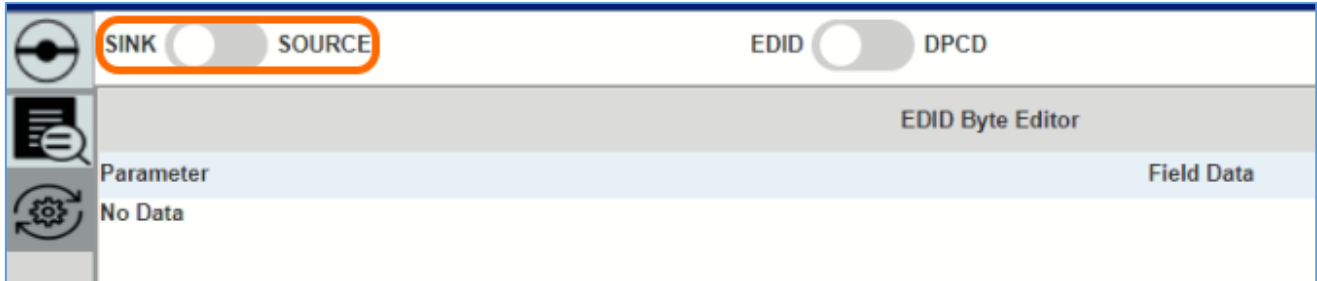


FIGURE 7.43: SELECT SINK OR SOURCE ROLE OF DUT IN EXERCISER SCREEN

3. Navigate to the Analyzer tab and click on the **Get Captures** button.

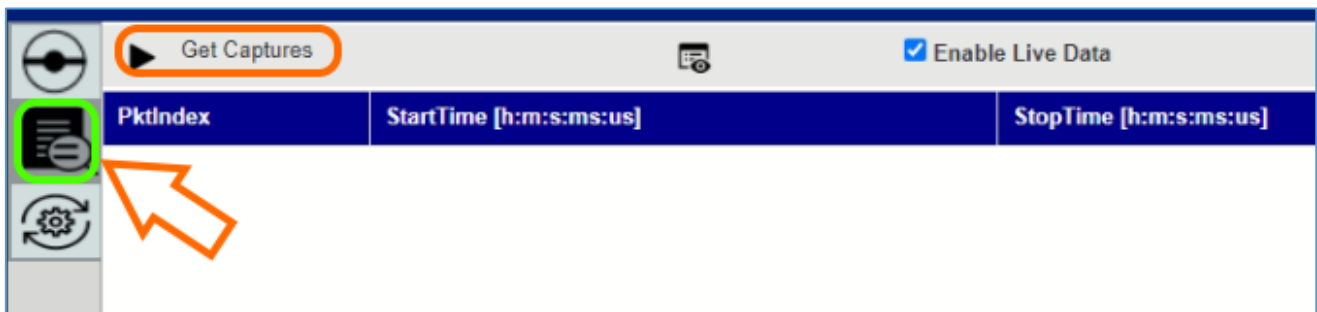
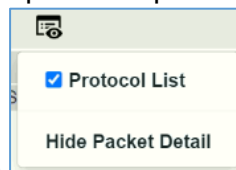


FIGURE 7.44: SELECT GET CAPTURES IN ANALYZER SCREEN

4. The Analyzer tab will then capture and display the AUX packet transaction details.

To manage the packet capture data view, select  above the data pane. Select from

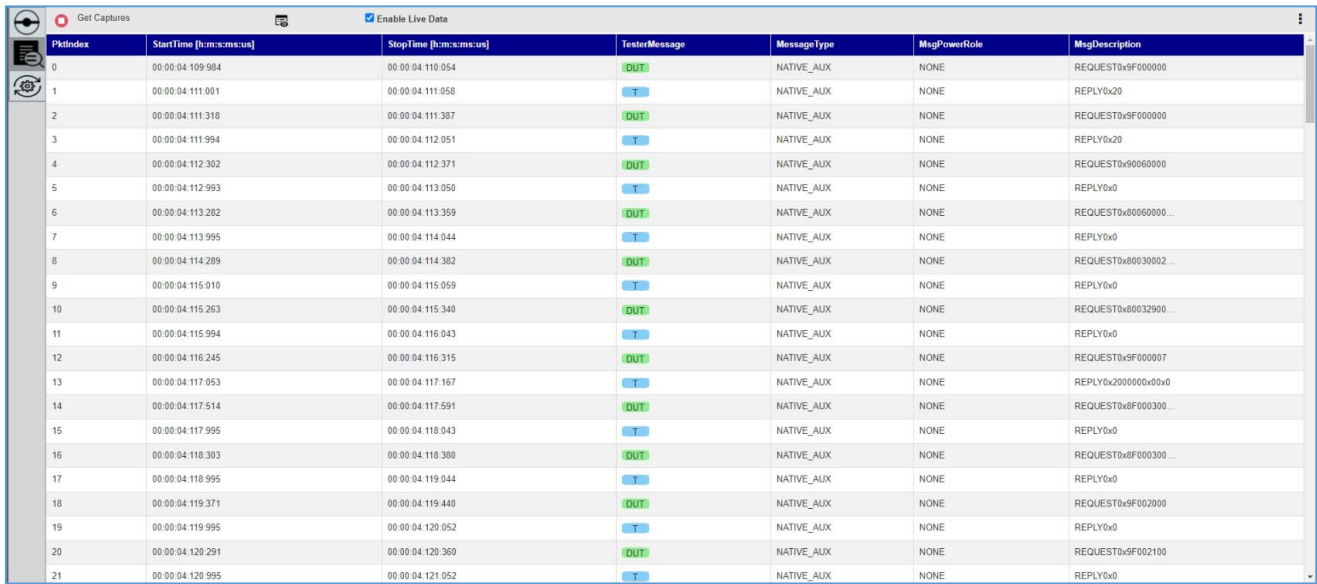


these options to enable or disable display of the protocol/packet details.

You can select to enable/disable real-time data acquisition using .

To clear the data display, click on **Clear Packets** from the sub menu on the top right of the screen as shown below.





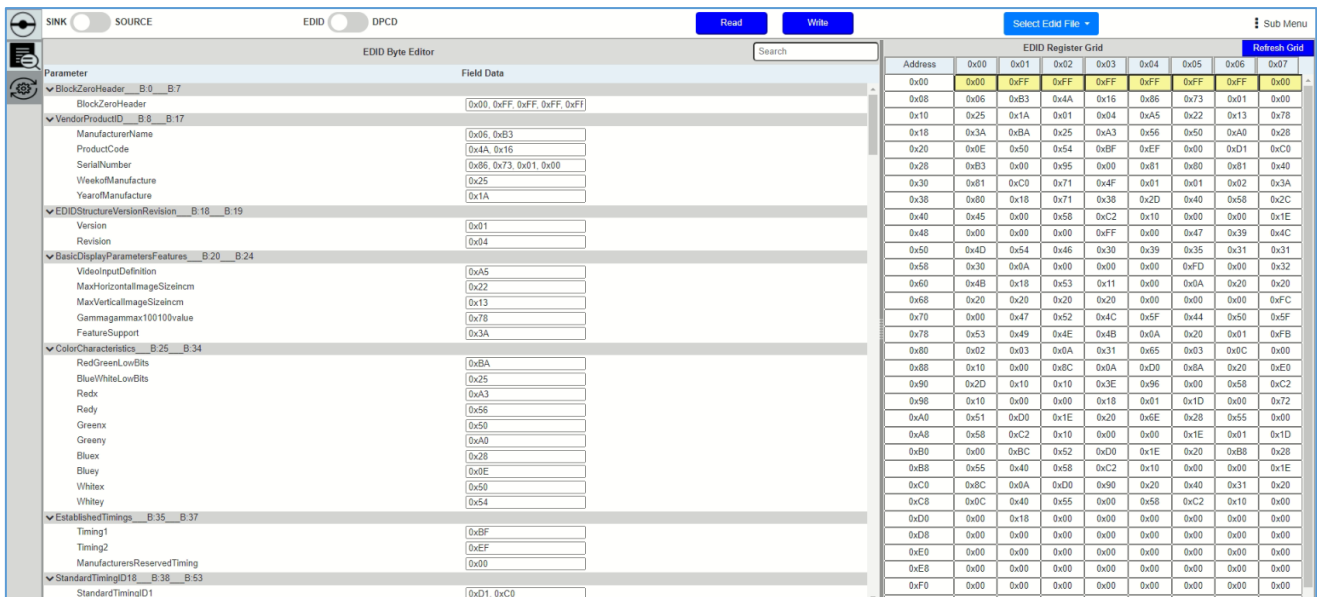
PkIndex	StartTime [h:m:s.ms.us]	StopTime [h:m:s.ms.us]	TesterMessage	Message Type	MsgPowerRole	MsgDescription
0	00:00:04.109.984	00:00:04.110.054	OUT	NATIVE_AUX	NONE	REQUEST0x9F000000
1	00:00:04.111.001	00:00:04.111.058	T	NATIVE_AUX	NONE	REPLY0x20
2	00:00:04.111.318	00:00:04.111.387	OUT	NATIVE_AUX	NONE	REQUEST0x9F000000
3	00:00:04.111.994	00:00:04.112.051	T	NATIVE_AUX	NONE	REPLY0x20
4	00:00:04.112.302	00:00:04.112.371	OUT	NATIVE_AUX	NONE	REQUEST0x90000000
5	00:00:04.112.993	00:00:04.113.050	T	NATIVE_AUX	NONE	REPLY0x0
6	00:00:04.113.282	00:00:04.113.359	OUT	NATIVE_AUX	NONE	REQUEST0x80000000...
7	00:00:04.113.995	00:00:04.114.044	T	NATIVE_AUX	NONE	REPLY0x0
8	00:00:04.114.289	00:00:04.114.382	OUT	NATIVE_AUX	NONE	REQUEST0x80030002...
9	00:00:04.115.010	00:00:04.115.059	T	NATIVE_AUX	NONE	REPLY0x0
10	00:00:04.115.263	00:00:04.115.340	OUT	NATIVE_AUX	NONE	REQUEST0x80032900...
11	00:00:04.115.994	00:00:04.116.043	T	NATIVE_AUX	NONE	REPLY0x0
12	00:00:04.116.245	00:00:04.116.315	OUT	NATIVE_AUX	NONE	REQUEST0x9F000007
13	00:00:04.117.053	00:00:04.117.167	T	NATIVE_AUX	NONE	REPLY0x200500000x0
14	00:00:04.117.514	00:00:04.117.591	OUT	NATIVE_AUX	NONE	REQUEST0x8F000300...
15	00:00:04.117.995	00:00:04.118.043	T	NATIVE_AUX	NONE	REPLY0x0
16	00:00:04.118.303	00:00:04.118.380	OUT	NATIVE_AUX	NONE	REQUEST0x8F000300...
17	00:00:04.118.995	00:00:04.119.044	T	NATIVE_AUX	NONE	REPLY0x0
18	00:00:04.119.371	00:00:04.119.440	OUT	NATIVE_AUX	NONE	REQUEST0x9F002000
19	00:00:04.119.995	00:00:04.120.052	T	NATIVE_AUX	NONE	REPLY0x0
20	00:00:04.120.291	00:00:04.120.360	OUT	NATIVE_AUX	NONE	REQUEST0x9F002100
21	00:00:04.120.995	00:00:04.121.052	T	NATIVE_AUX	NONE	REPLY0x0

FIGURE 7.45: RESULTS OF PACKET CAPTURE EXAMPLE IN ANALYZER SCREEN

7.3.2.2 Read DPCD/EDID Data for Source/Sink DUT's

Select the  button at the top of the Exerciser screen to read DPCD and EDID registers from the Sink DUT or read EDID registers from a file and keep them in the EDID registers.

When the Read button is selected, a detailed view of the DPCD/EDID registers will appear to allow you to configure the values as shown in the following examples. The DPCD and EDID register grids will display the respective binary values.



Address	0x00	0x01	0x02	0x03	0x04	0x05	0x06	0x07
0x00	0x00	0xFF	0xFF	0xFF	0xFF	0xFF	0xFF	0x00
0x08	0x06	0xB3	0x4A	0x16	0x86	0x73	0x01	0x00
0x10	0x25	0x1A	0x01	0x04	0xA5	0x22	0x13	0x78
0x18	0x3A	0xBA	0x25	0xA3	0x56	0x50	0xA0	0x28
0x20	0x0E	0x50	0x54	0xBF	0xEF	0x00	0xD1	0xC0
0x28	0xB3	0x00	0x95	0x00	0x81	0x80	0x81	0x40
0x30	0xB1	0xC0	0x71	0x4F	0x01	0x01	0x02	0x3A
0x38	0x80	0x18	0x71	0x38	0x2D	0x40	0x58	0x2C
0x40	0x45	0x00	0x58	0xC2	0x10	0x00	0x00	0x1E
0x48	0x00	0x00	0x00	0xFF	0x00	0x47	0x39	0x4C
0x50	0x4D	0x54	0x46	0x30	0x39	0x35	0x31	0x31
0x58	0x30	0xA0	0x00	0x00	0x00	0xD0	0x00	0x32
0x60	0x4B	0x18	0x53	0x11	0x00	0x0A	0x20	0x20
0x68	0x20	0x20	0x20	0x20	0x00	0x00	0x00	0xFC
0x70	0x00	0x47	0x52	0x4C	0x5F	0x44	0x50	0x5F
0x78	0x53	0x49	0x4E	0x4B	0x0A	0x20	0x01	0xFB
0x80	0x02	0x03	0xA0	0x31	0x65	0x03	0x0C	0x00
0x88	0x10	0x00	0x8C	0xA0	0x96	0x8A	0x20	0x0A
0x90	0x2D	0x10	0x10	0x3E	0x06	0x00	0x58	0xC2
0x98	0x10	0x00	0x00	0x18	0x01	0x1D	0x00	0x72
0xA0	0x51	0xD0	0x1E	0x20	0x6E	0x28	0x55	0x00
0xA8	0x58	0xC2	0x10	0x00	0x00	0x1E	0x01	0x1D
0xB0	0x00	0xBC	0x52	0xD0	0x1E	0x20	0xB8	0x28
0xB8	0x55	0x40	0x58	0xC2	0x10	0x00	0x00	0x1E
0xC0	0x8C	0xA0	0xD0	0x90	0x20	0x40	0x31	0x20
0xC8	0x0C	0x40	0x55	0x00	0x58	0xC2	0x10	0x00
0xD0	0x00	0x18	0x00	0x00	0x00	0x00	0x00	0x00
0xD8	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00
0xE0	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00
0xE8	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00
0xF0	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00

FIGURE 7.46: READ EDID EDITOR VIEW FOR SINK TEST MODE

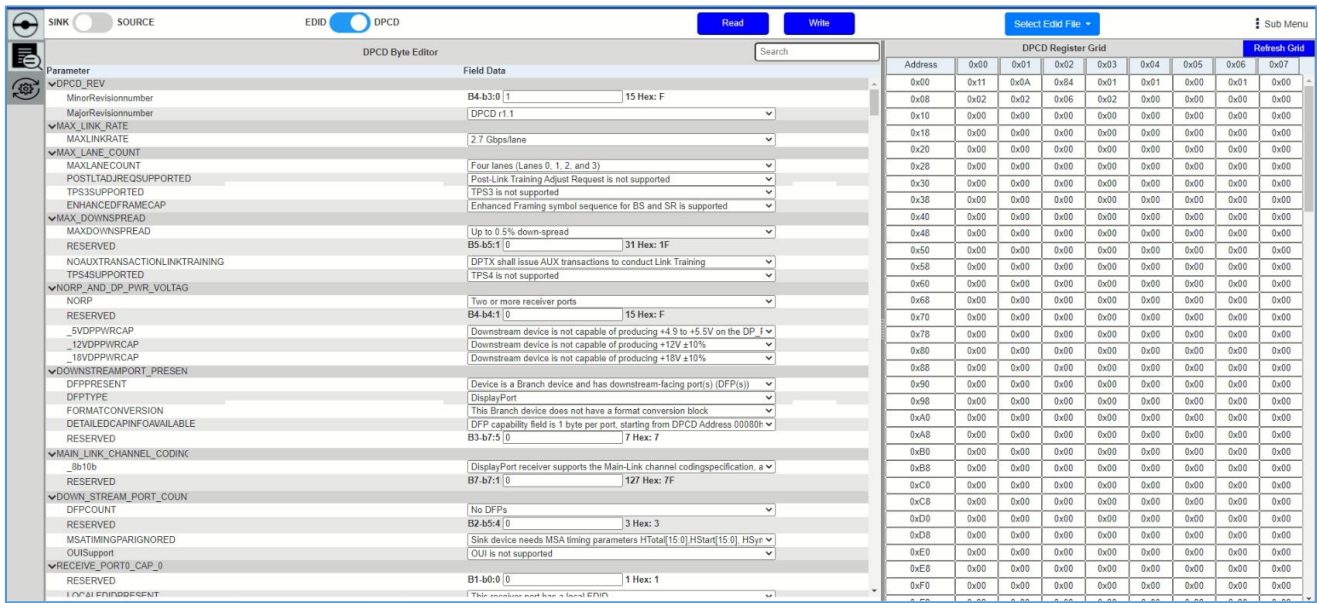


FIGURE 7.47: READ DPCD EDITOR VIEW FOR SINK TEST MODE

The following procedure describes how to read DPCD or EDID registers from the DUT:

1. In the Connection Setup screen, select **Standard DP** from the drop-down list and click on the **Exerciser** button. Set up the test equipment as shown in the connection diagram.

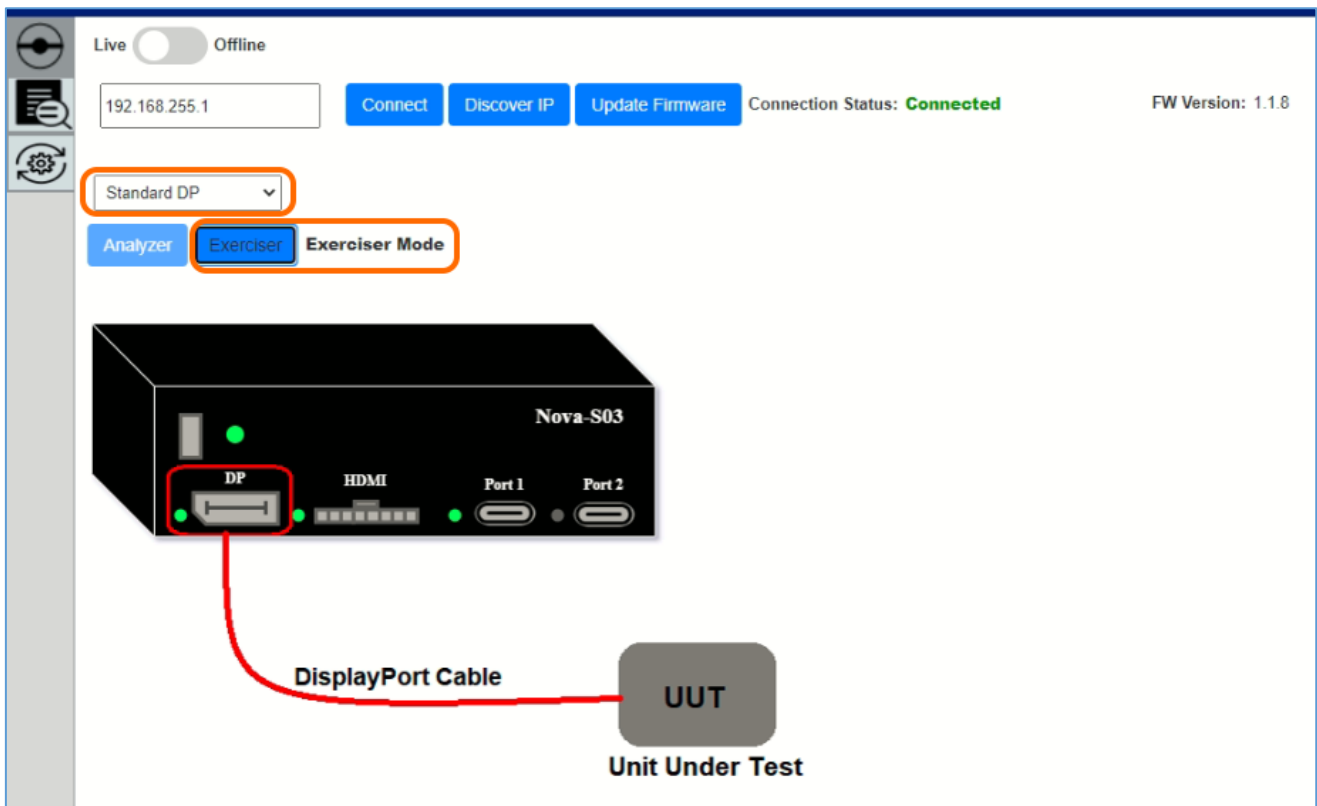


FIGURE 7.48: SELECT AND SET UP EXERCISER MODE FOR STANDARD DISPLAYPORT

- Navigate to the Exerciser tab and select the **Sink** or **Source** role of the DUT. *Note by default the Sink mode is selected; move the slider to the Source mode if the user wants to set the NOVA-S03 tester as a Sink and vice versa.*

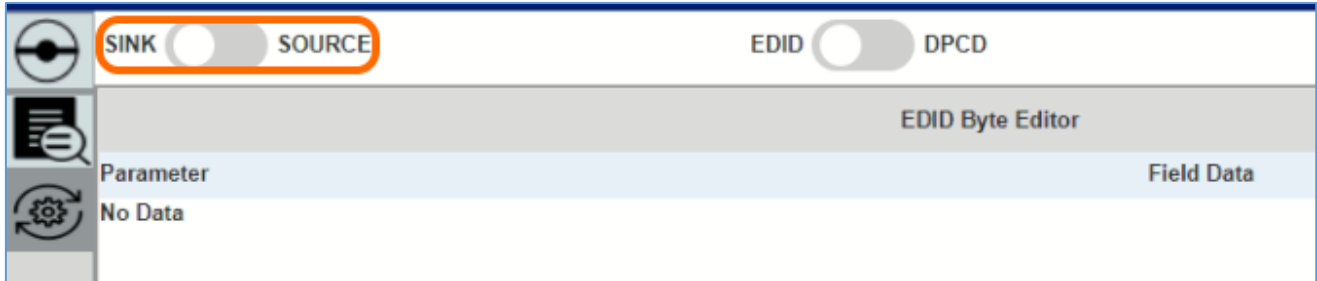


FIGURE 7.49: SELECT SINK OR SOURCE ROLE OF DUT IN EXERCISER SCREEN

- Select the **EDID** or **DPCD** register mode by toggling the slider. Note by default the EDID register mode is selected; move the slider to the DPCD mode for the DPCD register to be read and vice versa.

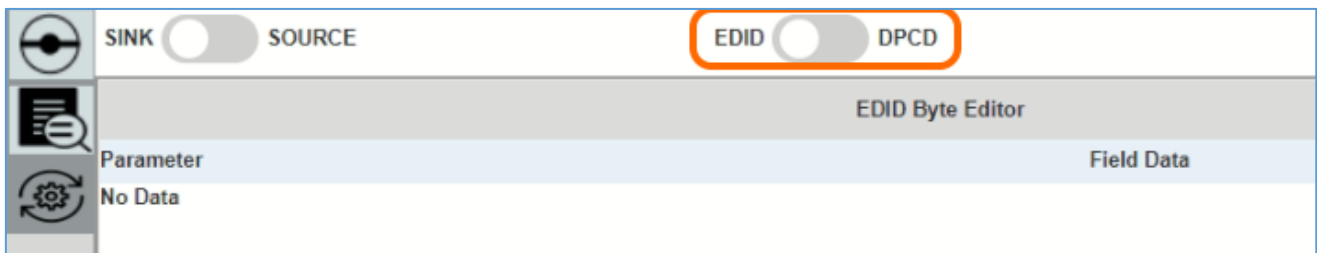


FIGURE 7.50: SELECT EDID OR DPCD REGISTER MODE IN EXERCISER SCREEN

- Click on the **Read** button in the Exerciser screen. Wait for approximately 20 seconds and the DPCD/EDID registers data will be updated on the screen.

7.3.2.3 Read EDID from Files

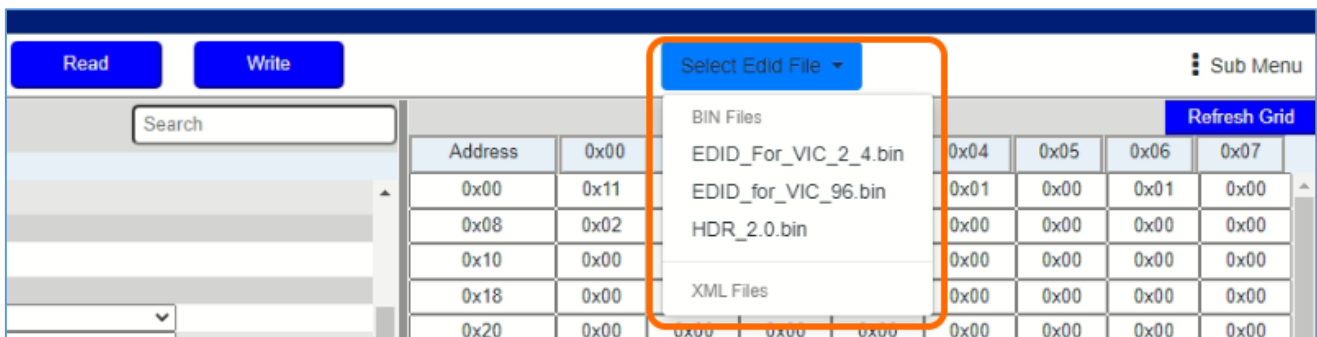


FIGURE 7.51: SELECT EDID FILES

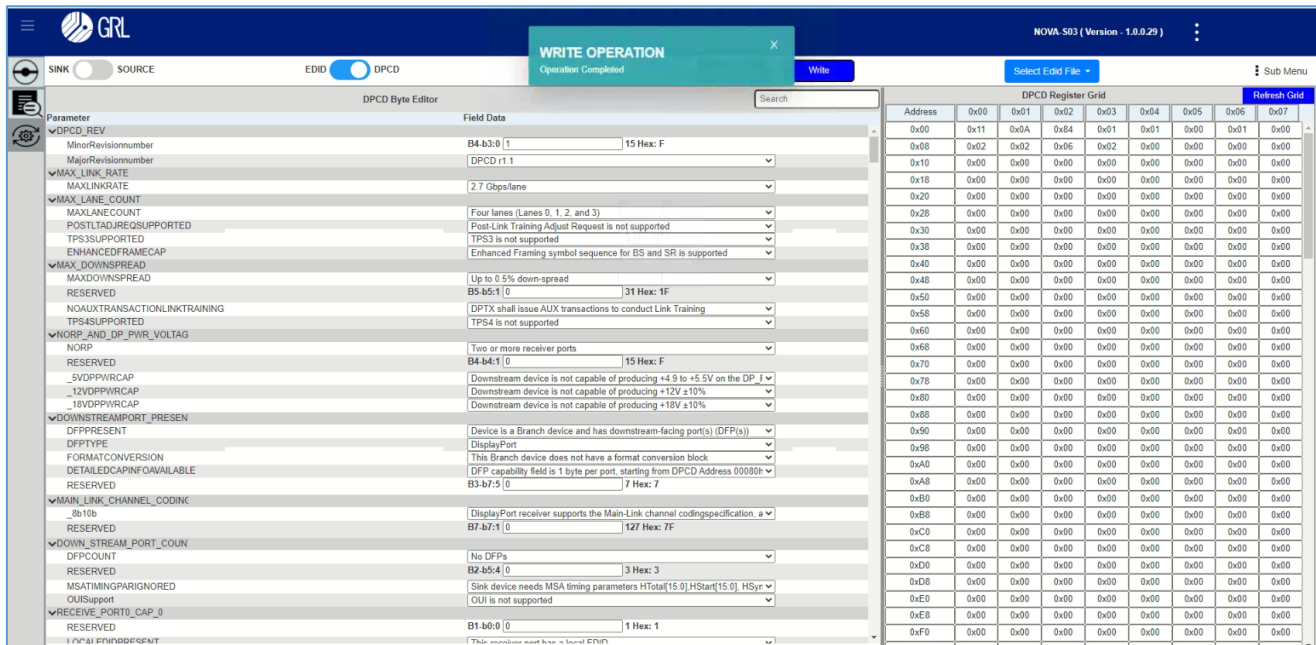
Use the **Select EDID File** drop-down menu to read EDID registers from BIN or XML files and keep them in the EDID registers.

Note: For the EDID files to appear in the drop-down menu, you will need to place the EDID files in the following location— "C:\GRL\NOVA-S03\EDID_FILES".

Select and load the specific EDID file from the **Select EDID File** drop-down menu.

7.3.2.4 Write DPCD/EDID Data for Source/Sink DUT's

After configuring the DPCD/EDID registers, select the **Write** button to write the DPCD registers to the Sink DUT or write binary EDID files into the EDID registers.



You can save the registers to a file by clicking on the **Save** option from the **Sub Menu** drop-down menu. The files will be saved in the following location— "C:\GRL\NOVA-S03\AppData". Note: The file name will be "EDID_File"/"DPCD_File".

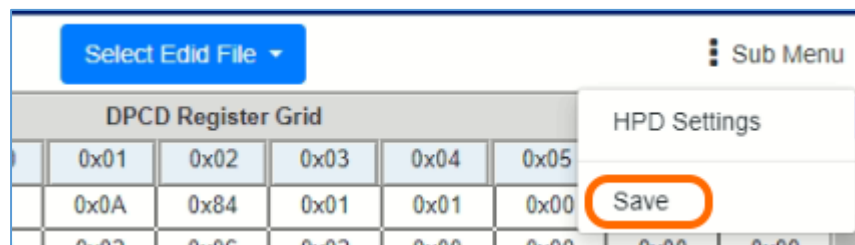


FIGURE 7.52: SAVE REGISTER TO A FILE

7.3.2.5 Enable Hot Plug Detection (HPD) for Source Test Mode

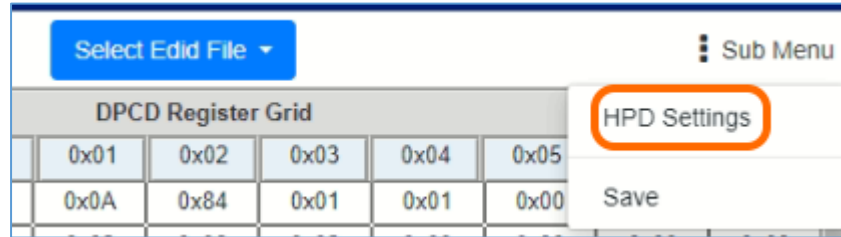


FIGURE 7.53: SELECT TO ENABLE HOT PLUG DETECTION

Use the **Sub Menu** drop-down menu to simulate the Hot Plug Detect signal in the Source test mode by selecting **HPD Settings**.

Set the **Hot Plug On** or **Off** by selecting the respective option.

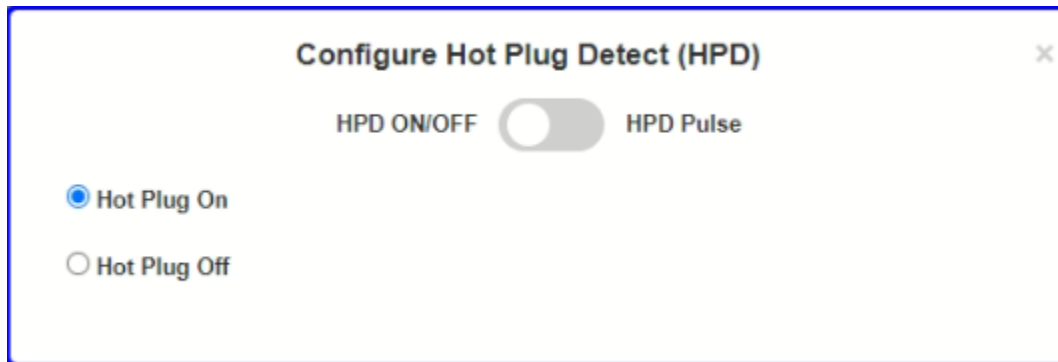


FIGURE 7.54: ENABLE/DISABLE HOT PLUG

To enable the **HPD Pulse** signal, slide the toggle to “HPD Pulse”. When HPD Pulse is selected, the Hot Plug is set to ON and the Source should be able to read the EDID data and send the appropriate signal. Set the time duration and click on the **Set Pulse** button. *Note: The time duration will default to 7 ms if not specified after clicking on the Set Pulse button.*

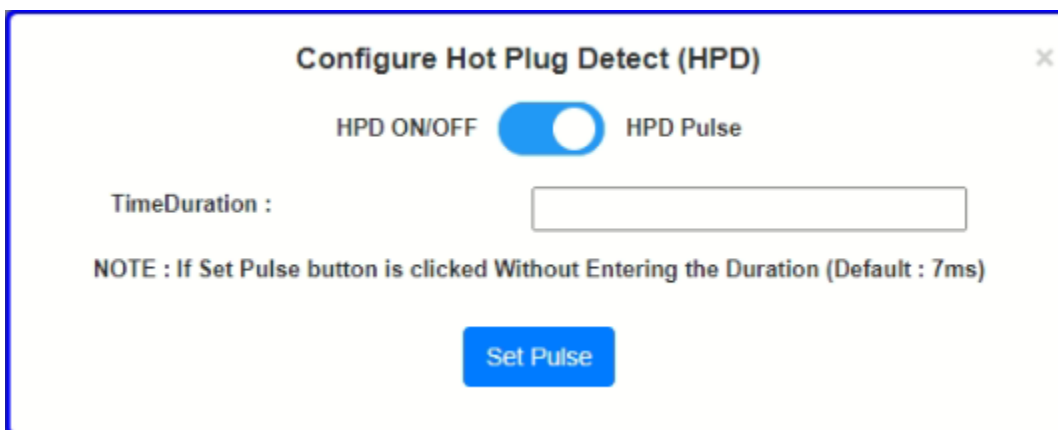


FIGURE 7.55: SET HPD PULSE

7.4 Analyzer Tab

The NOVA-S03 Browser App *Analyzer* screen allows the user to set-up the NOVA-S03 analyzer hardware in the modes such as exerciser and analyzer mode. In the Exerciser mode, the user can run the USB Power Delivery communication protocol and emulate the USB Power Delivery communication packets. While in the Analyzer mode, the analyzer hardware can capture all the USB Power Delivery packet transaction between two link partners.

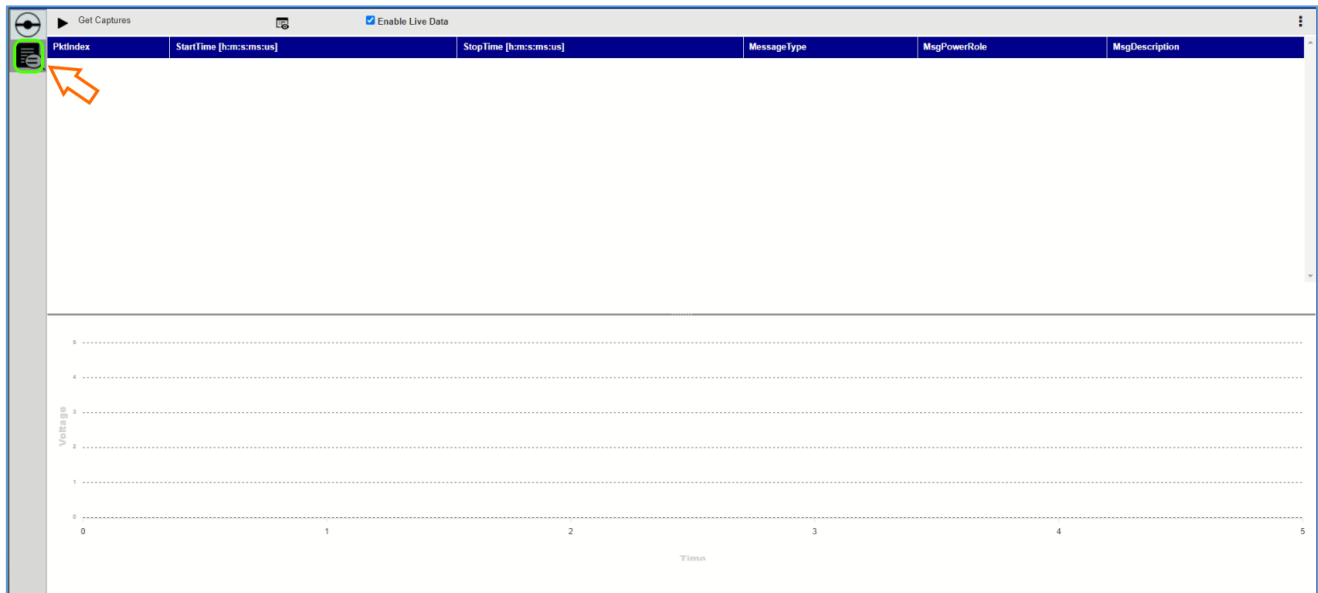


FIGURE 7.56: ANALYZER SCREEN (FOR USB POWER DELIVERY TESTING)

7.4.1 USB Power Delivery Exerciser Mode

1. In the Connection Setup screen, select **USB-PD** from the drop-down list and click on the **Exerciser** button. Set up the test equipment as shown in the connection diagram.

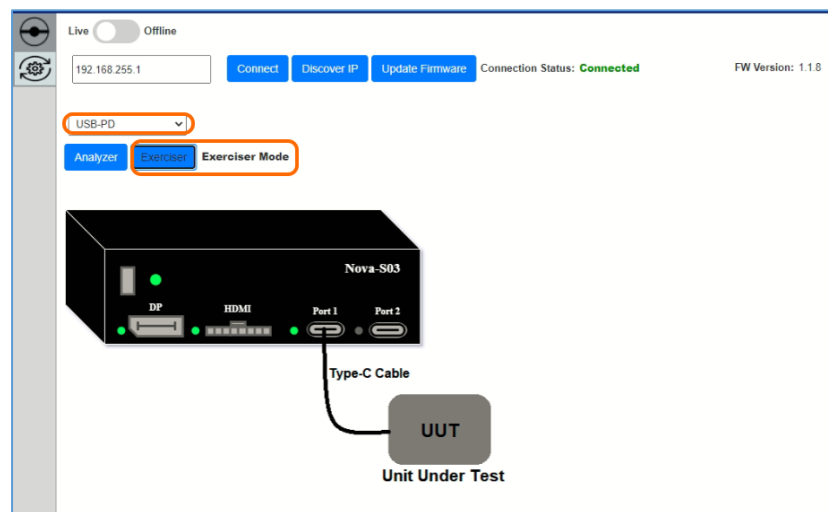


FIGURE 7.57: SELECT AND SET UP EXERCISER MODE FOR USB POWER DELIVERY

2. Navigate to the Exerciser/Analyzer tab and use the top USB Power Delivery controls to simulate Attach/Detach detection for the Source/Sink DUT.

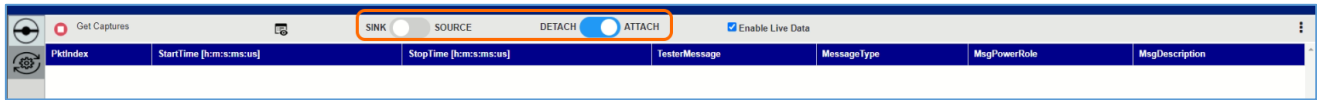
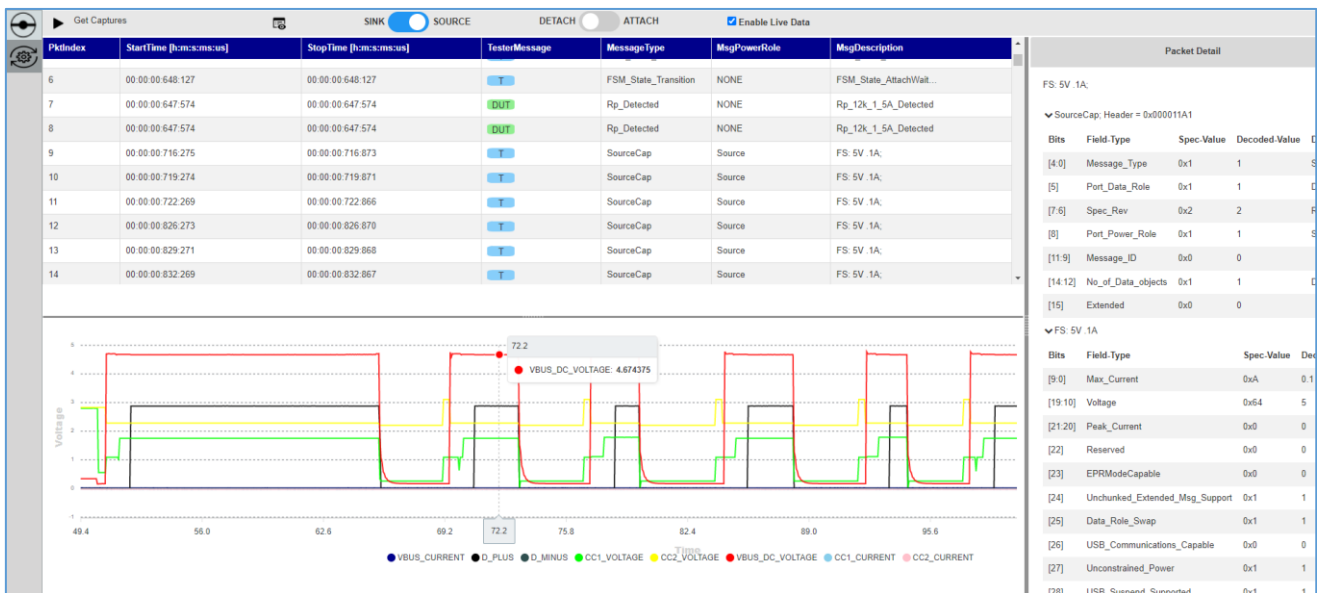


FIGURE 7.58: ANALYZER SCREEN — USB POWER DELIVERY EXERCISER MODE

Toggle the **Sink/Source** and **Detach/Attach** sliders to perform simulation, for example, to attach the DUT to the NOVA-S03 analyzer hardware acting as a Source, select “Source” → “Attach”.

The Protocol List pane on the bottom will display USB Power Delivery protocol negotiations with traces running in real-time mode as shown in the following example:



7.4.2 USB Power Delivery Analyzer Mode

1. In the Connection Setup screen, select **USB-PD** from the drop-down list and click on the **Analyzer** button. Set up the test equipment as shown in the connection diagram.

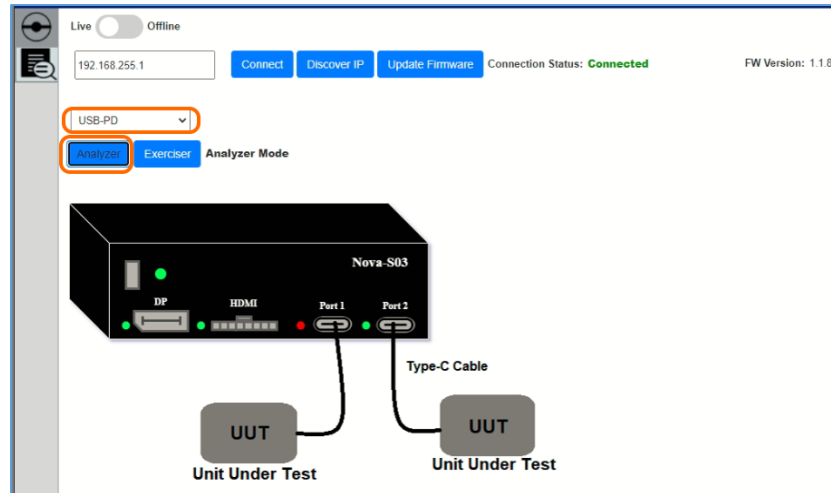


FIGURE 7.59: SELECT AND SET UP ANALYZER MODE FOR USB POWER DELIVERY

2. Navigate to the Analyzer tab to run USB Power Delivery protocol negotiations with traces in real-time mode.

Select to start test execution which will display the communications exchange protocol and waveform displays.

To terminate the test run, select .

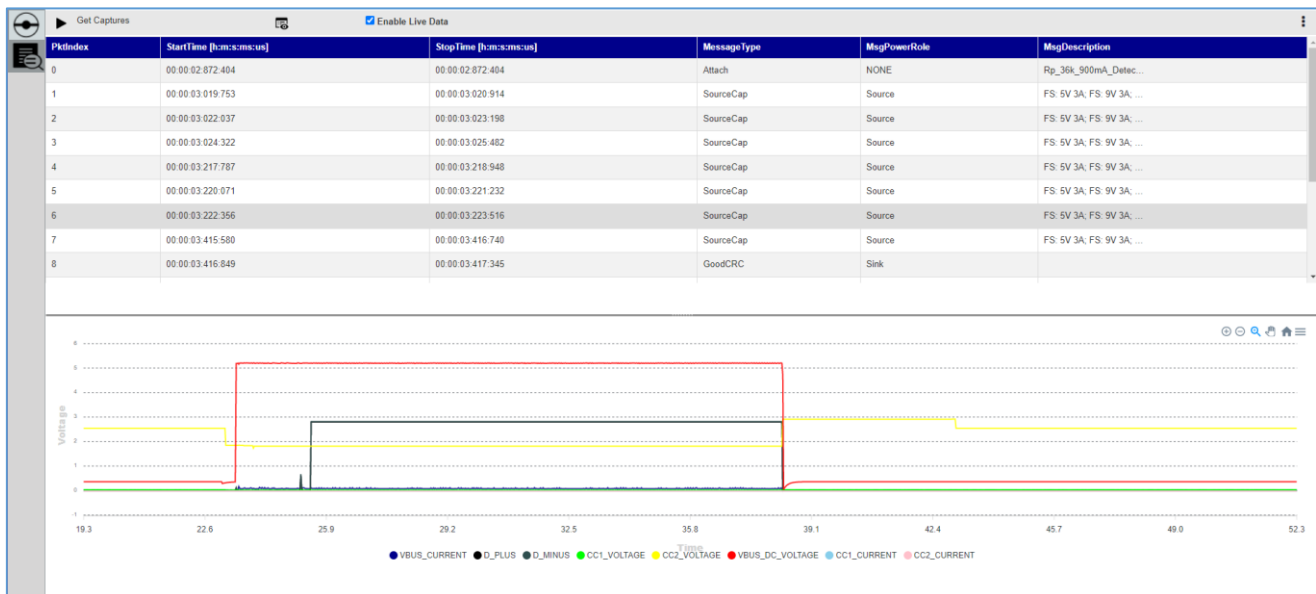
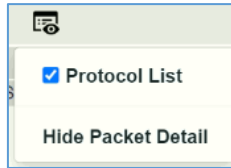


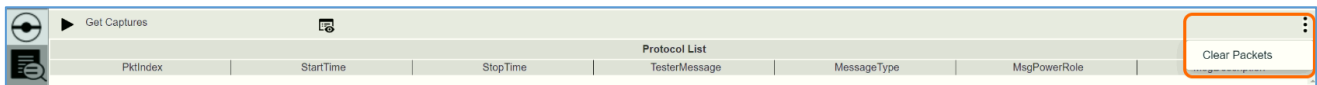
FIGURE 7.60: ANALYZER SCREEN — USB POWER DELIVERY ANALYZER MODE

3. To manage the test result display views, select  above the results



pane. Select from these options to enable display of the test summary, protocol and packet details. You can select to enable/disable real-time data acquisition using .

To clear the data display, click on **Clear Packets** from the sub menu on the top right of the screen as shown below.



4. Double-click on a protocol message to navigate to the exact time stamp and packet details of the plot as shown in the following example:

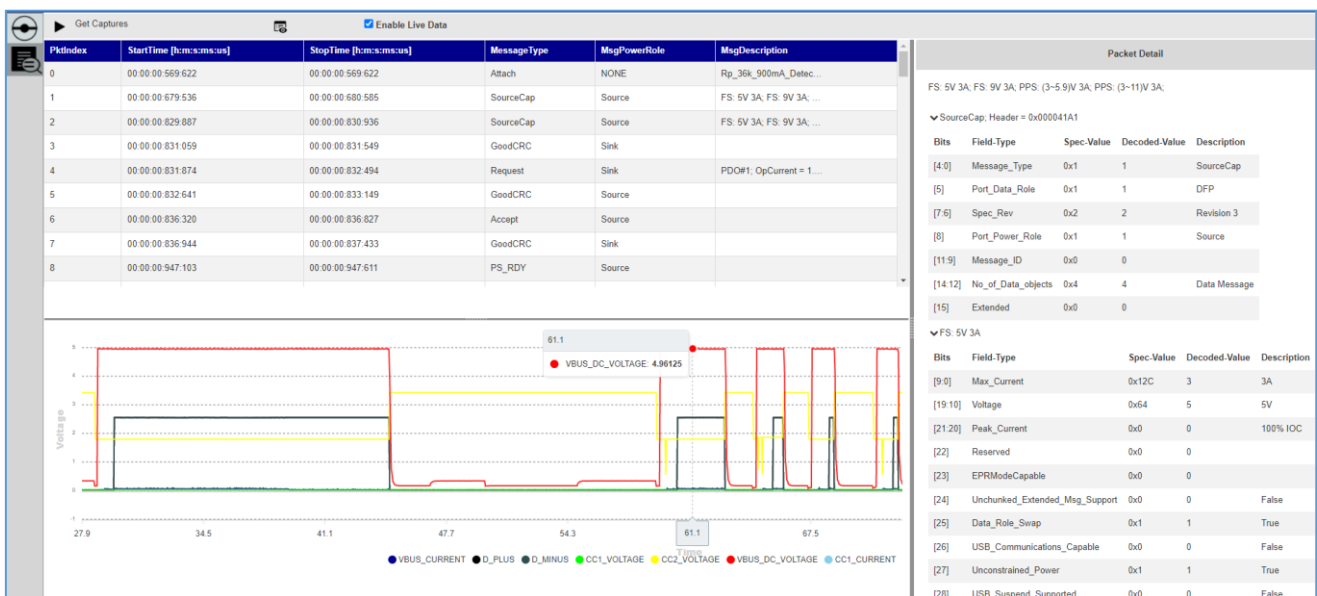


FIGURE 7.61: VIEW PACKET DETAILS EXAMPLE

You can scroll through the trace plot to view more details of each measurement as indicated by the trace markers:

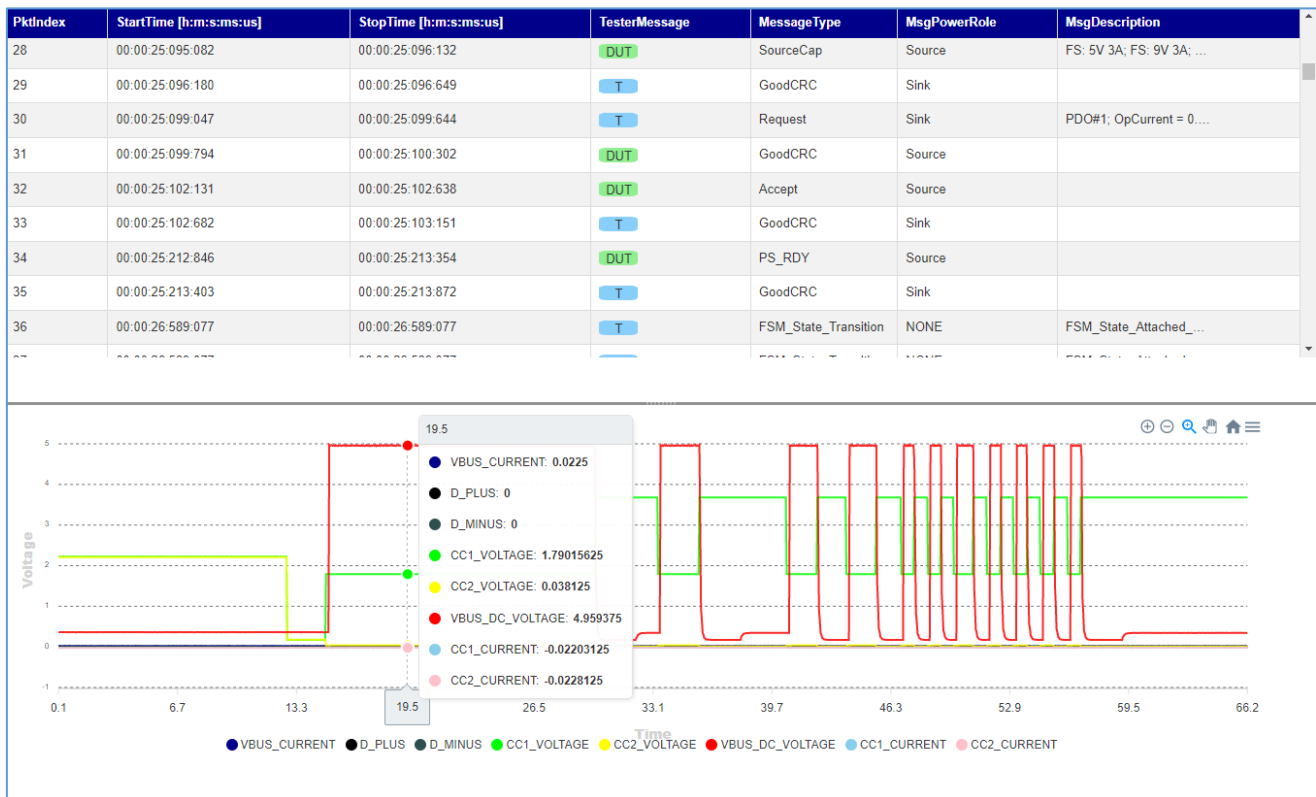
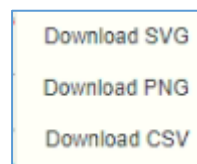


FIGURE 7.62: VIEW MEASUREMENT DETAILS WITH TRACE MARKERS

The common plot specific buttons  can be used to control the trace view as desired which includes panning and zooming in/out of the trace plots. You can use your mouse cursor to hover on top of each plot specific button to view the description of each button function.

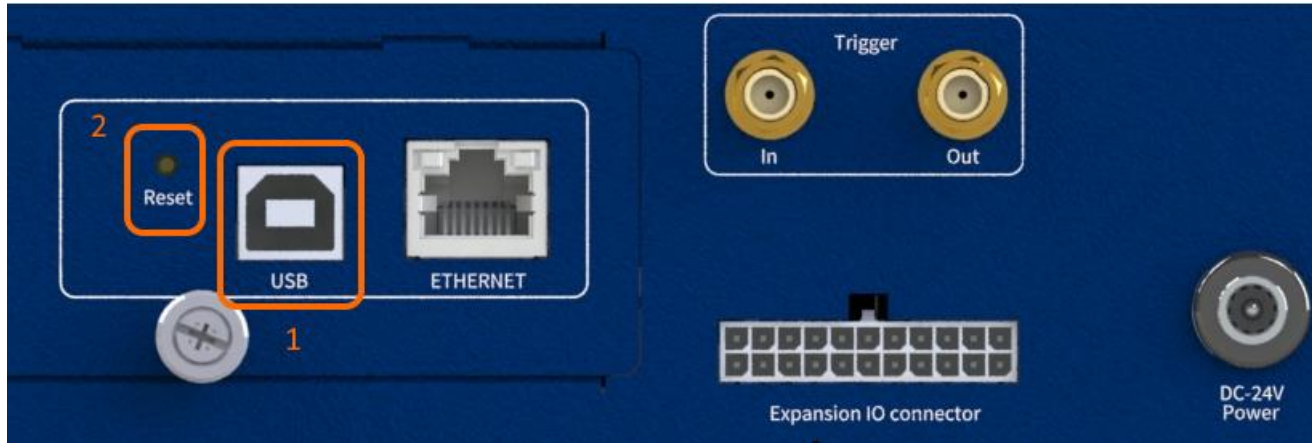
When the testing is complete, the screen displays all the data gathered during the testing process. Select  at the top right of the trace plot to save the plot to any of the following file types:



8 Appendix: Manual Firmware Update Procedure

Use the following steps to update the NOVA-S03 firmware manually:

1. Using a standard USB Type-B cable, connect the firmware update **USB** port (USB Type-B) from the rear of the NOVA-S03 analyzer hardware to the control PC.



2. Press the **Reset** button on the rear of the NOVA-S03 analyzer hardware.
3. Wait for the control PC to detect a new removable USB drive.
4. Copy all the files from the "C:\GRL\NOVA-S03\Firmware_Files" folder into the newly detected removable USB drive.
5. Power cycle the NOVA-S03 analyzer hardware using the Power switch on the front panel of the NOVA-S03 analyzer hardware.

Note: If Step 4 fails, format the removable drive that appears in the control PC after connecting the firmware update USB cable.

END_OF_DOCUMENT