

# Quick Operating Guide & Use Examples

UCD-400  
DisplayPort™ 1.4 Test Device with  
HBR3 Support

# UCD-400 – Versatile Tool for DP 1.4 Users

- Capture and Source up to 8K@30 & 4K@120 video and audio
- Test DP 1.4 / HBR3 Sinks, Sources and Repeaters
- Verify HDCP 1.3 and HDCP 2.2 operation;  
Run HDCP 2.2 Compliance Test
- Monitor link status, set configuration parameters
- USB 3.0 connected
- *UCD Console* GUI for debugging
- High level *TSI API* for easy integration

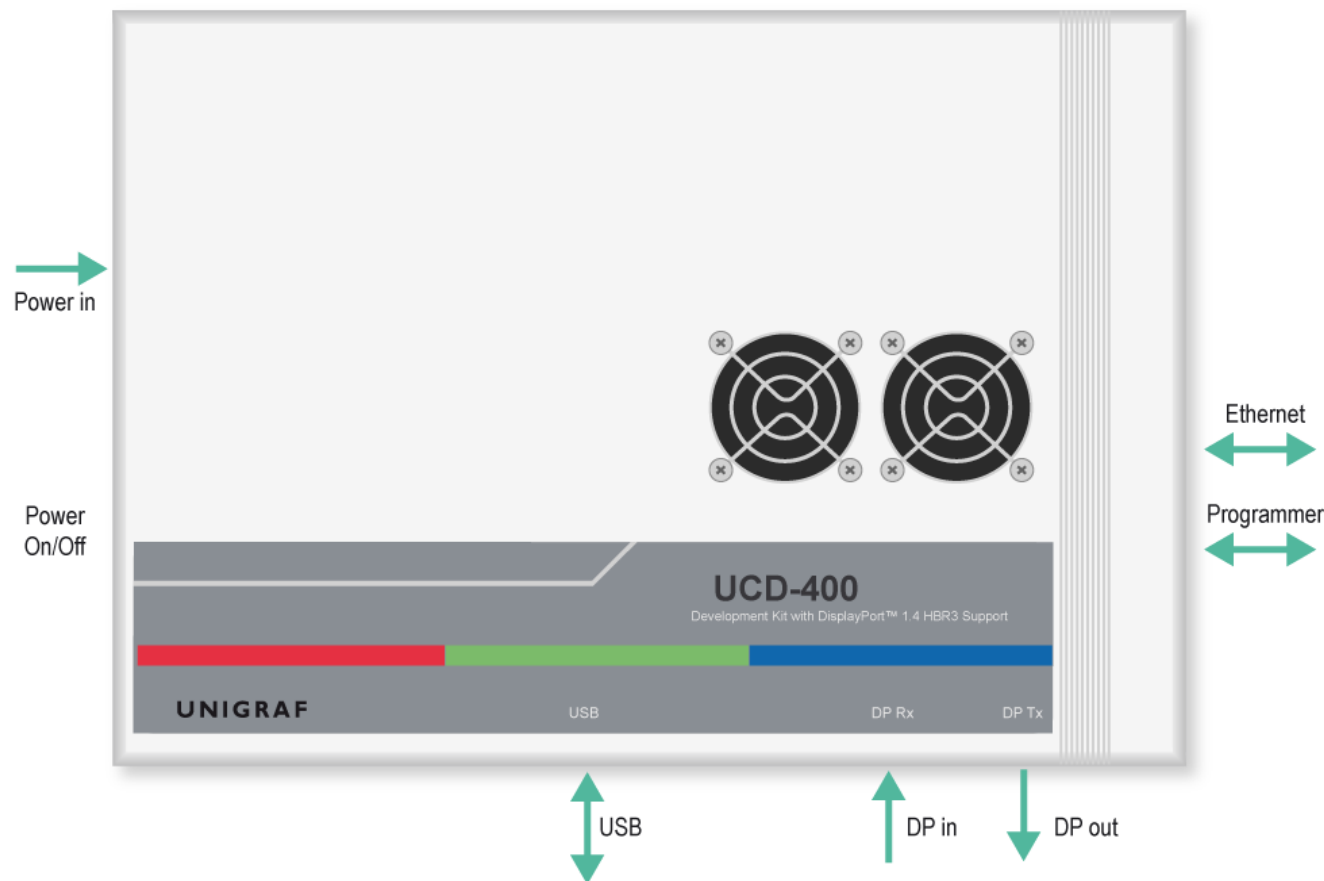


# Software for R&D and Test Automation

- UCD Console GUI
  - ✓ Preview and test application for desktop use
    - Each interface function has a well structured dialog for superior at-a-glance viewability.
  - ✓ GUI for executing bench-top tests
    - Predefined functionality Test Cases
    - Standards based Compliance Tests
- Unigraf TSI API
  - ✓ Test software that provides the system integrator a fast and reliable way for ensuring the functionality of the tested equipment.

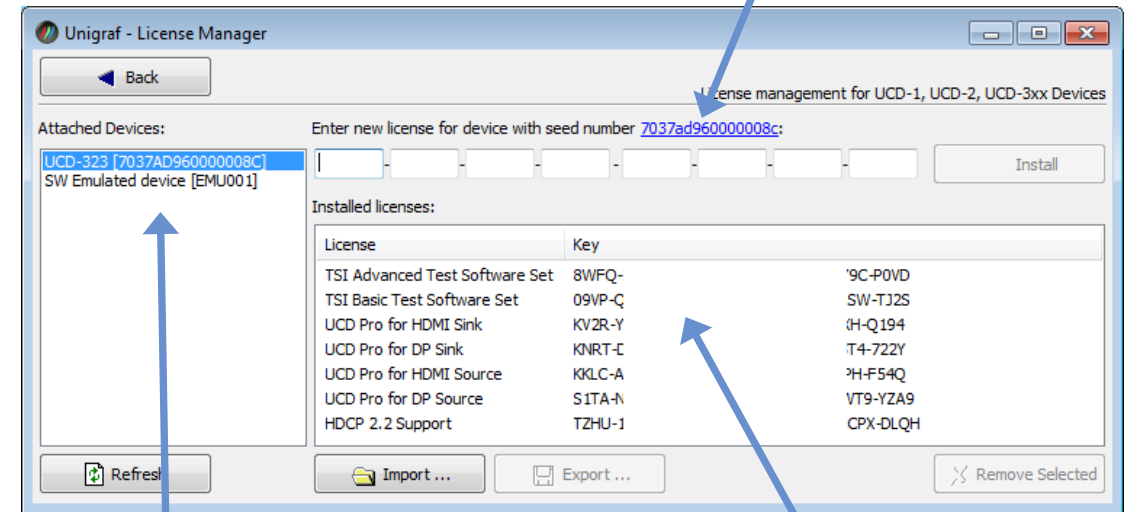
# Connections

Name	Description
DP in	DisplayPort™ 1.4 compliant input from the upstream Source
DP out	DisplayPort™ 1.4 compliant output to the downstream Sink
Power in	+12 Vdc Power Supply Input
Power On/Off	Rocker power switch
USB	USB 3.0 connection to host PC
Programmer	USB interface for configuring the UCD-400 device FW
Ethernet	Ethernet interface for updating the UCD-400 device FW



# Feature Licensing

- Product features are divided to license enabled groups
- *License Keys* are tied to a *Seed Number* in UCD-400 HW
- License Keys can be copied to any number of PCs
- Licenses are managed with *License Manager SW*

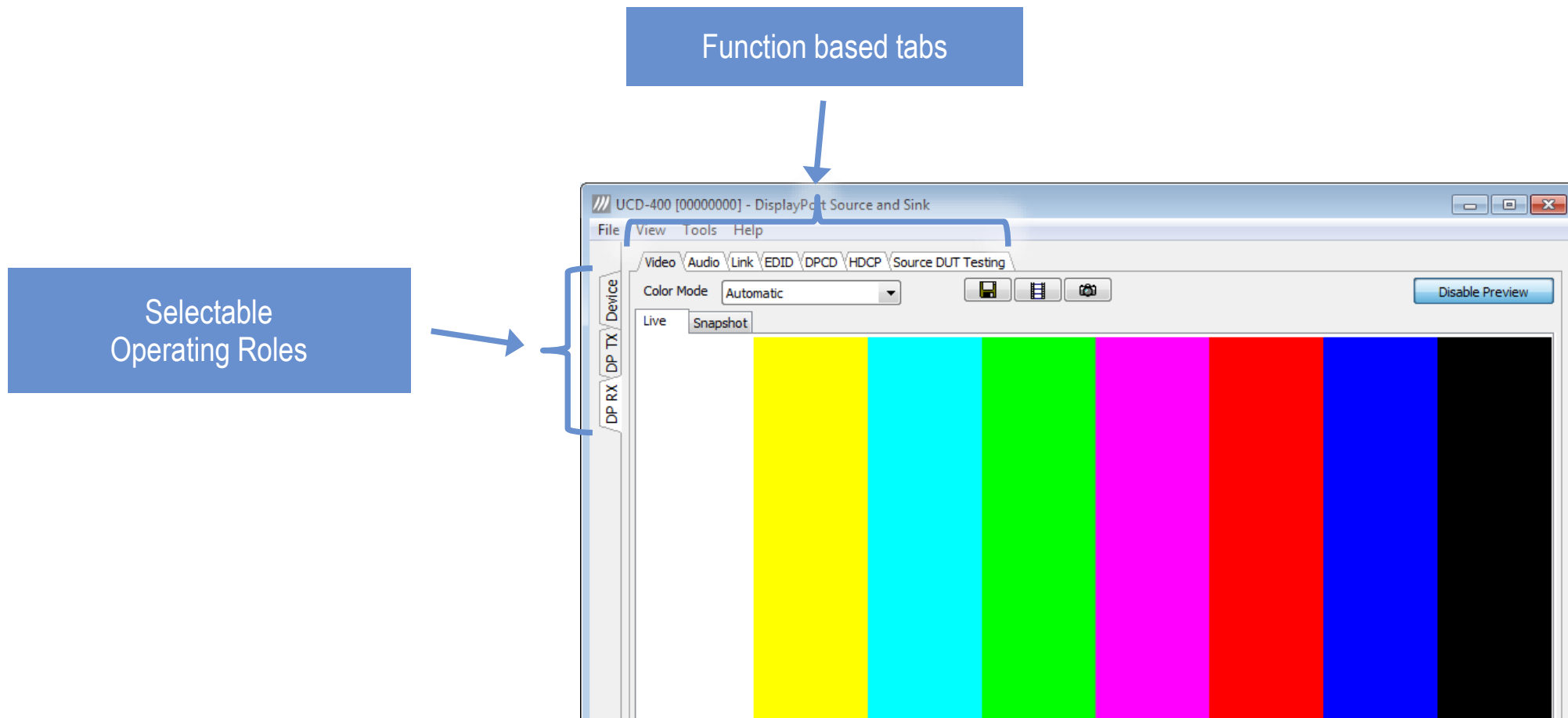


Device Seed Number

Attached devices

Licenses installed for the selected device

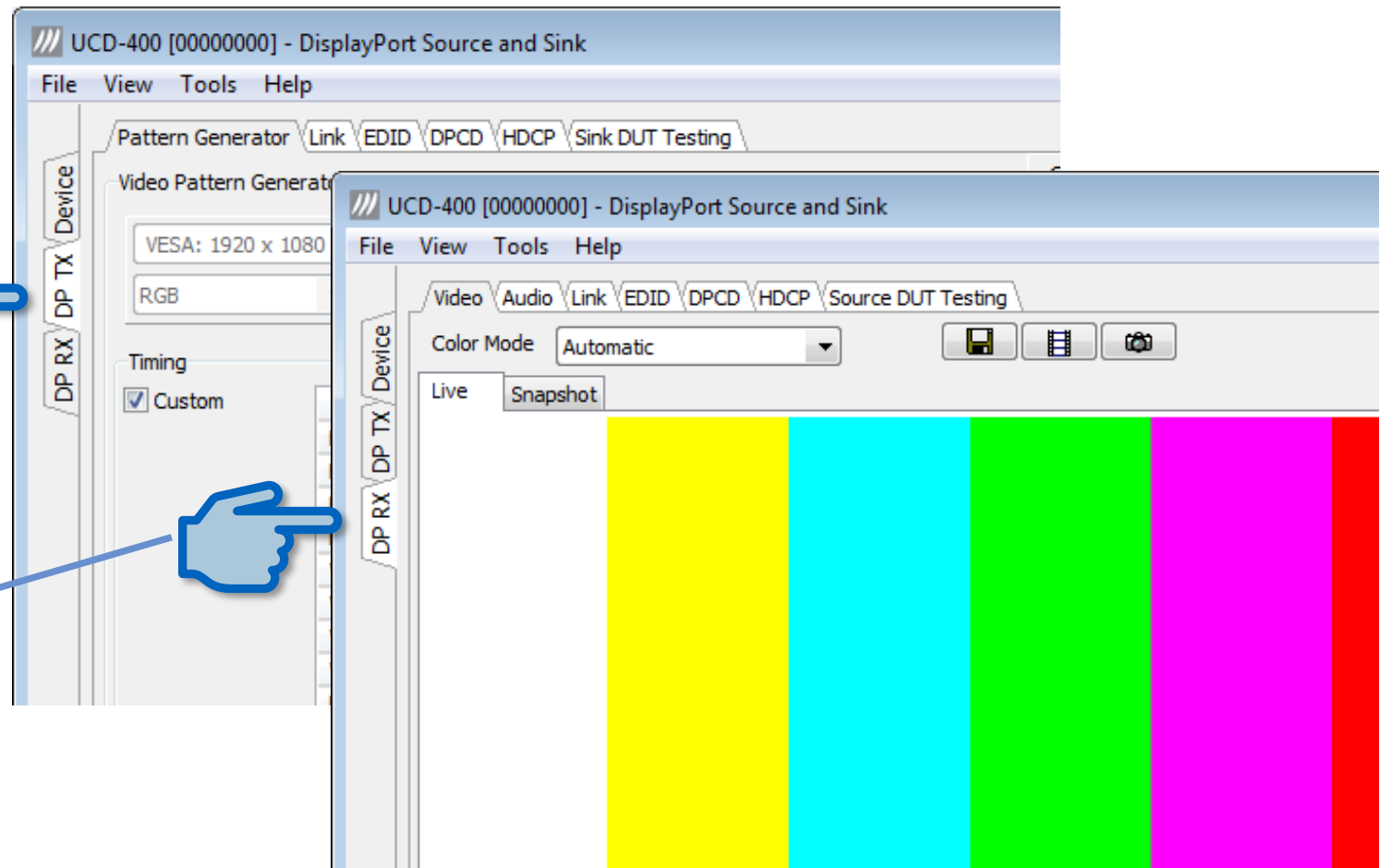
## UCD Console



## UCD-400 Roles

Reference Source  
(Test Sink DUT)

Reference Sink  
(Test Source DUT)



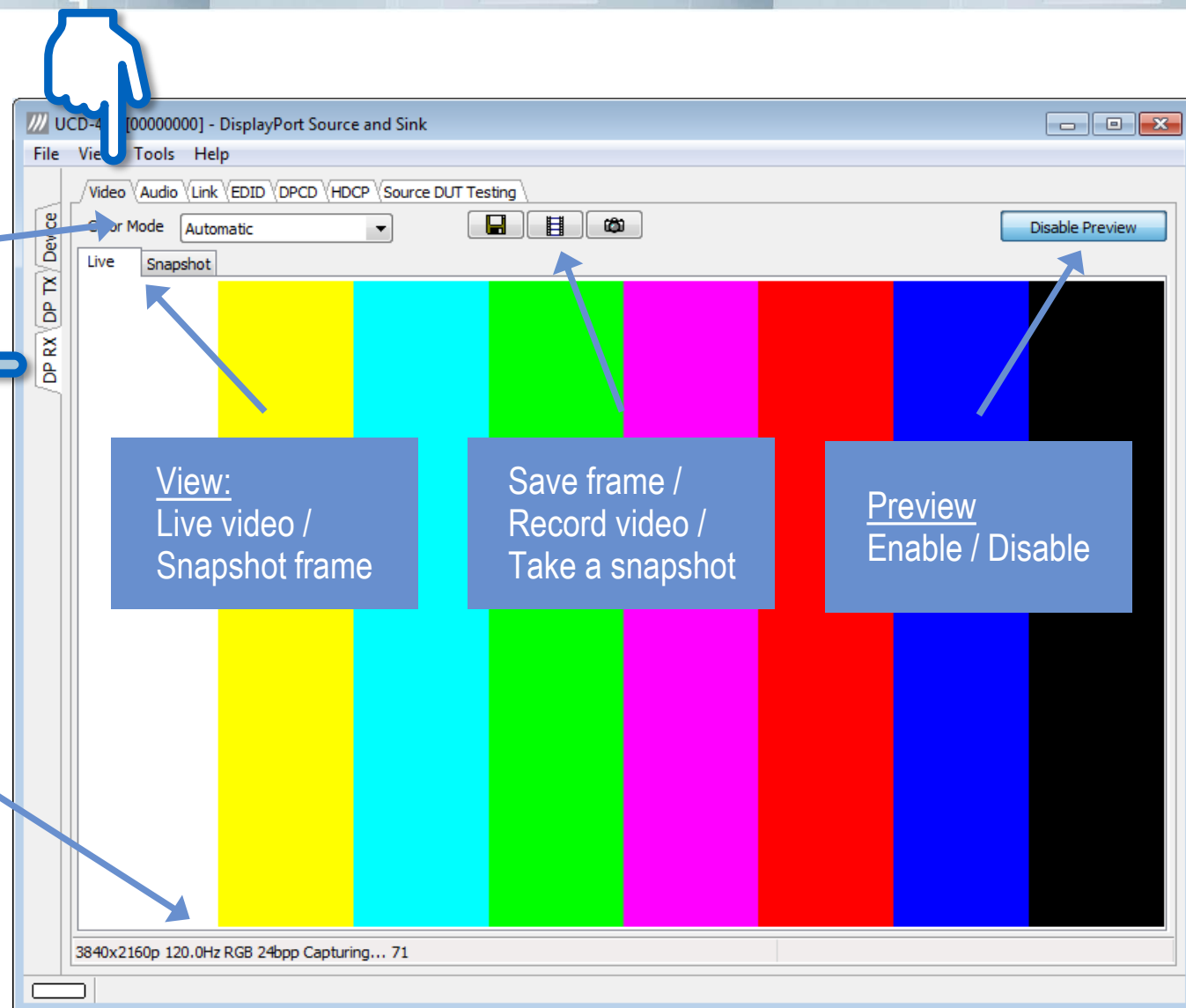
# Video Preview / Capture

## Preview color mode

- No conversion
- Automatic
- YCbCr (ITU-709) -> RGB
- SMPTE 170M -> RGB

## Detected video:

- Video mode
- Frame Rate
- Color mode
- Frame sequence number



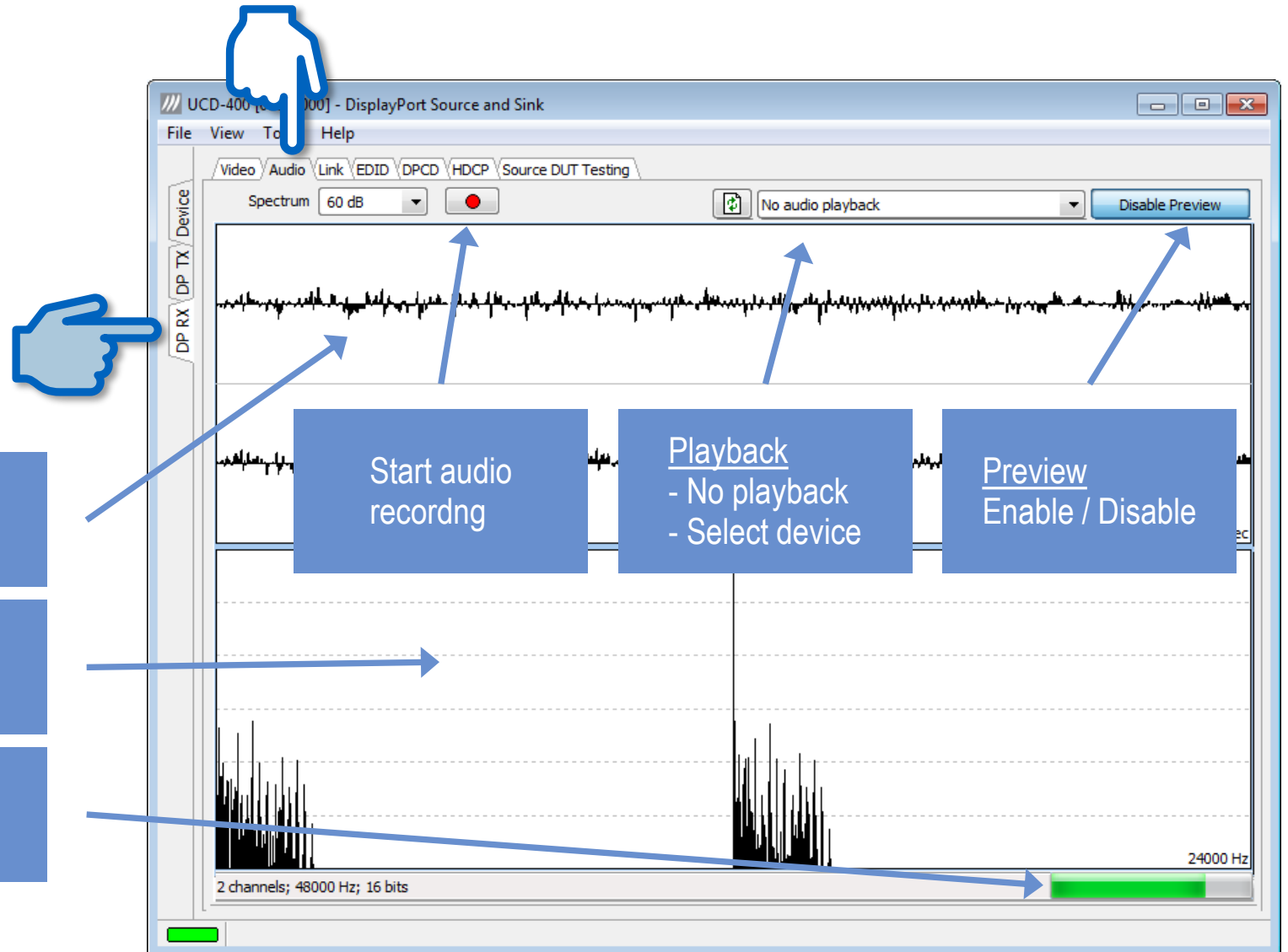


# Audio Monitor / Capture

Captured audio channels:  
Signal waveform

Captured audio channels:  
Frequency spectrum

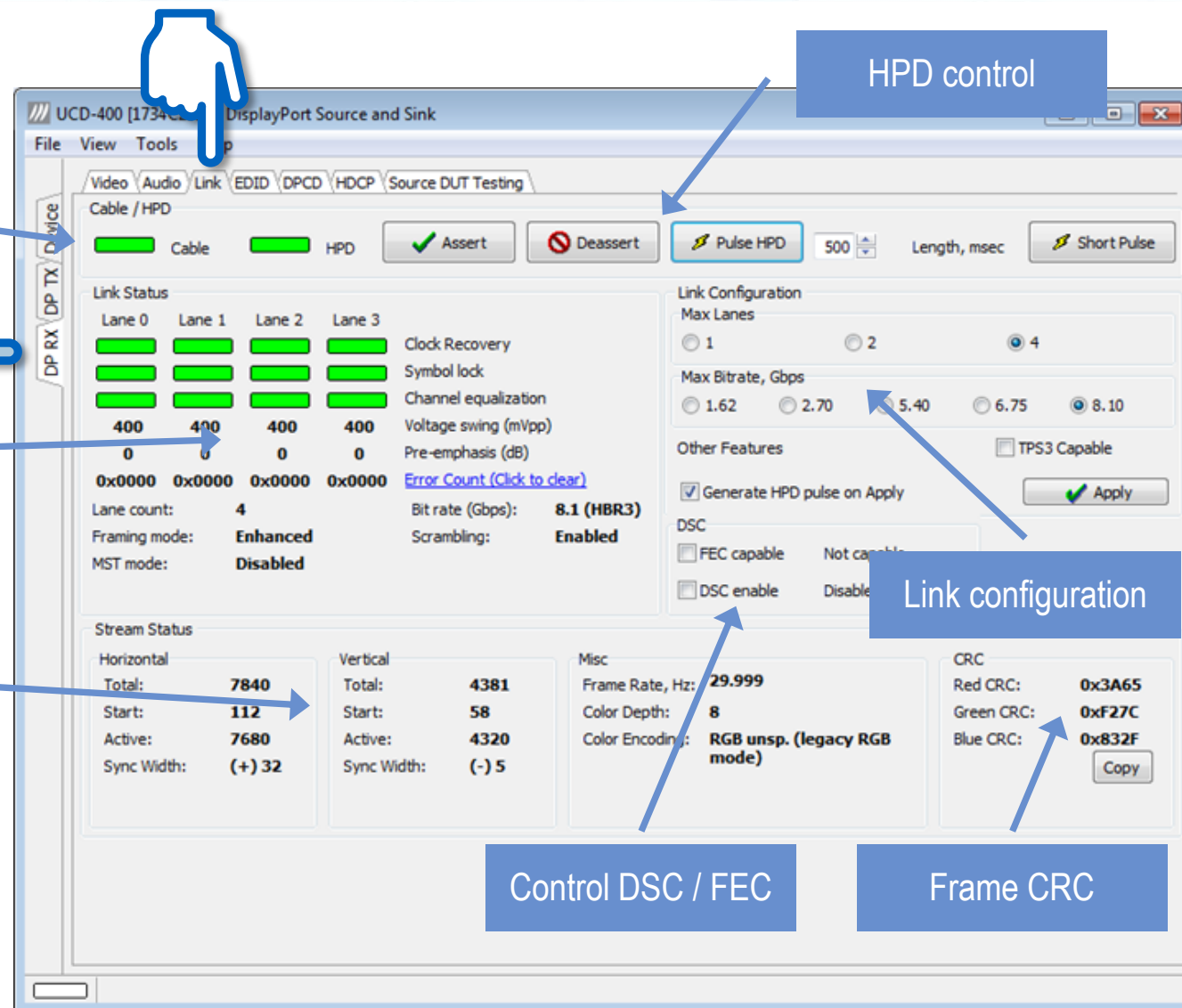
Captured audio channels:  
Sound level indicator



## Link Status

Cable detection  
HPD status

Links status

Stream status:  
Received MSA

## EDID

UCD-400 [00000000] - DisplayPort Source and Sink

File View Tools Help

Video Audio Link **EDID** DPCD HDCP Source DUT Testing

Device DP RX DP TX

EDID Data:

000000	00 ff ff ff ff ff 00 54
000010	34 18 01 04 b5 3d 23 78 3a
000020	0f 50 54 bf ef 80 71 4f 81
000030	b3 00 95 00 d1 c0 4d d0 00 a0 10 70 3e 80 30 20
000040	35 00 5f 59 21 00 00 1a 56 5e 00 a0 a0 29 50
000050	30 20 35 00 5f 59 21 00 00 1a 00 00 00 fd 00 38
000060	4b 1e 86 36 00 0a 20 20 20 20 20 20 00 00 fc
000070	00 55 43 44 2d 33 58 58 20 44 50 0a 20 20 01 d0
000080	02 03 12 11 83 4f 00 00 29
000090	1f c0 00 00 00 00 00 00 00
0000a0	00 00 00 00 00 00 00 00 00
0000b0	00 00 00 00 00 00 00 00 00
0000c0	00 00 00 00 00 00 00 00 00
0000d0	00 00 00 00 00 00 00 00 00
0000e0	00 00 00 00 00 00 00 00 00
0000f0	00 00 00 00 00 00 00 00 00 00 00 00 00 5c

Load / save as file

Load ...

Save as ...

Clear / append

Clear

Append file ...

EDID Editor ...

Click to launch EDID Editor

Read / Write to HW

Read

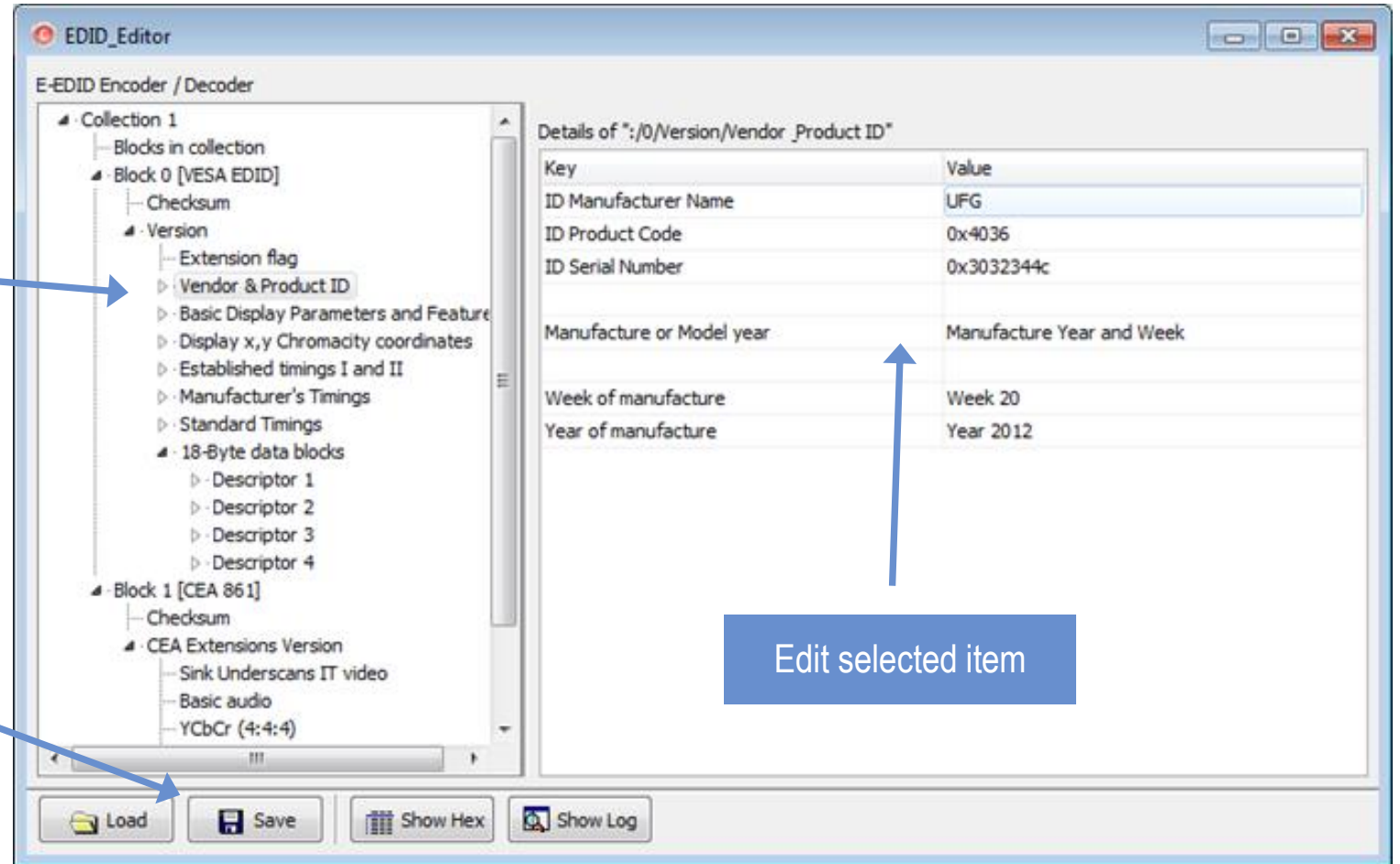
Write

Edit EDID data as HEX

## EDID Editor

Logical tree view  
Click to expand / collapse

Load / save as file



Edit selected item

## DPCD Editor

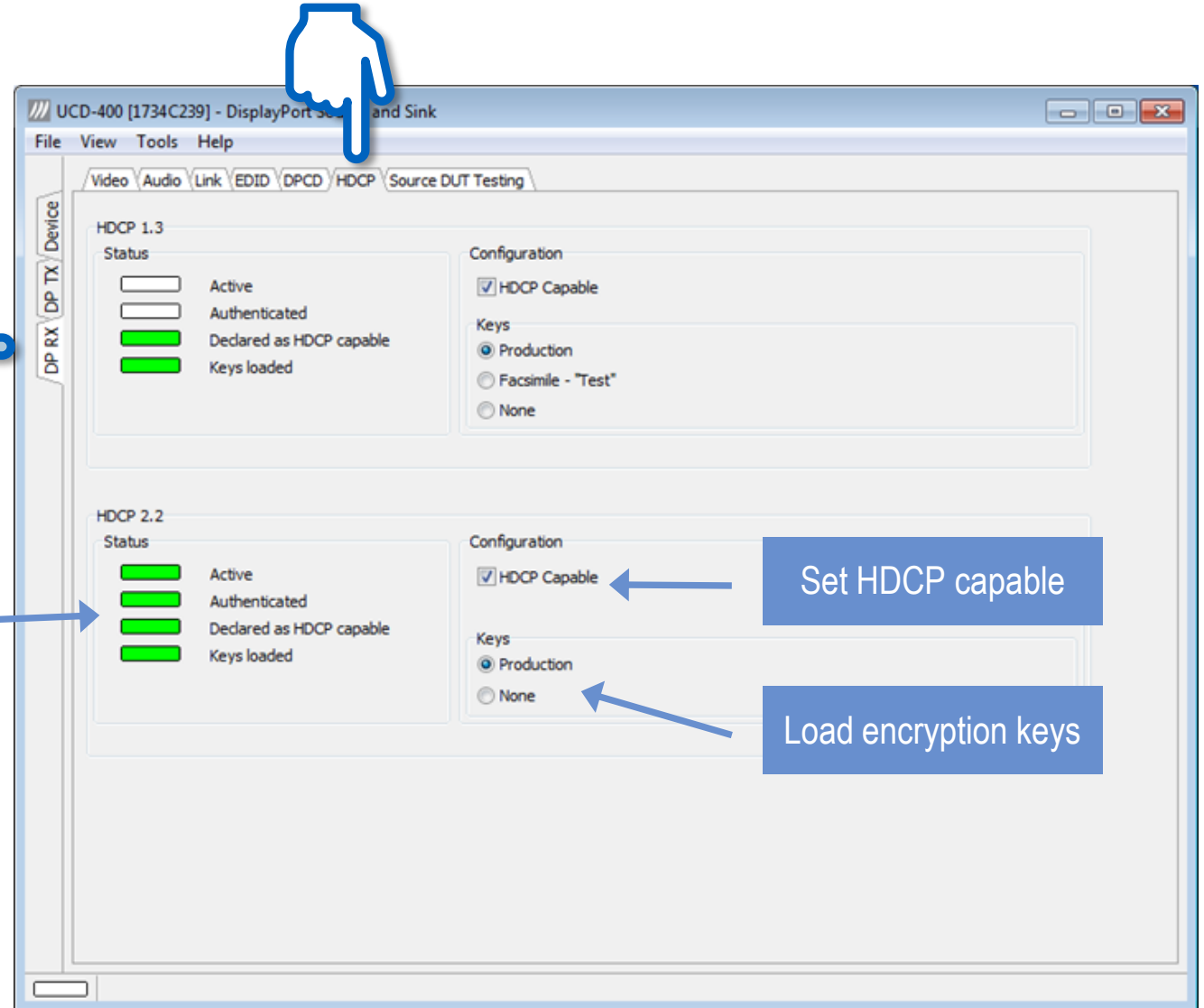
The screenshot shows the DPCD Editor window for a UCD-400 device. The interface includes a menu bar (File, View, Tools, Help), a tab bar (Video, Audio, Link, EDID, DPCD, HDCP, Source DUT Testing), and a sidebar with device selection options (Device, DP RX, DP TX). The main area is divided into two sections for DPCD address ranges. The top section is for address range 0x0 to 0x100, and the bottom section is for address range 0x100 to 0x180. Each section has a 'Set Reference' button, a 'Refresh' button, and a 'Write Changes' button. The right sidebar displays the decoded register content for the selected address range.

Annotations and their corresponding actions:

- Set decoder interpretation**: Points to the 'DPCD Decoder' dropdown menu.
- Load / save as file**: Points to the 'Load' and 'Save' buttons in the top right.
- Set address range**: Points to the 'DPCD Address range' input field in the top section.
- Decoded register content**: Points to the decoded register content displayed in the right sidebar.
- Read / Write to HW**: Points to the 'Refresh' and 'Write Changes' buttons in the bottom section.
- Two DPCD register address ranges**: Points to the two main sections for DPCD address ranges.
- Set as compare reference**: Points to the 'Set Reference' button in the bottom section.

# HDCP Status

HDCP authentication status





# Run Test Cases

The screenshot shows the UCD-400 [1727C238] - DisplayPort Source and Sink Tester software interface. The interface is divided into several sections:

- Left Panel:** Contains a tree view of test sets under the 'Device' tab. The tree view includes:
  - ▶ CRC based Video Test Set
  - ▶ Link Test Set
  - ▶ Link Layer CTS
  - ▶ HDCP 2.2 CTS 1A Test Set
  - ▶ HDCP 2.2 CTS 1B Test Set
- Right Panel:** Contains a table of test parameters and their values.

Parameter	Value
Test timeout, milliseconds	100000
Total number of frames	2000
Number of frames to be tested	20
Number of bad frames allowed	2
Reference width	1920
Reference height	1080
Reference refresh rate, Hz	18
Reference colorimetry, mHz	0
R value CRC[1]	0xDA1F
G value CRC[1]	0xB9CB
B value CRC[1]	0x2E77
R value CRC[2]	0xDA1F
G value CRC[2]	0xB9CB
B value CRC[2]	0x2E77
- Bottom Panel:** Contains buttons for 'Run', 'Test runs', 'Time between tests, sec', 'Report', and 'Clear'. The 'Test runs' field is set to 1, and the 'Time between tests, sec' field is set to 1.

Annotations with arrows point to the following elements:

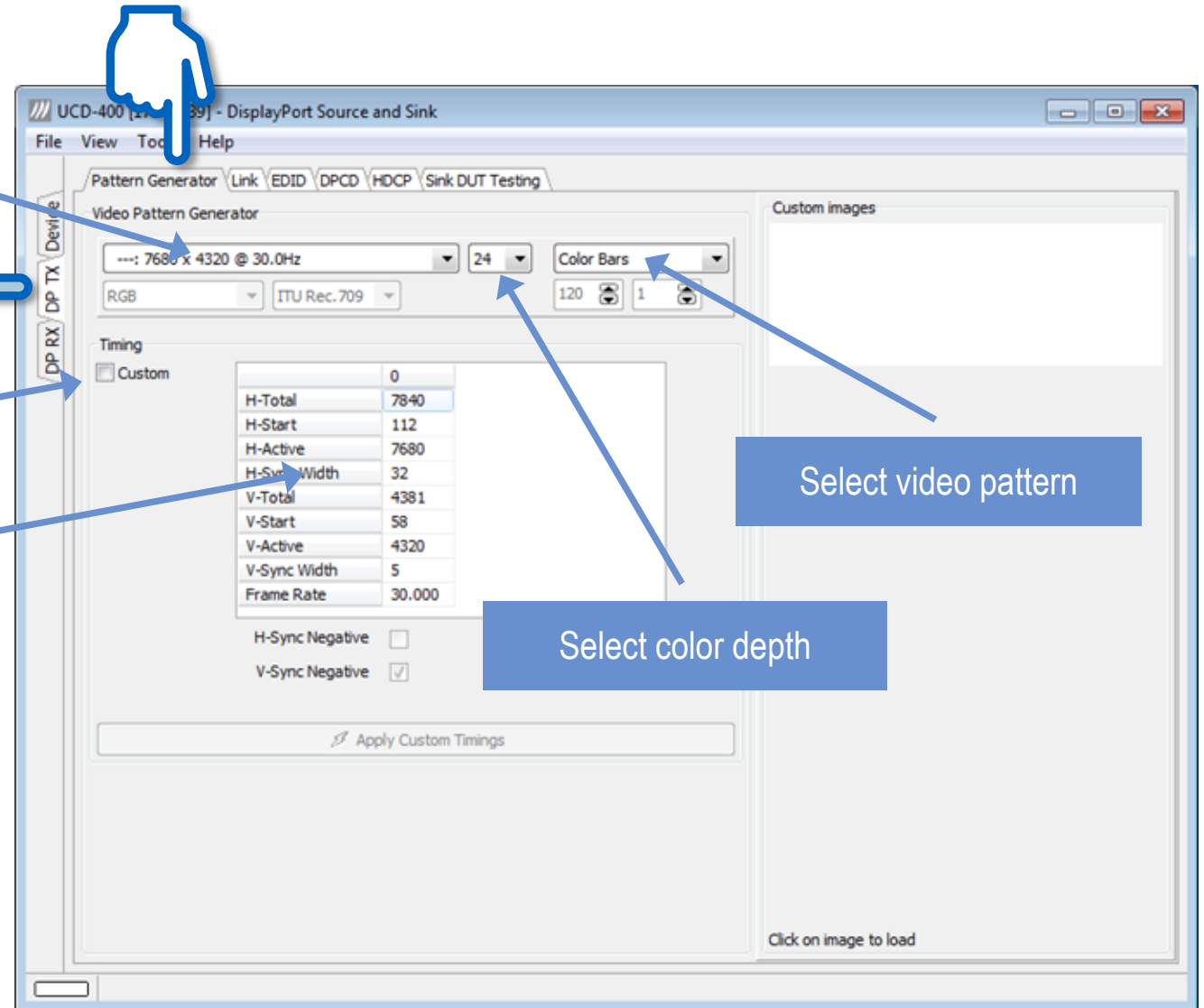
- Select tests to run:** Points to the tree view of test sets.
- Set test parameters:** Points to the table of test parameters.
- Load / save parameters:** Points to the 'Load', 'Save', and 'More...' buttons.
- Start test:** Points to the 'Run' button.
- Select # runs and delay:** Points to the 'Test runs' and 'Time between tests, sec' fields.
- Additional test parameters:** Points to the 'More...' button.
- Create a report:** Points to the 'Report' button.

# Video Pattern Generator

Select standard video mode

Use custom timings

View / edit video mode details



Select video pattern

Select color depth

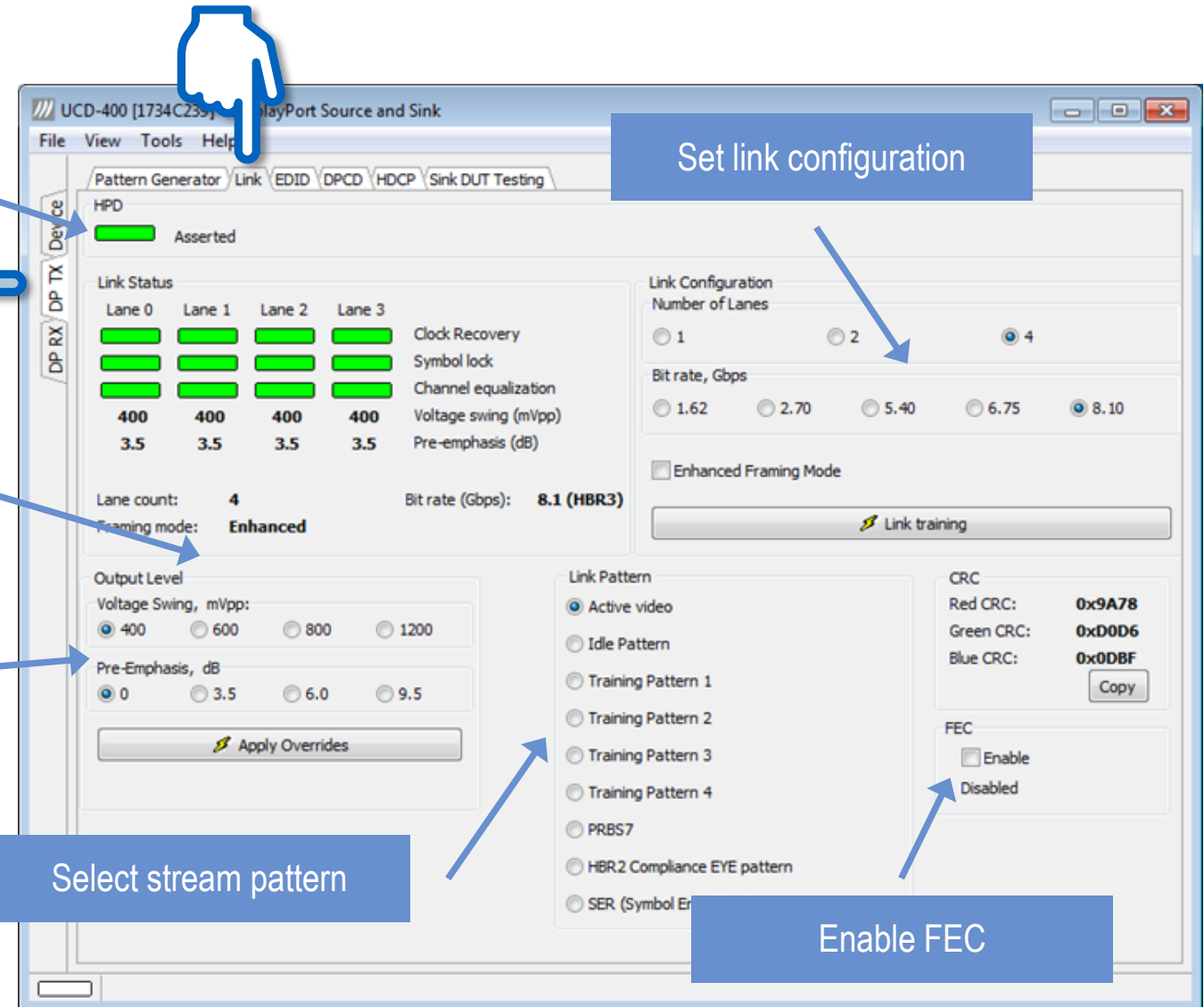


## Link Status

HPD status

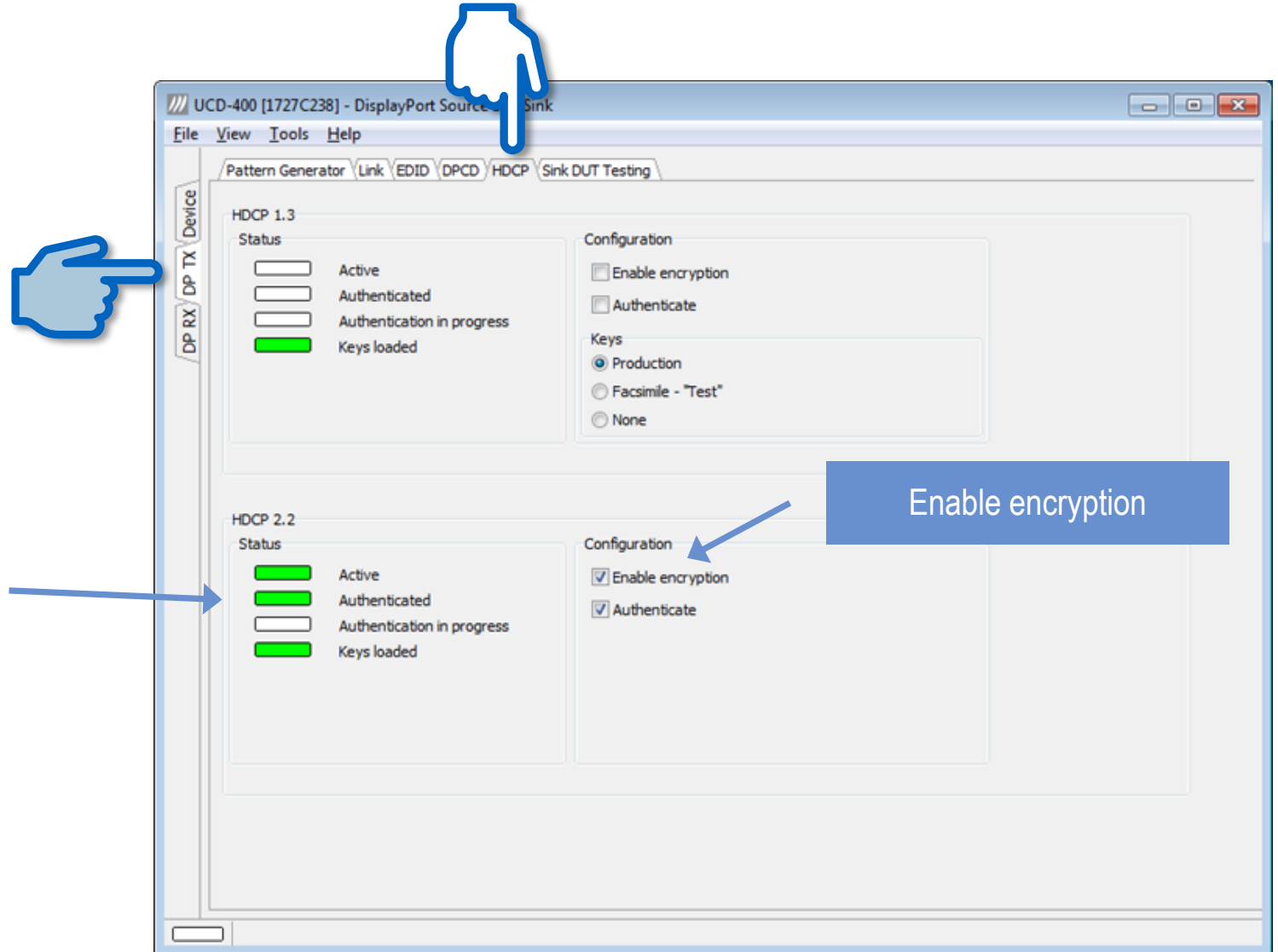
Link status

Set link voltage level override



# HDCP Status

HDCP authentication status



# Run Test Cases

Select tests to run

Start test

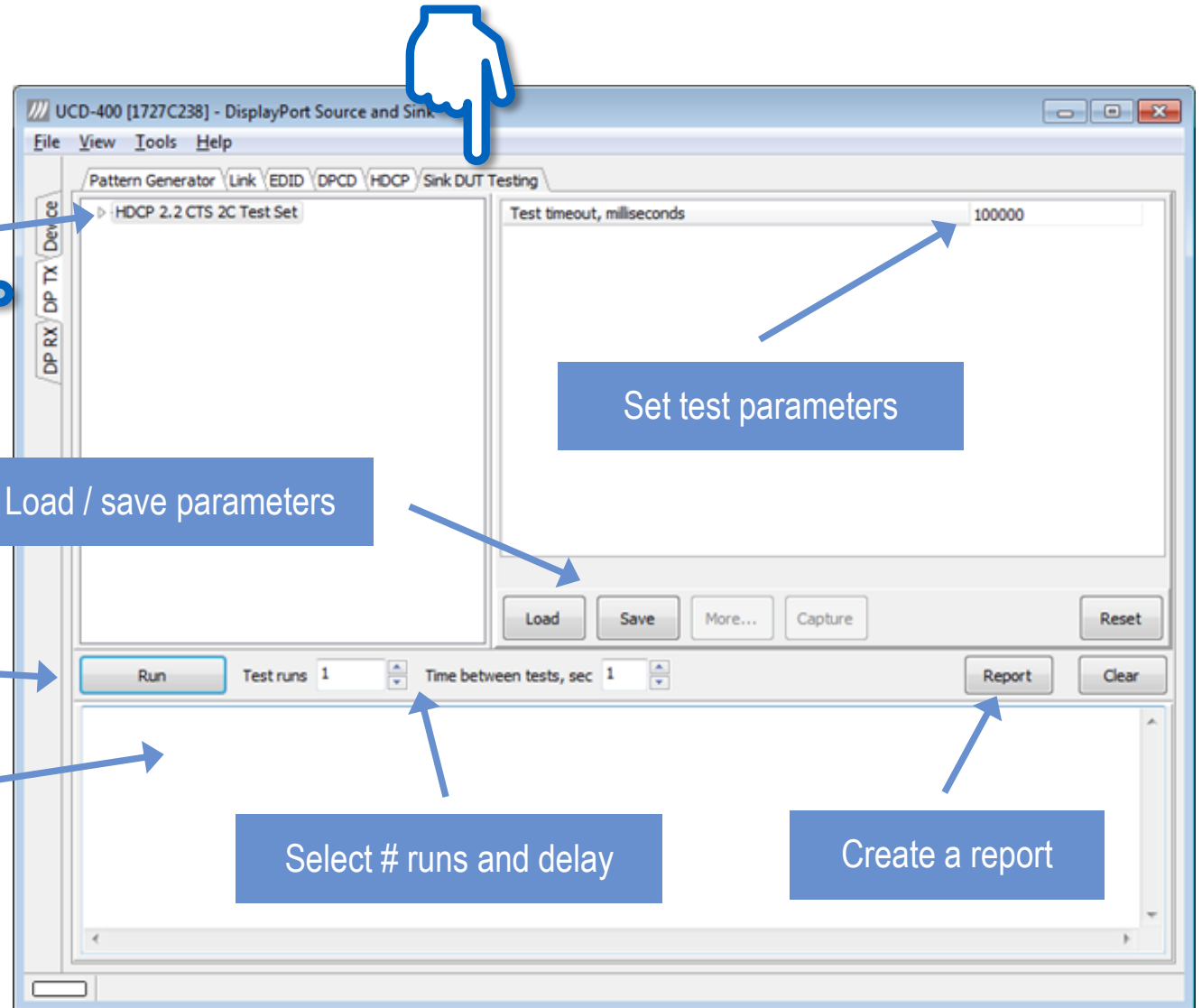
Test results

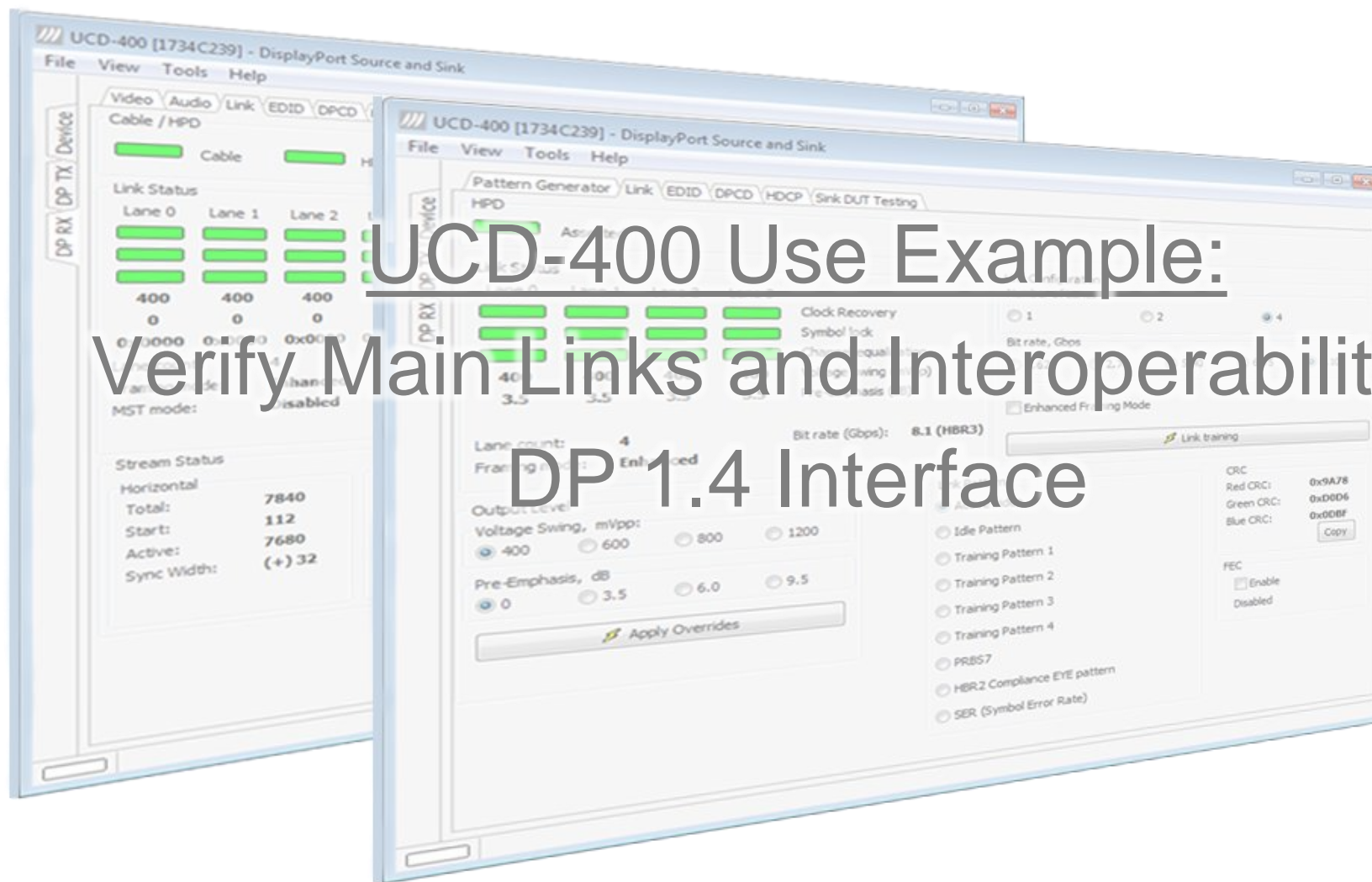
Load / save parameters

Set test parameters

Select # runs and delay

Create a report



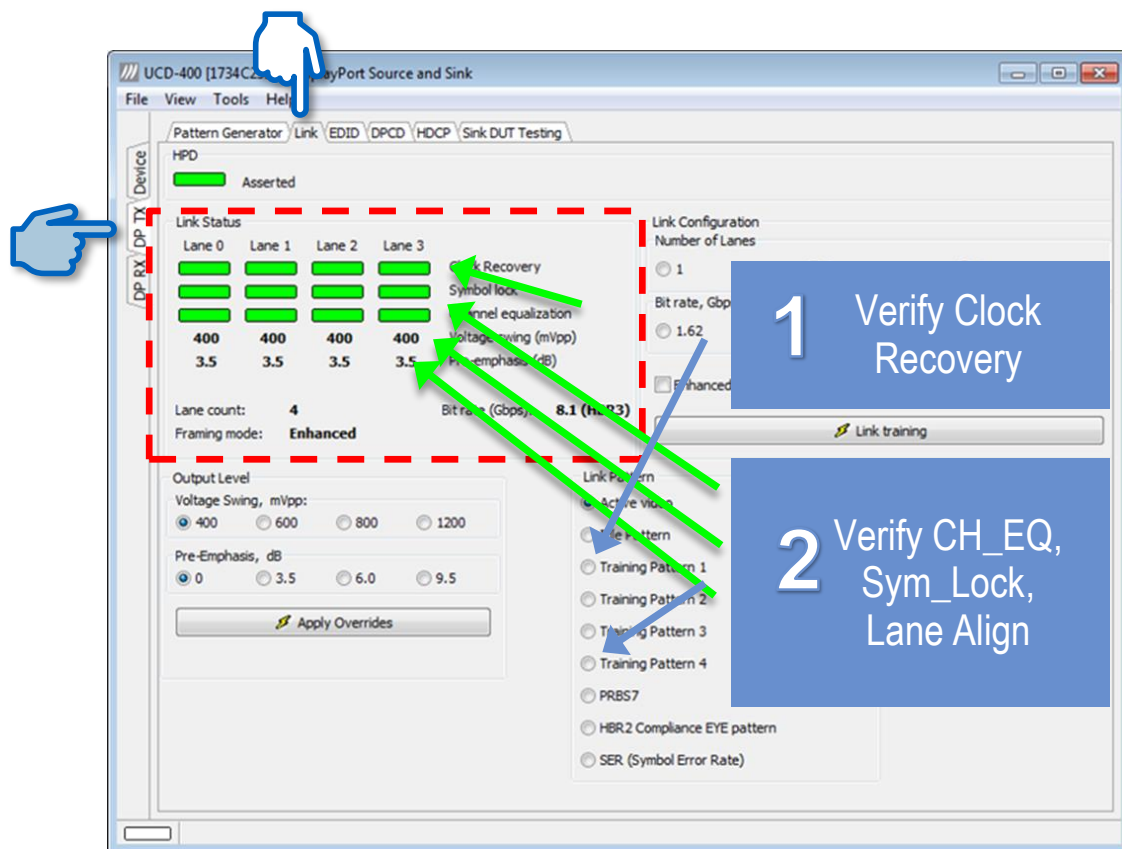


## UCD-400 Use Example: Verify Main Links and Interoperability of DP 1.4 Interface

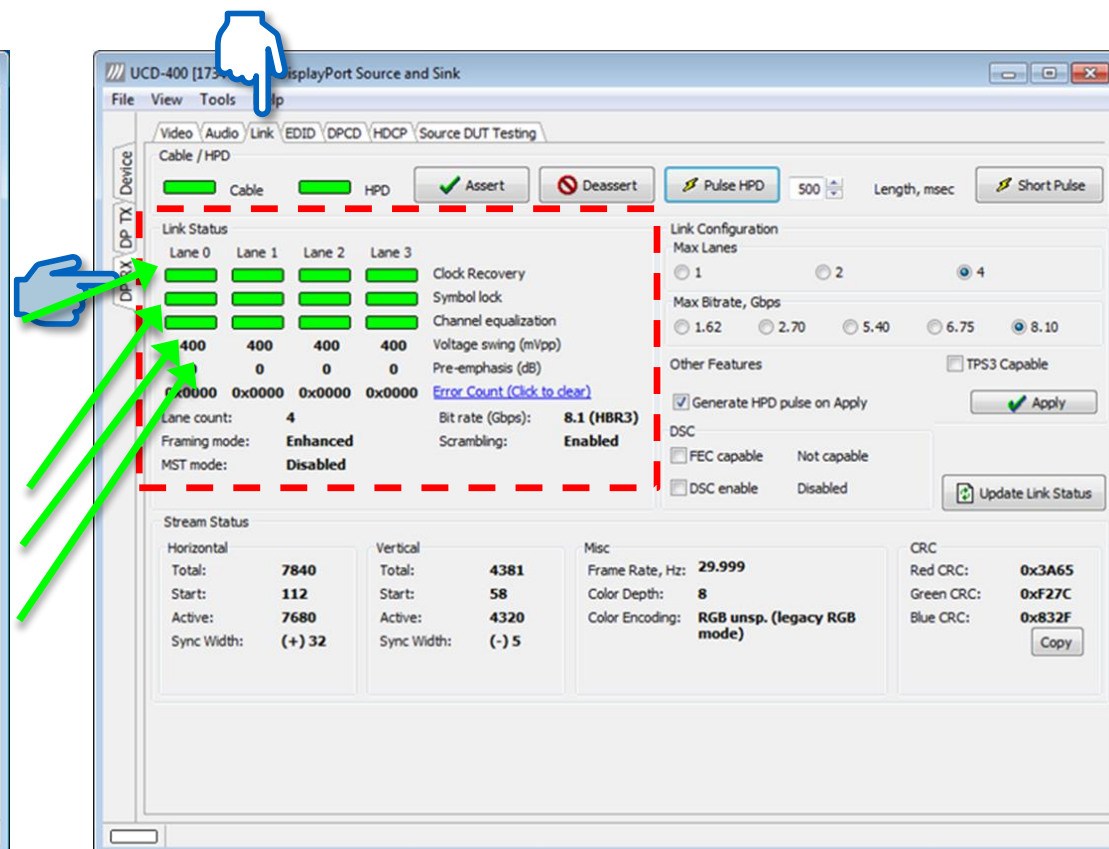
# Agenda: Four Basic Tests

- Verify HBR3 LT manually
- Link Training test
  - ✓ Test LT at all supported link counts and link rates
- Verify proper link training and video mode (4K@p60)
  - ✓ Use pre-designed EDID to force the desired mode
- Run video stability test
  - ✓ Verify CRC (check-sum) of 2000 captured frames

## Verify LT Manually



Reference Source / Link

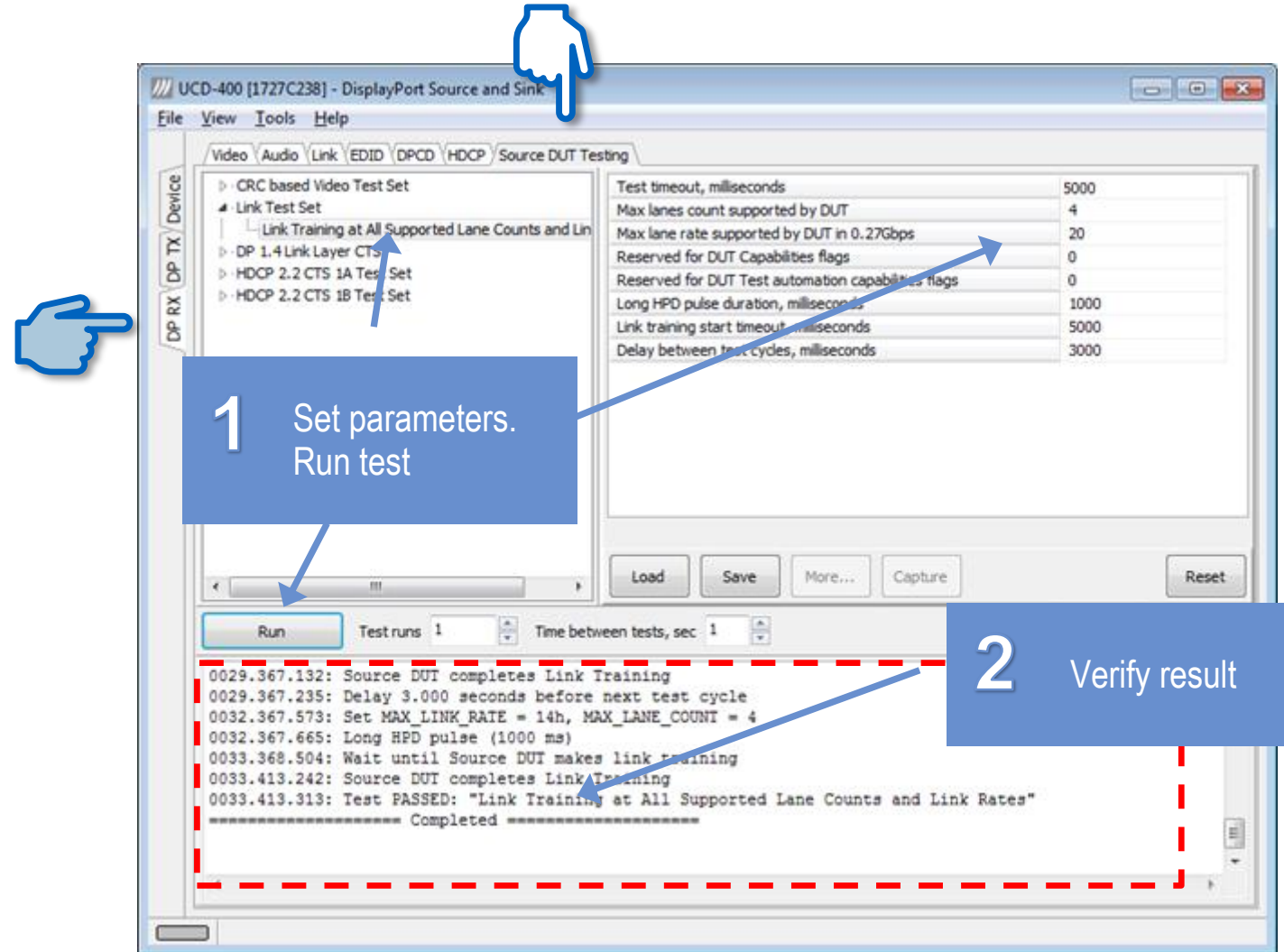


Reference Sink / Link



# Link Training Test

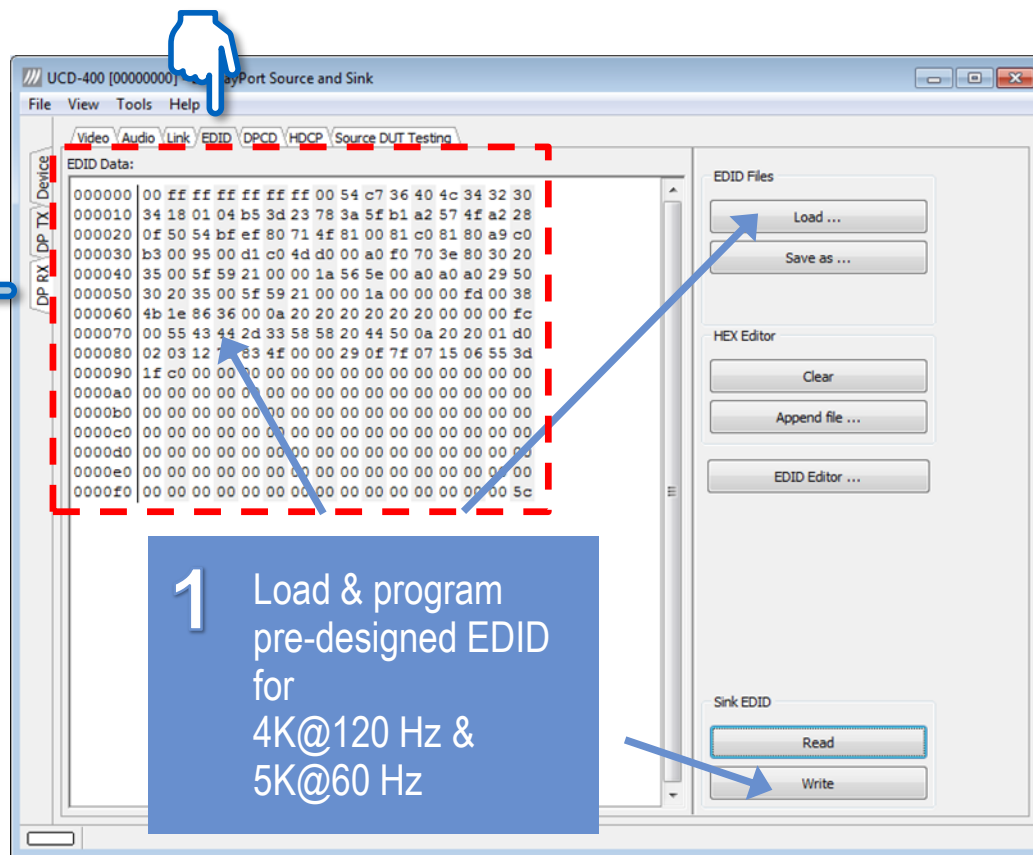
- Test:  
Link Training at  
All Supported  
Lane Counts and  
Link Rates
- Part of LL CTS



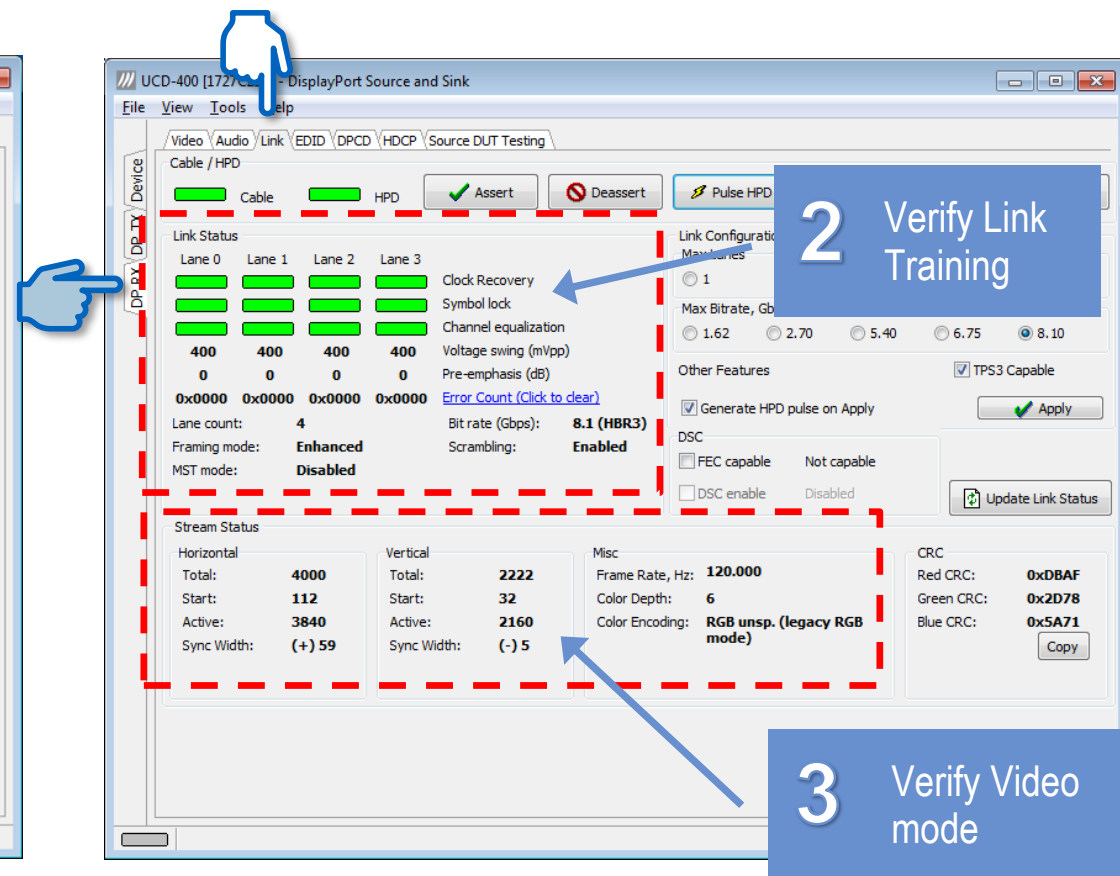
Reference Sink / Source DUT Testing

## Link Training and

## Video Mode



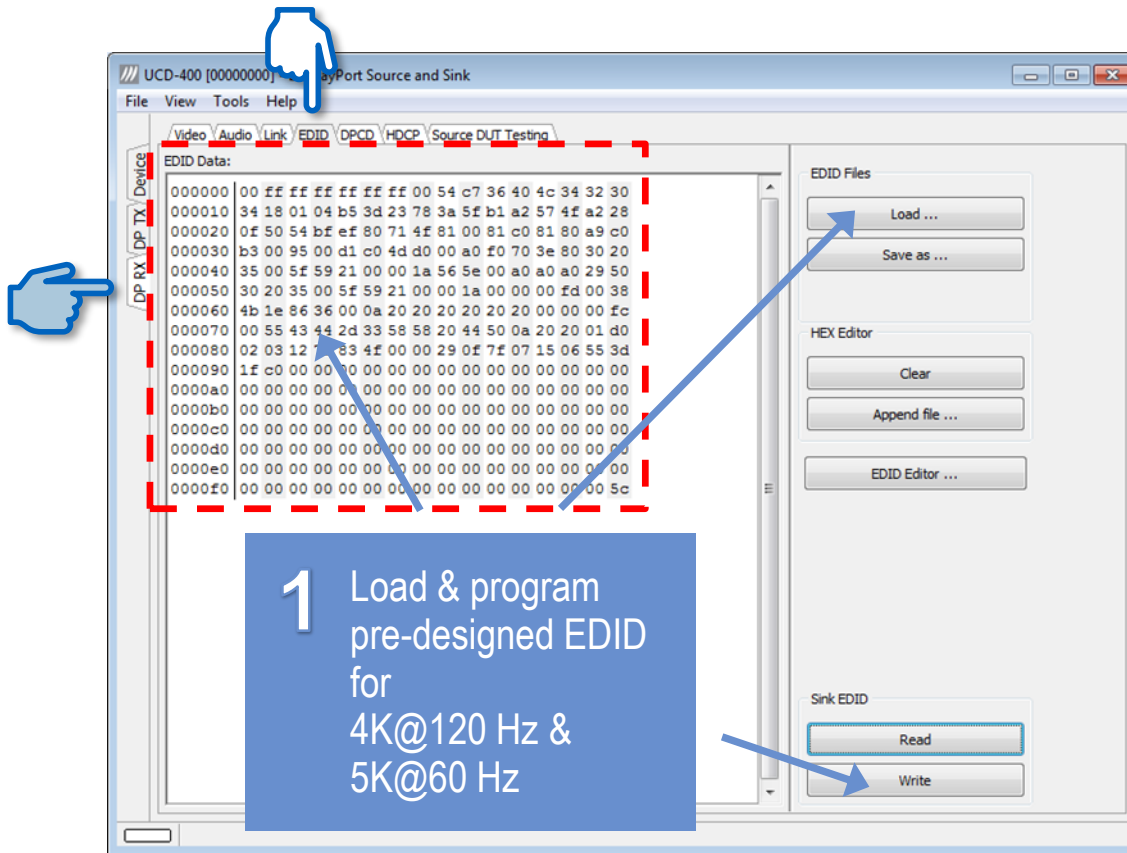
Reference Sink / EDID



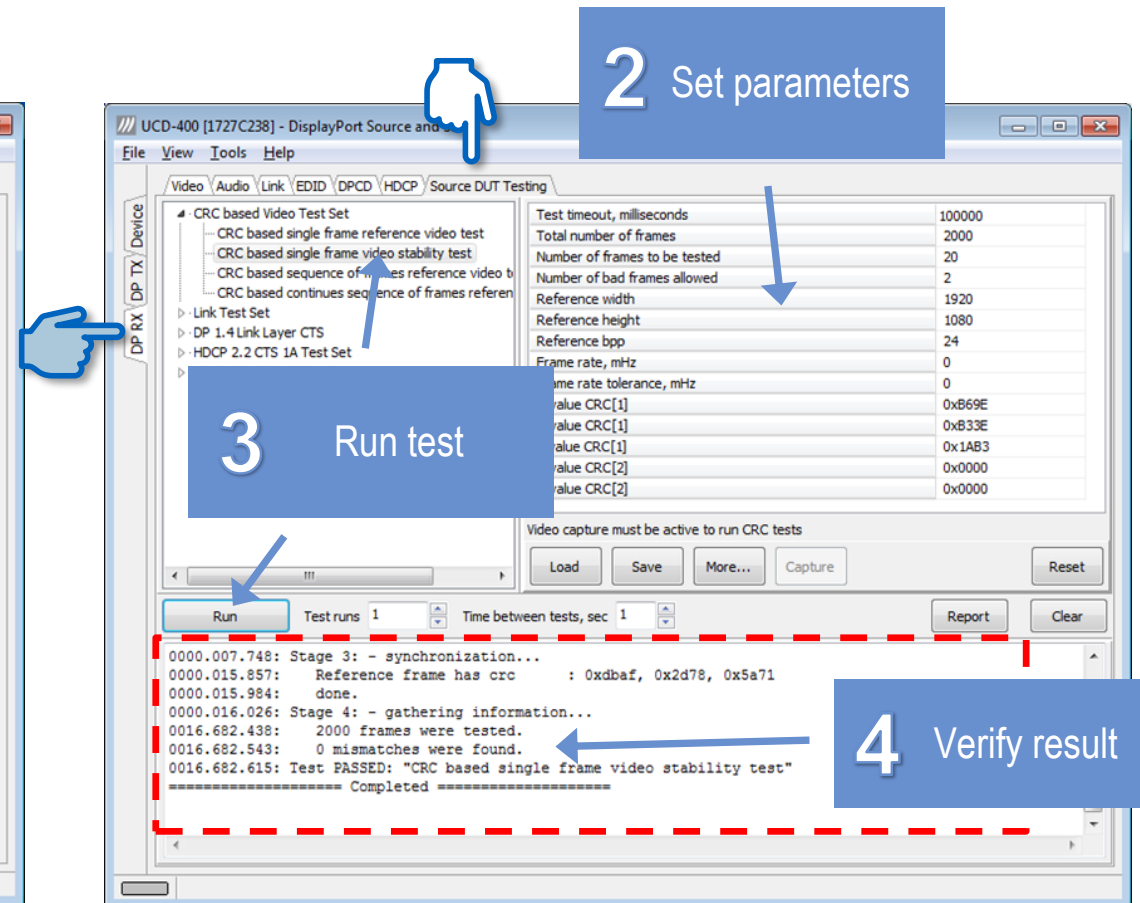
Reference Sink / Link



# Video Stability Test



Reference Sink / EDID



Reference Sink / Source DUT Testing

# UCD-400 Specifications

- Input DP 1.4 (8K@30 Hz, 4K@120 Hz)
- Output DP 1.4 (8K@30 Hz, 4K@120 Hz)
- Maximum pixel clock 1,332 MHz
- HDCP 1.3 and HDCP 2.2 support
- Computer Interface USB 3.0
- Operating System Windows 10, 8 and 7
- Power Input +12 Vdc (AC/DC converter included)
- Module Size 280 x 200 x 80 mm
- Weight 1.2 kg

# UCD-400 Features: DisplayPort Reference Source (DPTx)

Pattern Generator	Fixed and custom Video Timings Fixed and custom Video Patterns
Link	Link Status (Clock Recovery, Symbol Lock, Voltage swing, Pre-emphasis, Lane count, Link rate, Framing mode) HPD Status: (Asserted / De-asserted) Set link configuration: (Lane count, Link Rate, Framing mode, Clock mode) FEC Feature
EDID	Read / Write, Save / Load, EDID Editor
DPCD	Read / Write, Save / Load, Decoded DPCD content
HDCP	HDCP 1.3 and HDCP 2.2 Support Control: (Enable / Disable, authenticate only, Encryption Enable / Disable) Status: (Authentication status, Encryption status)
Sink Device Testing	Execute TSI Tests Execute HDCP 2.2 CTS for testing DP Sink DUT

# UCD-400 Features: DisplayPort Reference Sink (DPRx)

Video	Preview, Capture, Store frame and video Video status
Audio	Monitor and graphical preview, Capture audio. Audio Status
Link	Link Status, Set Link Configuration Stream Status (video, audio) HPD Status, Assert / De-assert, Long /Short Pulse FEC Feature, DSC Decoder
EDID	Read / Write, Save / Load, EDID Editor
DPCD	Read / Write, Save / Load, Decoded DPCD content
HDCP	HDCP 1.3 and HDCP 2.2 Support Control: (Enable / Disable, Authenticate only, Encryption Enable / Disable) Status: (Authentication status, Encryption status)
Source Device Testing	Execute TSI Tests Execute DP LL CTS Execute HDCP 2.2 CTS for testing DP Source DUT

Thank You!



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