

DPR-120 Shell

User's Manual

14.July.2014



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1. GENERAL

1.1. About this document

This document applies to release 1.8 of DPR-120 Test Automation shell (DPR_Shell.exe [1.8.2]).

1.1.1. Document History

- 7.July.2014
Initial version for evaluation.
- 14.July.2014
Revised for 1.8 [R2] release. Added notice of DPCD file extensions, Added notice about EDID file extensions, Revised the DPCD file format description.

1.1.2. Release History

1.0 [R0] – 29.April.2013

Initial Release.

1.2 [R1] – 20.May.2013

Added MSA Log. Added automatic link status updated. Added basic CTS support. Added colorimetry selector content. Fixed issue which caused GUI to refuse closing if device detached. Fixed communications issue causing access violation. Fixed issue where some configurations were not saved. Fixed issue causing license loading to not work. Fixed read of empty EDID. Fixed issue of link status not read on startup. Fixed issue where report information was not correctly updated. Fixed issue which caused “clear results” to not work. Fixed installation problems.

1.3 [R0] – 26.July.2013

Added “DP Monitor” -tab. MSA Log moved to DP Monitor. Last MSA/CRC view always visible in DP Monitor tab. Chaged EDID handling to allow any EDID block to be written on the device. Fixed issue where “Generate HPD pulse on apply” checkbox didn't work. Added short HPD pulse button.

1.4 [R0] – 15.Oct.2013

Additional information displayed on GUI front page. Bottom panel reserved for HPD controls. Added DPCD read/write and decode. Added CRC logging. Added monitored stream selection.

1.5 [R5] – 20.Dec.2013

Added DP Error counts read & reset. Added HTML reporting. Added save/load CTS setup feature. Un-used CTS settings removed. Added CTS Test set A. Fixed issue which caused bad MSA log/attributes to show after reset.

1.6 [R4] – 24.Feb.2014

Added CTS Test set B. Fixed stability issues. Test logs are now printed while test running. Firmware uses LED 1 to show DP Input HDCP encryption status, LED 2 for DP Monitor port cable and link status.

1.7 [R4] – 7.May.2014

Added 3 new tests to test set B. Corrected various log messages. Fixed issues on low resolution timings on Monitor out port.

1.8 [R2] – 14.July.2014

Added test automation shell interpreter. Added Shell user's manual.

1.2.Acronyms and abbreviations

<i>API</i>	Application Programming Interface.
<i>UAPI</i>	Unified Application Programming Interface.
<i>DLL</i>	Dynamic Link Library.
<i>GUI</i>	Graphical User Interface.
<i>CTS</i>	Compliance Testing System.
<i>MSA</i>	Main Stream Attributes.
<i>CRC</i>	Cyclic Redundancy Check.
<i>IDE</i>	Integrated Development Environment
<i>OS</i>	Operating System
<i>EDID</i>	Extended Display Identification Data.

2. COMPONENTS AND FEATURES

This section describes the features and components of DPR-120 Test Automation shell.

2.1.DPR Shell

The DPR-120 Shell is a 32-bit command-line interpreter utility. It uses the DPRA API to communicate with DPR-120 devices, and covers most of the functionality enabled by the API.

Features

The shell has features to carry out these tasks:

- Interactive mode: User types commands which are carried out by the shell.
- Multitasking: The shell listens for device events, and displays event information on screen while user is able to edit/enter commands.
- Script mode: Shell reads commands from a text file and runs the commands one by one.
- License management: Licenses can be added, removed and listed.
- List, configure and run CTS tests.
- Save CTS test reports.
- Read and write DPCD registers.
- Read DPCD register values to a file.
- Write DPCD registers from a file.
- Read & Write EDID blocks.
- Control HPD line
- Read link status, MSA and CRC values.
- Log MSA and CRC values to file.
- Select stream to monitor.
- Built in help system.

3. COMMANDS

This section describes all DPR-Shell commands.

In the examples, any user entered text is represented by having that text shown as *bold italics*. Required parameters are placed in angle brackets like <this>, and optional parameters are in square brackets like [this].

When entering commands, never type the parameter's name on the command line – Use only the wanted value/setting of the parameter.

3.1. Base level commands

This section describes commands that are always available and require no open device to function.

3.1.1. Help <topic> [...]

Invokes the built-in help system. Help without any further topic shows the base level help. To get further help, for example of some command type the command after the help command.

Example

The print-out below shows the prints from two commands “help dpmon” and “help dpmon read”:

```
Base > help dpmon
dpmon <Subcommand> <Parameters>

DPMon features currently available are stream selection
and reading current MSA or CRC values.

Valid sub-commands are:
  select <stream-index>: Select which stream to monitor.
  read <'MSA'|'CRC'>: Read current MSA or CRC values of the monitored
stream.
  log <...>: Log MSA and/or CRC values to a file
             - Please see sub-command specific help for details.
Base > help dpmon read
dpmon read <'MSA'|'CRC'>
Read current MSA or CRC values from the currently monitored stream.
The first parameter indicates which values are to be read.
Currently valid parameters are 'MSA' and 'CRC'.
Base >
```

3.1.2. Exit

Exits the shell.

3.1.3.Open <Device ID>

Open a DPR-120 device for device operations. A Device ID parameter is required: Device ID values are assigned for each device attached to the local system. The first device ID value is always 1.

During the device opening procedure, the open command will automatically update the device's firmware if necessary. The open command will also load licenses for the device if there any available for it in the persistent storage.

After the device is opened, the command prompt will show which device the shell is commanding.

If device have not been listed previously, this command will first run the list command automatically, and then proceed to open the device by the given ID.

Example:

```
DPR-120 Shell, V1.8 [R1], (C) 2014, Unigraf Oy. All Rights Reserved.
Entering interactive mode ...

Enter 'HELP' for instructions.
Base > open 1
Searching devices ...
1 Devices found:
- Device ID [1]: DPR-120 [1317C327], Serial 1317C327
Device DPR-120 [1317C327] Opened.
Device version:
Firmware package Version 1.8
[F1.3.0_N1.1.2_A1.1.3_V1.1.4]
Loaded 4 licenses.
DPR-120 [1317C327] >
```

If device's have been previously listed with the list command, this command will not re-search for attached devices (even if new devices are attached or a device is removed). Instead the device from the previous listing is opened (even if it's ID value would change if the list was run again).

Example:

```
DPR-120 Shell, V1.8 [R1], (C) 2014, Unigraf Oy. All Rights Reserved.
Entering interactive mode ...

Enter 'HELP' for instructions.
Base > list
Searching devices ...
2 Devices found:
- Device ID [1]: DPR-120 [1317C327], Serial 1317C327
- Device ID [2]: DPR-120 [1350C369], Serial 1350C369
Base > open 2
Device DPR-120 [1350C369] Opened.
Device version:
Firmware package Version 1.8
[F1.3.0_N1.1.2_A1.1.3_V1.1.4]
Loaded 0 licenses.
DPR-120 [1350C369] > list
Searching devices ...
1 Devices found:
- Device ID [1]: DPR-120 [1350C369], Serial 1350C369
DPR-120 [1350C369] >
```

3.1.4.List

Search for DPR-120 devices attached to the local system and show the resulting list on screen. The list can be used to select which device to open in case there are several. The listing shows device ID value, name of the device and the device's serial number.

Example:

```
Base > list
Searching devices ...
1 Devices found:
- Device ID [1]: DPR-120 [1317C327], Serial 1317C327
Base >
```

3.1.5.Close

Close the open device. This command will also stop CRC and MSA logging if log features have been enabled.

Example:

```
DPR-120 [1317C327] > close
Device closed.
Base >
```

3.1.6.CLS

Clear the command-prompt window.

3.1.7.RUN

Run a DOS command.

```
Base > RUN "dir C:\"
Volume in drive C has no label.
Volume Serial Number is 7013-E3EF

Directory of C:\

10.08.2012  10:49    <DIR>          Intel
14.07.2009  06:20    <DIR>          PerfLogs
26.03.2013  12:16    <DIR>          PMAIL
07.05.2014  16:37    <DIR>          Program Files
03.07.2014  13:23    <DIR>          Program Files (x86)
14.10.2013  16:43    <DIR>          Quarantine
07.07.2014  08:25    <DIR>          Temp
01.04.2014  14:42    <DIR>          Users
05.05.2014  10:44    <DIR>          VirtualMachines
03.07.2014  15:24    <DIR>          Windows
10.09.2012  15:27    <DIR>          WinDriver
             0 File(s)          0 bytes
             11 Dir(s)  43 044 388 864 bytes free

Base >
```

Please note that this command is experimental, and using it may have unforeseen side-effects.

3.2. License management commands

This section describes how to use the licensing shell commands.

3.2.1. License add <key>

Add a license key to the currently opened device's license pool. Enter the license key as printed on the license sticker on the device. A license string usually contains eight (8) groups of four (4) letters separated with dashes ('-').

Important: Adding a license does not save it to the persistent license storage. Use “License save” command to save the licenses to the persistent storage for later use.

Example:

```
DPR-120 [1317C327] > license add █████-████-████-████-████-████-████-████
License added
DPR-120 [1317C327] >
```

Note: In the example, the key is blacked out.

3.2.2. License list

Lists the licenses in the current device's license pool.

Example:

```
DPR-120 [1317C327] > license list
Key 1: '████-████-████-████-████-████-████-████'
      LL CTS Extensions, Test set A+B
Key 2: '████-████-████-████-████-████-████-████'
      Test Automation Shell
DPR-120 [1317C327] >
```

Note: In the example, the keys are blacked out.

3.2.3. License remove <key-index>

Remove a license key by key index. To see list of key's, and the related key indexes, use the command “License list”.

Important: Removing a license does not save the modifications to the persistent storage. Use “License save” command to save changes to the persistent storage.

Example:

```
DPR-120 [1317C327] > license remove 1
Key 1: '████-████-████-████-████-████-████-████'
      Test Automation Shell
Removed successfully.
DPR-120 [1317C327] >
```

Note: In the example, the key is blacked out.

3.2.4. License save

Save the current device's license pool to persistent storage.

Example:

```
DPR-120 [1317C327] > license save  
Saved 2 Licenses  
DPR-120 [1317C327]
```

TBD

3.2.5. License load

Loads licenses for currently open device from the persistent storage.

Important: Loading does not remove entered licenses – Instead each license loaded from the persistent storage is added to the license pool of the device.

Example:

```
DPR-120 [1317C327] > license load  
Loaded 2 licenses.  
DPR-120 [1317C327] >
```

3.3.DP Input related commands

This section describes the DPIN line of commands.

3.3.1.DPIN HPD <Operation>

This commands is used to control or read the HDP line status. Please note that changing the HPD line state will probably cause MSA or DPIN state change prints.

Possible operations are:

- “Assert”: Set the HPD line into asserted state.
- “Deassert”: Set the HPD line into deasserted state.
- “Check”: Read and show the current HPD line status.
- A numeric value from 1 to 65000: Generate a HPD pulse of given length. The value indicates the length in milliseconds.

Examples:

```
DPR-120 [1317C327] > dpin hpd check
HPD Status = Asserted
```

```
DPR-120 [1317C327] > dpin hpd deassert
HPD De-asserted
Clock Recovery      [--]  [--]  [--]  [--]
Symbol Lock         [--]  [--]  [--]  [--]
Channel equalization [--]  [--]  [--]  [--]
Voltage Swing (mVpp) 400   400   400   400
Pre-Emphasis (dB)   0      0      0      0
LaneCount = 4
FrameMode = Enhanced
MST_Mode = SST_Mode
BitRate = 2.7 Gbps
Scrambling = Disabled
```

```
DPR-120 [1317C327] > dpin hpd assert
HPD Asserted
Clock Recovery      [XX]  [XX]  [XX]  [XX]
Symbol Lock         [XX]  [XX]  [XX]  [XX]
Channel equalization [XX]  [XX]  [XX]  [XX]
Voltage Swing (mVpp) 400   400   400   400
Pre-Emphasis (dB)   0      0      0      0
LaneCount = 4
FrameMode = Enhanced
MST_Mode = SST_Mode
BitRate = 2.7 Gbps
Scrambling = Disabled
```

(Continued...)

(...Continued)

```
DPR-120 [1317C327] > dpin hpd 7000
HPD Pulse started (No notification on completion)
Clock Recovery          [--]  [--]  [--]  [--]
Symbol Lock             [--]  [--]  [--]  [--]
Channel equalization    [--]  [--]  [--]  [--]
Voltage Swing (mVpp)    400   400   400   400
Pre-Emphasis (dB)       0     0     0     0
LaneCount = 4
FrameMode = Enhanced
MST_Mode = SST_Mode
BitRate = 2.7 Gbps
Scrambling = Disabled
Clock Recovery          [XX]  [XX]  [XX]  [XX]
Symbol Lock             [XX]  [XX]  [XX]  [XX]
Channel equalization    [XX]  [XX]  [XX]  [XX]
Voltage Swing (mVpp)    400   400   400   400
Pre-Emphasis (dB)       0     0     0     0
LaneCount = 4
FrameMode = Enhanced
MST_Mode = SST_Mode
BitRate = 2.7 Gbps
Scrambling = Disabled
DPR-120 [1317C327] >
```

3.3.2.DPIN Linkconfig show

Show the current DPIN link configuration.

Example:

```
DPR-120 [1317C327] > DPIN Linkconfig show
MaxLanes = 4, MaxLinkRate = 0x14 (5.4 Gbps), MST = 1, TPS3 = 0
DPR-120 [1317C327] >
```

3.3.3.DPIN Linkconfig <Lane_count> <Speed> <MST> <TPS3>

Set DPIN Link configuration.

- <Lane_Count>: Numeric value defining the maximum number of lanes supported. Possible settings are 1, 2 or 4.
- <Speed>: Indicates maximum link speed. Possible settings are “RBR”, “HBR” and “HBR2”.
- <MST>: Indicates whether or not MST is supported on DPIN. Possible values are 0 (=MST Not supported) and 1 (= MST Supported)
- <TPS3>: Indicates whether or not TPS3 is supported on DPIN. Possible values are 0 (=TPS3 Not supported) and 1 (=TPS3 Supported)

Example:

```
DPR-120 [1317C327] > DPIN Linkconfig show
MaxLanes = 4, MaxLinkRate = 0x14 (5.4 Gbps), MST = 1, TPS3 = 0
DPR-120 [1317C327] > DPIN linkconfig 2 HBR 0 0
Link config set.
DPR-120 [1317C327] > DPIN Linkconfig show
MaxLanes = 2, MaxLinkRate = 0xa (2.7 Gbps), MST = 0, TPS3 = 0
DPR-120 [1317C327] >
```

3.3.4.DPIN DPCD Read <Address> [Length]

Read DPCD addresses and display the values on screen. The first value defines the DPCD address from which to start reading. The Length parameter is optional – If omitted it defaults to 16 bytes. Maximum length is 128 bytes.

Examples:

```
DPR-120 [1317C327] > DPIN DPCD Read 0x100
Length not specified, defaulting to 16 bytes.
0x00000100: 0a 84 20 00 00 00 00 00 00 00 00 00 00 00 00 00
DPR-120 [1317C327] > DPIN DPCD Read 0x100 64
0x00000100: 0a 84 20 00 00 00 00 00 00 00 00 00 00 00 00 00
0x00000110: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0x00000120: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0x00000130: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DPR-120 [1317C327] >
```


3.3.5.DPIN DPCD Write <Address> <Data1> [Data2] ...

Write data to DPCD addresses.

The first parameter defines the first DPCD address to be written. At least one additional parameter must be entered, defining the value to write to the address.

More values can be entered, and the values will be written to following addresses. Maximum number of bytes to write on single command is 128.

The written values are limited to 8-bit quantities, but for simplicity these values can be expressed with numeric range -128 to 255.

Example:

```
DPR-120 [1317C327] > DPIN dpcd write 0x100 0x0a 0x84 0x20 0x00 0x00
Wrote 5 bytes.
DPR-120 [1317C327] >
```

3.3.6.DPIN DPCD Save <Target-file> <Address> [Length]

Read DPCD addresses and save to file.

The first parameter defines the target file. To append to an existing file, start the filename with a '+' -character.

The second parameter defines the starting DPCD address.

The third parameter defines the number of bytes to read from the DPCD. This parameter is optional, and if omitted the default length is 16 bytes.

Important: The DPCD save insists on the “.DPD” extension. If another extension is issued, it will be replaced with “.DPD” – If no extension is present, “.DPD” will be appended.

Example:

```
DPR-120 [1317C327] > DPIN DPCD save C:\temp\DPCD1.bin 0x100 32
DPR-120 [1317C327] > DPIN DPCD save +C:\temp\DPCD1.bin 0x200 32
DPR-120 [1317C327] >
```

Note: The resulting DPCD1.bin files contents are as follows:

```
00000000h: 01 00 00 00 00 01 00 00 20 00 00 00 0A 84 20 00
00000010h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00000020h: 00 00 00 00 00 00 00 00 00 00 00 00 00 02 00 00
00000030h: 20 00 00 00 02 00 77 77 81 00 00 00 00 00 00 00
00000040h: 00 00 00 00 9E D4 9F D4 9F D4 9D D0 00 00 00 00
00000050h: 00 00 00 00
```

Important: Please refer to 4.1.1 for file-format description.

3.3.7.DPIN DPCD Load <Source-file>

Write DPCD addresses with data from a file previously saved with “DPIN DPCD Save” -command.

The first parameter identifies the file from which to read DPCD target address(es) and DPCD data.

Important: The DPCD loader insists on the “.DPD” extension. If another extension is issued, it will be replaced with “.DPD” – If no extension is present, “.DPD” will be appended.

Example:

```
DPR-120 [1317C327] > DPIN DPCD load C:\temp\DPCD1.bin
Writing 32 bytes to 0x00000100
Writing 32 bytes to 0x00000200
DPR-120 [1317C327] >
```

Note: This example used the file created in the “DPIN DPCD Save” example.

3.3.8.DPIN Status

Shows DP Input status information.

Example:

```
DPR-120 [1317C327] > DPIN status
Clock Recovery          [XX] [XX] [XX] [XX]
Symbol Lock             [XX] [XX] [XX] [XX]
Channel equalization    [XX] [XX] [XX] [XX]
Voltage Swing (mVpp)   400  400  400  400
Pre-Emphasis (dB)      0     0     0     0
LaneCount = 4
FrameMode = Enhanced
MST_Mode = SST_Mode
BitRate = 2.7 Gbps
Scrambling = Disabled
DPR-120 [1317C327] >
```

3.3.9.DPIN Streams

Shows currently received streams on the DP IN.

Example:

```
DPR-120 [1350C369] > dpin streams
Stream #1: Payload bandwidth number = 0x03c0, VCP_ID = 0x01
Stream #2: Payload bandwidth number = 0x03c0, VCP_ID = 0x02
DPR-120 [1350C369] >
```

3.4. Virtual sink related commands

This section describes the virtual sink related commands

3.4.1. SINK EDID Load <Source-file>

Loads EDID data from the given file, and sets it as the EDID of the DPR-120 device's sink function.

Important: The EDID loader will insist that the file has the “.bin” extension. If another extension is issued, it will be replaced with “.bin” – If no extension is present, “.bin” is appended.

Example:

```
DPR-120 [1317C327] > sink edid load c:\temp\edid  
Loaded 256 bytes of EDID data to DPR-120.  
DPR-120 [1317C327] >
```

3.4.2. SINK EDID Save <Target-file>

Read EDID data from DPR-120 device's sink function and save it into the given file.

Important: The EDID saver will insist that the file has the “.bin” extension. If another extension is issued, it will be replaced with “.bin” – If no extension is present, “.bin” is appended.

Example:

```
DPR-120 [1317C327] > sink edid save c:\temp\edid  
Saved 256 bytes of EDID Data from DPR-120.  
DPR-120 [1317C327] >
```

3.5.DP Monitoring related commands

This section describes the commands that control DP Monitoring features.

3.5.1.DPMON Select <Stream_Index>

Select which stream is copied on the DP Mon output – The selected stream will also work as source for MSA and CRC reading and logging.

To see list of available streams, use the “DPIN Streams” -command. If the input is receiving single stream that stream is always copied to the DP Mon output and this command has no effect.

3.5.2.DPMON Read <Data_ID>

Read data from the stream being copied to the DP Mon output. Possible Data_ID's are:

- “MSA”: Read the stream's current Main Stream Attributes.
- “CRC”: Read the stream's current CRC values.

Example:

```
DPR-120 [1317C327] > DPMON Read MSA
VCP_ID = 0x00, Time 0x00c37a79
Flags = 0x01, MISC0 = 0x20, MISC1 = 0x00
HTotal 1056 VTotal 628
HStart 216 VStart 27
HActive 800 VActive 600
HSWidth 128 VSWidth 4
HSync polarity = +, VSync polarity = +
DPR-120 [1317C327] > DPMON Read CRC
VCP_ID = 0x00, Time = 0x00c518ae
CRC_RED = 0x997d, CRC_GREEN = 0x8bbb, CRC_BLUE = 0xffffa
DPR-120 [1317C327] >
```

3.5.3.DPMON Log Start <Data_ID> <Target_File>

Start logging of MSA or CRC values into the given target file. The files are human readable text files.

The first parameter must be either “MSA” or “CRC” indicating which data is to be logged.

The second parameter defines the target file. To append to an existing file, start the file-name with a '+' -character.

Example:

```
DPR-120 [1317C327] > DPMON Log Start MSA C:\Temp\MSA_LOG.txt
MSA Log started...
DPR-120 [1317C327] > DPMON Log Start CRC C:\Temp\CRC_LOG.txt
CRC Log started...
MSA Changed:
VCP_ID = 0x00, Time 0x00c83d67 Flags = 0x01, MISC0 = 0x20, MISC1 = 0x00
HTotal    1056 VTotal    628
HStart    216 VStart    27
HActive   800 VActive   600
HSWidth   128 VSWidth   4
HSync polarity = +, VSync polarity = +

VCP_ID = 0x00, Time = 0x00c83d5b
CRC_RED = 0x997d, CRC_GREEN = 0x8bbb, CRC_BLUE = 0xffff
DPR-120 [1317C327] >
```

3.5.4.DPMON Log Stop <Data_ID>

Stop logging of MSA or CRC values. The logging must have been started previously with a “DPMON Log Start ...” -command.

Example:

```
DPR-120 [1317C327] > DPMON Log Stop CRC
CRC Log stopped...
DPR-120 [1317C327] > DPMON Log Stop MSA
MSA Log stopped...
DPR-120 [1317C327] >
```

3.6.CTS Testing related commands

This section describes the commands that are related to CTS testing

3.6.1.CTS List

List currently available CTS tests. The number of CTS tests available depends on firmware version and available licenses.

```
DPR-120 [1317C327] > cts list
Test 1: '(400.3.1.1) Successful LT at All Supported Lane Counts and Link
Speeds: HBR2 Extension'
Test 2: '(400.3.1.2) Successful LT with Request of Higher Differential
Voltage Swing During Clock Recovery Sequence: HBR2 Extension'
Test 3: '(400.3.1.3) Successful LT to a Lower Link Rate #1: Iterate at Max
Voltage Swing: HBR2 Extension'
Test 4: '(400.3.1.4) Successful LT to a Lower Link Rate #2: Iterate at
Minimum Voltage Swing: HBR2 Extension'
Test 5: '(400.3.1.5) Successful LT with Request of a Higher Pre-emphasis
and Post Cursor 2 Setting During Channel Equalization Sequence'
Test 6: '(400.3.1.6) Successful LT at Lower Link Rate Due to Loss of Symbol
Lock During Channel Equalization Sequence: HBR2 Extension'
Test 7: '(400.3.1.7) Unsuccessful LT at Lower Link Rate #1: Iterate at Max
Voltage Swing: HBR2 Extension'
Test 8: '(400.3.1.8) Unsuccessful LT at Lower Link Rate #2: Iterate at
Minimum Voltage Swing: HBR2 Extension'
Test 9: '(400.3.1.9) Unsuccessful LT due to Failure in Channel Equalization
Sequence [loop count > 5]: HBR2 Extension'
Test 10: '(700.1.1.1) Additional DPCD Handling Test 1'
Test 11: '(700.1.1.2) Additional DPCD Handling Test 2'
Test 12: '(400.3.1.12) Successful LT to a Lower Link Rate #3: Iterate at
Max Voltage Swing'
Test 13: '(400.3.1.13) Successful LT to a Lower Link Rate #4: Iterate at
Minimum Voltage Swing'
Test 14: '(400.3.1.14) Successful Link Downgrade to Lowest Link Rate:
Failed Clock Recovery at HBR2, Loss of Clock Recovery during Channel
Equalization at HBR'
Test 15: '(400.3.1.15) Successful LT with Simultaneous Request for
Differential Voltage Swing and Post Cursor during Clock Recovery & Channel
Equalization Sequences'
Test 16: '(400.3.2.1) Successful Link Re-training After IRQ HPD Pulse Due
to Loss of Symbol Lock: HBR2 Extension'
Test 17: '(400.3.2.2) Successful Link Re-training After IRQ HPD Pulse Due
to Loss of Clock Recovery Lock: HBR2 Extension'
Test 18: '(400.3.2.3) Successful Link Re-training After IRQ HPD Pulse Due
to Loss of Inter-lane Alignment Lock: HBR2 Extension'
Test 19: '(400.3.3.1) Video Time Stamp Generation'
```

3.6.2.CTS Config load <config_file>

Load CTS configuration from a file. The file format is the same as used by the DPR-120 GUI.

The first parameter defines the source file from which to load the configuration. If the file-name or path contains spaces, enclose it with double-quotes.

3.6.3.CTS Config save <config_file>

Save CTS configuration to a file. The file format is compatible with the DPR-120 GUI.

The first parameter defines the target file. If the file-name or path contains spaces, enclose it with double-quotes.

3.6.4.CTS Config show [conf_entry]

Show current CTS configuration, or part of configuration.

The first parameter is optional, if omitted all configuration areas are shown. Otherwise, possible values are “all”, “link”, “flags”, “ta-flags”, “timestamps”, “most_packed” or “colorimetry”.

Example:

```
DPR-120 [1317C327] > cts config show
### Link configuration ###
Max Lanes = 4
Max bit-rate = 5.4 Gbps
HPD Timeout = 700ms.

### DUT Flags configuration ###
-- No flags --

### CTS Test automation flags configuration ###
DPRA_TA_TEST_LINK_TRAINING
DPRA_TA_TEST_VIDEO_PATTERN
DPRA_TA_TEST_EDID_READ
DPRA_TA_DUT_READY_LT_END

### Timestamp generation configuration ###
Failsafe: 640x480 @ 60 Hz, 18 bpp 25.175 MHz
RBR, 1-Lane: 848x480 @ 60 Hz, 24 bpp 33.750 MHz
RBR, 2-Lanes: 1280x720 @ 60 Hz, 24 bpp 74.250 MHz
RBR, 4-Lanes: 1920x1080 @ 60 Hz, 24 bpp 148.500 MHz
HBR, 1-Lane: 1280x720 @ 60 Hz, 24 bpp 74.250 MHz
HBR, 2-Lanes: 1280x960 @ 60 Hz, 24 bpp 108.000MHz
HBR, 4-Lanes: 1920x1440 @ 60 Hz, 24 bpp 234.000 MHz
HBR2, 1-Lane: 1280x960 @ 60 Hz, 24 bpp 108.000MHz
HBR2, 2-Lanes: 1920x1080 @ 60 Hz, 24 bpp 148.500 MHz
HBR2, 4-Lanes: 1920x1080 @ 120 Hz, 24 bpp 297.000 MHz

### Most packed timings configuration ###
1-Lane: 1280x960 @ 60 Hz, 24 bpp 108.000MHz
2-Lanes: 1920x1440 @ 60 Hz, 24 bpp 234.000 MHz
4-Lanes: 1920x1080 @ 120 Hz, 24 bpp 297.000 MHz

### Colorimetry configuration ###
0: RGB VESA ITU.601 18bpp
1: RGB VESA ITU.601 24bpp
DPR-120 [1317C327] >
```

3.6.5.CTS Config Link <Max-lanes> <Max-rate> <HPD_Timeout>

Set CTS link configuration parameters.

The first parameter defines maximum number of lanes. Possible settings are 1, 2 or 4.

Second parameter defines maximum bit rate. Possible settings are "RBR", "HBR" or "HBR2".

Third parameter defines HPD timeout in milliseconds. Allowed range is from 1 to 65000.

Example:

```
DPR-120 [1317C327] > cts config link 4 HBR2 700
Done.
DPR-120 [1317C327] >
```

3.6.6.CTS Config flags <'+'|-> <Flag1> [Flag2] [...]

Set or clear CTS configuration flags.

The first parameter indicates whether flags are cleared or set. Use "+" to set flags, and "-" to clear flags.

The second parameter defines the first flag to be changed. Flags are "FIXED_TIMING", "SPREAD_SPECTRUM", "DRIVER_L3", "PRE_EMPHASIS_L3", "VFC_NO_LT", "LCR_NO_LET" and "ALL".

The third parameter (and following) are optional and may list additional flags to change.

Example:

```
DPR-120 [1317C327] > cts config flags - all
Done.
DPR-120 [1317C327] > cts config flags + FIXED_TIMING DRIVER_L3
Done.
DPR-120 [1317C327] > cts config show flags
### DUT Flags configuration ###
DPRA_TA_DRIVER_L3
DPRA_TA_FIXED_TIMING
DPR-120 [1317C327] >
```


3.6.7.CTS Config ta_flags <'+'|'-> <Flag1> [Flag2] [...]

Set or clear CTS Test Automation flags.

The first parameter indicates whether flags are cleared or set. Use “+” to set flags, and “-” to clear flags.

The second parameter defines the first flag to be changed. Flags are “LINK_TRAINING”, “VIDEO_PATTERN”, “EDID_READ” and “ALL”.

The third parameter (and following) are optional and may list additional flags to change.

Example:

```
DPR-120 [1317C327] > cts config ta_flags - all
Done.
DPR-120 [1317C327] > cts config ta_flags + EDID_READ
Done.
DPR-120 [1317C327] > cts config show ta_flags
### CTS Test automation flags configuration ###
DPRA_TA_TEST_EDID_READ
DPRA_TA_DUT_READY_LT_END
DPR-120 [1317C327] >
```

3.6.8.CTS Config ready_event <Event>

Set's CTS Test Automation DUT Ready event type.

The first parameter defines the DUT Ready Event used. Possible settings are “NONE”, “EDID_READ”, “LT_END” or “ACTIVE_VIDEO”

Example:

```
DPR-120 [1317C327] > cts config ready_event LT_END
Done.
DPR-120 [1317C327] >
```

3.6.9.CTS Config timestamp <BitRate> <Lanes> <ResolutionID>

Set timestamp generation timings.

The first parameter defines the bitrate for which to set timing. Possible settings are “RBR”, “HBR” or “HBR2”.

The second parameter defines the number of lanes. Possible settings are 1, 2 or 4.

The third parameter defines the timestamp generation timing. See table below for resolution ID values:

ResolutionID	Description
0	None
1	640x480 @ 60 Hz, 18 bpp 25.175 MHz
2	848x480 @ 60 Hz, 24 bpp 33.750 MHz
3	1280x720 @ 60 Hz, 24 bpp 74.250 MHz
4	1280x960 @ 60 Hz, 24 bpp 108.000MHz
5	1920x1080 @ 60 Hz, 24 bpp 148.500 MHz
6	1920x1440 @ 60 Hz, 24 bpp 234.000 MHz
7	1920x1080 @ 120 Hz, 24 bpp 297.000 MHz

Example:

```
DPR-120 [1317C327] > cts config timestamp rbr 1 2
Done.
DPR-120 [1317C327] > cts config show timestamps
### Timestamp generation configuration ###
Failsafe: 640x480 @ 60 Hz, 18 bpp 25.175 MHz
RBR, 1-Lane: 848x480 @ 60 Hz, 24 bpp 33.750 MHz
RBR, 2-Lanes: 1280x720 @ 60 Hz, 24 bpp 74.250 MHz
RBR, 4-Lanes: 1920x1080 @ 60 Hz, 24 bpp 148.500 MHz
HBR, 1-Lane: 1280x720 @ 60 Hz, 24 bpp 74.250 MHz
HBR, 2-Lanes: 640x480 @ 60 Hz, 18 bpp 25.175 MHz
HBR, 4-Lanes: 1920x1440 @ 60 Hz, 24 bpp 234.000 MHz
HBR2, 1-Lane: 1280x960 @ 60 Hz, 24 bpp 108.000MHz
HBR2, 2-Lanes: 1920x1080 @ 60 Hz, 24 bpp 148.500 MHz
HBR2, 4-Lanes: 1920x1080 @ 120 Hz, 24 bpp 297.000 MHz
DPR-120 [1317C327] >
```

3.6.10.CTS Config most_packed <ResID1> <ResID2> <ResID4>

Set most packed timings.

The first parameter defines the timing for 1 lane.

Second parameter defines the timing for 2 lanes.

Third parameter defines the timing for 4 lanes.

Please see the table below for resolution ID values:

ResolutionID	Description
0	None
1	640x480 @ 60 Hz, 18 bpp 25.175 MHz
2	848x480 @ 60 Hz, 24 bpp 33.750 MHz
3	1280x720 @ 60 Hz, 24 bpp 74.250 MHz
4	1280x960 @ 60 Hz, 24 bpp 108.000MHz
5	1920x1080 @ 60 Hz, 24 bpp 148.500 MHz
6	1920x1440 @ 60 Hz, 24 bpp 234.000 MHz
7	1920x1080 @ 120 Hz, 24 bpp 297.000 MHz

Example:

```
DPR-120 [1317C327] > cts config most_packed 4 6 7
Done.
DPR-120 [1317C327] >
```

3.6.11.CTS Config colorimetry <'+'|-> <CL_ID1> [CL_ID2] [...]

Add or remove colorimetry definitions.

The first parameter defines if colorimetry definitions are added or removed. To add colorimetry definitions use '+' character, to remove use '-' character.

The second parameter defines a colorimetry definition to add/remove.

The third parameter (an following) define additional colorimetry definitions to add/remove.

Please see table below for colorimetry definition ID values:

Colorimetry ID	Description
0	RGB VESA 18bpp
1	RGB VESA 24bpp
2	RGB VESA 30bpp
3	RGB CEA 24bpp
4	RGB CEA 30bpp
5	YCbCr 4:2:2 CEA ITU.601 24bpp
6	YCbCr 4:2:2 CEA ITU.601 30bpp
7	YCbCr 4:2:2 CEA ITU.709 24bpp
8	YCbCr 4:2:2 CEA ITU.709 30bpp
9	YCbCr 4:4:4 CEA ITU.601 24bpp
10	YCbCr 4:4:4 CEA ITU.601 30bpp
11	YCbCr 4:4:4 CEA ITU.709 24bpp
12	YCbCr 4:4:4 CEA ITU.709 30bpp

Example:

```
DPR-120 [1317C327] > cts config colorimetry + 10 11 12
Done.
DPR-120 [1317C327] > cts config show colorimetry
### Colorimetry configuration ###
0: RGB VESA ITU.601 18bpp
1: RGB VESA ITU.601 24bpp
2: YCbCr 4:4:4 CEA ITU.601 30bpp
3: YCbCr 4:4:4 CEA ITU.709 24bpp
4: YCbCr 4:4:4 CEA ITU.709 30bpp
DPR-120 [1317C327] >
```

3.6.12.CTS Run <Test_Index>

Run a CTS Test.

Important: A CTS Test may require test operator to perform certain steps on source devices to fulfill the requirements of the DP CTS specifications. In this case, the shell will enter a special feedback mode, in which only the feedback response commands are working. Please refer to chapters 3.6.13, 3.6.14, 3.6.15 and 3.6.16.

```
DPR-120 [1317C327] > cts run 19
Starting 19: '(400.3.3.1) Video Time Stamp Generation'
Starting test: (400.3.3.1) Video Time Stamp Generation

Configure EDID for the test
Create EDID for video mode 1920x1080@60Hz 24 bpp
Set MAX_LINK_RATE = 06h, MAX_LANE_COUNT = 4
Long HPD Pulse (700 ms)
Wait until Source DUT writes to the LINK_BW_SET and LANE_COUNT_SET fields
  AUX RD: 0x200: 6 02 00 00 00 00 00

### OPERATOR FEEDBACK REQUIRED ###

Test video pattern request
1920x1080@60Hz 24 bpp
To reply, enter command 'Proceed' to complete test.
DPR-120 [1317C327] >
```

Note: The test requests the operator to set a specific video timing, and then issue the “proceed” command.

3.6.13.Proceed

This command is only available when a CTS test requires operator feedback. It instructs the DPR-120 firmware to proceed with the test.

Important: Please, issue this command only if it was listed as valid option in the operator feedback request.

Example:

```
DPR-120 [1317C327] > proceed
  AUX WR: 0x100: 2 06 84
Source DUT sets LANE_COUNT_SET = 4
Source DUT sets LINK_BW_SET = 06h
Source DUT sets LANE_COUNT_SET = 4
Source DUT sets LINK_BW_SET = 06h
  AUX WR: 0x102: 5 21 00 00 00 00
Source DUT starts LT
_CR LT iter_, 4 lane(s)
  AUX RD: 0x202: 6 11 11 80 00 00 00
  AUX WR: 0x102: 5 22 00 00 00 00
_EQ LT iter_, 4 lane(s)
  AUX RD: 0x202: 6 77 77 81 00 00 00
  AUX WR: 0x102: 5 20 00 00 00 00
Source DUT completes LT
Source DUT writes TRAINING_PATTERN_SET = 0h
Equalization succeeded on all active lanes
Symbol lock succeeded on all active lanes
All lanes are properly skewed
Operator request for test video pattern 1920x1080@60Hz 24 bpp
Operator feedback received
Waiting for requested video ...
Main Stream Attributes do not match expected values:
  Received 1056 Htotal differs from expected 2200 one
  Received 800 Hactive differs from expected 1920 one
  Received 216 Hstart differs from expected 192 one
  Received 128 Hsync width differs from expected 44 one
  Received 628 Vtotal differs from expected 1125 one
  Received 600 Vactive differs from expected 1080 one
  Received 27 Vstart differs from expected 41 one
  Received 4 Vsync width differs from expected 5 one
Requested video mode has not been sent
Test FAILED, step 14, error 33: Incorrect MSA attributes

Test result = 2 (FAIL)
DPR-120 [1317C327] >
```

3.6.14.Pass

This command is only available when a CTS test requires operator feedback. It instructs the DPR-120 firmware to mark the test as passed.

Important: Please, issue this command only if it was listed as valid option in the operator feedback request.

3.6.15.Fail

This command is only available when a CTS test requires operator feedback. It instructs the DPR-120 firmware to mark the test as failed.

Important: Please, issue this command only if it was listed as valid option in the operator feedback request.

3.6.16.Abort

This command is only available when a CTS test requires operator feedback. It instructs the DPR-120 firmware to abort the test.

Important: *Please, issue this command only if it was listed as valid option in the operator feedback request.*

3.7.CTS reporting related commands

3.7.1.CTS Report DUT_Model <String>

Set DUT Model information string for CTS report. If the string contains spaces, or capital characters are wanted, enclose the string with double-quotes.

3.7.2.CTS Report DUT_Revision <String>

Set DUT Revision information. If the string contains spaces, or capital characters are wanted, enclose the string with double-quotes.n string for CTS report.

3.7.3.CTS Report DUT_FW <String>

Set DUT Firmware version information string for CTS report. If the string contains spaces, or capital characters are wanted, enclose the string with double-quotes.

3.7.4.CTS Report DUT_Serial <String>

Set DUT Serial number string for CTS Report. If the string contains spaces, or capital characters are wanted, enclose the string with double-quotes.

3.7.5.CTS Report DUT_Driver <String>

Set DUT Device Driver version information or other driver identification string for CTS report. If the string contains spaces, or capital characters are wanted, enclose the string with double-quotes.

3.7.6.CTS Report Tester <String>

Set Test Operator's name for CTS report. If the string contains spaces, or capital characters are wanted, enclose the string with double-quotes.

3.7.7.CTS Report Remarks <String>

Set Remarks section text for CTS report. If the string contains spaces, or capital characters are wanted, enclose the string with double-quotes.

3.7.8.CTS Report show

Show current user provided information for report.

Example:

```
DPR-120 [1317C327] > cts report show
DUT Model:
Model info not set

DUT Revision:
Revision info not set

DUT Firmware:
Firmware info not set

DUT Serial:
Serial# not set

DUT Driver:
Driver info not set

Tester's name:
John/Jane Doe

Remakrs:
Generated with DPR-120 Test Automation Shell

DPR-120 [1317C327] >
```

3.7.9.CTS Report save <Target_File>

Save CTS report to given target file. The report is saved in HTML format.

Example:

```
DPR-120 [1317C327] > cts report save c:\temp\Report1.html
Device version:
Firmware package Version 1.8
[F1.3.0_N1.1.2_A1.1.3_V1.1.4]
Report saved.
DPR-120 [1317C327] >
```

Note: The device FW version is (re)checked, because it is needed to generate the report.

4. DEFINITIONS

4.1. File formats

This section defines the contents of the file generated by the Shell's save commands.

4.1.1. DPCD Register save files

These files are binary. Please see table below:

Offset	Size	Chunk	Description
0	4	None	DPCD file version. Currently set to 1. Little-endian byte-order.
4	4	0	DPCD Address for the first chunk. Little-endian byte-order.
8	4		"nSize" - Number of data bytes contained for the first chunk. Maximum chunk size is 128 bytes. Little-endian byte-order.
12 + nSize	4	1	DPCD Address for the second chunk. Little-endian byte-order.
16	4		"nSize2" - Number of data bytes contained for the first chunk. Maximum chunk size is 128 bytes. Little-endian byte-order.
20 + nSize + nSize2			...

Note: The DPCD save command only writes a single chunk at a time. Additional chunks can be added to the file with a second DPCD save command using file append feature. This file format is the same the DPR-120 GUI uses, but the notice that the GUI is limited to two chunks!

4.1.2. EDID save files

EDID save files contain pure EDID data in binary format.

4.2.Cheat sheet

```

Help <topic> [...]
Exit
Open <Device ID>
List
Close
CLS
Run <DOS_Command>

License add <key>
License list
License remove <key-index>
License save
License load

DPIN HPD <Operation>
DPIN Linkconfig show
DPIN Linkconfig <Lane_count> <Speed> <MST> <TPS3>
DPIN DPCD Read <Address> [Length]
DPIN DPCD Write <Address> <Data1> [Data2]
DPIN DPCD Save <Target-file> <Address> [Length]
DPIN DPCD Load <Source-file>
DPIN Status
DPIN Streams

SINK EDID Load <Source-file>
SINK EDID Save <Target-file>

DPMON Select <Stream_Index>
DPMON Read <Data_ID>
DPMON Log Start <Data_ID> <Target_File>
DPMON Log Stop <Data_ID>

CTS List
CTS Config load <config_file>
CTS Config save <config_file>
CTS Config show [conf_entry]
CTS Config Link <Max-lanes> <Max-rate> <HPD_Timeout>
CTS Config flags <'+'|'-> <Flag1> [Flag2] [...]
CTS Config ta_flags <'+'|'-> <Flag1> [Flag2] [...]
CTS Config ready_event <Event>
CTS Config timestamp <BitRate> <Lanes> <ResolutionID>
CTS Config most_packed <ResID1> <ResID2> <ResID4>
CTS Config colorimetry <'+'|'-> <CL_ID1> [CL_ID2] [...]
CTS Run <Test_Index>

Proceed
Pass
Fail
Abort

CTS Report DUT_Model <String>
CTS Report DUT_Revision <String>
CTS Report DUT_FW <String>
CTS Report DUT_Serial <String>
CTS Report DUT_Driver <String>
CTS Report Tester <String>
CTS Report Remarks <String>
CTS Report show
CTS Report save <Target_File>

```