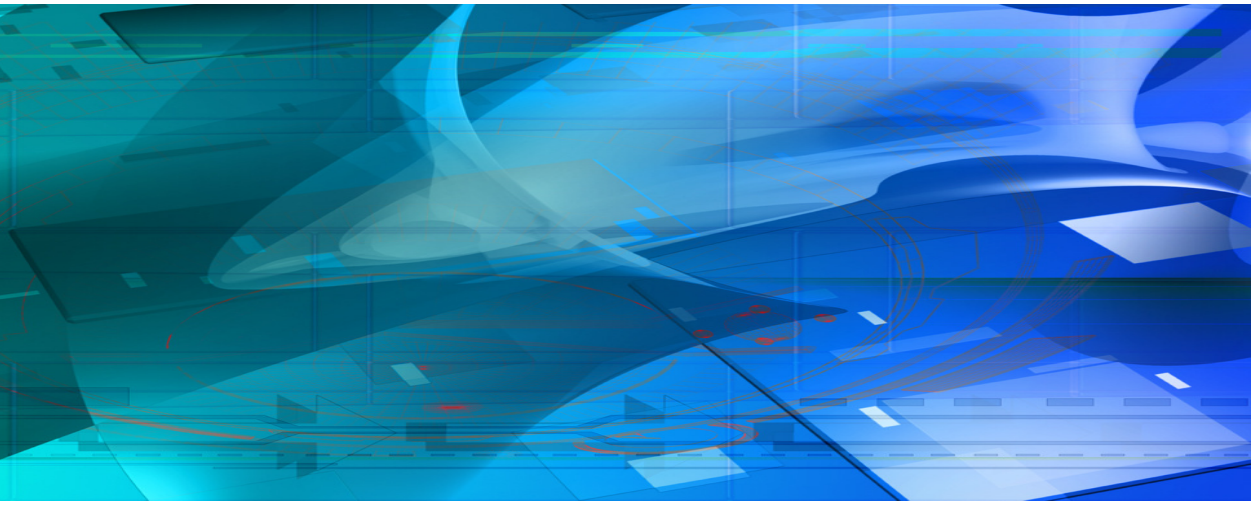
Unigraf DPT-200



Quick Guide

UNIGRAF

Copyright

This manual © Unigraf Oy. All rights reserved

Reproduction of this manual in whole or in part without written permission of Unigraf Oy is prohibited.

Notice

The information given in this manual is verified in the correctness on the date of issue. The authors reserve the rights to make any changes to this product and to revise the information about the products contained in this manual without an obligation to notify any persons about such revisions or changes.

Edition

Quick Guide to DPT-200

Date: 3 June 2011

Company information

Unigraf Oy
Ruukintie 3, FI-02330 ESPOO, Finland

Tel. +358 9 859 550, Fax. +358 9 802 6699

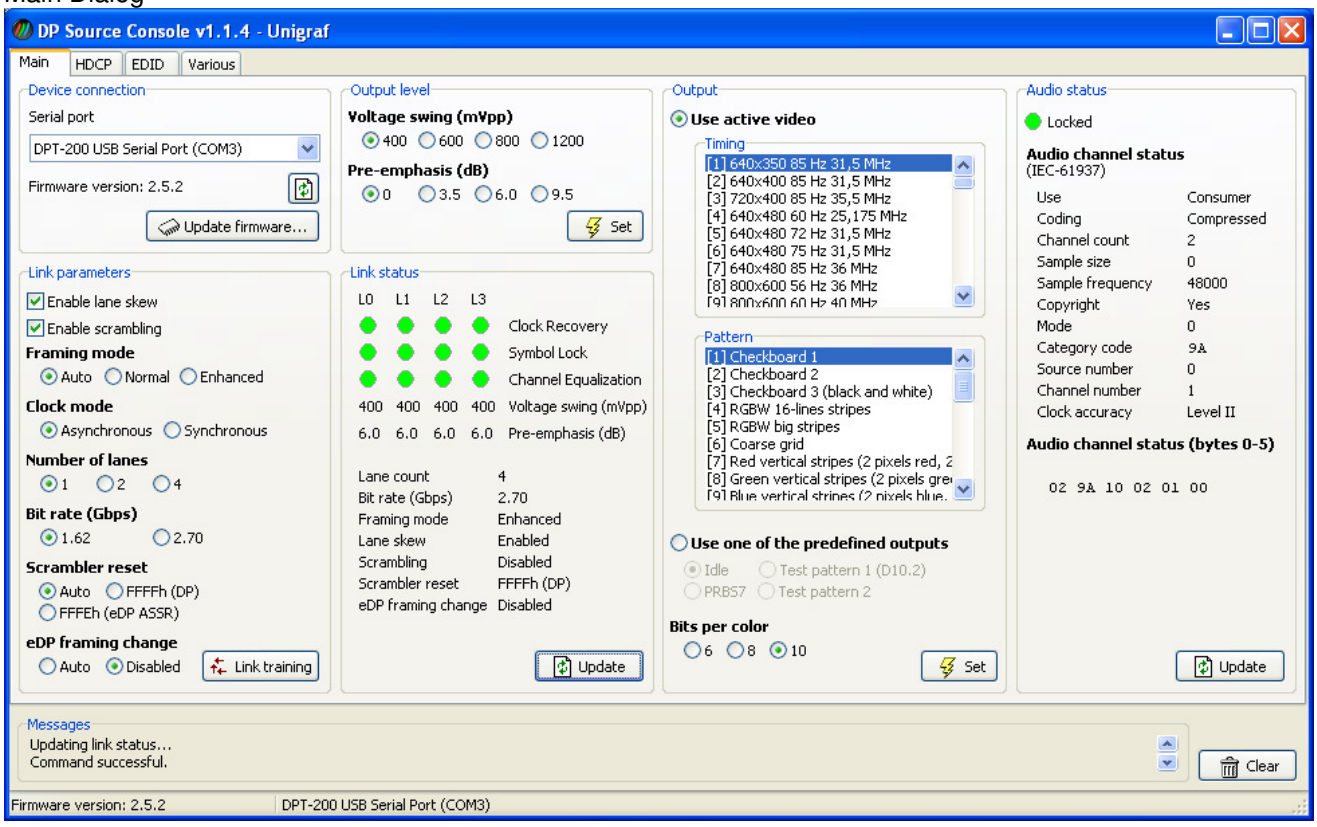
http://www.unigraf.fi

Introduction

The DPT-200 is a full featured and easy to use DisplayPort™ source for development, debug and production line testing of DP controlled flat panel display modules, monitors and TV sets. DPT-200 is fully compatible with Unigraf DP RefSource CTS tools.
The DPT-200 allows you to monitor all aspects of the DP interface like Link and HDCP status, sink EDID and DPCD. You can also manually set DPCD, Link Parameters, Output Level Timing and Pattern used. The Source Console GUI also includes an advanced EDID editor and programmer for changing the sink EDID information.
The DPT-200 allows you to easily perform tasks that are not possible with normal DP source devices. In addition to the Source Console GUI, you can use the Production Test Command set to interface DPT-200 to your automated production system.

Dialogs

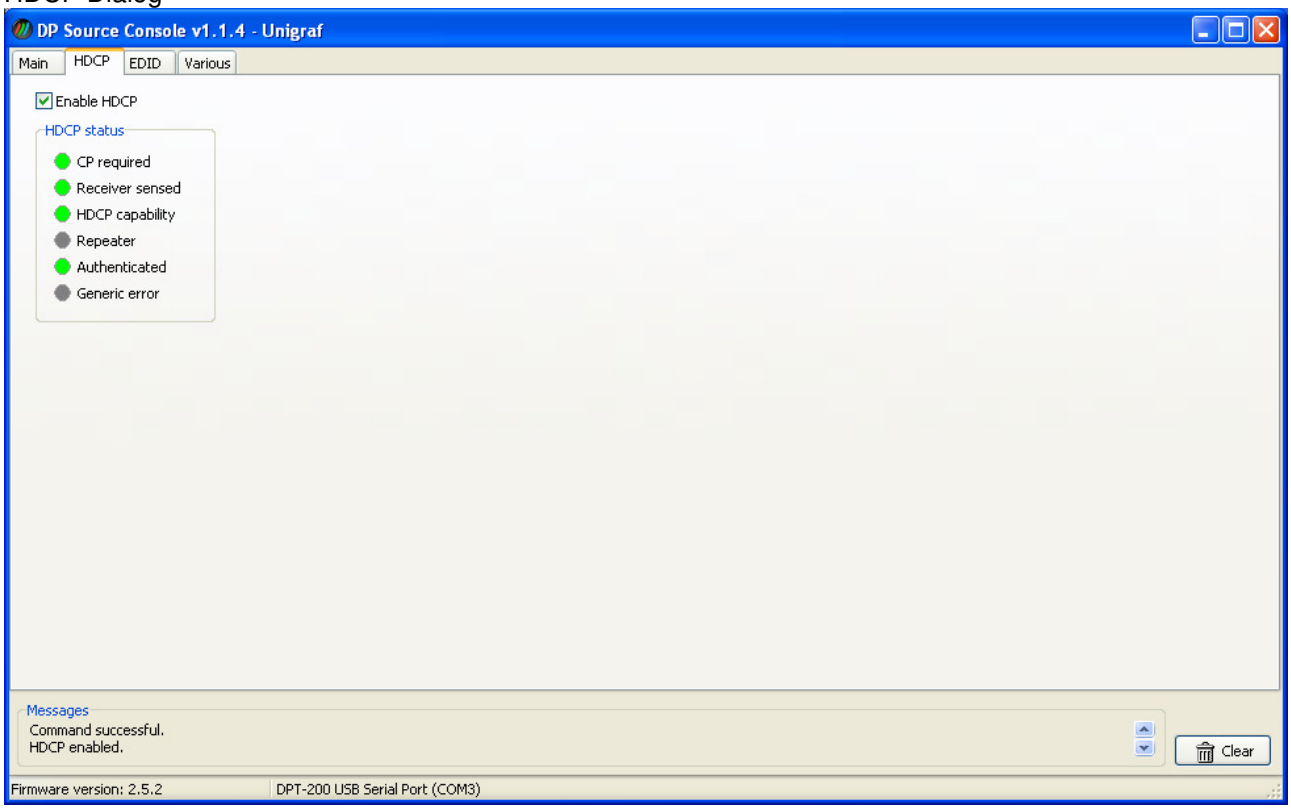
Main Dialog



Main features:

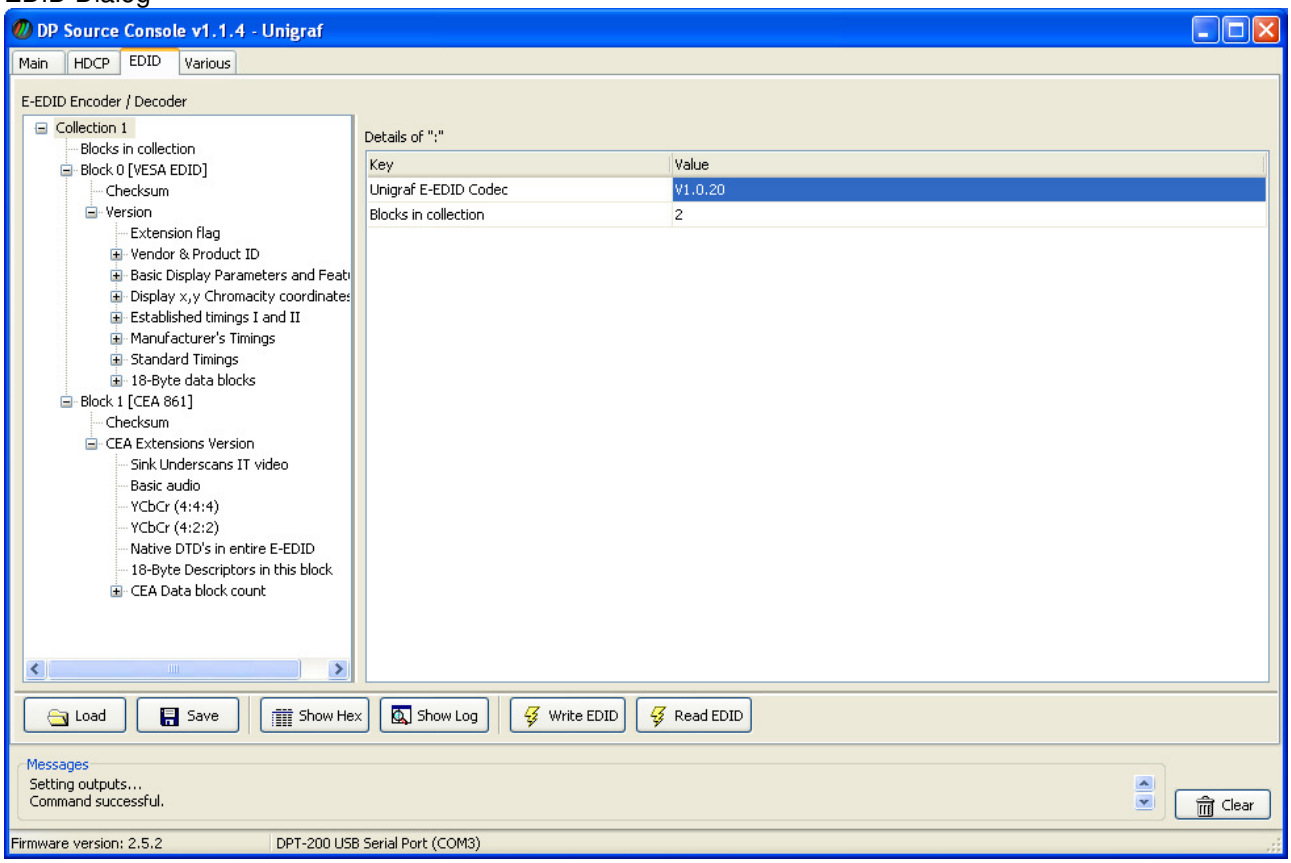
- Firmware update
- Link training
- Timing selection
- Pattern selection
- Link Status information
- Link parameter settings
- Communication messages

HDCP Dialog



Main features:
- Status information only

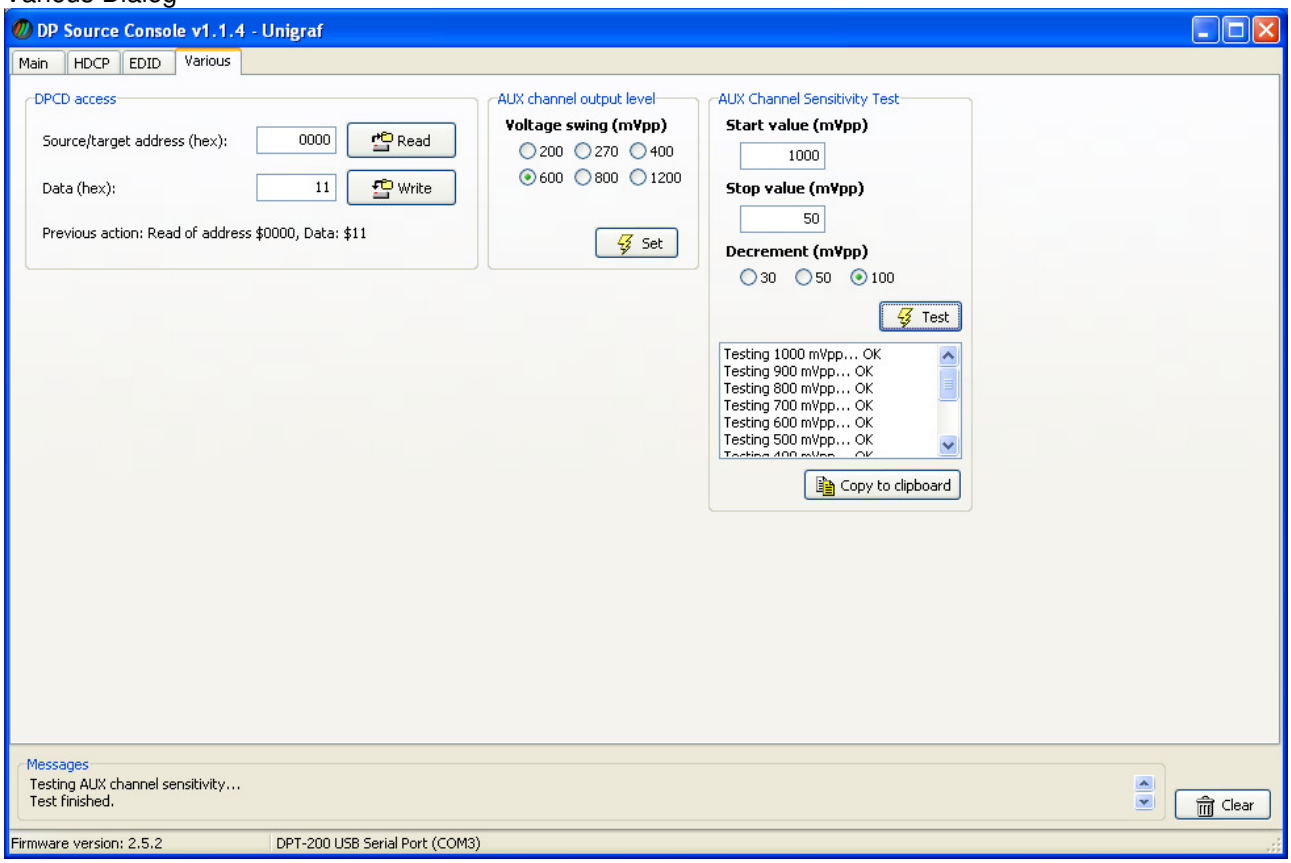
EDID Dialog



Main features

- EDID reading from the SINK
- EDID editing
- EDID writing to the SINK

Various Dialog



Main Features

- DPCD access
- Aux channel control

Resolutions

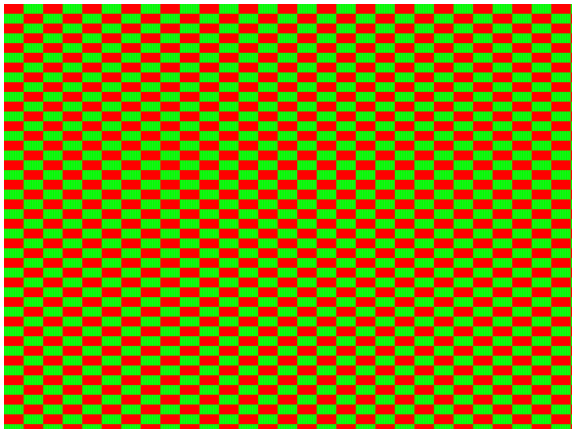
DPT-200 timings and resolutions are fixed.

Available resolutions:

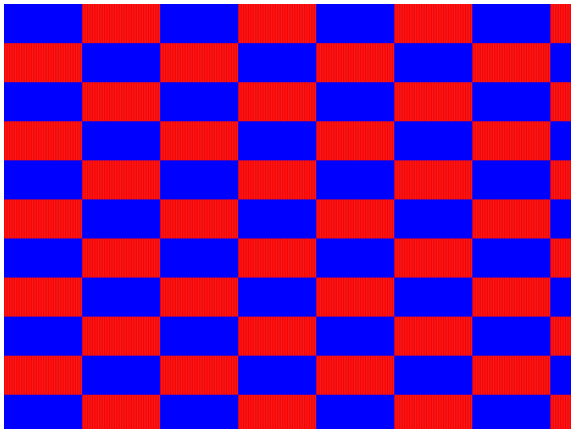
- 640 x 350 85 Hz
- 640 x 400 85 HZ
- 720 x 400 85 Hz
- 640 x 480 60, 70, 75, 80 Hz
- 800 x 600 56, 60 Hz
- 800 x 600 72, 75, 85, 120 Hz
- 848 x 480 60 Hz
- 1024 x 768 60, 70, 75, 85, 120 Hz
- 1152 x 864 75 Hz
- 1280 x 720 60 Hz
- 1280 x 768 60, 60RB, 75, 85, 120 Hz
- 1280 x 800 60, 60RB, 75, 85, 120 Hz
- 1280 x 960 60, 85, 120 Hz
- 1280 x 1024 60, 75, 85, 120 Hz
- 1360 x 768 60, 120 Hz
- 1366 x 768 60, 60, Hz
- 1400 x 1050 60 RB, 60, 75, 85, 120 Hz
- 1440 x 900 60 RB, 60, 75, 85, 120 Hz
- 1600 x 900 60 Hz
- 1600 x 1200 60, 65, 70, 75, 85, 120 Hz
- 1680 x 1050 60, 60, 75, 85, 120 Hz
- 1792 x 1344 60, 75 Hz
- 1856 x 1392 60 Hz
- 1920 x 1080 60 Hz
- 1920 x 1200 60RB, 60, 75 Hz
- 1920 x 1440 60 Hz
- 2048 x 1152 60 Hz
- 2560 x 1600 60 Hz

Patterns

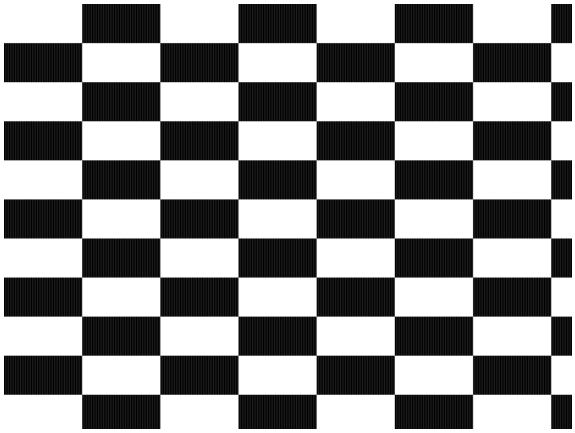
DPT-200 patterns are fixed. End user cannot change, edit or modify patterns.



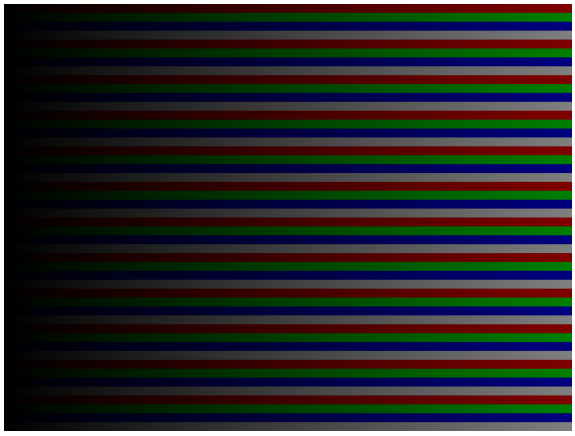
ChessBoard1
Cropped sample



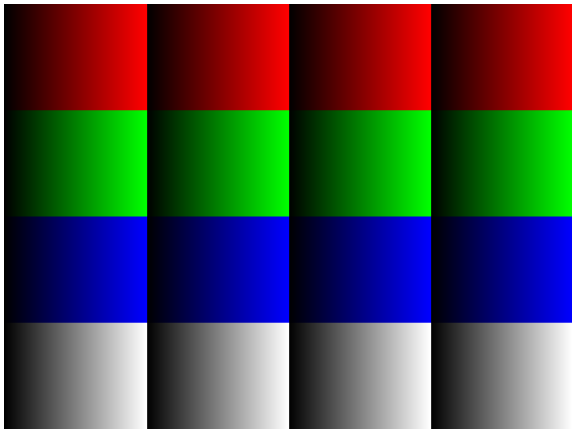
ChessBoard2
Cropped sample



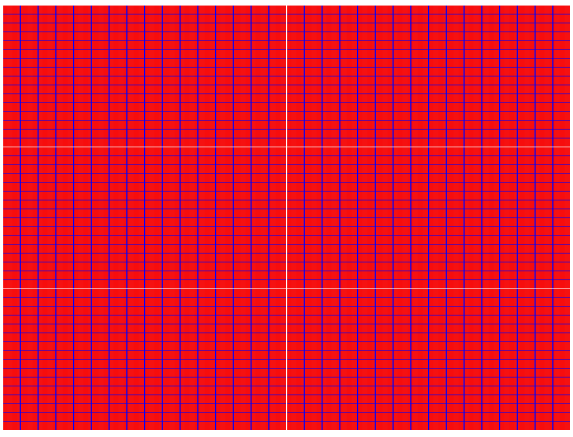
ChessBoard3
Cropped sample



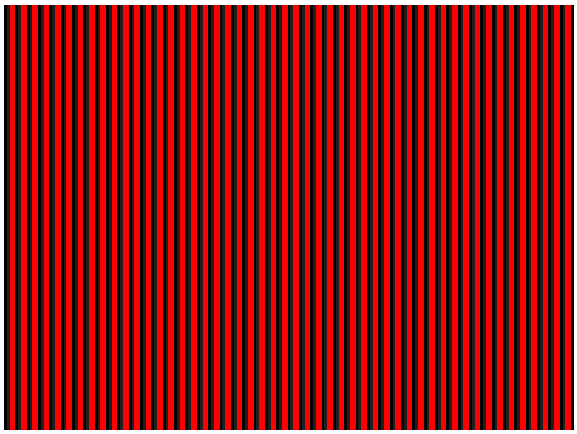
Color Stripes
Scaled sample



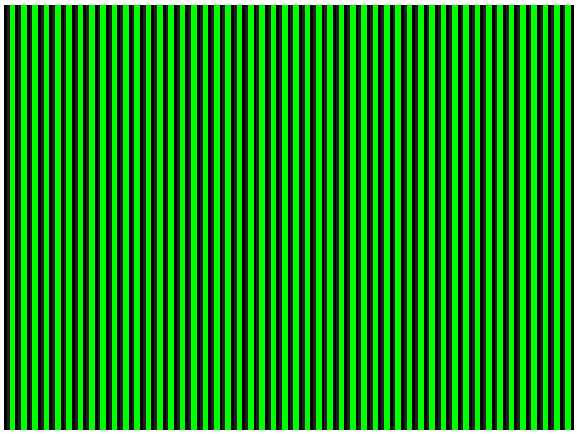
Color Stripes
Scaled sample



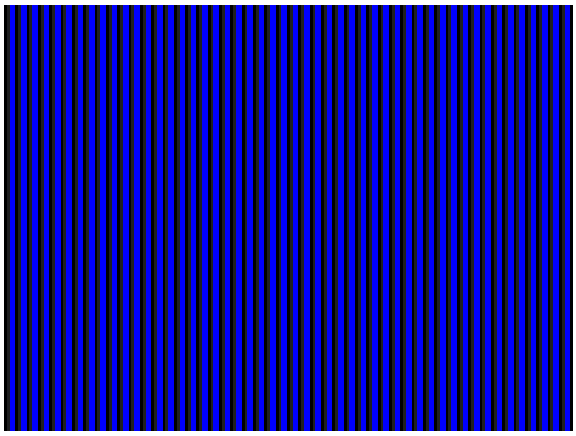
Coarse Grid
Scaled sample



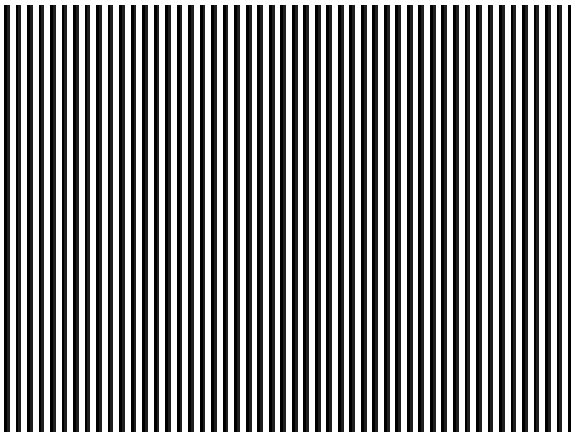
Red 1 pix Vertical Stripes
Magnified sample



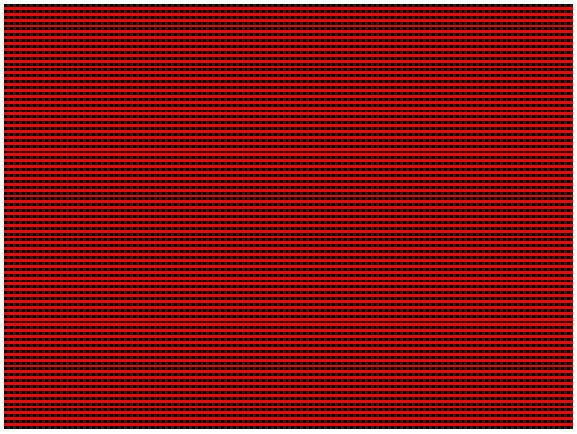
Green 1 pix Vertical Stripes
Magnified sample



Blue 1 pix Vertical Stripes
Magnified sample

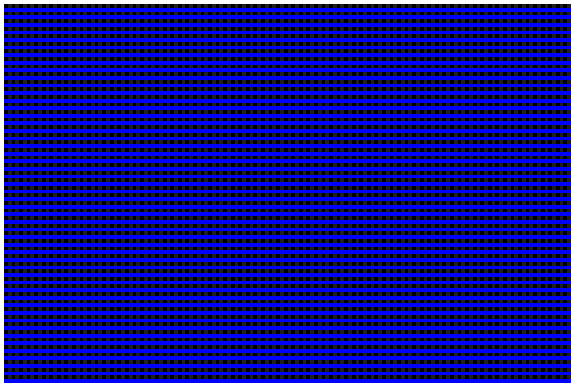


BlackWhite 1 pix Vertical Stripes
Magnified Sample

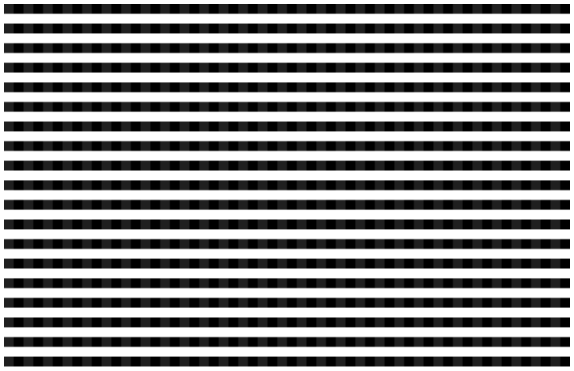


Red 1 pix Horizontal Stripes
Magnified Sample

Green 1 pix Vertical Stripes
Magnified Sample

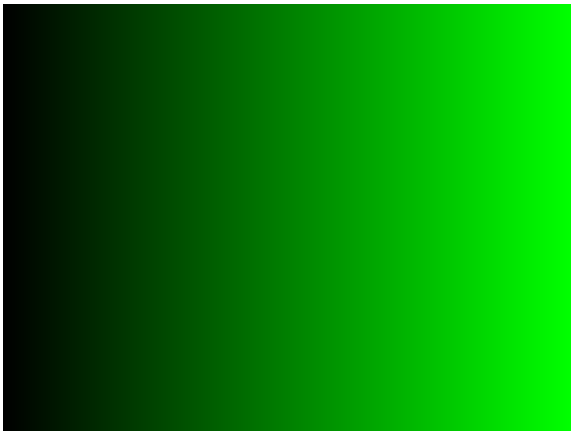


Blue 1 pix Vertical Stripes
Magnified sample



White 1 pix Horizontal Stripes
Magnified sample

Red Horizontal Slide
Scaled sample



Green Horizontal Slide
Scaled Sample

Blue Horizontal Slide
Scaled Sample

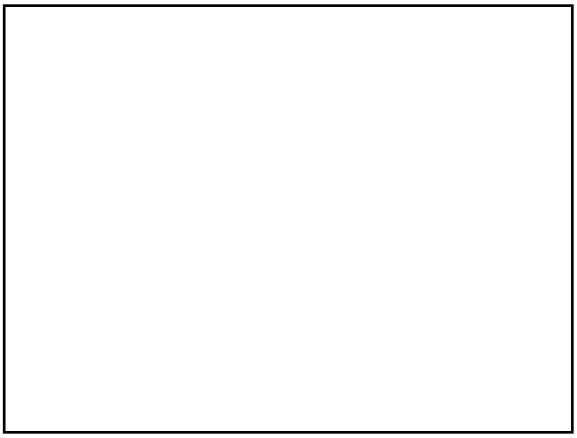
White Horizontal Slide
Scaled sample

Blue Horizontal Coarse Slide
Scaled sample

Green Horizontal Coarse Slide
Scaled sample

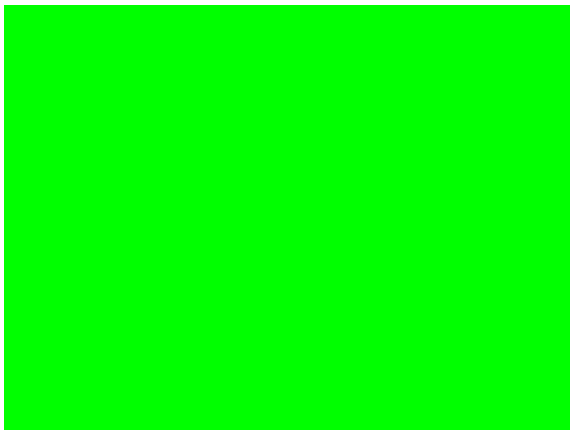
Red Horizontal Coarse Slide
Scaled Sample

White Horizontal Coarse Slide
Scaled sample



Solid White

Solid Red



Solid Green

Solid Blue

Solid Black

DPT-200 keypad

DPT-200 can be controlled directly from keypad. Keypad is using serial connection (RS-232) with 9-ping dsub connector.

Requirements:

- DPT-200 firmware v.1.2.0 or newer.
- DPTX firmware v.2.4.1 or newer.
- Genovation MiniTerm 900 keypad with 1x16 LCD display and 20 keys (configured as the VTG-5225 keypad).

The keypad can be used as-is with its own external power supply or it can be modified (its plug connector replaced by Unigraf) to get power directly from the DPT-200.

For working with the DPT-200, the generic keys assume functions as from the figure below:

TIM	PAT	TST	
7	8	9	↑
4	5	6	
1	2	3	↓
AUTO	0	OK	

To start using the keypad, just plug it to the DPT-200 keypad connector and press the Reset pushbutton. The USB interface will be disabled and the keypad will become active.

To revert to usual mode without a keypad, just unplug the keypad and press the DPT-200 Reset pushbutton.

TIM: set the DPT into Timing mode. Keys “Up”, “Down” and 2 digit number select the current video timing.

PAT: set the DPT into Pattern mode. Keys “Up”, “Down” and 2 digit number select the current video pattern.

TST: set the DPT into Test mode. Keys “Up”, “Down” and 2 digit number select the current test to be performed.

OK: activates the currently selected Timing or Pattern. In Test mode, starts the execution of the currently selected test.

AUTO: toggles Auto mode on/off. If Auto mode is on, Timings, Patterns and Tests are activated as soon as they are selected (the OK key is no more required).

At the moment about 70 VESA timings, 26 patterns and 1 test have been programmed. More items can be added according to customer particular needs.

Appendix A

DTP-200 Production Test Command specification

Rev. 1.6

Revision history

Rev.	Date	Author	Description
1.0	17.03.2009	MDe	First version
1.1	20.03.2009	MDe	ACK and NACK syntax changed
1.2	13.05.2009	MDe	Several commands added
1.3	26.05.2009	MDe	Small changes
1.4	20.10.2009	MDe	PT_AUX_LEVEL command added
1.5	25.03.2010	MDe	PT_AUX_LEVEL calibration table added
1.6	24.03.2011	MDe	DPCD and EDID rd/wr commands added

Table of Contents

Acronyms and abbreviations

CTS	Compliance Test System
DP	DisplayPort
DPRX	DP Receiver
DPTX	DP Transmitter
DUT	Device Under Test
GUI	Graphical User Interface
I2C	Inter Integrated Circuit bus
LL	Link Layer
PC	Personal Computer
PTCMD	Production Test Command(s)
TE	Test Equipment
USB	Universal Serial Bus

Test command set

As a production testing aid, the DPT-200 can execute on or more sequences of operations, selected by using serial communication.

General

The DPT-200 is a DisplayPort Test Equipment build around the DPTX chip and communicating with a host PC through a RS232 interface. For its operation as production line tester a special set of RS232 commands is used: the Production Test Commands (shortly PTCMDs).

Production Test Commands can be issued by the host using a predefined 115200 Baud rate, 8 bits data, no parity and no handshake format. Every time the DPT-200 receives a command, it replies back to host with an acknowledge message or with an error message.

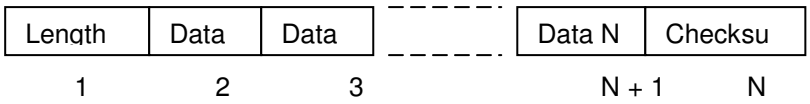
For instance:

HOST		DPT-200
Sends “SET_4_LANES”	→	
	←	Replies “ACK”
Sends “SET_LOW_BITRATE”	→	
	←	Replies “ACK”
Sends “SET_6_LANES”	→	
	←	Replies “NACK” (error)

The host must always wait for the DPT-200 reply before issuing the next command.

Command syntax

All commands are always formatted in the following way:



- *Length* is the total number of bytes included in the command (N+2).
- *Checksum* is the 2’s complement of the sum of all command bytes from 1 to N+1.

For instance the command:

0x04 0x71 0x1D 0x6E

means:

0x04 = length (command made of 4 bytes)
0x71 = data byte 1
0x1D = data byte 2
0x6E = checksum

Checksum:
0x04 + 0x71 + 0x1D = 0x92
NOT(0x92) + 1 = 0x6D + 1 = 0x6E (2’s complement of 0x92)

Commands sent from the host to the DPT-200 are called ***Requests***. Commands sent from the DPT-200 back to the host are called ***Replies***.

PTCMD Requests

PT_EDID_READ

Offset	Length	Description
0	1	0x07 (length)
1	1	0x72
2	1	0x16 (PT_EDID_READ)
3	1	Segment number (0, 1…)
4	1	Offset (0 – 255, bytes)
5	1	Number of bytes to read (1 – 128)
6	1	Checksum

Reads a number of EDID bytes from the DP sink. A Segment is 256 bytes long. Max 128 bytes can be read for each request.

Replies:
PT_EDID_READ
NACK

PT_EDID_WRITE

Offset	Length	Description
0	1	Length (7 + N)
1	1	0x72
2	1	0x17 (PT_EDID_WRITE)
3	1	Segment number (0, 1…)
4	1	Offset (0 – 255, bytes)
5	1	Number of bytes to write (1 – 128)
6	N	EDID data
6+N	1	Checksum

Writes a number of EDID bytes to the DP sink. A Segment is 256 bytes long. Max 128 bytes can be written for each request.

Replies:
ACK
NACK

PT_DPCD_READ

Offset	Length	Description
0	6	0x06 (length)
1	1	0x72
2	1	0x1A (PT_DPCD_READ)
3	2	Address
5	1	Checksum

Reads a single byte from the DP sink DPCD memory.

Replies:
PT_DPCD_READ
NACK

PT_DPCD_WRITE

Offset	Length	Description
0	7	0x07 (length)
1	1	0x72
2	1	0x1B (PT_DPCD_WRITE)
3	2	Address
5	1	Data
6	1	Checksum

Writes a single byte to the DP sink DPCD memory.

Replies:
ACK
NACK

PT_FW_VER

Offset	Length	Description
0	1	0x04 (length)
1	1	0x72
2	1	0x1C (PT_SER_NUM)
3	1	0x6E (Checksum)

Gets the TE current firmware version.

Replies:
PT_FW_VER
NACK

PT_SER_NUM

Offset	Length	Description
0	1	0x04 (length)
1	1	0x72
2	1	0x1D (PT_SER_NUM)
3	1	0x6D (Checksum)

Gets the TE serial number.

Replies:
PT_SER_NUM
NACK

PT_AUX_LEVEL

Offset	Length	Description
0	1	0x05 (length)
1	1	0x72
2	1	0x1E (PT_AUX_LEVEL)
3	1	Level (0x00 – 0xFF)
4	1	Checksum

Sets the output voltage level for the AUX channel. The relationship of the parameter value and the achieved output voltage is indicative and according to the following table:

Level	Voltage swing (mVpp)
4	30
8	60
11	80
16	120
24	190
32	260
40	340
48	410

64	570
80	720
96	900
128	1210
160	1510

Replies:
ACK
NACK

PT_SET_LINK

Offset	Length	Description
0	1	0x0A (length)
1	1	0x72
2	1	0x52 (PT_SET_LINK)
3	1	Skew: 0 = disable 1 = enable
4	1	Scrambling: 0 = disable 1 = enable
5	1	0 = asynchronous clock 1 = synchronous clock
6	1	Enhanced framing: 0 = disable 1 = enable
7	1	Voltage swing level: 0, 1, 2 or 3
8	1	Pre-emphasis level: 0, 1 , 2 or 3
9	1	Checksum

Sets the current DP link parameters.

Replies:
ACK or
NACK

PT_SET_LANES

Offset	Length	Description
0	1	0x05 (length)
1	1	0x72
2	1	0x53 (PT_SET_LANES)
3	1	Number of lanes (1, 2 or 4)
4	1	Checksum

Sets the number of lanes used.

Replies:
ACK or
NACK

PT_SET_BRATE

Offset	Length	Description
0	1	0x05 (length)
1	1	0x72
2	1	0x54 (PT_SET_BRATE)
3	1	Bitrate (0x06 or 0x0A)
4	1	Checksum

Sets the bitrate used (0x06 = low, 0x0A = high).

Replies:
ACK or
NACK

PT_SET_TIM

Offset	Length	Description
0	1	0x05 (length)
1	1	0x72
2	1	0x55 (PT_SET_TIM)
3	1	video timing index (0 to 9)
4	1	Checksum

Sets the index of video timing to use when outputting active video. The supported video timings are listed in Table 1.

Table 1. DPT-200 supported video timings.

Index	Description
0	640 x 480, 27.125 MHz
1	800 x 600, 40 MHz
2	1024 x 768, 65 MHz
3	1280 x 1024, 108 MHz
4	1600 x 1200, 162 MHz
5	1680 x 1050, 119 MHz
6	1920 x 1200, 154 MHz
7	2560 x 1600, 268.5 MHz
8	1280 x 800, 71 MHz
9	1792 x 1344, 204.75 MHz

Replies:

ACK or
NACK

PT_SET_PATT

Offset	Length	Description
0	1	0x05 (length)
1	1	0x72
2	1	0x56 (PT_SET_PATT)
3	1	video pattern index (0 to 26)
4	1	Checksum

Sets the index of video pattern to use when outputting active video. The supported video patterns are listed in Table 2.

Table 2. DPT-200 supported video patterns.

Index	Description
0	Checkboard 1
1	Checkboard 2
2	Checkboard 3 (black and white)
3	RGBW 16-lines stripes
4	RGBW big stripes
5	Coarse grid
6	Red vertical stripes (2 pixels red, 2 pixel black)
7	Green vertical stripes (2 pixels green, 2 pixel black)
8	Blue vertical stripes (2 pixels blue, 2 pixel black)
9	White vertical stripes (2 pixels white, 2 pixel black)
10	Red horizontal stripes (2 pixels red, 2 pixel black)
11	Green horizontal stripes (2 pixels green, 2 pixel black)
12	Blue horizontal stripes (2 pixels blue, 2 pixel black)
13	White horizontal stripes (2 pixels white, 2 pixel black)
14	Blue H-Slide
15	Green H-Slide
16	Red H-Slide
17	White H-Slide
18	Blue coarse H-Slide
19	Green coarse H-Slide
20	Red coarse H-Slide
21	White coarse H-Slide
22	Solid white
23	Solid red

24	Solid green
25	Solid blue
26	Solid black

Replies:
ACK or
NACK

PT_OUT_IDLE

Offset	Length	Description
0	1	0x04 (length)
1	1	0x72
2	1	0x57 (PT_OUT_IDLE)
3	1	0x33 (Checksum)

Ouputs the idle pattern.

Replies:
ACK or
NACK

PT_OUT_VIDEO

Offset	Length	Description
0	1	0x04 (length)
1	1	0x72
2	1	0x58 (PT_OUT_VIDEO)
3	1	0x32 (Checksum)

Ouputs active video.

Replies:
ACK or
NACK

PT_OUT_D102

Offset	Length	Description
0	1	0x04 (length)
1	1	0x72
2	1	0x59 (PT_OUT_D102)
3	1	0x31 (Checksum)

Ouputs the D10.2 pattern.

Replies:
ACK or
NACK

PT_OUT_PRBS7

Offset	Length	Description
0	1	0x04 (length)
1	1	0x72
2	1	0x5A (PT_OUT_PRBS7)
3	1	0x30 (Checksum)

Ouputs the PRBS7 pattern.

Replies:
ACK or
NACK

Replies

ACK

Offset	Length	Description
0	1	0x04 (length)
1	1	0x72
2	1	0x0C (ACK)
3	1	0x7E (Checksum)

NACK

Offset	Length	Description
0	1	0x04 (length)
1	1	0x72
2	1	0x0B (NACK)
3	1	0x7F (Checksum)

PT_EDID_READ

Offset	Length	Description
0	1	Length (4 + N)
1	1	0x72
2	1	0x16 (PT_EDID_READ)
3	N	EDID data
3+N	1	Checksum

PT_DPCD_READ

Offset	Length	Description
0	1	0x05 (length)
1	1	0x72
2	1	0x1A (PT_DPCD_READ)
3	1	Data read
4	1	Checksum

PT_FW_VER

Offset	Length	Description
0	1	0x07 (length)
1	1	0x72
2	1	0x1C (PT_FW_VER)
3	1	Major
4	1	Minor
5	1	Revision
6	1	Checksum

PT_SER_NUM

Offset	Length	Description
0	1	0x0C (length)
1	1	0x72
2	1	0x1D (PT_SER_NUM)
3	8	Serial number
11	1	Checksum