D-Cine Premiere Training DP100

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Quality of Digital vs Film

Display

- **Contrast**, deep blacks
- **Color space**, ‘film look’ vs video
- **Resolution**, nr of pixels per inch

<table>
<thead>
<tr>
<th></th>
<th>DLP</th>
<th>DLP Cinema</th>
<th>LCD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contrast</td>
<td>+</td>
<td>++</td>
<td>=</td>
</tr>
<tr>
<td>Color space</td>
<td>+</td>
<td>++</td>
<td>=</td>
</tr>
<tr>
<td>Resolution</td>
<td>+</td>
<td>+</td>
<td>++</td>
</tr>
</tbody>
</table>

Signal Processing

- **Bit depth**, 10 bit or more
- **Compression**, ratio, inter-frame

DLP Cinema (TM)

- 1.3 – 2 M pixels
- moving mirrors
- light switch
- 24 fps

*dlp_demo.exe*
What is DLP-Cinema?

General DLP-Cinema™ features

**CinePalette™ Color Management**
Expanded color palette to achieve film-look and accurate color reproduction between post production and cinema.

**CineCanvas™ Image Management**
Insertion of graphics and subtitles. Also provides electronic apertures and high quality image resizing.

**CineLink™ Security Management**
Encrypted link between server and projector, watermarking, and fingerprinting.

**CineBlack™ Contrast Management**
Dark, stable blacks with smooth tonal scale between deepest blacks and purest whites.
Color Temperature

2856°
Tungsten Illumination

5400°
SMPTE 196M

D-6500°
TV standard

D-9300°
Domestic T.V.

D Illuminant Curve

Black Body Curve
# CineCanvas

1. Operator Schedules Movie, Selects Audio and Subtitles

2. At Showtime, Server Activates Projector Subtitling and Provides Setup Information

3. Projector Requests Required Subtitle files from Server -- Presentation Files, Font File

4. Servers Sends Picture and Timing information to Projector

5. Projector Inserts Subtitles in Real-time
CineLink™ 1 Encrypt Cycle

Key Stream Generator

Image Data

Mixer

Replace Illegal Codes

292M Link
CineLink™ 2 Encrypt Cycle

Key Stream Generator (AES Based, 128bit Key)

Illegal Code Compensation (292M Only)

Image Data → Mixer → 292M Link

Mixer → DVI Link
## DCI recommendations V5.0

<table>
<thead>
<tr>
<th>Image Parameters</th>
<th>Nominal (Projected Image)</th>
<th>Tolerances (Review Rooms)</th>
<th>Tolerances (Theatrical)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pixel Count</td>
<td>2048 x 1080 or 4096 x 2160</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Luminance Uniformity, corners and sides</td>
<td>85% of center</td>
<td>80% to 90% of center</td>
<td>70% to 90% of center</td>
</tr>
<tr>
<td>Calibrated White Luminance, center</td>
<td>48 cd/m² (14 ftL)</td>
<td>±2.4 cd/m² (±0.7 ftL)</td>
<td>±10.2 cd/m² (±3.0 ftL)</td>
</tr>
<tr>
<td>Calibrated White Chromaticity, center from code values [3794 3890 3890]</td>
<td>x=3.140, y=3.810</td>
<td>±0.002 x, y</td>
<td>±0.006 x, y</td>
</tr>
<tr>
<td>Color Uniformity of White Field, corners</td>
<td>Matches center</td>
<td>±0.008 x, y Relative to center</td>
<td>±0.010 x, y Relative to center</td>
</tr>
<tr>
<td>Sequential Contrast</td>
<td>2000:1 minimum</td>
<td>1500:1 minimum</td>
<td>1200:1 minimum</td>
</tr>
<tr>
<td>Intra-frame Contrast</td>
<td>150:1 minimum</td>
<td>100:1 minimum</td>
<td>100:1 minimum</td>
</tr>
<tr>
<td>Grayscale Tracking</td>
<td>No visible color shading</td>
<td>No visible color shading</td>
<td>No visible color shading</td>
</tr>
<tr>
<td>Contouring</td>
<td>Continuous, smooth ramp, with no visible steps</td>
<td>(same)</td>
<td>(same)</td>
</tr>
<tr>
<td>Transfer Function</td>
<td>Gamma 2.6</td>
<td>±2%&lt;sup&gt;6&lt;/sup&gt; Per component</td>
<td>±5%&lt;sup&gt;6&lt;/sup&gt; Per component</td>
</tr>
<tr>
<td>Color Gamut</td>
<td>Minimum Color Gamut enclosed by white point, black point&lt;sup&gt;1&lt;/sup&gt; and Red: 0.680 x, 0.330 y, 10.1 Y Green: 0.265 x, 0.590 y, 34.6 Y Blue: 0.150 x, 0.060 y, 33.1 Y</td>
<td>(same)</td>
<td>(same)</td>
</tr>
<tr>
<td>Color Accuracy</td>
<td>Colorimetric Match</td>
<td>+/- 4 delta E&lt;sup&gt;6&lt;/sup&gt;</td>
<td>+/- 4 delta E&lt;sup&gt;7&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

Table 17: Reference Image Parameters and Tolerances
# DLP-Cinema Specifications

<table>
<thead>
<tr>
<th>Digital Micro-mirror Device</th>
<th>3 chip 1280 x 1024 SXGA</th>
<th>3 chip 2048 X 1080 2K</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DLP Cinema dark metal type 3</td>
<td>DLP Cinema dark metal</td>
</tr>
<tr>
<td></td>
<td>0.9” diagonal / 10° tilt</td>
<td>1.2” diagonal / 12° tilt</td>
</tr>
<tr>
<td>Processing:</td>
<td>Bit depth: 45 bit (15 per color)</td>
<td>Bit depth: 48 bit (16 per color)</td>
</tr>
<tr>
<td>Contrast Ratio:</td>
<td>1250:1 – 1500:1 (sequential)</td>
<td>1700:1 – 2400:1 (sequential)</td>
</tr>
<tr>
<td>Light output:</td>
<td>1800 – 6000 cinema lumens</td>
<td>7000 – 18000 cinema lumens</td>
</tr>
<tr>
<td></td>
<td>14fL up to 10m screens</td>
<td>14fL up to 20m screens</td>
</tr>
</tbody>
</table>
**DP100 USP**

**Two piece Digital Head and Pedestal**

- **Digital head**
  - Modular design
    - Lamp module 2-8 kW
    - Sealed engine module
    - Secure Processing card cage
  - Button and touch panel control
  - Motorized anamorph lens
  - Integrated 2K Acsar2 with 4 inputs, full PIP
  - Advanced cooling

- **Pedestal**
  - 13u 19” Rack space
  - Microprocessor controlled electronic power supply
Sealed engine principle

Projector optics

Off state

TIR

Color Prism

Mirror

Lens

Light

DMD-window
Sealed engine principle

Projector optics

Off state

TIR

Color Prism

Mirror

DMD-window

Light

Lens

Efficiency

Ansi contrast influence

ON/OFF contrast influence

Sealed engine
D-Cine Premiere brightness

Cinema brightness not = to AV brightness

Film brightness = 16 Fl open gate
Digital cinema brightness = 14 Fl full white

Fl versus Lumens:

1Fl = 10,75 lux  
14 Fl = 150 lux

Lumens = lux * m²

Lamp is chozen depending m²:

14 Fl = (150 x m²) lumens
D-Cine Premiere brightness

On site brightness, affecting factors

Color correction : 5 – 10 %
Lamp decay : 10-20% after 100 hours
            30-40% towards end of life
Port glass window : neglectable for multi coated single glass.
                   5% for single coated
                   15% for poor quality or dirty window
Anamorph lens : 3-5 %
Screen reflection : screen gain only valid new status!
           gain = reflected light / direct light

Conclusion: 10 to ... % loss possible
D-Cine Premiere brightness

Cinema Lumens per lamp

**DP50**
- 3kW Osram HS: 5100 - 6800 lumens
- 5kW Osram H: 6400 - 8500 lumens
- 7kW USHIO SC: 7000 - 9400 lumens
- 6kW Osram HP: 10000 - 13500 lumens

**DP30**
- 2kW Osram HP: 4500 - 6000 lumens (SDC)
- 1,2kW Osram HP: 1800 – 2400 lumens (HDC)

**DP100**
- 6kW Osram HP: 13000 - 18000 lumens
- 3kW Osram HS: 7500 - 10000 lumens
DP100 Lamps

Lamp module equipped with:

3kW lamp HP – 1500h
6kW lamp HP – 500h

Note short wire!

Adaptors included for Osram and Ushio Lamps from 2 to 8 KW.

Modular design of lamp house:

Fast swap of lamp in <5 min
Easy installation by operator
Quality guarantee by service technician
Lowest impact & risk at lamp explosion
CLO & auto lamp alignment
DP100 Lenses

Prime lenses:

M25 1.25 - 1.45:1
M25 1.45 – 1.8:1
M25 1.8 – 2.2:1
M25 2.2 – 3.0:1
M25 3.0 – 4.0:1

Native resolution projector:

= 2048 x 1080
= AR of 1,9

Anamorph lens 1.25:

= AR of 2,37 (1,9 x 1,25)
DP100 Inputs

2 x HD-SDI input SMPTE 292M (single or dual port)
2 x DVI input VGA-SXGA 24-96Hz (single or dual port)

2 x Ethernet 100-base T control
2 x Serial RS232, direct and loop, GPIO, LTC,
Acsar2

Input modules: up to 4
DVI, RGB, video, RGB-YUV, SDI, HDSDI
active loop trough / hot swopable auto sensing

Output:
2k resolution
up to 4 fully scalable layers (for each input) PIP