D-Cine Premiere Training DP100

April - 2005

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BARCO

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Quality of Digital vs Film

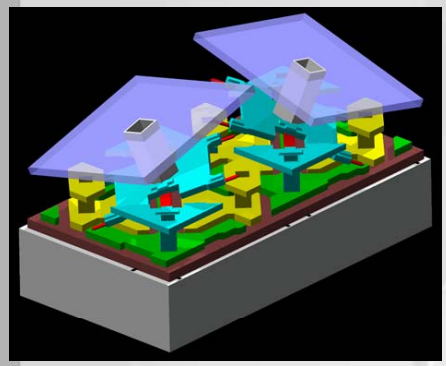
Display

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

DLP	DLP Cinema	LCD
+	++	=
+	++	=
+	+	++

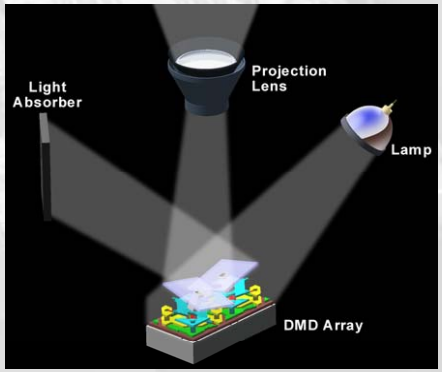
Signal Processing

- ☆ **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

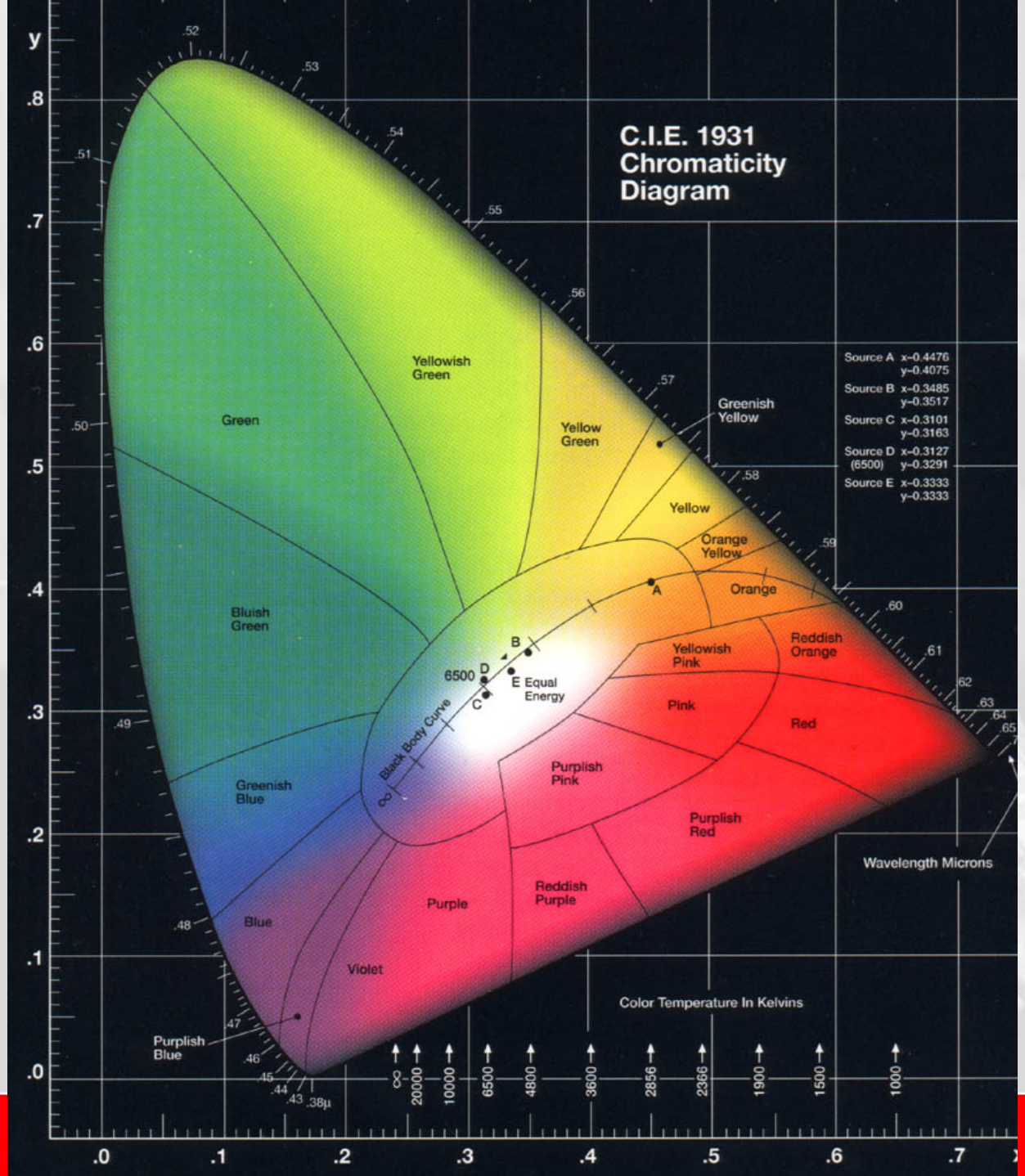
Insertion of graphics and subtitles. Also provides electronic apertures and high quality image resizing.

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.



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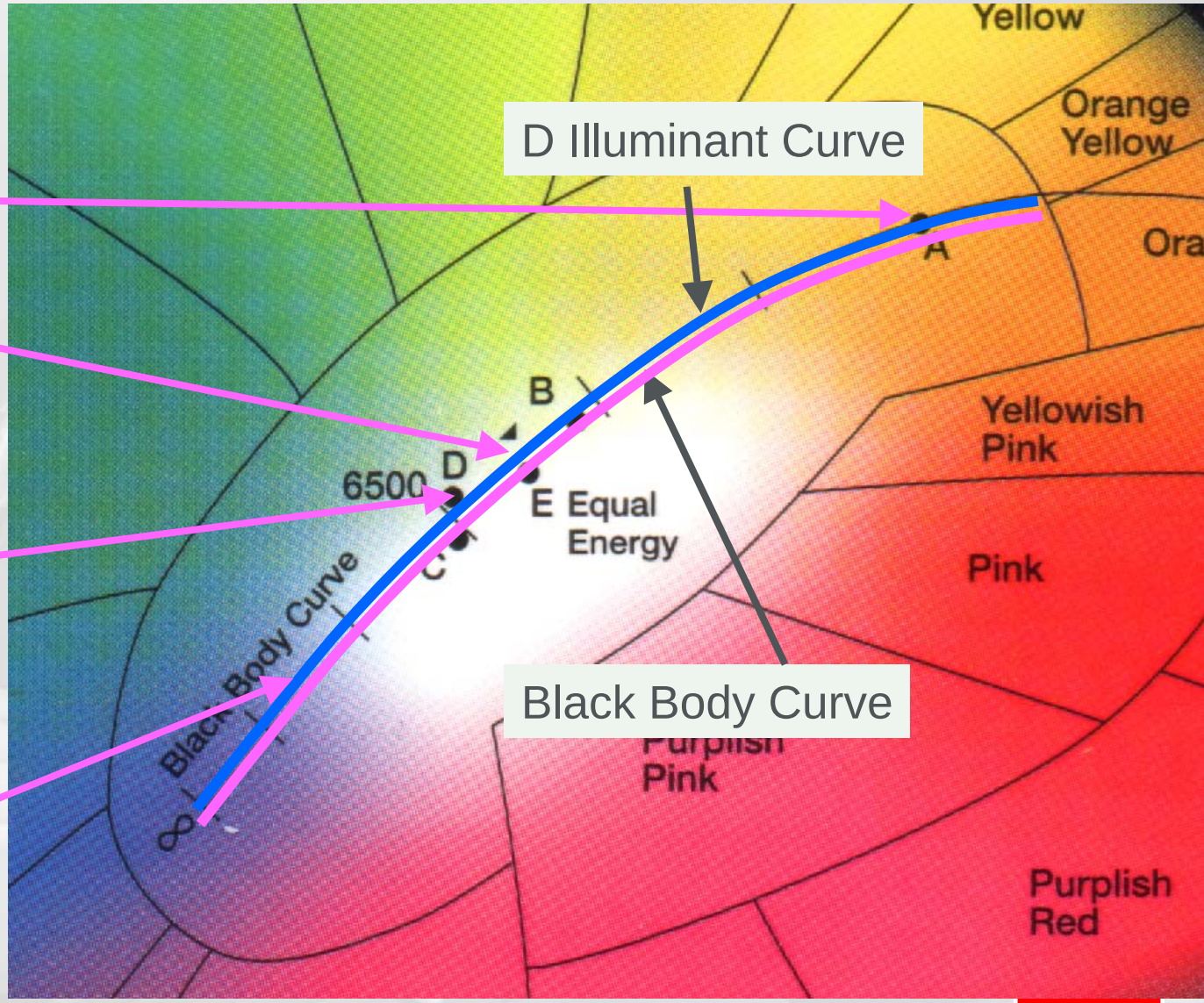
Color Temperature

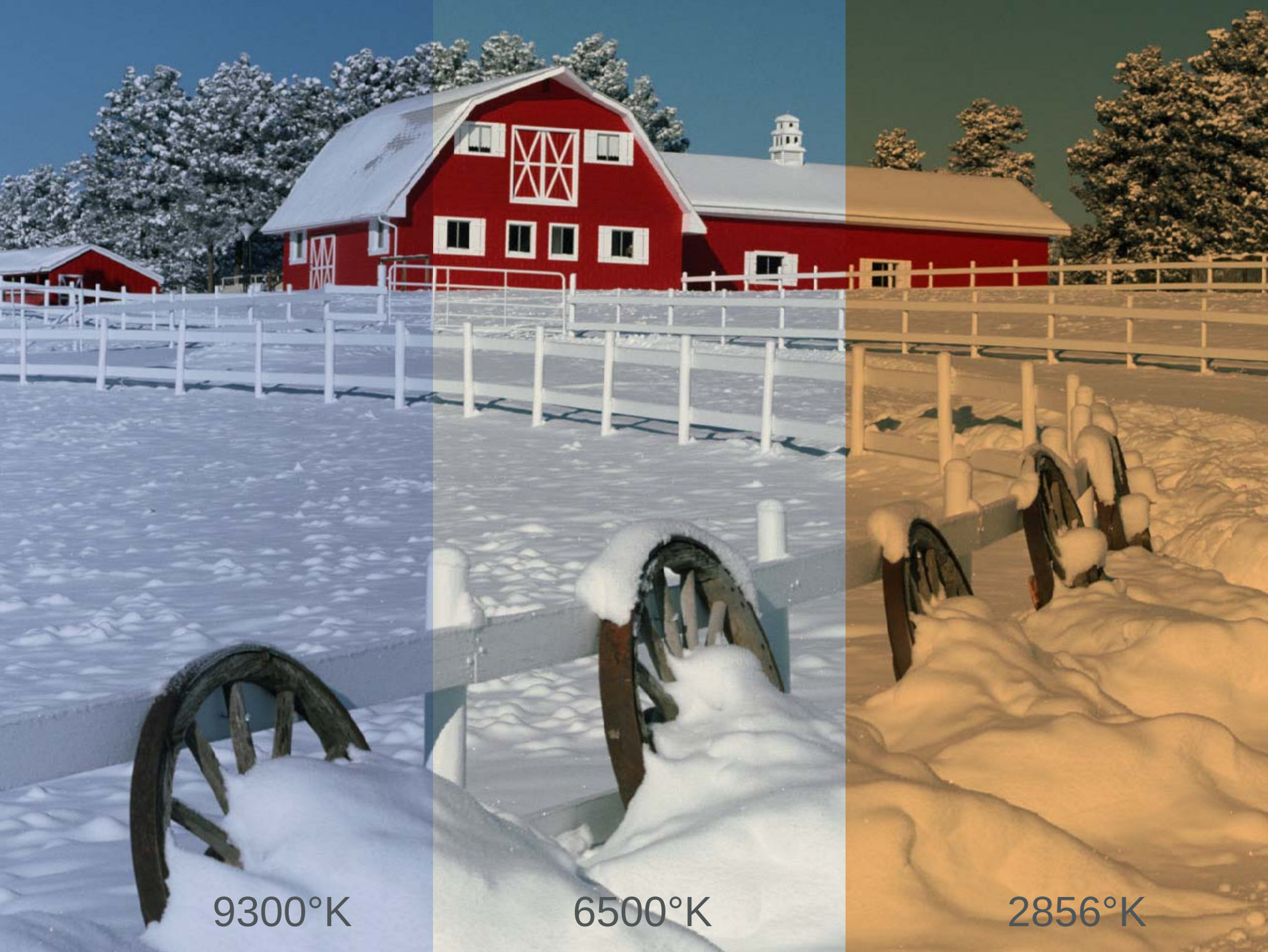
2856°
Tungsten Illumination

5400°
SMPTE 196M

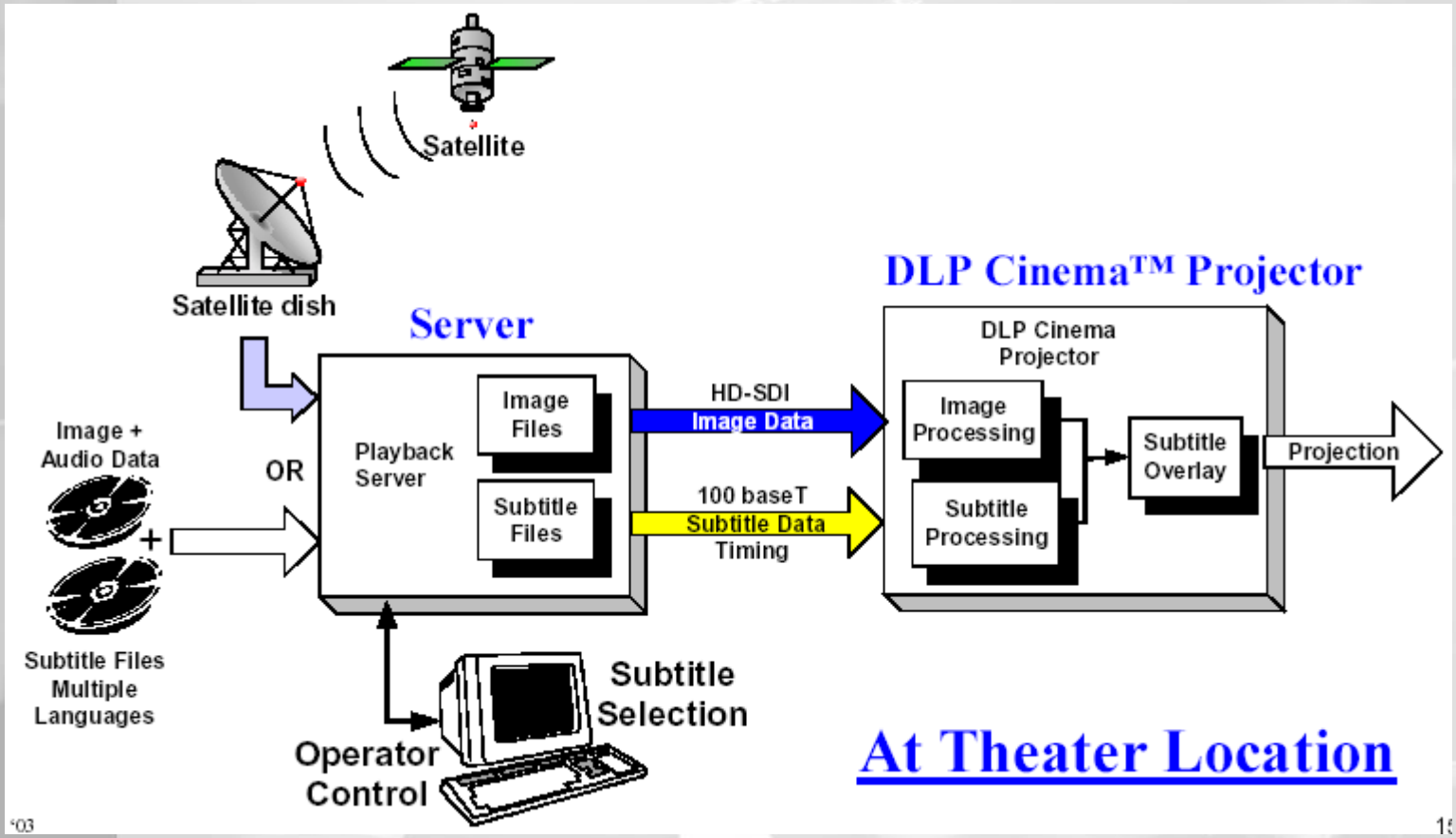
D-6500°
TV standard

D-9300°
Domestic T.V.




9300°K
6500°K
2856°K

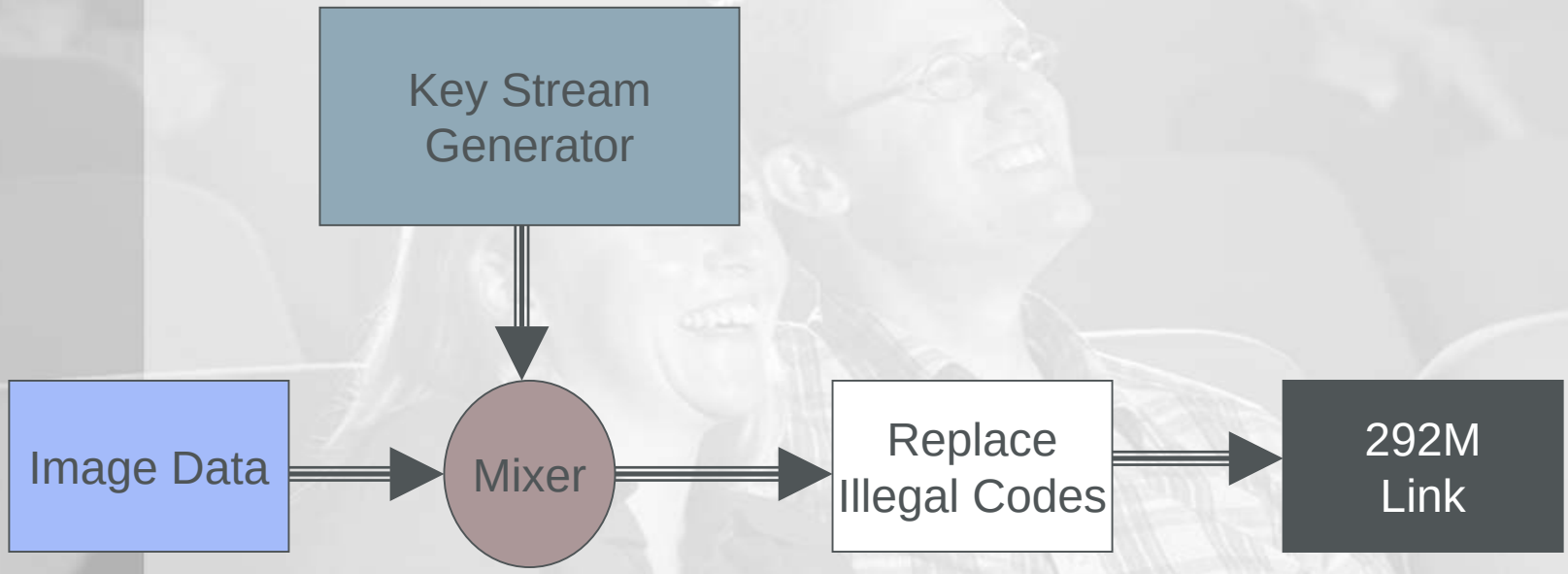
CineCanvas


Satellite
Satellite dish
Server
Playback Server
Image Files
Subtitle Files
Image + Audio Data
OR
Subtitle Files Multiple Languages
HD-SDI
Image Data
100 baseT
Subtitle Data
Timing
DLP Cinema™ Projector
DLP Cinema Projector
Image Processing
Subtitle Processing
Subtitle Overlay
Projection
Subtitle Selection
Operator Control
At Theater Location
'03

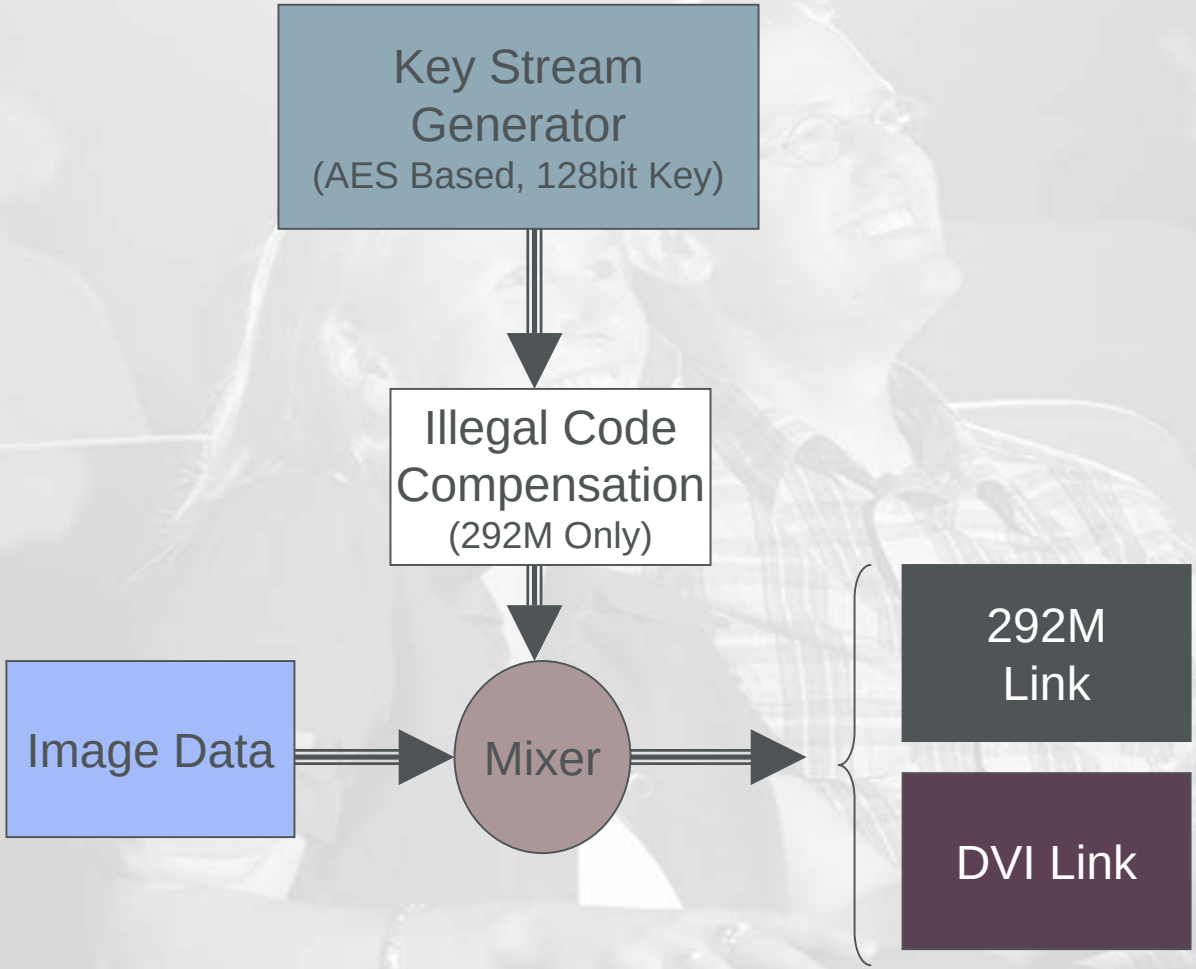
CineCanvas

1	Operator Schedules Movie, Selects Audio and Subtitles	
2	At Showtime, Server Activates Projector Subtitling and Provides Setup Information	 ← Subtitle Selection (100baseT) 
3	Projector Requests Required Subtitle files from Server -- Presentation Files, Font File	 → Retrieve Files (http://...) 
4	Servers Sends Picture and Timing information to Projector	 ← Image & Timing (HD-SDI) 
5	Projector Inserts Subtitles in Real-time	 ← Image & Timing (HD-SDI) 

CineLink™ 1 Encrypt Cycle



CineLink™ 2 Encrypt Cycle



DCI recommendations V5.0

Image Parameters	Nominal (Projected Image)	Tolerances (Review Rooms)	Tolerances (Theaterical)
Pixel Count	2048 x 1080 or 4096 x 2160	N/A	N/A
Luminance Uniformity, corners and sides	85% of center	80% to 90% of center	70% to 90% of center
Calibrated White Luminance, center	48 cd/m² (14 fL)	±2.4 cd/m² (± 0.7 fL)	±10.2 cd/m² (± 3.0 fL)
Calibrated White Chromaticity, center from code values [3794 3960 3890]	x=.3140, y=.3510	±.002 x, y	±.006 x, y
Color Uniformity of White Field, corners	Matches center	±.008 x, y Relative to center	±.010 x, y Relative to center
Sequential Contrast	2000:1 minimum	1500:1 minimum	1200:1 minimum
Intra-frame Contrast	150:1 minimum	100:1 mininum	100:1 mininum
Grayscale Tracking	No visible color shading	No visible color shading	No visible color shading
Contouring	Continuous, smooth ramp, with no visible steps	(same)	(same)
Transfer Function	Gamma 2.6	± 2%[6] Per component	± 5%[5] Per component
Color Gamut	Minimum Color Gamut enclosed by white point, black point[7] and Red: 0.680 x, 0.320 y, 10.1 Y Green: 0.265 x, 0.690 y, 34.6 Y Blue: 0.150 x, 0.060 y, 3.31 Y	(same)	(same)
Color Accuracy	Colorimetric Match	+/- 4 delta E[8]	+/- 4 delta E[7]

Table 17: Reference Image Parameters and Tolerances

DLP-Cinema Specifications

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

DP100 USP

Two piece Digital Head and Pedestal

- **Digital head**

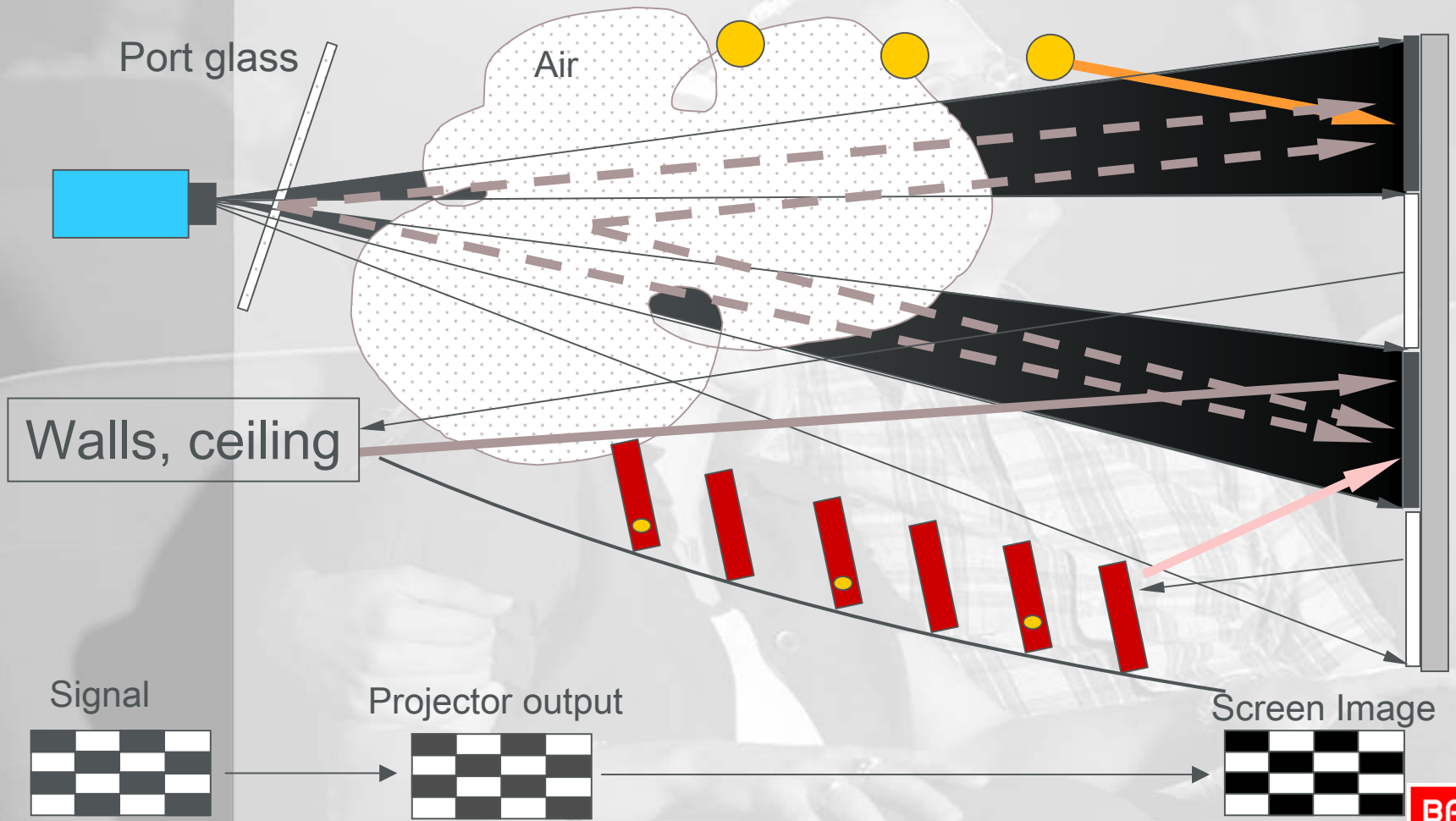
✓ Modular design
  - ✓ Lamp module 2-8 kW
  - ✓ Sealed engine module
  - ✓ Secure Processing card cage

✓ Button and touch panel control
✓ Motorized anamorph lens
✓ Integrated 2K Acsar2 with 4 inputs, full PIP
✓ Advanced cooling

- **Pedestal**

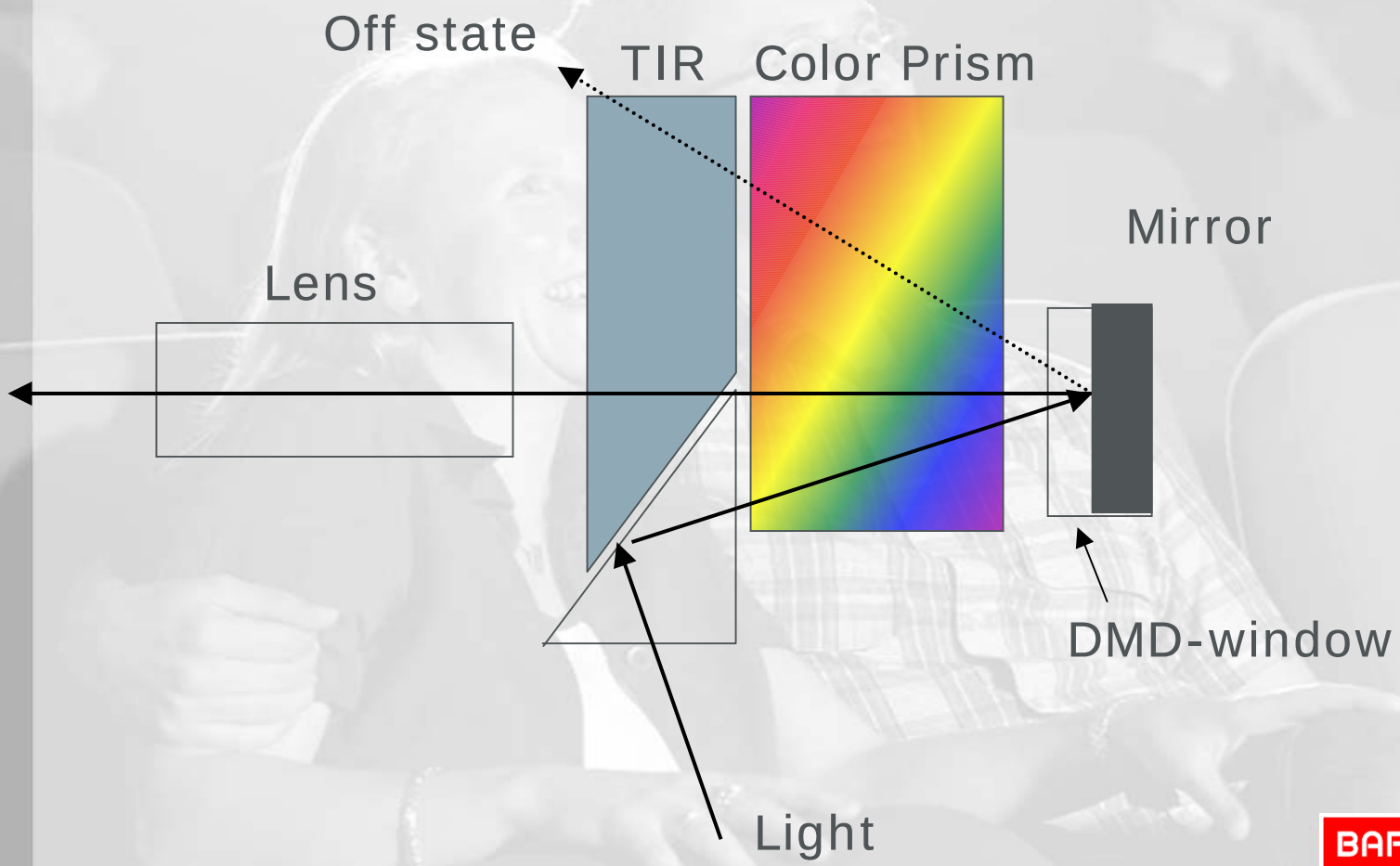
✓ 13u 19” Rack space
✓ Microprocessor controlled electronic power supply

System Contrast

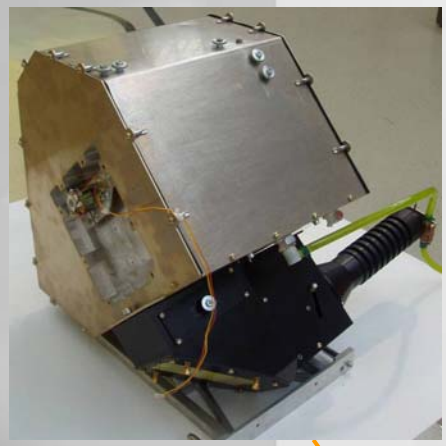


Sealed engine principle

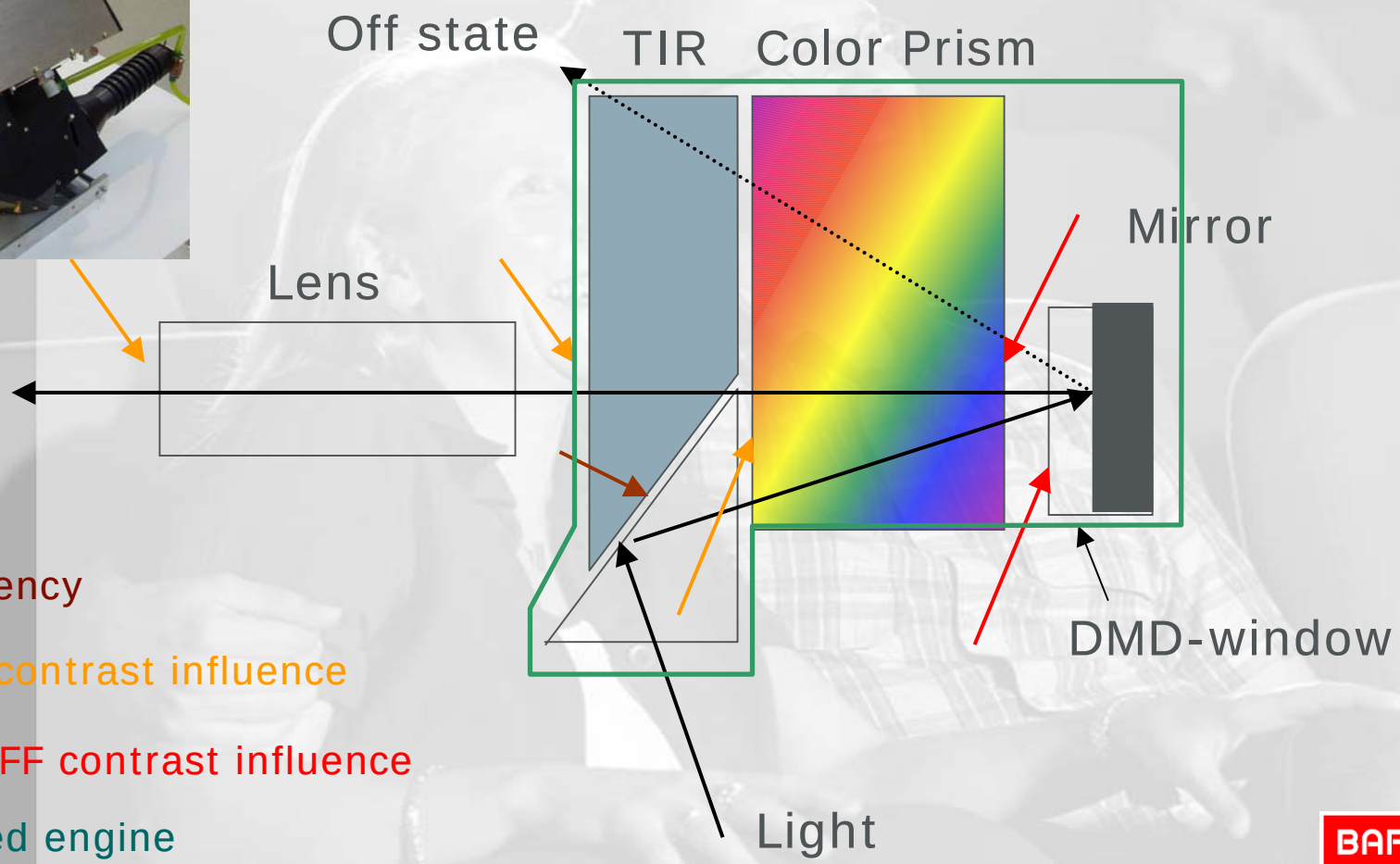
Projector optics



Sealed engine principle



Projector optics



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 birghtness = 14 Fl full white

Fl versus Lumens:

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

Lumens = lux * m^2

Lamp is chozen depending m^2:

14 Fl = (150 x m^2) 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

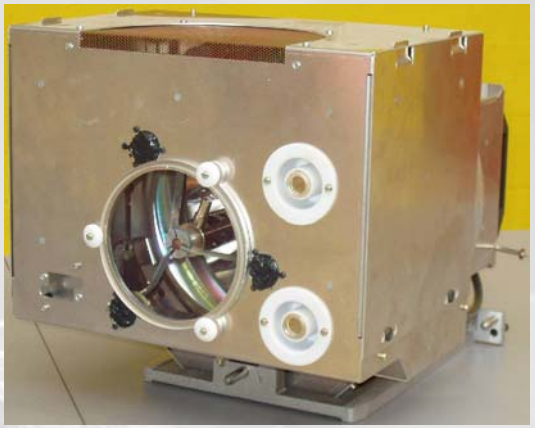
6kW Osram HP	13000 - 18000 lumens
3kW Osram HS	7500 - 10000 lumens

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

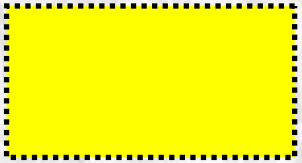
M25 2.2 – 3.0:1

M25 3.0 – 4.0:1

Native resolution projector:

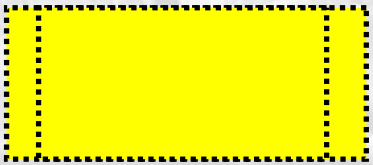
= 2048 x 1080

= **AR of 1,9**



Anamorph lens 1.25:

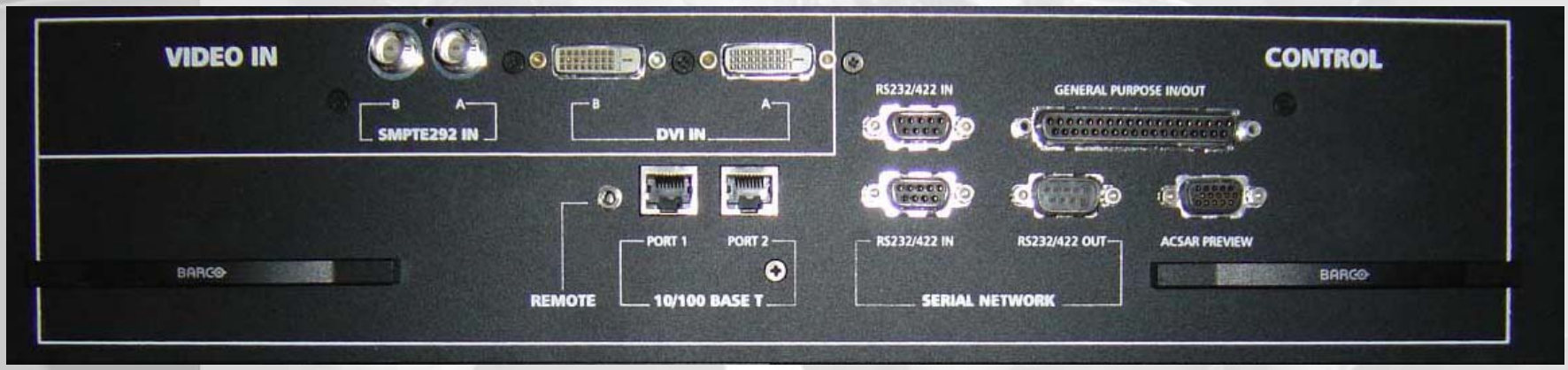
= **AR of 2,37** (1,9 x 1,25)



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,



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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