



PANEL PERFORMANCE AND REALISING REC 2020

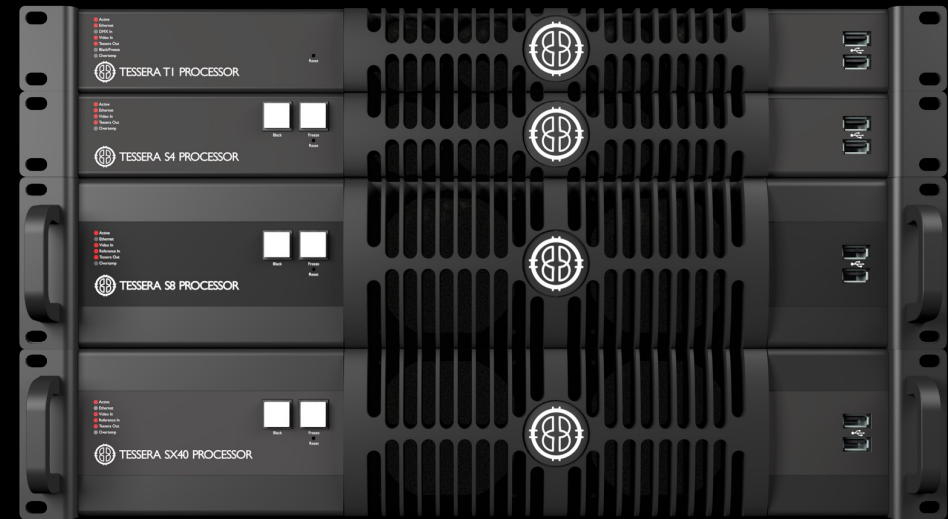
Hugh Davies-Webb
Product Manager



**TECHNOLOGY WE USE TO
HELP YOU GET COLOUR RIGHT**

INTRODUCTION

- Brompton Technology Ltd are based in West London
- Design and manufacture high end video processing for LED panels
- It's 10 years since we launched our M2 processor – still a stalwart in many rental inventories and installations around the world.
- We have offices in LA, Shenzhen and Taipei



TECHNOLOGY – PROCESSORS

4K

SX40



- Flagship
- Full HDR video processing
- Up to 40 outputs via 4 XDs

S8



- Cost-effective workhorse
- Full HDR video processing
- 8 outputs to panels

XD



- Data Distribution Unit
- Companion to SX40
- 10 outputs to panels

HD (FIRST GENERATION)

S4



- Inexpensive solution for small-scale systems
- Standard video processing
- 4 outputs to panels

T1



- Support for creative LED products
- Creative video processing
- 1 output to creative fixtures

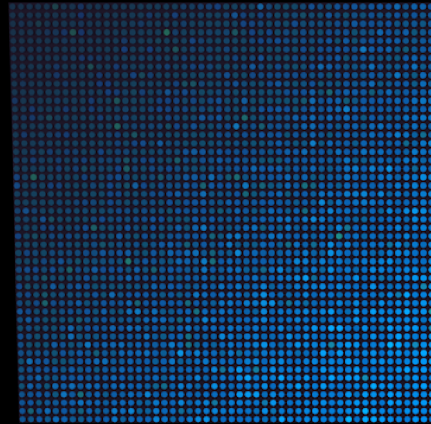
R2/R2+ RECEIVER CARDS

- SO-DIMM sized 'brains' for LED panels
- Talks to LED driver chips
- Deals with things like Extended Bit Depth, Dark Magic, OSCA

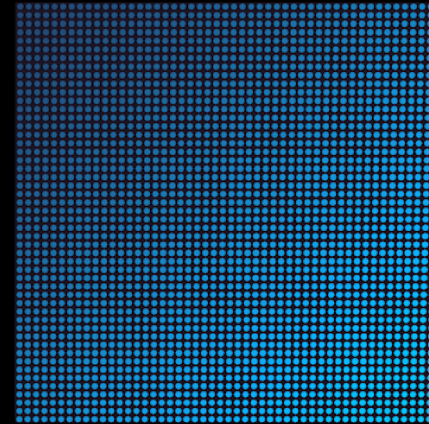


LED CAMERA CALIBRATION

Uncalibrated



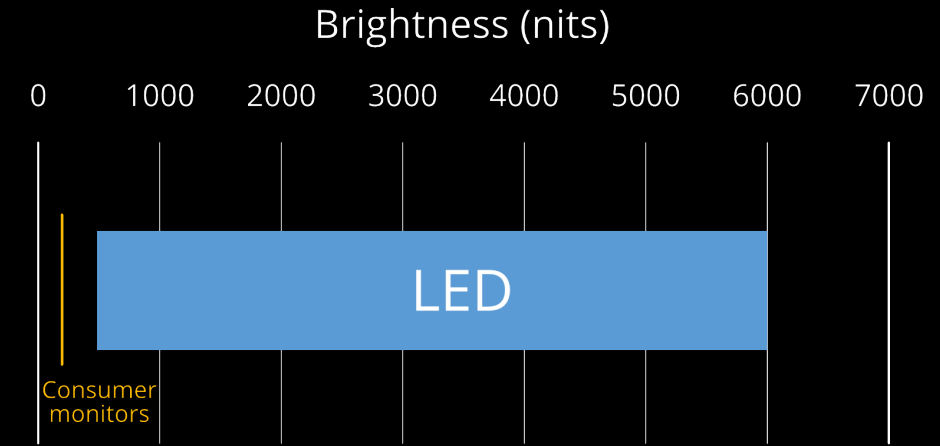
Calibrated



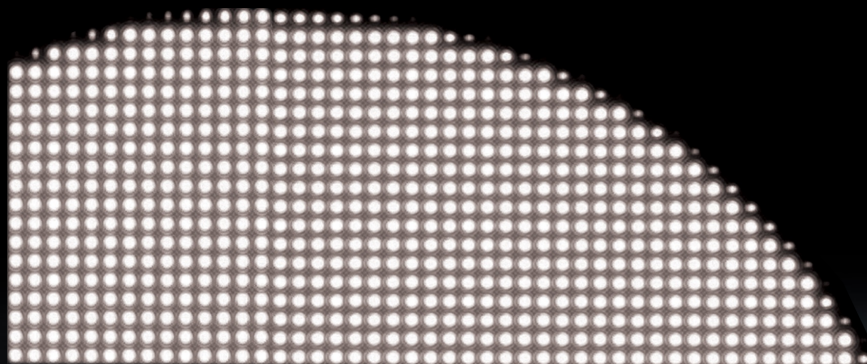
10 & 12 bit inputs



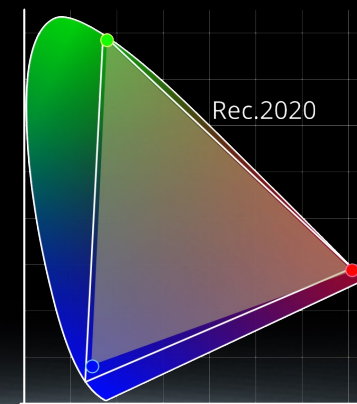
Brightness range



Independent LEDs



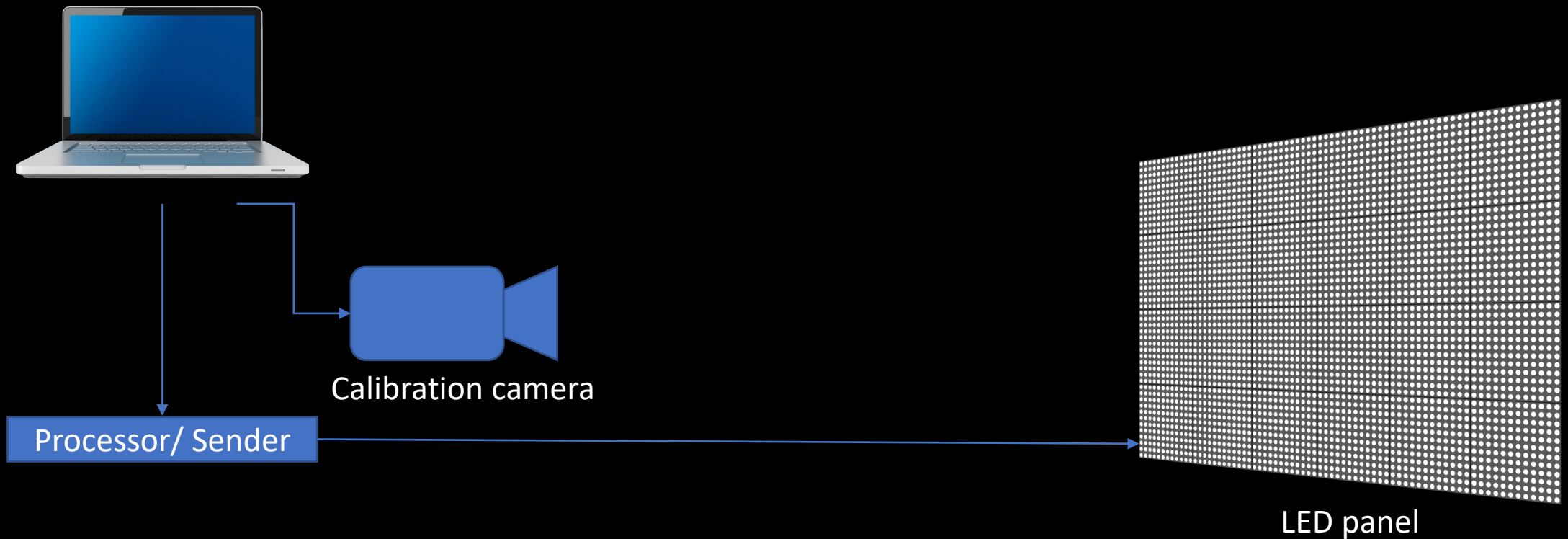
Saturated colours



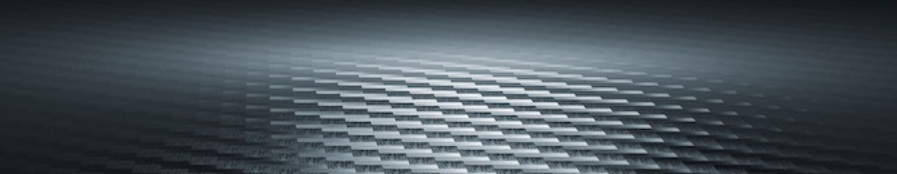
LEDS AND REC 2020

- Modern LEDs and driver chips are capable of hitting majority of Rec 709, DCI P3, Rec 2020 colour spaces
- LEDs have superb black level – 0% is black
- Intense whites
- However there has always been an issue with colour accuracy – this is an issue for

LECAGY CALIBRATION

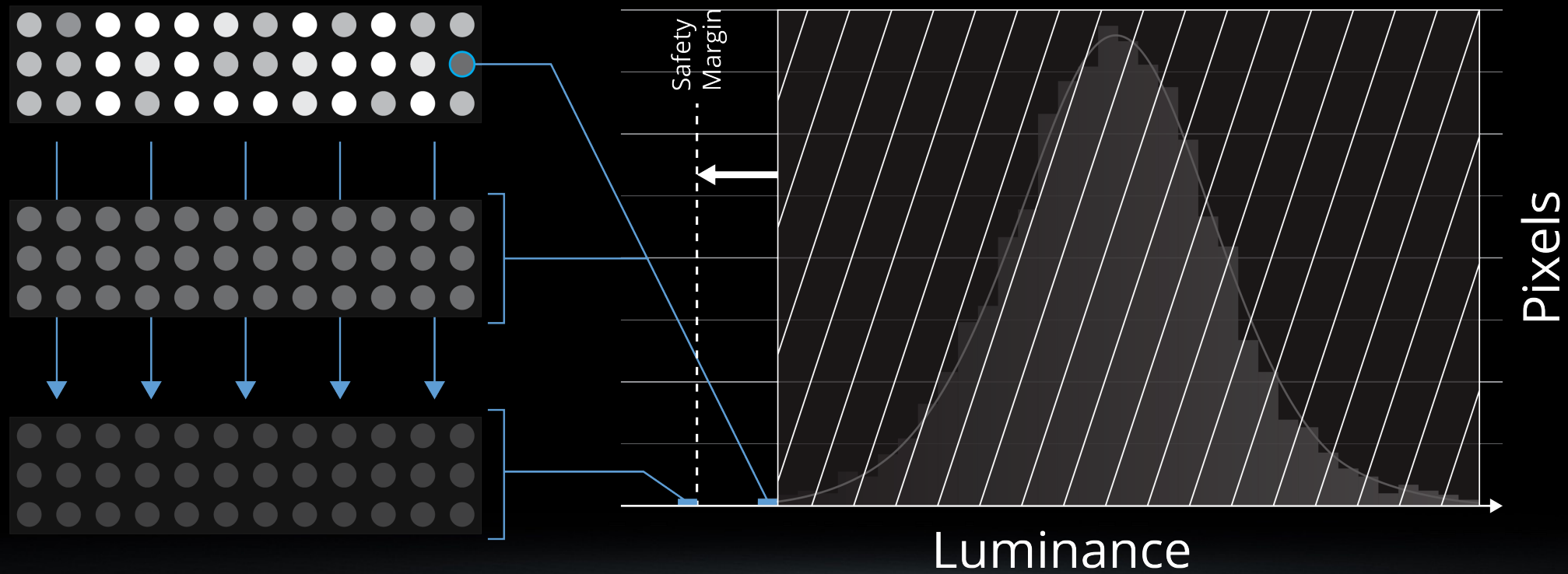


HDR



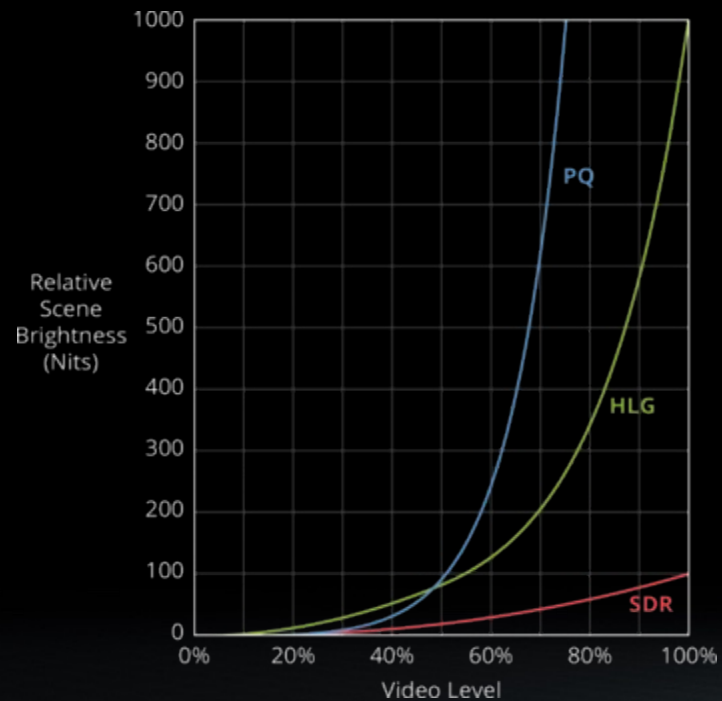
LEGACY CALIBRATION

Maximum LED Luminance



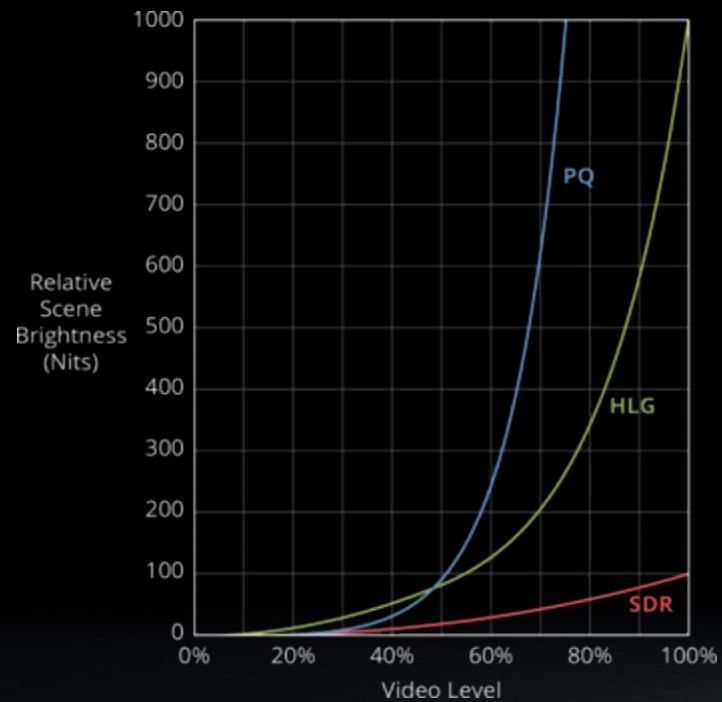
HDR

Increased Brightness Range

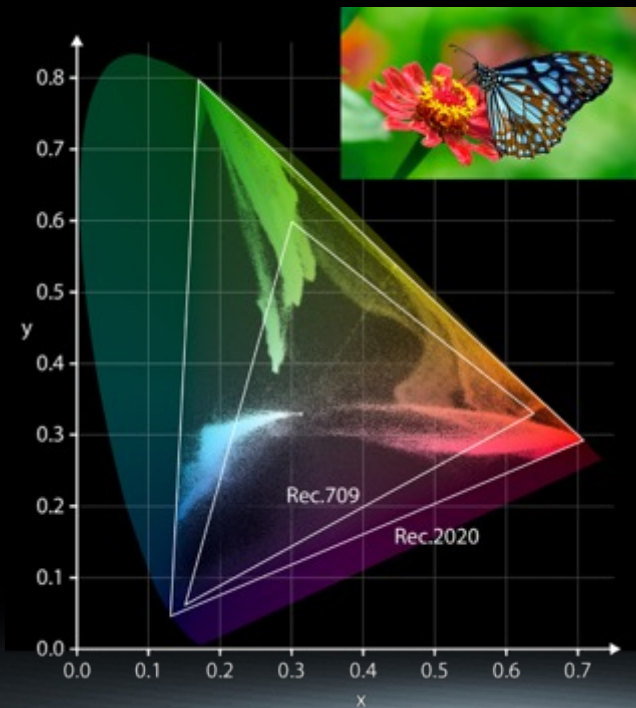


HDR

Increased Brightness Range

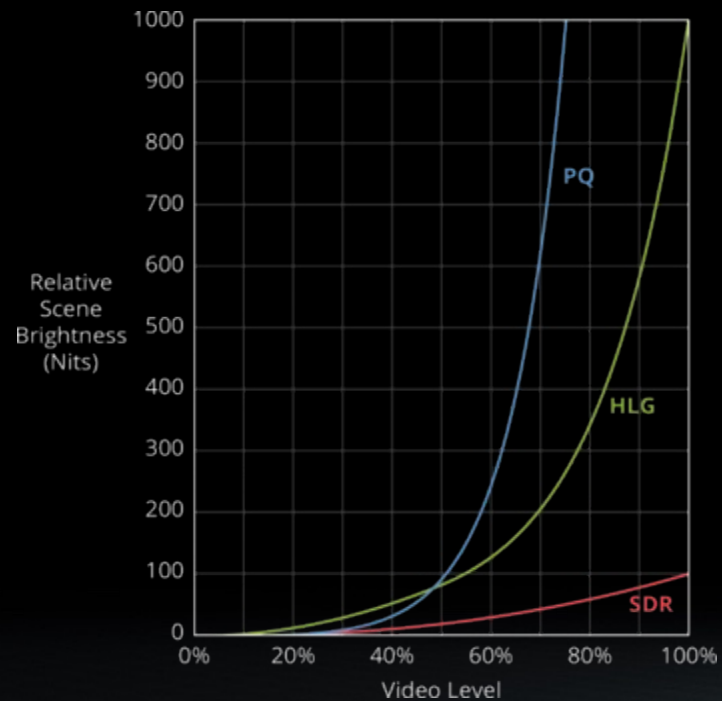


Wider Colour Gamut

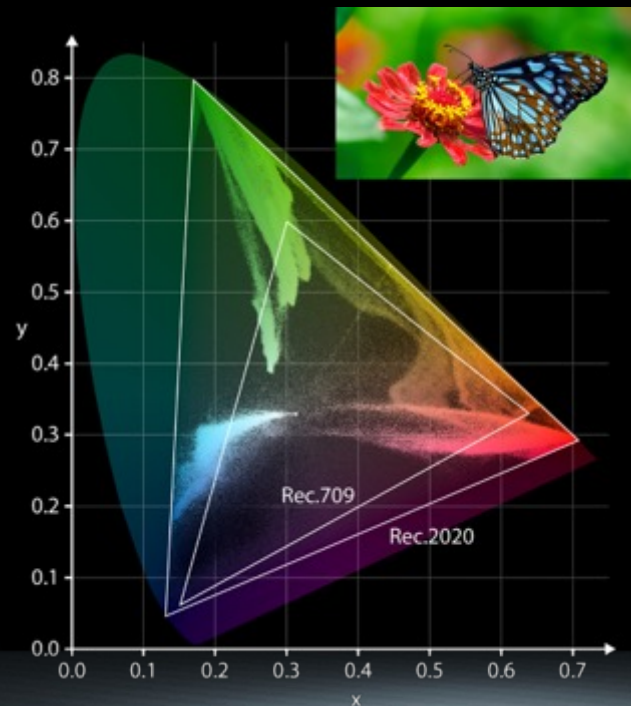


HDR

Increased Brightness Range



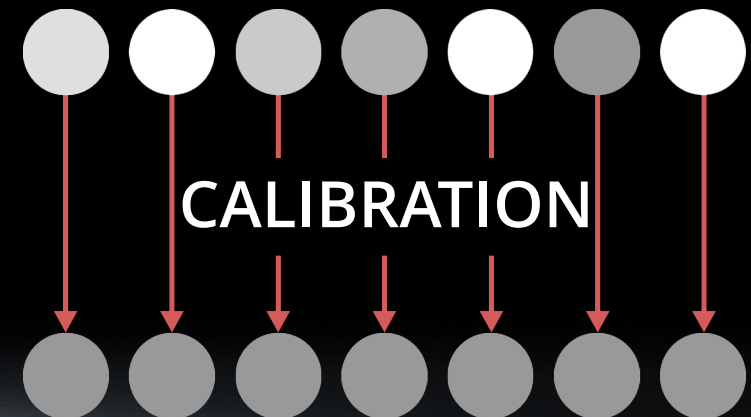
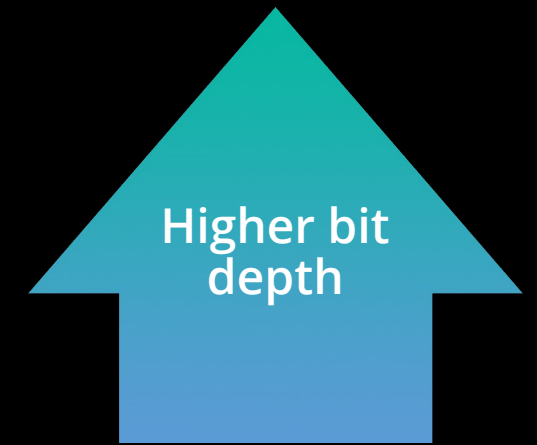
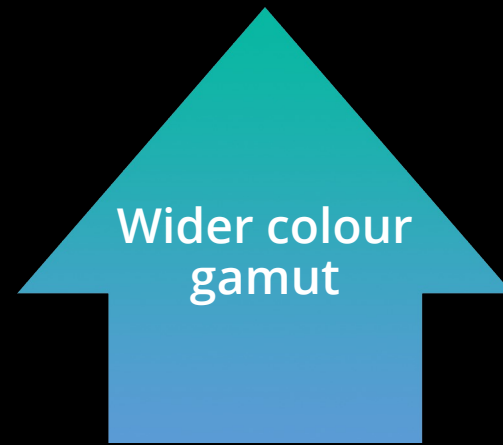
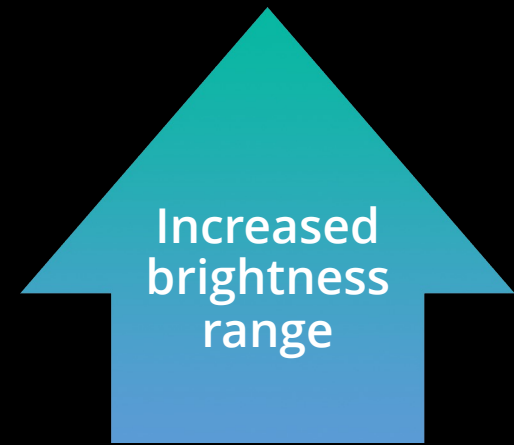
Wider Colour Gamut



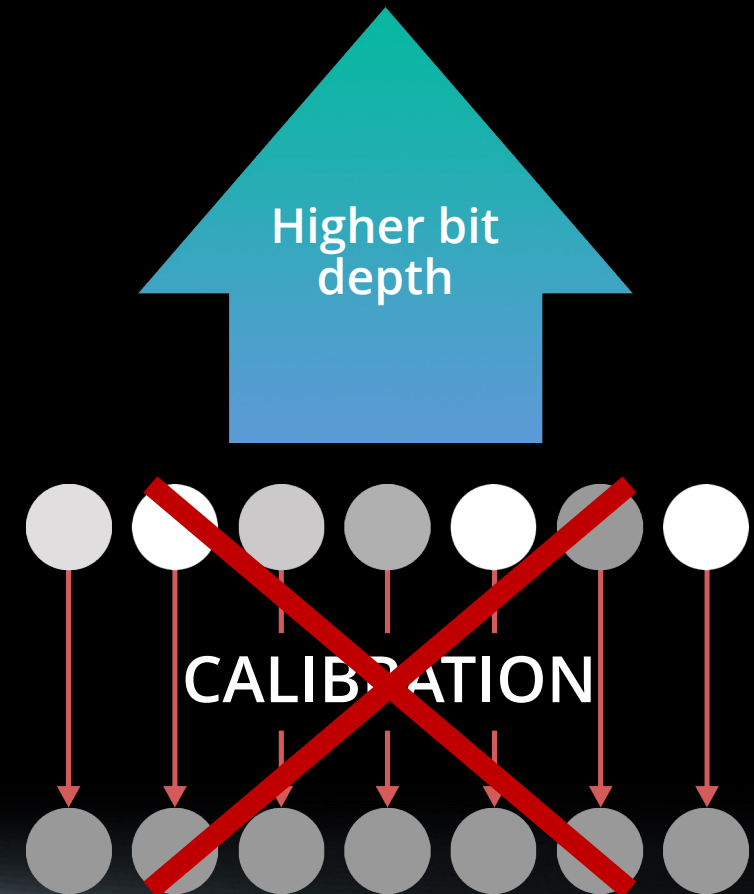
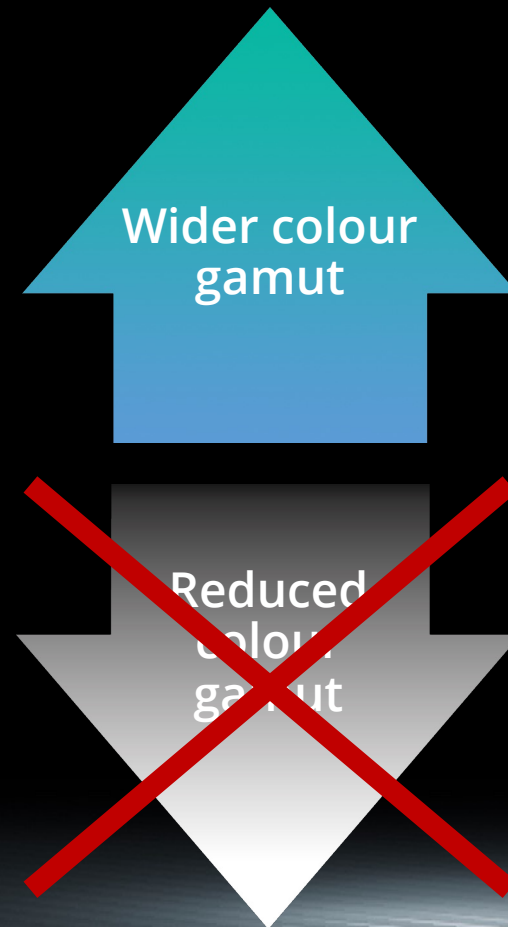
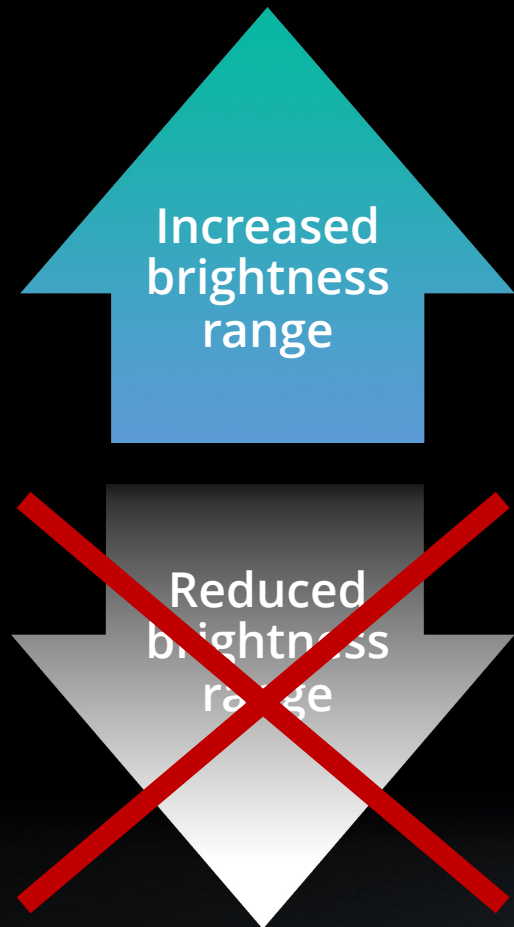
Higher Bit Depth



HDR



HDR



HDR



Increased
brightness
range



Wider colour
gamut



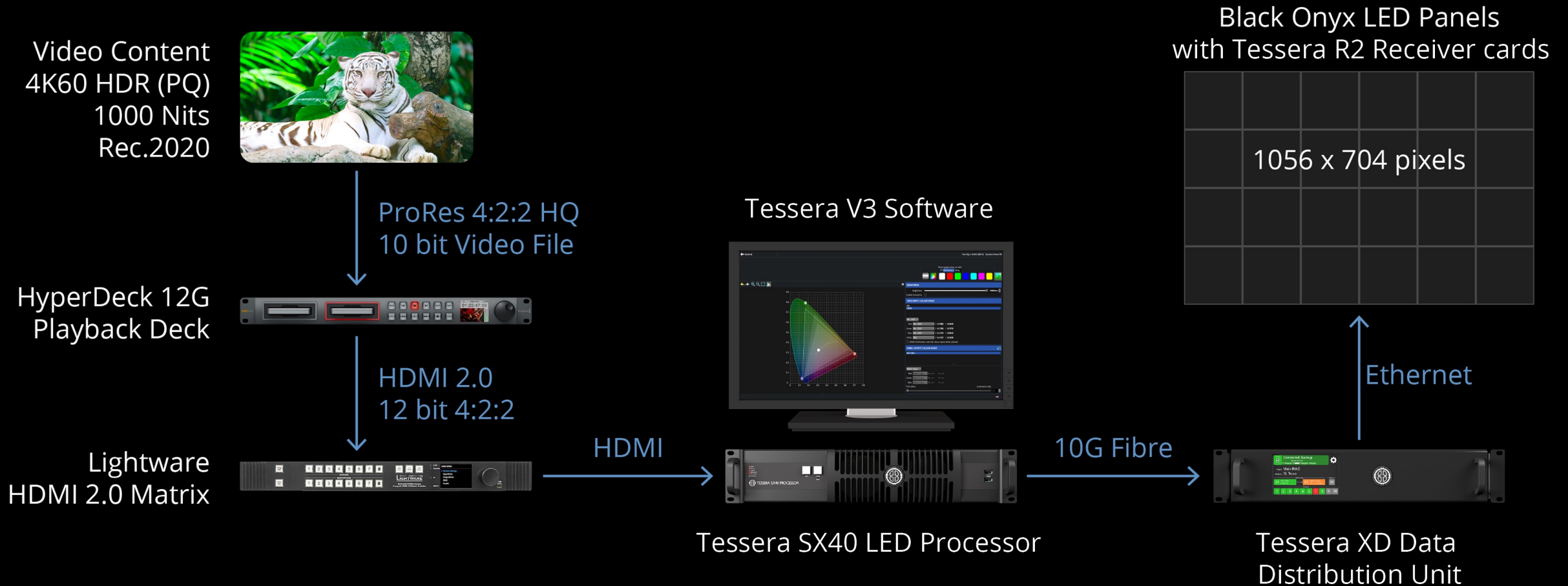
Higher bit
depth

?



DYNAMIC CALIBRATION





HYDRA CALIBRATION CAMERA

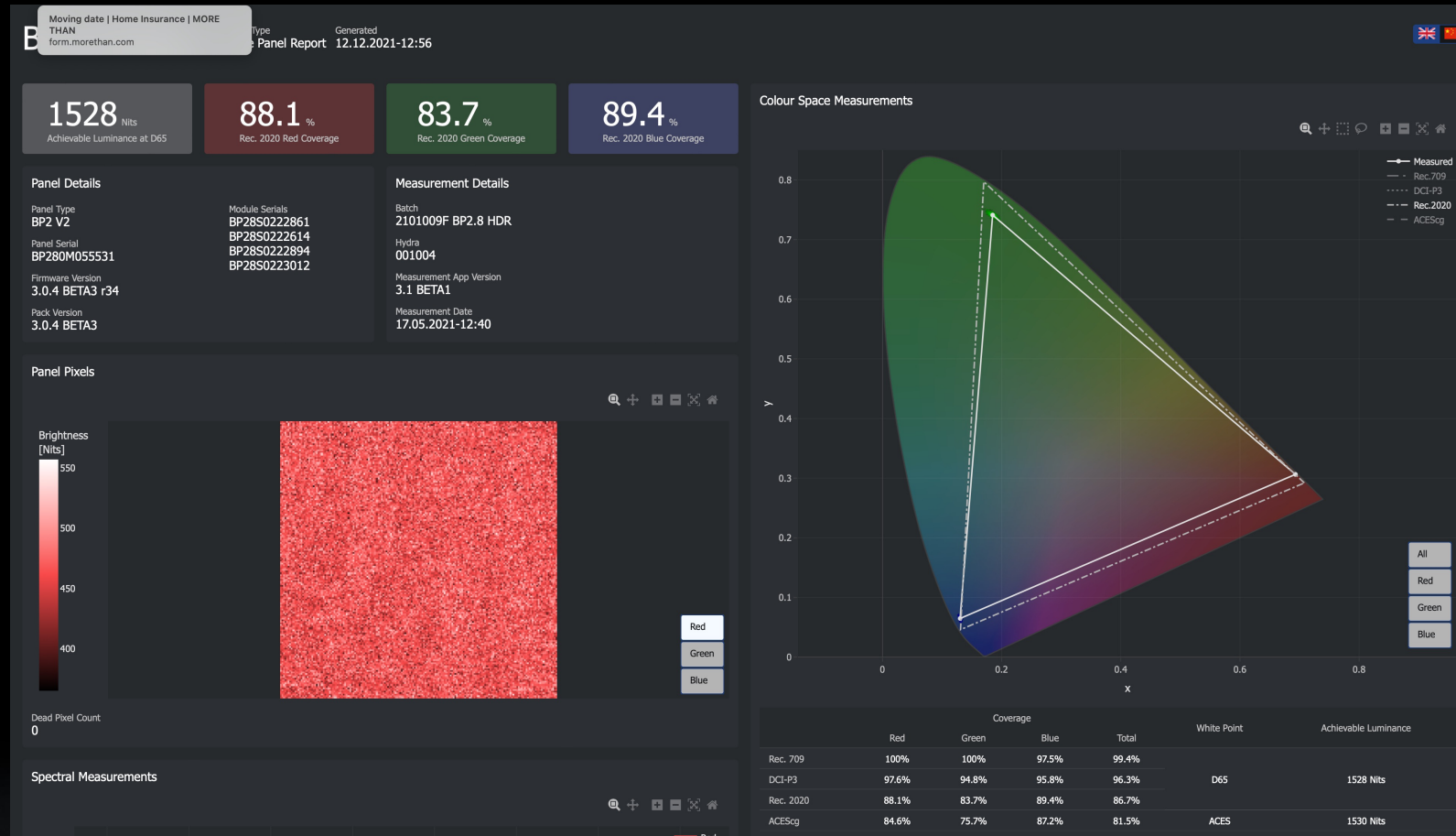




HYDRA SYSTEM

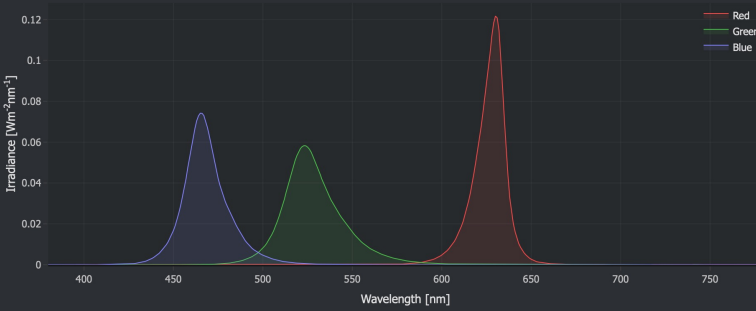
- All in one unit
- Fast calibration
- Easy to use

DYNACAL REPORT



Dead Pixel Count
0

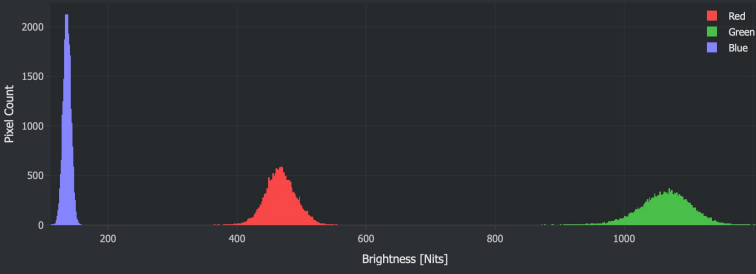
Spectral Measurements



Graph showing Irradiance [Wm⁻²nm⁻¹] vs Wavelength [nm] for Red, Green, and Blue channels. The Red channel has a peak at 630 nm, Green at 523 nm, and Blue at 465 nm.

	Red	Green	Blue
Peak Wavelength	630	523	465
Full Width Half Max	15	28	21

Pixel Brightness



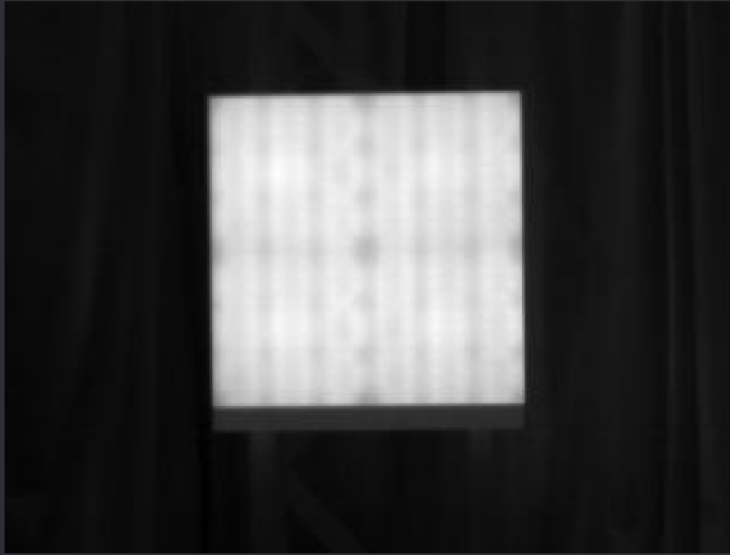
Graph showing Pixel Count vs Brightness [Nits] for Red, Green, and Blue channels. The Blue channel has a high peak at low brightness (~100 Nits), while Red and Green have broader peaks at higher brightness levels (~450-500 Nits).

	Coverage			Total	White Point	Achievable Luminance
	Red	Green	Blue			
Rec. 709	100%	100%	97.5%	99.4%		
DCI-P3	97.6%	94.8%	95.8%	96.3%	D65	1528 Nits
Rec. 2020	88.1%	83.7%	89.4%	86.7%		
ACEScg	84.6%	75.7%	87.2%	81.5%	ACES	1530 Nits

Thermal Measurements

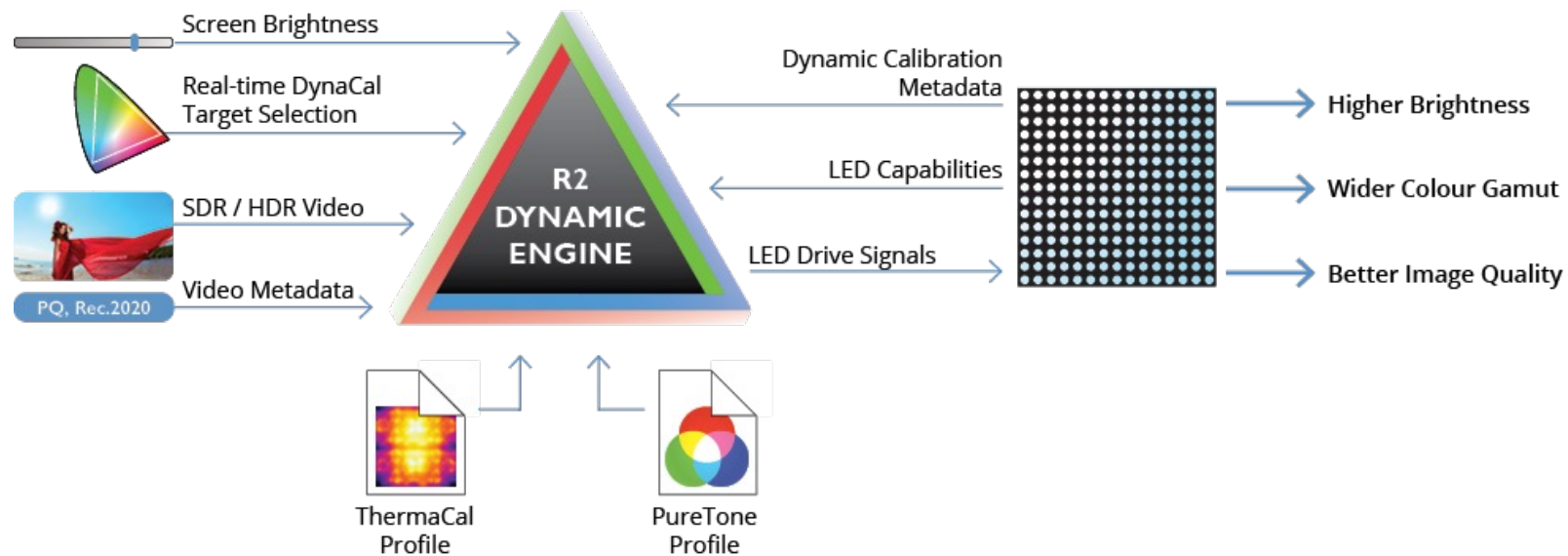
Target Temperature	Ambient Temperature	Start Temperature	End Temperature
40.0°C	24.7°C	40.0°C	40.0°C

Thermal Image

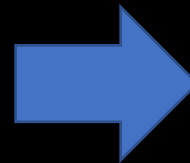


Thermal image showing a bright rectangular area (the screen) against a dark background, indicating heat distribution.

DYNAMIC ENGINE



SOURCE METADATA



HDMI

Status: Signal locked

Resolution: 3840x2160

Frame Rate: 60.00Hz

Sampling: 4:2:2 Limited Range

Bit Depth: 12 bits per channel

HDR Status: HDR (PQ), Rec. 2020, 1000 Nits
Format: PQ
Colour Space: Rec. 2020

Min Display Mastering Luminance: 0.0001 Nits
Max Display Mastering Luminance: 1000 Nits
Max Content Light Level: 1000 Nits
Max Frame-Average Light Level: 50 Nits
Red Target: 0.7080, 0.2920
Green Target: 0.1700, 0.7970
Blue Target: 0.1310, 0.0460
White Target: 0.3127, 0.3290

Colour Format: **From Input** RGB YCbCr

Quantisation Range: **From Input** Full Limited

HDR Format: **From Input** SDR PQ HLG

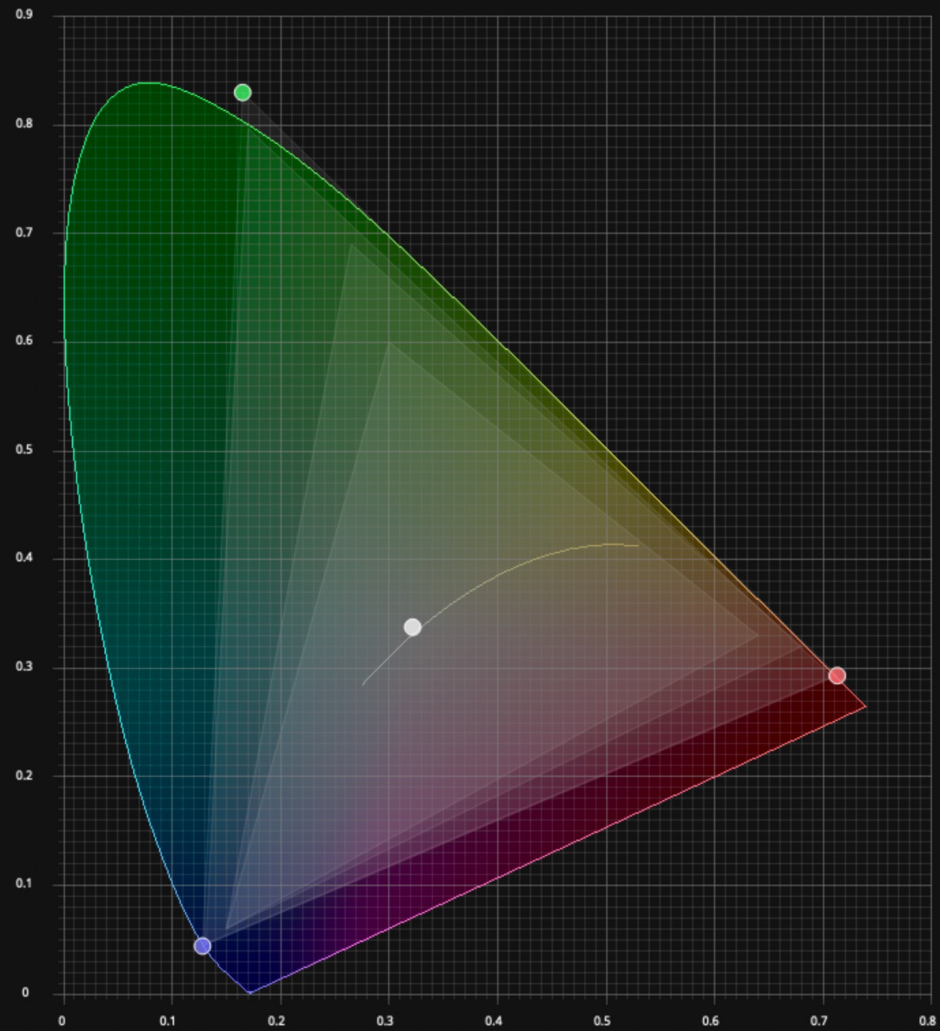
PQ MaxCLL Override: **1000Nits**

PQ Gain: **1.00**

PQ Auto Brighten:

Colour Space: **Rec. 2020** DCI-P3 Rec. 709 ACEScg Custom

HDMI InfoFrames override colour space when present



VIDEO INPUT COLOUR SPACE

SDI

HDMI (Current)

ACEScg

Red ACEScg X 0.7130 Y 0.2930

Green ACEScg X 0.1650 Y 0.8300

Blue ACEScg X 0.1280 Y 0.0440

White ACES X 0.3216 Y 0.3376

HDMI InfoFrames override colour space when present

PANEL OUTPUT COLOUR SPACE

CF2.9

Match Input

Red Match Input X Y

Green Match Input X Y

Blue Match Input X Y

Full colour

Luminance only

0%

DYNAMIC CALIBRATION



DYNAMIC CALIBRATION



Uniformity



DYNAMIC CALIBRATION



Uniformity

Colour Accuracy



DYNAMIC CALIBRATION



Uniformity

Colour Accuracy

Extreme Brightness



DYNAMIC CALIBRATION



Uniformity

Colour Accuracy

Extreme Brightness

Maximum Colour Gamut

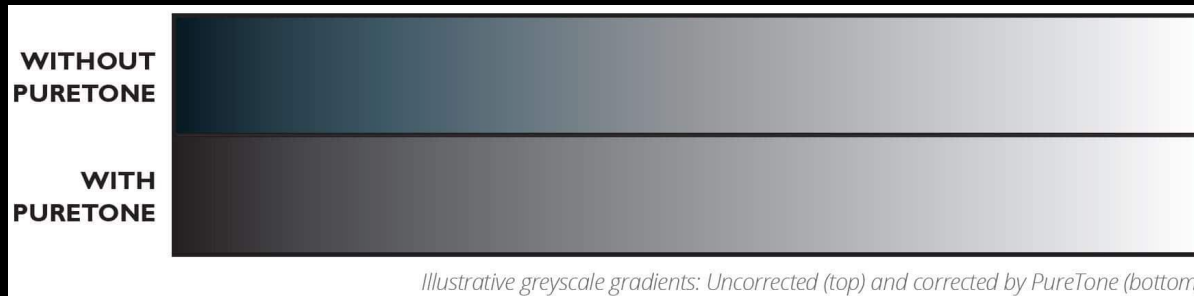
TECHNICAL ASPECTS

- Dynamic Calibration is **REQUIRED** for Brompton HDR
- Dynamic Calibration works with all current Tessera features
- Both **NEW** and **EXISTING** LED panels can use it provided:
 - Panels are fitted with a Tessera R2/ R2+ Receiver Card
 - Panels are measured by our HYDRA System

DYNAMIC
CALIBRATION 

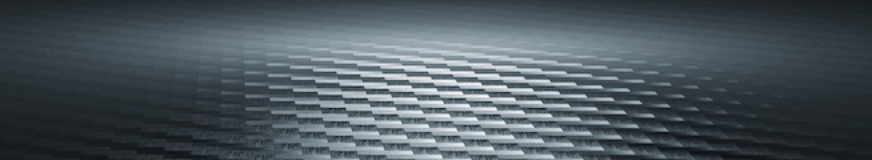
PURETONE

- Batch Matching
- Corrects non-linearity in LEDs
- Important for low-level brightness





XD DATA DISTRIBUTION UNIT



TESSERA PROTOCOL

- 1GbE protocol
- Works at Layer 2 – no IP addressing
- Works with off-the-shelf network switches etc
- A daisy chain of LED panels is a 'String'
- The amount of LED panels that one of our 1GbE outputs is dependent on network bit depth
- Running at 12-bit at 60Hz you can run 350,000 pixels.



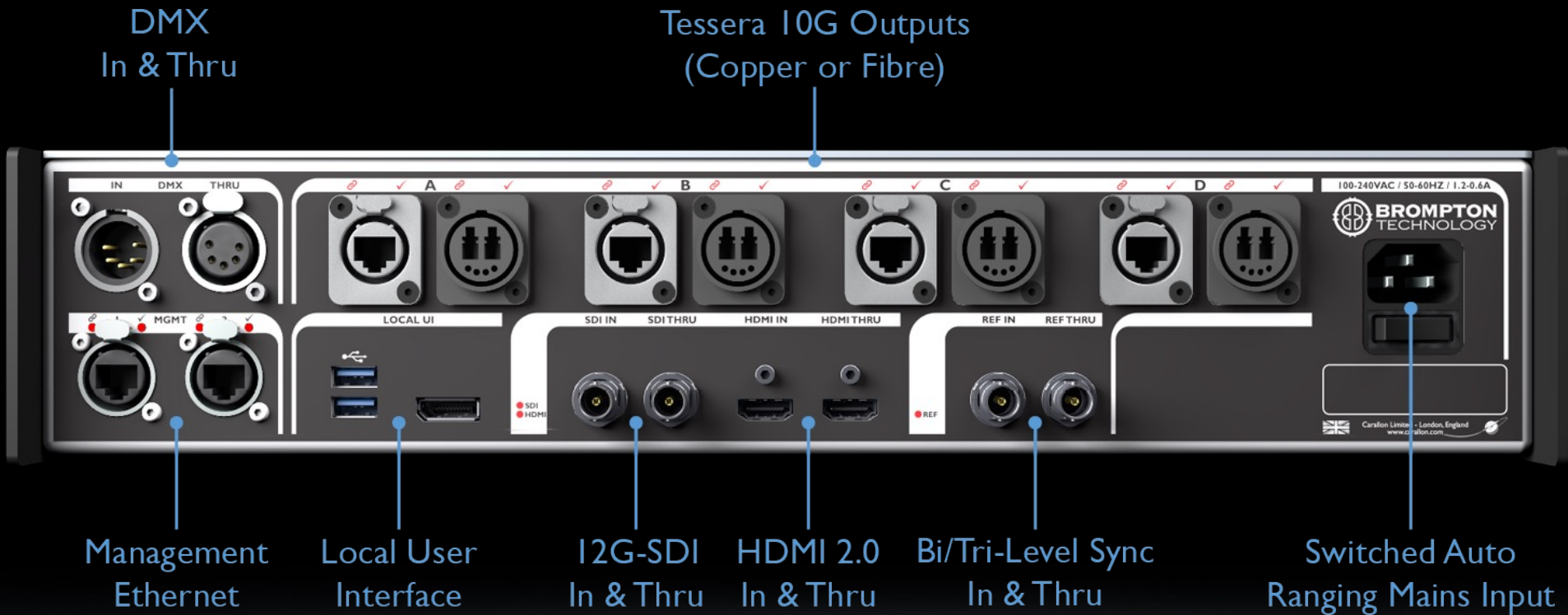


Why use 10
when 1 is more
than enough



SX40

TESSERA SX40 | REAR



10G ETHERNET

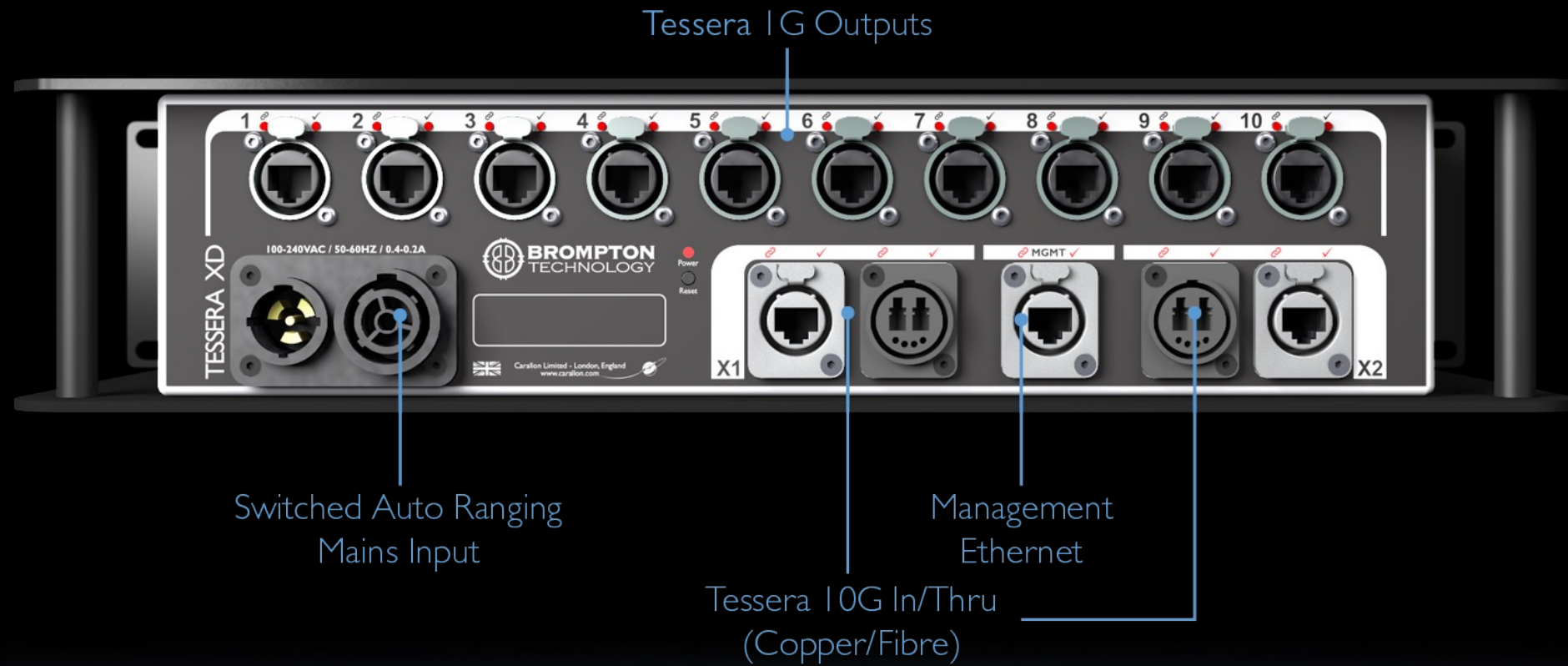
- Reduces the number of home-runs from processor to panels
- Uses a proprietary multiplexing algorithm built on standard 10GbE to ensure all connected fixtures remain in sync.
- We support single mode fibre optic and recommend Cat 6A
- Ruggedized connectors – Neutrik etherCon and Neutrik OpticalCon Duo – both compatible with Cat 5e/6/6A etc and LC connectors respectively

TESSERA XD | FRONT

Touchscreen



TESSERA XD | REAR

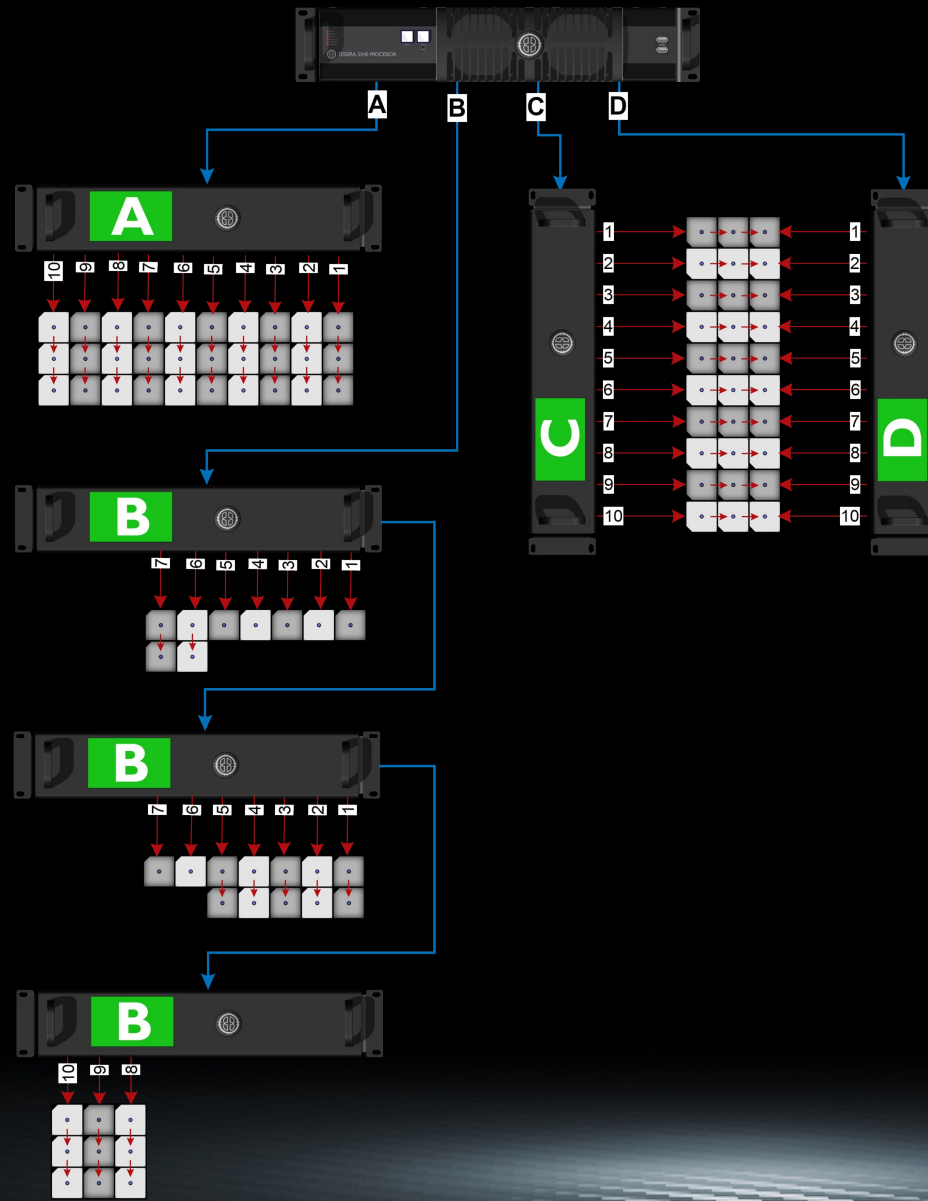


- 10 1GbE for convenient distribution – using off the shelf 1GbE infrastructure
- Plug and play – works seamlessly with our software. No configuration required.
- XD units can be daisy chained together for flexibility

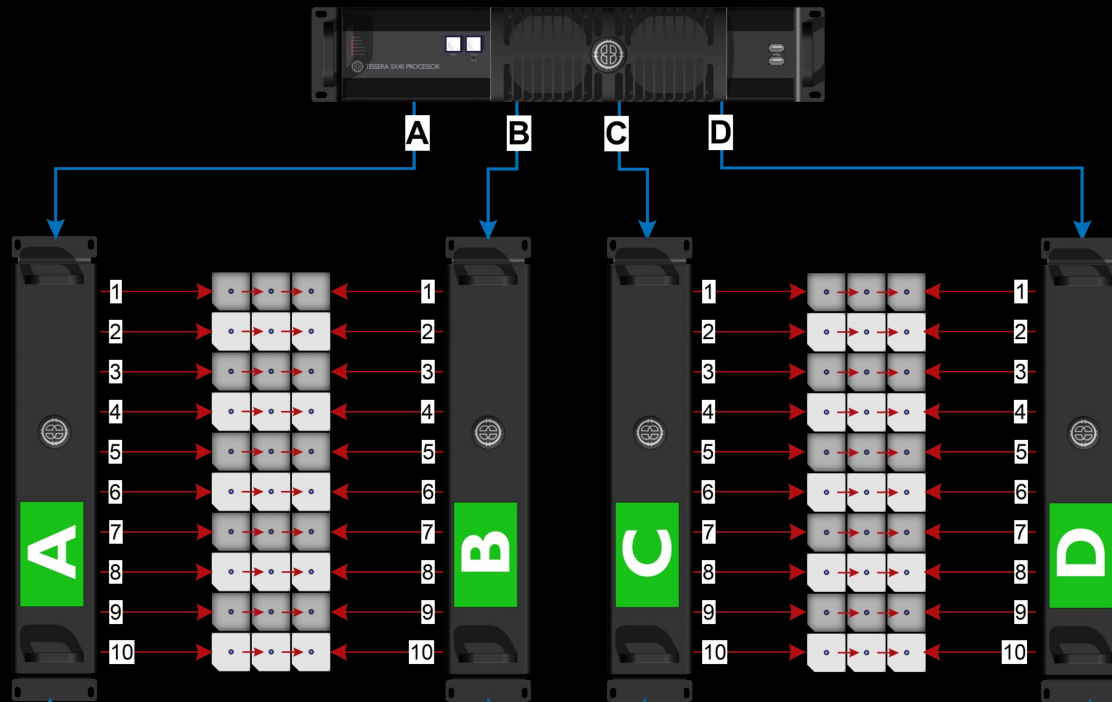
RUGGEDIZED, TRUSS MOUNTING



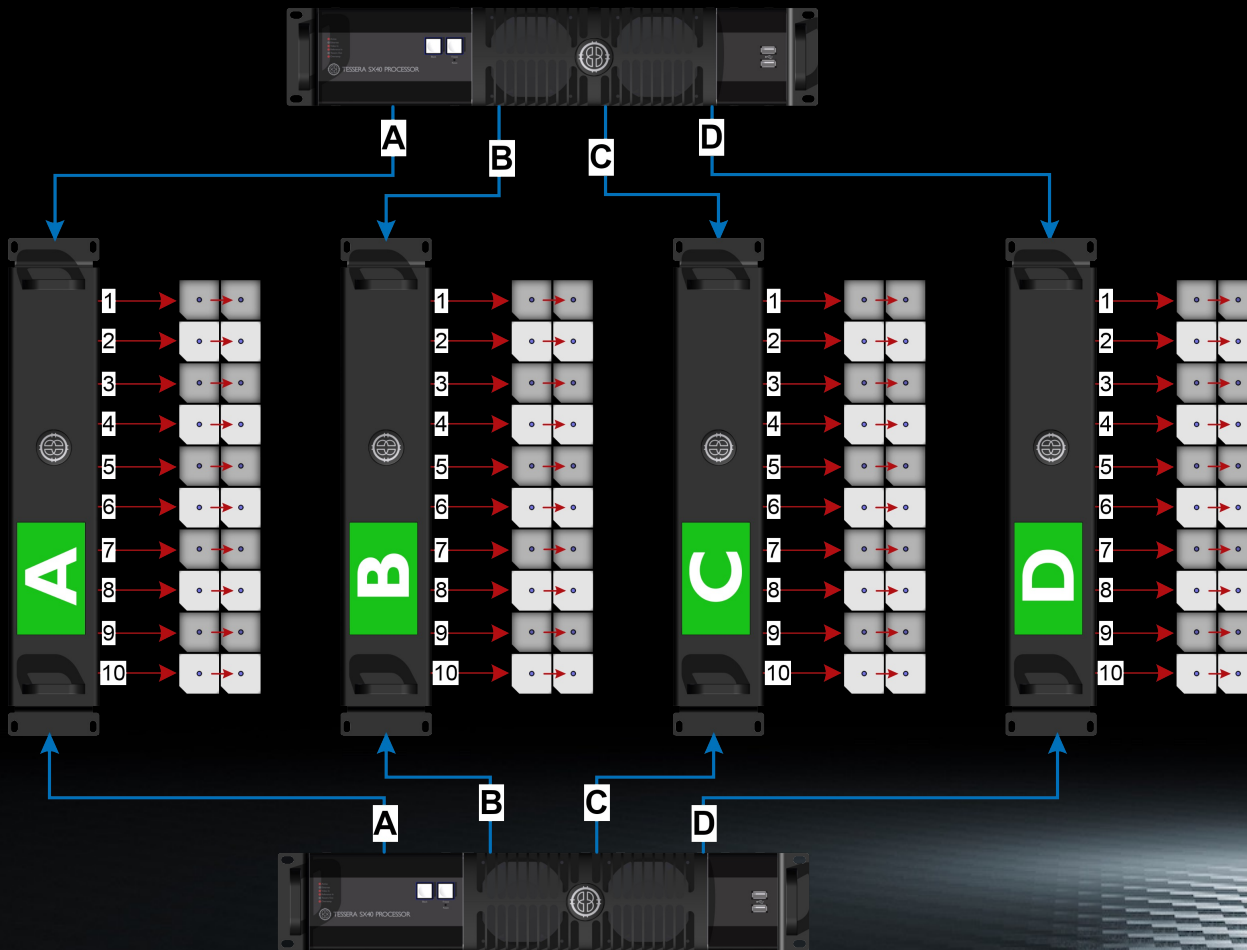




LOOP REDUNDANCY



PROCESSOR REDUNDANCY



PROCESSOR AND LINK REDUNDANCY

