

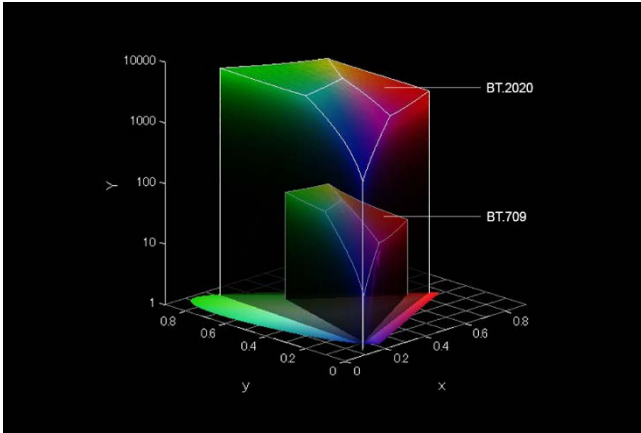
R

HDR-10

UHD Test Patterns

I n s t r u c t i o n | M a n u a l

Introduction



With all of the progressive advancements in display technology and changes within industry standards, Ultra High Definition(UHD), Wide Color Gamut(WCG), High Dynamic Range(HDR) just to name a few, makes it a confusing, yet exciting time for all AV enthusiasts and professionals alike. When it comes to video calibration, we have been utilizing the same standards for decades. The current legacy standards will not suffice in regards to new UHD/HDR displays and/or content moving forward.

Since current UHD/HDR test patterns are limited, I have created an entire suite of UHD/HDR-10 test patterns that not only adhere to new industry standards, they conform to the UHDA (UHD Alliance) standards and specs, UHD 3840x2160 resolution, Wide color Gamut, BT.2020, HDR10, 10-Bit, ST.2086 color spec and ST.2084 transfer function. This project follows the same idea behind my “Advanced Calibration

Disc”, an attainable solution to calibrate and/or measure your new UHD/HDR display without having to spend thousands on a new UHD/HDR test pattern generator. I have created all new test patterns from the ground up, triplets that utilize the ST.2084 transfer function, precise RGB to YCbCr BT.2020 conversion, and H.265/HEVC encoding with the proper metadata tags so your HDR-10 enabled display can properly decipher these new test patterns. This project was also designed around a familiar layout, “Basic Setup Patterns”, “Advanced Setup Patterns”, and “Miscellaneous Patterns” which include full 5% and 10% window suites. I have also included workflows for Calman, ChromaPure, and HCFR calibration software.

The test patterns can be download and stored on a flash drive and/or an external hard drive for playback on any compatible UHD/HDR-10 enabled display or UHD Blu-ray player via USB. These test patterns have also been encoded separately into individual files for ease of use and flexibility. Please visit my website @ diversifiedvideosolutions.com for instruction manuals, products, services, support and see what other video calibration solutions we have available. Thank you for your support!

Quick Links

[R.Masciola's UHD/HDR-10 Test Patterns \(AVS Forum\)](#)

[Diversified Video Solutions \(Official Site\)](#)

R.Masciola's UHD | HDR-10 Pattern Suite

R HDR-10
UHD Test Patterns

UHD/HDR-10 Test Pattern Suite

Test Pattern & Mastering Display Metadata

Resolution: 3840 x 2160
Frame Rate: 23.976 (24000/1001)
Chroma subsampling: 4:2:0|Type 2
Bit depth: 10-Bit
Color primaries: BT.2020
Transfer characteristics: SMPTE ST 2084 (PQ)
Matrix coefficients: BT.2020 nc
Mastering display color primaries: P3, WP: x 0.3127 y 0.329
Mastering display luminance: min 0.0005 cd/m2, max 1000 cd/m2
MaxCLL: 1000 cd/m2
MaxFALL: 400 cd/m2

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REV_018

This Pattern suite offers a comprehensive set of reference patterns to assist in the calibration of your UHD/HDR-10 enabled display. This suite is comprised of 1,300+ patterns that adhere to the newly regulated standards created by the UHD Alliance and guaranteed triplet perfection. I have broken down the pattern sets into 6 sections Basic Setup Patterns, Advanced Setup Patterns, Misc. Patterns, and 3 separate workflows listed below.

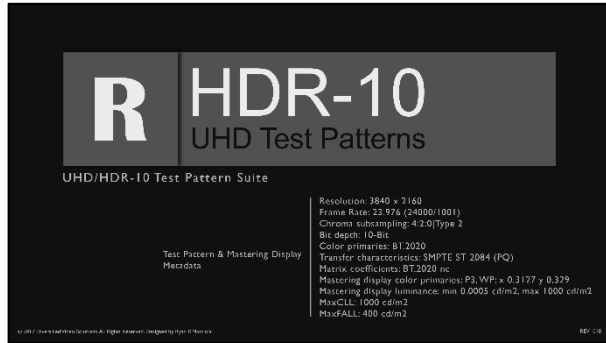
Calibration software

[HCFR](#) - A free yet very intuitive calibration software that is compatible with a wide variety of meters. Coined as a Video Projector/Monitor Calibration Software originally developed as ColorHCFR. This code base is based off version 2.1 and will aim for a more open development process and integrates an ArgyllCMS interface for continued meter support and development.

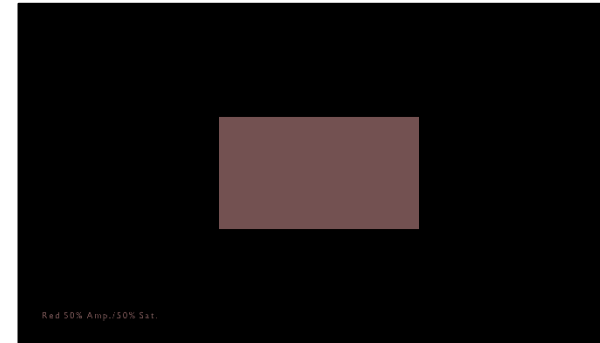
[ChromaPure](#) - A paid for software built around a very simplistic yet powerful infrastructure. Designed to be familiar to anyone who has ever surfed the web. Simply click one of the buttons along the left side of the program window to open one of its modules. Each module performs a different video calibration function and allows the user to quickly bring a any video display with adequate controls into conformity with industry standards.

[Calman](#) - A paid for software with an extremely powerful engine, customizable workflows, and compatible with almost all available meters, reference pattern generators, and standalone video processors. One of the most comprehensive and flexible calibration software packages available.

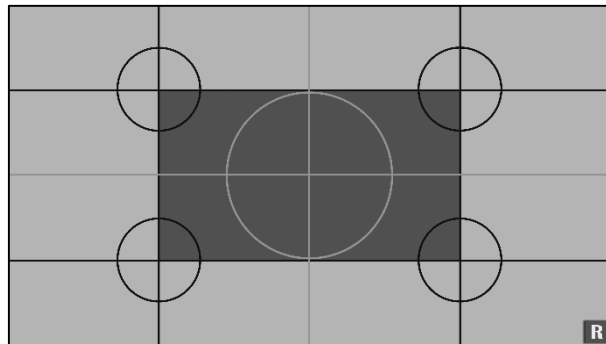
Basic Setup Patterns



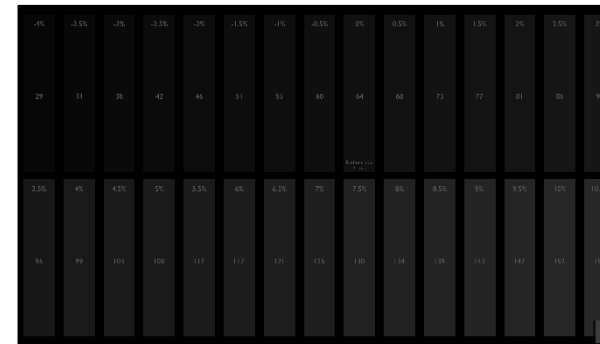
Title – The main title page of the pattern suite. This page displays the pattern metadata, revision, and copyright of the patterns.



Color Profiling – A series of White, Red, Green, and Blue color patches to assist in creating a color matrix profile. This color profile based on your reference meter measurements will then be utilized by your field meter as a point of reference during your calibration session.

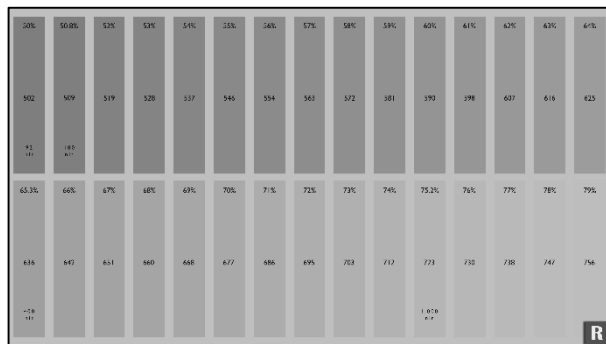


Meter Position – This pattern was designed to assist in the centering of your meter on to your display for video calibration.



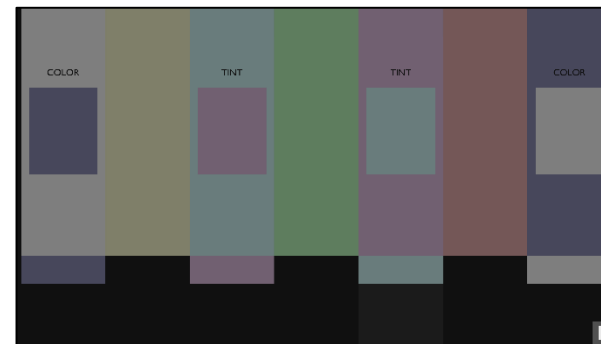
Black Clipping – This pattern was designed to help with your display's brightness adjustment. Start off by raising your brightness to where you see flashing bars past the reference point 64 and slowly lower your display's brightness until you can barely see bar 68 flashing.

Basic Setup Patterns continued



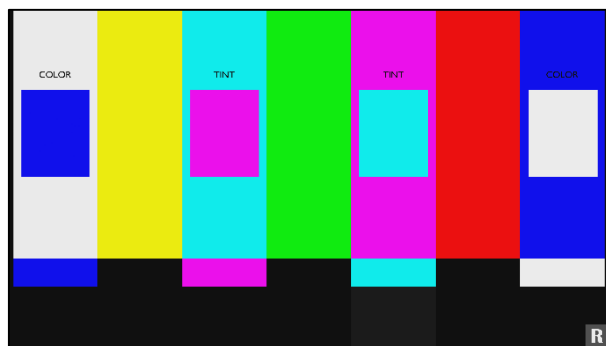
White Clipping – This pattern shows how well your display maps peak luminance information based on the metadata in which it’s being feed. The metadata within this particular pattern is designed to clip at 1,000 nit. However, no matter how much you lower and/or raise the contrast

controls, the peak luminance information(the flashing bars) will always display the peak nit level data even though the light output maybe increasing or decreasing.



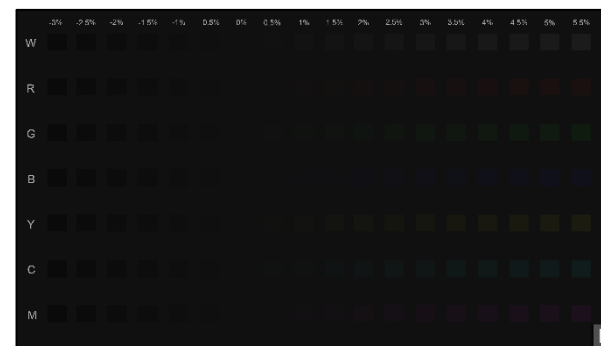
Color Bars BT.2020 50% – This pattern is set to 50% of the BT.2020 color gamut or roughly 100 nit. You can use this pattern to set color and tint controls with a blue filter. If your display is one of the few that includes a blue only mode, it can be used in place of a blue filter. If not,

there are several ways to obtain color filters online.



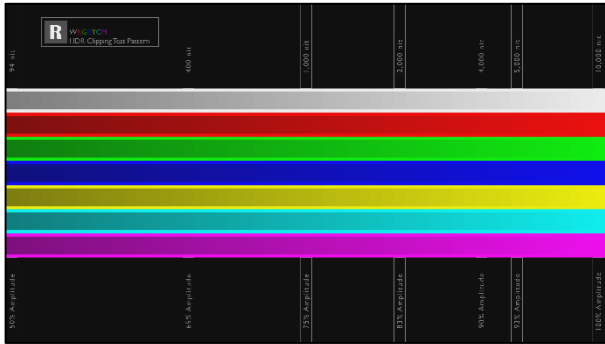
Color Bars – You can use this pattern to set color and tint controls with a blue filter. If your display is one of the few that includes a blue only mode, it can be used in place of a blue filter. If not, there are several ways to obtain color filters online. However, this color and tint pattern

should only be used for observation purposes, as it displays 100% amplitude and 100% saturation of the BT.2020 gamut, which currently is an unattainable target by consumer displays.



Color Clipping Low – This pattern merely shows where your colors are clipping on the other end of the spectrum. It’s Not Vital if all colors aren’t flashing to the 0% mark, just so long as none of the colors flash past mark 0% mark or further.

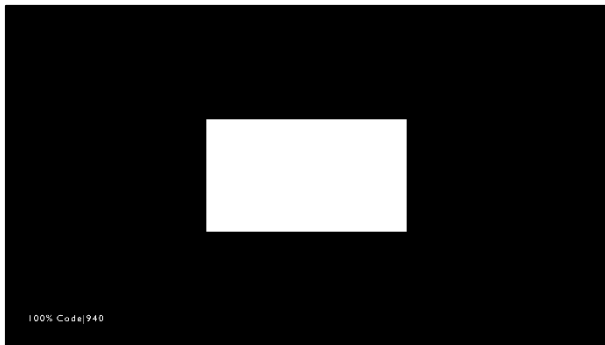
Basic Setup Patterns continued



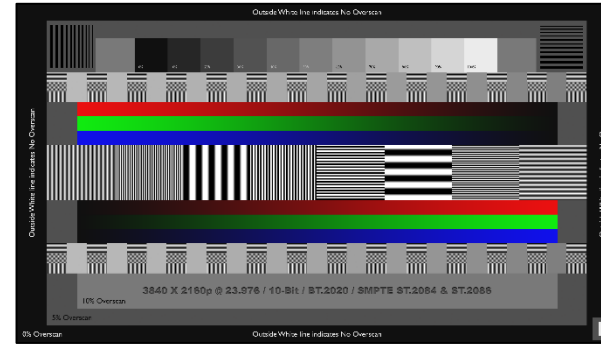
HDR Clipping Mix – You can use this pattern to set your display’s color and check for clipping. Raise your display’s color control slowly until no colors are flashing. You shouldn’t see any flashing near 100% stimulus mark, as this represents 100% of the BT.2020 color space @ 10,000 nit.

Most displays will flash around the 75% stimulus mark or roughly 1,000 nit.

Miscellaneous Patterns

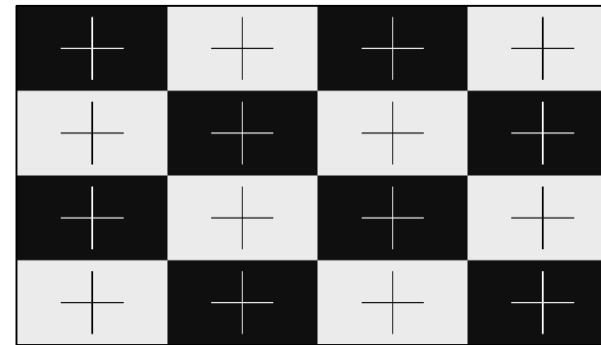


Contrast Ratio – This pattern was designed to be utilized with a meter to test the absolute peak luminance and dynamic contrast ratio of your display.



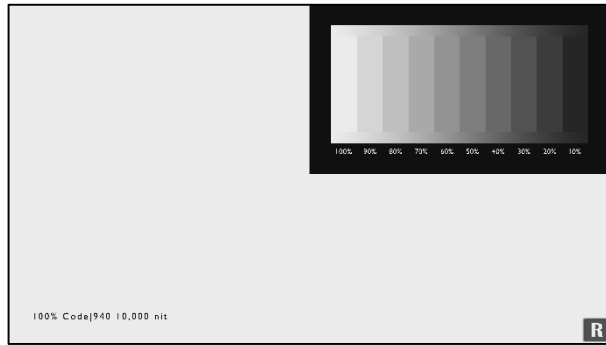
Sharpness & Overscan – You can use this pattern to properly adjust your display’s sharpness and/or set your overscan to fill the screen properly. You can typically lower your sharpness setting to lowest value and be fine. However, if the image looks soft, raise the value until you

see ringing or noise around any of the black bars or lines within the pattern, then take it back down a few clicks. Overscan can be adjusted by the 3 overscan marks within the pattern. For absolutely no overscan, select your display’s setting that exposes the entire white border outline of the pattern.



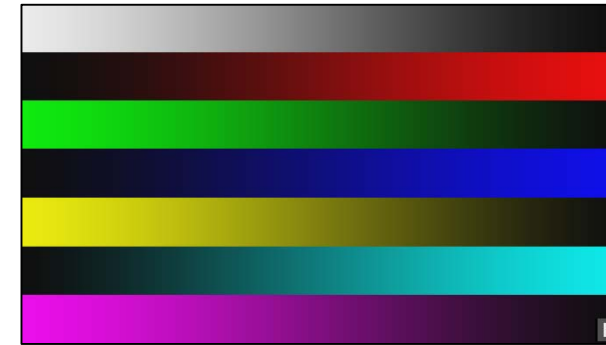
ANSI Contrast – This pattern was designed to be utilized with a meter and take individual ANSI contrast measurements of your display. This will provide a true representation of your displays native contrast.

Miscellaneous Patterns continued



Dynamic Contrast – This pattern Primarily is utilized to quickly observe any possible changes that might occur as APL varies. As the full field pattern cycles, watch for any changes within the grayscale window. If the grayscale changes with the cycle, your display is

dynamically adjusting picture levels.

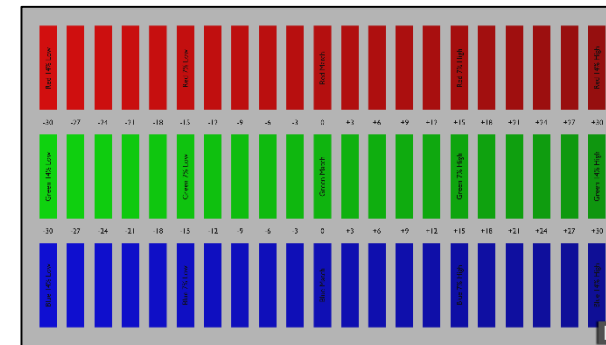


Color Ramps – This pattern displays the entire BT.2020 gamut from 0 to 10,000 nit utilizing a 10bit gradient. Displaying in Grayscale, Red, Green, Blue, Yellow, Cyan, and Magenta. However, most consumer displays will start to clip above 75% (1,000 nit) as you reach the brighter part of

the ramp.

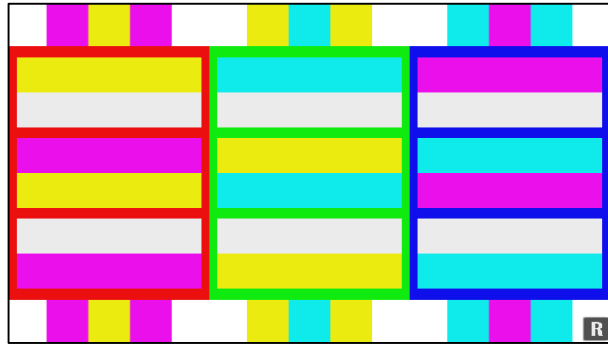


Grayscale Ramp – The grayscale ramp exhibits the entire grayscale range of (1) through (940) in the top and bottom of the pattern. The reference marks indicate reference black (64) and 75% stimulus (721) @ 1,000 nit. The center of the ramp is broken up into 5% steps.



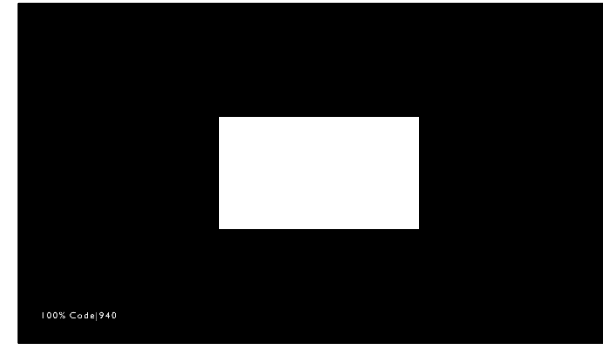
Color Decoding – This pattern can be used to observe how the primary colors (red, green, blue) relate to gray. Color filters are needed for this pattern.

Miscellaneous Patterns continued



flash in between.

Flashing Color Primary – This pattern shows red, green, and blue bars (primary colors) and the three related secondary colors (yellow, cyan, magenta) flashing on top. Above and below each primary color the two secondary colors related to the primary color also

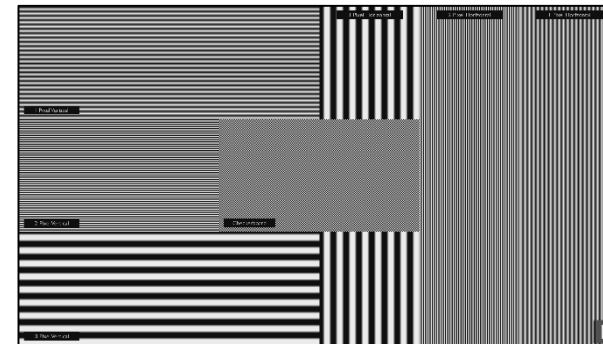


peak native luminance.

Different nit Levels – This pattern folder is comprised of 3 subsection that include 11 step grayscale sweeps at different nit levels, 1,000, 4,000 and 10,000 nit. However, depending on your display, the peak luminance metadata may be ignored and only output the display's peak



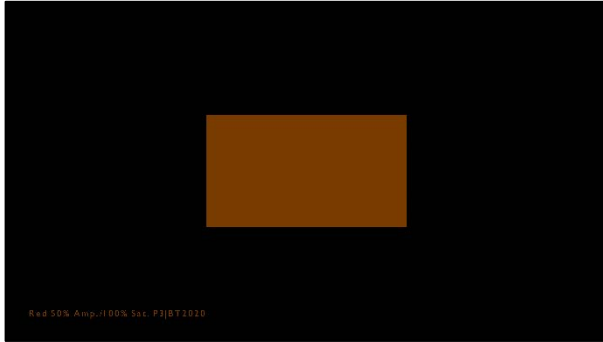
Grayscale Sweeps – This pattern file folder is comprised of 9 subsection that include 11 step grayscale sweeps at different patch sizes that range from 2% to 40%. This will allow for observation changes in luminance based on patch sizes.



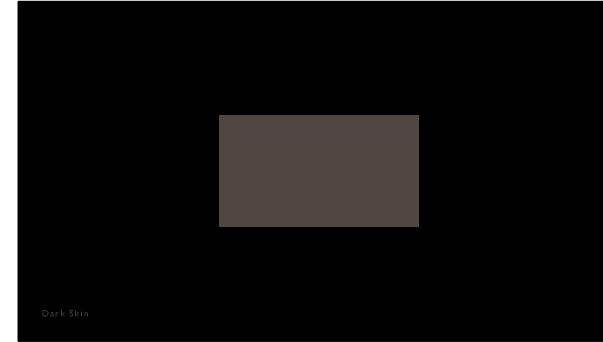
pattern displaying all.

Resolution Patterns – This pattern file folder is comprised of 8 different UHD resolution patterns that will test your displays ability to resolve 3840x2160. These patterns have been divided into horizontal & vertical patterns, 1, 2, & 3 pixel counts, and one mixed resolution

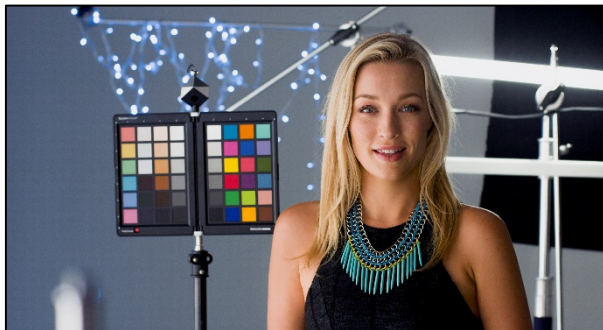
Miscellaneous Patterns continued



P3 in BT2020 Patterns – This pattern file folder is comprised of 2 separate subsections of P3 in BT.2020, which include a 6 point color sweep and a 30 point color saturation sweep. These patterns demonstrate P3 color targets in a BT.2020 container.

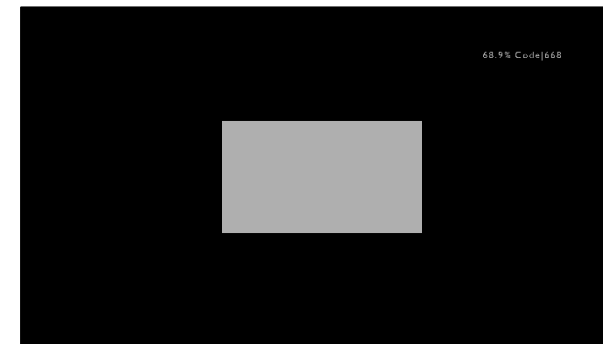


ColorChecker Sweeps – This pattern file folder is comprised of 3 separate subsections of ColorChecker sweeps which include the following, The 24 Point MCD Original ColorChecker from my first project, The 18 Point ChromaPure Skin Tone ColorChecker, and The 24 Point Pantone Skin Tones ColorChecker. These 3 pattern sets have been redesigned to accurately target 50% of the BT.2020 color gamut or roughly 100 nit.



Test Footage – This pattern file folder includes 5 separate reference test clips. Landscape, Nature, Skin Tone, City Sunset in 1.85:1, and Oceanside in 2.40:1. Each test clip has been designed to accurately target 75% of the BT.2020 color gamut or roughly 1,000 nit. These 5

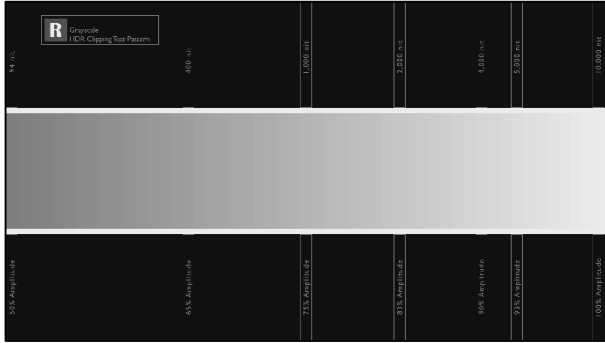
test clips can act as a reference for before and after calibration observations.



LG OLED Code based test patterns – This file folder contains LG OLED specific code based grayscale test patches for both 2016 & 2017 OLED models. Please reference the LG spec sheet links below for further detail.

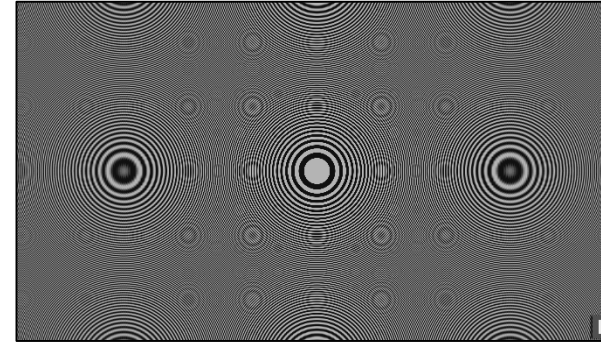
[2016 Models](#) & [2017 Models](#)

Miscellaneous Patterns continued

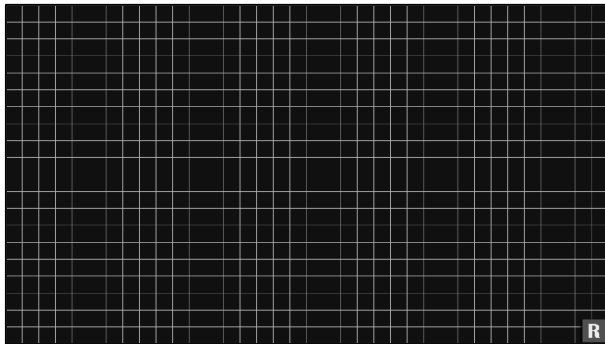


HDR Clipping Test Patterns – You can utilize these pattern to properly set your display’s contrast and color clipping. These clipping patterns are designed to target 1,000 nit. You shouldn’t see any flashing above 75% stimulus or near the 100% stimulus mark, as this represents

100% of the BT.2020 color space @ 10,000 nit.



Digital Zone Plate Patterns – These patterns were designed to expose any anomalies within your display’s ability to resolves certain resolution frequencies. The Zone Plate patterns are available in White, Red, Green, Blue, Yellow, Cyan, and Magenta.



Grid Pattern– This grid pattern was designed to assist front projection alignment, convergence, focus, and geometry. This pattern typically isn’t needed for fixed pixel displays like LCD or OLED.

R.Masciola's UHD|HDR-10 Pattern Suite

Basic Setup

- **Title**
- **Meter Placement**
- **Meter Profile** (10% Window Patterns Red, Green, & Blue @ 50%Amp/50%Sat)
- **Black Clipping** (1 & 2)
- **White Clipping** (1, 2, & 3)
- **Color Bars** (100% BT.2020 & 50% BT.2020)
- **Color Clipping** (Color Clipping Mix, Low, & High)
- **Sharpness & Overscan**

Workflows

Calman HDR-10 Workflow

- Pre Calibration View Module
- White Balance Module
- Grayscale Module
- CMS Adjust Module
- ColorChecker Module
- Saturation Sweeps Module
- Post Calibration View Module

ChromaPure HDR-10 Workflow

- Grayscale Module
- Gamma Module
- Basic CMS Sweep Module
- Advanced CMS Saturation Sweep Module
- ColorChecker Module

HCFR HDR-10 Workflow

- Grayscale Module
- Basic CMS Sweep Module
- Advanced CMS Saturation Sweep Module
- ColorChecker Module

Advanced Setup Patterns

5% Window Patterns

- **11 Step Grayscale**
- **21 Step Grayscale**
- **10 Step Gamma**
- **20 Step Gamma**
- **100% Amplitude/100% Saturation Color**
- **75% Amplitude/100% Saturation Color**
- **50% Amplitude/100% Saturation Color**
- **50% Amplitude/50% Saturation Color**
- **50% Amplitude Color Saturation Sweep**
- **40 Point Color Checker**
- **Near White**
- **Near Black**
- **Contrast**

10% Window Patterns

- **11 Step Grayscale**
- **21 Step Grayscale**
- **10 Step Gamma**
- **20 Step Gamma**
- **100% Amplitude/100% Saturation Color**
- **75% Amplitude/100% Saturation Color**
- **50% Amplitude/100% Saturation Color**
- **50% Amplitude/50% Saturation Color**
- **50% Amplitude Color Saturation Sweep**
- **40 Point Color Checker**
- **Near White**
- **Near Black**
- **Contrast**

Miscellaneous Setup Patterns

- **Contrast Ratio** (2%, 5%, 10%, 15%, 20%, 25%, 30%, 35%, & 40%)
- **ANSI Contrast** (ANSI Meter Placement & ANSI Contrast)
- **Dynamic Contrast**
- **Grayscale Ramps** (Grayscale Steps, Grayscale Ramp, & Grayscale Ramp Mix)
- **Color Ramps** (Color Steps, Color Ramps, & RGBYCM Single Color Ramps)
- **Color Decoding** (Color Decoding & Color Decoding 50% Amp)
- **Color Flashing Primary**
- **Grayscale Sweeps** (2% Window Patterns, 5% Window Patterns, 10% Window Patterns, 15% Window Patterns, 20% Window Patterns, 25% Window Patterns, 30% Window Patterns, 35% Window Patterns, & 40% Window Patterns)
- **Different nit Levels** (10% Window Patterns at 1,000 nit, 4,000 nit & 10,000 nit)
- **Resolution Patterns** (Resolution Mix Pattern, Resolution Vertical Pattern 1 Pixel, Resolution Vertical Pattern 2 Pixel, Resolution Vertical Pattern 3 Pixel, Resolution Horizontal Pattern 1 Pixel, Resolution Horizontal Pattern 2 Pixel, Resolution Horizontal Pattern 3 Pixel, & Resolution Black Pixels Single)
- **P3 in BT2020 Patterns**
- **ColorChecker Sweeps**
- **Test Footage** (Landscape, Nature, Skin Tone, City Sunset 1.85:1, Oceanside 2.40:1, Pantone Skin Tone, Restaurant Scene, & Indian Market)
- **LG OLED Test Patterns** (2016 & 2017 Code Values)
- **HDR Clipping Test Patterns**
- **Digital Zone Plate Patterns**

R.Masciola's UHD|HDR-10 Pattern Suite

Miscellaneous Setup Patterns

- **Grid Pattern**
- **4% APL Window Patterns** (21 Step Grayscale & 50% Amp_50% Sat Color)
- **Frame Rate & Judder Patterns** (Judder Test 24 FPS, Judder Test 60 FPS, & Multi-Bar Judder Test 24 FPS)
- **Radial Gradient Patterns** (WRGBYCM)
- **Chroma Subsampling Patterns** (Chroma Subsampling 100 nit, 500 nit, & 1,000 nit)

Pattern Metadata

Video

ID:.....256(0x100)
Menu ID:.....1 (0x1)
Format:.....HEVC
Format/Info:High Efficiency Video Coding
Format profile:.....Main 10@L5.1@Main
Codec ID:.....36
Duration:.....1mn 0s
Width:.....3840 pixels
Height:.....2160 pixels
Display aspect ratio:.....16:9
Frame rate:.....23.976 (24000/1001)fps
Color space:.....YUV
Chroma subsampling:.....4:2:0 (Type 2)
Bit depth:.....10 bits
Writing library:.....x265 2.6+13-6b079854e56e:[Windows][GCC 7.2.0][64 bit] 10bit
Encoding settings: cpuid=1173503 / frame-threads=3 / numa-pools=8 / wpp / no-pmode / no-pme / no-psnr / no-ssim / log-level=2 / input-csp=1 / input-res=3840x2160 / interlace=0 / total-frames=1439 / level-idc=51 / high-tier=1 / uhd-bd=1 / ref=4 / no-allow-non-conformance / repeat-headers / annexb / aud / hrd / info / hash=0 / no-temporal-layers / no-open-gop / min-keyint=1 / keyint=24 / bframes=4 / b-adapt=2 / b-pyramid / bframe-bias=0 / rc-lookahead=25 / lookahead-slices=4 / scenecut=40 / no-intra-refresh / ctu=64 / min-cu-size=8 / rect / no-amp / max-tu-size=32 / tu-inter-depth=1 / tu-intra-depth=1 / limit-tu=0 / rdoq-level=2 / dynamic-rd=0.00 / no-ssim-rd / signhide / no-tskip / nr-intra=0 / nr-inter=0 / no-constrained-intra / no-strong-intra-smoothing / max-merge=3 / limit-refs=3 / limit-modes / me=3 / subme=3 / merange=57 / temporal-mvp / weightp / no-weightb / no-analyze-src-pics / deblock=0:0 / sao / no-sao-non-deblock / rd=4 / no-early-skip / rskip / no-fast-intra / no-tskip-fast /

no-cu-lossless / no-b-intra / rdpenalty=0 / psy-rd=2.00 / psy-rdoq=1.00 / no-rd-refine / analysis-mode=0 / no-lossless / cbqpoffs=0 / crqpoffs=0 / rc=abr / bitrate=50000 / qcomp=0.60 / qpstep=4 / stats-write=0 / stats-read=0 / vbv-maxrate=70000 / vbv-bufsize=50000 / vbv-init=0.9 / ipratio=1.40 / pbratio=1.30 / aq-mode=1 / aq-strength=1.00 / cutree / zone-count=0 / no-strict-cbr / qg-size=32 / no-rc-grain / qpmax=69 / qpmin=0 / sar=1 / overscan=0 / videoformat=0 / range=0 / colorprim=9 / transfer=16 / colormatrix=9 / chromaloc=1 / chromaloc-top=2 / chromaloc-bottom=2 / display-window=0 / master-display=G(13250,34500) B(7500,3000) R(34000,16000) WP(15635,16450) L(5400000,0) / max-cll=0,0 / min-luma=0 / max-luma=1023 / log2-max-poc-lsb=8 / vui-timing-info / vui-hrd-info / slices=1 / opt-qp-pps / opt-ref-list-length-pps / no-multi-pass-opt-rps / scenecut-bias=0.05 / no-opt-cu-delta-qp / no-aq-motion / hdr / no-hdr-opt / no-dhdr10-opt / refine-level=5 / no-limit-sao / ctu-info=0
Color range:.....Limited
Color primaries:.....BT.2020
Transfer characteristics:.....SMPTE ST 2084 (PQ)
Matrix coefficients:.....BT.2020 non-constant
Mastering display color primaries:.....R: x=0.680000 y=0.320000, G: x=0.265000 y=0.690000, B: x=0.150000 y=0.060000, White point: x=0.312700 y=0.329000
Mastering display luminance:.....min: 0.0005 cd/m2 , max: 1000.0000 cd/m2
Maximum Content Light Level:.....1000 cd/m2
Maximum Frame Average Light Level:.....400 cd/m2

Pattern Metadata

Audio

ID:.....257 (0x101)
Menu ID:.....1 (0x1)
Format:.....AAC
Format/Info:.....Advanced Audio Codec
Format version:.....Version 2
Format profile:.....LC
Muxing mode:.....ADTS
Codec ID:.....15
Duration:.....1mn 2s
Channel(s):.....2 channels
Channel positions:.....Front: L R
Sampling rate:.....48.0 KHz
Frame rate:.....46.875 fps (1024 spf)
Compression mode:.....Lossy