

# AVSHD

ITU-R BT.709

## Contents

---

1-3	Menu and Patterns
4-7	Basic Settings Instructions
8-12	Misc. Patterns Instructions
13-14	Resolution Images
15	Definition of Terms

# MENU AND PATTERNS

The HD DVD version of **AVS HD 709** consists of twelve video sections on one menu. The Basic Settings, Misc. Patterns, and Resolution sections require no test equipment beyond possibly a color filter, and the other sections are included for grayscale and color measurements. Each section has a number of patterns divided into 2-minute chapters. There will be a short description here for the different items that appear on the menu, followed by a list of the sections and related chapters. The number symbol (#) indicates a title number for the section that might appear on your disc player, and the chapter numbers are shown in italics. The disk is generally intended to be navigated by choosing a section from the menu, chapter skipping between patterns within the section, and returning to the menu to choose a different section.

## Title Menu

**BASIC SETTINGS** – Used for setting black-level, white-level, color, tint, sharpness, and screen position. Instructions are provided later in this document.

**10% GRAYSCALE** – Measurement windows in 10% steps (*1-11*) and above white (*12*).

**5% GRAYSCALE** – Windows with 5% steps (*1-21*) and above white (*22-23*). In ColorHCFR 5% patterns can be measured by changing the grayscale levels parameter to 20.

**75% or 100% COLORS** – Color windows for measurements. Chapters *1-7* are arranged for ColorHCFR primaries and secondaries. Chapters *7-14* are arranged for CalMAN.

**ADJUST GRAY** – Windows (*1-6*), levels patterns (*7-9*), and fields (*10-15*) for initial grayscale adjustments. The grayscale portion allows for 25% step measurements and a check of above white. In ColorHCFR 25% grayscale can be measured by changing the grayscale levels parameter to 4.

**CONTRAST** – This section includes windows (*1-2*) or fields (*5-6*) for on/off contrast and ANSI patterns (*3-4* or *7-8*). Chapters *1-4* will work for most ColorHCFR users measuring contrast.

**MISC. PATTERNS** – Intended for various video adjustment applications, see provided instructions later in this document.

**NEAR BLK/WHT** – Windows (*1-10*) or fields (*11-20*), for measurements with the ColorHCFR near black scale (*1-5* or *11-15*) and near white scale (*6-10* or *16-20*). The near black patterns include labels that are below-black and can be viewed if black-level is increased. The readout on the player is generally intended to be used to check which pattern is currently displayed, and it should be understood that the patterns automatically advance to the next approximately every two minutes unless paused.



Basic Settings  
10% Grayscale  
5% Grayscale  
75% Colors  
100% Colors  
Adjust Gray  
Contrast  
Misc. Patterns  
Near Blk/Wht  
Resolution  
Saturation  
Uniformity

**RESOLUTION** – Images to check for scaling on 1080p displays. If none of the electronic components resize the image, then a 1080p display would typically be expected to show the single pixel patterns in this section. Further information appears later in this document in the Resolution Images section.

**SATURATION** – Windows for saturation scale measurements in ColorHCFR.

**UNIFORMITY** – Fields for measurements or for observing uniformity. This section includes 10% grayscale (1-11), above white (12), 75% color (13-19), and 100% color (20-26) patterns.

#### **BASIC SETTINGS - #1**

- 1 Black Clipping Pattern
- 2 APL Clipping Pattern
- 3 White Clipping Pattern
- 4 Flashing Color Bars
- 5 Sharpness and Overscan

#### **10% GRAYSCALE - #2**

- 1 0% Black Field
- 2 10% Gray Window
- 3 20% Gray Window
- 4 30% Gray Window
- 5 40% Gray Window
- 6 50% Gray Window
- 7 60% Gray Window
- 8 70% Gray Window
- 9 80% Gray Window
- 10 90% Gray Window
- 11 100% White Window
- 12 109% Above White Win.

#### **5% GRAYSCALE - #3**

- 1 0% Black Field
- 2 5% Gray Window
- 3 10% Gray Window
- 4 15% Gray Window
- 5 20% Gray Window
- 6 25% Gray Window
- 7 30% Gray Window
- 8 35% Gray Window
- 9 40% Gray Window
- 10 45% Gray Window
- 11 50% Gray Window
- 12 55% Gray Window
- 13 60% Gray Window
- 14 65% Gray Window
- 15 70% Gray Window
- 16 75% Gray Window
- 17 80% Gray Window
- 18 85% Gray Window
- 19 90% Gray Window
- 20 95% Gray Window
- 21 100% White Window
- 22 105% Above White Win.
- 23 109% Above White Win.

#### **75% COLORS - #4**

- 1 75% Red Window
- 2 75% Green Window
- 3 75% Blue Window
- 4 75% Yellow Window
- 5 75% Cyan Window
- 6 75% Magenta Window
- 7 75% Gray Window
- 8 75% Red Window
- 9 75% Green Window
- 10 75% Blue Window
- 11 75% Cyan Window
- 12 75% Magenta Window
- 13 75% Yellow Window
- 14 100% White Window

#### **100% COLORS - #5**

- 1 100% Red Window
- 2 100% Green Window
- 3 100% Blue Window
- 4 100% Yellow Window
- 5 100% Cyan Window
- 6 100% Magenta Window
- 7 100% White Window
- 8 100% Red Window
- 9 100% Green Window
- 10 100% Blue Window
- 11 100% Cyan Window
- 12 100% Magenta Window
- 13 100% Yellow Window
- 14 100% White Window

#### **ADJUST GRAY - #6**

- 1 0% Black Field
- 2 25% Gray Window
- 3 50% Gray Window
- 4 75% Gray Window
- 5 100% White Window
- 6 109% Above White Win.
- 7 Black Clipping Pattern
- 8 APL Clipping Pattern
- 9 White Clipping Pattern
- 10 0% Black Field
- 11 25% Gray Field
- 12 50% Gray Field
- 13 75% Gray Field
- 14 100% White Field
- 15 109% Above White Fld.

### CONTRAST - #7

- 1 0% Black Field
- 2 100% White Window
- 3 Center Modified ANSI Contrast
- 4 Reverse Modified ANSI Contrast
- 5 0% Black Field
- 6 100% White Field
- 7 ANSI Contrast
- 8 Reverse ANSI Contrast

### MISC. PATTERNS - #8

- 1 Grayscale Ramp
- 2 Grayscale Steps
- 3 Color Steps
- 4 Flashing Primary Colors
- 5 Flashing Color Decoder
- 6 RGB Low Clipping
- 7 RGB High Clipping
- 8 Dynamic and Center
- 9 Crosshatch with Circles
- 10 Small 1080p Crosshatch
- 11 Star Chart
- 12 Backlight Comparison
- 13 Constant Height 2.35:1

### NEAR BLK/WHT - #9

- 1 0% Black Field
- 2 1% Gray Window
- 3 2% Gray Window
- 4 3% Gray Window
- 5 4% Gray Window
- 6 96% Gray Window
- 7 97% Gray Window
- 8 98% Gray Window
- 9 99% Gray Window
- 10 100% White Window
- 11 0% Black Field
- 12 1% Gray Field
- 13 2% Gray Field
- 14 3% Gray Field
- 15 4% Gray Field
- 16 96% Gray Field
- 17 97% Gray Field
- 18 98% Gray Field
- 19 99% Gray Field
- 20 100% White Field

### RESOLUTION - #10

- 1 Checkerboard Pattern
- 2 Single Black Pixels
- 3 Vertical Resolution -1 Pixel
- 4 Horizontal Resolution -1 Pixel
- 5 Vertical Resolution - 2 Pixel
- 6 Horizontal Resolution - 2 Pixel
- 7 Vertical Resolution - 3 Pixel
- 8 Horizontal Resolution - 3 Pixel

### SATURATION - #11

- 1 0% Red Sat. Window
- 2 25% Red Sat. Window
- 3 50% Red Sat. Window
- 4 75% Red Sat. Window
- 5 100% Red Sat. Window
- 6 0% Green Sat. Window
- 7 25% Green Sat. Win.
- 8 50% Green Sat. Win.
- 9 75% Green Sat. Win.
- 10 100% Green Sat. Win.
- 11 0% Blue Sat. Window
- 12 25% Blue Sat. Window
- 13 50% Blue Sat. Window
- 14 75% Blue Sat. Window
- 15 100% Blue Sat. Window
- 16 0% Yellow Sat. Win.
- 17 25% Yellow Sat. Win.
- 18 50% Yellow Sat. Win.
- 19 75% Yellow Sat. Win.
- 20 100% Yellow Sat. Win.
- 21 0% Cyan Sat. Window
- 22 25% Cyan Sat. Window
- 23 50% Cyan Sat. Window
- 24 75% Cyan Sat. Window
- 25 100% Cyan Sat. Window
- 26 0% Magenta Sat. Win.
- 27 25% Magenta Sat. Win.
- 28 50% Magenta Sat. Win.
- 29 75% Magenta Sat. Win.
- 30 100% Magenta Sat. Win.

### UNIFORMITY - #12

- 1 0% Black Field
- 2 10% Gray Field
- 3 20% Gray Field
- 4 30% Gray Field
- 5 40% Gray Field
- 6 50% Gray Field
- 7 60% Gray Field
- 8 70% Gray Field
- 9 80% Gray Field
- 10 90% Gray Field
- 11 100% White Field
- 12 109% Above White Fld.
- 13 75% Red Field
- 14 75% Green Field
- 15 75% Blue Field
- 16 75% Yellow Field
- 17 75% Cyan Field
- 18 75% Magenta Field
- 19 75% Gray Field
- 20 100% Red Field
- 21 100% Green Field
- 22 100% Blue Field
- 23 100% Yellow Field
- 24 100% Cyan Field
- 25 100% Magenta Field
- 26 100% White Field

# BASIC SETTINGS INSTRUCTIONS

Typical digital displays have controls for black-level (brightness), white-level (contrast or picture), color, tint (hue), and sharpness. This section contains three clipping patterns for setting black-level and white-level, color bars for setting color and tint, and a pattern primarily intended for adjusting sharpness. Directly below is a simple description of how to use this section for setting each basic user control, and further details follow in the complete descriptions for the Basic Settings chapters.

**BLACK-LEVEL** – Look at chapters 1 and 2. Typically set the brightness control to the lowest setting where the bars numbered 17-25 flash. For chapter 2 it may be more difficult to see 17 flash, and we suggest setting brightness no lower than where 19-25 flash. Many displays can use a similar brightness setting for chapters 1 and 2, but use the higher setting if results differ significantly.

**WHITE-LEVEL** – Look at chapters 2 and 3. Generally set the contrast control as high as possible, so long as most all the bars numbered 230-253 flash. For a less-conservative approach, or for displays that do not display 235-253, flashing bars 230-234 is also acceptable. You may also want to look at items such as color shift or eyestrain, which are mentioned in the White Clipping Pattern description.

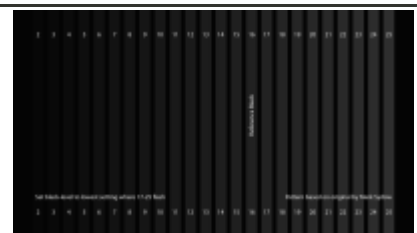
**COLOR** – Look at chapter 4 through a blue filter. Adjust the color control to find a setting where the flashing boxes labeled color most closely match the bar.

**TINT** – Look at chapter 4 through a blue filter. Adjust the tint control so that the flashing boxes marked tint most closely match the bar.

**SHARPNESS** – Go to chapter 5. Set sharpness low enough so that no light edges form on the black objects such as the large square, but not so low that the black objects blur into the gray. If the black objects never lose definition and blur into the gray, then you may set sharpness to minimum.

## 1 - Black Clipping Pattern

This is a very low APL pattern for observing black-level on a digital display. When setting black-level (brightness) the basic idea is that you want to set the control as dark as possible without losing detail. A setting that is too high unnecessarily raises the brightness of black to washout the image, and a too low setting will cause a loss of detail. Ideally you want the darkest blacks with all the intended detail, which is indicated by 17 still flashing.

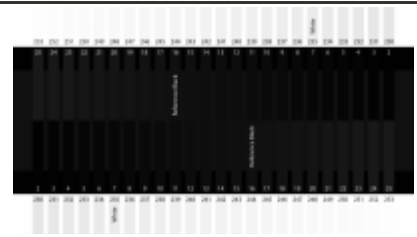


To get an idea how this pattern works, begin by setting brightness very high. With brightness set very high you should see this pattern contains a number of vertical bars flashing over top of a dark background. As you lower the brightness controls you will see the lower numbered bars disappear into the background. To get the darkest black possible without losing detail, you want to turn down brightness to the lowest setting where 17 continues to just barely flash. If your display is able to show the flashing bars numbered 2-16, ideally when you are done the bars from 16 down will blend together so that you can only see 17-25 flash. Basically for a digital display, just set brightness as dark as possible so that 17 remains flashing.



## 2 - APL Clipping Pattern

This pattern is very similar to the first, but it has a higher APL and shows the levels around white (235) that will be discussed with the next pattern. Like the first pattern, this can also be used for setting black-level. The idea is similar, to set the black-level as dark as possible while retaining the intended detail.

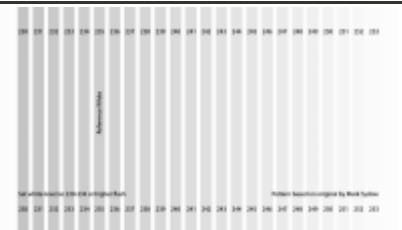


Again if you start by setting the brightness too high you can see the flashing bars that are included in the dark portion of the image. The middle of the dark area flashes reference black (16) and the portion of the image near the numbers works exactly like the Black Clipping Pattern. As you turn down the black-level (brightness) control, the lower numbered bars will blend with the background. Ideally you would want 2-16 to blend together as a dark shade of black and for 17 to just barely flash. Because of the bright white in the image, and because reference black is used for flashing in the middle, it might be harder to see the bars near 17 flash than with the first pattern. At the very minimum we suggest turning brightness no lower than where it is possible to see 19-25 flash if you look very closely.

One use for this pattern is to check the setting given by the Black Clipping Pattern. On many digital displays the same black-level setting received from the first pattern will also work with this pattern. Every TV might not be able to use the black-level setting from the Black Clipping Pattern, because some TVs might vary black-level with different APL images. If you find that the first and second patterns clearly require different brightness settings with your display, we would suggest using the higher of the two settings to try to avoid unnecessary clipping and loss of detail near black.

## 3 - White Clipping Pattern

This very high APL pattern can be used to observe clipping near white on digital displays. Somewhat similar to the Black Clipping Pattern, you can lower the white-level (contrast or picture) control and you should see a number of vertical flashing bars. If you see no flashing at all, then either the source or display is clipping near-whites. Typically that should not be an issue, but if you happen to run into a situation where lowering contrast at the display still does not begin to show any flashing, then you next need to check either the player or any other sources in the video chain of the electronics to find which device is clipping the signal. Because of the very high APL of this pattern, you might also want to check levels on the APL Clipping Pattern, but for simplicity this document will only discuss white-levels once.



Our suggestion will be to avoid any clipping before the signal gets to the display, to ensure the best video quality possible. That means if you turn down contrast at the display, and turn off any clipping controls a few TVs may have, ideally you want to be able to see the bars above 235 flash to ensure the entire signal reaches the display. One example of a situation where the entire signal might not reach the display is that some receivers have been reported to clip, and in that case you might never be able to see levels 235-253 flash without updating the equipment or not passing the video through the device. Most importantly you should always see flashing grays from 230 to 234 with this pattern on digital displays, but if possible it might be preferable if your electronics allow you to see the vertical bars numbered higher than white (235) flash with this pattern when turning down white-level at the display.

Generally you want to have the white-level control set about as high as possible, as long as it does not introduce any detrimental effects. We will suggest starting with a high contrast setting, and then looking for any issues that might require turning down white-level. This [link from Michael TLV](#) mentions checking (1) clipping, (2) discoloration, and (3) eye-fatigue when setting white-level.

1. As long as you can see the bars marked 230-234 flash, essentially clipping is fine and you have finished with this item. If you cannot see 230- 234 flash, then you need to turn down white-level until they flash. A more conservative approach is to set white-level no higher than where most all the bars flash. It is perfectly acceptable if your display never clips near 235 and if you can always see the bars brighter than 235 flash, but the minimum is flashing from 230 to 234.
2. For discoloration, you generally want to see if you can notice any change in shade of grays near white as you adjust the white-level setting. With some displays increasing contrast beyond a point might cause the bright grayscale to begin to have a pinkish or other colored tint. If you cannot spot a change in tint by turning down contrast, then the second item is satisfied.
3. You could watch a movie to make sure whites appear relatively bright and you do not encounter eyestrain. Having eyestrain when watching would indicate a need to dim the display. If your TV seems too bright and has a backlight setting or iris control, you might try turning the setting down, which will also give you darker blacks. If the TV is still too bright after lowering those controls, then white-level could also be lowered to avoid eye-fatigue.

We mention a few white-level items in the Misc. Patterns section, and measurements can give more objective information, but generally the items mentioned above are the most straightforward issues to watch for in setting white-level. If your contrast is at a high setting where at least 230 to 234 flash, and there does not appear to be any discoloration or eye-fatigue watching, then congratulations you are done setting white-level. If you have tried to follow the above items and cannot spot any of the possible detrimental effects mentioned, and would simply like to error on the side of caution, then merely set contrast as high as it can go while you can still see that most all of the bars numbered higher than 235 flash. Some manufacturers seemingly have tried to limit the amount of possible error the white-level control can introduce, so even on the absolute highest contrast setting some digital displays may never clip levels lower than 253 and it could be difficult to clearly spot any of the items discussed.

## 4 - Flashing Color Bars

This pattern is used to set color and tint controls with a blue filter. If your display is one of the few that includes a blue only mode, that can be used in place of a blue filter. Different ways to get color filters include ordering the [THX Glasses](#), obtaining [Lee Filters \(#71, #106, #139\)](#), getting another calibration disc that has filters such as [DVE](#) and [Avia](#), or ordering the [Avia filters](#). While using a colorimeter or spectroradiometer might give a better level of accuracy than a filter, what we will describe here is using a blue filter to set color and tint.



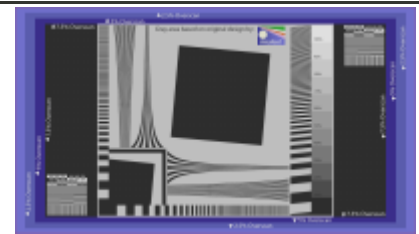
The gray bar at the left has a flashing blue box and the blue bar has a flashing gray box. Look through a blue filter at these two bars. As you raise and lower the color control you will see the gray and blue change relative to each other. You want to set the color control so gray and blue match. Ideally when this happens you would see almost no flashing on the boxes through the blue color filter. Realistically you might always be able to see a little bit of flashing, and if that's the case

then just set the color control so that gray and blue come as close as possible to matching.

The magenta and cyan bars also have flashing boxes with the other color. Looking through the blue filter, you use these two bars to adjust the tint (hue) control. The idea is similar to setting the color control. Ideally you would not want to see any flashing when looking through the blue filter, but just use the tint control to get them to look as close as possible.

## 5 - Sharpness and Overscan

This pattern can be used to center the screen on rear-projection TVs, which is done by simply adjusting screen position to even out blue along the vertical and horizontal edges. For TVs that do not overscan, there is a white single-pixel outline on the pattern to indicate that the image lacks overscan. In the upper right and lower left corners inside the blue there are also single-pixel patterns to check for scaling with 1080p displays. Primarily though



this pattern is included in order to set sharpness. To get some idea about what will be discussed, you first might want to see if you can notice any on-screen differences in this pattern between setting sharpness at maximum and setting sharpness to minimum. Try looking closely and see if you can pick out any changes in the image by altering the sharpness setting. With some TVs a higher setting might just tend to make the curved lines blocky, rather than smooth like in the original image.

Some displays can simply use sharpness at minimum, and others need to be set. When adjusting sharpness, the most basic item to look for is if a white edge or halo forms between objects when sharpness is set high. The original image contains no white between objects, so for example if a lighter edge were to form along the outside of the large square then sharpness would need to be turned down. One item to look for when turning sharpness down is if the edges between shades begin to blur together. For example, if the TV exhibits blurring with a low sharpness then the black from the square might intrude into the gray. For 1080p displays, another item to watch for when turning sharpness down is if the white dots included in the black areas remain single pixels like in the original image, or if they become stretched as sharpness is lowered. If your TV has a sharpness control and does not distort the image as sharpness is turned down, then you simply might be able to set sharpness to minimum.

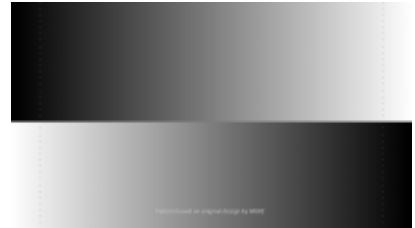
Sony SXR-D is an example of a TV that generally requires a sharpness setting above minimum. If you look at the edges between different items in the pattern, this type of display will introduce white when sharpness is adjusted too high. The most pronounced effect, and often easiest to see, are the white halos formed along vertical edges when sharpness is set too high. On the other hand SXR-D cannot simply have sharpness set to minimum, because they tend to lose edges and blur objects together if sharpness is too low. On the SXR-D the white dots in the image can become stretched out or repeated into the black when sharpness is set too low, and the black square will intrude into the gray with a low sharpness setting. Generally the way to use the pattern with a TV that requires a sharpness setting above minimum is to set the control high enough so that edges between colors do not become blurred together, but not so high that white edges are formed. For a display like SXR-D that cannot simply use sharpness at minimum, we suggest choosing a setting between where you begin seeing white halos (sharpness too high) and where you can begin to see objects become blurred (sharpness too low).



# MISC. PATTERNS INSTRUCTIONS

## 1 - Grayscale Ramp

The ramp exhibits the entire grayscale range from 1 to 254. The white dots indicate the location of black (16) and the black dots indicate white (235). Like with all the grayscale patterns, this one would be expected to display a neutral gray across the image. That simply means that you would ideally want the pattern to show a change in brightness across the range with little to no introduction of a colored tint. For example with some displays increasing the contrast setting could possibly cause the tint for the lighter portion to change, and by slightly lowering contrast the tint across the image might be more uniform. Because the image includes the entire grayscale range, you may also be able to observe clipping for black-level and white-level controls with this pattern.



## 2 - Grayscale Steps

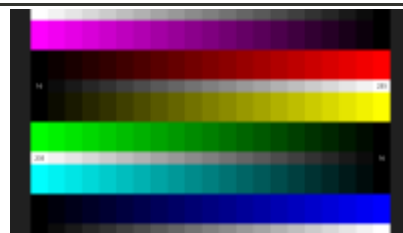
This image shows grayscale bars from black to white (16 to 235) at 5% steps, a 5% above white (246) and below-black (5) bar, and a bar for maximum-white (254) and minimum-black (1). The 5% bars are all the same width, but some displays will never show the two bars brighter than white or the two bars darker than black. When black-level (brightness) is set properly, the bars darker than black should blend with black. The bars between black and white should be distinct from each other, and should not blend together. Any blending together of bars between black and white, where one bar cannot be distinguished from another, would typically indicate a problem that might be able to be corrected with settings for the electronics.



The steps between bars are generally intended to be perceptually uniform. Each bar going up from black to white should seem to increase in brightness by about the same amount as the previous step. If you cannot tell one bar apart from another between black and white, you will lose detail in that range of brightness when watching the display. For example with some digital displays, a very high contrast setting might cause the TV essentially to run out of brightness so that the top steps approaching white no longer appear to increase as much as the prior steps do. The same can happen near black where for example you might not be able to differentiate black and the bar 5% brighter than black. Using measurements a lack of increasing brightness would show up in gamma, but this image can be used to pick out certain issues where the steps between black and white do not increase by a seemingly similar amount of brightness.

### 3 - Color Steps

The image contains bars, from level 16 to 235 at 5% steps, for each of the primary and secondary colors. There are matching gray levels next to each color bar. Similar to the previous grayscale pattern, the 5% steps from one bar to the next are generally intended to be perceptually uniform. Each bar going up from 16 to 235 should seem to increase in brightness by approximately the same amount as the previous step. It is possible that a white-level, or other control on the display, could possibly alter the steps and affect if they appear to increase by a seemingly similar amount of brightness from one bar to the next. This pattern is primarily included to observe by eye how the colors change in comparison to the grayscale from 16 to 235.



### 4 - Flashing Primary Colors

This pattern shows red, green, and blue bars (primary colors) with gray and the two 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 flash between each other. Like with the Flashing Color Bars pattern from the Basic Settings section, this image can be used with color filters for adjusting color and tint (hue) controls. When you look through the blue filter you will be looking at the flashing blue bar, use the red filter to look at the vertical red bar, and a green filter with the green bar.



The idea of this pattern is very similar to the Flashing Color Bars, but it also allows you to observe red and green primaries instead of just blue. With a perfect setup there would be the same amount of blue in the blue, gray, cyan, and magenta - all the colors that appear in the vertical blue bar. The same holds true for the red and green bars compared with the related colors that flash there also. Ideally all the colors that flash on the vertical bar would be the same brightness when viewed through the corresponding filter. You can follow the adjustment steps from the Flashing Color Bars description with the blue bar here. The easiest control to watch work will probably be color. When you adjust the color control you will almost certainly see the flashing gray change in relation to the bar when looking through the color filter. You should see that the flashing colors other than gray (the secondary colors) on each bar will change when you adjust the tint control. The two secondary colors at the top and bottom of each primary color bar can be used to set tint (hue), just like how magenta is compared against cyan in the Flashing Color Bars description.

In the end you just want to get the flashing stripes on each bar to most closely match the bar. Realistically you'll probably always see some bit of difference between the flashing colors on the bar you're looking at through the color filter, because there's only so much that can be done with user color and tint controls. Also color filters are certainly not perfect, so you simply want to find a good compromise. If you would like another description on how to use patterns like this to adjust color and tint, you might want to read the "COLOR BARS" and "MISCELLANEOUS - Tricolor" sections from the [Avia II Advanced Patterns PDF](#). If looking at the Avia descriptions, it is generally most important to notice which colors are next to each other in the different patterns they describe using. In addition, it might be helpful to know Avia uses the word saturation to mean color control, which is different from how we define saturation for this document.

## 5 - Flashing Color Decoder

This pattern can be used to observe how the primary colors (red, green, blue) relate to gray. When looking through the color filter that corresponds to the primary color (ex. blue filter when looking at blue), you will see that one or possibly two of the bars for that color most closely matches gray. That most closely matching bar gives you an idea how that color relates to gray. The middle bar (0) would mean that the color is right on and your setting matches gray as intended, while the negative (-) and positive (+) bars to the left and right indicate a low or a high color setting.

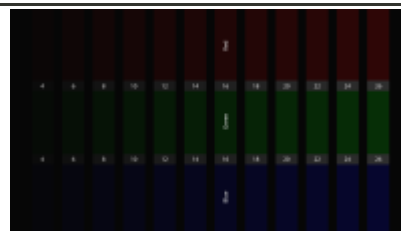


As you adjust the color control, you will see that the most closely matching bar varies depending on the color setting. Ideally you would want all of the bars to match at 0. Most likely though, if one color is closest to 0 then the others might be high or low. Getting blue to match gray is the way color is typically set, but this pattern will also allow you to observe what that does to red and green in relation to gray. Having red come close to matching gray when looking through the red filter is another way to set color, but you do not necessarily want to do that at the expense of blue. The idea is generally to choose a setting you consider the best compromise for all three colors.

The Avia II descriptions mentioned for the previous pattern again might help you decide upon a final color setting. If you look at the Avia text, then this pattern is similar to their "Color Decoder" pattern. There are labeling differences between this pattern and what Avia shows, but the general idea about setting color is along the same lines as described in their document.

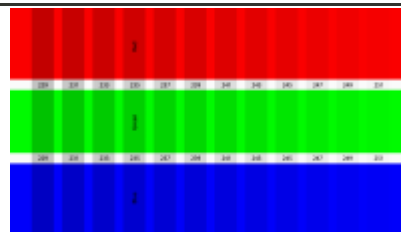
## 6 - RGB Low Clipping

This pattern is similar to the Black Clipping Pattern, and likewise the image is intended to look at the black-level setting. The major difference with this pattern is that it splits the vertical bars into red, green, and blue. Flashing gray is still included behind the lettering that labels the digital brightness values. Instead of labeling 16 as black, the bar is marked as red, green, and blue to remind the user that 16 and the lower levels to the left are allowed to clip or blend together. With this pattern you might find that red, green, and blue clip at slightly different levels near black.



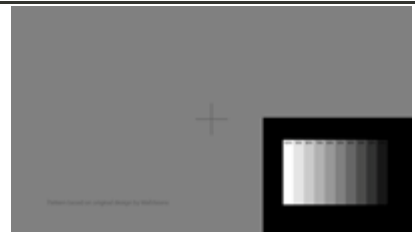
## 7 - RGB High Clipping

The clipping pattern here is very similar to the White Clipping Pattern. The major difference with this pattern is that it splits the vertical bars into red, green, and blue. Flashing gray is still included behind the lettering that labels the digital values. Instead of labeling 235 as white, the bar is labeled as red, green, and blue to remind the user that 235 and higher values to the right are allowed to blend together or clip. Using this pattern you may find that red, green, and blue do not necessarily clip at exactly the same levels.



## 8 - Dynamic and Center

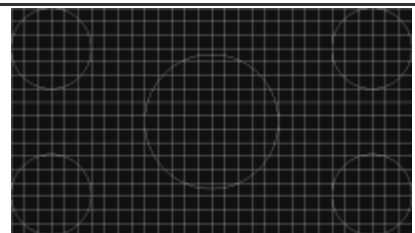
Primarily this pattern is included to quickly observe any possible changes that might occur as APL varies. When the background changes, that alters APL. The pattern can show if your TV has a tendency to adjust levels depending upon the on-screen APL, and it may allow you to observe some effects of certain settings. The pattern also includes a center symbol (+) for aligning measurement equipment in the middle of the screen.



With TVs that have an adjusting iris or backlight, you might notice that the grayscale bars in the lower right corner could change shade depending upon the APL. On some displays the bars in the lower right corner might even blend together at different APL levels, which would indicate a loss of detail. Ideally the grayscale bars in the corner of this pattern would remain about the same shade regardless of the background currently displayed, and the bars would be distinct from each other and never blend, but that might not be possible with all displays. The pattern can simply allow you to observe how your display may react differently depending upon chosen settings. For example you may find that by turning off an adjusting iris, or some other type of dynamic setting, the grayscale bars no longer have the same amount of shift in brightness depending upon the current APL.

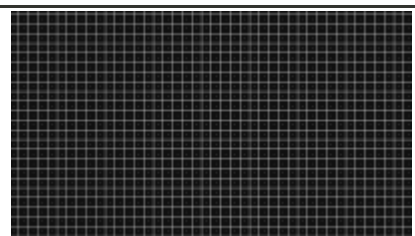
## 9 - Crosshatch with Circles

This pattern can be used to observe such things as convergence and geometry on projection or CRT displays, and the pattern is not intended for fixed-pixel displays such as plasma and direct-view LCD. The image consists of white lines on a black background, so if there is mis-convergence with your display you might be able to see the red, green, and blue that make up white. Certain displays will have controls to correct for mis-convergence, and in such a case you would attempt to get the red, green, and blue to align to create white. The white lines in the pattern are straight and any aberration would indicate geometry distortions, which can be corrected on some displays by physical adjustments or display controls. The outside circles might always go off the screen on rear-projection TVs, due to overscan.



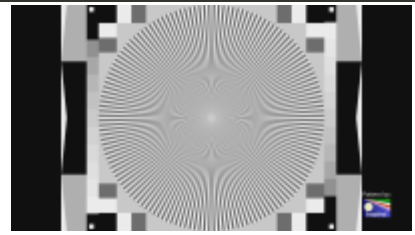
## 10 - Small 1080p Crosshatch

This crosshatch uses single pixel white lines for a more detailed look at convergence and geometry on 1080p displays that are displaying an unscaled signal. For a quick check of scaling, a single white pixel appears in the black area between the grid lines. There might be a bit of unintended flashing in the pattern that we were unable to eliminate with the video encoding. Some players will keep an image on-screen while paused, so if pausing the video is an option with your player it might help to stop any possible flashing on this pattern.



## 11 - Star Chart

Some TV settings can cause such things as jagged edges on diagonal lines and moiré when turned on. This gray pattern might allow you to observe some of the negative effects on image quality that certain sharpness related controls might introduce. On Sony displays for example the controls to look at with this pattern might be labeled detail enhancer and edge enhancer. The odd look in the center of the star is in the encoded image and comes from the pattern having been created by scaling down a much higher resolution original image.



## 12 - Backlight Comparison

For critical viewing, the general recommendation is to watch a display in a light-controlled room. While some large displays can be viewed in a completely unlighted room, for many displays there can be advantages to having a limited amount of light in the room. For example controlled light in the room may help to reduce eye fatigue compared to watching a TV in a totally dark room, and for some displays lighting may help to make the darkest shades appear blacker than in an unlighted room. One way to have a controlled amount of light in the room is to use backlighting, which is simply placing a neutral light behind the TV.



This pattern is intended for comparison while adjusting the brightness of backlighting. Ideally the area behind the display would be lighted no brighter than the right half and no darker than the left half of the on-screen image. The pattern simply offers a suggested range of how bright or how dark you may want to light your room. With a quality display only a limited amount of light is needed in the room, as indicated by the pattern, but for some displays with poor black-level performance it may help to make black appear darker by using more light in the room than this pattern suggests.

## 13 - Constant Height 2.35:1

This image is intended for 2.35:1 front projection. The vertical lines and circles in the corners are meant to check for distortions in the projected image.

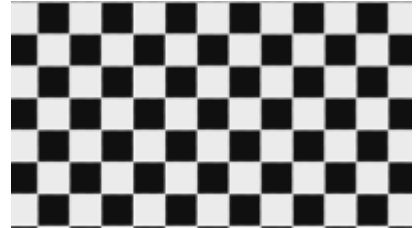




# RESOLUTION IMAGES

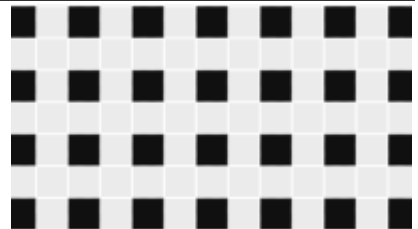
## **1 - Checkerboard Pattern**

Each pixel alternates between black and white in the original unscaled video.



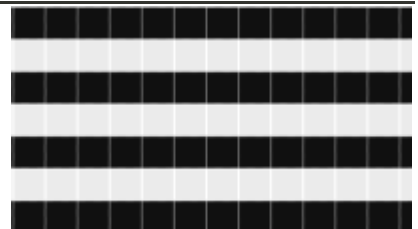
## **2 - Single Black Pixels**

White pixels separate each individual black pixel in the original unscaled video.



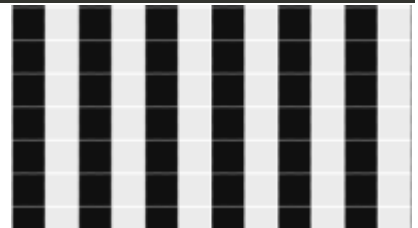
## **3 - Vertical Resolution – 1 Pixel**

Original unscaled video contains single pixel wide lines that alternate between black and white.



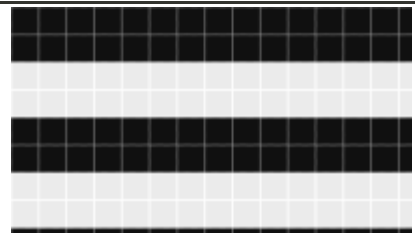
## **4 - Horizontal Resolution – 1 Pixel**

Original unscaled video contains single pixel wide columns that alternate between black and white.



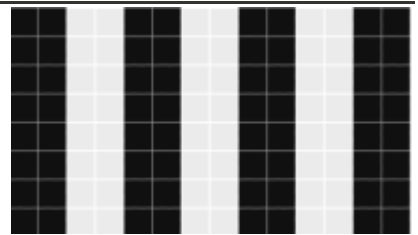
### 5 - Vertical Resolution – 2 Pixel

Original unscaled video contains two pixel wide lines that alternate between black and white.



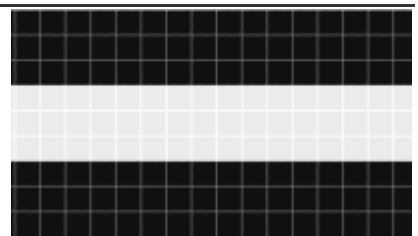
### 6 - Horizontal Resolution – 2 Pixel

Original unscaled video contains two pixel wide columns that alternate between black and white.



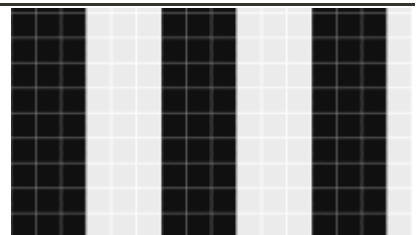
### 7 - Vertical Resolution – 3 Pixel

Original unscaled video contains three pixel wide lines that alternate between black and white.



### 8 - Horizontal Resolution – 3 Pixel

Original unscaled video contains three pixel wide columns that alternate between black and white.



# DEFINITION OF TERMS

## Average Picture Level (APL)

---

In this document average picture level is abbreviated as APL. Average picture level simply refers to the brightness of the image averaged across the whole screen. White is brighter than black, so a full screen of white would have a much higher APL than a full screen of black. A window only takes up a portion of the screen while a field takes up the whole screen, so a white window has a lower APL than a white field. While APL will vary during a movie for example, the average level of brightness across the screen for a majority of video content would generally come nearer to a full screen of black than a full screen of white.

APL does not matter with some displays for calibration, and it does matter with others. Many digital displays that fall into the categories of LCD, DLP, D-ILA, or SXRD might perform similarly regardless of APL. Other displays, such as Plasma or CRT, would generally be expected to vary to a greater extent depending upon APL of the displayed image. Because it is possible that the APL of a pattern might not represent typical video material and could affect how a display will perform, some patterns with a very high or low APL will be inappropriate to use with certain displays. For example due to APL the Black and White Clipping Patterns are generally not intended for CRT, and windows would typically be recommended for Plasma measurements instead of fields.

## Clipping

---

For our purpose here, clip or clipping has been used to describe a situation where you cannot tell a difference between lower or higher levels on the disc. For example as you turn down the brightness control while looking at the first pattern in the Basic Settings section, the lower numbered bars will begin to blend with the background and stop flashing on a digital display. We will use the term clipping to refer to similar situations where all the levels past a point appear the same. For example if brightness is lowered too far and you cannot distinguish 16 from 20 on the Black Clipping Pattern, then we would say the levels lower than 20 are being clipped.

## Percent (%)

---

The percent values shown for a pattern are generally relative to the 16-235 digital luma values for video, or percent stimulus, where 16 is at the level of black (0% gray) and 235 is the level of white (100% gray). For example 75% gray would be 3/4 of the way between 16 and 235, or it would have a luma value around 164. Commonly when a percentage (%) is listed for a pattern in this document, it is simply shorthand to indicate percent stimulus.

Two other situations where percentages are used include descriptions of steps and for saturation. The grayscale measurement sections are labeled as 10% grayscale for example, and this simply means that there is approximately a 10% stimulus step between each of the grayscale patterns from black to white. When percentage is listed for saturation, it just refers to how far the color falls between gray and maximum color saturation.

## Saturation

---

When saturation is listed, it refers to how far the color is away from gray (0% saturation) on a CIE xy grid. A color at maximum saturation would be noted as 100% saturation.