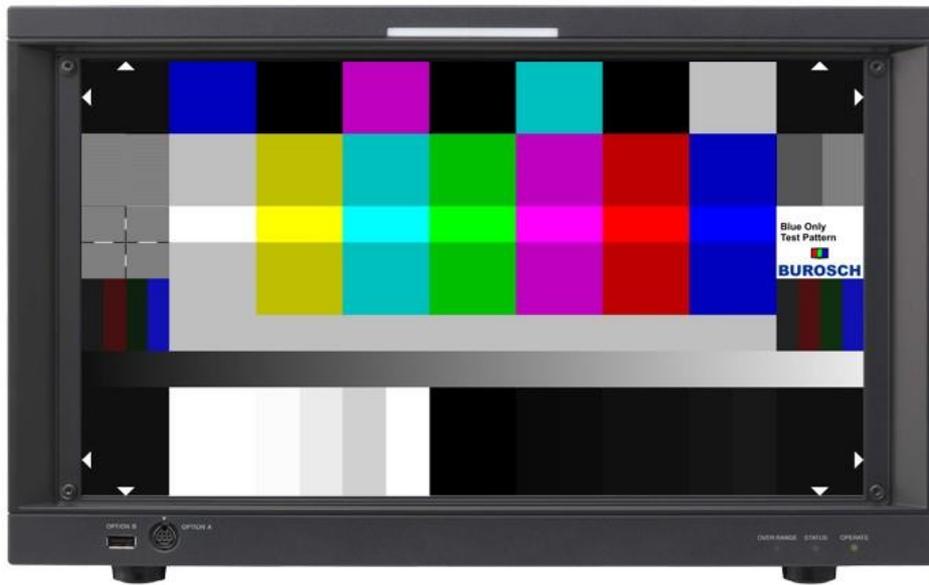


# BUROSCH



## Technical Documentation Blue Only Test Pattern

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## 2. Introduction

This documentation describes in detail the technical characteristics and possible uses of the Blue Only test pattern, which represents in essence a development of the ARIB test image.

We, the company Burosch Audio-Video-Technik have expanded the ARIB test pattern for some additional and in our opinion absolutely necessary functions for the HD usage. We have years of experience in the preparation of test patterns, and benefit from our recent developments in the field of HD playback. A test image is a visual and technical reference, so after adjusting with our reference test patterns you can assume, that you can see all the image details like in the original, recorder video material.

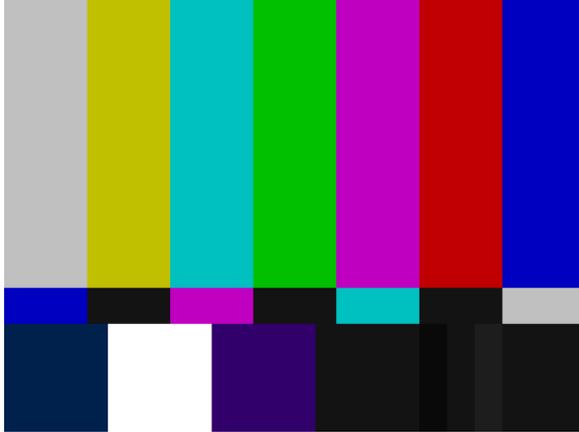
The goal should be: The unbiased, accurate and natural reproduction.

The emphasis in preparing this test image was an improved ability to adjust color precisely with the Blue Only Mode. In addition, we have extended the test image with the functions for adjusting overscan and sharpness. In addition, the test image contains control fields for interlaced and progressive transmission and color calculation for SD or HD.

The test image is, of course manufacturer independent. You can therefore use it due to the adjustment of projectors, LCD, plasma, LED, or even for CRT TVs.

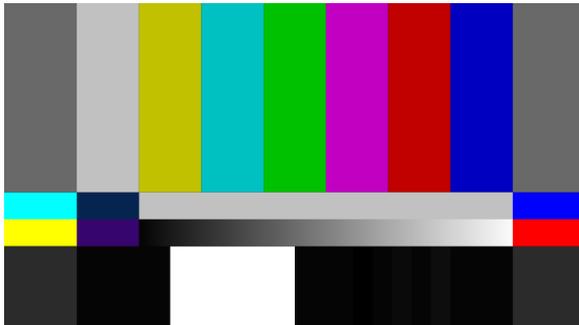
### 3. Basics

#### 3.1 SMPTE Color Bar



The left figure shows the SMPTE test pattern. This was developed in the 70s in America, to check NTSC display devices and the transmission paths. It has an aspect ratio of 4:3 and is also due to the used color coding limited usable for the verification of HD devices and signal paths.

#### 3.2 ARIB Test Pattern



It was developed by the Asian Association of Broadcasters - ARIB. Nowadays it is also standardized by the SMPTE. You can see, that the middle area of the test image is backward compatible to the NTSC test pattern. If you cut down the new 16:9 test pattern at the edges of the image, the contents are almost identical to the contents of the SMPTE 4:3 test image. The video range (normal range) was retained. But some modifications were made to the HD era. Thus there are at PLUGE (the

different black stripes down right) an extended gradation.

The rather extensive documentation of this test image can be found at:  
[http://www.arib.or.jp/english/html/overview/doc/6-STD-B28v1\\_0-E1.pdf](http://www.arib.or.jp/english/html/overview/doc/6-STD-B28v1_0-E1.pdf)

## 4. The Blue Only Test Pattern

This test image is aimed at professional users who need an desired functionality then the ARIB test pattern.

The Blue Only test image has been designed and developed in full HD with 1920 x 1080px. However, it can be used with some restrictions also on display devices with lower resolution in 16:9 format.

Many of our customers are familiar with the ARIB test pattern, but repeatedly complained the limited functionality of the ARIB test pattern. Therefore, we looked ad the SMPTE and ARIB test pattern and now introduce you to the Blue Only Test Pattern. A further test pattern, from Burosch Audio-Video-technik.

With the help of the Blue Only mode you can adjust the color rendering perfectly in terms of saturation and hue. We are able to take advantage of RGB additive color mixing. As shown in Figure 4.1 It's possible to mix different colors with the three primary colors red, green and blue. You see in the figure also the mixed complementary colors cyan, magenta, and yellow. A numerically equal mixture of the three primary colors will result in white or gray gradations.

If you run the test image on a display with lower resolution maybe errors occur in the test fields for sharpness and interlaced and progressive, so this functions can not be optimally adjusted.

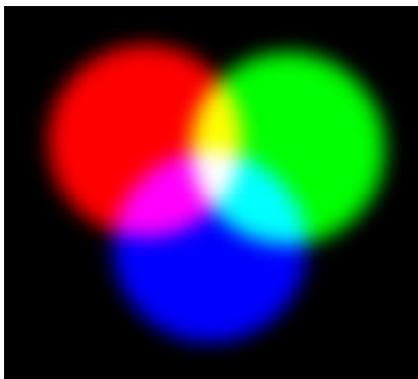
The settings for brightness, contrast and color can be used without restrictions.

This restriction applies to all display resolutions that are smaller than full HD 1920 x 1080px.

The test image is coded in 8 bit for the video range from 16 – 235. This is also called Normal Range.

But it also includes areas in full-range 0 / 0 / 0 and 255 / 255 / 255, this is pointed out separately below.

See also Chapter 7



**Figure 4.1** – Additive color mixing, red, green and blue produce white.

Yellow = Red + Green

Cyan = Blue + Green

Magenta = Red + Blue

## 4.1 Blue Only Mode

The Blue Only mode can be found in professional monitors in the broadcast area. With this mode you can perfectly adjust the color rendering of the display.

Meanwhile, some consumer manufacturers have also integrated this mode into their TVs.

Unfortunately, the Blue Only mode can often only be found at high-priced equipment in the professional area. As mentioned above, with the Blue Only mode you can adjust, the hue and color saturation perfectly.

If your display does not have a Blue Only Mode, you can order blue filters from us. Just hold the filter between your eyes and the display. So you get the same effect as in the Blue Only Mode, because the film transmits only the blue components of the image and the image looks blue colored to your eyes. If you still see other colors than blue, please double the filter, until you only see the color blue.

If in the following RGB values are specified, they always appear in the following order:

Red Green Blue.

Thus, for example has the color cyan, the 8 bit RGB code values 0 / 255 / 255. A mix of blue and green, without blue. In the Blue Only Mode, this bar appears black, because there is no blue in it.

See Figure 4.1.1

The colors white, cyan, magenta and blue however have in the blue channel the maximum code value of 255. So these areas appear white. See Figure 4.1.1.

To differ the Blue only Mode from Luminance Only Mode, the picture is often blue tinted.

It should be noted yet, that the code value 255 is for 100% saturated colors.

See also chapter 6.4



**Figure 4.1.1** – The blue channel of the Blue Only test pattern, right image: additional colored blue.

### Tip!

On the market are different blue filters and blue glasses available. These films have different spectral properties and filtering the red and green color display components out much differently. Therefore it can come to slightly variations in the adjusted display.



**Figure. 4.1.2**  
The Blue Only test pattern. This is the way your test image should look ideally.

### 5. The individual picture elements at a glance

<b>Line 1</b>	↙ Overscan 16 16 16	75% Blue 0 0 191	Black 0 0 0	75% Magenta 191 0 191	Black 0 0 0	75% Cyan 0 191 191	Black 0 0 0	75% White 191 191 191	↘ Overscan 16 16 16					
<b>Line 2</b>	Interlaced / Progressiv	75% White 191 191 191	75% Yellow 191 191 0	75% Cyan 0 191 191	75% Green 0 191 0	75% Magenta 191 0 191	75% Blue 0 0 191	Blue Only Test Pattern 255 255 255						
<b>Line 3</b>	Focus / Aperture	100% White 255 255 255	100% Yellow 255 255 0	100% Cyan 0 255 255	100% Green 0 0 255	100% Magenta 255 0 255	100% Blue 0 0 255							
<b>Line 4</b>	Rec. 709 27 71 16 16	75% White 191 191 191	75% Yellow 191 191 0	75% Cyan 0 191 191	75% Green 0 191 0	75% Magenta 191 0 191	75% Blue 0 191 0	Rec. 601 34 78 16 16						
<b>Line 5</b>	27 16 32 16	Grey Ramp 16 16 16 to 235 235 235												
<b>Line 6</b>	27 16 16 180	Grey Ramp 16 16 16 to 235 235 235												
<b>Line 7</b>	↙ Overscan 16 16 16	Contrast / Kontrast			Brightness / Helligkeit			↘ Overscan 16 16 16						
		255	251	235	208	255	0	10	12	16	20	24	24	24
		255	251	235	208	255	0	10	12	16	20	24	24	24
		255	251	235	208	255	0	10	12	16	20	24	24	24

**Figure 5.1**  
Structure of the Blue Only test pattern with the single 8 bit RGB code values at a glance. See also Chapter 7

## 5.1 Line 1 – Overscan and Blue Only reference fields

- On the edges of the test pattern are the markings for the overscan function. The white markings are in 8 bit RGB 255 / 255 / 255 coded. The background is black, in 8 bit as 16 / 16 / 16 coded.\*
- Between the image edge markings are alternate color and black areas, which are required to adjust the chrominance (color). These bars are identical to the bars below the color bars in the 4:3 NTSC SMPTE test pattern.

\* See also chapter 6.1.2 and 7

## 5.2 Line 2 – interlaced progressive fields and 75% color bar

- On the left side is the testing field to check for interlaced or progressive signal transmission.
- Alongside you see a 7 stripe color bar with 75% luminance.

## 5.3 Line 3 – 100% color bar

- In this line the 7 times color bar has a luminance of 100%. The White Squares, have a code value of 255 / 255 / 255.

## 5.4 Line 4 – Sharpness test field and 75% color bar

- See chapter 5.2
- As in Line 2 here is a 7 times color bar with 75% luminance located.
- In addition, located on the edge of the test pattern is a crosshair to adjust the sharpness / aperture.

## 5.5 Line 5 – Rec. 709 / Rec. 601 Luminance signal Y reference field

- On the left and right side of the test pattern, there are test fields with 4 different vertical color bars. With these test fields you can determine whether the test pattern is transmitted as an SD or HD signal and / or whether the luminance signal Y was calculated correctly according to the SD or HD Standard.
- In the middle of the test pattern is a gray area with 8 bit RGB code values (235 / 235 / 235) for adjusting the color in the Blue Only mode.

## 5.6 Line 6 – Gray Ramp

- With this Gray Ramp (the ARIB standard calls it Y ramp signal) quantization errors can easily be detected.  
In addition, the ramp can help to discover possible non-linear gamma distortions.

## 5.7 Reihe 7 – Overscan and brightness / contrast / Pluge

- On the edges of the test pattern are markings to adjust the overscan. The white markings are in coded 8 bit RGB with 235 / 235 / 235. The background is black, which in turn is in 8-bit encoded as 16 / 16 / 16.\*
- In between you can see various white and black levels that can be used to adjust brightness and contrast, and also to define the video range (normal range 16 - 235 as well as Full or Extended Range) can be verified.  
Details see Chapter 6.1 and 6.2

## 6. The application of the test image, in practice

### 6.1 In General

Before you should adjust your display you should allow the display to warm up, because the imaging elements are temperature dependent and can heat up considerably during operation. Simply swithc the display on 20 minutes before you want to adjust it. This is because the electronic components can change there technical values during this time. Only after this warm up time, a constant display brightness, contrast and color is guaranteed.

**Please follow the steps in the following order to adjust your screen.**

1. Brightness
2. Contrast
3. Color
4. Overscan
5. Sharpness

#### 6.1.1 Preferences – Luminance Only

To adjust the brightness, switch your screen to the Luminance Only mode. If your display does not have such a mode, please adjust the color saturation of the image down to 0, so that you only can see a black-white representation of the test pattern.

Alternatively, you can also adjust brightness and contrast in the color view of the test pattern, but in this case, the fields for contrast and brightness are not so clearly visible.



Figure 6.1.1.1 – Luminance Only view of the test image

#### 6.1.2 Determine the video-range (Full / Extended / Normal)

The brightness of a video signal is recorded, transferred, processed and displayed in a variety of video ranges.

**There are three different Standardized Video Ranges:**

Video Range	Black – 8 bit	IRE Value	White 8 bit	IRE Value
Normal	16	0	235	100
Extended	12	-10	251	110
Full	0		255	

If an image with extended-range values, is shown on a display, which may simply represent normal range, it comes to a so-called clipping. This means that all values that lie below or above the values 16 or 235 will show the values 16 or 235. It's finally not possible to show brighter white or darker black as possible from the system itself.

**This is illustrated with an example:**

Let's think about a display, which can only show normal range values. This display will now get an image, which includes dark shades with code values between 0 and 16. The display would in this case, show all the shades of gray as a pure black with the code value 16. The values below 16 then are clipped.

White values that lie outside of the video range, are also limited to the maximum value of the according video range (clipped).

If the display can show full or extended range, it is not a problem to represent a smaller video range. Clipping occurs only with a larger video range, who will be displayed on a device that only supports a smaller video range.

In some playback devices, the Extended Range can be explicitly enabled in the menu. This feature is sometimes referred to as Super Black and Super White.

One exception is the transmission of color signals, they are always transmitted in the full range. With a quantization of 8 bits, this corresponds to code values from 0 to 255.



**Figure 6.1.2.1** – The black levels - for adjusting the display brightness - can also be used to evaluate the video range of the signal.

Alternatively, the video range of the display device can be determined very easily with our test image. First turn - as described in Chapter 6.1.1 - your display in the Luminance Only Mode.

Adjust the brightness to the maximum value. Now look for luminance differences between each of the six black bars - in the lower right area of the test image – when you can see all of the 6 black bars, your display can show Full Range.

However, if you see only a big black bar on the left and right, with two single thin black bars, then your display is only able to play Normal Range. The bars 1, 2, 3 and 4 do not vary in brightness.

In the case of an Extended Range playback, you only see the bars 3, 4, 5 and 6. The bars 1 and 2 appear to you as an area with no obvious differences in brightness.

In some cases it's maybe possible, that additional image enhancement algorithms in the device leads to incorrect results with the described method above. So it can for example be, that some units of the normal range (16 - 235) are converted to Full or Extended Range. This leads inevitably to a different representation.

Therefore, please make sure in advance what's the supported video range of your display is. (Manual or ask the manufacturer). You should adjust the black level always according to the video range of the video display.

This method of determining the video range is manufacturer independent. You can apply this method for displays or projectors.



**Figure 6.1.2.1** – **Top** - Full Range. All six bars of the gray scale are visible.  
**Center** - Extended Range. Only the bars 3 to 6 are visible.  
**Below** - Normal Range. Only the three right bars are visible.

## 6.2 Brightness

The most important function that should always be adjusted as the first, is the brightness. Here, the black level depending on the videorange will be adjusted correctly. This ensures, that the finest black shades (dark areas) can be visible on the display for your eyes.

Here one must note, that however the setting of the brightness is always a function of the ambient light. This has two consequences.

Firstly, it is essential to set the display brighter in a bright environment, than in a dark environment.

Second, you should certainly think about re-adjusting, will the ambient light is changing.

The crucial elements in the test pattern for the brightness adjustment are the black levels in the lower right area of the test image.

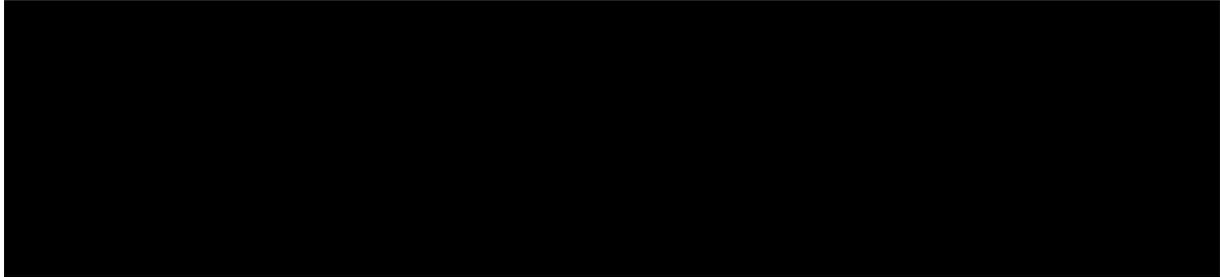


**Figure 6.2** – The lower image area of the test pattern to adjust the brightness. The bars 1 to 6 are emphasized for the figure( white lines). Depending on the video range of your display you will see a similar or different representation. Please read the previous chapter.  
The video range of your display pretends, which bars you have to use to adjust the brightness.

### Tip!

Sometimes a sophisticated distinction between the different black levels by device-specific gamma curves can be difficult. If you are not able to adjust the brightness of your display like the outlined instructions below, please check, if your display device has activated a special gamma curve or if any other image enhancement algorithms are enabled.

## 6.2.1 Adjust Brightness - Normal Range



**Figure 6.2.1.1** – For adjusting the brightness in normal range, use the bars 4, 5 and 6.

The best way to set the brightness of the display is to set the value in the menu to the middle and reduces the brightness now slowly until you can perceive only a minimal difference between the individual bars. If the bar 4 also at maximum brightness setting does not differ from the left-hand bar (1, 2 and 3), the test image is transmitted and / or displayed the normal range. For the right adjustment therefore you have to use the three black bars 4, 5 and 6, like explained below.

Once the bar 5 is minimally brighter than the bar 4, the black level is set correctly. There should still be a recognizable difference between the bar 4 and the bar 5. Please also note that the bar 6 must be a littlebit lighter than the bar 5.

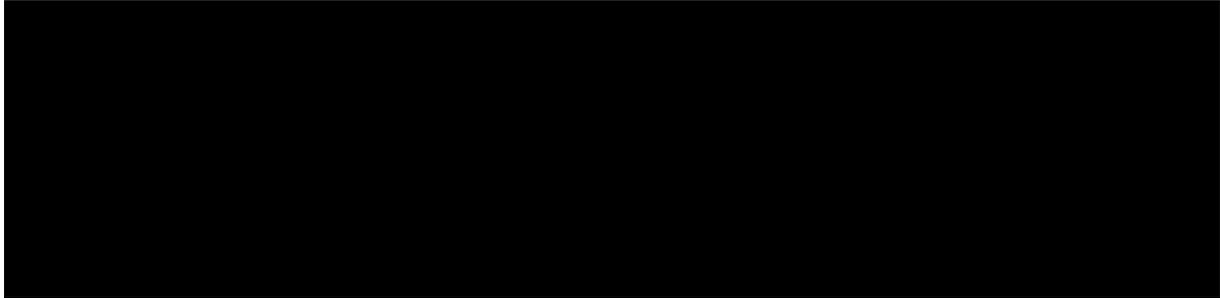
If the brightness is set too high, the bars significantly raise from each other and you should reduce the brightness

If a transmission takes place with Extended Range or Full Range, you should use the left-hand bar (1.2 and 3) to adjust. (See next chapter)



**Figure 6.2.1.2** – **Above:** Here the brightness for normal range is adjusted properly. The bar 4 is minimally darker than the bar 5 and bar 6 is slightly brighter than the other bars.  
**Middle:** The bar 4, 5 and 6 differ significantly, and black (bar 3) appear gray. The brightness is set too high.  
**Below:** The bars 4, 5 and 6 are not discernible. The brightness is set too low.

## 6.2.2 Adjust Brightness – Extended Range / Full Range



**Figure 6.2.2.1** – To adjust the brightness for extended range use the bars 3 and 4.  
For Full Range the bars 1 and 2 must be used.

Here are the adjustments for Extended Range will be explained.

If the beams 1, 2 and 3 are visible at the maximum brightness of the display device, your display device is capable to show Full Range. Then proceed as described for Normal or Extended Range, however, take the bars 1, 2 and 3 as a reference.

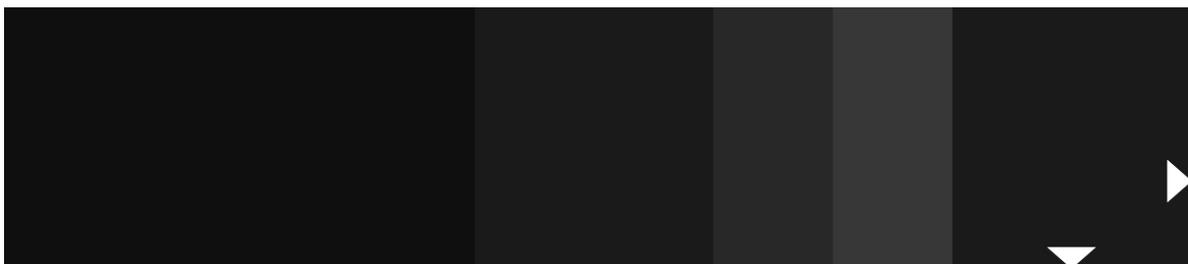
In the case of Extended Range, the bars 1 and 2 should show the same Luminance as bar 3.

Once the bar 4 is minimally brighter than the bar 3, the black level is set correctly. There should still be a recognizable difference between the bar 3 and the bar 4. Please also note that the bar 5 and 6 must be a little bit lighter than the bar 4.

If the brightness is set too high, the bars significantly raise from each other and you should reduce the brightness

If a transmission takes place with Full Range, you should use the left-hand bars (1,2 and 3) to adjust the brightness.

Then, the bar 2 should be minimal brighter than bar 1. From left to right, the bars should gradually become lighter.





**Figure 6.2.2.2** – **Above:** Here the brightness for extended range is adjusted properly. The bar 3 is minimally darker than the bar 4 and the bars 5 and 6 are slightly brighter than the other bars.  
**Middle:** The bars differ significantly, and black appears gray. The brightness is set too high.  
**Below:** The bars are not different in brightness. The brightness is set too low.

### 6.3 Contrast



**Figure 6.3.1** – The lower image area of the test pattern to adjust the contrast. The bars 1 to 5 are emphasized for the figure (white lines). Depending on the video range of your display you will see a similar or different representation.

Also for adjusting the contrast, the previously described effects of ambient light should be considered. When the ambient light is changing, brightness and contrast should absolutely be readjusted. A change in the contrast affects the bright areas of a video signal. When adjusting the contrast, the aim therefore should be, that the finest levels of brightness in the bright image areas are visible after adjusting. So the contrast should be adjusted that way, that the representation of finest details in bright image areas is possible.

As explained the white level also have different code values for Normal, Full and Extended Range. Because the human eye, however, can see brightness differences in bright image areas not that good than luminance changes in dark image areas. So the Video Range should be determined with the black bars.

Therefore, please check as described above the video range of your display device.

**You should use the following bars as a reference, depending on the video range of your display, to adjust the contrast:**

Video Range	Reference Bar (see Figure 6.3.1)	Code Value
Full	1	255
Extended	2	251
Normal	3	235

### Tip!

In addition to the fine adjustment of brightness, contrast and to adjust the gamma curve, we recommend our 256 Greystep test pattern, which is available on our Professional Display Tuning Test Disc in our webshop. Moreover, this disc also includes test sequences with real content, to verify the authenticity of skin tones and the quality of color reproduction.

### 6.3.1 Adjust Contrast – Normal Range

For adjusting the contrast, the steps are similar to the adjustment of the brightness values.

Set the value for the contrast in the menu to the minimum.

Adjust the value now slowly up. Once you are able to distinguish the white corresponding to your video range - Normal Range bar 3 (see Figure 6.3.1) - just from the right adjacent bar 4, the contrast is set properly. See Figure 6.3.1.1

Now you can see all the details in the bright areas of the picture (fine brightness gradations).



**Figure 6.3.1.1** – **Above:** Here the contrast for normal range is adjusted properly. The bar 3 is minimally brighter than the bar 4.  
**Middle:** The bars vary significantly. The contrast value is set too low.  
**Below:** All the bars have the same brightness. You can't see any differences. The contrast value is set too high.

### 6.3.2 Adjust Contrast – Extended Range / Full Range

When the display is able to show extended range, the bar 2 serves as a reference for adjusting the contrast. The bars 1 and 2 in this case should have the same luminance, no matter how you adjust the contrast.

If you can see differences between the bar 1 and 2 then please check - as previously described - which video range is supported by your display device.

If it is extended range, adjust the contrast so that the bar 3 is just slightly different from the 2nd bar. In addition, the bar 4 should be minimally darker than the 3rd bar. If you have the contrast of the display correctly adjusted, you can be sure, that you in the future will see all the details in the bright image areas (lights).



**Figure 6.3.2.1** – **Above:** Here the contrast for extended range is adjusted properly. The bar 2 is minimally brighter than the bar 3. The bar 4 is slightly darker than the Bar 3.  
**Middle:** The bars vary significantly. The contrast value is set too low.  
**Below:** All the bars have the same brightness. You can't see any differences. The contrast value is set too high.

## 6.4 Color

Before you adjust the menu settings for color, make sure you have correctly set the brightness and contrast functions.

As already mentioned, you adjust the color with the help of the Blue Ony Mode.

If your display device have such a mode, please activate this.

Alternatively, you can rely on a blue filter. As initially mentioned, you just keep this between your eyes and the display. This film is available on request from us.

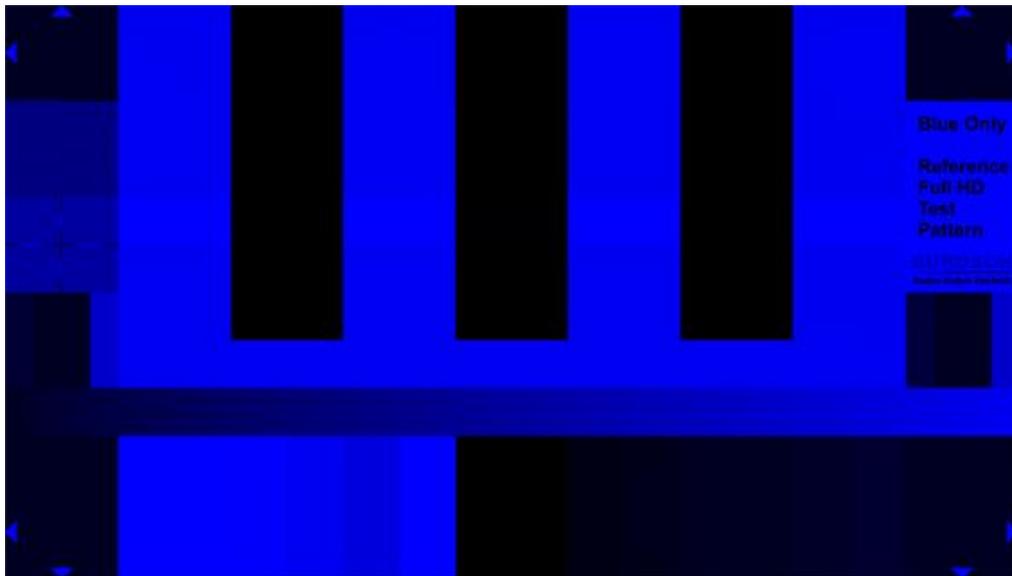
Adjusting the color, you have to use the options Saturation / Chroma and Hue / Phase. These settings are available for broadcast monitors in general. With consumer displays these settings can have a different name or even may not be available. In this case, please take a look at the manual and / or consult your manufacturer.

### 6.4.1 Adjust Color

If the display is adjusted properly, there should now differences in brightness should be visible between the 75% color bars and the bars above and below the color (reference fields) See Figure 6.4.1 for correct settings.

The bar in the Blue Only mode are then displayed in a horizontal sequence, alternately light or dark.

The 100% color bar in the center of the test pattern are slightly lighter in the colors white, cyan, magenta and blue, than the color bars with 75% saturation.

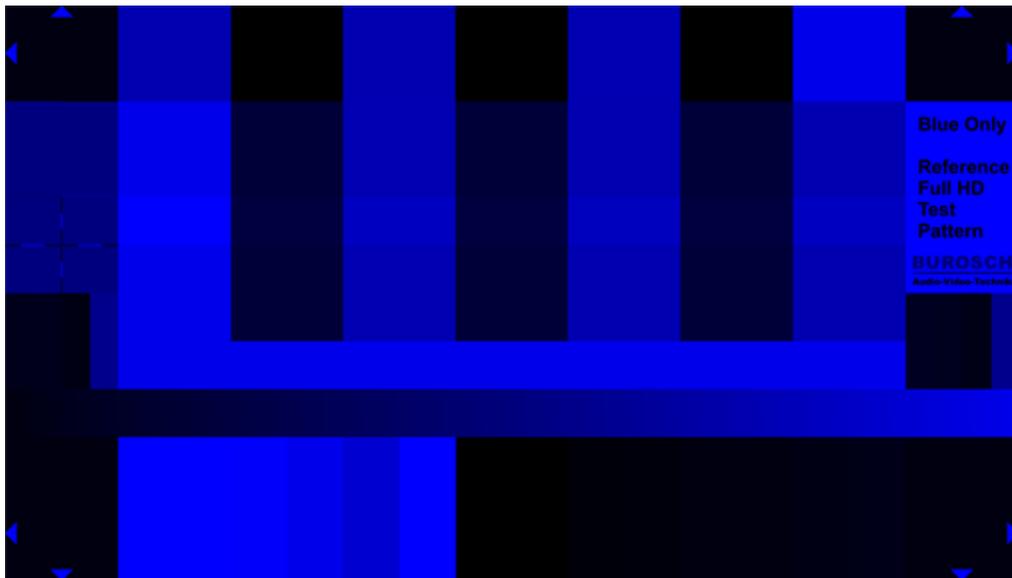


**Figure 6.4.1** – Correctly adjusted color. Between the Bars and the upper and lower bars of the 75% color bars (reference field) is not a recognizable difference in brightness. The color bars are alternately light and dark. For the colors white, cyan, magenta and blue, you can see a brightness difference between 75% and 100% color bar.

### 6.4.2 Adjust Color – Saturation / Chroma

When the Saturation / Chroma is set too low or too high you can see a clear difference between the color bar and the areas above and below the color bars (reference fields). In this case, you have to adjusted the saturation as long as there will be no differences in brightness visible (between the color bar and the reference fields below and above the color bars). The bars in horizontal direction should then alternately be light and dark.

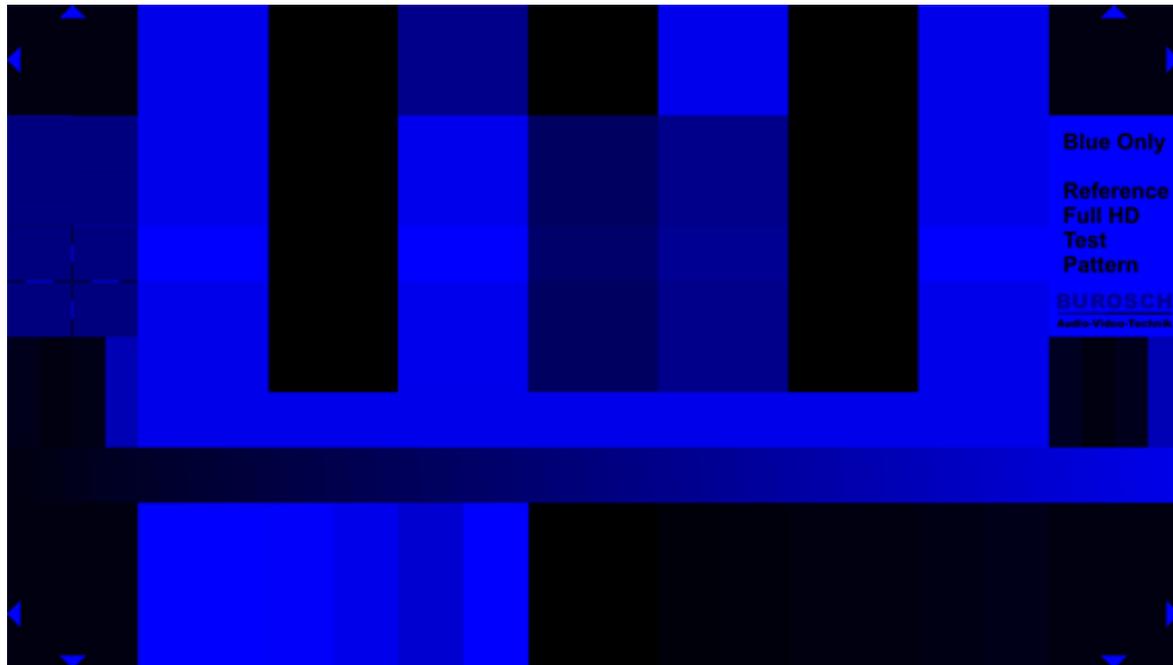
See Figure 6.4.1



**Figure 6.4.2** – Saturation / chroma set incorrectly. In this case, the saturation is too low. The color bars have a different brightness level than the picture elements above and below the color bar.

### 6.4.3 Adjust Color – Hue / Phase

If an incorrect Hue / Phase value is set, in the colors cyan, magenta and green brightness differences between the color bar and the reference fields above and below the color bars are visible. In this case, the settings for Hue / Phase must be adjusted, until the swatches have the same brightness as the reference fields.



**Figure 6.4.3** – Hue / Phase set wrong. You can see a brightness difference in the patches cyan, magenta and green.

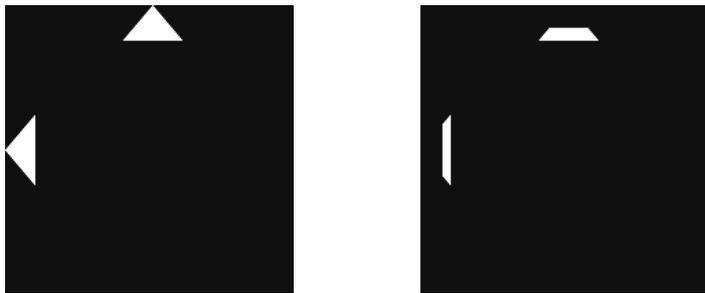
## 6.5 Image Markers / Overscan

With this edge markings, you can check fast and easy check, if your display show a wrong aspect ratio, an pixel shift or an overall overscan.. If your display is set correctly all the triangles in the corners must be completely visible.

The corresponding menu option is often referred as overscan, aspect ratio, or pixel to pixel view.

### Tip!

An activated overscan function can cause errors in the interlaced progressiv testfield and the sharpness test field. You should adjust the overscan function first, before you try to adjust the other functions.



**Figure 6.5.1 Ausschnitt** – **Left** – correctly set.  
**Right** - wrong settings (overscan enabled)



**Figure 6.5.2 Gesamtansicht** – **Left** – correctly set.  
**Right** - wrong settings (overscan enabled)

## 6.6 Sharpness / Aperture

With the crosshair on the left edge of the test pattern you can adjust the sharpness (sometimes called aperture) correctly.

With digital projectors, it is useful to resort to special focus test images from Burosch Audio-Video-Technik, because their lenses sometimes blurring the edge. The same applies for the adjustment of the sharpness with tube TVs.

If the sharpness / Aperture is set correctly there should be no double contours visible. In addition, in the interlaced progressive test field no brightness modulations should be visible.

See Figure 6.6.1

### Tip!

The settings for overscan have an impact on this test field too. Please adjust the overscan or pixel to pixel view first.



**Figure 6.6.1** – **Left** – correctly set.  
**Right** - wrong settings (double contours visible)

## 6.7 Interlaced / Progressiv

If you see only a white and a black box, the test image is than transmitted as an interlaced signal.

Bei einer progressiven Bildübertragung sehen Sie zwei Felder mit je 1px breiten Linien. Diese Felder sollten bei einer korrekten Darstellung keine Helligkeitsmodulation aufweisen und jede der 1px breiten Linien sollte klar und deutlich (schwarz, weiß) erkennbar sein.

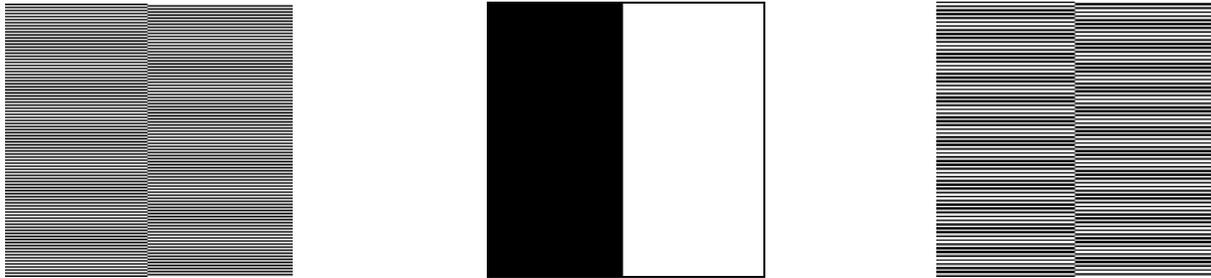
Siehe Figure 6.7.1

In a progressive image transmission, you will see two boxes, each with 1px wide lines. These fields should show a correct representation without any intensity modulation, and each of the 1px wide lines should be visible.

See Figure 6.7.1

### Tip!

As mentioned above, the settings for sharpness and overscan have an impact on this test field too. If you definitely have a progressiv image transmission but you see brightness modulations in this test pattern please recheck the settings for overscan and sharpness.



**Figure 6.7.1** – **Left** - Progressive. Each of the 1px wide lines is visible.  
**Middle** - interlaced. The fields are shown in black and white /  
**Right** - sharpness / overscan set incorrectly it comes to brightness modulations.

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## 6.8 Rec. 709 / Rec. 601 Luminance signal Y reference field

These fields can be used to more easily determine which standard (SD or HD), the signal is present, or whether the calculation of the luminance signal is correct or there has been a transformation of the signal.

For SD there is the color standard REC.601 whereas in HD, a new standard was introduced, REC.709. Among other things, the difference between these two standards are the calculation of the Luminance Signal Y.

Both standards operate on the Y`CbCr process in which the luminance signal Y (luminance - or brightness signal) is determined from the three primary colors with the help of coefficients. These coefficients take into account the brightness rating for different colors.

So the human eye sees blue shades darker than the - for example - green colors.

### The formulas for the luminance signal Y at SD and HD:

$$\text{SD / Rec. 601 } Y' = 0.299 R' + 0.587 G' + 0.114 B'$$

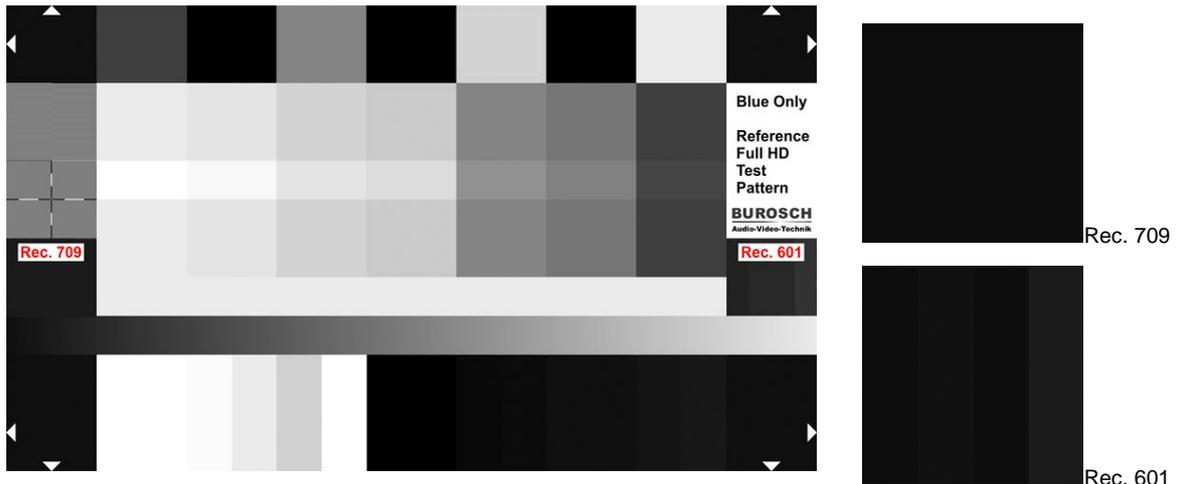
$$\text{HD / Rec. 709 } Y' = 0.2126 R' + 0.7152 G' + 0.0722 B'$$

The colors in this test field are arranged so that in the Luminance mode you will see a uniform, equally bright surface.

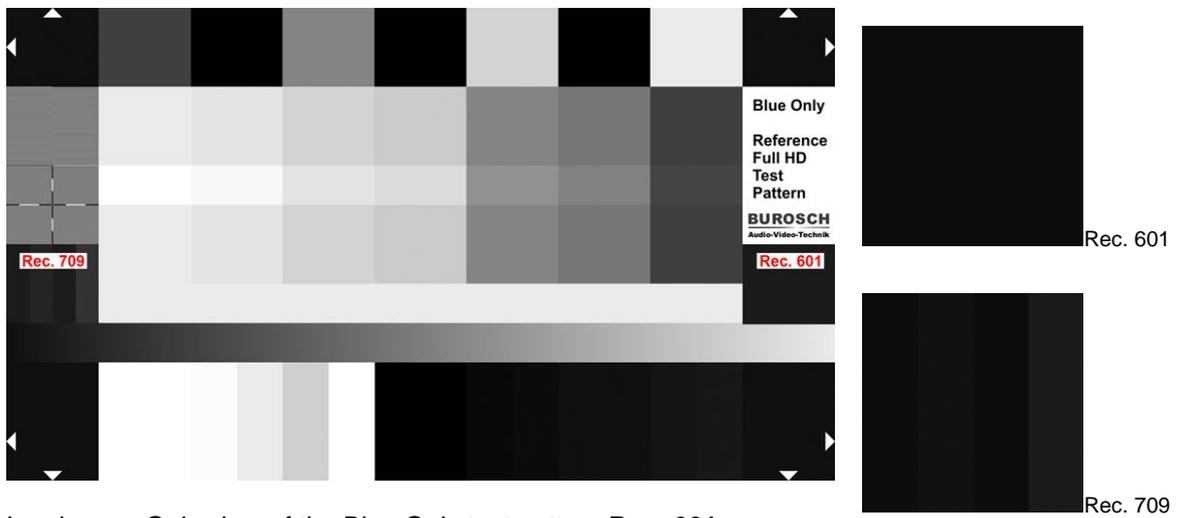
So if you e.g. can identify individual bars in the left test field, the signal is transferred in the SD standard REC 601. The right box should therefore form a uniform dark area. All bars in the area should have the same brightness.

Unfortunately it can sometimes lead to errors in the representation of colors by the display devices internal color space transformations or improvements.

If your display device shows such a behavior, please check whether your display has such functions and whether these can be disabled.



Luminance Only view of the Blue Only test pattern **Rec. 709**



Luminance Only view of the Blue Only test pattern **Rec. 601**

**Figure 6.8.1** – **Above** – Rec. 709 / HD  
**Below** – Rec. 601 / SD

## 6.9 Gray ramp signal

Use this brightness gradient (gray ramp) of 16 / 16 / 16 (black) to 235 / 235 / 235 (white), which runs diagonally - from the upper left corner to the lower right corner – to see quantization or clipping errors. In addition, the correct adjustment of brightness and contrast can be checked again. See Figure 6.9.1.



**Figure 6.9.1** – **Above** – Brightness and contrast are set incorrectly. Clipping in whit and black areas. **Below** – Extreme quantization errors, you can see banding effects. The ramp is no longer uniform and shows the subtle shades of gray in different steps.

### 7. Waveform and vectorscope display of the individual picture elements

↙ Overscan 16 16 16 ↘	75% Blue 0 0 191	Black 0 0 0	75% Magenta 191 0 191	Black 0 0 0	75% Cyan 0 191 191	Black 0 0 0	75% White 191 191 191	↘ Overscan 16 16 16 ↙
Interlaced / Progressiv	75% White 191 191 191	75% Yellow 191 191 0	75% Cyan 0 191 191	75% Green 0 191 0	75% Magenta 191 0 191	75% Red 191 0 0	75% Blue 0 0 191	Blue Only Test Pattern 255 255 255
Focus / Aperture	100% White 255 255 255	100% Yellow 255 255 0	100% Cyan 0 255 255	100% Green 0 0 255	100% Magenta 255 0 255	100% Red 255 0 0	100% Blue 0 0 255	
Rec. 709 27 71 16 16 27 16 32 16 27 16 16 180	75% White 191 191 191	75% Yellow 191 191 0	75% Cyan 0 191 191	75% Green 0 191 0	75% Magenta 191 0 191	75% Red 191 0 0	75% Green 0 191 0	Rec. 601 34 78 16 16 34 16 47 16 34 16 16 180
Grey 191 191 191								
Grey Ramp 16 16 16 to 235 235 235								
Contrast / Kontrast			Brightness / Helligkeit					
255	251	235	208	255	0	10	12	24
255	251	235	208	255	0	10	12	24
255	251	235	208	255	0	10	12	24
↙ Overscan 16 16 16 ↘								↘ Overscan 16 16 16 ↙

**Figure 7.a**  
Structure of the Blue Only test pattern with the different code values at a glance.

<b>Line 1</b>	△ Overscan 16 16 16	75% Blue 0 0 191	Black 0 0 0	75% Magenta 191 0 191	Black 0 0 0	75% Cyan 0 191 191	Black 0 0 0	75% White 191 191 191	△ Overscan 16 16 16				
<b>Line 2</b>	Interlaced / Progressiv	75% White 191 191 191	75% Yellow 191 191 0	75% Cyan 0 191 191	75% Green 0 191 0	75% Magenta 191 0 191	75% Red 191 0 0	75% Blue 0 0 191	Blue Only Test Pattern 255 255 255				
<b>Line 3</b>	Focus / Aperture	100% White 255 255 255	100% Yellow 255 255 0	100% Cyan 0 255 255	100% Green 0 0 255	100% Magenta 255 0 255	100% Red 255 0 0	100% Blue 0 0 255					
<b>Line 4</b>	Rec. 709	75% White 191 191 191	75% Yellow 191 191 0	75% Cyan 0 191 191	75% Green 0 191 0	75% Magenta 191 0 191	75% Red 191 0 0	75% Green 0 191 0	Rec. 601				
<b>Line 5</b>	27 71 16  16 27 16 32  16 27 16 16 180	Grey 191 191 191							34 78 16  16 34 16 47  16 34 16 16 180				
<b>Line 6</b>	Grey Ramp 16 16 16 to 235 235 235												
<b>Line 7</b>	△ Overscan 16 16 16	Contrast / Kontrast				Brighthness / Helligkeit						△ Overscan 16 16 16	
		255	251	235	208	255	0	10	12	16	20	24	
		255	251	235	208	255	0	10	12	16	20	24	
		255	251	235	208	255	0	10	12	16	20	24	

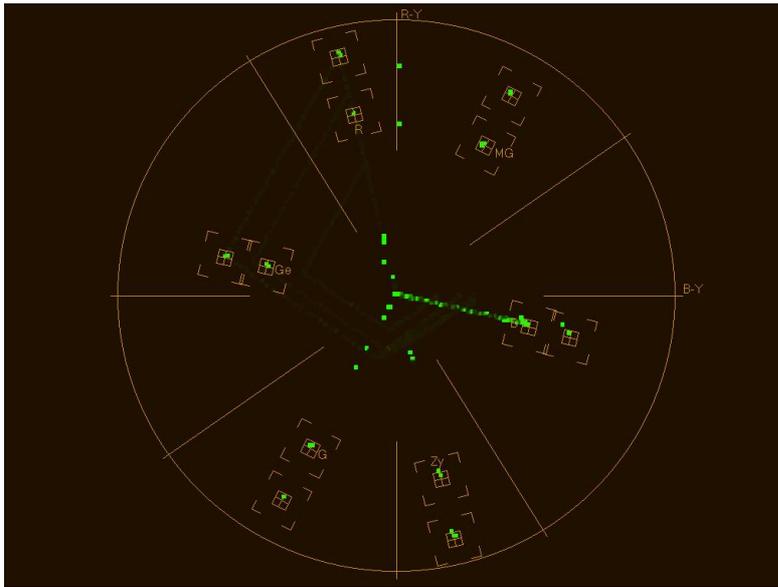
**Figure 7.b** – Structure of the Blue Only test pattern with the various Lines at a glance.

## 7.1 Vectorscope Display

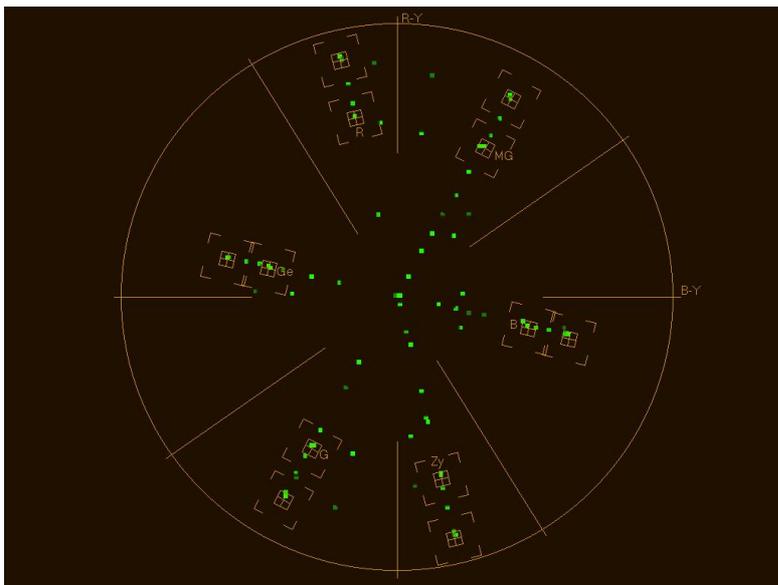
Figure 7.a shows the structure of the Blue Only test image with the 8 bit code values in RGB.

75% Yellow 191 / 191 / 0 means Red = 191 Green = 191 and Blue = 0

The following figuree show the overall view and excerpts of the vectorscope image. This test image was not explicitly designed for the use with a vectorscope, so it can be difficult to interperate the image content. To achieve a correct representation of the vectorscope, the targets have to be for the HD color space REC.709.



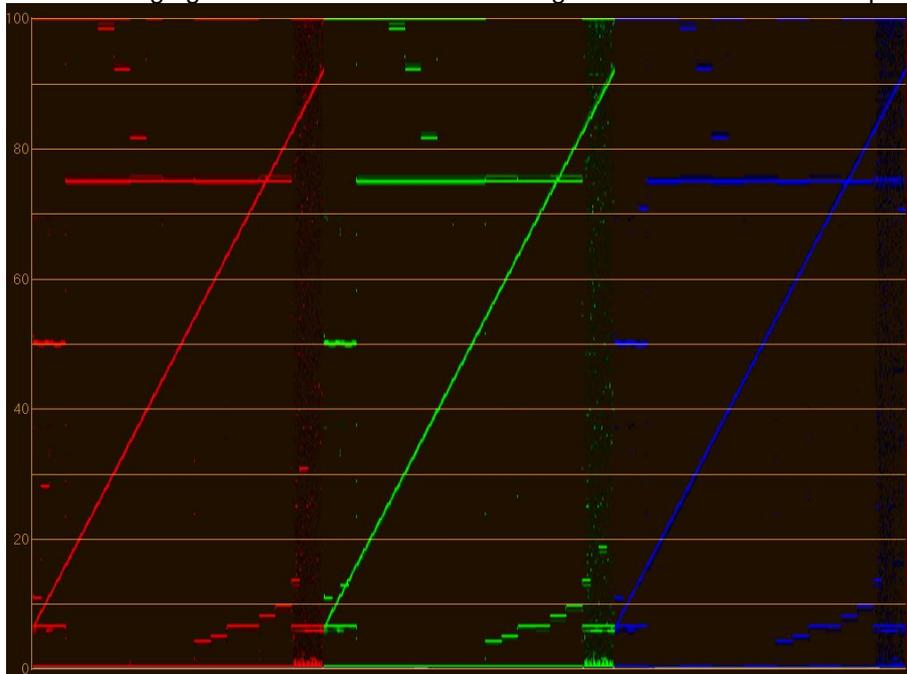
**Figure 7.1.1** – Vectorscope display of the whole Blue Only test pattern.



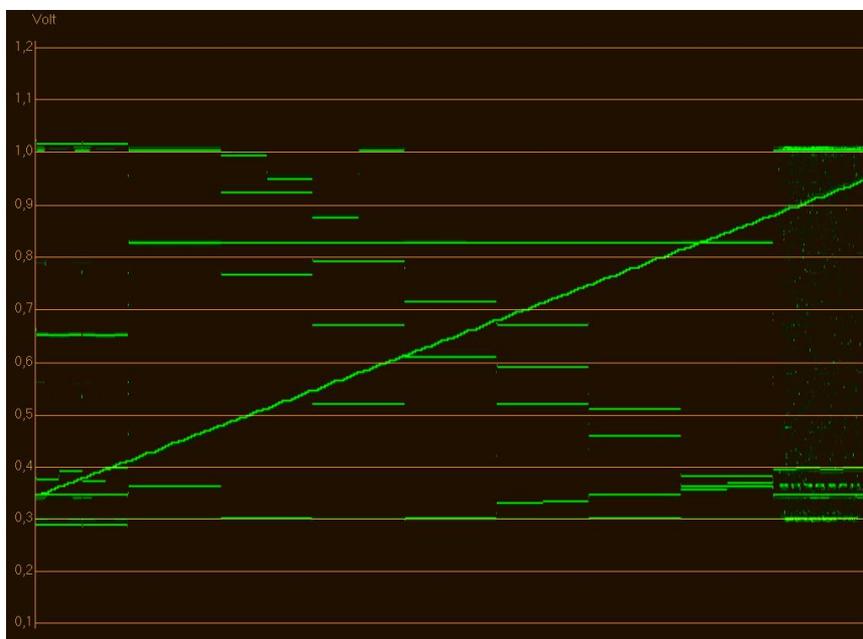
**Figure 7.1.2** – Detail Vectorscope display of the 75% und 100% - color bars.

## 7.2 Waveform Display

The following figures show the entire test image in different waveform representations.

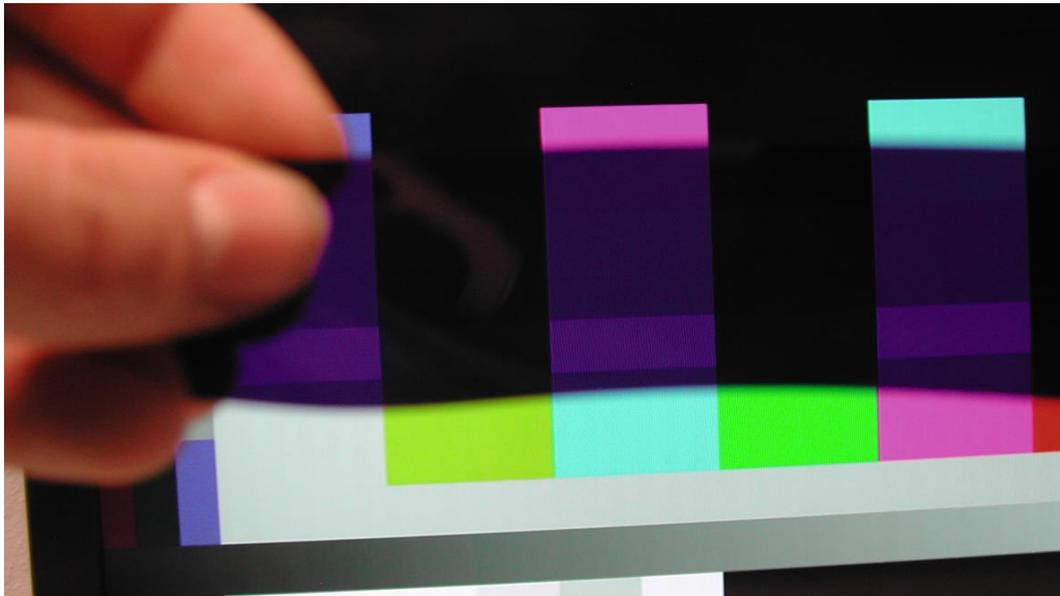


**Figure 7.2.1** – Waveform Display Parade RGB



**Figure 7.2.2** – Waveform Y-Signal Voltages in volts.

## 8. Test Pattern in practice



**Figure 8.1** – The Blue Only test image with blue filter in use



**Figure 8.2** – The Blue Only test pattern on two standard definition CRT displays.  
**Left** - Luminance Only Mode  
**Right** - Blue Only mode.

## 9. Glossary

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## 10. Imprint

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