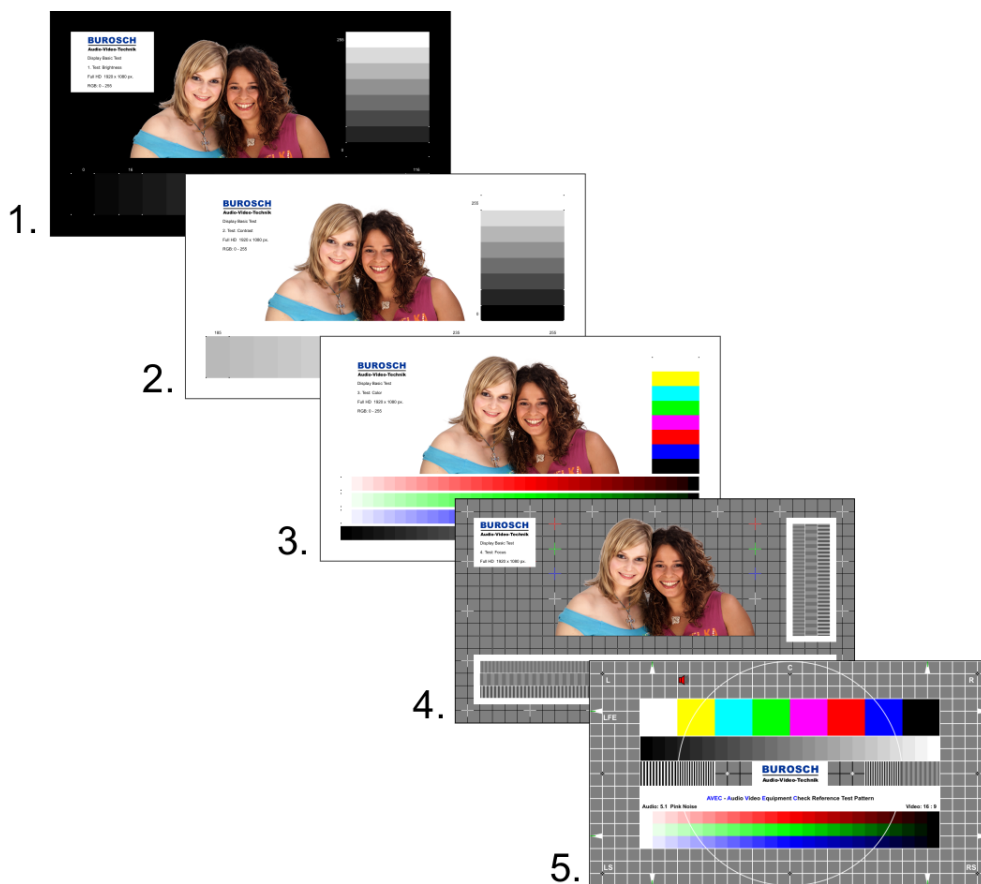


# Display Basic Tuning

## Reference Test Pattern Optimum Adjustment



**BUROSCH**  
**Audio-Video-Technik**

[www.burosch.de](http://www.burosch.de)

## Display Basic Tuning

### Introduction

For playback of high image quality it is necessary that the image source, image sender (e.g. TV, screen or projector) and the ambiance is exactly adjusted to each other. The manufacturers making their best to initialize the devices but your exact component combination and your ambiance they cannot know. Subsequent you find a easy manual with authentic test patterns. With the help of the test patterns you are able to optimize your playback string easily. The motives always consist of an abstract test pattern which lets read off good and a naturally motive which represent the effect of typical film- or video images.



**Important:** Please adjust the lighting conditions so how you later watch a film before calibration. Please avoid changed in parameters like „brightness“, „contrast“ or „gamma“ in your source devices. Please switch off all additive couplings and (alleged) image upgradings like DNR, noise compression, black value accentuation, contrast amplification and so on in the sources and image senders. After the basic adjustment you can of course experiment a little bit which of these adjustments make sense and helps the image quality.

**Very important:** Please keep the sequence of the adjustments because otherwise the parameters starting to impact each other – first brightness then contrast and after the color and at least everything more. Almost all modern devices give a lot of pre-adjustments. As a rule one of them is named „movie“, „film“ or alike and is typically bent on balanced playback and so a good initial point for your adjustments work.

Don't forget: Read the maual how to save the options, so that you needn't to repeat the adjustments at the again switch on. High quality image senders use more memory for different inputs and signal forms. Differ for example in High-Definition and Standard-Definition signals. Whether the adjustments of a memory or another resolution take effects you can easily find out: Please skew a simply indentifiable parameter maximal, e.g. color to minimum. Switch now please. Is the color in the other input or the other resolution missing, too, so both use the same memory.

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#### First most important test pattern: Brightness

The most important and everytime first adjustment is the brightness control. The human eye oriented itself not on the bright parts but on the dark parts of an image for contrast sense. The brightness control have an impact on the brightness of the whole image and you use it for adjusting the black value.

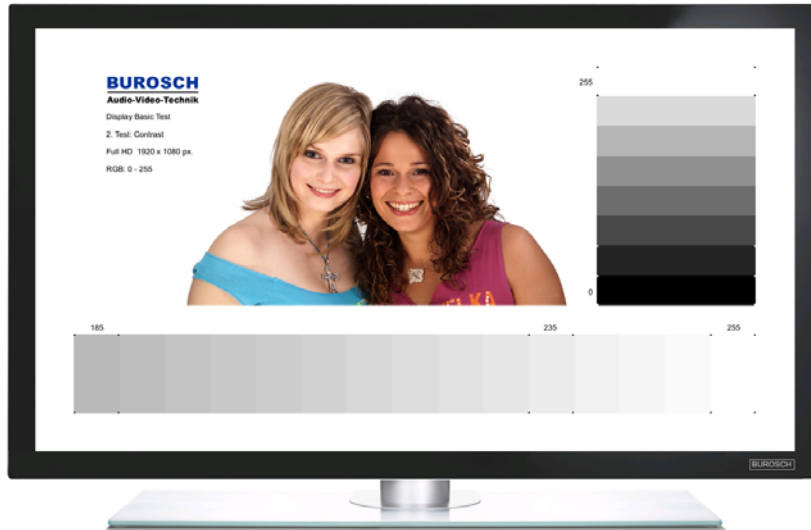
The right display of the test pattern is as following:

- background – black
- middle – two models, bright and dark type
- right – gray bar from white (255) top until black (0) bottom
- bottom – gray bar from complete black (0) left over video level black (16) until middle gray (116) right
- The nuances of all gray steps is homogeneous.
- All steps are completely colorless

So you find the right adjustment:

- first adjust the brightness down
- adjust the contrast and color control in middle position or factory setting
- adjust the brightness control slowly up until you can see on complete black background as many as possible gray steps horizontally
- at least all steps over „16“ should be visible
- Depending on devices it could be that the steps before „16“ are not differentiable from the background. Thats normal.
- Please note the right model. The color of her hairs must be differentiable with her dark skin.
- In case of need pass on maximum 1 dark step than turning on the brightness that the background isn't maximum black

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#### second test pattern: contrast

The second adjustment defined the maximum brightness of the image and will be executed with the contrast control. The contrast control influences only the bright parts of the image and is for adjustment of the white value.

The right display of the test pattern is as following:

- background – white
- middle – two models, bright and dark type
- right – gray bar from white (255) top until black (0) bottom
- bottom – gray bar from middle gray (116) left over video level white (235) until maximum white (255) right
- The nuances of all gray steps is homogeneous.
- All steps are completely colorless

So you find the right adjustment:

- first adjust the contrast control long down
- adjust the color control in middle position or factory setting
- adjust the contrast control slowly up until you can see on complete white background as many as possible gray steps horizontally
- at least all steps over „235“ should be visible
- Depending on devices it could be that the steps from „235“ and up are not differentiable from the background. That's normal.
- Please note the left model. The color of her skin must be naturally.
- In case of need pass on ultimate maximum brightness than the upper gray steps become colored. This is a sign that one of the basic colors begins to overdrive. Light parts like clouds get these color and make the image unnaturally.

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#### Third test pattern: color

The third adjustment defined the amount of color the image get. This identify the quality of color, the color saturation in the image. The difficulty for color evaluation comes often along so that the image senders have a too high adjusted color temperature from factory, what colors the image a little bit blue. If you can adjust the color temperature, choose 6500K or D65. Are the parameters described in words, please choose „neutral“ or „warm“ . Typically the nearly best adjustment is when the image occurs a little bit too warm (too reddish) for you. The control for this adjustment is called „color“. Don't mix it up with „color tone“ or „basic tint“. Letter please let absolute in middle position.

The right display of the test pattern is as following:

- background – white
- middle – two models, bright and dark type
- right – color bars with all primary and secondary colors in 100% saturation. From top: white, yellow, cyan, green, magenta, red, blue, black
- bottom – 3 color steps, red, green, blue from maximum white on left over maximum color saturation until complete black on right
- undermost – gray steps from complete black until maximum white on right
- The nuances of all gray steps is homogeneous.

So you find the right adjustment:

- Bring the color control in middle position or factory setting
- Now adjust the color control slowly up or down until the color bars and the middle of the color steps reach the maximum saturation but all steps must be differentiable to each other. In many cases the colors overdrive not until then the naturally saturation. Then the image of the models helps a lot to find a naturally saturation level. Eventually you can put your own hand beside of the foto to be a criterion for the colors
- In case of need pass on little bit of saturation then overdrive the color playback. You

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perceive it when the saturation of the color steps in the middle are no more clearly differentiable.

- For a once more checkup please keep in mind the gray steps which must be clearly visible and homogeneous stepped from maximum black to complete white. If necessary please repeat the brightness and contrast adjustments for fine tuning

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#### Fourth test pattern: focus

The focus test pattern makes scaling and artificial over-focussing visible and if necessary to correct it. You get the sharpest image result if you see the image with maximum contour sharpness without over-focussing. In this case the pixels are exactly similar to your image sender.

The right display of the test pattern is as following:

- background – middle gray with black grid and white crosses. Half-left und half-right there is a red, green and a blue cross exactly on the grid.
- middle – two models, bright and dark type
- right – three vertical areas of horizontal black and white stripes of homogeneous stroke width of 1 pixel on the left, 2 pixel in the middle and 3 pixel on the right.
- Bottom – three horizontal areas of vertical black and white stripes of homogeneous stroke width of 1 pixel on top, 2 pixel in the middle and 3 pixel at the bottom.

So you find the right adjustment:

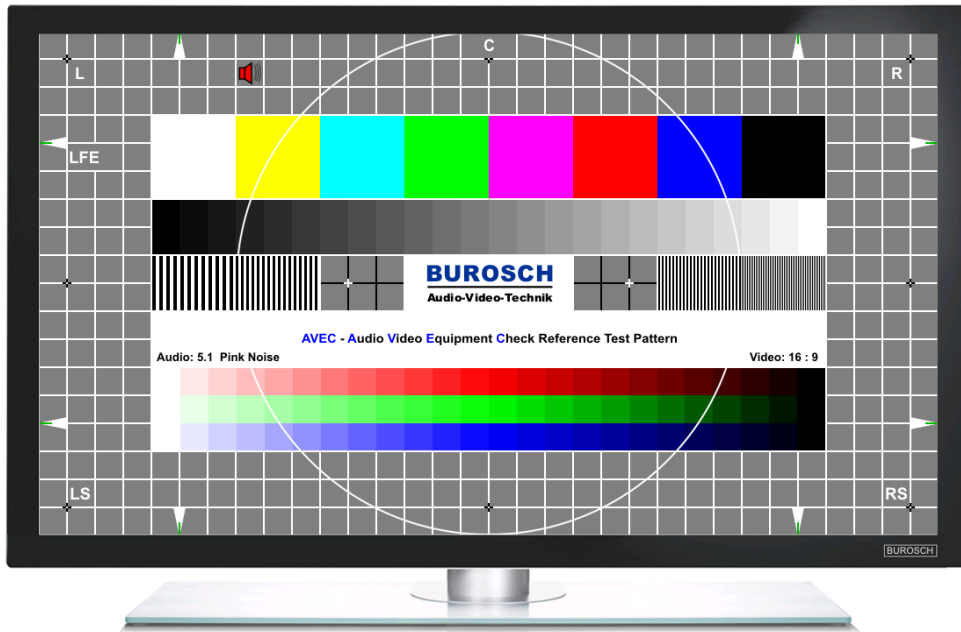
- turn the sharpness/edge-enhancement control so far down until the grid lines are displayed without shadow, double contours or another change-over to the gray background. But so high that they are displayed maximum sharp.  
Don't wonder: It is often at the lowest stop position. On the faces and hairs of the models you can easily find out how unnaturally a slight over-focussing takes effect.
- Only when there is no scaling you see the horizontal and vertical stripes pattern exactly, without annoyances or overlaid pattern.
  - If you see all stripes but different gap between the fine lines there is probably a overscan – a slight blow-up of the image. This you can switch off or turn to zero on many image senders
  - If the fine lines are barely or even as only gray area visible there is a scaling of the image. This could be a wrong calibration of the source device or a compulsory conversion if the image sender has another resolution than the test pattern.

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- The colored crosses must converge exactly with the grid. If they don't do this you can adjust it with the chroma-delay-control in many image senders. It is normal that the colored crosses are less blurred and wider visible than the black grid lines.



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#### Fifth test pattern: AVEC Audio Video Equipment Check

The Universal test pattern AVEC Audio Video Equipment Check offers a overview for performance and adjustment of the image sender and the signal string. There is a neutral test grid with a circle, overscan marks, sharpness test patterns, color bars and color steps plus gray steps. The Universal test pattern should mainly be a overview. You should use the single test patterns for possible correction

The right display of the test pattern is as following:

- background – middle gray with white grid of squarish fields. In the middle a white circle, that touches exactly the upper and lower outline of the image. All grid and circle lines must be visible very sharp and mustn't have double contours or shadows
- image border – 2 arrows per every image border are for identification of possile overscan, cut or a skewing of the image. All 8 arrows should reach exactly the image border.
- Middle top – color bars with all primary and secondary colors in 100% saturation. From left: white, yellow, cyan, green, magenta, red, blue, black. The colors should be preferably sharp-edged separated and in maximum saturation.
- Middle as second – gray bar from maximum black until maximum white. The gradings of all steps are homogeneous
- middle outer left and right – 4 areas of vertical black and white stripes of same-sized stroke width of 4 pixel, 3 pixel on the left and 2 pixel and 1 pixel width on the right. All stripes should be clearly and sharply visible.  
At a necessary image size conversion (scaling) for adaptation on the native resolution of a image sender should the fine lines become blurred at most.
- Middle inside – middle gray with black grid and white crosses. The lines must not show double contours or shadows.

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- Bottom – 3 color steps: red, green and blue from maximum white on the left over maximum color saturation in the middle until maximum black on the right. The grading of all steps is homogeneous.

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Standards are helpful and important

For a correct playback of a film or a video or even of an image there have to be a neutral transfer. You often hear the argumentation that these isn't necessary because the vision of every human is different and so a objective playback isn't possible. As a matter of principle is this argumentation right. Admittedly there will be ignored that it's only possible if the signal transfer acts neutral and straight. Only when the expressed image is similar to the recorded image by the camera, the human is able to perceive what he would saw at location by his individual sensation.

The transfer itself have to behave neutrally. Big worldwide institues look after the standards so that the neutrality is warranted.

In german speaking countries is the institute for broadcast engineering of the public broadcasting corporation of ARD, ZDF, DLR, ORF and SRG/SSR mainly responsible for the standards:

[www.irt.de](http://www.irt.de)

For the whole european area the European Broadcast Union, EBU in Switzerland handles superordinate to the local development institutes:

[www.ebu.ch](http://www.ebu.ch)

On international floor established in 1865 in Paris the International Telecommunication Union, ITU is included:

[www.itu.int](http://www.itu.int)

For best image evaluation and calibration you use the test pictures from this document. It works also with real, filmed motives but with reservations. The big advantage of test patterns from Burosch Audio-Video-Technik is the knowledge how the test patterns have to look and the knowledge how to reproduce them. Only this way the neutrality of the transmission and the playback can be measured exactly and if necessary to correct it:

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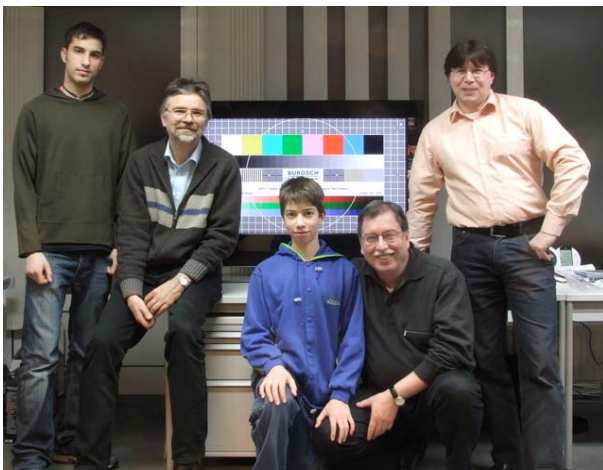
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