

BUROSCH

Audio-Video-Technik



Display Basic Tuning

Quick Guide

Technical Documentation

Display Basic Tuning Quick Guide

Please pay special attention to the order of the test patterns and consistent keep this order:

1. Reference Test Pattern Brightness



2. Reference Test Pattern Contrast



3. Reference Test Pattern Color



4. Reference Test Pattern Focus



5. Reference Test Pattern AVEC



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These five reference test patterns described in this documentation help you adjusting the basic setting of the most important parameters of the image reproduction of your TV-device. The Basic Tuning test patterns act as purchase criterion for initial purchases of TV sets directly in the specialty store. Further the test patterns are adapted for a running quality conformance test. These five reference test patterns are the basis for optimizing and evaluating the image quality of the display. Our test signals are used in display development departments of the industrial companies and in labors of famous trade journals for comparative product tests.

We advise to use these five test patterns as one whole compendium.

For an optimal adjustment of your TV-display it is necessary to maintain the particular order. Image evaluations and image optimizing precede always the same principle:

1. Brightness adjustment
2. Contrast
3. Color
4. Focus
5. AVEC Universal test pattern which checks the speakers additionally

We advise to repeat the image calibration by the help of the Basic Tuning test patterns two or three times after the first adjusting to make sure the correct adjustment.

Further you find always actual information around the topics test signals and home cinema on our web site www.burosch.de.

The documentation of the fifth reference test pattern AVEC (Audio Video Equipment Check) you find separate on our website. In this documentation here the AVEC test pattern is described very cursory.

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1 General Tips and Notes

Here you see all tips and notes which you implicitly have to keep in mind:

Because of an external backlight a more relaxed watching television for the human eye is possible. Thereby is to mind that the backlight has to be placed behind the display without any glares. For external backlights you can use a usual illuminants with small light power.

Please let you and your eye a few minutes time to better detect potentially color differences or display problems. For it this test pattern is optimal applicable because you often don't have enough time for a cognition at quick motions.

The test patterns are optimal adapted for an aspect ratio of 16:9. For other aspect ratios (16:10, 4:3, ...) please use the source signal from your corresponding transducer.

Please only use applicable test patterns which are adapted for your individual application:

- SD for resolutions up to 1,366 x 768 Pixel interlaced
- FullHD for resolutions of 1,920 x 1,080 Pixel and 1,280 x 720 Pixel

Please note that static test patterns like this one mustn't be displayed more than one hour without changing pictures of the TV-display because of possible phosphor burn-ins which causes so-called "ghosts", especially on flat screens.

The same effect of "ghosts" can also be caused by broadcasting station icons or black bars which appear when a film is reproduced in another mode than its production mode. These things also cause diverse burn-ins on a display.

Therefore we advise a not so long display of the test signal on the display unit.

Because of printer settings and for clarification of the bad image reproduction the real images will be displayed only symbolical and suggestively.

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2 Reference Test Pattern: Brightness

The first and always the most important calibration is the brightness. The brightness also called “black value” is the most important adjustment for the human eye. Because of the non linear brightness sensation of our human eye which reacts very sensitive on dark areas it’s especially important to calibrate the black value correctly. Scientifically proven the human eye detects more brightness differences in darker areas than in bright ones.

The following image shows the test pattern in optimal display.



First reference test pattern: Brightness

This test pattern shows 15-stepped gray bars at the bottom and 8-stepped gray bars on the right. In the middle there is a portrait of two young women with different skin types. All test pattern elements are shown on a maximum black background (0% White).

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2.1 Reference Test Pattern: Brightness / Optimal Display



Please keep the gray bars marked with red arrows in mind which help you calibrating the brightness.

- Background maximum black (0% white)
- Two women with different skin types in the middle of the image
- On the right: vertical 8-stepped gray bars from 100% white (on top) up to 0% white (maximum black)
- At the bottom: horizontal 15-stepped gray bars from maximum black on the left up to middle gray (RGB 116; approx. 45% white) on the right
- All nuances are homogeneous and don't show any color faults.

You find the correct adjustment by following this procedure:

1. Please set the brightness control far down
2. Set the contrast and color control in center position and factory setting respectively
3. Now you can adjust the brightness control slowly up and pay attention to the black background and the horizontal gray bars at the bottom. You have to be able to see as many gray bars you can and the background still must be complete black

At least you have to see all horizontal and vertical gray steps clearly on a maximum black background. Please also pay attention to the naturalness of the two women. Especially the hairs of the right dark-skinned woman must show differences. In case of need rather resign nuances in maximum one gray step than losing the maximum black background. The white points on the darkest gray steps help you identify the darkest gray bars which help you with the adjustment.

IMPORTANT: The background still has to be completely black! Because of the today's technique the PDP Plasma technology displays the black value best.

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3 Reference Test Pattern: Contrast

The second adjustment defines the maximum brightness of the reproduced image on the display and has to be preceded by the help of the contrast control of your display.

Usually the parameter “Contrast” impacts only the bright areas in the image and so it acts as a control for the white-value of the display.

The following image shows the test pattern for contrast in optimal display.



Second test pattern: Contrast

This test pattern shows two gray bars – one with 15 steps at the bottom and one with 8 steps on the right side – on a 100% white background. Further there is a real image showing two women with different skin types. The left woman is light-skinned; the right woman is dark-skinned. This portrait of the two women is for check-up of the naturalness of skins.

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3.1 Reference Test Pattern: Contrast / Optimal Display



Please keep the gray bars marked with red arrows in mind which help you calibrating the brightness.

- Background 100% white
- Two women with different skin types in the middle
- On the right: Vertical 8-stepped gray bars from 100% white (on top) to 0% white (maximum black) at the bottom
- At the bottom: Horizontal 15-stepped gray bars from middle gray (RGB 116) on the left to maximum white (100%) on the right.
- All nuances are homogeneous and don't show any color faults

You find the correct adjustment by following this procedure:

1. Please set the contrast control far down
2. Set the color control in center position and factory setting respectively
3. Now you can adjust the contrast control of your display slowly up and pay attention to the neutral 100% white background and the horizontal gray bars at the bottom. You have to be able to see as many gray bars you can at a 100% white background.

At least you have to see all horizontal and vertical gray steps clearly on a neutral 100% white background. Please also pay attention to the naturalness of the two women. Especially the bright parts like the skin and shoulder area of the left woman have to show natural nuances and differences respectively. In case of need rather resign having a 100% white background than color faults in the bright gray steps.

IMPORTANT: The gray bars mustn't show any color faults! In the case of doubt please compare the 100% white bar with a piece of a normal matt white paper which confirms the neutrality of white this way.

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4 Reference Test Pattern: Color

The third test pattern is for color adjustment which defines the value of colors the image gets. This adjustment assigns the quantity of color and saturation respectively. A problem of color adjustment is that the most displays have set a too high color temperature from the factory. This colors the image blue. If you can adjust the color temperature please set “6,500K” and “D65”, “Neutral” or “Warm” respectively.

The object of this test pattern is to ensure a natural reproduction of colors.

The following image shows the test pattern for color in optimal display.



Third test pattern: Color

This test pattern shows three color steps (Red, Green, and Blue) and one gray bar – all with the same numbers of steps at the bottom and typically 8-stepped color bars on the right side. The background of this test pattern is 100% white (D65). Further there is a real image showing two women with different skin types. The left woman is light-skinned; the right woman is dark-skinned. This portrait of the two women is for check-up of the naturalness of skins.

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4.1 Reference Test Pattern: Color / Optimal Display



Please keep the color steps and color bars in mind (red arrows) which helps you calibrating the colors and so the naturalness of skins.

- Background 100% white
- Two women with different skin types in the middle
- On the right: Vertical 8-stepped color bars with all primary and secondary colors in full saturation. From top: White, yellow, cyan, green, magenta, red, blue, black
- At the bottom: 3 horizontal RGB-steps from bright at left over full saturation in the middle until complete black on the right. Further there are gray bars from complete black (left) to 100% white (right) on the bottom.
- All nuances of the RGB-steps and the gray bars are homogeneous and don't show any color faults

You find the correct adjustment by following this procedure:

1. Please set the color control in center position and factory setting respectively
2. Now you can adjust the color control of your display slowly up or down until the maximum saturation of the color bars and the middle RGB-steps is reached and pay attention to the nuances and the naturalness of the real image simultaneously. In case of need don't hesitate to hold your own hand beside the real image to check the naturalness of colors on this way.

The object of your adjustment should always be the natural image impression. Ideally all 24 steps of the color and gray bars should be clearly distinguishable.

IMPORTANT: The gray bars at the bottom mustn't show any color faults! In the case of doubt please compare the 100% white bar with a piece of a normal matt white paper which confirms the neutrality of white this way.

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5 Reference Test Pattern: Focus

The last adjustment is the focus control. By the help of the “Focus” test pattern you are able to detect scaling (blur) and artificial over-focusing. The sharpest image result you get if the image isn’t recalculated and displayed with maximum contour sharpness without over-focusing. In this case the pixels from the image source compares exactly with the pixels of your display.

The following image shows the test pattern for focus in optimal display.



Fourth test pattern: Focus

This test pattern is made up of 3 vertical Multiburst stripe patterns on the right side and 3 stripe patterns on bottom. The Multiburst stripes are made up of hard differentiated black and white stripes in change with different gaps at each stripe pattern. Again there is an image of two women for evaluating the naturalness. The background is 50% white (middle gray) with black grid lines on it which show exact squares. Further there are white cross hairs around the image and red, green, and blue cross hairs beside the two women.

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5.1 Reference Test Pattern / Optimal Display



Please keep the red marked areas in mind which help you calibrating the focus. Important here is the sharp display of the gridlines over the whole image surface.

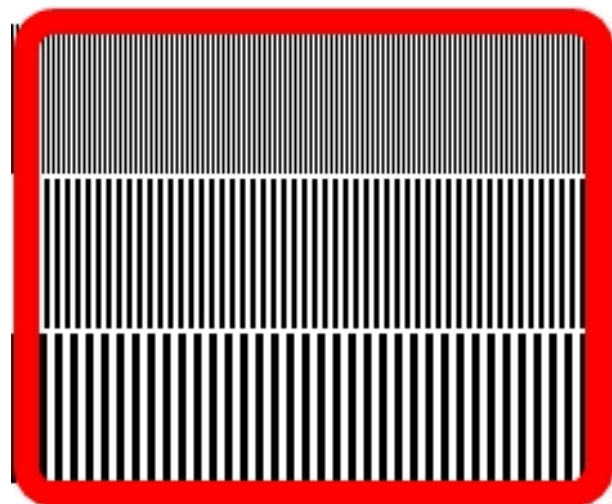
- 50% neutral white background with black grid lines which show exact squares
- All cross hairs perfect visible without blurring or over-focusing
- There haven't to be visible any over-focusing artifacts like double contours parallel beside the black grid lines.
- The hairs of the two women are perfect differentiated and natural
- On the right: Multiburst stripe patterns (black-white-changing) with 1 pixel gap in the left pattern, 2 pixels in middle pattern and 3 pixels gap in the right pattern
- On the bottom: Multiburst stripe patterns (black-white-changing) with 1 pixel gap in the upper pattern, 2 pixels in middle pattern and 3 pixels gap in the lower pattern
- At least the hard contours of the two lowest Multiburst stripe patterns at the bottom and the two right Multibursts on the right side with 3 pixels and 2 pixels gap have to be clearly visible over the whole surface (see following two pictures on the next page which shows a general view and a detail view of the red marked area).

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General View



Detail View



Note: Of course it depends on your printer quality and printer settings respectively how the finest stripe patterns are reproduced. Ideally there have to be visible clearly changes from black to white with sharp contours with increasing gaps from top to bottom. So because of scaling of your printer it could be that the fine stripe patterns become blurred to a complete gray surface. Don't worry about this. That's quite normal.

You find the correct adjustment by following this procedure:

1. Please set the focus or sharpness control so far down until the grid lines are displayed without shadows, double-contours or other changeovers on the neutral gray background, but high enough so that they are displayed maximum sharp. Don't wonder: In most cases the perfect adjustment is far down in the scale.
2. On the hairs and faces of the two women and by the help of the Multiburst stripe patterns you can easily detect over-focusing or blurring. Only if there is no scaling you see all horizontal and vertical stripe patterns clearly.

At least you have to see the two last Multiburst stripe patterns on the right and at the bottom. Please also pay attention to the naturalness of the two women. Especially the hairs and the face and shoulder areas of the two women have to show fine nuances and natural differences respectively.

IMPORTANT: Especially in this test pattern you are able to detect false configurations in the signal source (e.g. DVD-Player ...). Only if the configurations of the signal source correspond with the display configurations an optimal reproduction is possible.

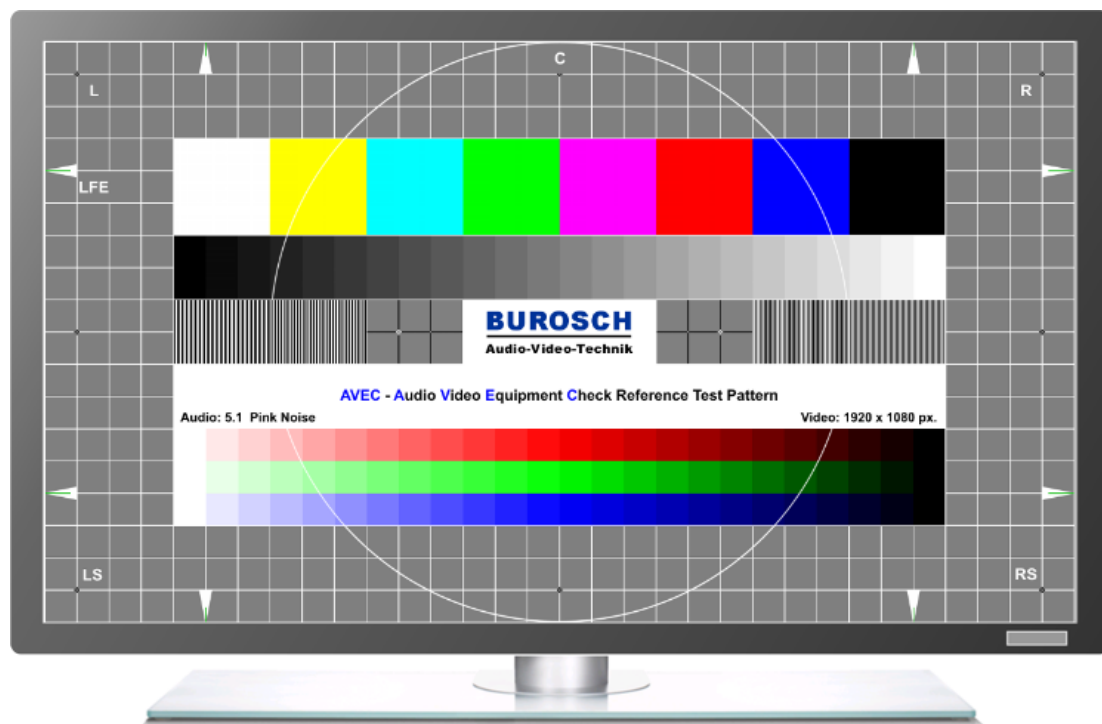
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6 Reference Test Pattern: AVEC

The last test pattern is called AVEC (Audio Video Equipment Check) which gives you the option for a final check of all parameters. With the reference test pattern AVEC you can evaluate and if needed to calibrate the following aspects of image reproduction once more:

- Focus
- Brightness
- Contrast
- Color balance (color temperature)
- Gamma
- Scaling
- Geometry (deformations)
- Over scan
- Speakers (audio)

The following image shows the AVEC test pattern in optimal display



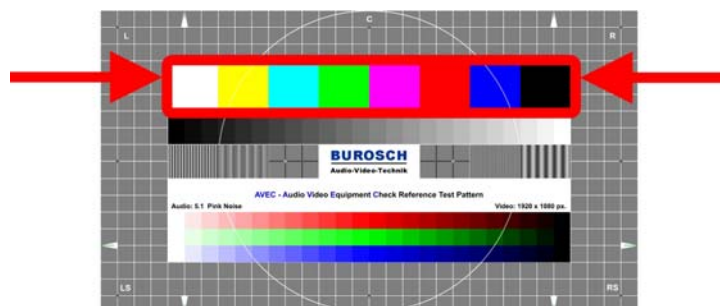
Reference test pattern AVEC in optimal display

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6.1 Reference Test Pattern AVEC / Test Zones

This test pattern is made up of 8 individual test zones. For more detailed information please read the AVEC manuscript which you can separate download from our web site.

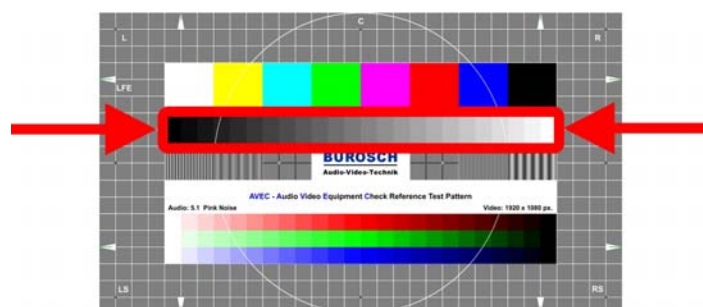
- Test Zone 1: Color Bars



Test Zone 1: Color Bars

This test zone allows a final check of the color intensity. The colors shown in this test zone are all primary and secondary colors from white to black. All colors have to be in 100% saturation.

- Test Zone 2: 24-stepped gray bars



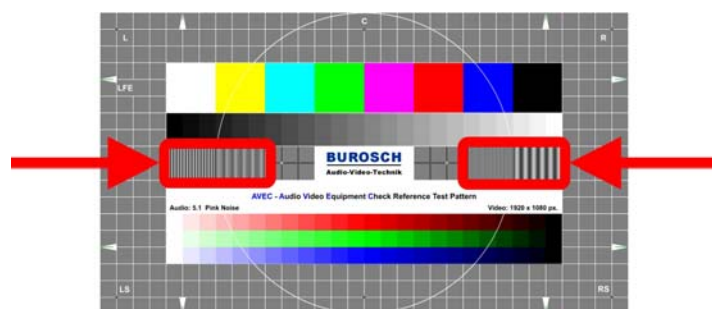
Test Zone 2: 24-stepped gray bars

This second test zone is very important to detect faults in the following parameters of image reproduction: Brightness, Contrast, Gamma, and Color Processing. If you see all nuances of the gray bars especially the darkest and brightest three steps very clearly and without color faults or color drifts the display is adjusted correctly.

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6.1 Reference Test Pattern AVEC / Test Zones

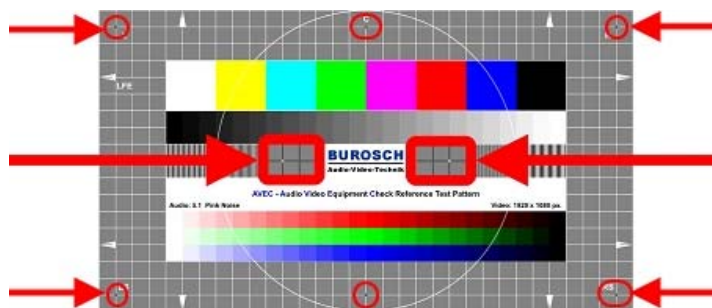
- Test Zone 3: Multiburst



Test Zone 3: Multiburst

The third test zone is the Multiburst stripe patterns, which show hard contoured black-white changeovers for the relative image evaluation of the displayable fine-resolution or scaling artifacts of the TV-display.

- Test Zone 4: Focus



Test Zone 4: Focus

By the help of the focus test fields you are able to see how good the focus control is adjusted. You can detect a blurring or an over-focusing by the lines of the test field easily. Over-focusing expresses in form of ringing, double contours as complementary contrast line on the original white or black line of the test pattern. Ideally you see clearly black cross hairs on a neutral gray background. The background mustn't show any color faults. If you see the cross hairs sharp enough without soft contours the focus control of the display is adjusted correctly.

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6.1 Reference Test Pattern AVEC / Test Zones

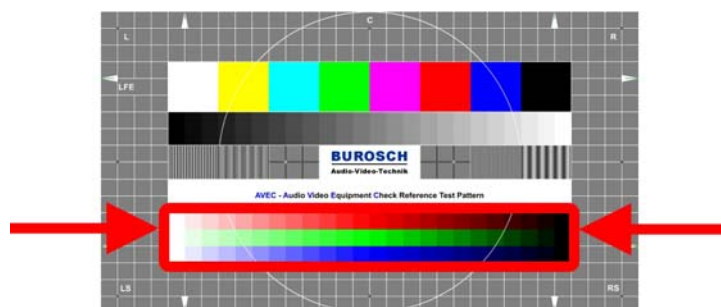
- Test Zone 5: White Balance



Test Zone 5: White Balance

The white, labeled bar acts as detection of potential false colors and color faults. Important at this test zone is the maintenance of the brilliant, color neutral white over the whole surface without any color faults or false colors. It is put the white on a level with the norm illuminant D65, which equates to an average daylight.

- Test Zone 6: RGB Steps



Test Zone 6: RGB Steps

This test zone gives you the last option to check the color intensity, color temperature and saturation respectively. With this test zone you are able to evaluate the color processing of your display especially the gamma of each primary color.

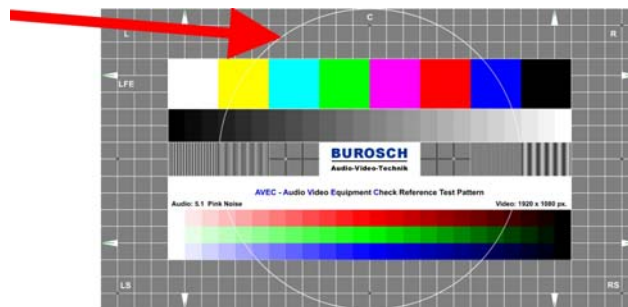
By the help of this test zone you ensure the naturalness in the later film.

Ideally you see all 24 nuances from 100% white on the left over 100% color saturation in the middle until 0% white (maximum black) on the right side of each primary color (red, green and blue).

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6.1 Reference Test Pattern AVEC / Test Zones

- Test Zone 7: Geometry

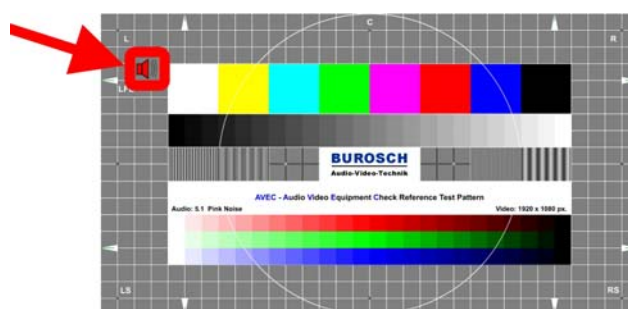


Test Zone 7: Geometry

This test zone is adapted for checking the image geometry of the display especially deformations in vertical and horizontal direction. The real test zone is the background where you see white grid lines showing perfect squares and a circle which implicitly has to be perfect round.

Ideally you see over the whole background surface perfect sharp squares with same length of each side and a perfect round circle which affects the upper and lower borders of the display screen. In cause of doubt please use a simply ruler which you can easily hold on the display to check the linearity of the squares and the horizontal / vertical diameter of the circle respectively.

- Test Zone 8: Audio Test



Test Zone 8: Audio Test

This audio test is optimized for testing 5.1 Dolby Digital Surround. The audio test is useful for identification of the whole channels, heavy consideration of the configuration of the bass management and the calibration of the playback string.

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7 Credits

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