DSP Setup Guide Vol.1 – the Sound Tuning Magazine from Audiotec Fischer including operation manual for configuring a sound setup

AUDIOTEC FISCHER

Sound Tuning Magazine

For DSP PC-Tool V2

DSP Setup Guide

Vol.1

GERMAN CAR AUDIO BRAX®

HELIX® GERMAN CAR HIFI

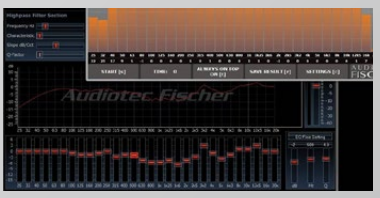
MATCH BY AUDIOTEC FISCHER

Channel routing

Time alignment

Filter settings

Equalizing



Topics

- The measuring microphone
- The ATF Real-Time Analyzer
- Configuring a sound setup step by step

DSP Setup Guide Vol. 1

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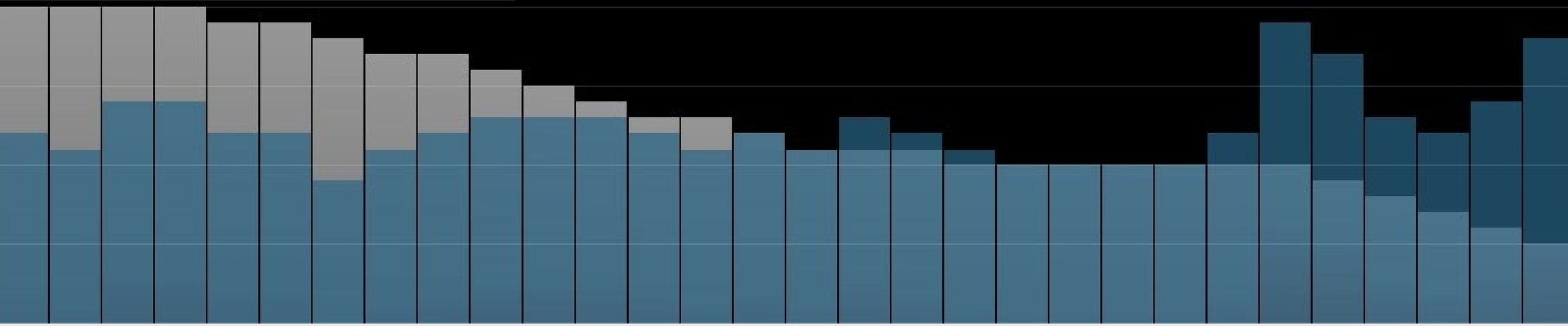


Content

1. Hardware

Basis for a successful measurement is an accurately installed measuring microphone.

Before you can do the first measurement you have to connect the measuring microphone and its preamplifier to your computer. In this case the MTK 1 serves as an example for connecting a measurement microphone to a PC.

1.1. Preparing the measuring microphone

1. Connect the XLR plug to the measuring microphone:

2. Connect the XLR jack to the microphone preamplifier:

3. Hook up the miniUSB plug of the included USB cable to the microphone preamplifier:

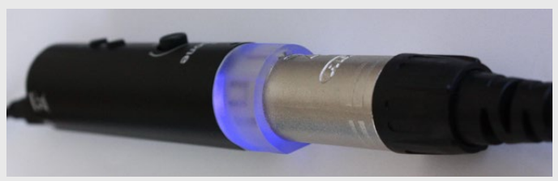
4. Connect the USB plug to a free USB port of your computer:

Hint

We strongly recommend not to hook up directly the microphone preamplifier to the microphone!

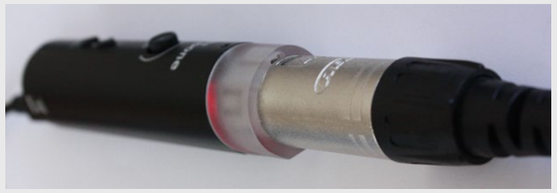
5. Set the gain control on the microphone preamplifier to center position:

6. After connecting the microphone preamplifier to your computer the transparent ring should light up blue:



7. Now activate the phantom power of the microphone amplifier by pressing the tiny push button once (marked with „48V"):

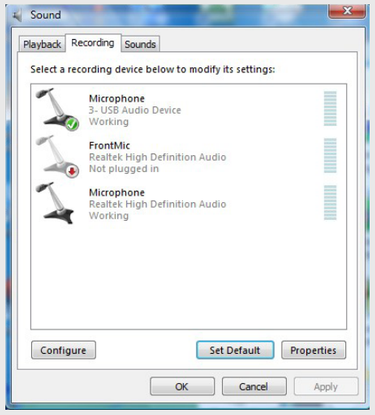
8. The transparent ring should now change its colour from blue to red:



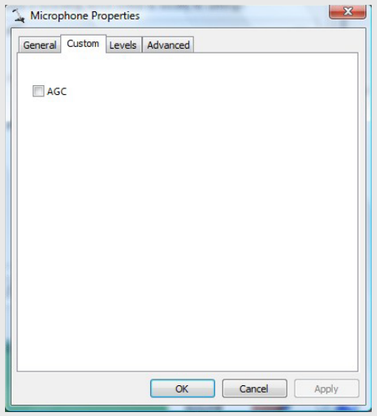
Important

It is mandatory that the microphone is connected to the computer before you start the audio analyzer in the DSP PC-Tool. The microphone will not be detected if you connect it after starting the software!

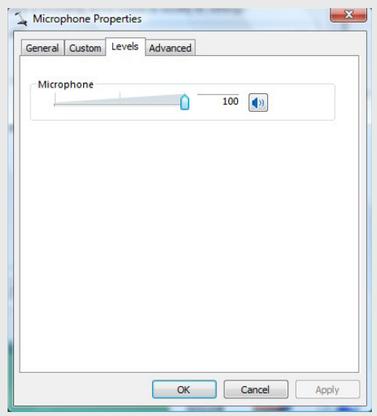
9. Please also check the audio settings in the control panel of your computer whether the microphone has been properly detected.



10. It is important that the automatic gain control „AGC" is deactivated.



11. Make sure that the microphone volume is set to 100%.



2.1. The test signal

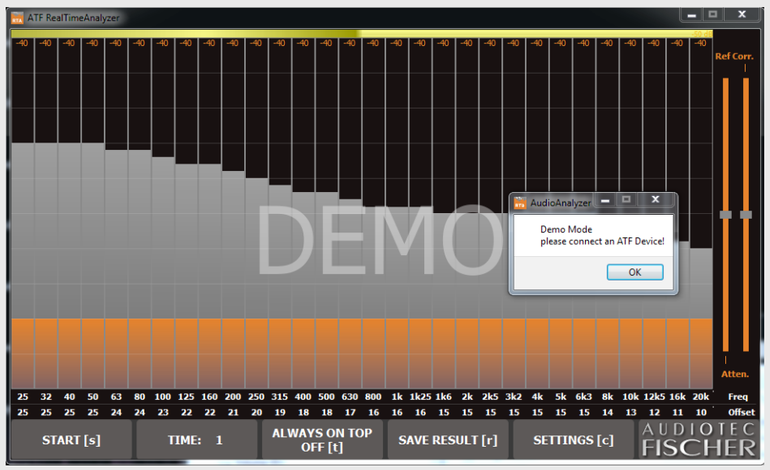
The measurement of frequency response curves with the ATF audio analyzer requires an appropriate test signal. In this case a so-called "pink noise" signal is used which has to be reproduced through your car audio system. The included USB memory stick incorporates such a test signal on the one hand as an uncompressed „WAV" file (preferred) and on the other as an compressed „MP3" file. As long as your car audio system offers a USB connector you can directly hook up the USB stick for playback. If your car stereo is not equipped with a USB port then you have to burn the „WAV" file via your computer to an audio CD first before you can use it in the CD drive of your head unit.

3. The ATF Real-Time Analyzer

In order to make frequency response measurements as simple as possible Audiotec Fischer has developed its own „Real-Time Analyzer" software.

3.1. Launching the ATF Real-Time Analyzer

At first open the Audiotec Fischer DSP PC-Tool and click on the red marked button „Real-Time Analyzer". If you use the Audiotec Fischer DSP PC-Tool in demo mode, the audio analyzer is working in demo mode as well with significantly reduced functionality. The measurement duration is limited to 1 second only (instead of 20 sec. in normal operation mode), means that it won't be possible to do a reasonable frequency response measurement. As soon as one of our DSP devices is properly hooked up to your computer, the audio analyzer will offer its full functionality.



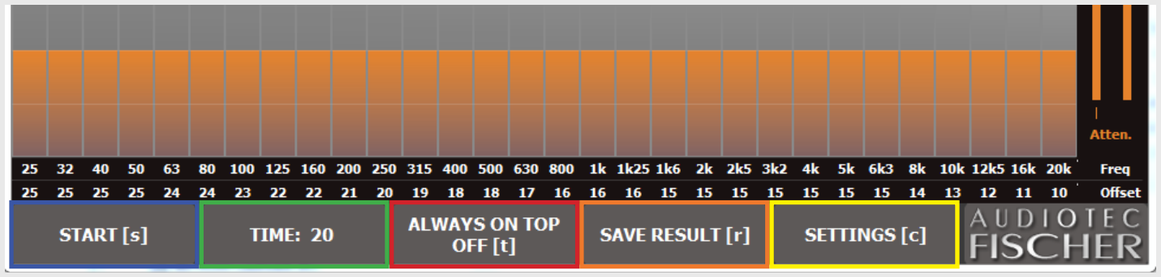
The software „ATF DSP PC-Tool" including the Real-Time Analyzer can be downloaded as a complete installation file from the Audiotec Fischer website.

Note

If you use the Audiotec Fischer DSP PC-Tool in demo mode without a connection to any of our DSP devices, then the audio analyzer is also working in demo mode with significantly reduced functionality. In this case the analyzer will be displayed as shown on the right:

3.2. Explanation of the different functions

To ensure a good workflow it is advisable to get familiar with the various functionalities of the ATF Real-Time Analyzer. The different functions are explained below:



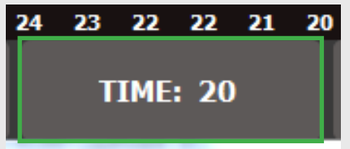
„Start" button

To start a measurement click on the blue marked button "START".

„Time" button

The green marked icon „TIME" displays the duration of the measurement. The default value of 20 seconds cannot be modified. After starting the measurement it will count down from „20" to „0". Nevertheless it is possible to stop a measurement earlier by clicking once more the „START" button.

We strongly recommend to exploit the full duration of 20 sec.



Advice:

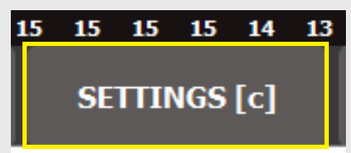
You can simply enter one of the letters in the angled brackets to activate a function

„Always on top off" button

The red marked button „ALWAYS ON TOP OFF" is a toogle switch. If you choose „ALWAYS ON TOP ON" then you can do adjustments in the DSP PC-Tool and watch the analyzer curve at the same time. Otherwise the analyzer curve will immediately disappear once you do any setting in the DSP PC-Tool.

„Save result" button

The orange marked button „SAVE RESULT" allows saving the measured frequency response curve as a "png" file to the hard drive of your computer.



„Settings" button

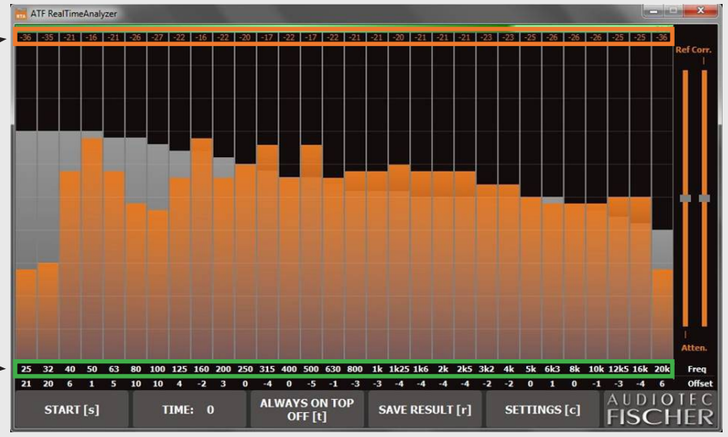
Hit the yellow marked button „SETTINGS" to enter the settings menu.

Sound pressure level in dB

The values below the coloured bar show the measured sound pressure level for each frequency band in decibels [dB].

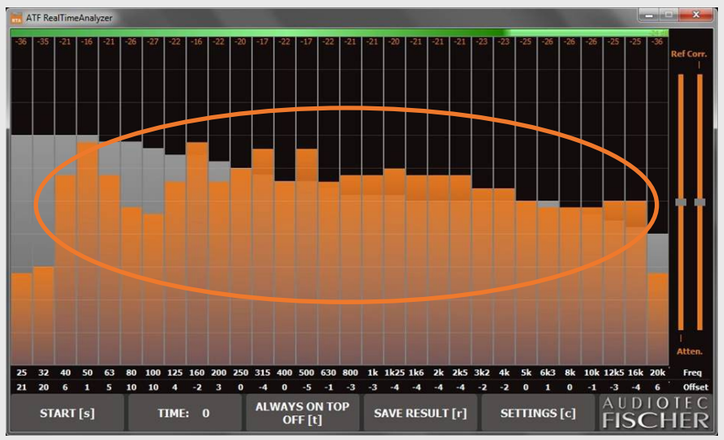
Frequency band in Hz

Here are the center frequencies of each single frequency band displayed in Hertz [Hz].



Note

All sound pressure dB values are no absolute but relative values only!



Frequency response curve

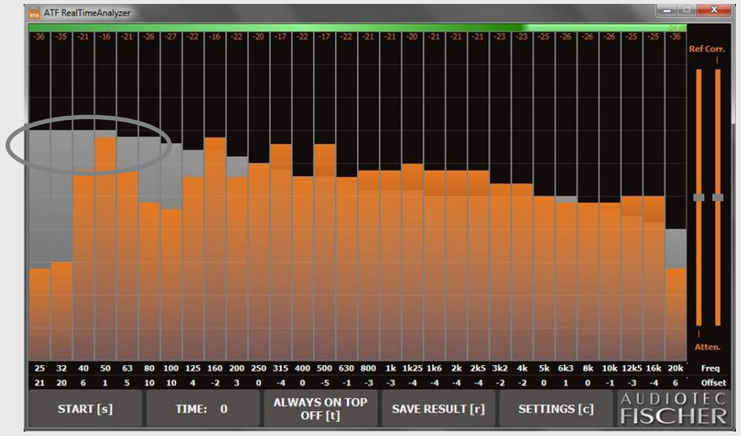
The thirty (30) orange bars show the measured frequency response curve in 1/3rd octave steps from 25 Hz to 20,000 Hz.

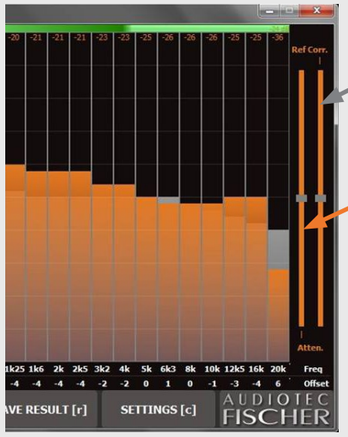
Note

The equalizer of the DSP PC-Tool has exactly the same frequency band resolution as the analyzer which makes adjustments pretty easy!

Reference curve

The thirty grey bars behind the orange bars indicate the chosen reference curve in 1/3rd octave steps.





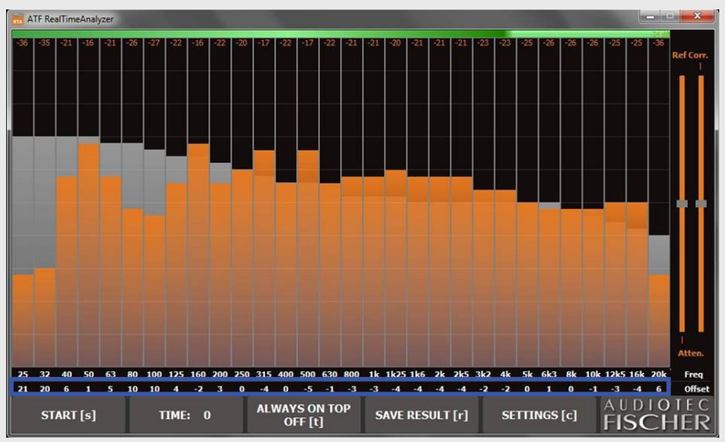
Slider

You can move the reference curve vertically up and down using the right slider on the right hand side.

Or you move the measured curve using the left slider on the right hand side.

Expert advice:

We recommend to move the reference curve so that the deviation of the reference and the measured curve will show minor dips and stronger peaks! Keep in mind that equalizing peaks are no problem at all, but „filling up" dips can lead to distortion and increased noise level!



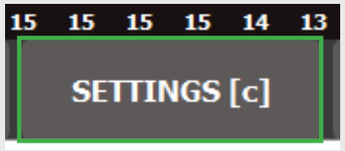
Offset

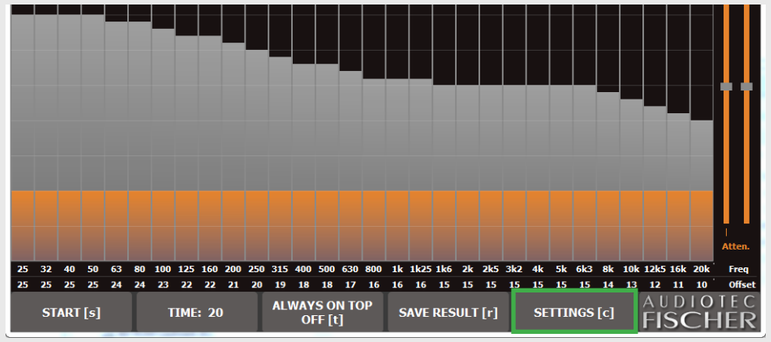
This line (blue marked) shows the offset of each measured frequency band from the reference curve in [dB]. Positive values correspond to boosts of specific bands, negative values mean that you have to cut certain bands accordingly.

Take great care with strong boosts (> 4dB) as this can easily lead to overmodulation of the DSP and therefore dramatic increase of distortion. Deep cuts (-10 dB and more) are no problem at all.

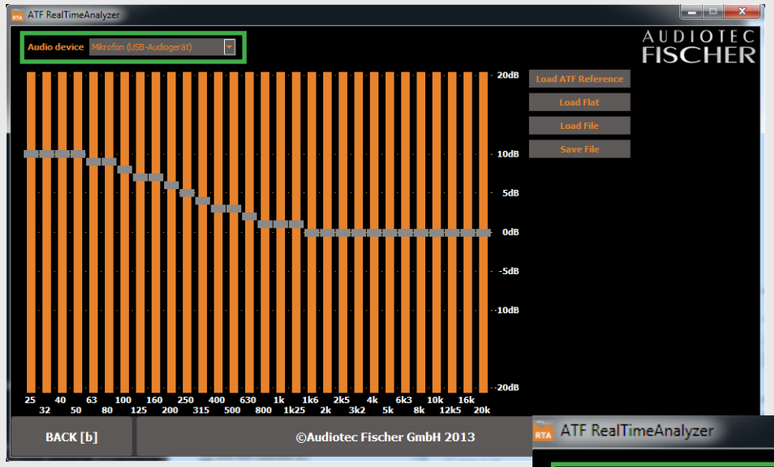
3.3. Setting up the Real-Time Analyzer

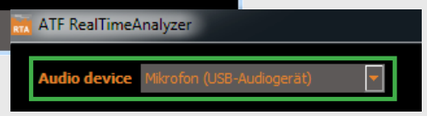
For configuring the Real-Time Analyzer, please click on the green marked button "SETTINGS" or simply hit the „c" on your keyboard.





Then you will see the following menu:



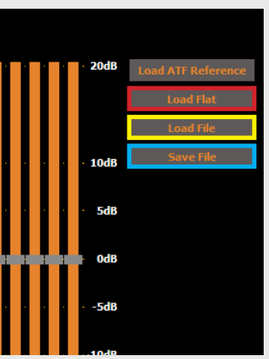


Important

Check first whether your connected microphone is actually the selected device (see green marked frame). It may happen that the internal microphone of your computer is chosen instead which would lead to totally wrong measuring results.

3.3.1. Configuring the reference curve

Choose the desired reference curve which you finally will achieve with the adjustment of the DSP. The „ATF Reference" is selected as default as this curve is identical to today's industry standard.



Alternatively you can choose a linear (flat) reference curve. To load the linear curve just click on the red marked button „Load Flat". This curve should only be used for home applications, not for car audio measurements, it definitely will not lead to satisfying results when applied for car audio purposes.

If the ATF Reference does not meet your personal taste it is also possible to define your own reference curve. Each single frequency band of the curve can be adapted separately.

After all settings in this menu have been done, you can switch back to the analyzer display by clicking on the „BACK" button or by hitting the "b" on your computer's keyboard.

Expert advice:

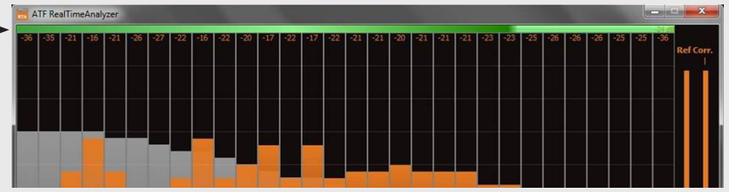
Save a self-defined reference curve via „Save File" (blue marked button) to your hard drive that you can recall it later on via the „Load File" button (yellow marked button).

3.4. Sound level indicator

To attain an optimal measurement result it is advisable to adjust the correct sound level. The ATF Real-Time Analyzer displays by a coloured bar in the upper segment if the sound level of your audio equipment is sufficient for the measurement or not.

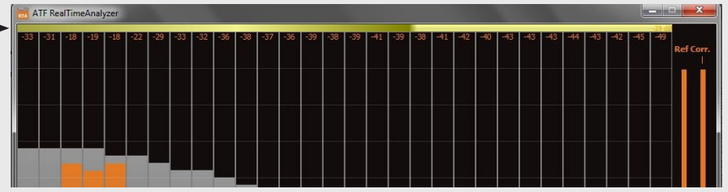
Green bar

Sound pressure level is correct!



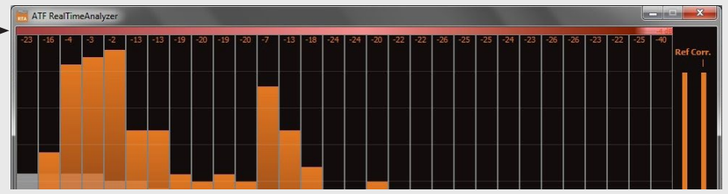
Yellow bar

Sound level too low; Crank up the volume of your car radio or check the sensitivity adjustment of the microphone in the control panel of your computer.



Red bar

Sound level too high; Reduce the volume level on your car radio or check the sensitivity adjustment of the microphone in the control panel of your computer.



3.4.1. Adjusting the correct sound level

1. Take place on the seat in the car in which the measurement will be done.
2. Start the "pink noise" playback on your car radio. Adjust the volume that any ambient noise is fully masked.
3. Hold the measuring microphone upright. Click on the „Start" button (or simply enter „s") and move the microphone slowly in a semicircle between your left and right ear.
4. Now the coloured bar indicated if the sound level is sufficient for the measurement or not.
5. This is an iterative process which may require several runs until you reach the correct sound level.

Note

You have to do the adjustment of the correct sound level for each vehicle and different measurement positions.

4. Configuring a sound setup

Step by step to your own sound setup

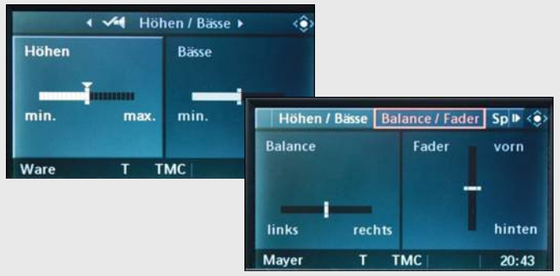
The creation of a sound setup consists of four work steps. At first you have to do the channel routing followed by the time alignment and the filter settings. At last do the equalizing.

Hint

You achieve the best result when the car is parked in the closed garage that no ambient noise can affect the measurement.

4.1. Preparations

- Sit in the driver's seat and make sure that all sound controls of your car radio are set either to linear or center position. Deactivate any existing loudness functions. The balance and fade controllers must be adjusted to "center position" as well.



- Connect your amplifier / processor to your PC and start the ATF DSP PC-Tool software.

4.2. Channel routing

The channel routing „organizes" all inputs and outputs.

- Start at first with the setup of channel routing matrix first. You can skip this step in case of the PP 52DSP when you do not use the RCA line outputs. In the appendix you will find a couple of examples for typical applications. Futher information about the channel routing can be found in the ATF DSP Special which can be downloaded for free at: www.audiotec-fischer.com

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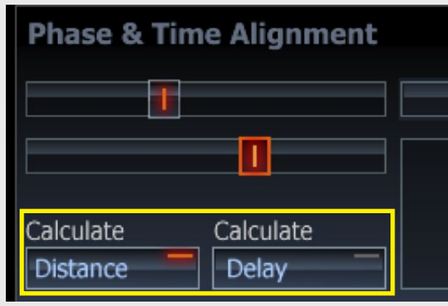
4.3. Adjusting the time alignment

A sensitive adjustment of the time alignment is the basis for a natural and precise sound staging in your car.



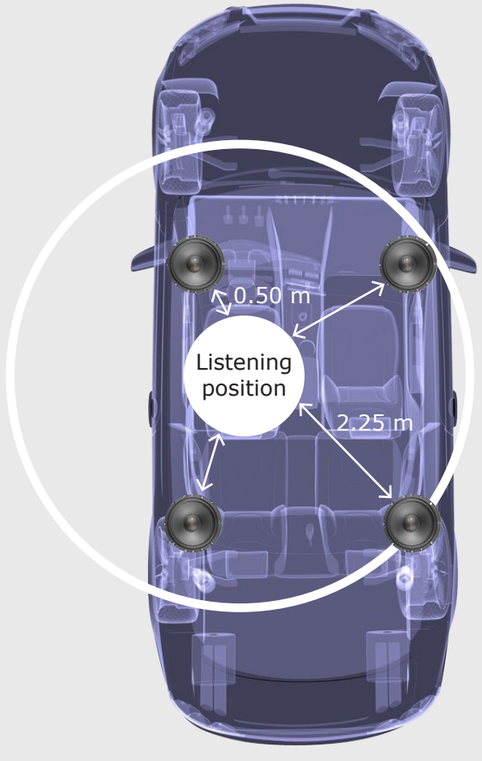
It is only possible to achieve a correct "front staging" of the music if the time alignment is adjusted properly. Therefore the software features sensitive adjustments in increments of 7 mm / 0.020 msec (for units with 48 kHz sampling rate) or 3.5 / 0.01 msec (for units with 96 kHz sampling rate). The software provides two different ways of adjusting the time alignment:

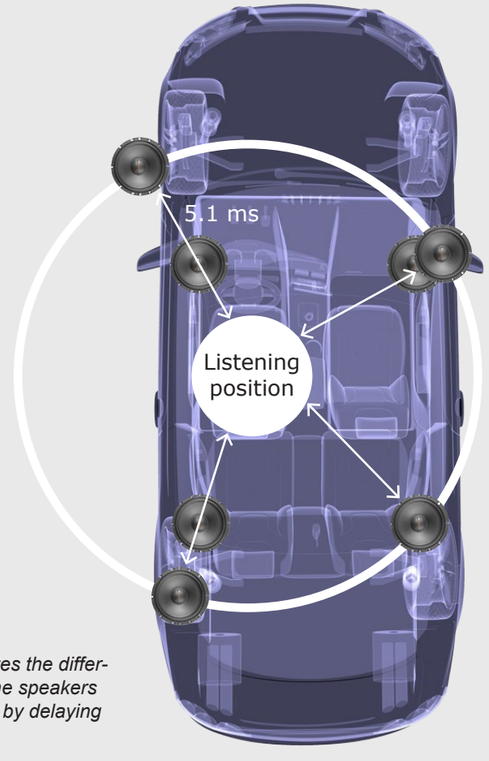
„Calculate Distance"
This mode requires the input of the distance between each loudspeaker and the ears of the listener. Simply use a tape measure to determine the distance. The program uses this to calculate the necessary time delay for each channel.

„Calculate Delay"
This mode requires the direct input of the preferred time delay value if available.

Important

The time alignment function may only be used to achieve the optimum stereo reproduction at one single listening position in the vehicle. However, spatial reproduction at the other positions are usually bad with time alignment. Always switch on the time alignment before adjusting the frequency response with the equalizer. When you adjust the time alignment of the subwoofer use either the "tape measure method" or the "Phase" slider. Other more precise methods are not necessary.



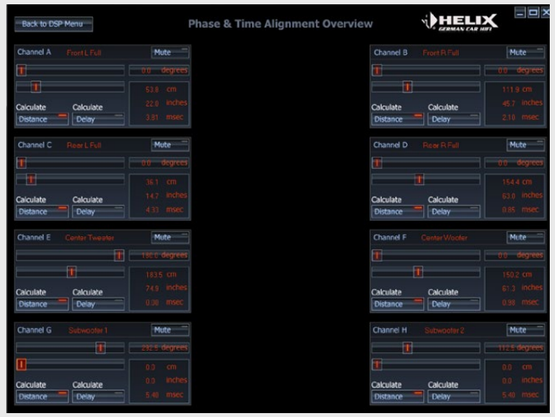


The DSP compensates the different distances from the speakers to the listener´s ears by delaying signals.

Expert advise for adjusting the time alignment („Time Alignment")

The optimum setting can easy be calculated by using the "Calculate Distance" mode as follows:

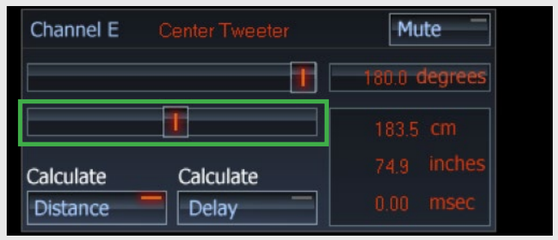
1. Open the time alignment overview and choose the „Calculate Distance" mode.



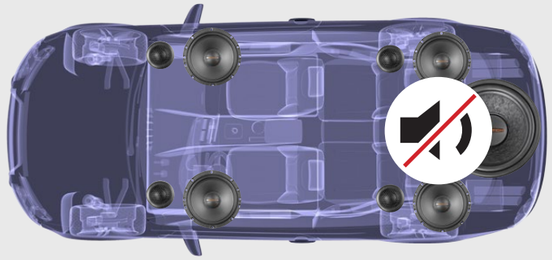
The time alignment overview displays the distance and delay values of all channels at a glance.

2. Use a tape measure to measure the distance between the individual speakers and your head in your listening position and enter these values accordingly.

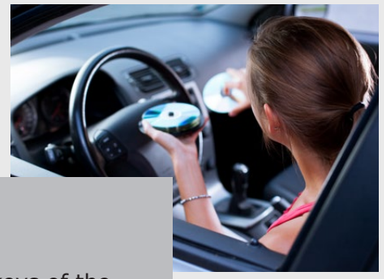
3. Adjust this distance value using the slide control.



4. Now mute the rear channels and the subwoofer using the "Mute" function.



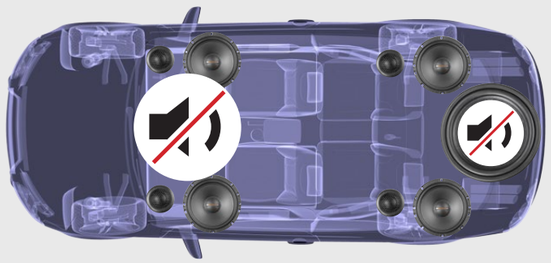
5. Select a music track which preferably consists only of vocals without instruments or chorus. Adjust the time alignment of each front speaker (Front left ... or Front right ...) in small increments until you can hear the voice either directly in front of you or slightly to the right, the so-called 1 o'clock position. In order to achieve the desired result you can adjust the time alignment by a few centimeter/ msec.



Advice:

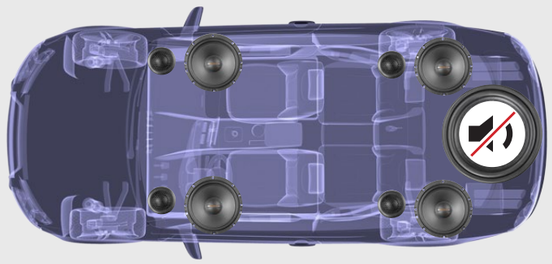
Use the arrow keys of the keyboard for easier fine adjustment

6. Now mute the front channels using the "Mute" function and reactivate the rear channels.



7. Adjust the time alignment of the rear speakers in the same way (use the same vocal track) until you hear the voice directly from behind or slightly from the right behind (the so- called 5 o'clock position).

8. Unmute / reactivate the front speakers. Keep the subwoofer channel muted as before.



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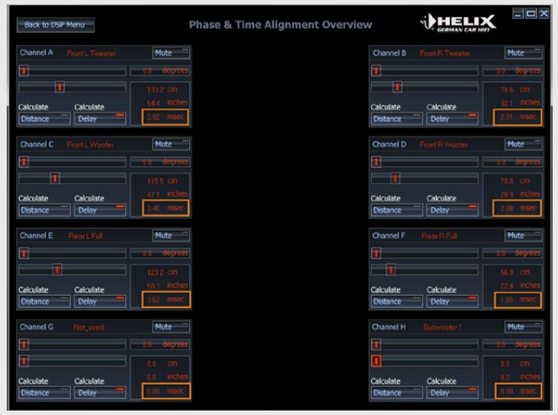
9. The amplifiers PP 52DSP and PP 82DSP offer the so-called „Additional Delta Delay Front / Rear" slide control to „electronically" shift the rear speakers backwards until it is almost impossible to notice them because then they cannot have any negative impact on a perfect front staging.

10. If you have a device without this feature you have to manually enter an extra delay for each rear channel. According to our experience values of approx. 100 - 200 cm (corresponds to 3 msec. delay) are sufficient. If you have done the time alignment setup by using the „Calculate Distance" method it is not possible then to add such an extra delay by simply using the sliders of the rear channels. This would affect all other channels. Do the following steps: Note the delay of each channel in "msec" and switch to "Calculate Delay" method. Enter the delay for each channel in msec. by using the individual sliders. Now you can vary the values for the rear channels without affecting the others. In the example the two rear channels have been additionally delayed by 100.6cm (= 2.96 msec.).



11. If you have done the time alignment for the front and rear channels correctly, then demute all the other channels. This completes the adjustment of the time alignment.

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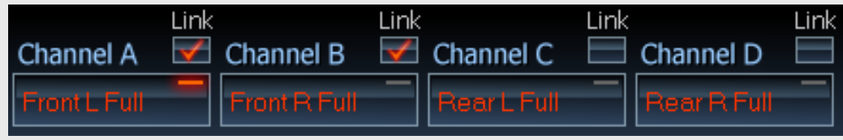
4.4. Selecting and linking channels for adjustment



The software allows each channel to be adjusted separately. In spite of this, it often makes sense to link the two front channels or the two rear channels for example. Therefore adjust them simultaneously. This is particularly recommended for the high- and lowpass filters because different values for right and left channel should be avoided. Even with the equalizer a separate adjustment of channels only makes sense if sound optimization is required for a single listening position only.

Simply insert a tick by the channels you want to adjust simultaneously (in the example above, the two front channels).

Important

When linking two or more channels the previous adjustments are not automatically transferred to the other channel/s. Only those adjustments which are made after linking will be applied to the linked channels.

Therefore please consider first if two or more channels should be adjusted simultaneously.

Expert advice:

When creating a vehicle-specific setup, Audiotec Fischer adjust the gain, filter and EQ settings of the two front channels identically. The rear channels will be proceeded in the same way.

4.5. High- and lowpass filter settings

The crossover with highpass and lowpass filters allocates the right frequency range for each specific speaker type.

This section enables the configuration of almost any type of highpass filter (left side) and lowpass filter (right side) for the selected channel.

The following parameters have to be adjusted separately:

- Crossover frequency
- Filter characteristics
- Slope
- Q-factor

(The „Q-factor"-slide control is only activated if you select the "Self-Define" characteristics).

The functions of the individual parameters are described below.

The highpass filter has to be made in the left section whereas the adjustment for the lowpass filter is done in the right section. Both filters affect the selected channel (or more than one channel if you have linked them before).

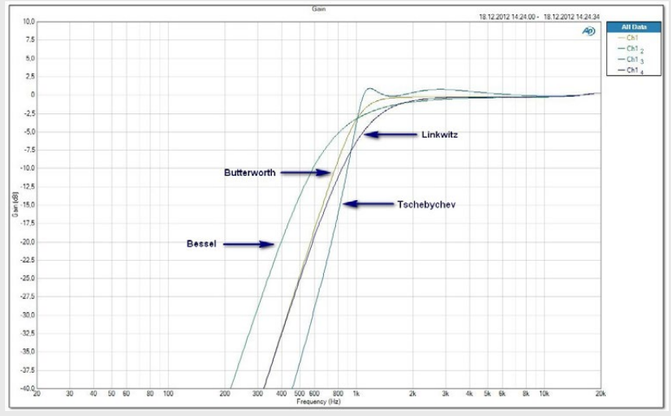
The different filter characteristics

Butterworth (Q = 0.71)

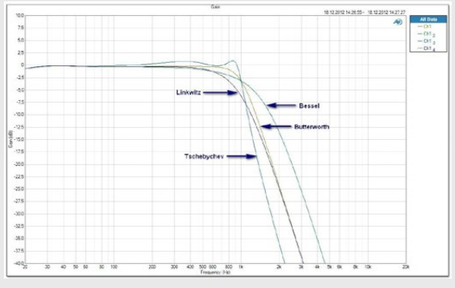
- Rather good impulse response
- Sharp transition from the passband to the stopband
- 3 dB gain in the crossover frequency range
- The most popular characteristics, suitable for almost all applications

Bessel (Q = 0.58)

- Very good impulse response
- Very gradual transition from the passband to the stopband
- Requires loudspeakers that have a smooth frequency response even outside their passband
- Less than 1 dB gain in the crossover frequency range
- Only practical in combination with very high quality loudspeaker systems; not recommended for subwoofers



Examples of the different filter characteristics are presented for a 1000 Hz highpass filter (above) and lowpass filter (right) with a slope of 24 dB per octave.



Linkwitz (Q = 0.50)

- Very good impulse response
- No steep transition from the passband to the stopband
- No gain at the crossover frequency
- Only useful in combination with very high quality loudspeaker systems; not particularly recommended for subwoofers

Tschebyschev (Q = approx. 0.90)

- Very sharp transition from the passband to the stopband
- Poor impulse response
- No flat frequency response (1 dB "ripple")
- Only recommended as a lowpass for subwoofer or as a highpass required for tweeters which are operating close to their resonance frequency

Note

If you have selected the "Linkwitz" filter characteristics, you are only able to set the values to "-12 dB" and "-24 dB" (-36dB as well for C-DSP and NOX4 DSP).

The "Self-Define" characteristic always has a slope of -12 dB per octave.

Self-Define

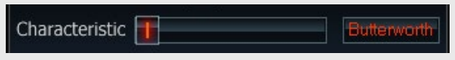
- Only available as a 12 dB filter with adjustable Q factor
- Useful as a highpass filter in so-called "filtered bass reflex systems" whereby the crossover frequency usually corresponds to the tuning frequency of the bass reflex port

Proceeding

1. Select the channel you want to adjust. To do so, simply click on the respective box with the left mouse button. The active channel is indicated by the red LED (green marked in the picture).

2. **Crossover frequency**
   Use the slide control to select the required crossover frequency for the highpass or lowpass filter. The setting accuracy depends on the device type.

3. **Filter characteristics**
   There are four different filter characteristics available for selection and the option of setting your own highpass and lowpass filter using "Self-Define". The table in the appendix presents an overview of the typical properties of the different filter characteristics.



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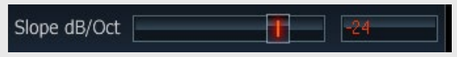
4. Slope dB/Oct

With this slider it is possible to modify the transition steepness of the filter. At a value of „0dB" the filter is not active. The adjustment ensued in 6 dB increments up to the maximum which depends on the connected device.



5. Q-Factor

This slide control is only active if you select the "Self-Define" characteristics. The slope for this characteristics setting is fixed at -12 dB and there is the option of adjusting the Q-factor of the high- or low-pass between 0.5 and 2.0 in increments of 0.1.

Expert advice:

Adjusting an appropriate crossover frequency and slope is more important than the selection of „characteristic" or „Q factor".

Examples of crossover frequencies

Especially in combination with a separate subwoofer it makes sense to relieve the speakers from low frequency response. This will have a positive impact on distortion, clarity of sound, power handling and maximum SPL. The following settings for the individual speaker sizes have been determined to be feasible:

Passive systems				
Speaker size	**Filter type**	**Filter slope**	**Characteristic**	**Minimum crossover frequency**
6x9" or 20 cm / 8"	highpass	-12 dB	Butterworth	40 Hz
16,5 cm / 6.5"	highpass	-12 dB to -24 dB	Butterworth	50 Hz
13 cm / 5.25"	highpass	-18 dB to -24 dB	Butterworth	70 Hz
10 cm / 4"	highpass	-18 dB to -24 dB	Butterworth	80 -100 Hz

For fully active speaker configurations you will find some reasonable filter settings below. Please note that these values are good for starting with a new setting but most likely need some fine tuning during the setup process depending on your specific application!

Active systems				
Speaker size	**Filter type**	**Filter slope**	**Characteristic**	**Minimum crossover frequency**
Tweeter 20 mm / 0.75"	highpass	-24 dB	Butterworth	3,000 Hz
Tweeter 20 mm / 0.75"	highpass	-12 dB	Butterworth	4,000 Hz
Tweeter 20 mm / 0.75"	highpass	-6 dB	Butterworth	6,000 Hz

Active systems				
Speaker size	**Filter type**	**Filter slope**	**Characteristic**	**Minimum crossover frequency**
Tweeter 25 mm / 1"	highpass	-24 dB	Butterworth	2,000 Hz
Tweeter 25 mm / 1"	highpass	-12 dB	Butterworth	3,000 Hz
Tweeter 25 mm / 1"	highpass	-6 dB	Butterworth	4,000 Hz
Midrange 50 mm / 2"	highpass	-24 dB	Butterworth	800 Hz
Midrange 50 mm / 2"	highpass	-12 dB	Butterworth	1,000 Hz
Midrange 50 mm / 2"	highpass	-6 dB	Butterworth	1,500 Hz
Midrange 50 mm / 2"	lowpass	-12 dB	Butterworth	3,000 - 5,000 Hz
Midrange 85 mm / 3.5"	highpass	-24 dB	Butterworth	500 Hz
Midrange 85 mm / 3.5"	highpass	-12 dB	Butterworth	800 Hz
Midrange 85 mm / 3.5"	highpass	-6 dB	Butterworth	1,000 Hz
Midrange 85 mm / 3.5"	lowpass	-12 dB	Butterworth	2,500 - 4,000 Hz
Woofer 13 cm / 5.25"	highpass	-18 dB to -24 dB	Butterworth	70 Hz
Woofer 13 cm / 5.25"	lowpass	-12 dB	Butterworth	3,000 - 5,000 Hz
Woofer 16,5 cm / 6.5"	highpass	-12 dB to -24 dB	Butterworth	50 Hz
Woofer 16,5 cm / 6.5"	lowpass	-12 dB	Butterworth	2,500 - 3,500 Hz
Woofer 20 cm / 8"	highpass	-12 dB	Butterworth	40 Hz
Woofer 20 cm / 8"	lowpass	-12 dB	Butterworth	2,000 Hz
Subwoofer	lowpass	-24 dB or higher	Butterworth or Tchebychev	60 - 100 Hz

Tips for adjustment

If you have any doubts choose preferably „Butterworth". This filter function is predominantly used in commercial crossovers.

The value you select for the slope depends heavily on the type of application. The following points may aid your decision:

- The steeper the slope, the worse the filter impulse response.
- The preferred slope for the subwoofer channel lowpass filter is "-24 dB".
- A standard value for the crossover network between the woofer and the tweeter in fully active systems is "-12 dB".
- If the frequency response of a midwoofer shows a lot of strong peaks outside its typical operational frequency range, it may be useful to select a steeper slope (e.g. -24 dB per octave) for the lowpass filter.
- A small 19 mm tweeter operating in a fully active system at up to 3000 Hz also requires a steeper slope (-18 dB to -24 dB) to avoid overloading and causing a considerable amount of distortion.
- In most cases a highpass filter for a woofer or subwoofer is sufficiently dimensioned with "-12 dB" and is only necessary when small loudspeaker systems are used.
- Take care when you choose a slope of just "-6 dB" in fully active systems, particularly with tweeters. Such filters shall only be used with a suitably selected crossover frequency.

4.6. Equalizing

The target of a properly adjusted EQ should be a smooth overall frequency response.

To optimally adjust setting of the equalizer using the "ATF DSP PC-Tool" it is absolutely necessary to be able to measure the frequency responses of the loudspeakers in your vehicle. Even absolute professionals are unable to make perfect adjustments by solely using their ear.

Thankfully, good measuring equipment is affordable and the investment is definitely worth. The following steps show how to do a frequency response in your vehicle.

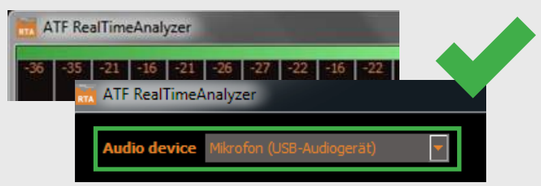
4.6.1. Adjusting the front speakers

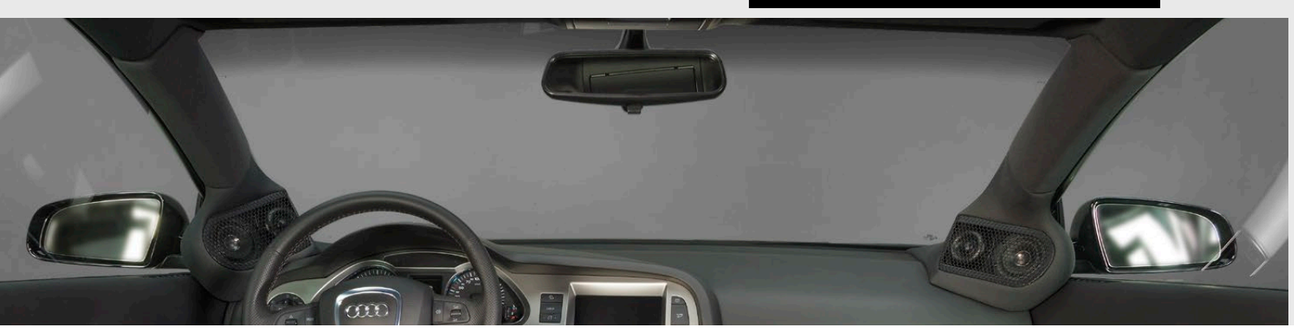
1. Mute all channels except the front channels and link the front channels.

2. Sit in the driver's seat with the measuring microphone and place your notebook / netbook on the passenger seat. Ensure that the screen is not positioned directly in front of any loudspeaker as this will influence the measurement.

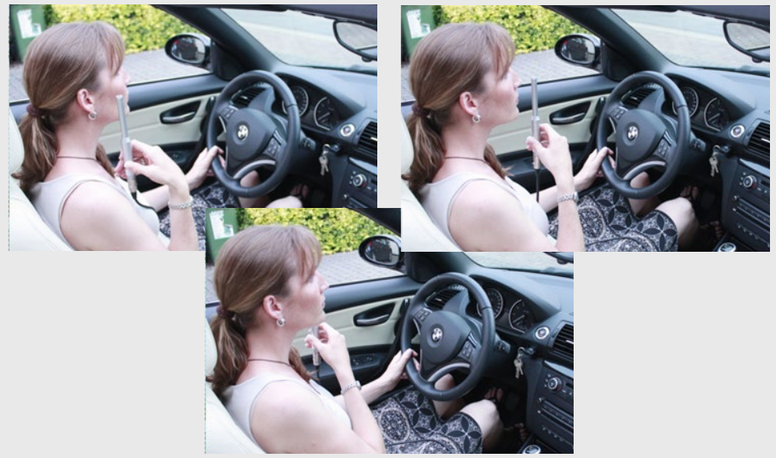
3. Start the "pink noise" playback on your car radio (activate the "repeat" function for that track if your car radio offers this feature). Adjust the volume so that any ambient noise is fully masked. Ideally, the vehicle will be in an closed garage while you are making the measurement that traffic noise does not affect the readings.

4. Check if your microphone is the selected device and if the sound level of your audio equipment is sufficient for the measurement or not (the bar should light up green). See chapter 3.4. for further information.

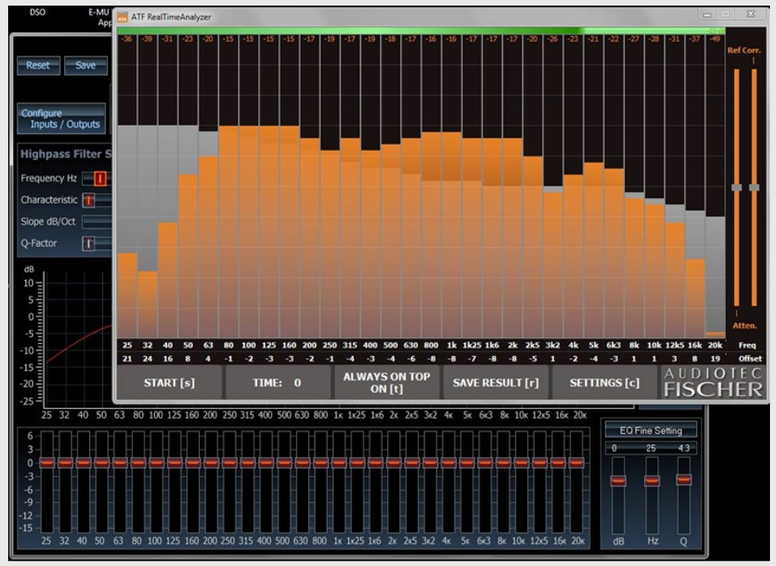




5. Hold the measuring microphone upright and move it slowly in a semicircle between your left and right ear back and forth. To start the measurement on your PC press the „START" key on the RTA software or simply press „s". The ATF Real-Time Analyzer will now do a first reading which takes 20 sec.

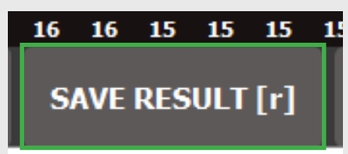


6. You can then identify the determined frequency response of the front speakers together with the reference (target) curve on your PC.



Expert advice:

Save the result of every measured frequency response curve for your own documentation. This allows you to display the result of the adjustments graphically. To save the result as a .png file just push the button „SAVE RESULT" or simply enter the letter „s".



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7. Now use the equalizer to adjust the frequency response that it matches the reference curve as close as possible.

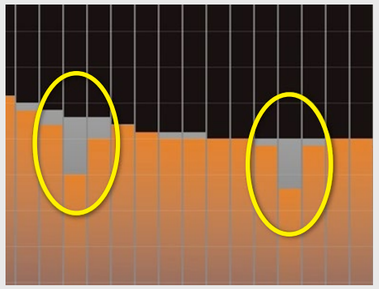
Note

This is an iterative process which may require several measurements / adjustments until you reach the grey target curve.

Deep narrow dips

Don‘t try to eliminate deep narrow dips in the frequency response (areas marked in yellow)! These dips are mainly a result of cancellation due to phase inversion and cannot be properly removed.

In many cases the human hearing will not recognize such cancellations.



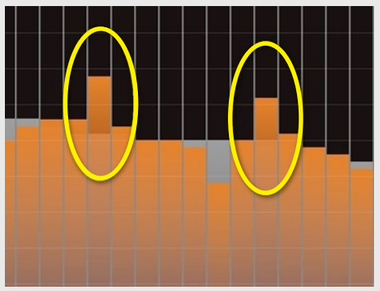
Advice:

If the resolution of the graphic equalizer itself isn‘t sufficient, make use of the „Fine Setting“ function for further optimization.

Strong narrow peaks

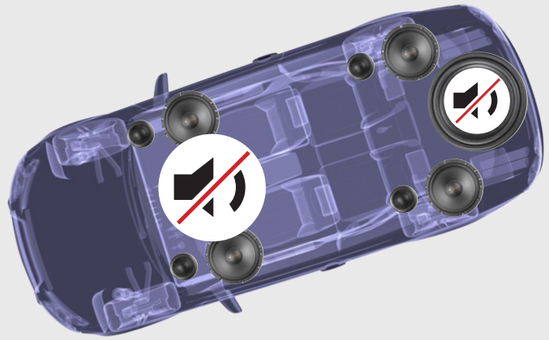
Strong narrow peaks in the frequency response should be definitely eliminated as the human hearing is very sensitive to such acoustical flaws.

You can find further information in the ATF DSP Special which can be downloaded for free at:
www.audiotec-fischer.com



4.6.2. Adjusting the rear speakers

8. After the equalizing for the front channels has been finished, mute them and demute the rear channels. Don’t forget to link the two rear channels if you don’t adjust them separately. The subwoofer remains muted.



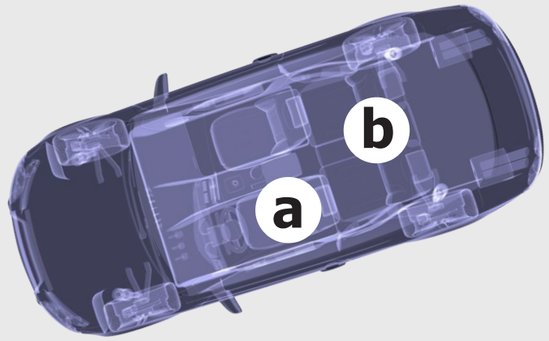
The right microphone position for measuring the rear speaker

There are two different approaches to perform the measurement process:

a) You also measure the rear loudspeakers from the driver’s seat. This method is only recommended if the vehicle has just two seats, or if you typically only travel alone. The rear loudspeakers usually sound very unpleasant in the rear seats if they have been optimized for the front listening position.

b) Alternatively, in vehicles with four or more seats sit in the center position of the rear seat bench.

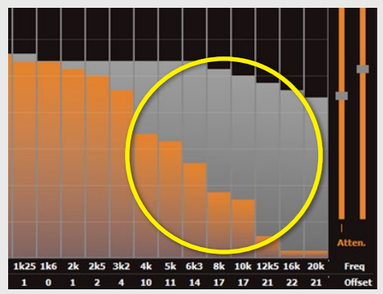
Audiotec Fischer uses this procedure to create the vehicle-specific setups for the MATCH amplifiers.



9. Now perform the measurement process as described before (see chapter 4.5.1.) in the same way for the rear loudspeakers.

10. Adjust the frequency response. In most cases it is hardly possible to achieve a full approach to the target curve for the rear speakers.

Extreme boost of selected frequency bands with the equalizer should be avoided at all times!



Note

Too much treble response of the rear speakers in most cases will have a negative impact on a proper front staging. You can find further information about qualizing in the ATF DSP Special which can be downloaded for free at:
www.audiotec-fischer.com

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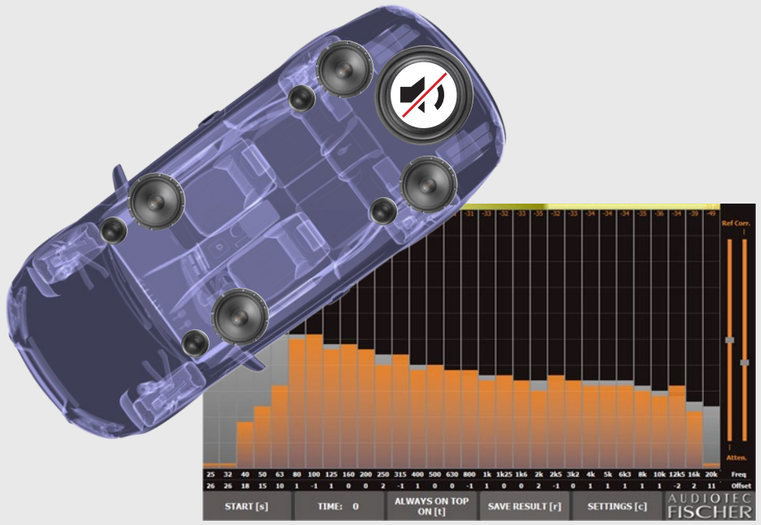
4.6.3. Checking the frequency response front and rear playing together

(continued from page 25)

11. Take place on the driver´s seat again.

12. Demute front and rear speakers (subwoofer channel remains muted) and do another frequency response measurement.

Normally it is necessary to do some fine adjustment of the EQ's when front and rear speakers are playing together. You can find futher information about equalizing in the ATF DSP Special, which can be downloaded for free at: www.audiotec-fischer.com



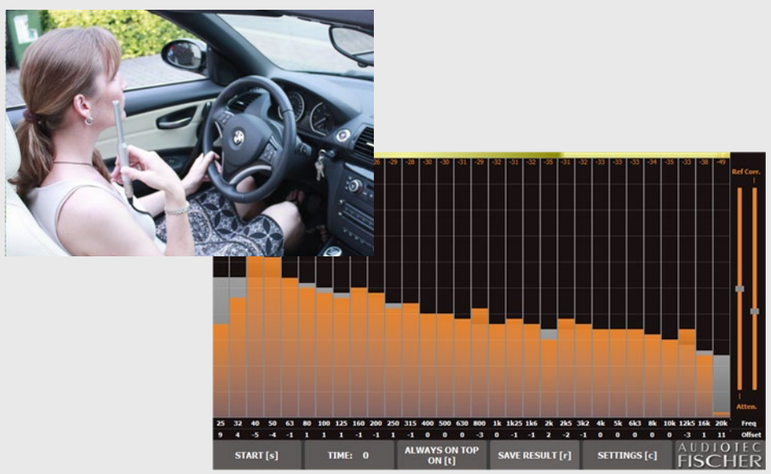
Hint

If you detect strong differences in the low frequency response then probably you notice a significant phase shift. It might be necessary to switch the phase of either the front or the rear speakers.

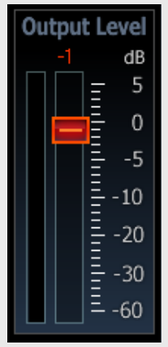
4.6.4. Adapting the subwoofer acoustical

13. Finally reactivate the subwoofer.

14. Make another frequency response measurement.

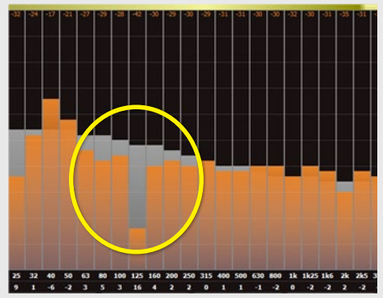


15. Vary the phase and output level of the subwoofer channel that you achieve a smooth transition in the frequency response from subwoofer to the other speakers, even without the use of the EQ.



Strong dip

A strong dip in the range of the crossover frequency indicates inadequate phase relationship between the subwoofer and the other channels. If you don't achieve a flat frequency response using the phase shift function finally try to compensate the flaws using the EQ of the subwoofer channel.



4.6.5. The final sound tuning

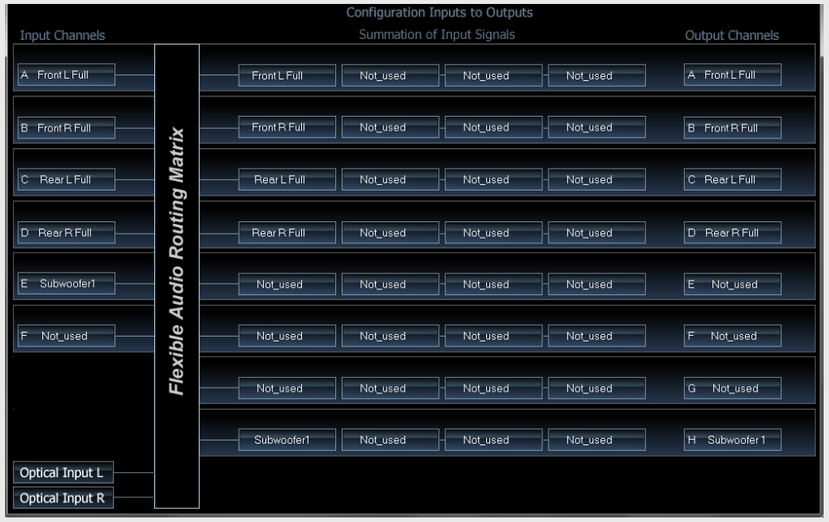
16. Now – after all these measurements and adjustments– do a first acoustical check by using music tracks you know "by heart". Adjusting the DSP in the way as described before usually leads to excellent acoustical results. Nevertheless, for the final sound tuning you should rely on your ears!

Important

After all settings are done you have to press the button <Store DSP> to transfer all parameters to the amplifier's / processor's internal memory.
Note: This step is mandatory – if you skip it, your data will get lost after turning the device off!
Store your setup as an „.afp"-file on your PC as well, using the button <Save> (mouse click left). If you want to share your setup with others who want to upload it to the device via microSD card then first you have to store it as an „ac1" or „ac2" file (right mouse click on button <Save>).

5.1. Examples for channel routing

a) Example for P-DSP / HELIX DSP



The car radio drives the five inputs A-E of the DSP. These inputs will be straightly routed to the outputs A-D + H. This is why you can find in the routing matrix only one edited input field per output channel.

Configuration

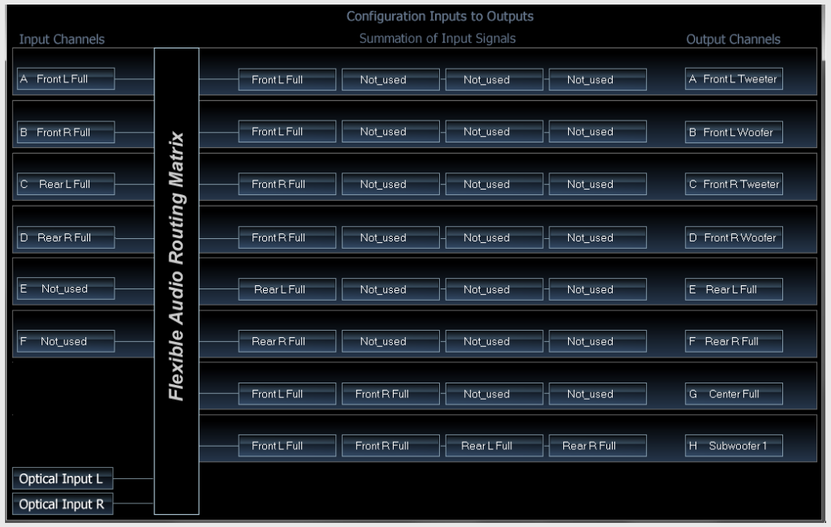
Radio

Radio with 5-channel preamp output (Front Left, Front Right, Rear Left, Rear Right, Subwoofer)

Speaker

Speaker configuration: full-range for "Front Left", "Front Right", "Rear Left" and "Rear Right" plus a separate subwoofer.

b) Example for P-DSP / HELIX DSP



The input A/B for the front speaker system will be routed to two output pairs A/B and C/D whereas the input C/D for the rear speakers will be routed to the outputs E/F. The fullrange center speaker (output G) receives a sum signal from both front input channels A/B and finally the subwoofer will be fed with a sum signal from all four inputs.

Configuration

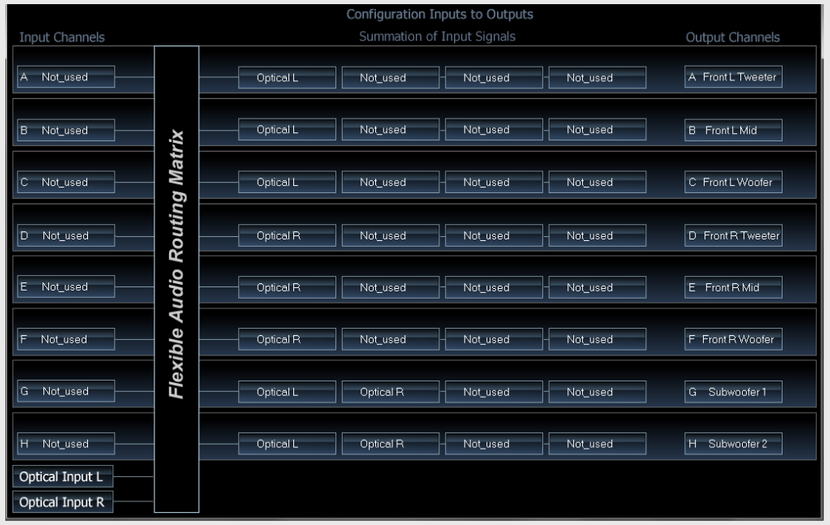
Radio

Car radio with 4-channel preamp output or highlevel speaker output (Front Left, Front Right, Rear Left, Rear Right)

Speaker

Speaker configuration: Fully active 2-way system for "Front Left" and "Front Right", full-range speakers for "Rear Left" and "Rear Right", fullrange center speaker plus a separate subwoofer.

c) Example for C-DSP



The car radio feeds the optical digital input of the device. The stereo signal will be distributed to all six outputs A – F for the front speaker system; the two subwoofers (outputs G+) get the sum signal of the left and right input channels.

Configuration

Radio

Signal source with digital optical output Left / Right.

Speaker

Speaker configuration: Fully active 3-way system for „Front Left" and "Front Right" plus two separate subwoofers.

d) Example for PP 52DSP

The PP 52DSP is a 5-channel amplifier with an additional stereo preamp output. The internal output stages are driving the front and rear speakers and one of the dedicated MATCH subwoofers whereas the preamp output can be used for other separate subwoofers or center speakers in combination with another power amplifier.

Configuration

Radio

Car radio with 4-channel highlevel speaker output (Front Left, Front Right, Rear Left, Rear Right).

Speaker

An additionally connected power amplifier to „LineOut Sub A" for a separate subwoofer; perhaps in combination with an additional center speaker on "LineOut B".

5 Supplement – 5.2. Check list

5.2. Check list configuring a sound setup

Number	Check item	Done
1.	Place the vehicle in a quiet environment	☐
2.	Connect the measurement microphone to the PC	☐
3.	Prepare the test signal (chapter 2.1. / p. 6)	☐
4.	Set all sound controls of your radio to either "linear" or to the center position	☐
5.	Deactivate any existing loudness functions	☐
6.	Adjust the balance and fade controllers to the „center position" as well	☐
7.	Connect the DSP device to the PC	☐
8.	Start the DSP PC-Tool	☐
9.	Check if your microphone is the selected device in the ATF Real-Time Analyzer (chapter 3.3. p. 10)	☐
10.	Choose the right reference curve (if you prefer another one as the ATF curve) (chapter 3.3.1. / p. 10)	☐
11.	Make the channel routing (chapter 4.2. / p. 12)	☐
12.	Adjust the time alignment (chapter 4.3. / p. 13)	☐
13.	Check which channels you like to link (chapter 4.4. / p. 17)	☐
14.	Set the high- and lowpass filters (chapter 4.5. / p. 18)	☐
15.	Mute all channels except the front channels and link the front channels	☐
16.	Place your notebook / netbook on the passenger seat. Ensure that the screen is not positioned directly in front of any loudspeaker (chapter 4.6.1. / p. 22)	☐
17.	Start the "pink noise" playback	☐
18.	Check if the sound level of your audio equipment is sufficient (chapter 3.4. / p. 11)	☐
19.	Measure the frequency response of the front speakers (chapter 4.6.1. / p. 22)	☐
20.	Use the equalizer to adjust the frequency response that it matches the reference curve as close as possible (chapter 4.6.1. / p. 22)	☐
21.	Repeat check item 15 and 16 until you reach the grey target curve	☐
22.	Mute the front channels and demute the rear channels, the subwoofer remains muted. Link the two rear channels if you don't adjust them separately	☐
23.	If necessary change your position for measuring the rear speakers (chapter 4.6.2. / p. 25)	☐
24.	Measure the frequency response of the rear speakers (chapter 4.6.2. / p. 25)	☐
25.	Use the equalizer to adjust the frequency response that it matches the reference curve as close as possible (chapter 4.6.2. / p. 25)	☐
26.	Repeat check item 20 and 21 until you reach the grey target curve as close as possible	☐
27.	Take place on the driver´s seat again	☐
28.	Demute front and rear speakers, the subwoofer remains muted	☐
29.	Make a measurement of front and rear speaker playing together (chapter 4.6.3. / p. 26)	☐
30.	Do a fine adjustment of the EQ´s	☐
31.	Reactivate the subwoofer	☐
32.	Make another frequency response measurement	
33.	Achieve a smooth transition in the frequency response from subwoofer to the other speakers (chapter 4.6.4. / p. 26)	☐
34.	Final sound tuning by listening to your favourite music or one of our recommended sound tracks (chapter 4.6.5. / p. 27)	☐
35.	Transfer all parameters to the amplifier´s / processor´s internal memory	☐
36.	Store your setup on the harddrive of your PC	☐

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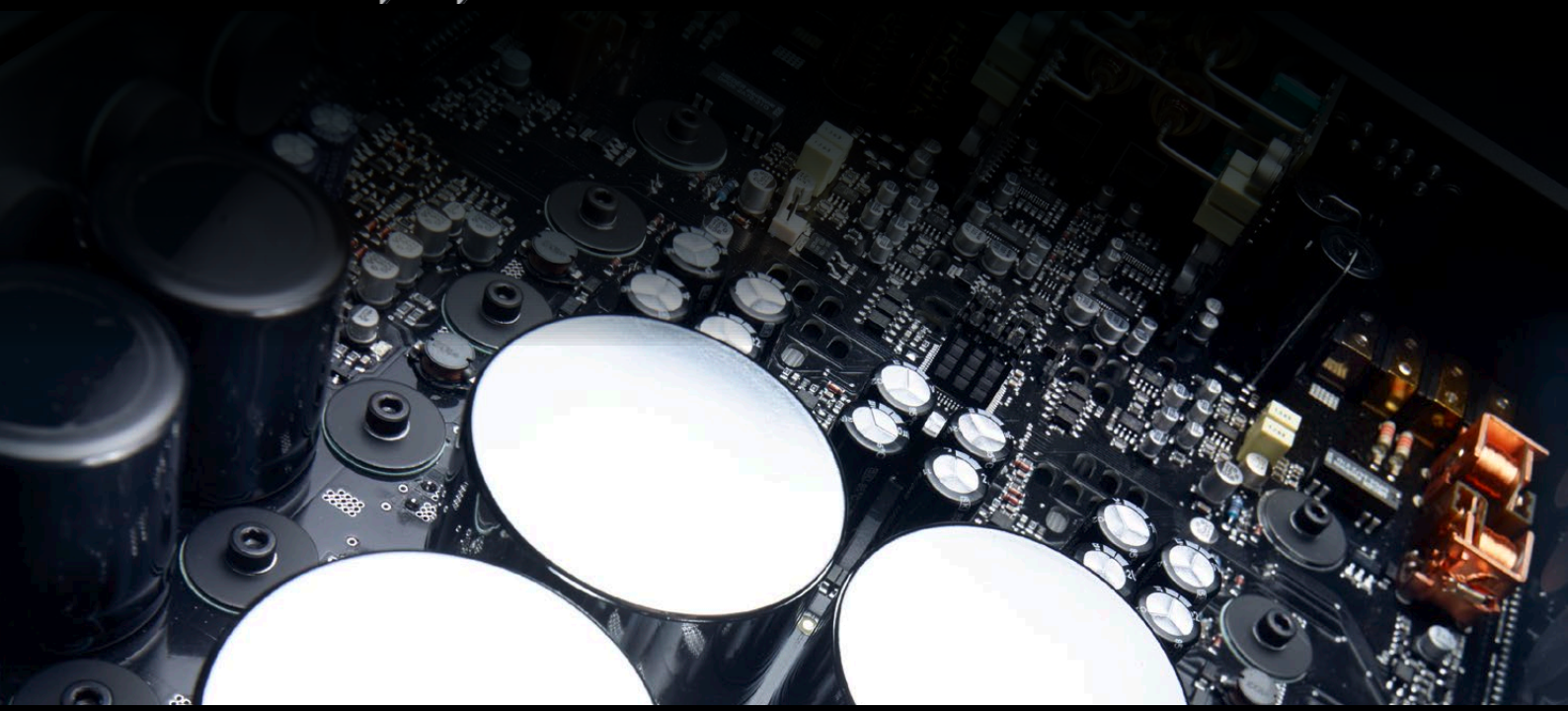
BRX

HELIX

MATCH



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