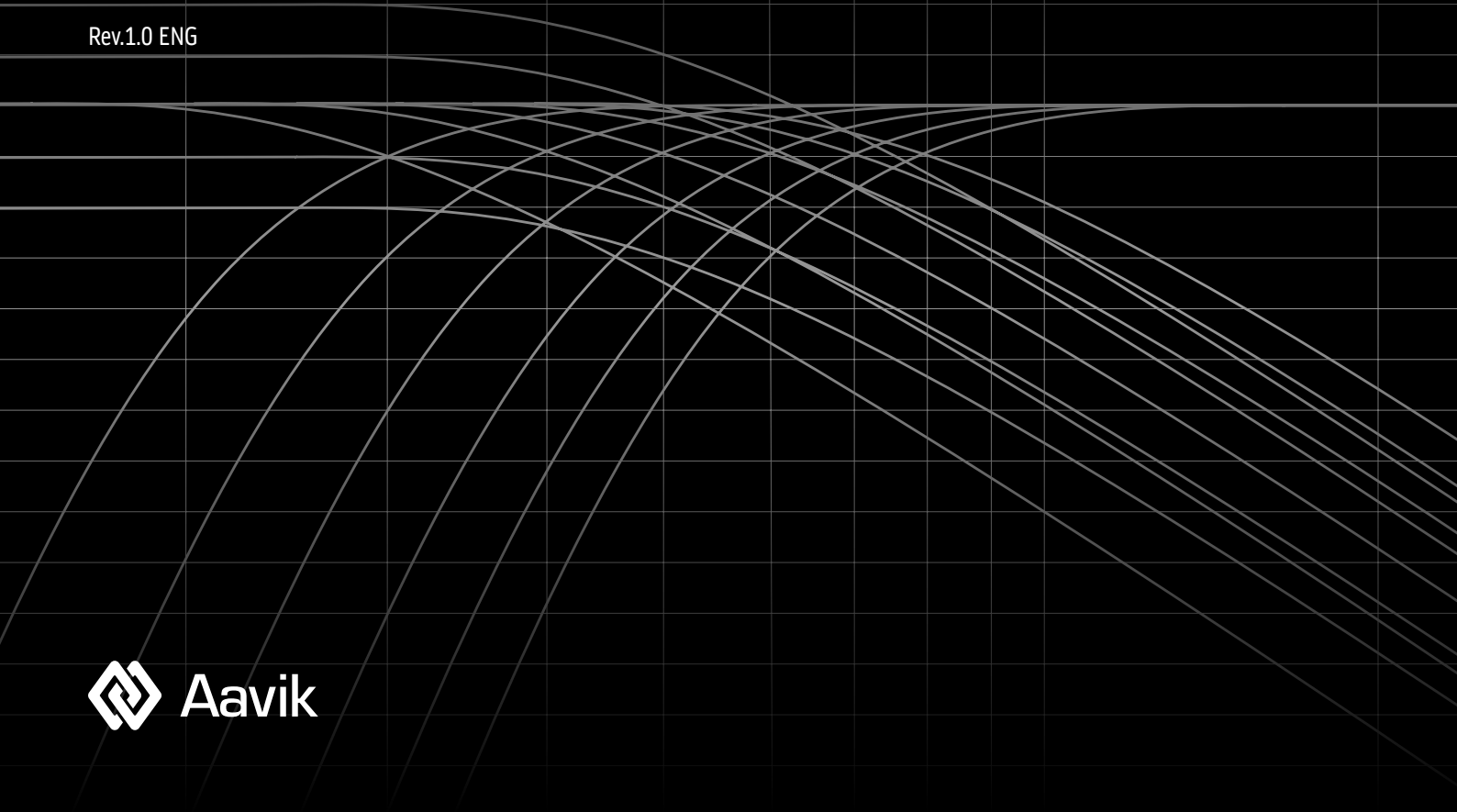
Active Analogue Dual Slope Crossover

USER GUIDE

Rev.1.0 ENG



Aavik

Contents

Introduction

Aavik Active Crossover is a very useful tool to fine tune the integration of speakers into almost any room and at the same time get the best performance out of the speakers.

The crossover are computer controlled but 100% analog and based on top-quality components to match the Aavik amplifiers in witch it can be found. All settings can be done using the menu directly on the front of the amplifiers or with the remote. This makes it very convenient to make small adjustments while enjoying your music.

The two frequency slopes of this 2-way crossover can be adjusted separately making it possible to customize how the low frequencies are divided between the drivers and at what volume.

Compatible Products

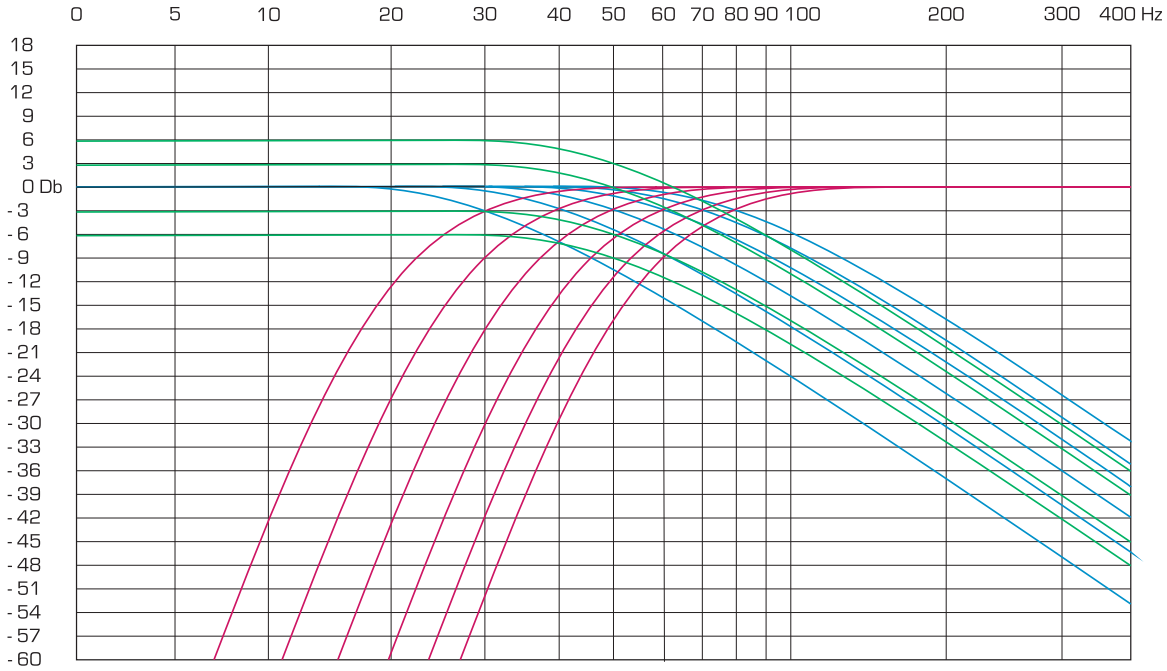
AAVIK AMPLIFIERS

The active crossover feature is integrated in all Aavik amplifiers within the **I** (integrated) and **C** (control/pre amp) models of the **x88** and **880** Series.

BØRRESEN LOUDSPEAKERS

Børresen floorstanding loudspeakers in the **M**, **C**, and **T** series are designed for bi-amping and integrate seamlessly with Aavik amplifiers featuring the Active Analogue Crossover.

Crossover Filter Overview

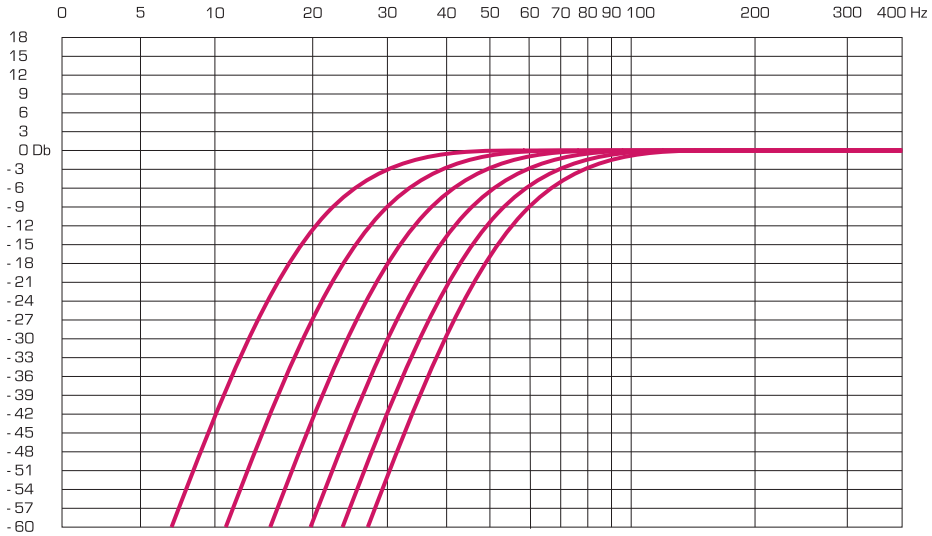


We're fully aware that the graph above may seem intimidating and difficult to understand. In addition to that, while it features multiple superimposed curves as is, they represent only HALF of the available low-pass and high-pass filter settings that are built into crossovers of selected Aavik devices. Should we want to show everything, this graph would be even more complex. On the upside, at a given time only two filters can be engaged from their numerous combinations as presented below.

As we move forward, we will separate this main graph into smaller pieces and explain them one by one for your convenience, so that you will know how our crossover works, what it does and when it should be used.

High-Pass Filter

This graph is the simplified representation of only high-pass filters built into our analog crossover. While it presents five settings to make it readable, there are 11 of them in total and the adjustment range that they provide spreads across frequencies from 30Hz to 80Hz. At a given time, only one setting can be used and this is by design.



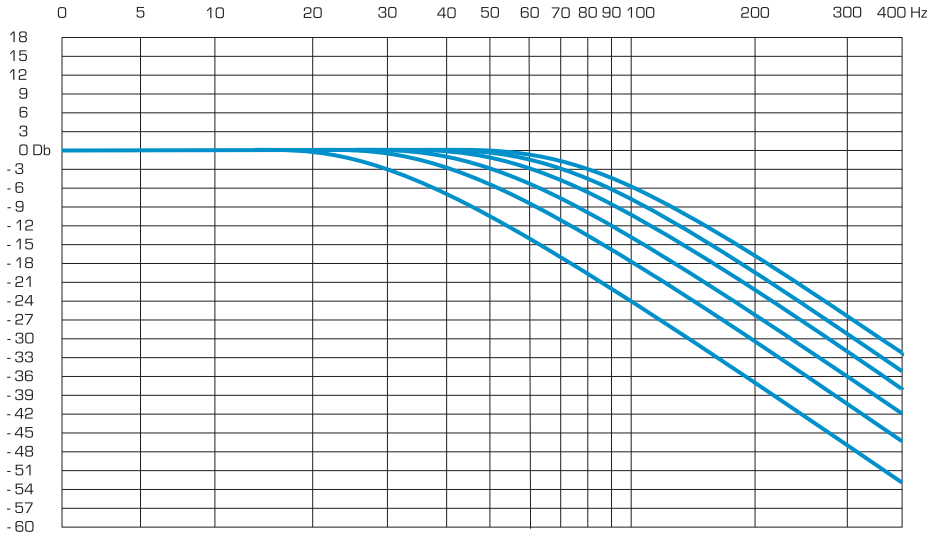
Just as its name suggests, the goal of this high-pass filter is to pass all frequencies above the cut-off frequency that we manually determine by selecting one specific value out of eleven available in the 30-80 Hz range. In short, this value tells our speakers below which frequency they mustn't play. Once our filter of choice is engaged, then our crossover applies it to the signal at a slope of 12dB per octave. This means that all frequencies below the cut-off point won't suddenly disappear as that would be unnatural. Instead they will roll off gradually and accordingly to the fixed slope settings. While our high-pass filter has been designed to roll off unwanted frequencies quickly and therefore it is quite steep, for bass filtering this is in fact desirable filter depth.

High-pass filters are immensely helpful i.e. in situations where we'd like to connect a standalone subwoofer to our stereo system. Since this sub will take care of only bass, our speakers don't have to produce it. High-pass filtering will not only enable this by relieving them from this task, but it will also allow us to utilize all drivers in our system for specific roles they're best at.

There is much more to high-pass filters than this one use case scenario. We shall explain this subject further into this chapter.

Low-Pass Filter

This graph is the simplified representation of only low-pass filters built into our analog crossover. While it also presents five settings to make it readable, there are 11 of them in total and the adjustment range that they provide spreads across frequencies from 30Hz to 80Hz as before. At a given time, only one setting can be used and this is by design.



Just as its name suggests, the goal of this low-pass filter is to pass all frequencies below the cut-off frequency that we manually determine by selecting one specific value out of eleven available in the 30-80 Hz range. In short, this value tells our speakers above which frequency they mustn't play. Once our filter of choice is engaged, then our crossover applies it to the signal at a slope of 24dB per octave. This means that all frequencies above the cut-off point won't suddenly disappear as that would be unnatural. Instead they will roll off gradually and accordingly to the fixed slope settings. While our low-pass filter has been designed to roll off unwanted frequencies slowly and is quite shallow, for filtering contents above low bass this is in fact desirable filter depth.

Low-pass filters are immensely helpful i.e. in situations where we'd like to control up to which frequency range a standalone subwoofer connected to our stereo system plays bass. Most such specialist speakers on the market can produce output from 20Hz up to 200Hz or more. Conventional speakers can produce bass significantly below 200Hz but very few can reach 20Hz. Low-pass filtering will allow us to use a subwoofer only for bass frequencies that our speakers can't play. This means that it essentially provides the option to use a subwoofer only as the extension of conventional speakers on bass. Without engaging this filter type, bass from a subwoofer and our speakers would largely overlap, which is counter-productive and not desirable.

Just as high-pass filters explained in detail above, their low-pass variant also has more to offer than just this one use case scenario. Further in this document we shall return to this subject.

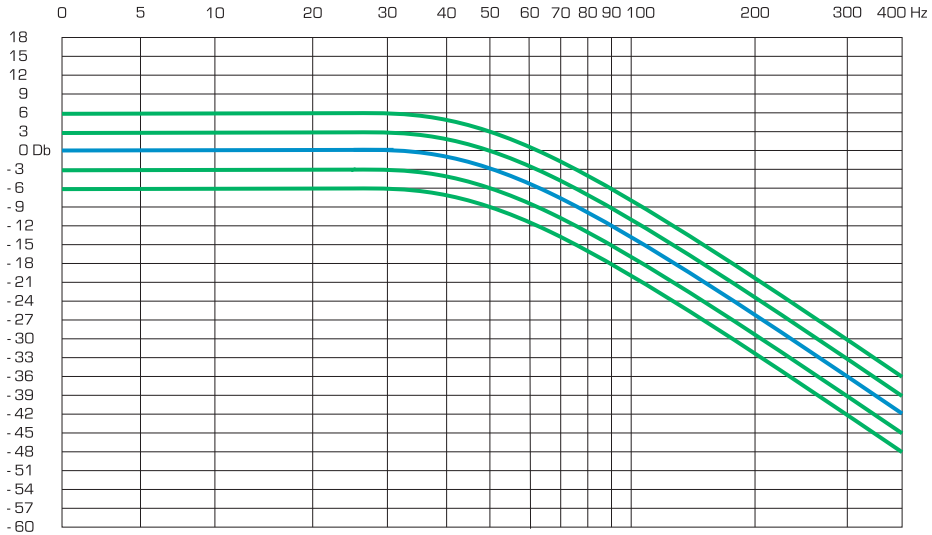
Low-Pass Level Control

The selection of cut-off frequencies baked into our low-pass filters is a very useful tool on its own right. To further expand this utility, we have implemented one additional feature for low-pass settings that allows us to control bass to a much greater extent.

Alongside low-pass cut-off frequency, in selected Aavik amplifiers with our crossover installed users can also tailor the level of this filter. This setting can control it within the +/-6dB range in 0,25dB steps. The -3dB cut-off point set at 50Hz on the graph above, represented by the blue curve, is our filter of choice. If after applying it we are happy about bass response of our system, we leave it where it is by not changing its level. However, should we want to reinforce bass response past the selected cut-off point, we can increase it by additional 6dB. Conversely, if past applying this filter our system's bass response is too strong, we can lower it by up to 6dB.

This option is particularly useful for fine-tuning our system's sound with the low-pass filter already engaged.

WARNING: while the +/-6dB level adjustment range may not seem like a lot, it is. When pushed too far, these settings can result in overpowering some drivers. The deliberately small 0,25dB steps are helpful in avoiding such situations. We advise to make adjustments one step at a time.



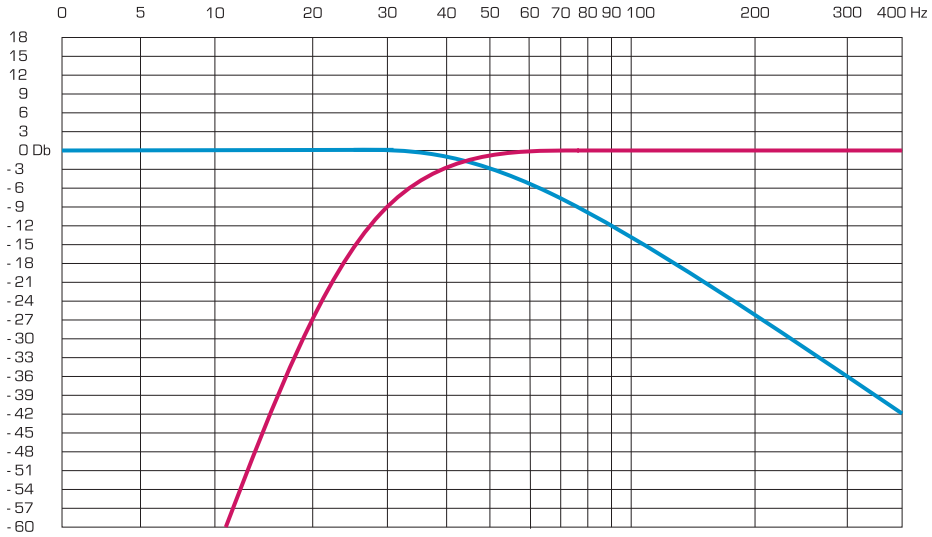
Combined Filter Operation

Although our high-pass and low-pass filters work extremely well on their own, their potential, flexibility and usefulness significantly raise when they're utilized at the same time.

Applying high-pass and low-pass filters to systems built upon speakers without the assistance of a dedicated bass module also nets enormous benefits. The lower frequency a driver has to output, the more current it needs and consequently the more its motor system heats up, which causes distortion and non-linear operation. This is of course not a problem for transducers built specifically for bass, but midrange drivers aren't happy about such tasks.

With this in mind, let's increase the cut-off frequencies of our filters shown on the graph above, and apply them to a large 2,5-way Børresen T3 speaker set that features one tweeter, one midwoofer and two woofers. The midwoofer outputs mid frequencies and also high bass, while two woofers produce lower bass. By applying our 70Hz high-pass filter to the midwoofer and 80Hz low pass to woofers, we essentially unburden the former from the extra work that makes it worse as a mid-range driver. Woofers subject to our low-pass can easily take over this task and we can further reinforce their output below 80Hz by increasing the filter's level. The result is the same Børresen T3 speaker set, but with far superior midrange and even stronger bass response below the cut-off frequency.

Lastly, separately adjustable cut-off frequencies of high-pass and low-pass filters combine them into a sliding network that can work as a notch filter.



Each listening space has a particularly troublesome room mode that is triggered by a specific frequency somewhere in the 20-200Hz range. If in our room that frequency is in the 30-80Hz crossover range and we know its exact value, then we can create a narrow filter that will decrease the output of our speakers for this specific frequency. The room mode in discussion won't fade completely, but its severity will be audibly lower than before.

Setup options

The Aavik active crossover offers a wide range of setup possibilities to optimize the performance of your speakers and system—no matter your room, speaker type, or listening preferences.

On the following pages you'll find five configuration options, each designed to address different acoustic challenges and system needs. Select the one that best matches your setup and discover how to unlock the full potential of your system.

Setup	Description	What you need	Page
OPTION 1 **Optimize Monitors**	Lower stress on small speakers for better clarity and power handling	Aavik integrated amplifier Compact speakers (monitors) 1 stereo RCA cable Standard speaker cables	**PAGE 10**
OPTION 2 **Tame Room Bass**	Control low-end in challenging acoustic spaces	Aavik integrated amplifier Bi-wireable Børresen loudspeakers 1 stereo RCA cable Standard speaker cables	**PAGE 12**
OPTION 3 **Add a Subwoofer**	Seamless integration with one or more subwoofers	Aavik integrated amplifier 1–2 active subwoofers 2 stereo RCA cables Standard speaker cables	**PAGE 14**
OPTION 4 **Bi-Amp with Power Amp**	Unlock full performance of bi-wireable speakers	Aavik integrated + power amplifier Bi-wireable Børresen loudspeakers 2 stereo RCA cables 2 sets of speaker cables	**PAGE 16**
OPTION 5 **Simple DC Filter**	Quick bass management without extra gear	Aavik I-x88 integrated amplifier Any loudspeakers Standard speaker cables	**PAGE 18**

Option 1 - Optimize Monitors

Using the active crossover in an integrated Aavik amplifier without any additional power amplifier

Lowering the stress on a pair of monitors and raising the power handling.

A small monitor can not play subbass below 30 – 40 Hz but it will still struggle to try and play those deep notes even though it is physical imposable. The result is stressed out bass driver where the membranes are moving a lot but in vain as sub-tones only comes out with too low sound pressure to be heard. Chances are also that the drivers will bottom-out with the risk of being damaged.

If the deepest tones are being kept away from the monitors, they can focus on what they do best without struggling to do the imposable. Power handling will be much higher nearly without any chance of damage. Distorting will drop and dynamics go up. The Bass-punch will be more firm with better definition.

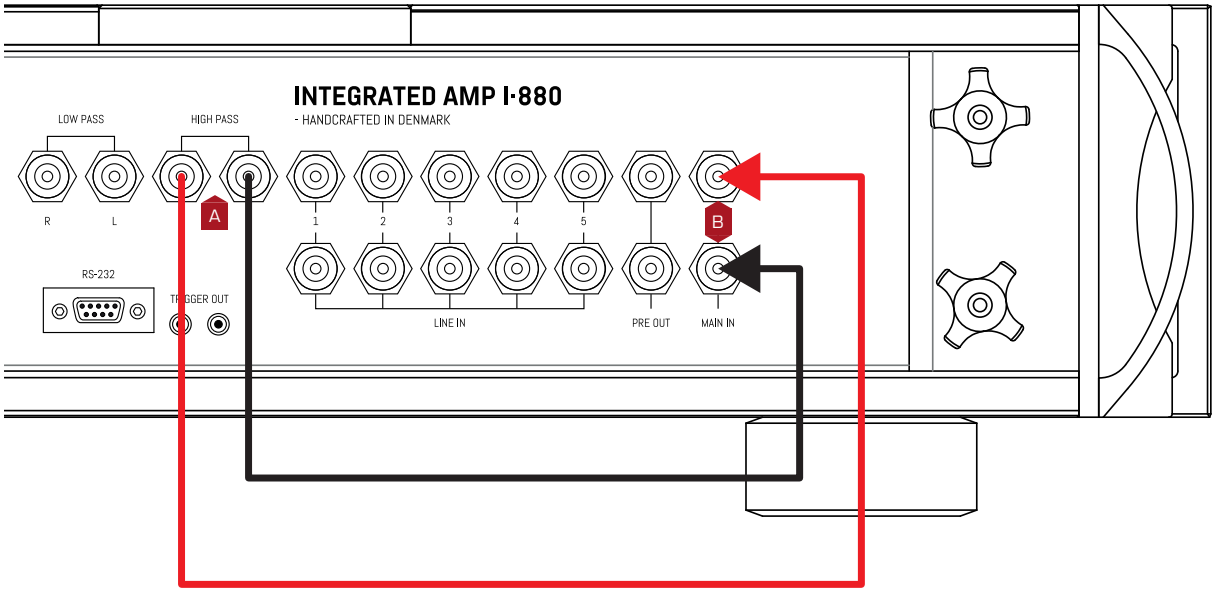
Setup setps:

1. Connect the speakers to the terminals as you normally would.

2. Connect a high-quality stereo interconnect from the HIGH PASS R/L A outputs to the MAIN IN R/L B inputs.

3. In the **MENU** of the integrated amp go to **MAIN IN SELECT** and switch to **EXTERNAL INPUT**.

4. Also, in the **MENU** go to **HIGH PASS FREQ** and select **50 / 40 / 30 Hz** depending on how low down you want the monitors to work. Notice! the steepness of this curve is 12 dB / Octave. So, if 40 Hz is selected there will still be supplied lower frequencies to the monitors but at lower signal strength.


INTEGRATED AMP I·880
- HANDCRAFTED IN DENMARK
LOW PASS
HIGH PASS
R
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A
1
2
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B
RS-232
TRIGGER OUT
LINE IN
PRE OUT
MAIN IN

Option 2 - Tame Room Bass

Integrating a big loudspeaker in almost any room

It can very often become a problem to integrate a speaker with big bass potential into a room. Room acoustics can be a challenge to many speakers simply because great full-range speakers of today can reproduce more than even bigger room can cope with.

Adjusting the acoustics in a room to be better at handling the bass without overpowering or resonating is a nearly imposable task and will in most cases change the style of the environment.

It is most often frequencies below 50-40 Hz that courses the biggest problems in a room because room resonances are often around or below this area.

There are a lot of sense in limiting the sub-frequencies to achieve better overall performance. Naturally, this can be seen as controversial, as many High-End enthusiasts are on a never-ending quest to dig deeper and deeper into the sub-bass area. However, it's a fact that most of the information on music software below 40 Hz are mainly noise as only a very small percentage of recorded music holds reel information down so deep.

By holding back just a little bit on the amount of sub-bass send to the loudspeakers we can trade a small "loss" to a much better functioning and sounding set-up in nearly any room. It also means that if you want a big speaker with big SPL and slam in a small room you can now have it!

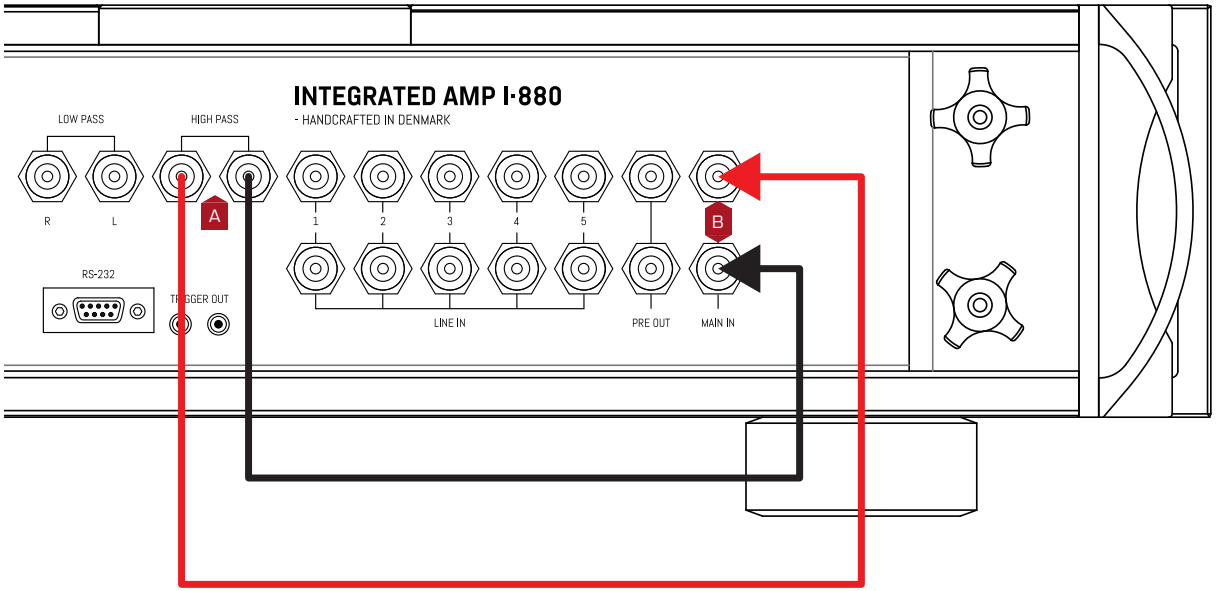
Setup setps:

1. Connect the speakers to the terminals as you normally would.

2. Connect a high-quality stereo interconnect from the HIGH PASS R/L A outputs to the MAIN IN R/L B inputs.

3. In the **MENU** of the integrated amp go to **MAIN IN SELECT** and switch to **EXTERNAL INPUT**.

4. Also, in the **MENU** go to **HIGH PASS FREQ** and select **40 / 35 / 30 Hz** depending on how low down you want the monitors to work. Notice! the steepness of this curve is 12 dB / Octave. So, if 40 Hz is selected there will still be supplied lower frequencies to the speakers but at lower signal strength.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HIGH PASS
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RS-232
TRIGGER OUT
LINE IN
PRE OUT
MAIN IN

Option 3 - Add a Subwoofer

Using the active crossover in an integrated Aavik amplifier and a powered subwoofer

Combining a set of loudspeakers with one or two subwoofers in perfect time alignment

Nearly all subwoofers relay on a build in DSP (Digital Sound Processor). Processing data do take time. Not much – but when we are dealing with music even the smallest delay will become notable and hurt the sound of a band in perfect harmony/timing.

A good subwoofer can add more weight and go deeper in the subbase area. However, If the main speakers and the sub are working together in the same frequency area, they will hardly never become a well-matched team. The big heavy membrane in the sub cannot keep up with the much more agile bass drivers in the main speakers.

Dividing the jobs between the speakers and the sub means that they are both doing only what they do best without stepping on each other's feet. So, we can have bass with definition, unstressed speakers, perfect timing top to bottom and a system that can power handle much better.

Setup setps:

1. Connect the speakers to the terminals as you normally would.

2. Connect a high-quality stereo interconnect from the HIGH PASS R/L A outputs to the MAIN IN R/L B inputs.

3. Run a good-quality stereo/mono interconnect from the LOW PASS R/L C outputs to the LINE IN omn the sub-woofer/subwoofers D. If the subwoofer features an unfiltered LINE IN then use those instead.

4. If the subwoofer only has filtered inputs adjust the VOLUME to between 50-90%. Make sure you got sufficient volume to work with. Finetuning is better done on the Aavik Amplifier.

5. If the subwoofer only has filtered inputs adjust the LOWPASS to BYPASS/highest setting.

6. In the **MENU** of the integrated amp go to **MAIN IN SELECT** and switch to **EXTERNAL INPUT**.

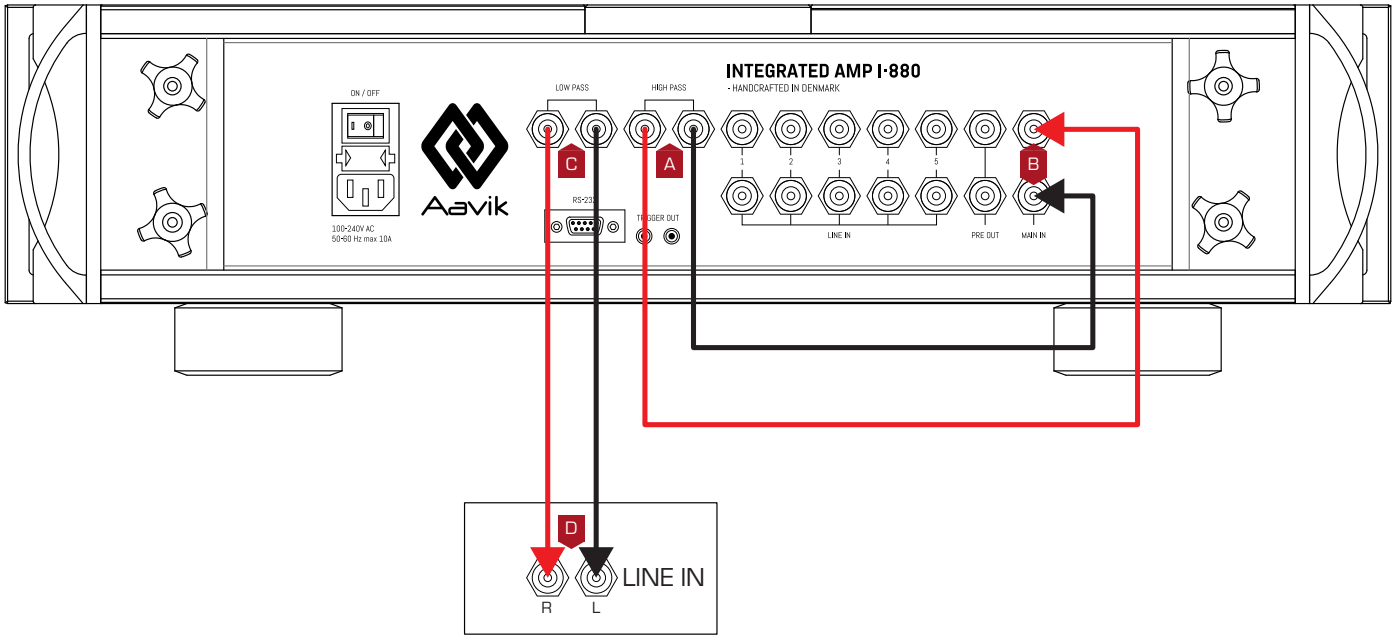
7. Also, in the **MENU** go to **HIGH PASS FREQ** and select **60 / 50 / 40 Hz** depending on how low down you want the main speakers to work. Notice the steepness of this curve is 12 dB / Octave. So, if 40 Hz is selected there will still be supplied lower frequencies to the speakers but at lower signal strength.

8. Also, in the **MENU** go to **LOW PASS FREQ** and select **50 / 40 / 30 Hz** depending on how high up you want the subwoofer/subwoofers to work.

Notice! the steepness of this curve is 24 dB / Octave. So, if 40 Hz is selected there will still be supplied higher frequencies to the subwoofer but at much lower signal strength.

Also worth noticing, the HIGH PASS FREQ and the LOW PASS FREQ do not need to match! The two curves can be set to overlap, if you want the speakers and the subwoofer to share some frequencies. Or they can be pulled apart to leave a drop in the bass response to lower the effect of the room's resonance frequency.

9. Also, in the **MENU** you can adjust the level sent to the subwoofer/subwoofers. Go to **LOW PASS LEVEL** and trim up/down in 0,25 dB steps between +/- 6 dB. NOTICE! Be very careful not to overpower the subwoofer as this can course damage to the driver and electronics.



Active Subwoofer

Option 4 - Bi-Amp with Power Amp

Using the active crossover in an integrated Aavik amplifier together with an additional stereo power amplifier

Exploit the full advantage of a set of bi-amping Børresen loudspeakers and the Aavik active crossover.

All Børresen floor standers in the M, T & C series are designed to take full advantage of the Aavik active crossover and two stereo power amplifiers.

Aavik amplifiers and Børresen loudspeakers can now form the perfect alliance to optimize their performance to nearly any listening room. By using the bi-amping binding posts of the speakers and the active filter in the Aavik amplifiers it is now possible to fine tune the sound to match the acoustics of the room.

All Børresen floor standing loudspeakers are with a build in passive 2.5-way parallel crossover. This crossover will always be engaged even though the speakers are being supplied from a bi-amping configuration.

The upper terminals supply the tweeter and the mid-woofer(s). They are separated in the passive crossover at 2.5 kHz.

The lower terminals supply the woofers only.

Setup setps:

1. Connect the speaker terminals on the integrated amplifier A to the upper binding posts 1/3 on the speakers B

2. Connect the speaker terminals on the power amplifier C to the lower binding posts 2/4 on the speakers D

3. Connect a high-quality stereo interconnect from the HIGH PASS R/L outputs E to the MAIN IN R/L inputs F.

4. Connect a high-quality stereo interconnect from the LOW PASS R/L outputs G to the LINE IN R/L inputs on the power amplifier H.

5. In the **MENU** of the integrated amp go to **MAIN IN SELECT** and switch to **EXTERNAL INPUT**.

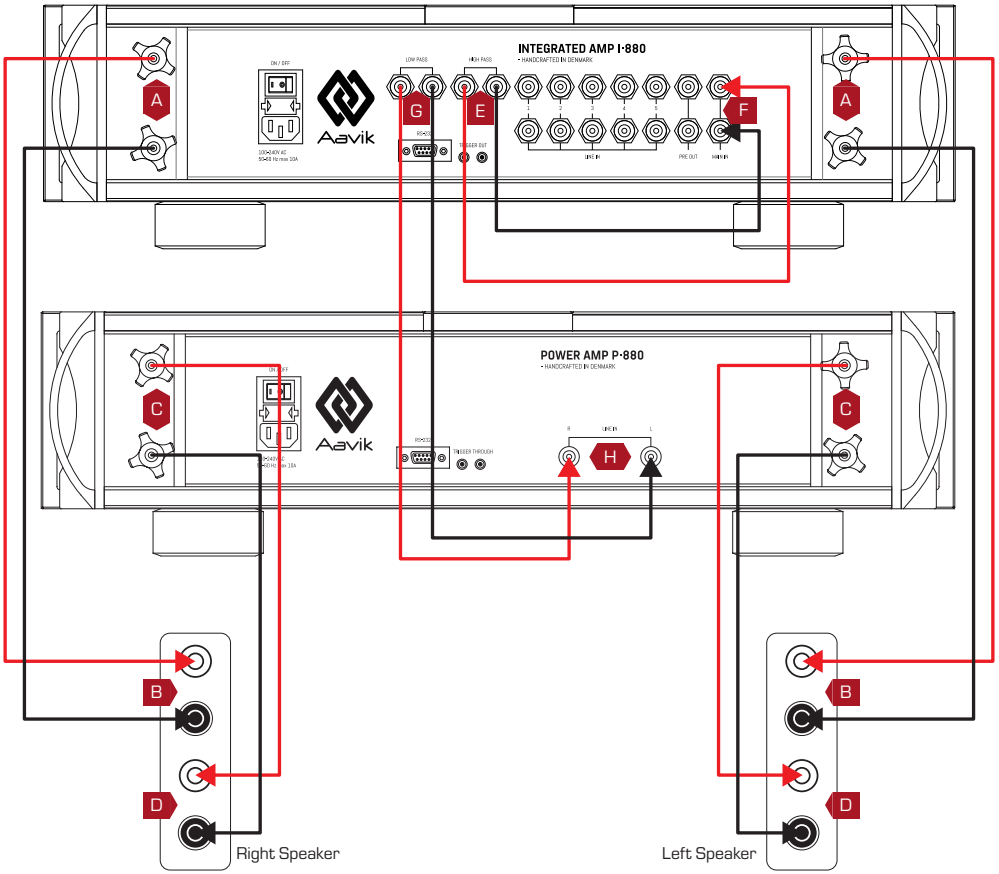
6. In the **MENU** of the power amplifier go to **GAIN** and select **32 dB**.

7. In the **MENU** on the integrated amplifier go to **HIGH PASS FREQ** and select **80 / 70 / 60 Hz** depending on how low down you want the high section* of the speakers to work. Notice the steepness of this curve is 12 dB / Octave. So, if 40 Hz is selected there will still be supplied lower frequencies to the speakers but at lower signal strength.

8. Also, in the **MENU** go to **LOW PASS FREQ** and select **70 / 60 / 50 Hz** depending on how high up you want the bass drivers to work. Notice! the steepness of this curve is 24 dB / Octave. So, if 40 Hz is selected there will still be supplied higher frequencies to the woofers but at much lower signal strength.

Also worth noticing, the **HIGH PASS FREQ** and the **LOW PASS FREQ** do not need to be set at the same cutoff frequency! The two curves can be set to overlap, so the mid-woofers and the woofers share a smaller or larger frequency area. Alternatively, they can be pulled apart to leave a drop in the bass response to lower the effect of the room's resonance frequency.

9. Also, in the **MENU** you can adjust the level sent to the woofers. Go to LOW PASS LEVEL and trim up/down in 0,25 dB steps between +/- 6 dB. **NOTICE!** Be very careful not to overpower the woofers as this can course damage to the drivers and electronics.


INTEGRATED AMP I·880
• HANDCRAFTED IN DENMARK
POWER AMP P·880
• HANDCRAFTED IN DENMARK
Aavik
A
B
C
D
E
F
G
H
Right Speaker
Left Speaker

Option 5 - Simple DC Filter

Using the more moderate and simplified filter option in the Aavik I-x88 amplifiers.

Take advantage of all the above-mentioned set-ups with a less invasive DC high-pass filter.

With the Aavik I-x88 Series of integrated amplifiers comes also a integrated direct-through 1. order DC filter. This filter is very easy to use as this option do not require any additional interconnects or power amplifiers. The slope of the filter is also smoother as the roll off is only 6 dB / octave.

The main reason for this filter option is to offer a simple an very musical way to lower the stress on the bass drivers in smaller speakers or to minimize the bass output from larger speakers making room integration easier.

Setup setps:

1. Connect the speakers to the terminals as you normally would.

2. In the **MENU** of the integrated amp go to **MAIN IN SELECT** / **INTERNAL SIGNALS** and choose between **INT. SIG. 25 Hz** / **INT. SIG. 40 HZ** / **INT. SIG. 70 Hz**

Notice! even if 70 Hz has been choosen as cut-off frequency there will still be send sub frequencies to the speakers but now at a lower volume. The result is that at 70 Hz the output is 3 dB lower and at 35 Hz 9 dB lower then without the filter engaged.

The direct-through filter option can be choosen instead of the separate high-pass filter output and can be combined with the separate low-pass filter.

User notes

Support & Contact

For any questions, technical guidance, or assistance with setup and system optimization, our support team is available to help you achieve the full potential of your system.

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audiogroupdenmark.com