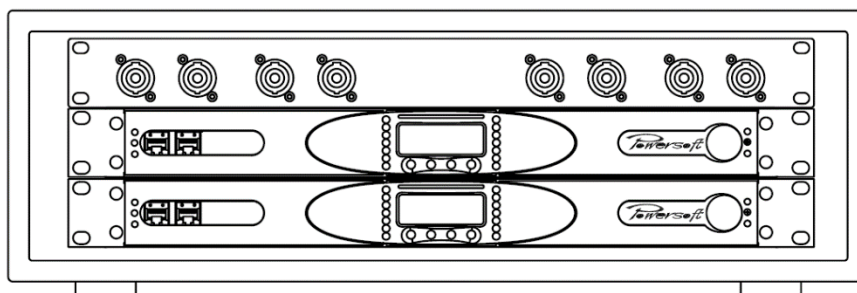


A03.3

Preset Guide

Powersoft K-DSP Series



General information

TW AUDiO Powersoft K-Series Preset Guide
Version 2.0 EN, 01/2020, TG

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1. Presets structure

The following chapter describes major A03.3 presets features.

1.1. New features and updates

Filter	Function
PEQ#1, all products*	CUT / FLAT / FULL modes* OFF – full mode ON, GAIN -6 dB – flat mode ON, GAIN -15 dB – cut mode Filter is individually adjustable.
PEQ#2 VERA10 ACTIVE, HF Channel (2) VERA10 PASSIVE	120 degrees horn correction High-shelving array size correction
PEQ#3 VERA10 PASSIVE	120 degrees horn version correction
PEQ#7 ALP (allpass filter)	Used for phase response compatibility to T24/VERA10, available for: M-Series, C-Series, M12+B15-PASSIVE, M15+B15- PASSIVE. Filter can be switched on/off

* PEQ#1 is **NOT** available for BS15, BS18, BS17, BS30, VS32, VS33, BSX, and T24 passive/active.



After reloading or loading a different preset all Output EQ-filter adjustments will be reset to default.

1.2. Presets

Device Presets (*.pam)

Device presets can be loaded from amplifier memory, from external preset card or from external preset files via Armonia software.



The presetlist A3.3 includes 50 selected presets. For customizing the presetlist and creating your own please read section 2.4.

The current presetlist is shown in the file:
TWAUDIO Presetlist K3DSP A03.3.pdf

The folder TW AUDiO channel presets A03.3 and the listing in “Channel presets K-DSP A03.3.pdf” provides an overview of all provided TW AUDiO device presets which you can add to your customized preset list.

Channel Presets (.chp)

Additionally, there are channel presets available (*.chp file). Channel presets allow user to make custom amplifier channels configuration. **Channel presets** can be loaded only via Armonia software (from external *.chp files).



BEFORE loading a channel preset (*.chp), do first import the device preset: DSP-on-165Vpk_____DSP-on-165Vpk____3.2 (preset no 2 from memory). This will reset all common device parameters as output attenuation, input routing, input-EQ-state, mains current limitation and power limiter cross limit mode to default values.

2. Transfer the presets to KDSP memory

2.1. Firmware and software

A03 presets work with firmware and software version listed in Table 1.

Table 1: software and firmware compatibility

Firmware	Software	Analog → DSP→ OUT	Digital→ DSP→ OUT
firmware 5.3.11	Armonia 2.10.3	5 ms latency	6 ms latency
firmware 5.3.11	Armonia 2.11.0	5 ms latency	6 ms latency



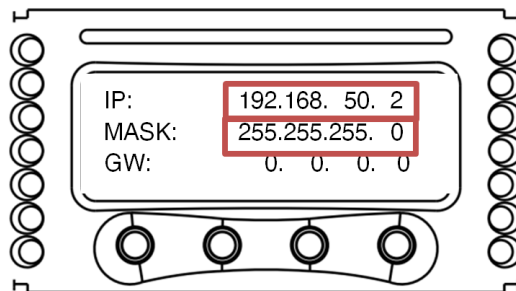
When building your own presets based on TW AUDiO presets, be aware of the Armonia version you use. Presets once exported from a newer version of Armonia are not downward compatible.

There are problems due to new data structure of device presets. Loading old device presets is not possible since Armonia 2.11. Please make sure, that you are using the actual channel and device presets from A03.3.

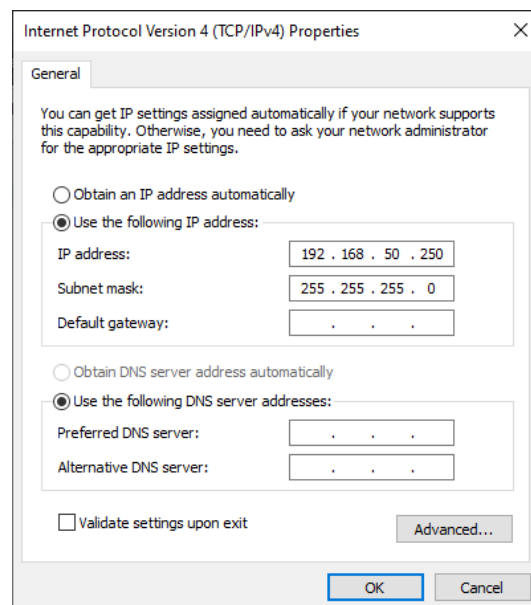
2.2. Network configuration

LAN network has to be configured in order to transfer presetlist to KDSP-Serie amplifier's internal memory. To connect you PC with amplifier please proceed:

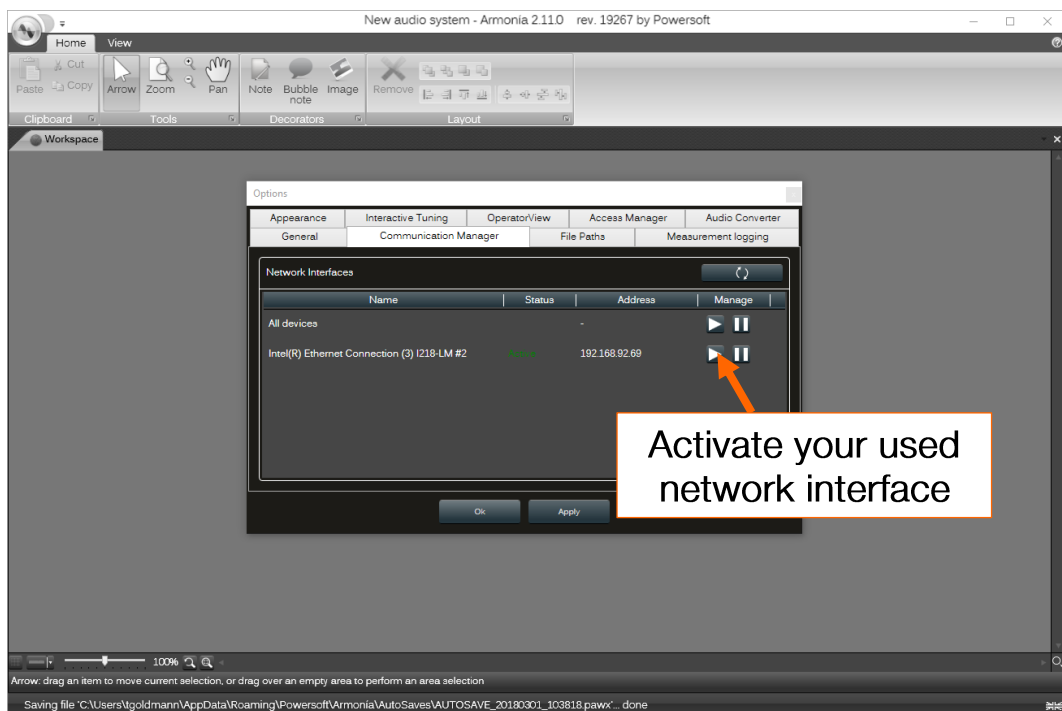
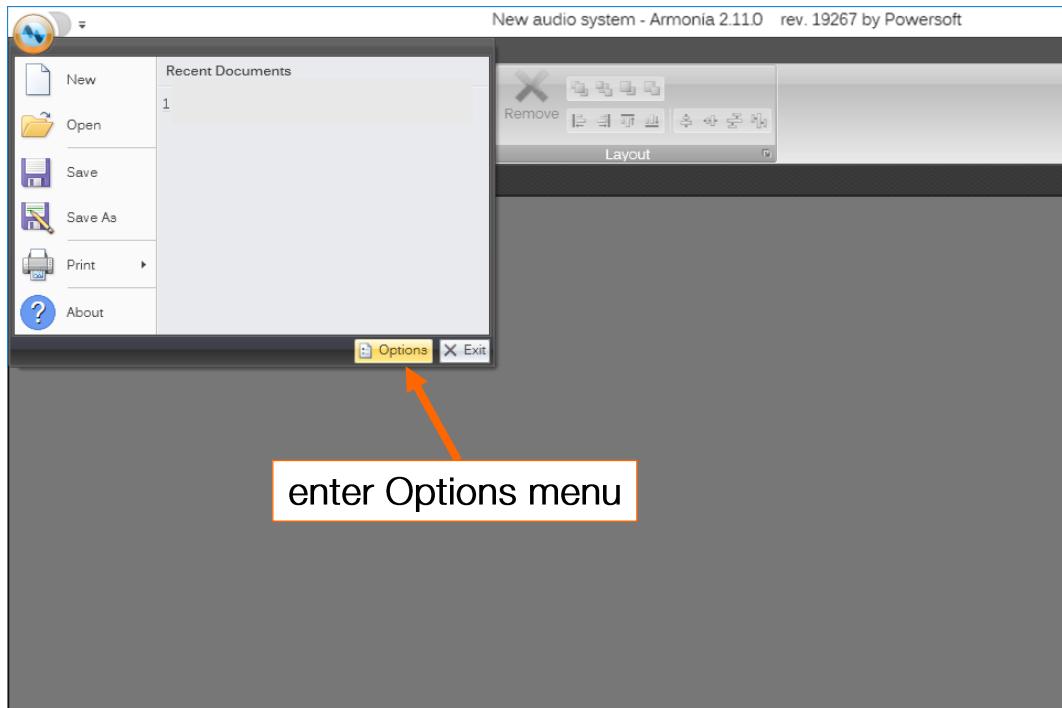
1. Use network cable to connect your KAESOP amplifiers to a computer where Armonia software is installed.
2. Set all amplifier to MANUAL addressing mode.
menu → Settings → Network settings → Addressing mode → MANUAL
3. Set all amplifiers in the same network
menu → Settings → Network settings → Set address



4. Set the computer ethernet interface to the same network



5. Check active ethernet interface in Armonia

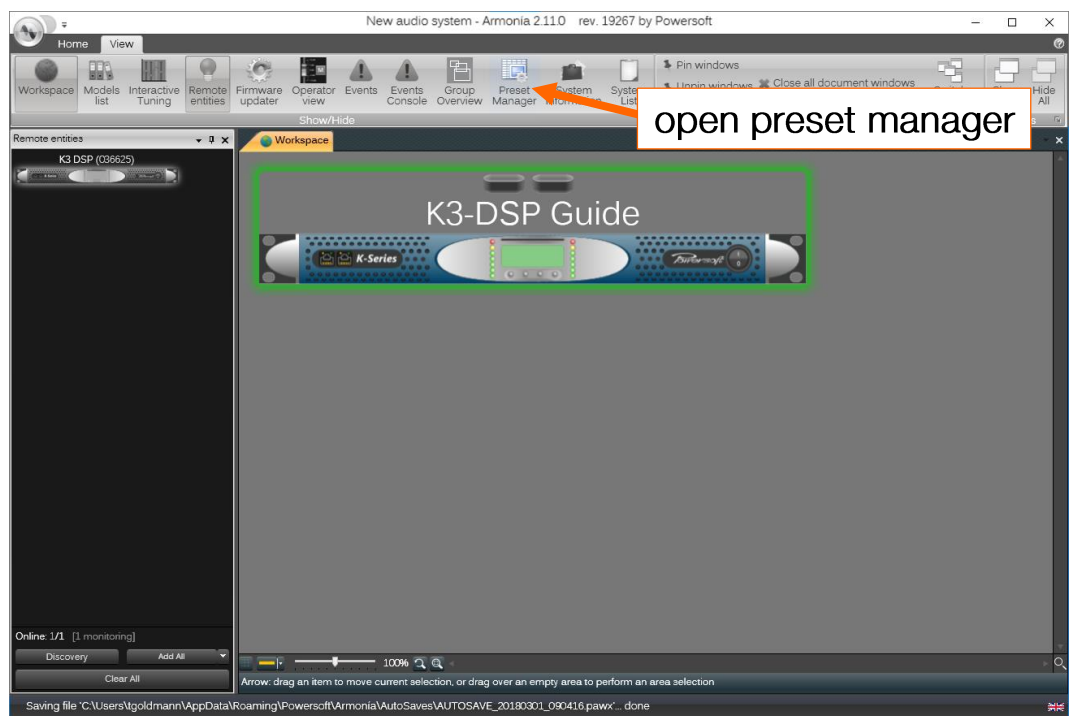
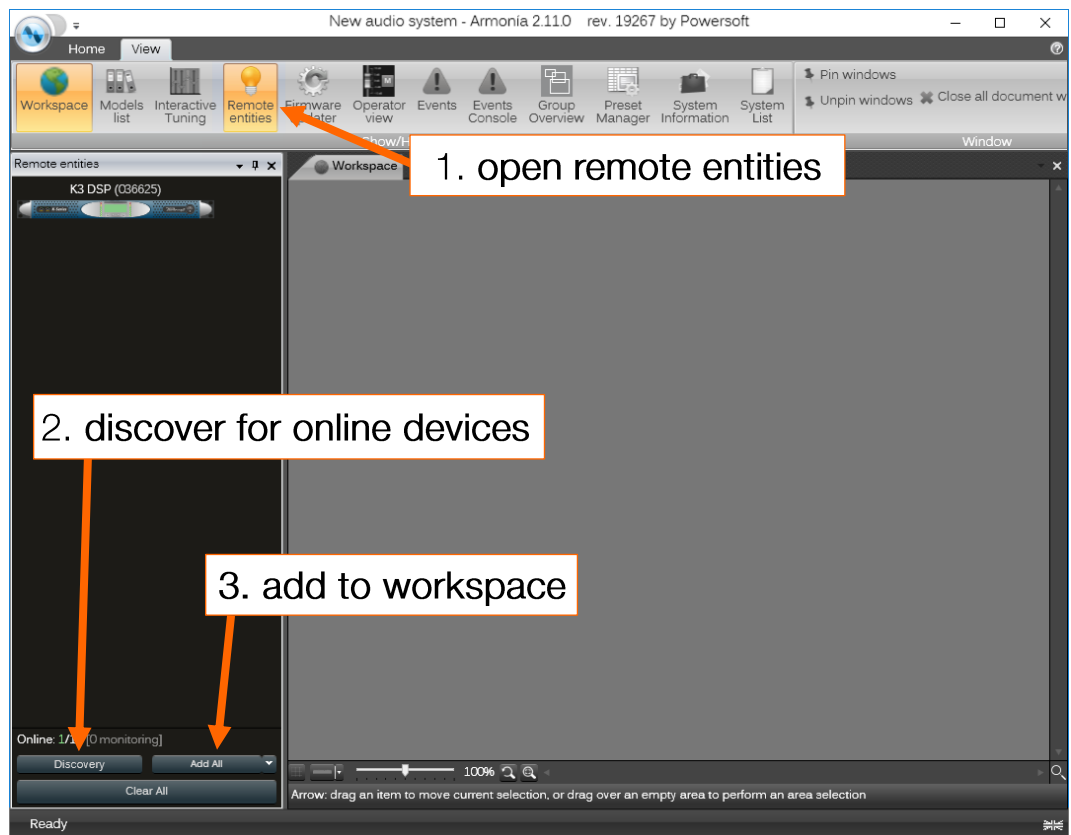


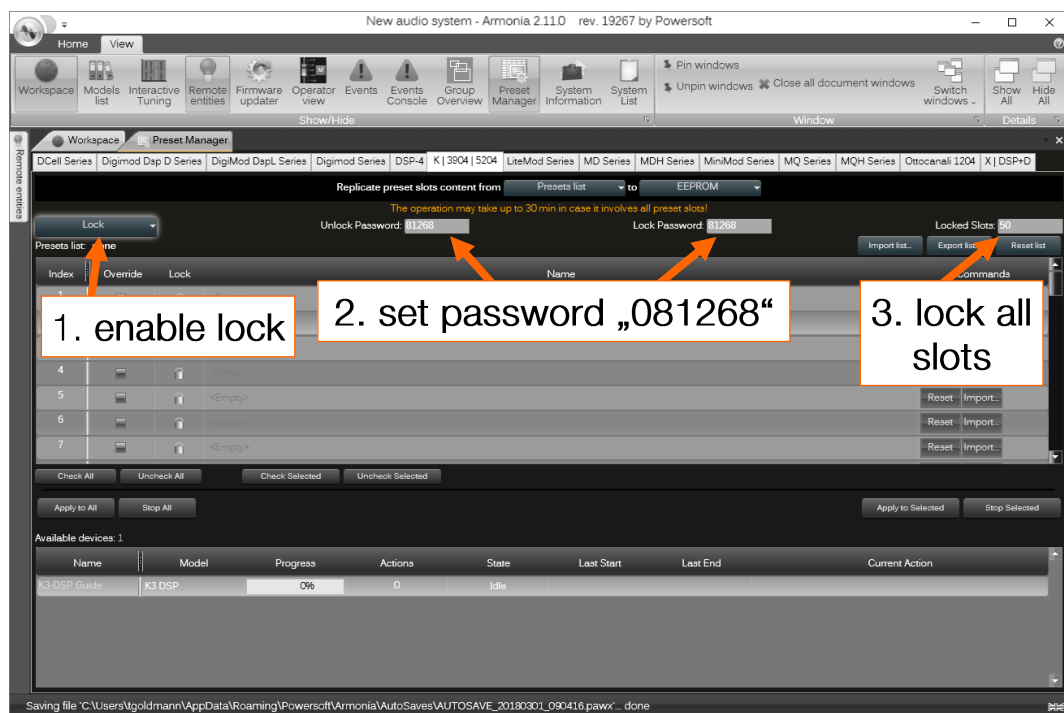
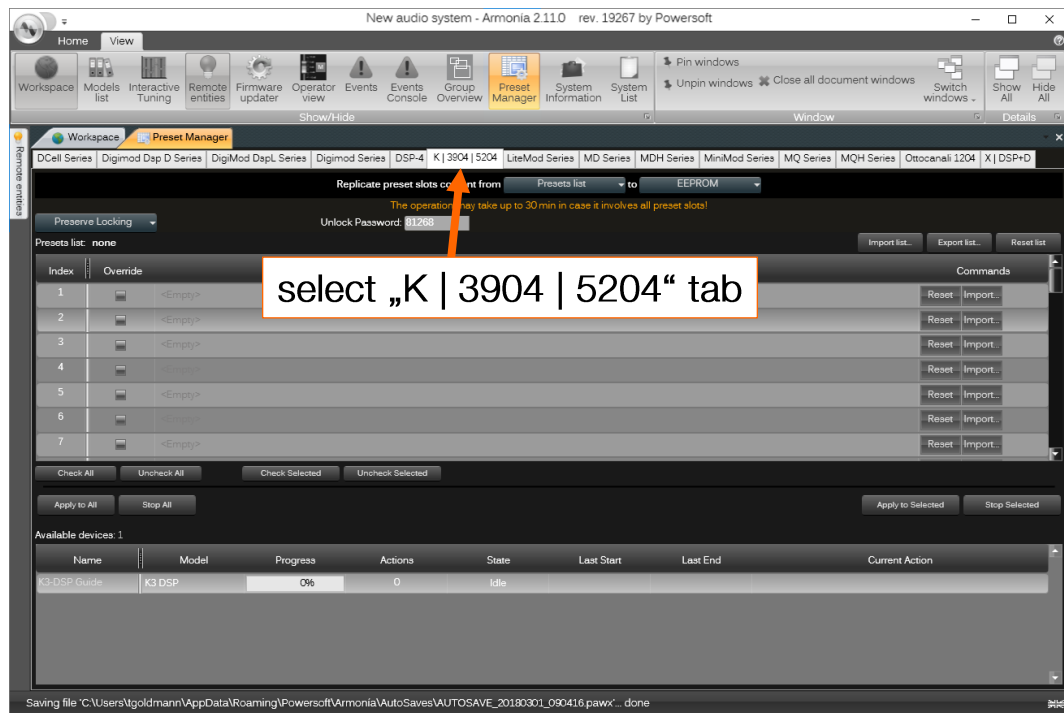
If amplifiers you want to transfer presets to are not equipped with KEASOP ports please read Armonia manual or contact TW AUDIO at support@twaudio.de.

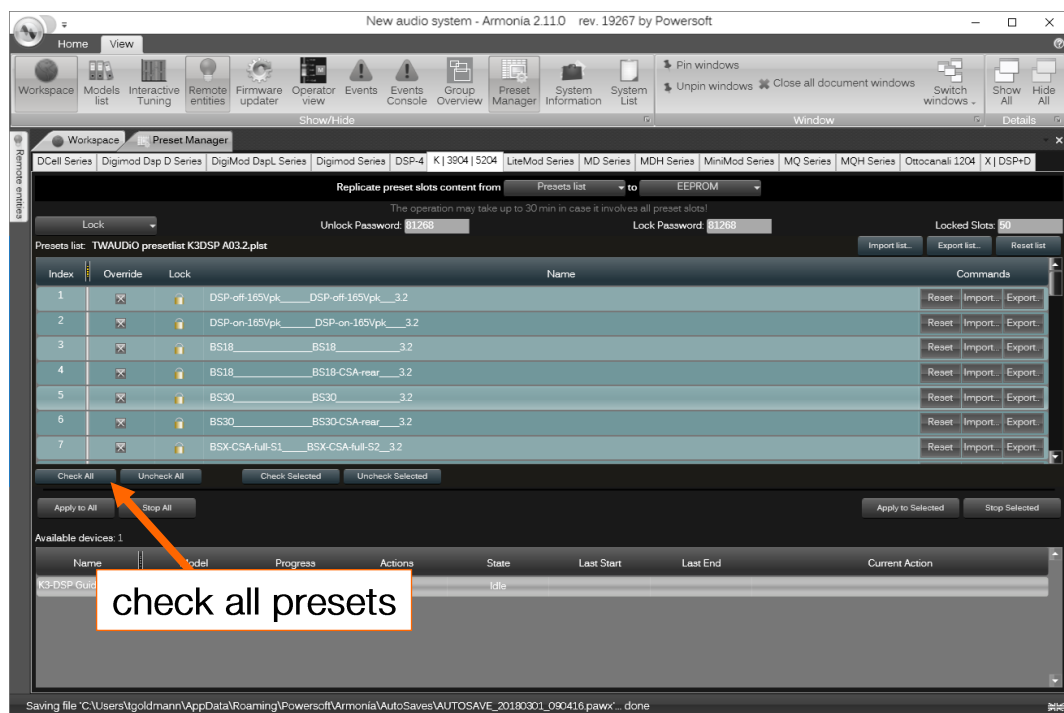
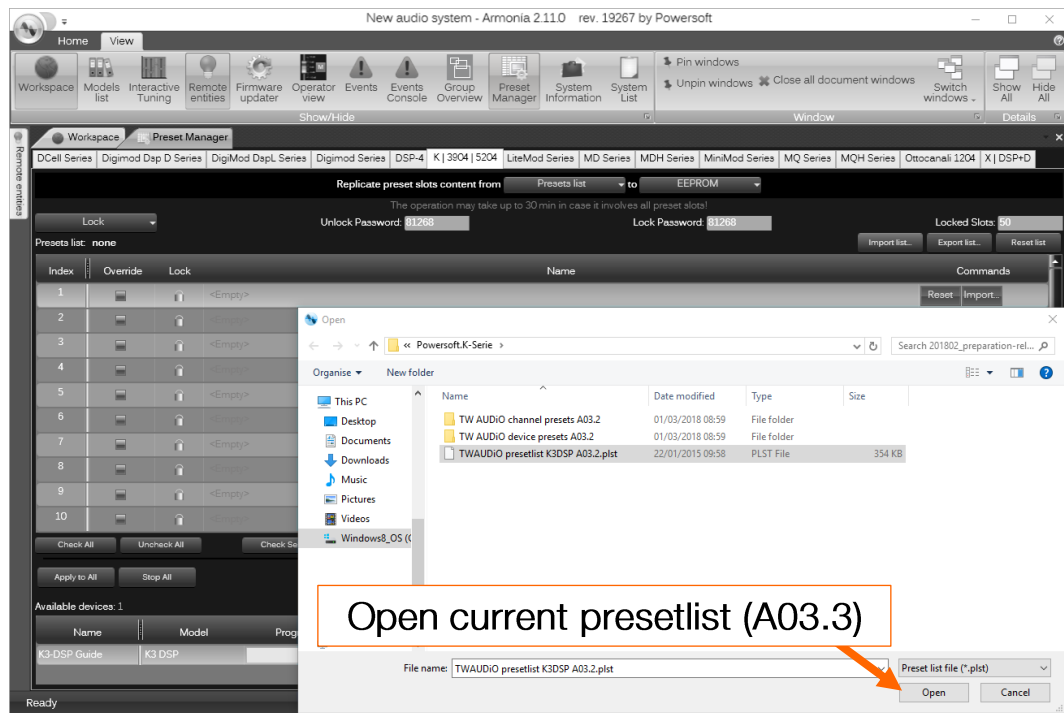
2.3. Import presetlist to KDSP amplifier

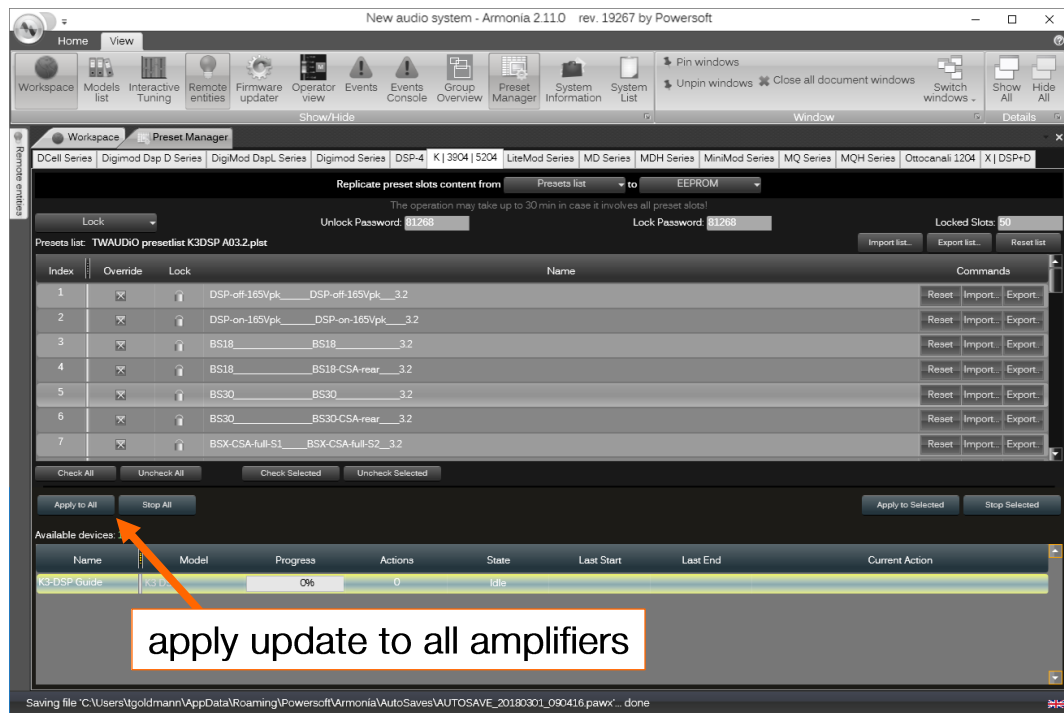


Attention! Presetlist procedure takes around 50min!

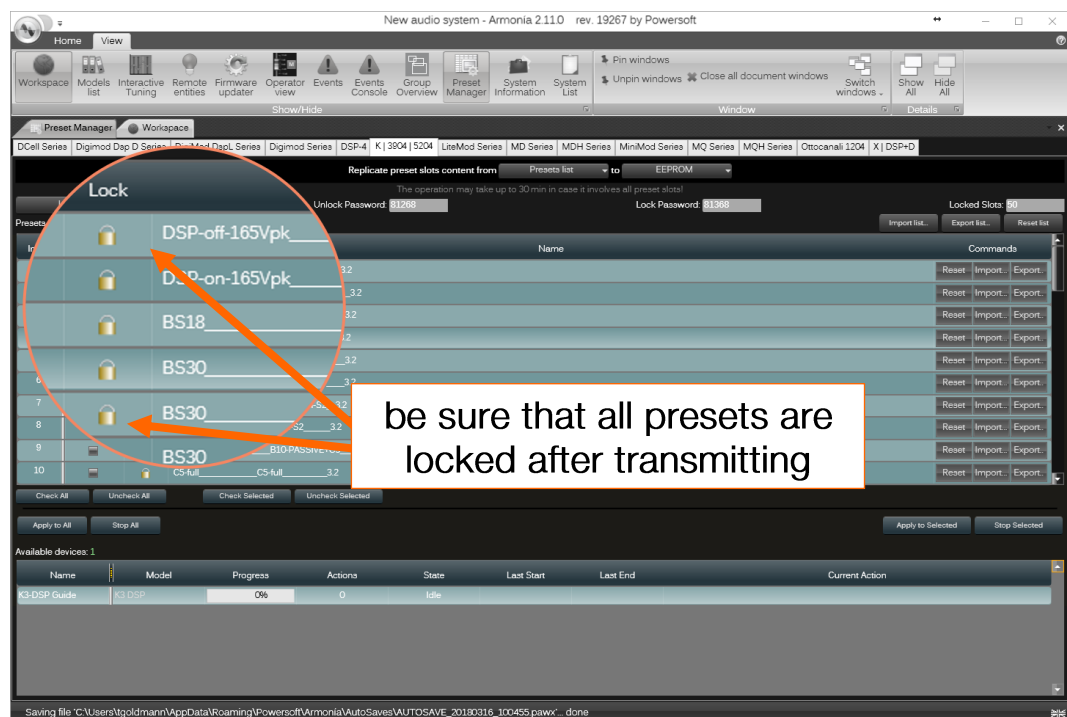




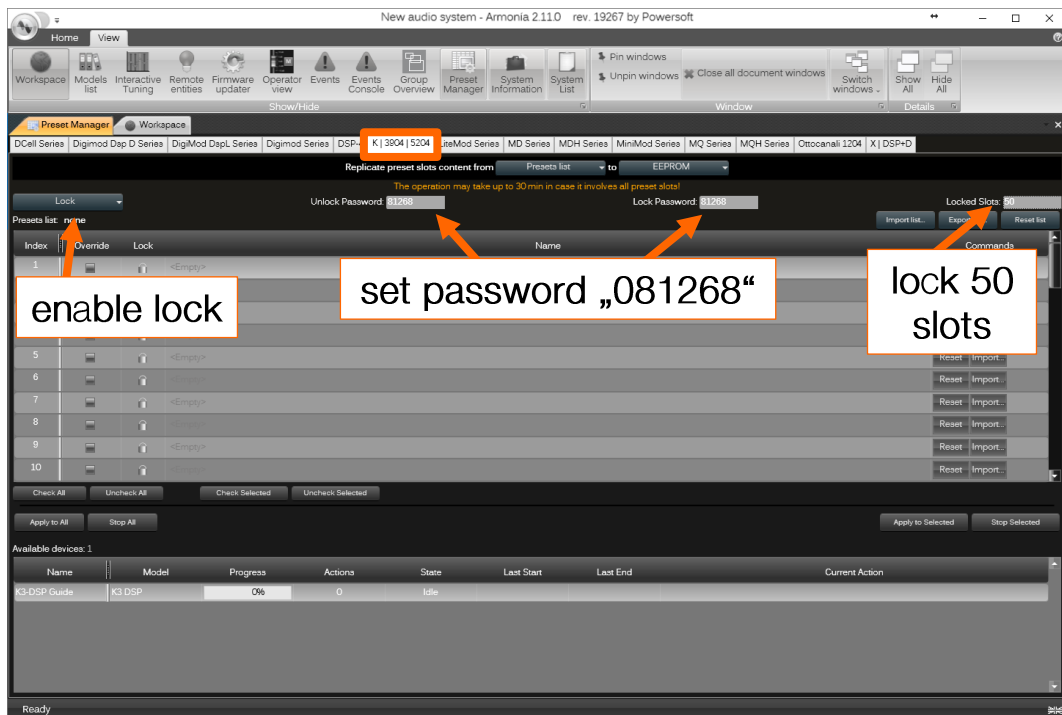
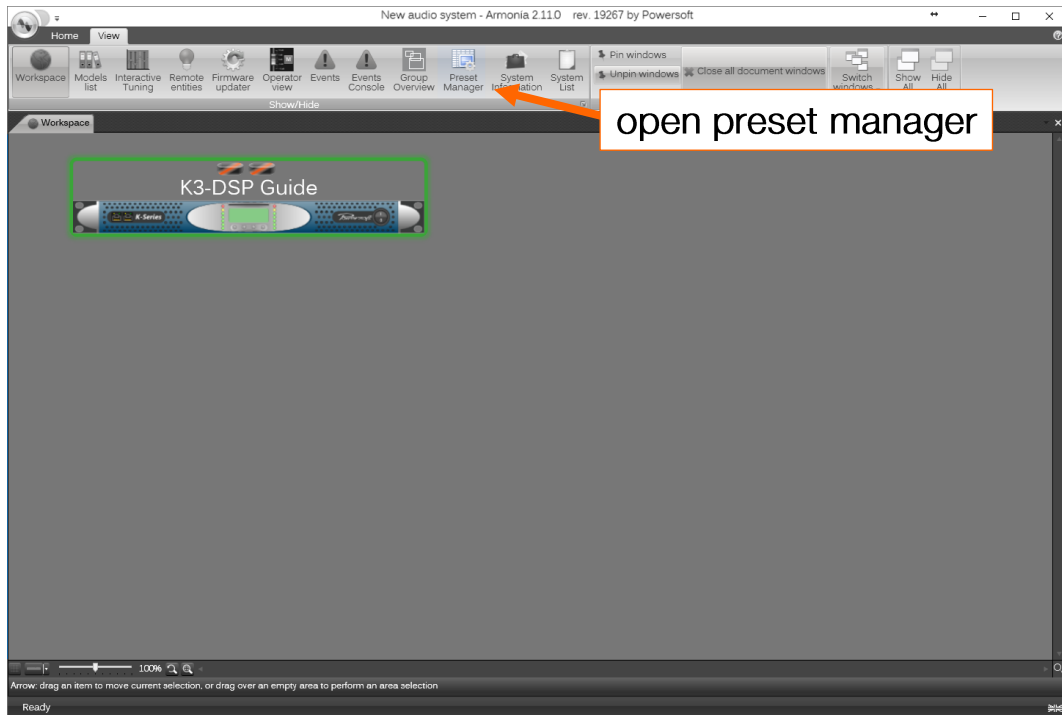


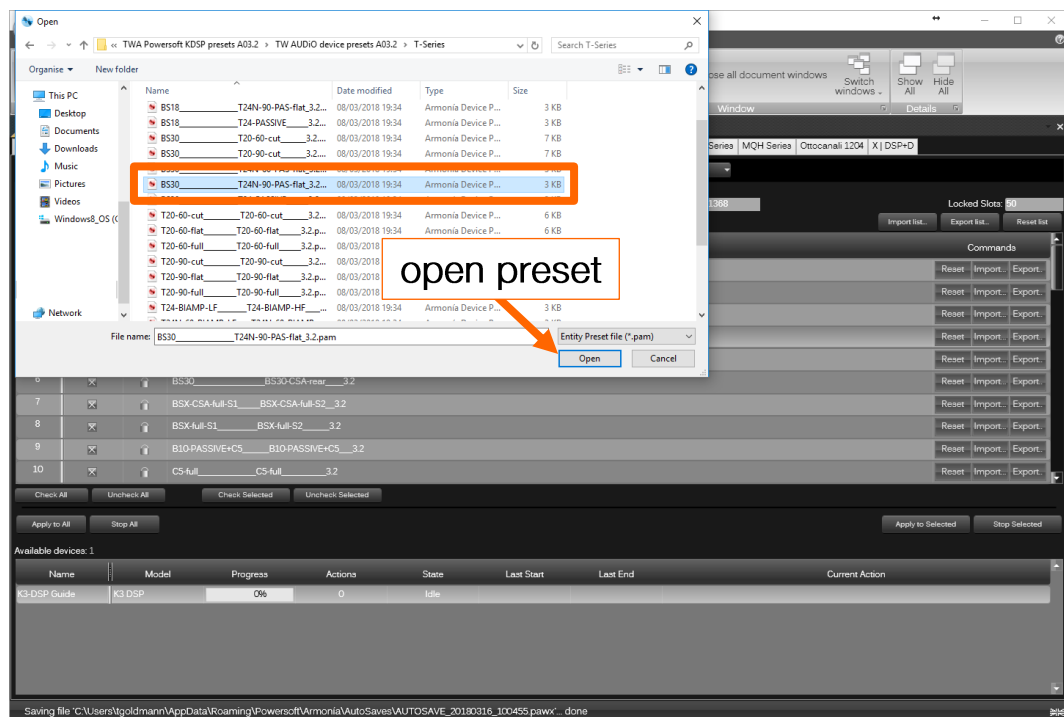
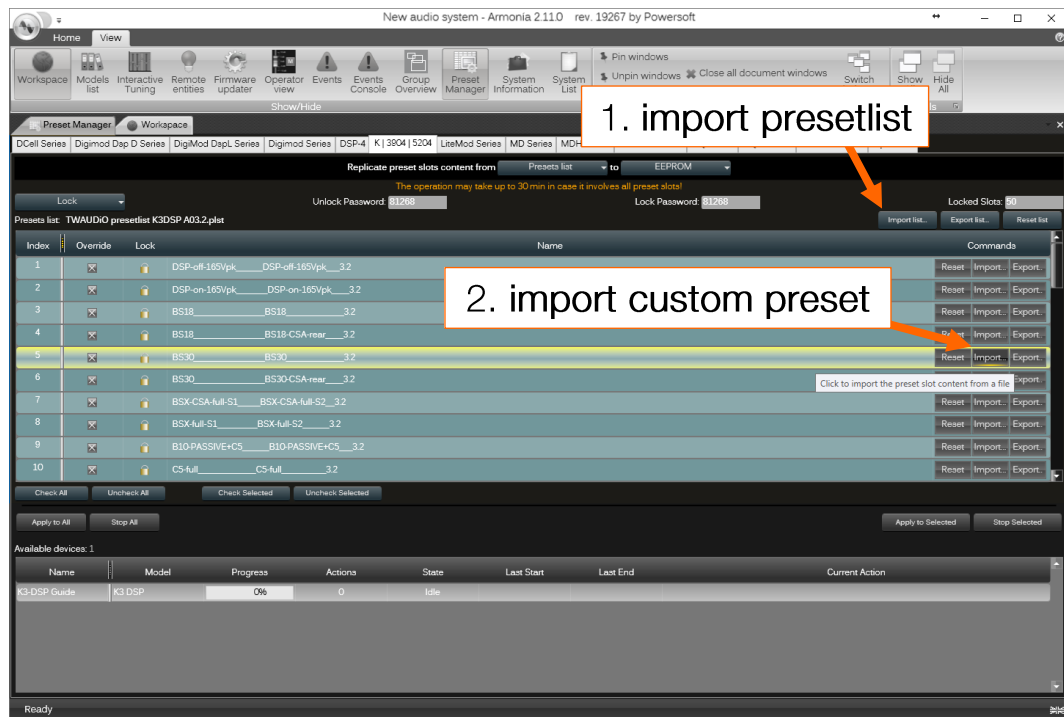


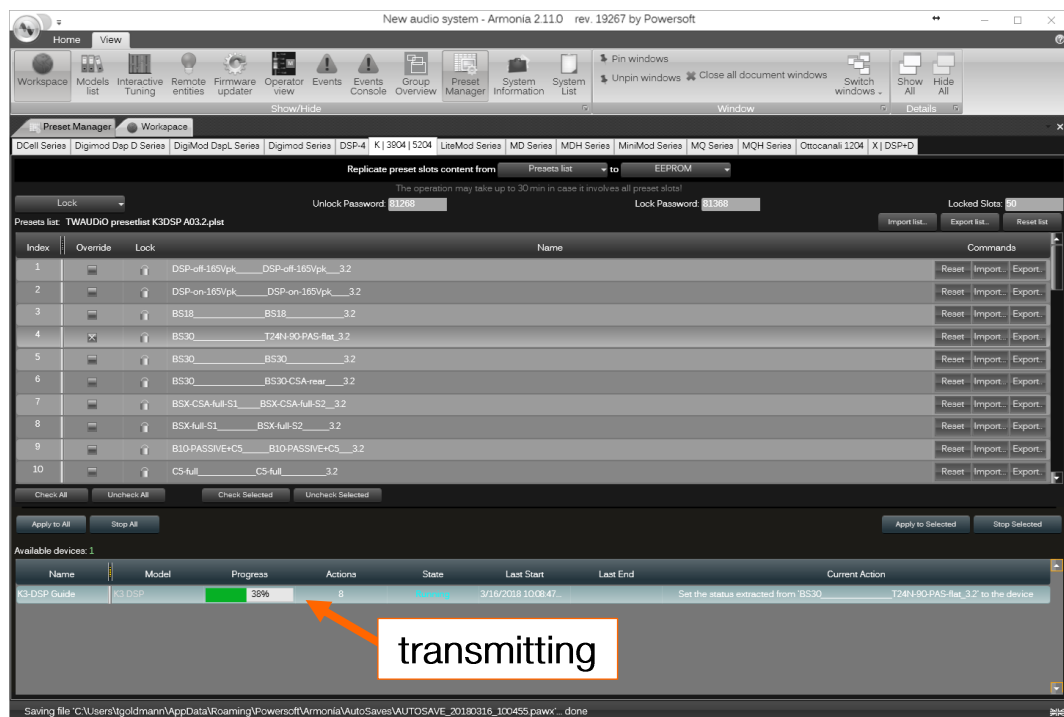
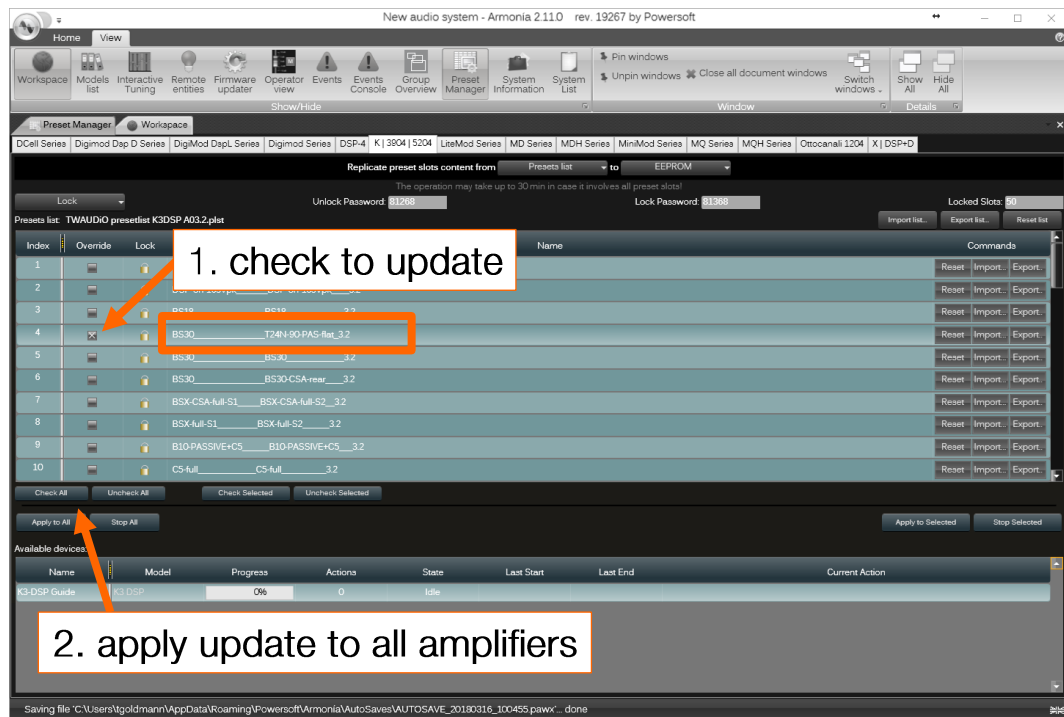
Be sure that after transfer all presets slots are locked. Go to the 'Presets' tab of each amplifier and check if padlock symbol is visible for all 50 slots.



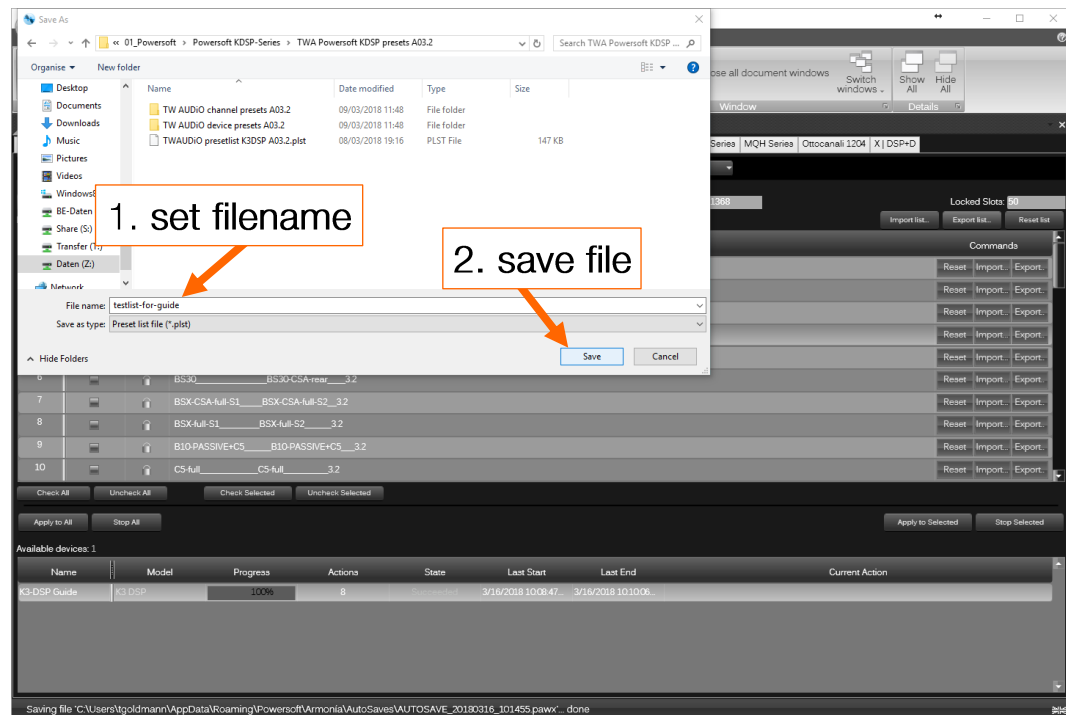
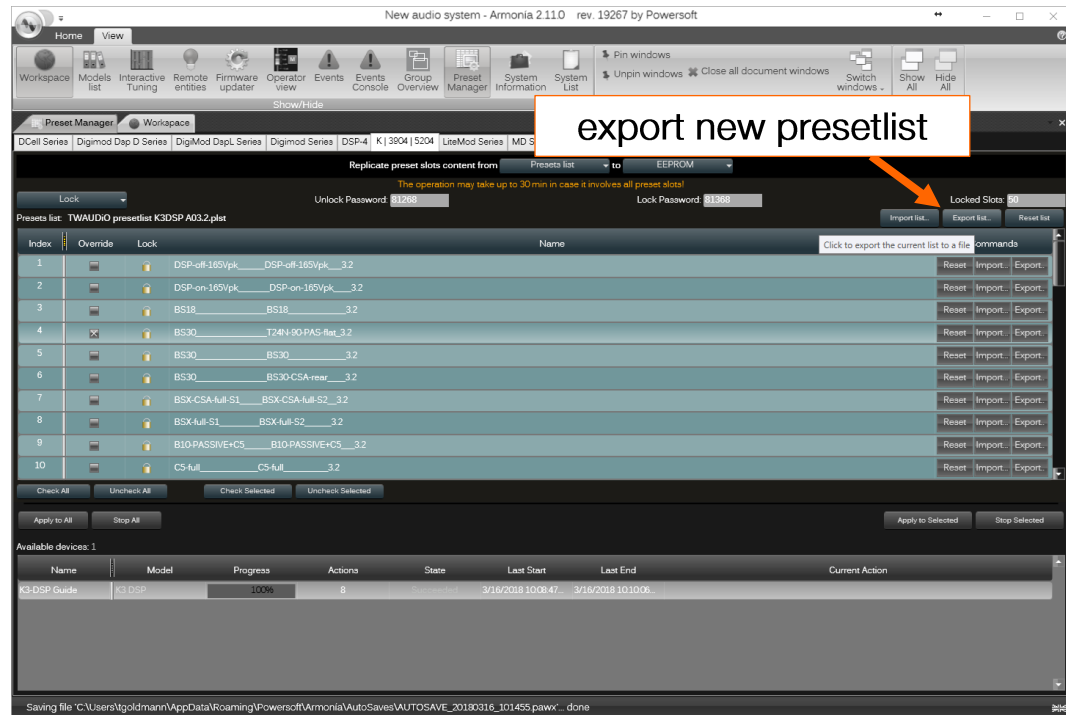
2.4. Customize presetlist



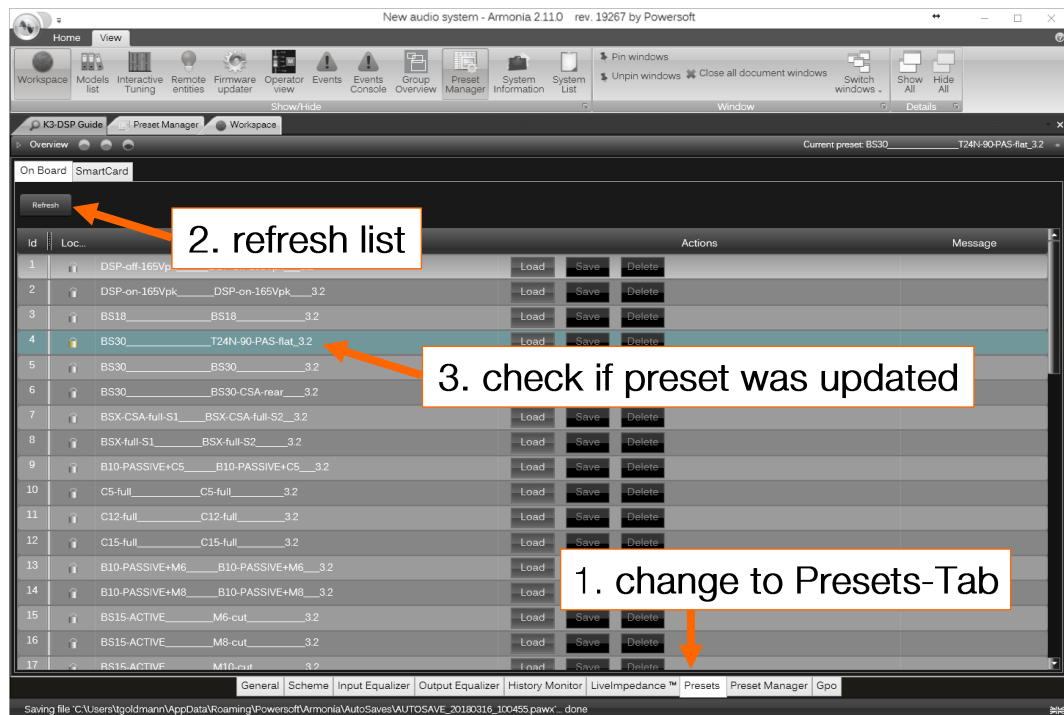
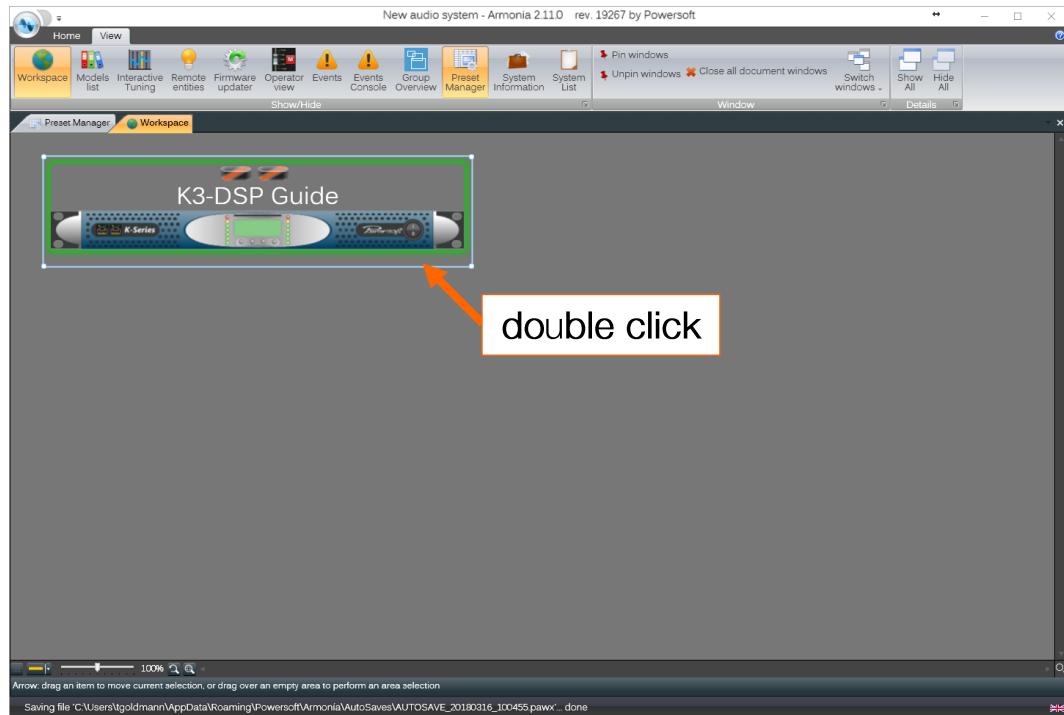




Export new list (.plst)



Checking if transmission was successful



3. Working with presets on display menu

3.1. Load device preset

menu → local presets → Recall local preset → choose preset → OK

3.2. Change FULL / CUT / FLAT Mode (appendix)

menu → settings → DSP settings → CH1 settings → EQs CH1 → OK → PEQ#1 edit
→ CH2 settings → EQs CH2 → OK → PEQ#1 edit

FULL Mode

FULL mode: switch PEQ#1 to OFF (or set gain to 0 dB)

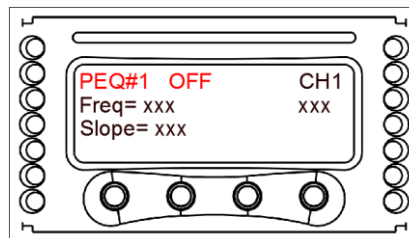


Figure 1: FULL mode

CUT Mode

CUT mode: switch PEQ#1 to ON, set gain to -15dB:

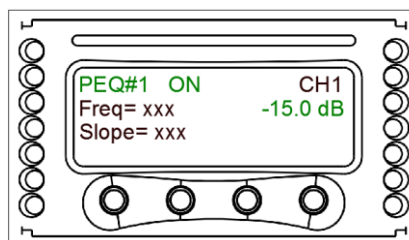


Figure 2: CUT Mode

FLAT Mode

FLAT mode: switch PEQ#1 to ON, set gain to -6dB

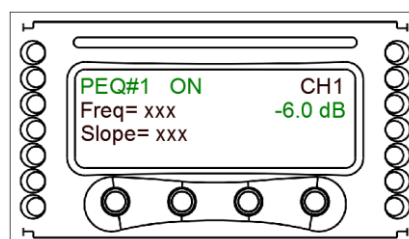


Figure 3: FLAT mode

3.3. Delays settings

To enter the delays on display menu please proceed:

Menu → Settings → DSP settings → CH1 Setup → Aux Dly (ms)

Menu → Settings → DSP settings → CH2 Setup → Aux Dly (ms)

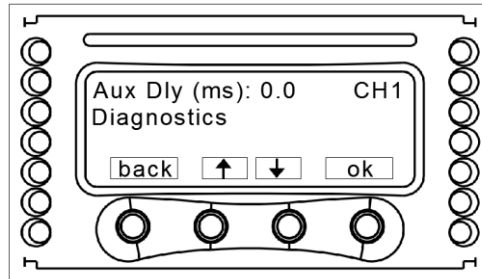


Figure 4: setting the delay on display menu



Reloading or loading different preset doesn't erase Aux delay values.

Aux delays, once set, stay until they are changed again or Input Section is reset by following procedure:

Menu → Settings → DSP settings → Reset Input Section

Aux delays set by front display menu refer to following block section can be accessed in Armonia:

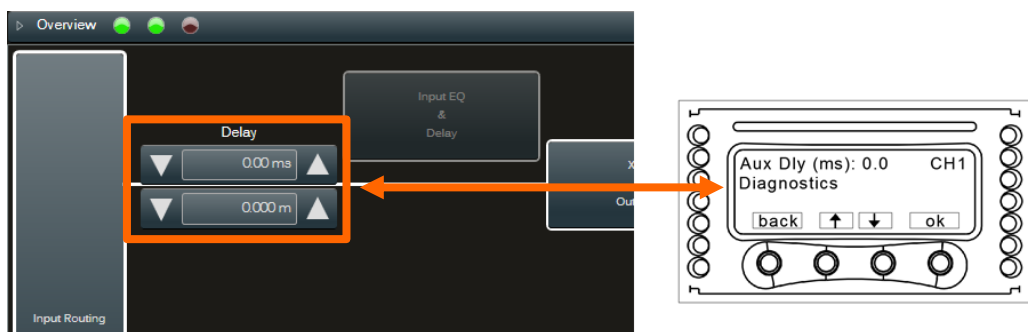


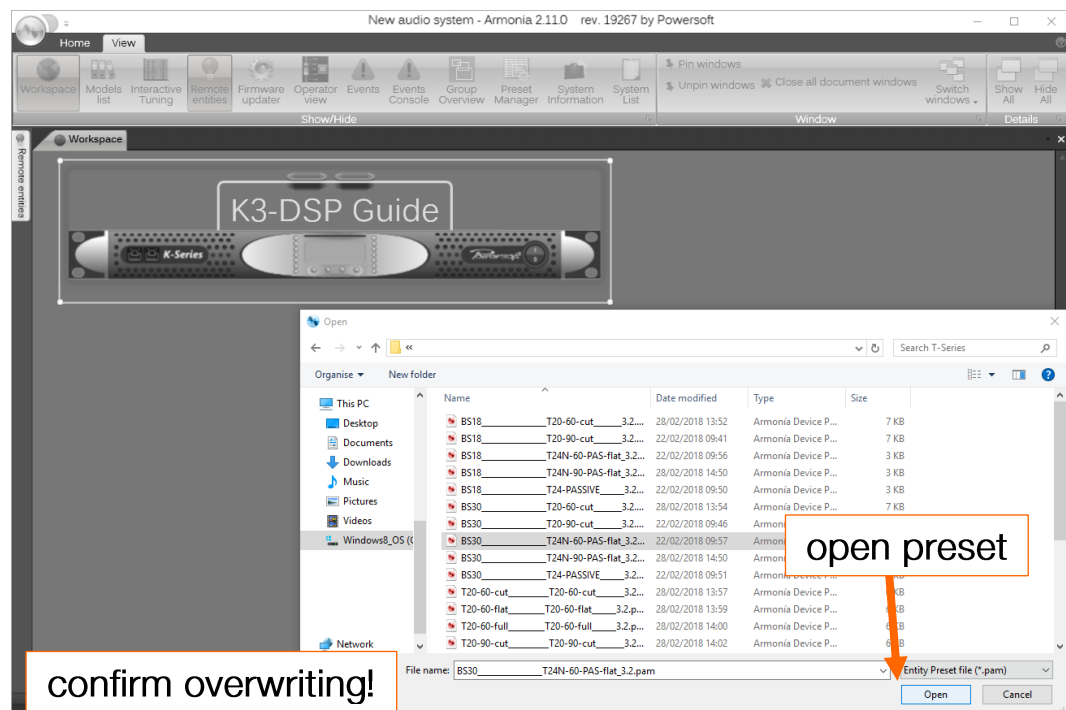
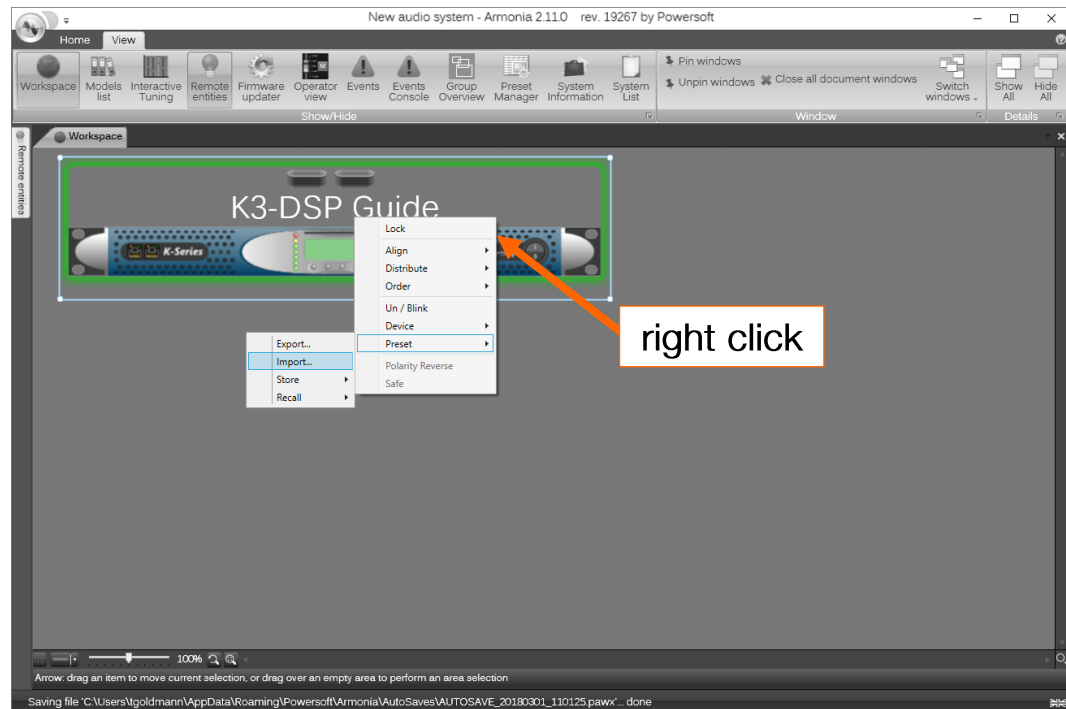
Figure 5: AUX delay in Armonia

4. Working with presets in the ARMONIA Software

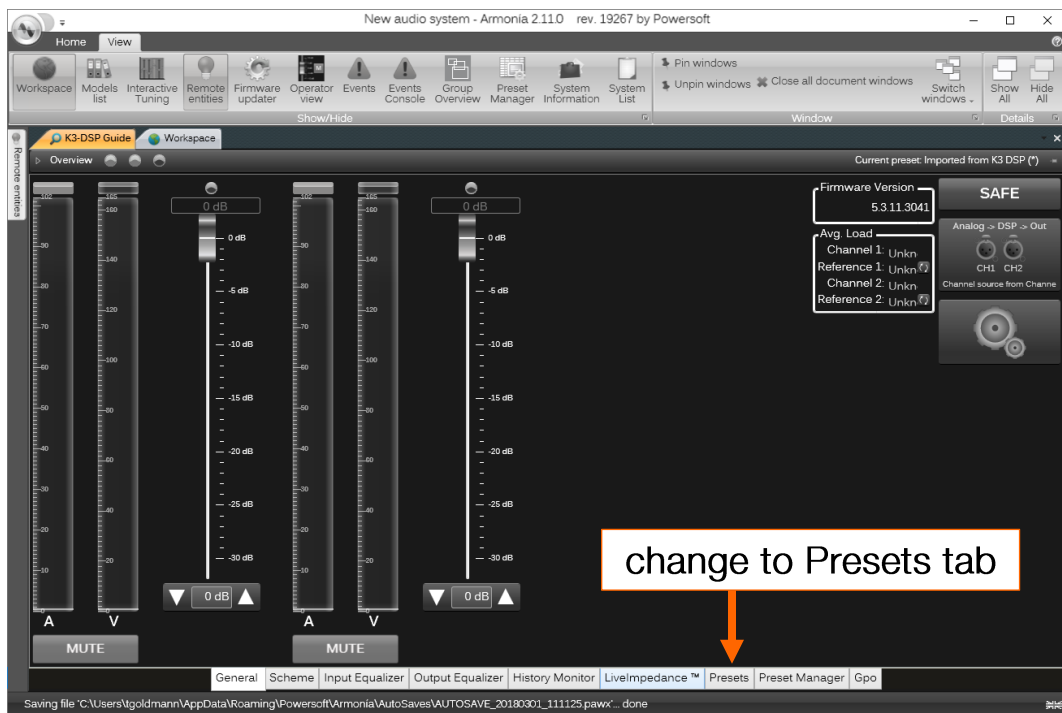
4.1. Loading the presets

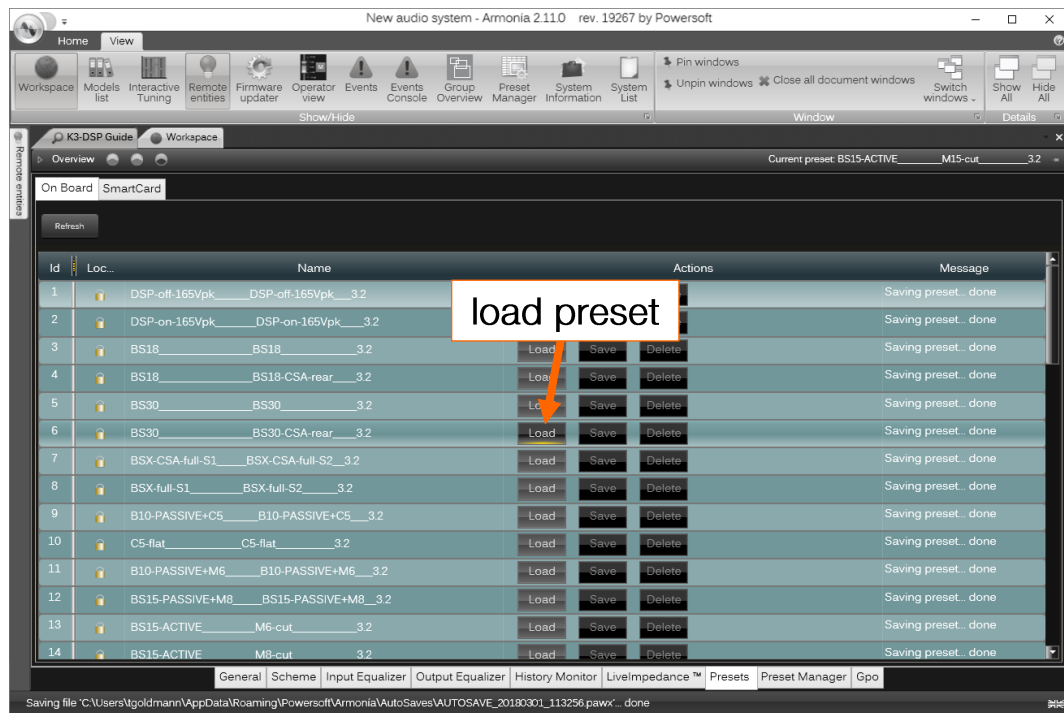
Loading Device Preset (*.pam)

From PC (*.pam file) into an amplifier



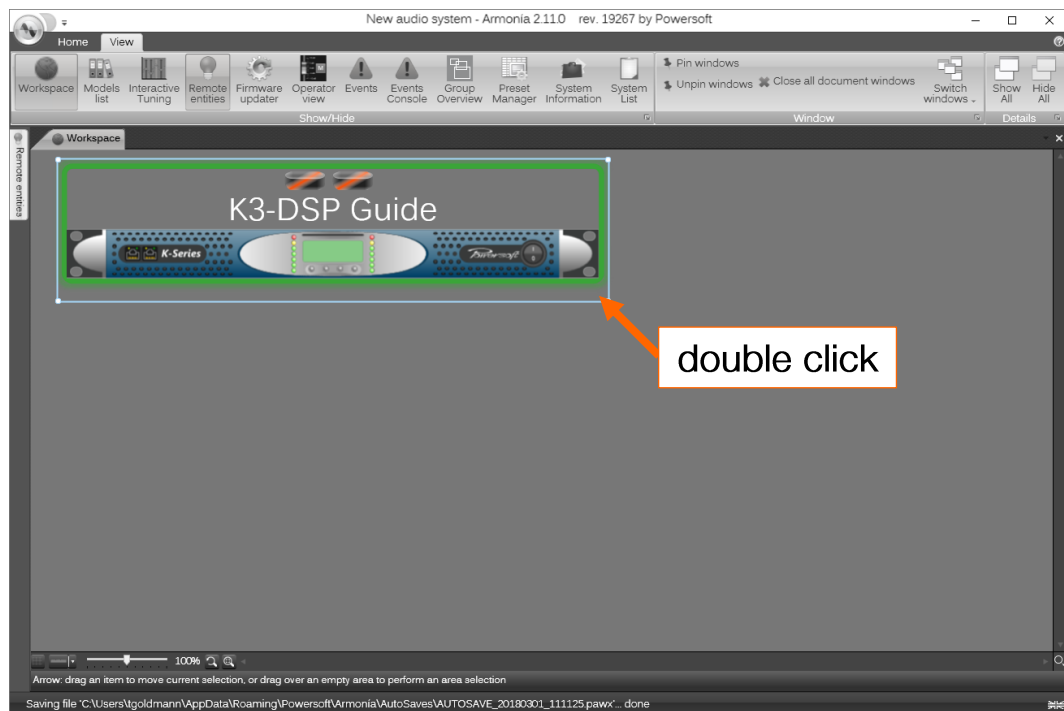
From amplifier internal memory

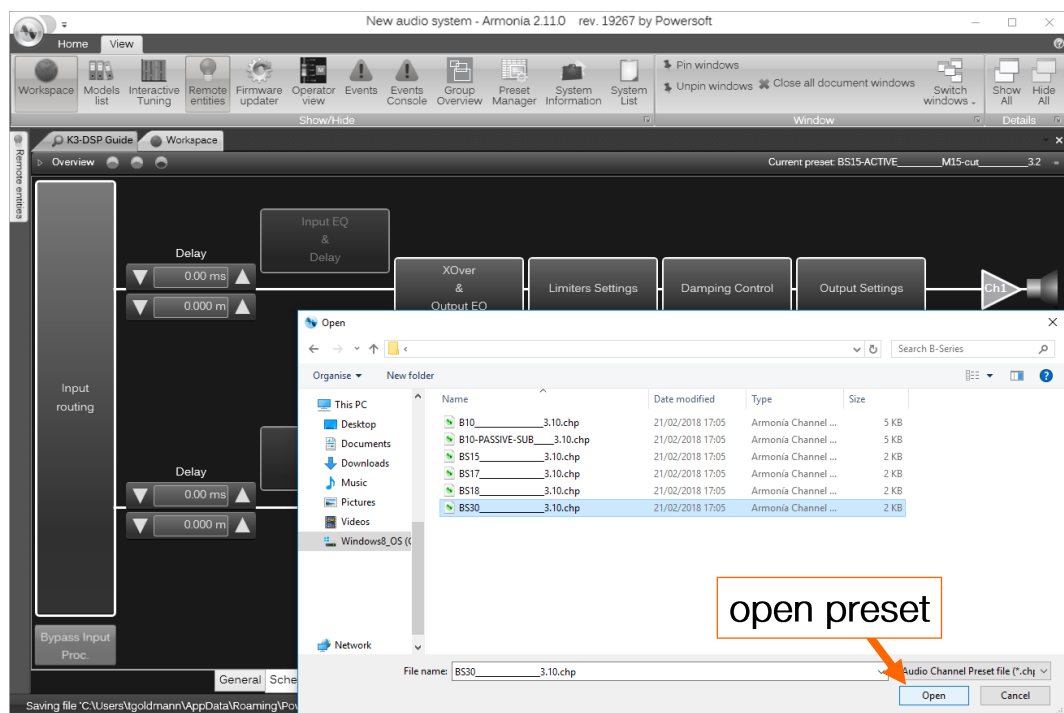
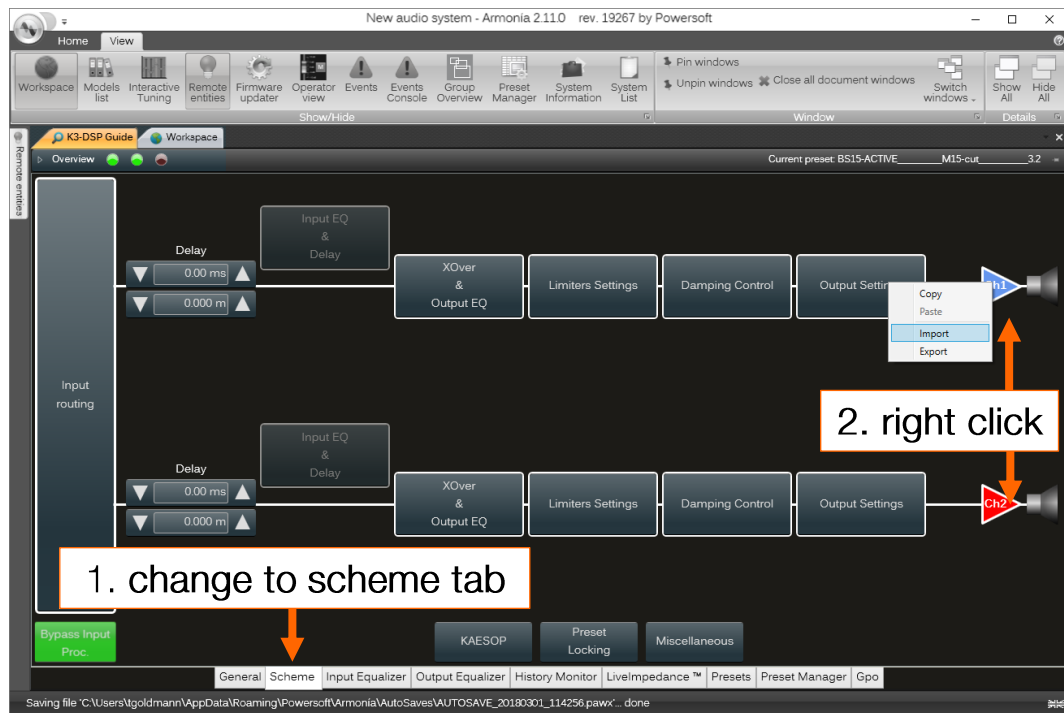




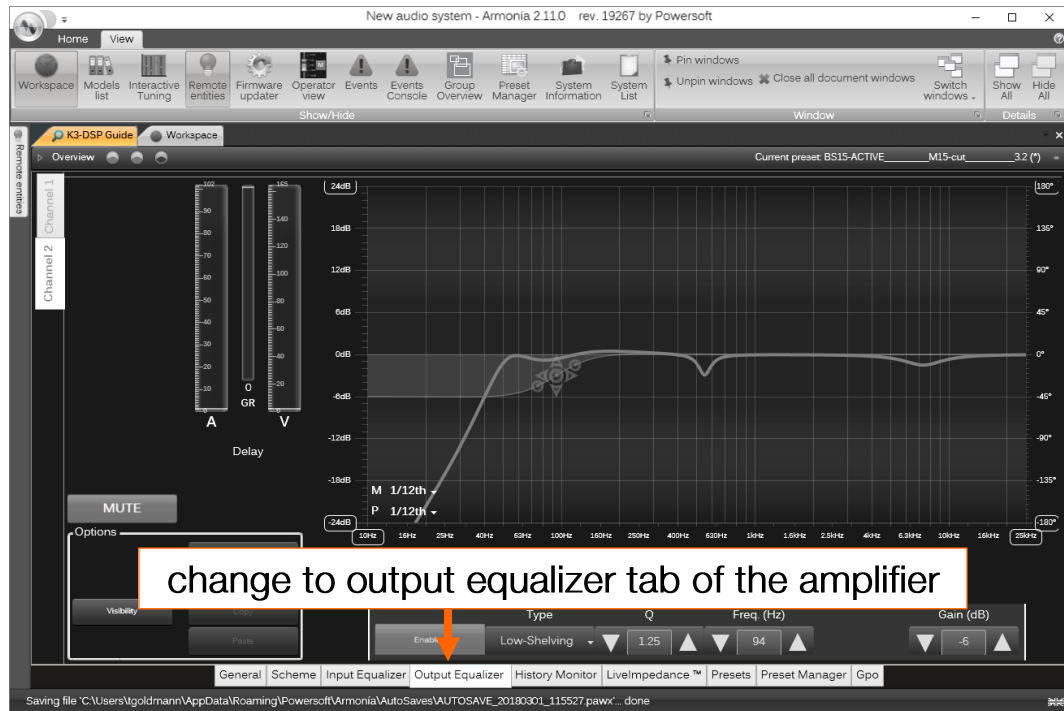
Loading Channel Presets (*.chp)

Loading a single channel preset (*.chp file) into an amplifier



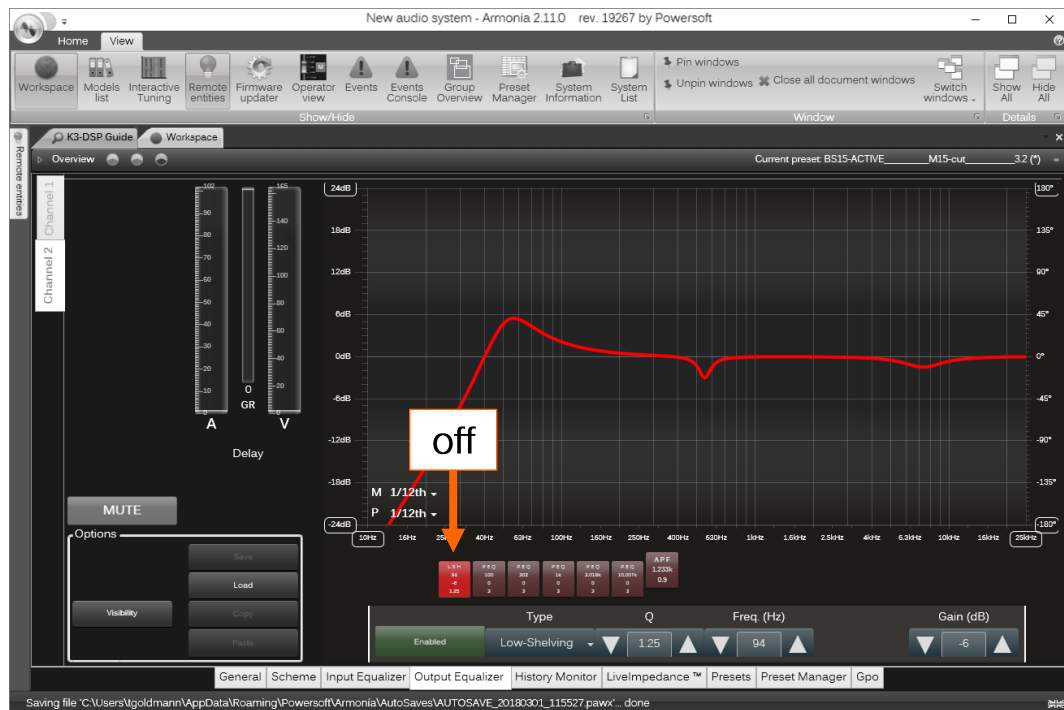


4.2. Change FULL/CUT/FLAT mode (appendix) in output EQ



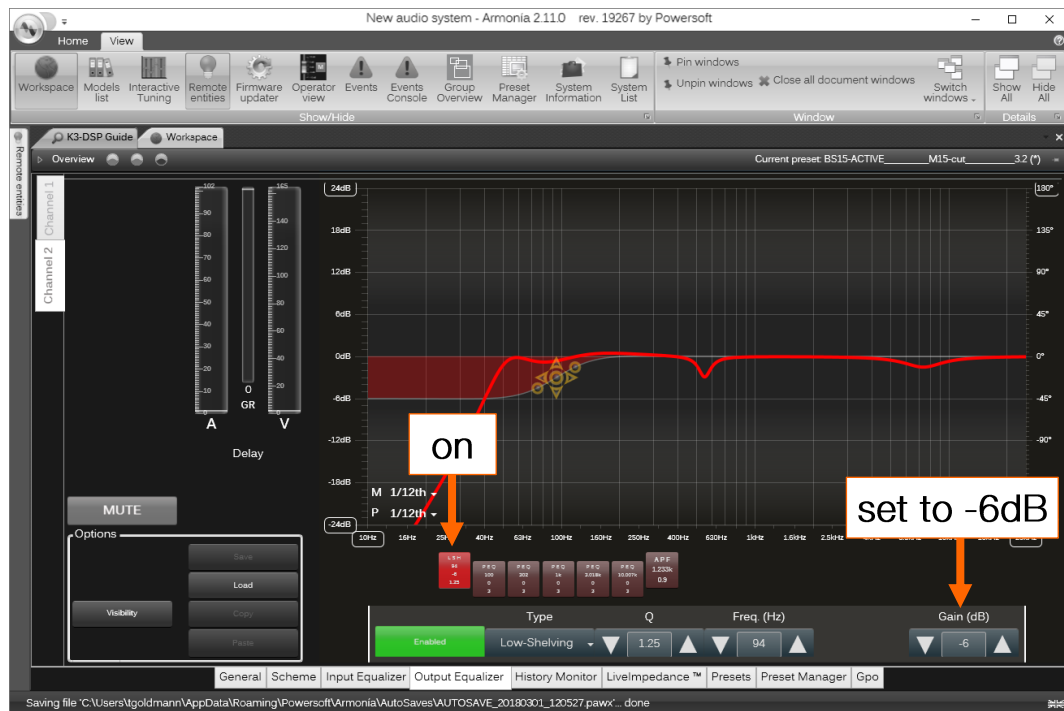
FULL Mode

Full mode: switch PEQ#1 to OFF



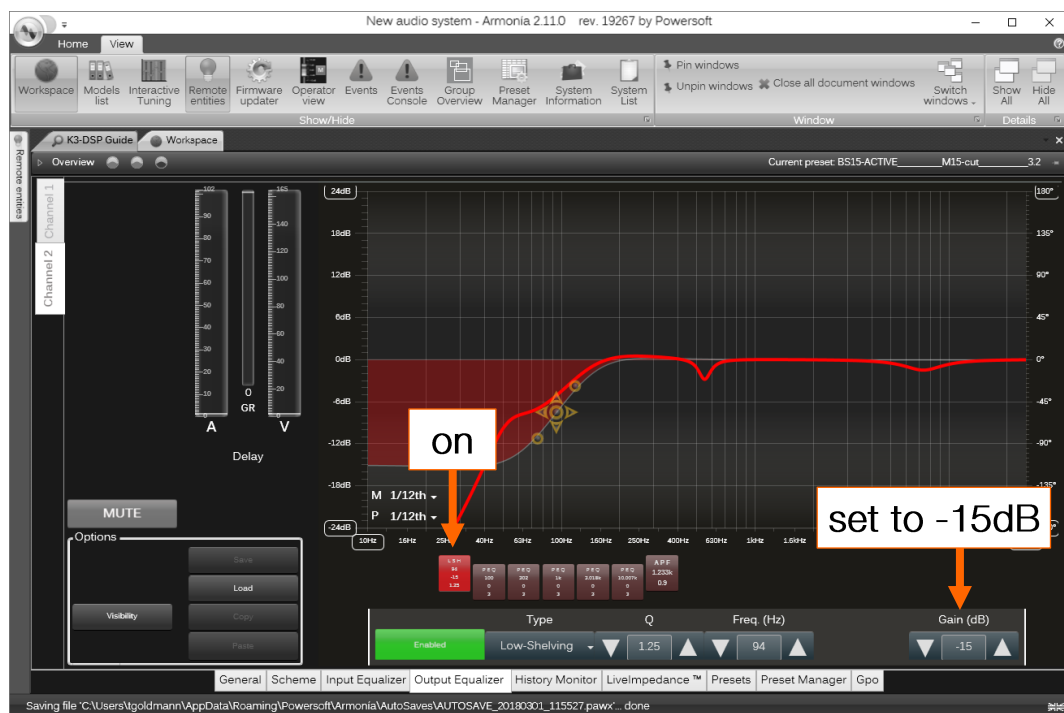
FLAT Mode

Flat mode: switch PEQ#1 to ON, set gain to -6dB



CUT Mode

Cut mode: switch PEQ#1 to ON, set gain to -15dB

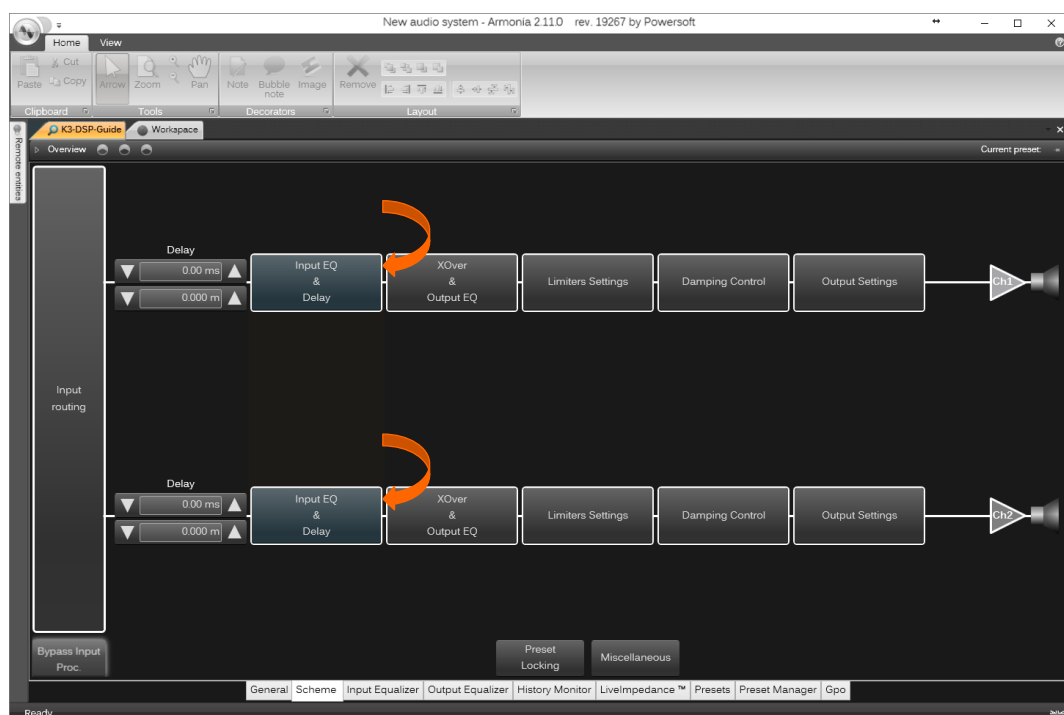
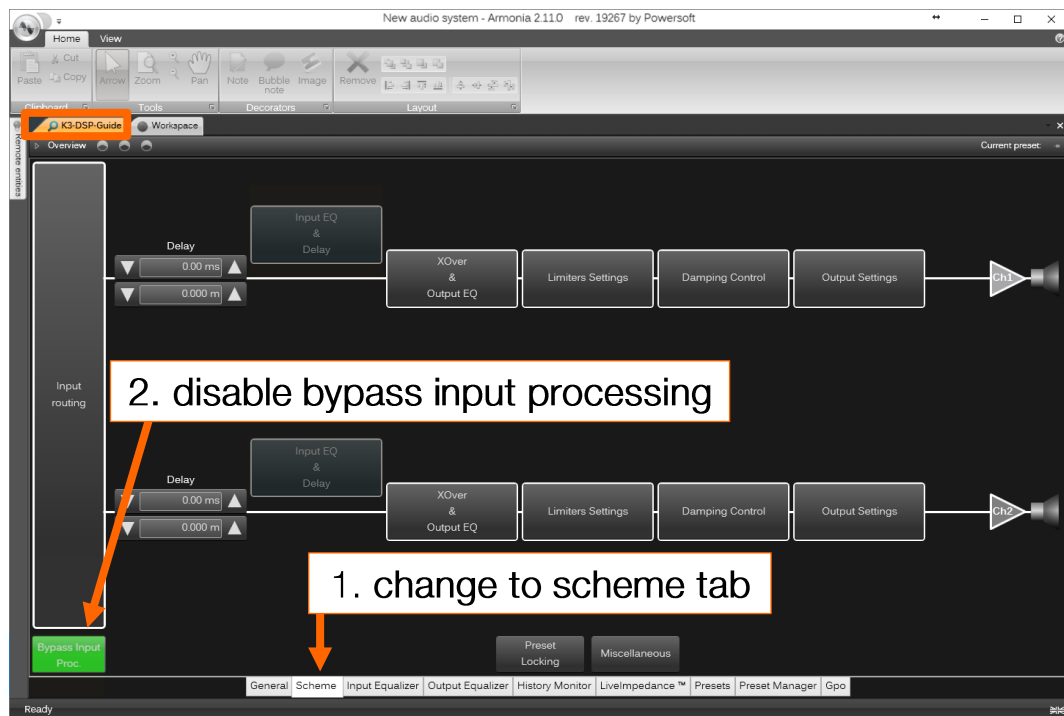


4.3. Delays settings

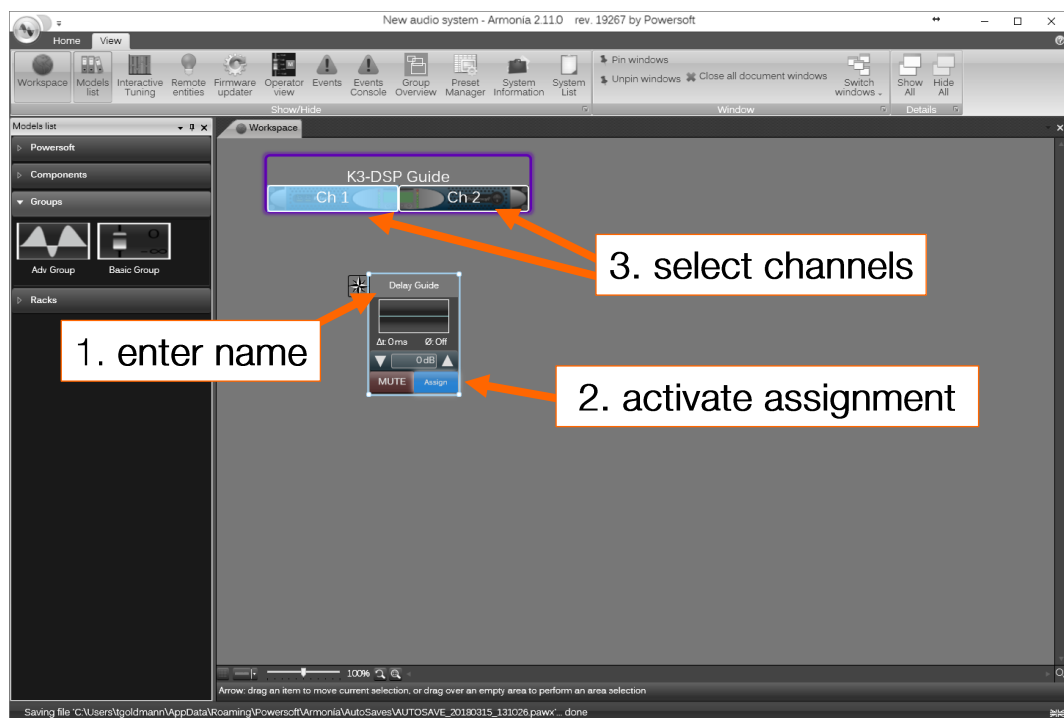
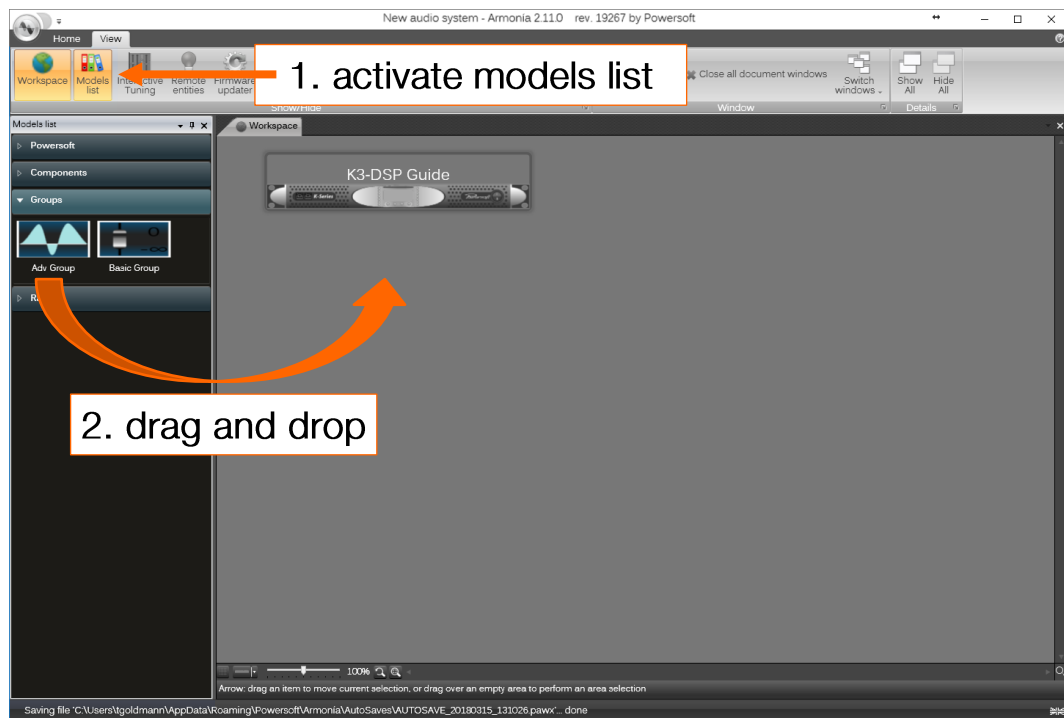
There are different methods to add delays to K-DSP output using Armonia. TW AUDiO recommends setting delays by Advanced Groups. Advanced Groups are assigned to Input EQ section of amplifier DSP.

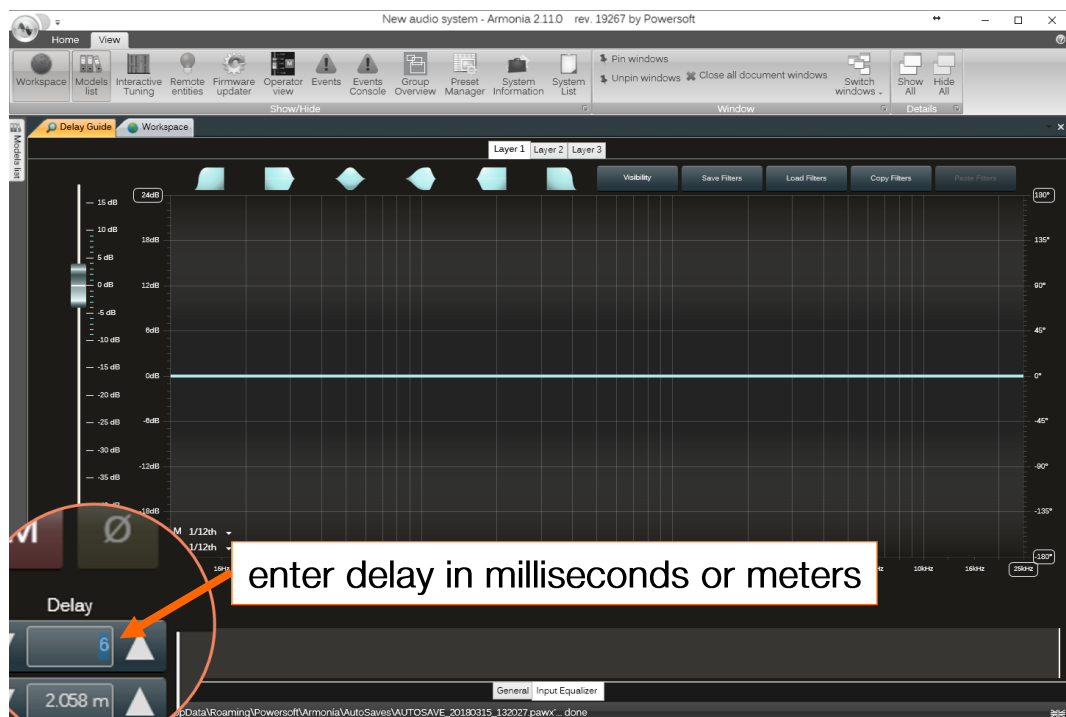
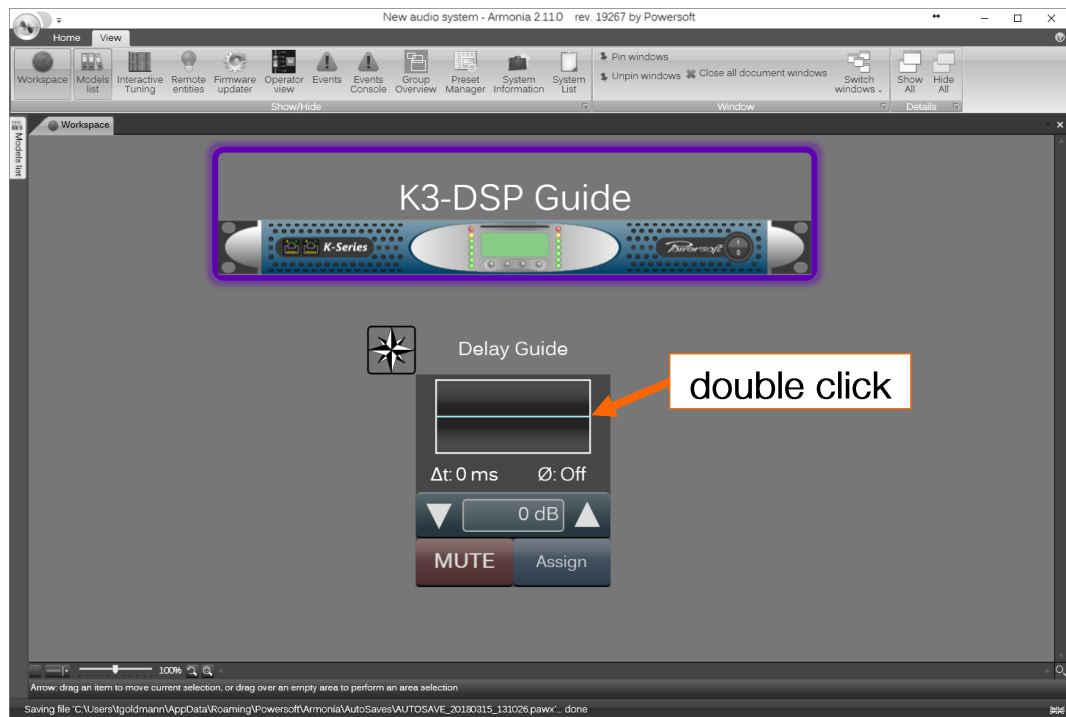
As default TW AUDiO presets are saved with bypassed input processing. In order to apply delays from Advanced Groups “Bypass Input Processing” has to be deactivated for each particular amplifier.

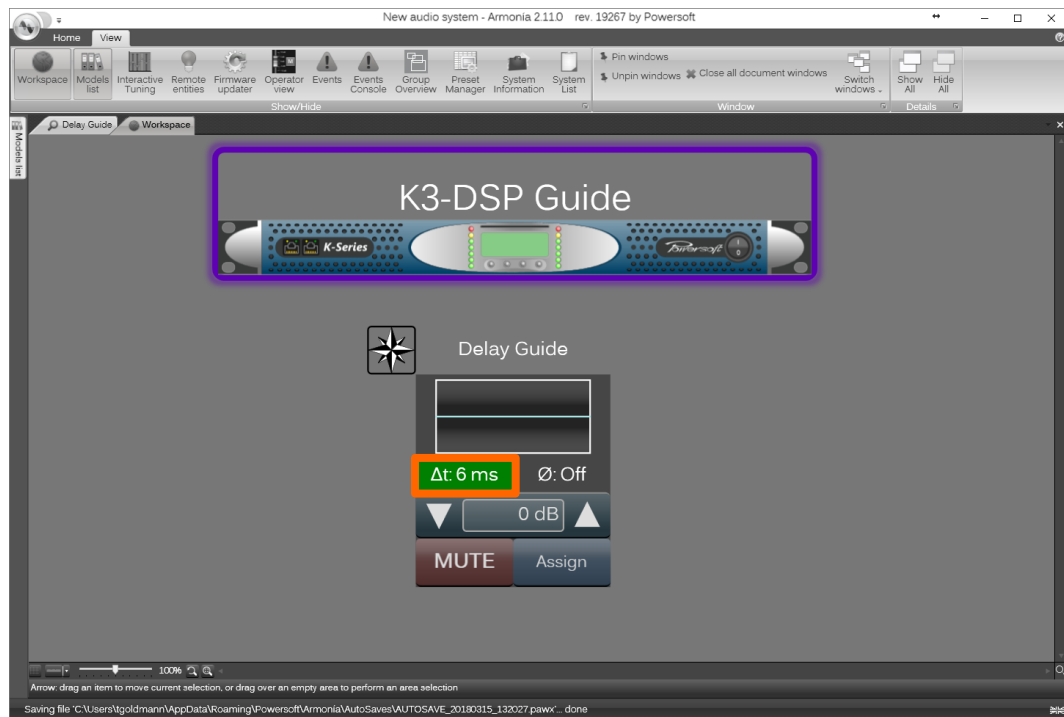
Deactivate Bypass Input Processing



Adding Advanced Group to workspace







5. System optimization

5.1. Loudspeaker system time alignment

Sound sources placed apart each other and pointed toward same direction, usually require time correction in order to reach destination at the same time. This typically refers to ground stack subwoofers wanted to be align with full-range sources flown/placed on speaker stand. This may also refer to front-fill, in-fill, delays sources, etc.

Methods of time alignment

1. Simply measuring the distance between sources with measuring tape or laser meter
2. Measuring the phase responses via transfer function with acoustical measurement tool like Smaart, SysTune etc.

Simple method measuring the distance between sources

1. Measure distance (d1) to first source, (e.g. top loudspeaker)
2. Measure distance (d2) to second source (e.g. subwoofer)
3. Sound source which is closer to measuring point requires delay
4. Use formula to calculate delay:
 - a. if $d1 = d2$, no delay required.

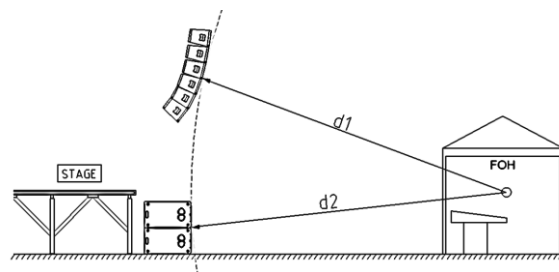


Figure 6: equal distances no delay required

- b. if $d2 > d1$, delay [ms] = $(d2-d1) \times 2,9$

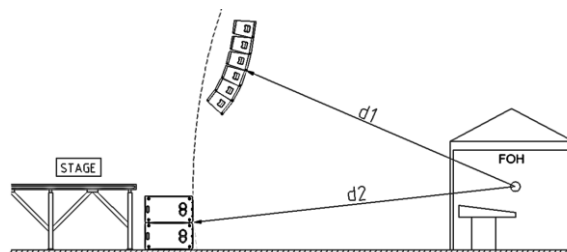


Figure 7: additional delay on tops

c. if $d_2 < d_1$, delay [ms] = $(d_1 - d_2) \times 2,9$,

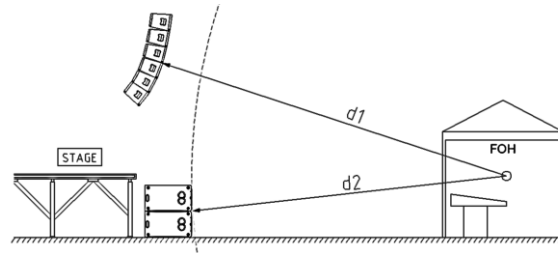


Figure 8: additional delay on subwoofers

In 2,9ms sound travels the distance of 1m. Speed of sound = 343m/s (at a temperature of 20°C).

Measuring the phase response

Phase alignment is based on transfer function measurements. Acoustical signal reproduced by sound sources is compared with signals being sent to the system. TW AUDiO offers regular sound systems measurements, optimization and control software trainings.

Visit www.twaudio.de homepage for more information.

Time alignment to VERA S32/S33

VERA S32 and S33 can operate in cardioid as well as endfired mode. Different delays strategies are applied to the presets. When physical distance is measured to the front grill of these subwoofers, please note the following:

- Cardioid preset – no additional delay is required, zero point for subwoofer is front speaker
- Endfire preset – zero point for subwoofer is the rear driver. Add 2,5ms more compensation delay compared to cardioid usage.

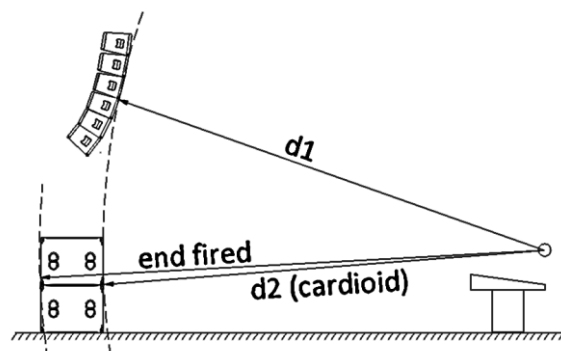


Figure 9: time alignment to VERA S32/S33

5.2. Endfire and cardioid arrays

Endfire subwoofer arrays

In an endfire array, a number of low frequencies sources are placed in line, one behind the other with specific spacing and delay strategy. It is the easiest way to achieve best possible sound pressure addition in the front with simultaneous partial energy reduction at the rear. This setup usually doesn't require any (acoustical) measurements.

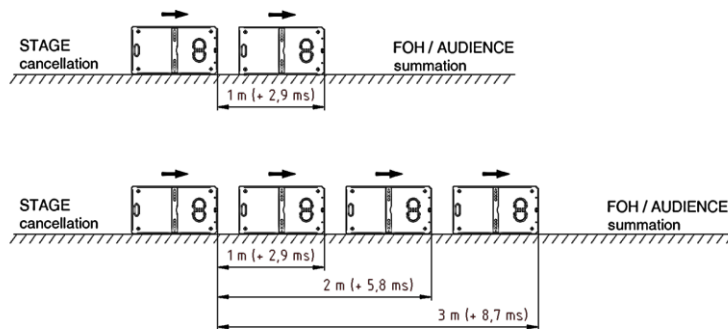


Figure 10: setting up endfire subwoofer systems

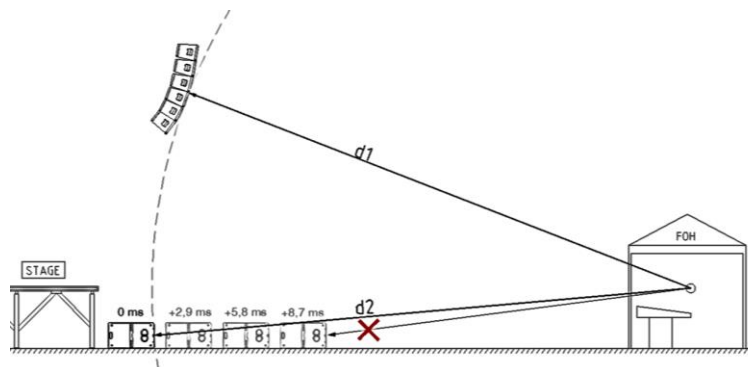


Figure 11: time alignment to VERA S32/S33 in endfire mode

For full-range source to end-fire subwoofer setup alignment BE SURE that distance is measured to subwoofer with zero delay set.

Or BE AWARE of delay you inserted to source (subwoofer) you measure distance to.



For BSX distance between subwoofers may be 1,2m. In this case delay value should be recalculated ($1,2\text{m} \times 2,9\text{ms}$) to 3,5ms

Cardioid subwoofer arrays

Cardioid subwoofer – the cardioid setup is to achieve a maximum cancelation on wide frequency bandwidth at the rear of the source.

Cardioid subwoofer array (CSA) – a configuration of standard subwoofer elements in a manner that creates cardioid dispersion (maximum cancelation on wide frequency bandwidth at the rear of the source)

Cardioid setup features

- > 15 dB attenuation at the back for wide range of frequencies
- independent amplifiers/channels with DSP settings for drivers facing front and back
- depends on frequency 0 to 3 dB SPL addition at the front
- BS18, BS30 cardioid presets were optimized with conditions:
 - a. array of three subwoofers, two facing front, one facing back
 - b. cardioid array was placed directly on the reflecting surface (floor)
- VS32, VS33 cardioid preset was optimized with conditions:
 - a. two boxes one top on the other
 - b. each subwoofer uses a 14/15 inch driver facing backwards and 18 inch driver facing front
 - c. cardioid subwoofer stack was placed directly on the reflecting surface (floor)

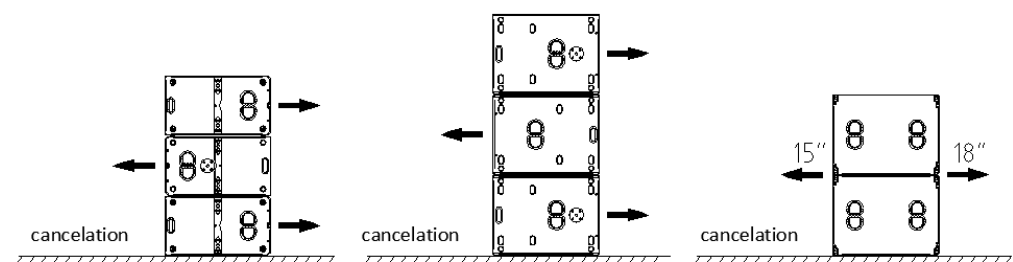


Figure 12: Cardioid subwoofer constellations

BSX cardioid preset

- array of 3 subwoofers, placed upright, two facing front, one facing back
- cardioid array was placed directly on the reflecting surface (floor)

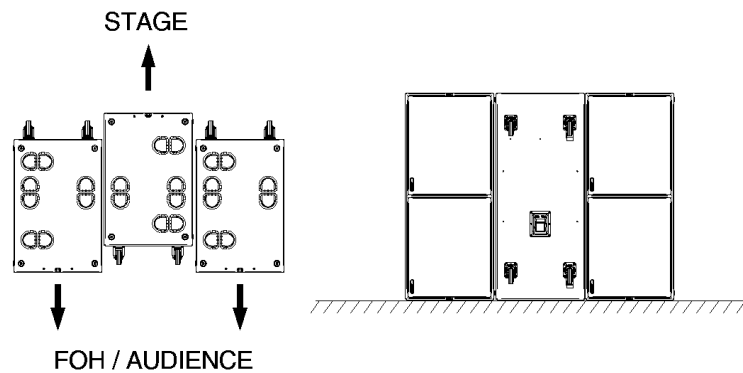


Figure 13: BSX cardioid setup



For best cardioid operation destructive reflections should be avoided, keep cardioid setup away from hard reflecting surfaces, especially at the rear. If stage or different surfaces close to cardioid setup defect cardioid operation usually endfire choice would be more senseful or further measurements are required.

5.3. Vertical array correction

Vertical array behaviours

Vertical arrays do need different frequency corrections depending on the array size, array curvature, room acoustics and weather conditions.

The longer the array, the more level below 1-2kHz will gain up because of summation/coupling effect. The following figure shows different frequency response for different arrays size. As might note coupling effect causes unbalanced frequency response between low-mid and high frequency energy.

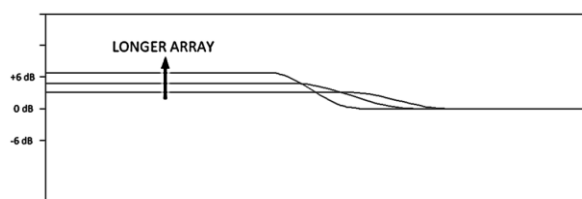


Figure 14: coupling effect

There are two methods to compensate this effect (Figure 15), one using low-shelving cut filter which reduces additional low-mid energy produced by array, either by using high-shelving filter in order to gain up missing mid-high energy to MHF drivers. These two methods are exchangeable and equal in results.

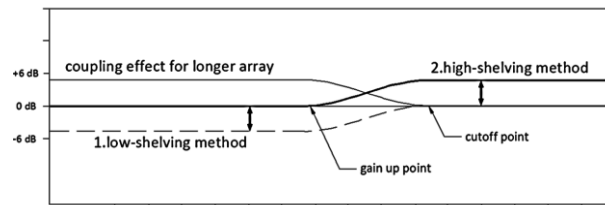


Figure 15: correction methods for the coupling effect

Typically coupling filter has center frequency set to 1kHz, whether it is low-shelving or high-shelving filter. Bandwidth (transition region) of such filter is then set to 4 octaves. It can be realized by raised cosine filters used in Input EQ or by preconfigured IIR shelving filter in Output EQ (slope: 0.7 1/oct). For different array sizes and application requirements different filter gains should be applied. The longer the array, the stronger coupling effect the greater correction is expected.

Regardless to array size low frequency electrical response for vertical array preset should stay at the same level. The longer the array, the better acoustical coupling/summation for low-mid region (Figure 14). Typically for longer arrays more subwoofers are used in the system. Therefore vertical array low frequency response matches to subwoofer energy without low-shelving cut. This is an automatic process, more subwoofers produce higher sound pressure level, for longer arrays low frequency response is acoustically boosted by coupling effect. Cross-over frequency between subwoofers and array is maintained.

As already described coupling effect impacts to frequencies below 1-2 kHz. In order to achieve balance frequency response should be corrected, mid-high energy in array has to be boosted (Figure 15).

Now, the smaller an array is the less number of subwoofers in system is used. In this case, the low-mid response of array should be less in level in order to match subwoofer energy. Less number of boxes in array results less coupling effect. Cross-over frequency between subwoofers and array is maintained as well.

Yet, for VERA10 Active preset mid-high frequency may be attenuated when shorter than 6 boxes array is used.

For array size correction TW AUDIO finds high-shelving as accurate method and implements it to its vertical array presets.

Regarding the mid-high frequency range it makes sense to split an array into different zones (long, middle and short throw) driven by individual amp channels. Depending on the curvature (more curved or less curved) different correction filters may be applied.

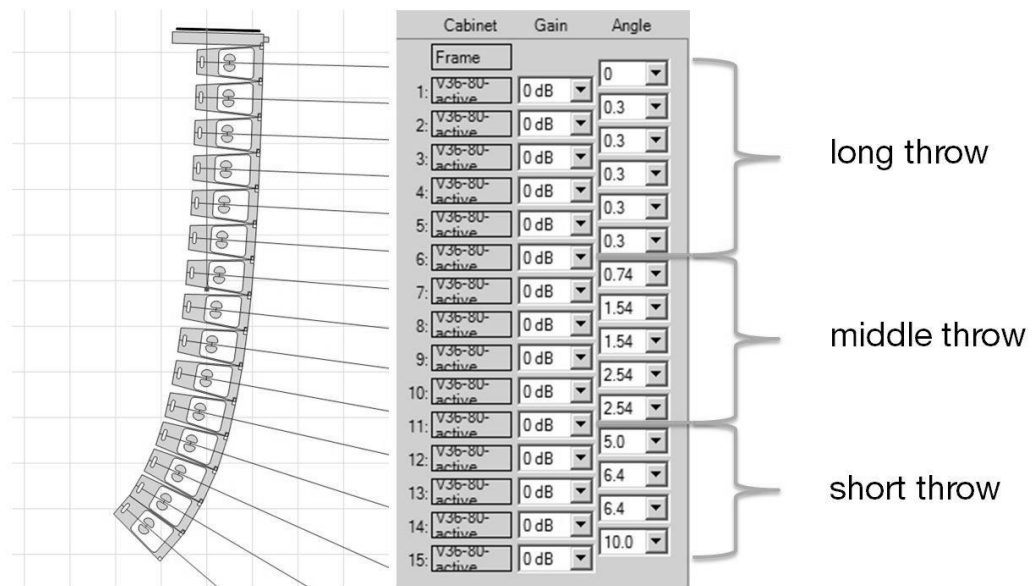


Figure 16: splitting an array into zones

Because of HF attenuation of air at distances larger than 40m, high frequencies can be boosted in the long throw zone. At shorter listening distances (near field) high frequencies can be reduced. In more curved array zones the overlapping and therefore the SPL produced in the mid band is less. Therefore it can be senseful to slightly boost the 2 to 4 kHz range.

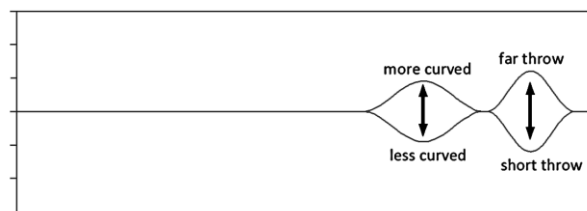


Figure 17: zone correction filters

For easy tuning and controlling bigger systems there is the possibility of individual grouping amp channels in Armonia software. Using Armonia's advanced groups there can be set gains, delays and EQs to all assigned amp channels at once. Amp channels can be assigned to different groups at the same time while all settings done in all groups will be summed automatically in the dedicated amp channels.

Figure 18 shows a system example that can be set in Armonia software. There are many groups that can be assigned to the same amplifier channel, for instance VERA36 MASTER group controls (coupling effect correction) all amplifiers driven VERA36, while VERA36 FAR adds far-throw correction only to amplifier VERA36 L1 and VERA36 R1.

All settings done in the advanced groups impact into the 'Input EQ & Delay' section of the assigned amp DSPs, independent from the loudspeaker preset settings stored in 'Output EQ'. All 'Input EQ & Delay' settings will be applied to amp channels until they are changed again, this works independent from changing or loading a channel or device preset. All TW AUDIO device presets are

stored with bypassed 'Input EQ & Delay' section. Bypass must be switched off in order to apply "Input EQ & Delay" settings to amp DSP channels.



Figure 18: system configuration in Armonia

VERA10 ACTIVE Array size correction

VERA10 Active preset is optimized for six boxes in array with splay angles: 1-3-5-7-10. Frequency response was optimized for best response and to match to energy produced by VERA-SYS-ONE's number of subwoofers.

Enlarge or reduce array size as well as different opening angles would require additional optimization. As described in section 5.3.1 high-shelving method is applied to the standard preset.

For array size correction PEQ#1 (high-shelving) for second channel (HF) is pre-configured, following settings should be applied:

- for array shorter than 6 modules – switch PEQ#1 ON and decrease (▼) filter gain
- for array longer than 6 modules – commonly standard preset is used. When coupling effect significantly changes frequency response switch PEQ#1 ON and increase (▲) filter gain

Filter gain adjustments depend on array size and application. PEQ#1 filter settings can be done via Armonia as well as front display menu.



Array size correction may also be applied using Armonia's Advanced groups, according to theory described in section 5.3.1. Be aware of different slope definition for Input and Output EQ. When array is being corrected by Advanced group slope should be set to 4 octaves, while preselected PEQ#1's slope from Output EQ is 0,7.

VERA10-PASSIVE Array size correction

VERA10 Passive preset is optimized for two boxes in array with splay angles: from 5 to 10 degrees. Enlarge array size as well as different opening angles would require additional optimization for best acoustical response.

PEQ#2 is pre-configured to correct array size:

- for array longer than 2 modules, mid-high frequencies should be boosted: Switch PEQ#2 on and increase (↑) filter gain.

Filter gain adjustments depend on array size and application. PEQ#2 filter is accessible in Armonia as well as front display menu.



Array size correction may also be applied using Armonia's Advanced groups, according to theory described in section 5.3.1. Be aware of different slope definition for Input and Output EQ. When array is being corrected by Advanced group slope should be set to 4 octaves, while preselected PEQ#1's slope from Output EQ is 0,7.

VERA10 120 degrees horn preset adjustment

The wider the horn the less MHF energy is produced on axis for the same input signal. Figure 19 shows differences between 80 degrees and 120 degrees horn version. Energy from these two different horns can be simplified and shown as two isosceles triangles with equal areas, but different dimensions.

Wider angle results less energy on axis (around 2 dB less for 120 degree horn compared to 80 degrees version), however more energy off axis.

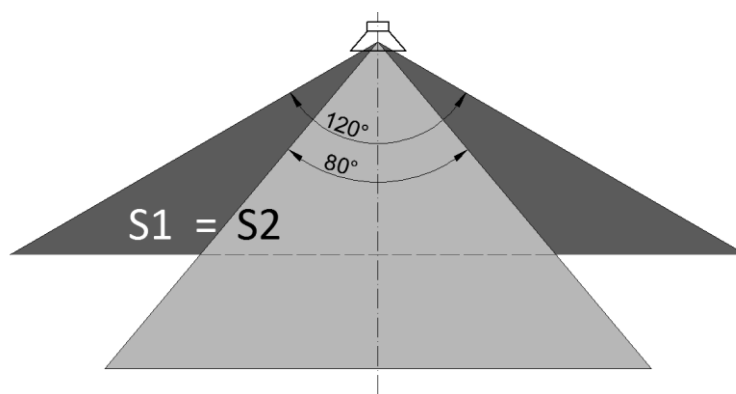


Figure 19: horizontal pattern of different horn versions

VERA10 equipped with 120 degrees horns is typically used as short throw cabinets combined to standard 80 degrees horn VERA10 array. As described in section 5.3 this can be an advantage for short-throw applications where less mid-high energy is typically expected.

Compensation would be senseful for the entire array equipped with 120 degrees version horns.

VERA10 ACTIVE

- use pre-configured PEQ#2 in channel two (MHF), simply switching PEQ#2 ON will compensate the difference.

VERA10 PASSIVE

- use pre-configured PEQ#3 filter (remember: for VERA10 PASSIVE preset PEQ#1 changes full/cut/flat, PEQ#2 is set for different array size), simply switching PEQ#3 ON will compensate the difference.

VERA20/VERA36 120 degree horn correction

Please select the following presets when using VERA20 or VERA36 with a 120 degree horn flair. The presets include an EQ to compensate the on axis HF loss due to the wider dispersion of the waveguide.

Presets for VERA20:

V20-120-cut_____3.10.chp

V20-120-flat_____3.10.chp

V20-120-full_____3.10.chp

V20-120-cut_____V20-120-cut_____3.2.pam

V20-120-flat_____V20-120-flat_____3.2.pam

V20-120-full_____V20-120-full_____3.2.pam

Presets for VERA36:

V36bi-120flat-LF____V36bi-120flat-MHF3.3.pam

V36bi-120full-LF____V36bi-120full-MHF3.3.pam

6. APPENDIX

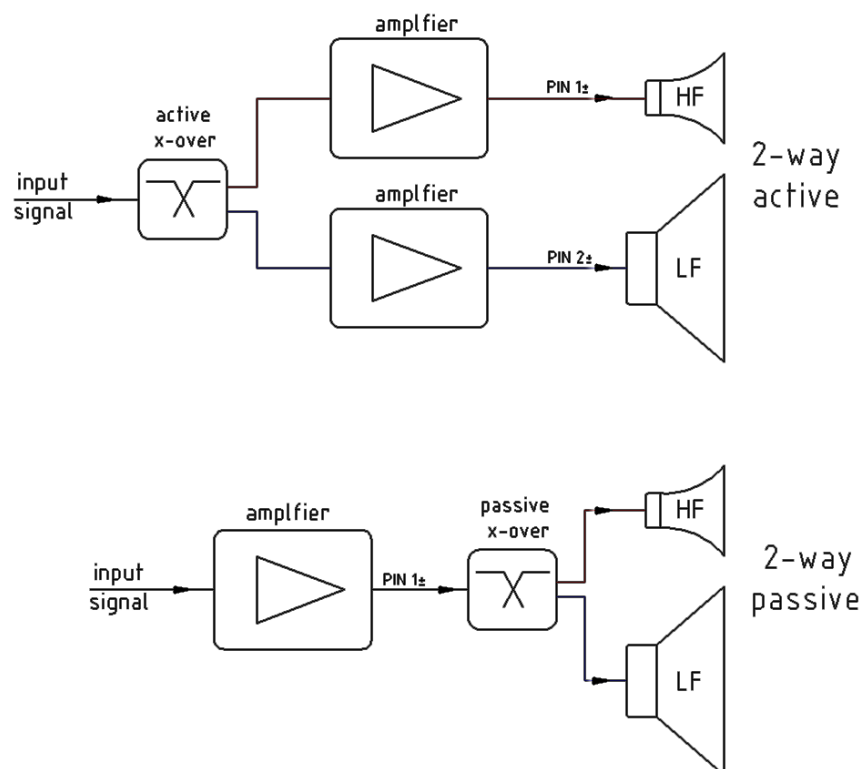
6.1. Glossary

active	active crossover splits frequency response within external DSP power before amplification (could be amplifier onboard DSP or external loudspeaker signal processor). Active could also mean self-powered loudspeaker which doesn't refer to TW AUDIO products.
Advanced group	available in Armonia software, feature allows controlling many amplifiers channels at the same time. Within the Advanced group there is a chance to add delay, change frequency response as well as adjust gain. Individual amplifier channels can be assigned to many groups at the same time; in this case all groups settings assigned to particular channel will be summed and applied to this channel. TW AUDIO recommends using Advanced groups for system optimization. Advanced groups always requires using the Armonia software. This feature applies settings to amplifier "Input EQ & Delay" DSP section. Settings stay until they are changed again or bypassed from amplifier signal chain. Reloading a preset or loading different one will not reset the settings, but bypass it.
all-pass filter	signal processing filter that passes all frequencies amplitudes equally but changes the phase relationship between those frequencies. PEQ#7 filter for M- and C-Series TW AUDIO speakers presets adapts phase response to T24/VERA10.
cardioid	multidriver, low-frequency system with unidirectional response or configuration of subwoofer elements in a manner that creates a cardioid dispersion. Cardioid dispersion might be achieved by special designed subwoofer enclosure (S33) or by Cardioid subwoofer array built from two omnidirectional subwoofers facing front and one facing opposite direction (more options are available) Cardioid setup requires at least two independent channel signal processing.
cut / flat / full mode	three different variants for low frequency responses related to TW AUDIO full-range products <i>cut mode</i> is used with subwoofer for the best headroom, low frequency is cut off to match to subwoofer response, <i>flat mode</i> is typically used as standalone loudspeaker without subwoofer, flat frequency response <i>full mode</i> is used as standalone loudspeaker without subwoofer, 50-100Hz is boosted to get more low energy Modes are changed by first open filter in Output EQ section (PEQ#1)
damping control™	Powersoft Damping Control is a proprietary algorithm which compensates for cable resistance. Cable parameters may be entered, and the algorithm calculates and applies the appropriate correction. Note: Damping Control should only be enabled if the amplifier channel is being used exclusively for frequencies below 400 Hz (available only for BS15, BS18, BS30, VL24, BSX, S33). Software calculates resistance for single wire, when 2-wire speaker cable is connected to K-DSP output multiply value by 2, or multiply by 4 for 4 wire speaker cables.
endfire array	a number of low frequencies sources (subwoofers) are placed in line, one behind the other with specific spacing and delay strategy. It is the easiest way to achieve best possible sound pressure addition in the front with simultaneous partial energy reduction at the rear
input EQ & Delay	independently to preset additional settings to amplifier channel might by be applied. All settings done in the advanced groups impact into the 'Input EQ & Delay' section of the assigned amp DSPs. All 'Input EQ & Delay' settings will be applied to amp channels until they are changed again, this works independent from

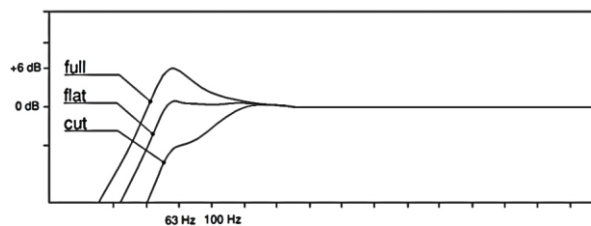
changing or loading a channel or device preset. All TW AUDIO device presets are stored with bypassed 'Input EQ & Delay' section. Bypass must be switched off in order to apply "Input EQ & Delay" settings to amp DSP channels

low/high-shelving filter	filter cutting or boosting signal below/above certain frequency. It might be used to correct vertical array amplitude response. From vertical array principles the longer the vertical array is the more additional energy below 1-2 kHz is reproduced (coupling effect). For coupling filter center frequency is typically set to 1 kHz with 4 octaves bandwidth slope.
output equalizer	Specific DSP settings used for loudspeaker presets (individual parameter adjustment, gain, delay, EQ, phase). Settings applied and protected by manufacture. However A03 presets open user filters accessible from Armonia as well as amplifier display menu. All settings are reset when different or again preset is recalled/imported.
passive	built-in passive components inside loudspeaker enclosure split frequency response after amplifier's output (after amplification) Study the diagram in next section
peak limiter	protects speakers from excessively loud peaks by limiting the maximum output voltage of the amplifier.
power limiter	protects speakers from burning due to excess power being delivered over an extended period of time.
reverse polarity	available only for subwoofer in Output Equalizer section, polarity of output signal can be reversed for specific application (e.g. custom Cardioid Subwoofer Arrays)

6.2. Active vs. passive

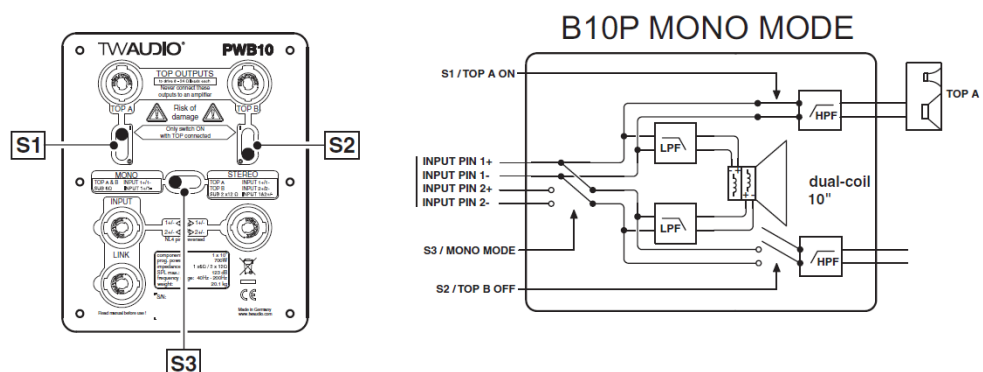


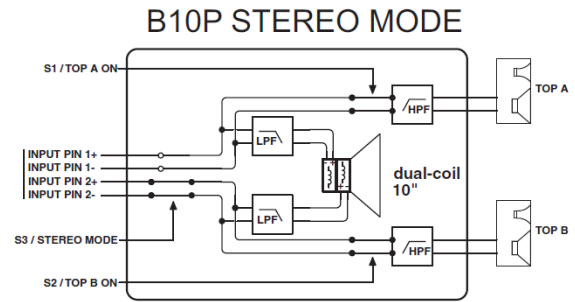
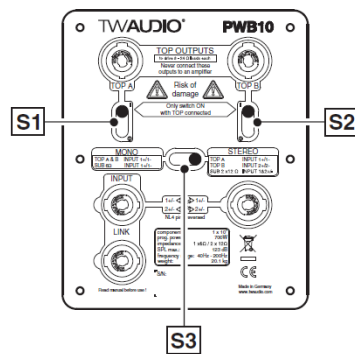
FLAT is typically used as standalone loudspeaker without subwoofer, flat frequency response.



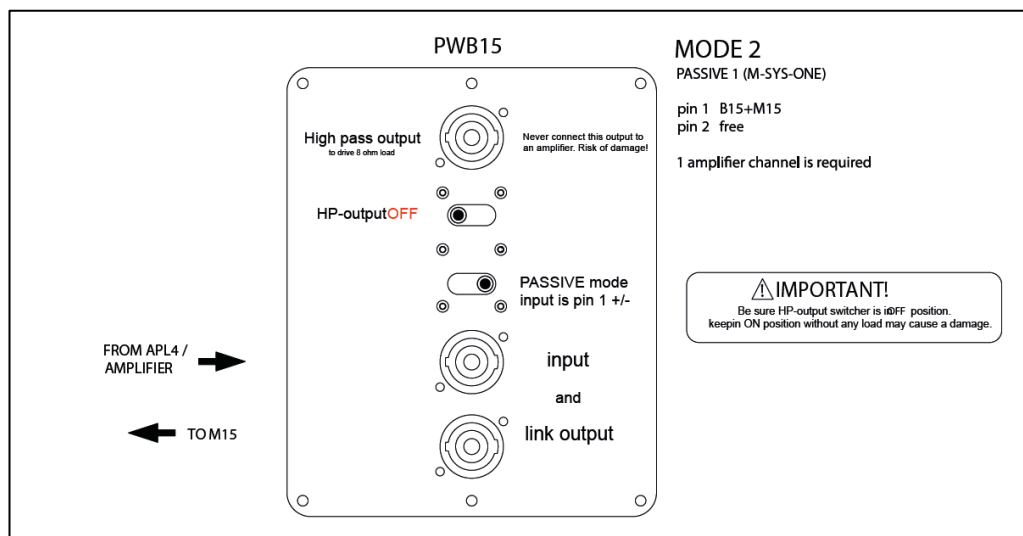
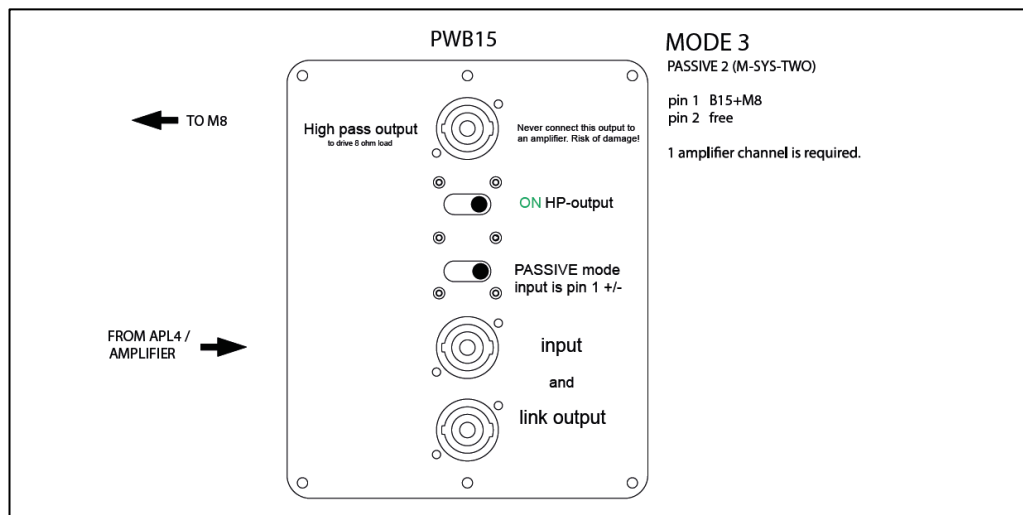
Low frequency preset response variants (M15 example)

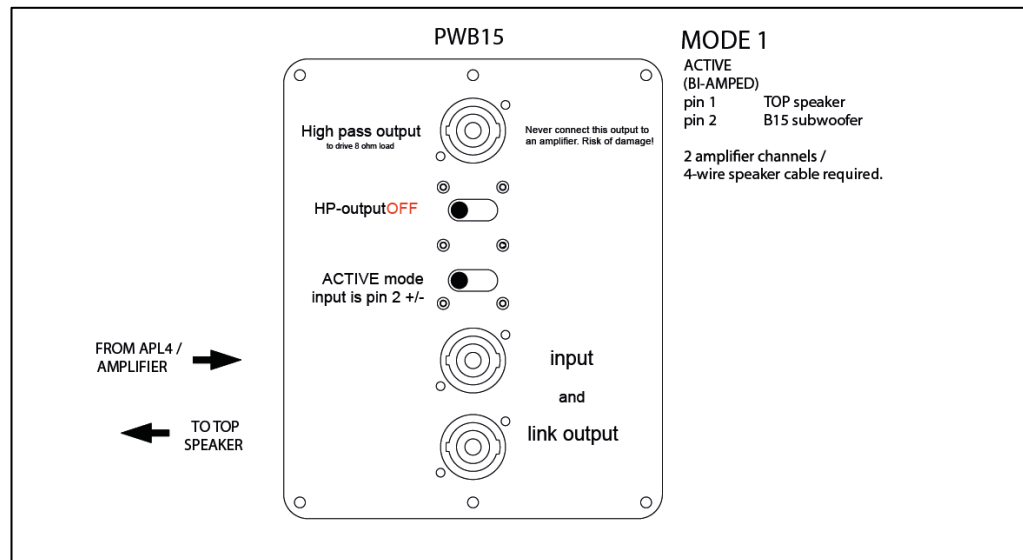
6.4. PWB10 operation modes





6.5. PWB15 operation modes





6.6. APL4-K wiring diagram

