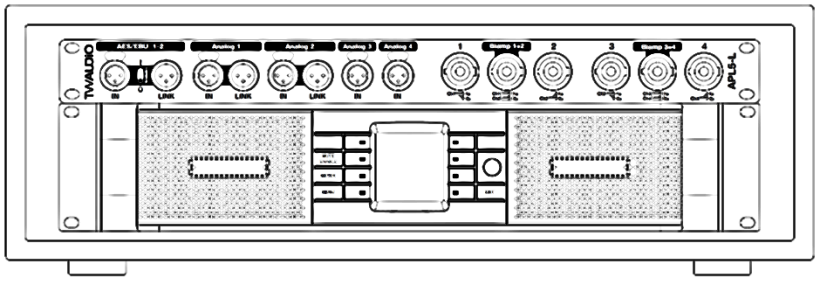
TWAUDIO®

A3.12 | Preset Guide Lab.Gruppen

P(LM) Series

PLM+ Series



General information

TW AUDiO Lab.Gruppen P(LM) / PLM+ Series preset guide
Version 1.5 EN, 17/11/2021, TG

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1. Introduction

1.1. TW AUDiO loudspeakers connection

On TW AUDiO loudspeakers' connectors (speakon chassis/terminals) signal on:

PIN1± is for all passive loudspeakers, and MHF/ HF signal for biamp / active products

PIN2± is for LF (low frequency) signal for all biamp / active loudspeakers

	BS15 PASSIVE	BS15 A	BS18	BS30	BSX
PIN1±	FULL RANGE				LF
PIN2±		LF	LF	LF	LF

	C5	C12 PASSIVE	C12 BIAMP	C15 PASSIVE	C15 BIAMP
PIN1±	FULL RANGE	FULL RANGE	HF	FULL RANGE	HF
PIN2±			LF		LF

	M6	M8	M10	M12	M15
PIN1±	FULL RANGE	FULL RANGE	FULL RANGE	FULL RANGE	FULL RANGE
PIN2±					

	T24N-PASSIVE	T24N-BIAMP	T20
PIN1±	FULL RANGE	HF	FULL RANGE
PIN2±		LF	

	VERA10 PASSIVE	VERA10 BIAMP	VERA L24	VERA36	VERA S33
PIN1±	FULL RANGE	HF		MHF	15 rear
PIN2±		LF	LF	LF	18 front

1.2. biamp / active / passive

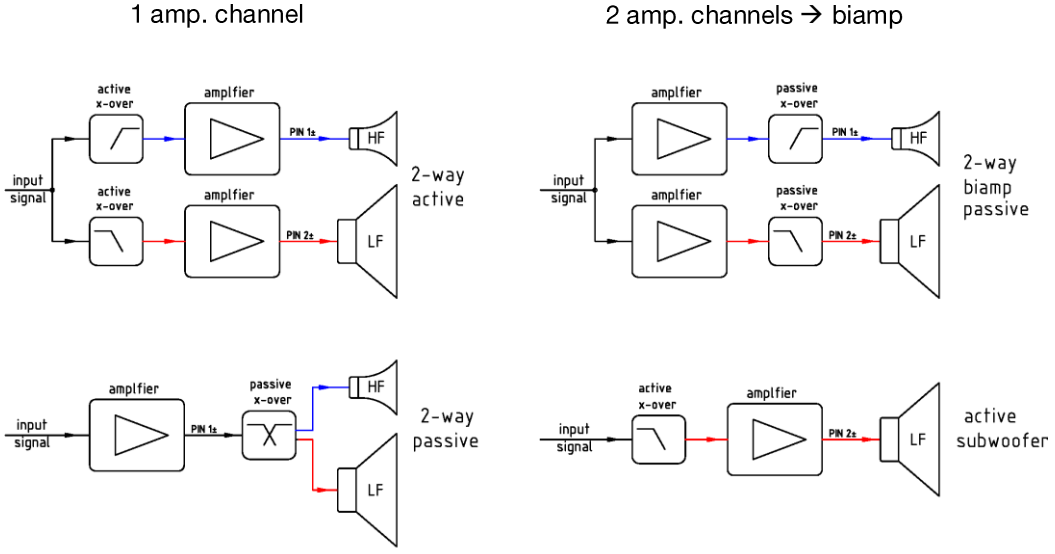


Fig. 1 TW AUDiO biamp / active / passive

1.3. Lab.gruppen PLM and PLM+ Output patch

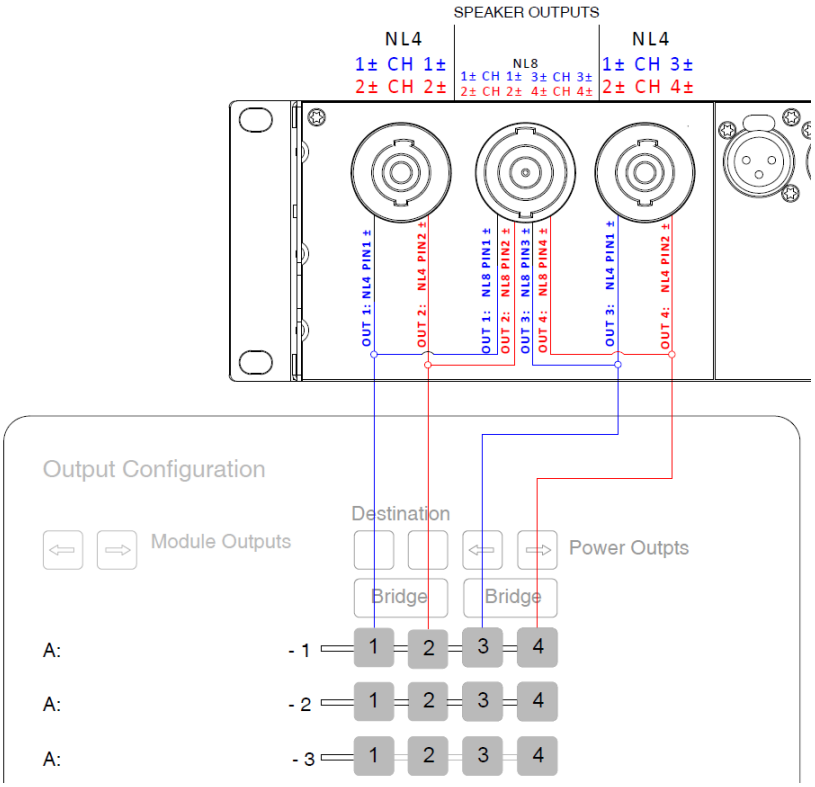


Fig. 2 Lab.Gruppen output patch and rear connectors of the PLM/PLM+ amplifier

1.4. APL4-L internal wiring

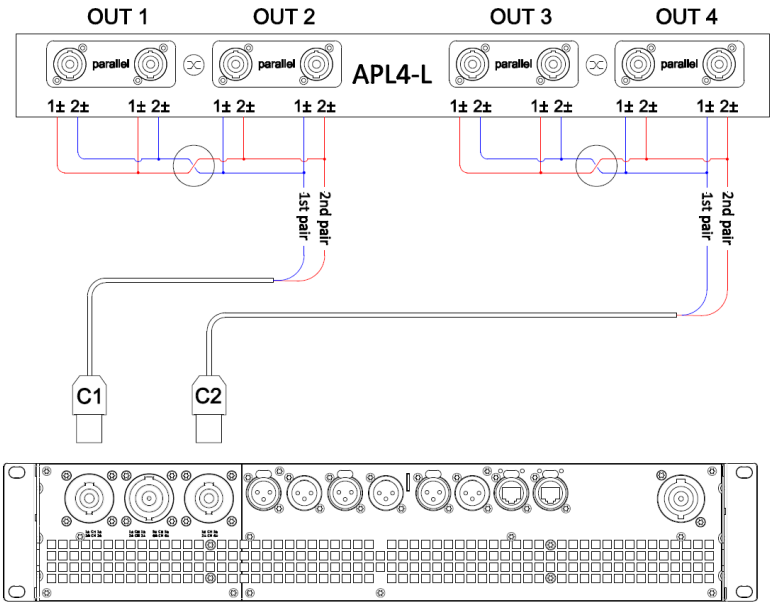


Fig. 3 APL4-L internal wiring

1.5. APL5-L internal wiring

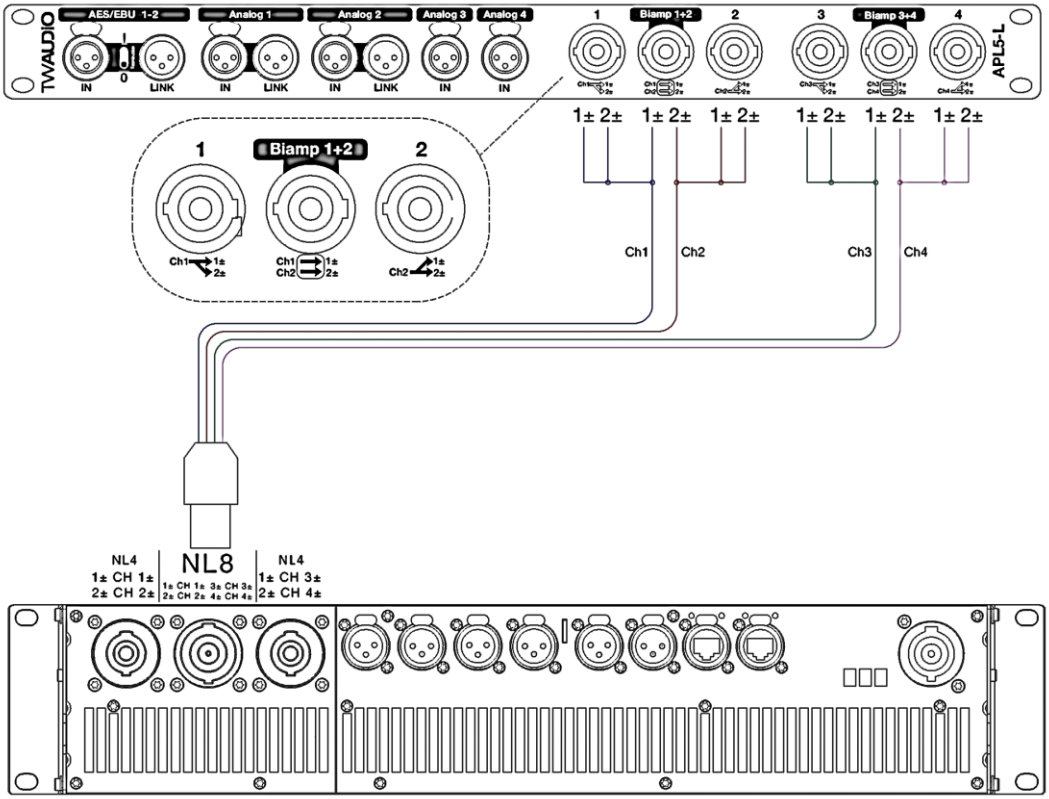


Fig. 4 APL5-L internal wiring

2. Modules presets

2.1. Presets structure

The Lake Contour preset consists of 4 files:

File extension	Description
*.csm	Preset data
*.mdl	Fingerprints for load verification (not used yet)
*.txt	Text file with information (displayed when recalling the modules)
*.bmp	Icon graphic displayed when recalling the modules

Channels which are not in use are not locked or hidden. For better system overview TW AUDiO recommends to hide channels which are not in use:

1. Enter the designer mode
   Home -> User Preferences -> Designer Functions -> Designer Mode

2. Go to the “Level-Design Page”
   Home-> Modules -> Select the module -> I/O Config Worksheet -> Levels Design

3. Type “unused” in the cell “Channel Label”.
   In the module presets output is muted
   In the frame preset:
   Output of the module is unmuted
   The amplifier channels are muted

After loading a module, check the output patch in the Output Configuration:

Home -> Modules -> Select the module -> I/O Config Worksheet -> magnifying lens

Please check the module preset table for correct patching.

2.2. Modules structure for PLM and LM Series – IMPORTANT!

PLM Series amplifiers (**PLM10000Q, PLM 14000, PLM20000Q**) along with LM processors (**LM44 and LM26**) support **two** Contour Modules.

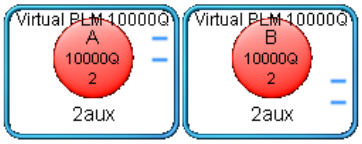


Fig. 5 PLM Series default modules overview

TW AUDiO module presets for PLM and LM Series are **3-aux** module type, where:

Module channel **1**: LF or sub must be routed to Output 2 or 4 → PIN2±
Module channel **2**: HF or passive loudspeaker must be routed to Output 1 or 3 → PIN1±
Module channel **3**: AUX channel for custom settings

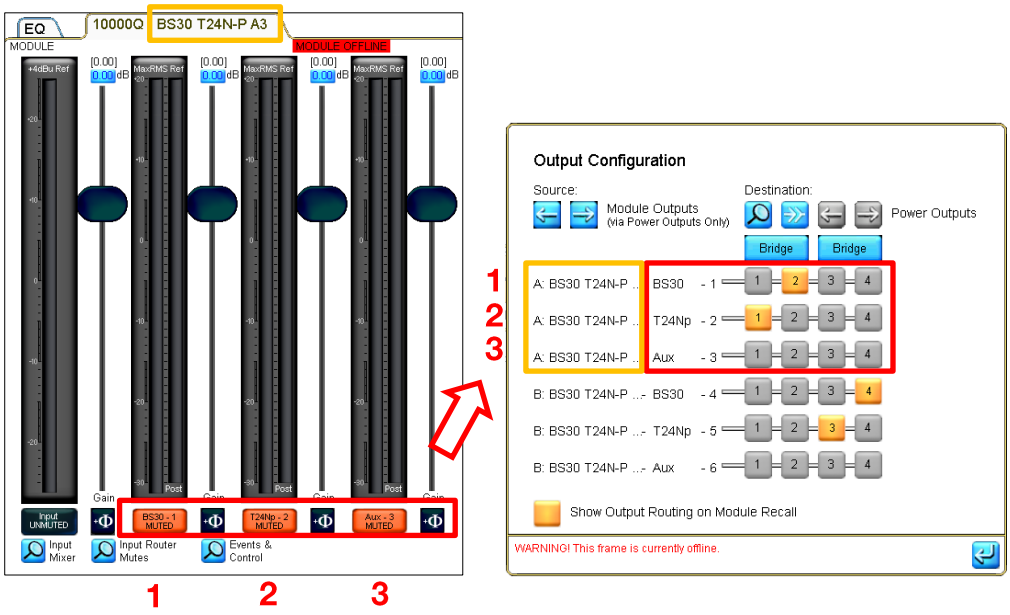


Fig. 6 TW AUDiO PLM and LM preset module and output routing (left: module, right: corresponding output patch)

All available TW AUDiO modules are listed in PDF files which are included into .zip library on www.twaudio.de as well as on LoadLibrary installed with Lake Controller.

2.3. Modules structure for PLM+ Series – IMPORTANT!

PLM+ amplifiers (**PLM12k44 and PLM20k44**) support **four** Contour Modules.

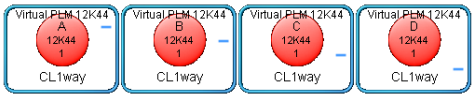


Fig. 7 PLM+ Series default modules overview

For PLM+ Series TW AUDiO provides two types of modules presets:

1. Module with 1 output (1-aux) for one-amplifier-channel-driven loudspeakers

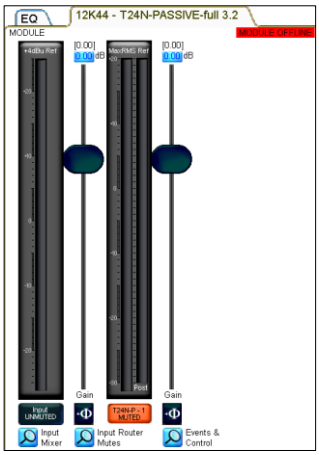


Fig. 8 TW AUDiO PLM+ 1-way module

2. Module with 2 outputs (2-aux) for two-amplifier-channels-driven loudspeakers → biamp

Module channel **1**: HF or passive loudspeaker must be routed to Output 1 or 3 → PIN1±
Module channel **2**: LF or sub must be routed to Output 2 or 4 → PIN2±

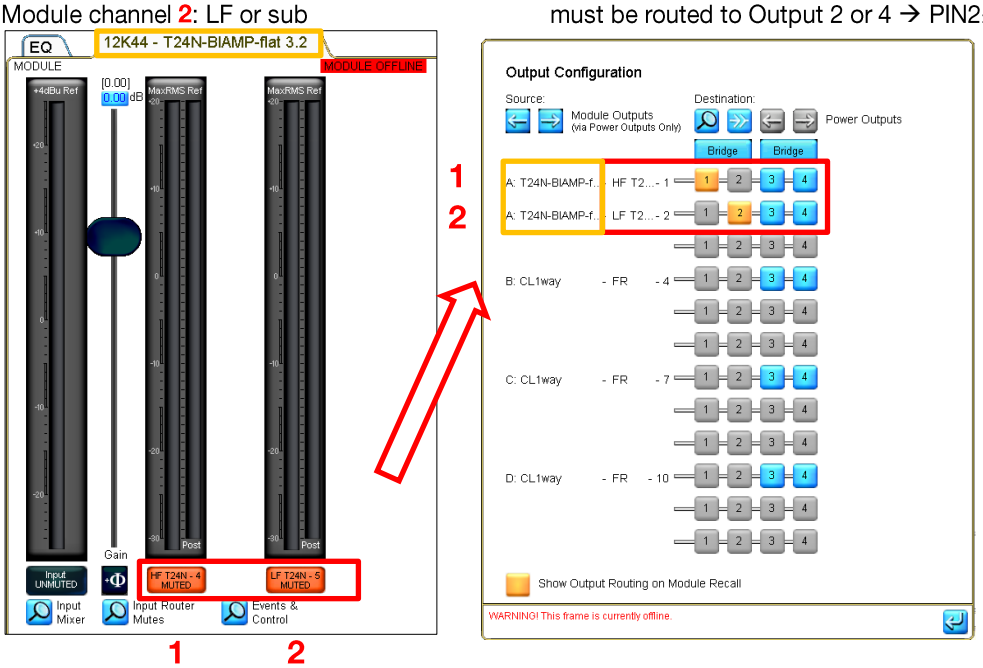


Fig. 9 TW AUDiO PLM+ module for biamp loudspeaker

BSX and VERA S33 are 2 outputs module presets.

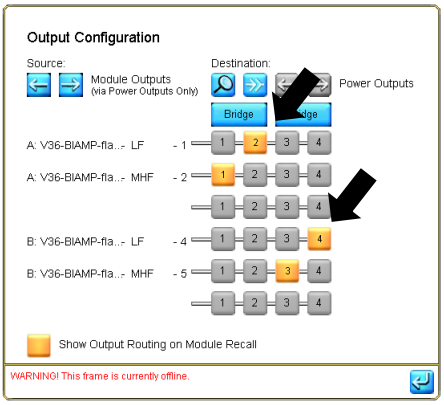
2.4. Differences between PLM and PLM+ modules

2.4.1. biamp / active products

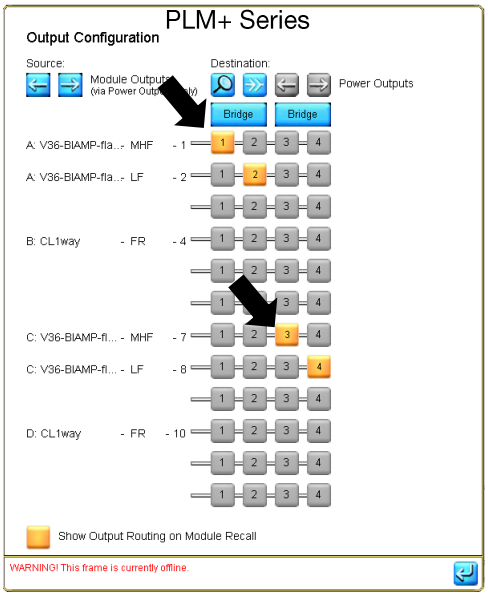
MODULE	PLM Series	PLM+ Series
OUTPUT 1	LF - low frequency channel	HF - high frequency channel
OUTPUT 2	HF - high frequency channel	LF - low frequency channel
OUTPUT 3	aux	N.A.

In order to use the same output on APL4-L, or connect system/loudspeaker directly to NL4 connector at the rear side of the amplifier output patching for PLM and PLM+ must be different.

PLM Series



PLM+ Series



2.4.2. Combination of passive top loudspeaker and active subwoofer

PLM Series
one module drives two loudspeakers (sub, top).

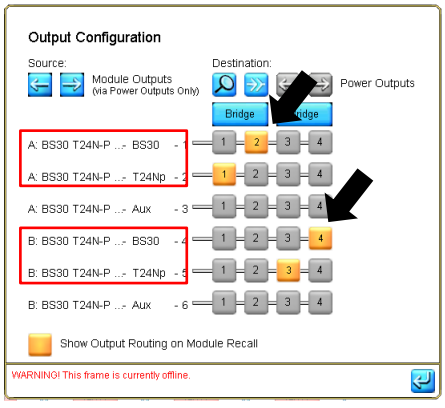


Fig. 10 PLM Two modules each with two outputs in use
(PA-SYS-ONE)

PLM+ Series
independent module drives each of loudspeakers (sub, top)

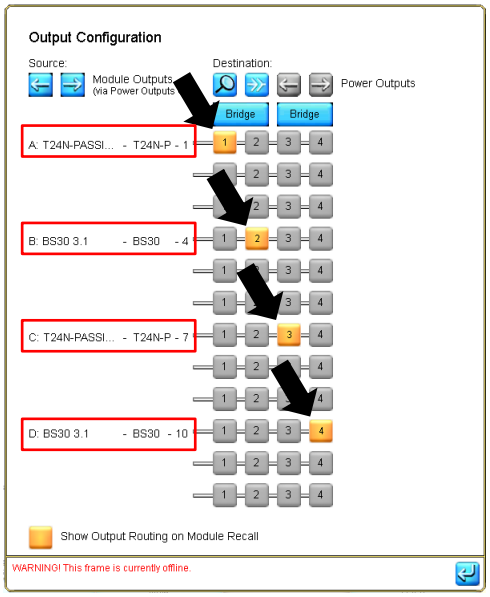


Fig. 11 PLM+ Four modules each with one output (PA-SYS-ONE)

2.5. TW AUDiO modules list for PLM+ (12k44, 20k44)

For a list of all module preset refer to pdf file: TW AUDiO modules for PLM+ file which is included into .zip library on www.twaudio.de as well as on LoadLibrary installed with Lake Controller.

2.6. TW AUDiO modules list for PLM (PLM10000Q, 20000Q)

For a list of all module preset refer to pdf file: TW AUDiO modules for PLM and LM file which is included into .zip library on www.twaudio.de as well as on LoadLibrary installed with Lake Controller.

3. Frame preset design guide

3.1. Common settings

AES not terminated

All Inputs Floating

Dante Disabled

Input Configuration: Factory default (Dante[1-4], Dante[5-8], AES[1LR,2LR], Analog[1-4]) @ all channels

RPM AUTO (PLM+ only)

3.2. General rules

Do not rename modules.

Prevent accidental stereo routing within one array (V36 Presets always from IN1).

All modules' input and output unmuted (also unused modules).

All amplifier's output channels muted.

HF / Top (in a System) is always routed to Amp channel 1 or 3.

LF / Sub (in a System) is always routed to Amp channel 2 or 4.

Aux channels umuted but Gain: -99 dB.

3.3. Typical Frame Configurations

Typical TW AUDiO frame configuration:

2x Biamp loudspeaker

2x Biamp system

4x Tops

4x Subs

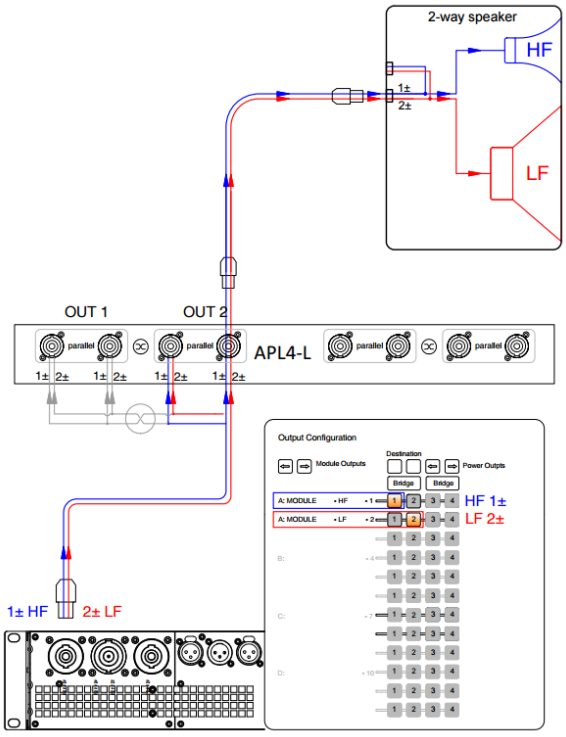
All examples are explained on next pages.

3.4. APL4-L Frame configurations

3.4.1. (APL4L) Frame settings – 2x biamp loudspeaker

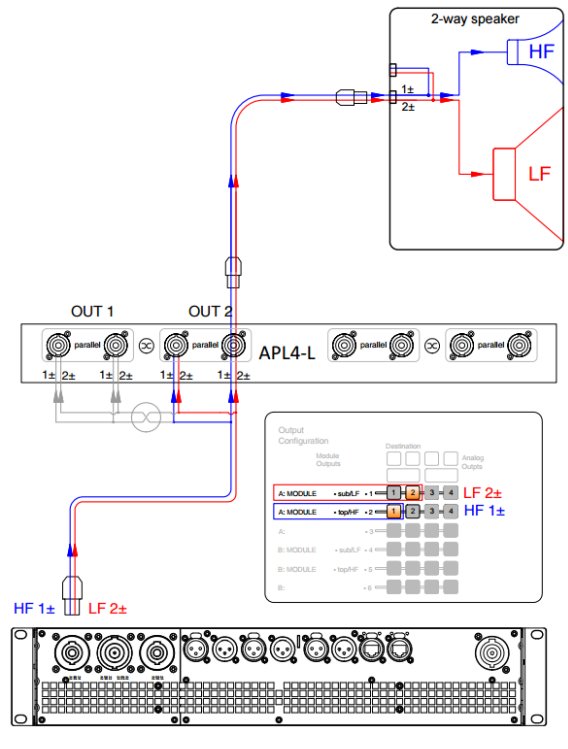
2x BIAMP LOUDSPEAKER

PLM 12k44, PLM 20kQ		
Module A	BIAMP	e.g.V36-BIAMP-full 3.8+
	Input	0 dB
	Out 1	HF
	Out 2	LF
	APL4:	OUT 2
Module B	empty	_____
	Input	-99 dB not muted
	Output	not patched
	-	-
	-	-
Module C	BIAMP	e.g. V36-BIAMP-full 3.8+
	Input	0 dB
	Out 3	HF
	Out 4	LF
	APL4	OUT 4
Module D	empty	_____
	Input	-99 dB not muted
	Output	not patched



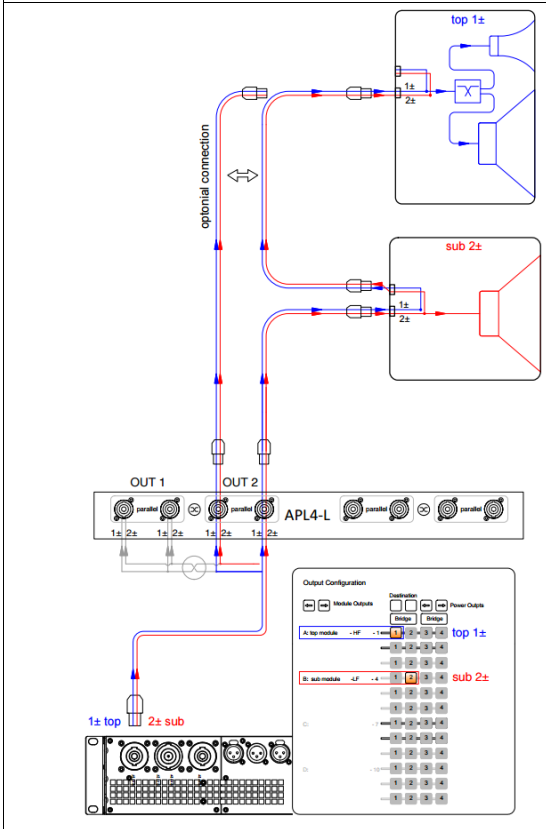
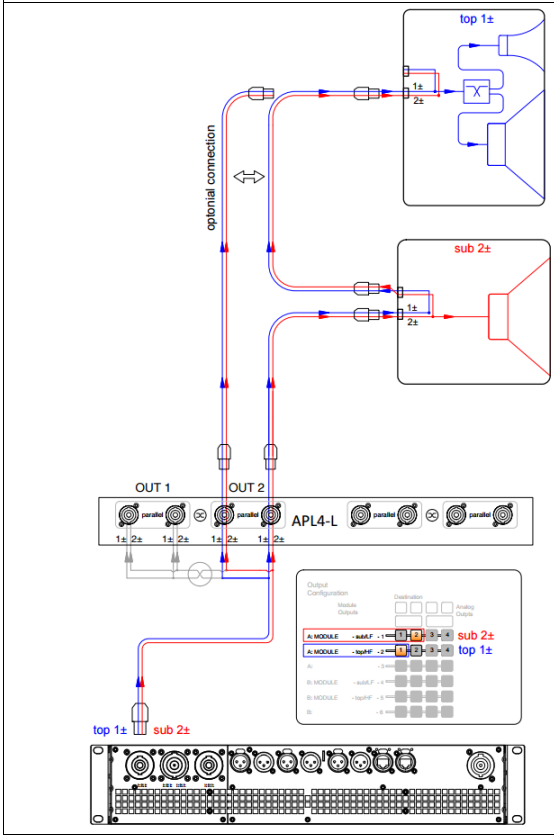
half the setup shown.

PLM 10000Q, PLM 20000Q		
Module A	BIAMP	V36-BIAMP-full 3.8+
	Input 1	0 dB
	Out 1	HF
	Out 2	LF
	APL4	OUT 2
Module B	BIAMP	V36-BIAMP-full 3.8+
	Input 2	0 dB
	Out 3	HF
	Out 4	LF
	APL4	OUT 4
Module C	NOT AVAILABLE on PLM	
Module D	NOT AVAILABLE on PLM	



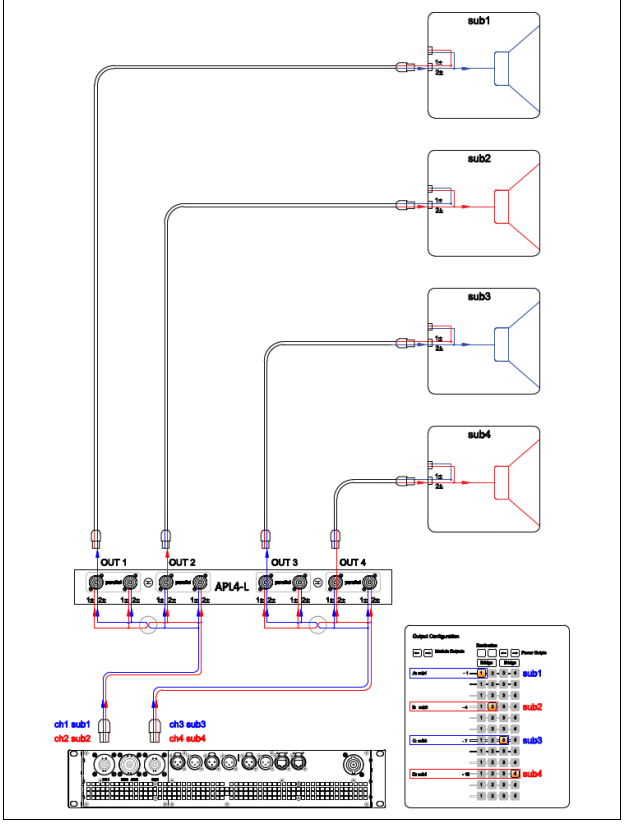
half the setup shown.

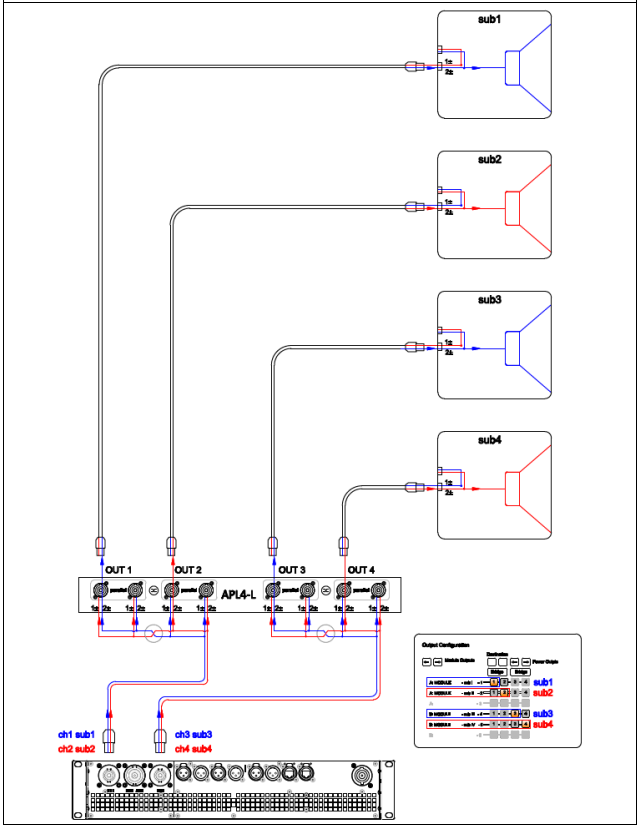
3.4.2. (APL4L) Frame settings – 2x biamp system

2x BIAMP SYSTEM					
PLM 12k44, PLM 20kQ			**PLM 10000Q, PLM 20000Q**		
Module A	TOP	eg. M10cut 3.8+	**Module A**	SUB+TOP	e.g. BS30 M10cut 3.8
	Input 1	0 dB		Input 1	0 dB
	Out 1	M10		Out 1	M10 (TOP)
	-	-		Out 2	B30 (SUB)
	APL4	OUT 2		APL4	OUT 2
Module B	SUB	eg.BS30 3.8+	**Module B**	SUB+TOP	e.g. BS30 M10cut 3.8
	Input 1	0 dB		Input 2	0 dB
	Out 2	B30		Out 3	M10 (TOP)
	-	-		Out 4	B30 (SUB)
	APL4	OUT 2		APL4	OUT 4
Module C	TOP	eg. M10cut 3.8+	**Module C**	NOT AVAILABLE on PLM	
	Input 2	0 dB			
	Out 3	M10			
	APL4	OUT 4			
Module D	SUB	eg.BS30 3.8+	**Module D**	NOT AVAILABLE on PLM	
	Input 1	0 dB			
	Out 4	B30			
	APL4	OUT 4			
					
half the setup shown			half the setup shown		

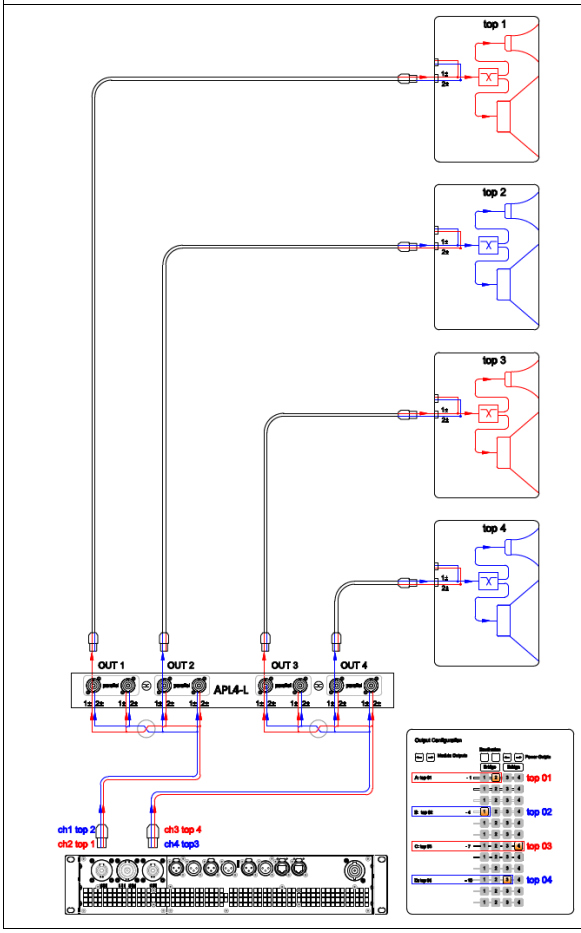
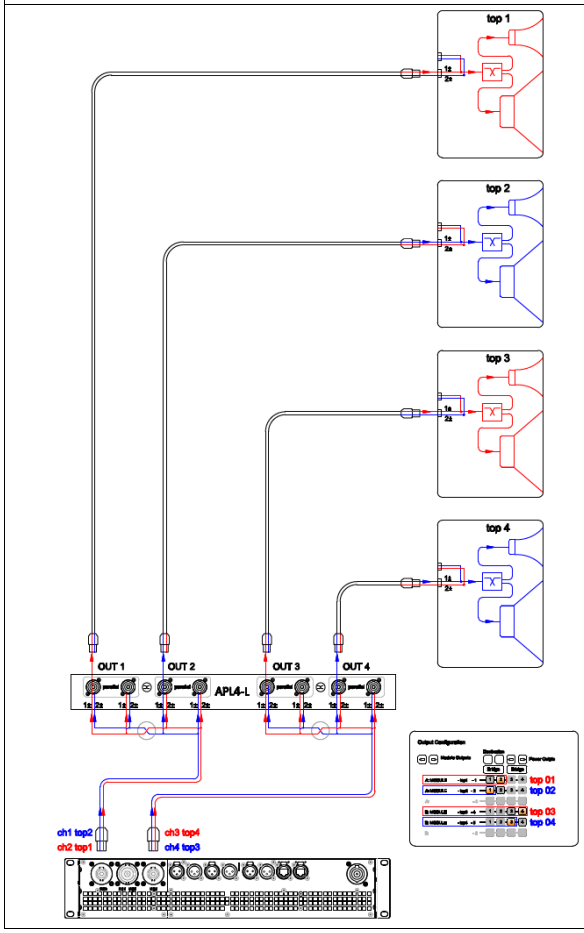
3.4.3. (APL4L) Frame settings – 4x Subs

4x SUBS					
PLM 12k44, PLM 20kQ			**PLM 10000Q, PLM 20000Q**		
Module A	SUB	e.g. BS30 3.8+	**Module A**	SUB	e.g. BS30 3.8
	Input 1	0 dB		Input 1	0 dB
	Out 1	B30		Out 1	BS30 (APL4: OUT 1)
	APL4	OUT 1		Out 2	BS30 (APL4: OUT 2)
Module B	SUB	e.g. BS30 3.8+	**Module B**	SUB	e.g. BS30 3.8
	Input 2	0 dB		Input 2	0 dB
	Out 2	B30		Out 3	BS30 (APL4: OUT 3)
	APL4	OUT 2		Out 4	BS30 (APL4: OUT 4)
Module C	SUB	e.g. BS30 3.8+	**Module C**	NOT AVAILABLE on PLM	
	Input 3	0 dB			
	Out 3	B30			
	APL4	OUT 3			
Module D	SUB	e.g. BS30 3.8+	**Module D**	NOT AVAILABLE on PLM	
	Input 4	0 dB			
	Out 4	B30			
	APL4	OUT 4			





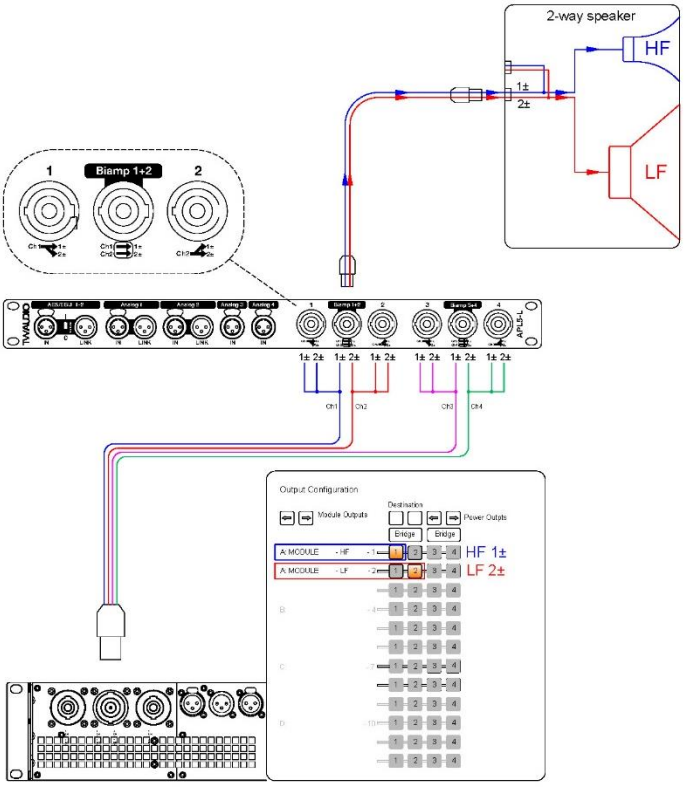
3.4.4. (APL4L) Frame settings – 4x Tops

4x TOPS					
PLM 12k44, PLM 20kQ			**PLM 10000Q, PLM 20000Q**		
Module A	TOP	eg. M10cut 3.8+	**Module A**	TOP+TOP	e.g. M8cut M10cut 3.8
	Input 1	0 dB		Input 1	0 dB
	Out 2	M10		Out 1	M8 (APL4: OUT 2)
	APL4	OUT 1		Out 2	M10 (APL4: OUT 1)
Module B	TOP	eg. M10cut 3.8+	**Module B**	TOP+TOP	e.g. M8cut M10cut 3.8
	Input 2	0 dB		Input 2	0 dB
	Out 1	M10		Out 3	M8 (APL4: OUT 4)
	APL4	OUT 2		Out 4	M10 (APL4: OUT 3)
Module C	TOP	eg. M10cut 3.8+	**Module C**	NOT AVAILABLE on PLM	
	Input 3	0 dB			
	Out 4	M10			
	APL4	OUT 3			
Module D	TOP	eg. M10cut 3.8+	**Module D**	NOT AVAILABLE on PLM	
	Input 4	0 dB			
	Out 3	M10			
	APL4	OUT 4			
					

3.5. APL5-L Frame Configuration

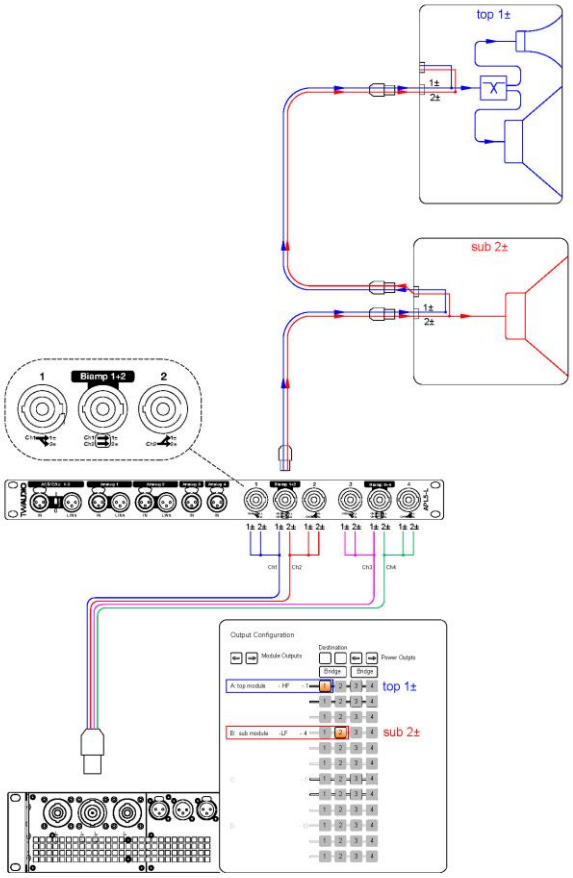
3.5.1. (APL5-L) Frame settings - 2x biamp loudspeaker

PLM 12k44, PLM 20kQ		
Module A	BIAMP	e.g.V36-BIAMP-full 3.8+
	Input	0 dB
	Out 1	HF
	Out 2	LF
	APL4:	OUT 2
Module B	empty	_____
	Input	-99 dB not muted
	Output	not patched
	-	-
	-	-
Module C	BIAMP	e.g. V36-BIAMP-full 3.8+
	Input	0 dB
	Out 3	HF
	Out 4	LF
	APL4	OUT 4
Module D	empty	_____
	Input	-99 dB not muted
	Output	not patched



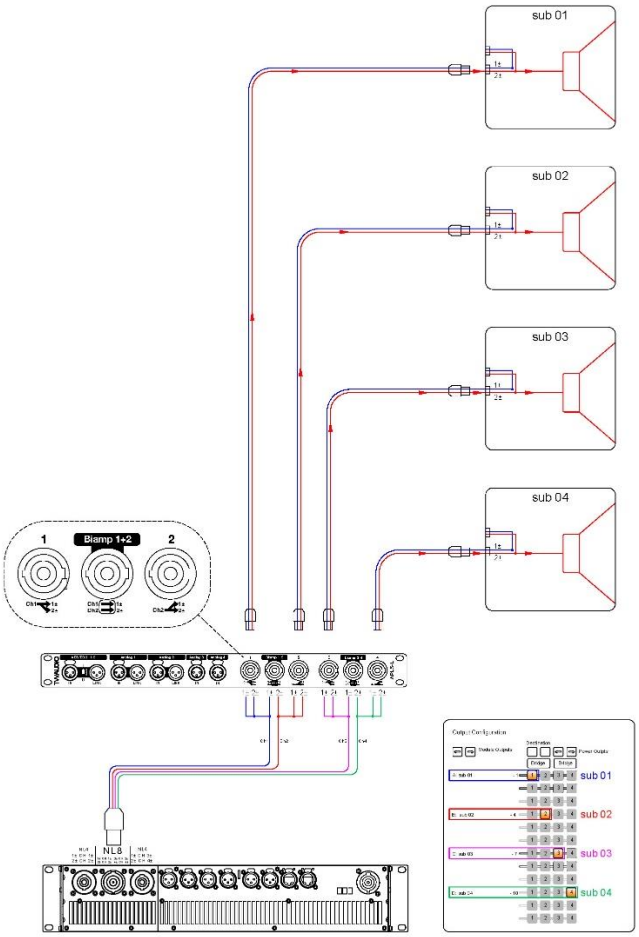
3.5.2. (APL5-L) Frame settings - 2x biamp system

PLM 12k44, PLM 20kQ		
Module A	TOP	eg. M10cut 3.8+
	Input 1	0 dB
	Out 1	M10
	-	-
	APL4	OUT 2
Module B	SUB	eg.BS30 3.8+
	Input 1	0 dB
	Out 2	B30
	-	-
	APL4	OUT 2
Module C	TOP	eg. M10cut 3.8+
	Input 2	0 dB
	Out 3	M10
	APL4	OUT 4
Module D	SUB	eg.BS30 3.8+
	Input 1	0 dB
	Out 4	B30
	APL4	OUT 4



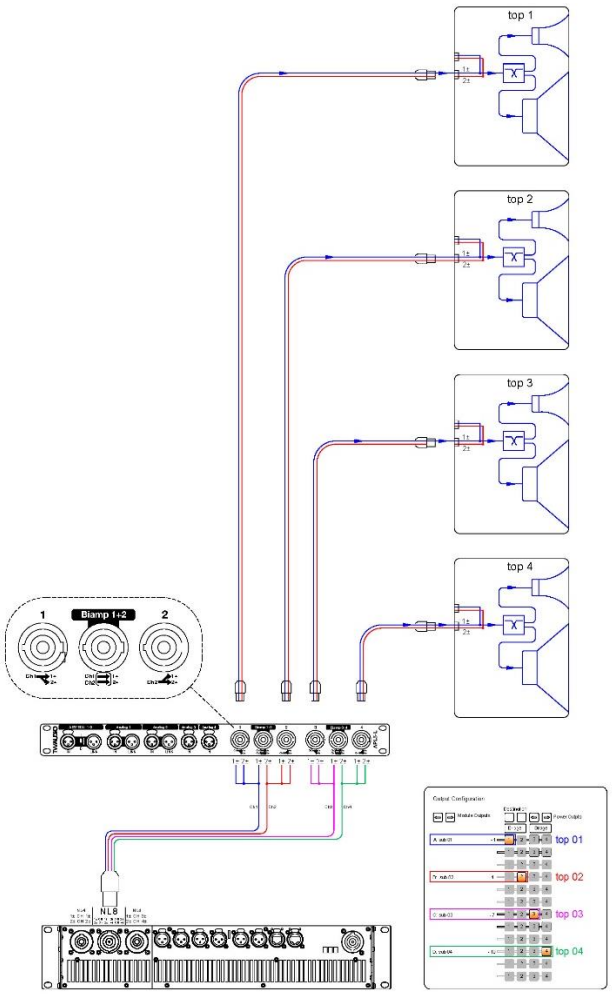
3.5.3. (APL5-L) Frame settings - 4x Subs

PLM 12k44, PLM 20kQ		
Module A	SUB	e.g. BS30 3.8+
	Input 1	0 dB
	Out 1	B30
	APL4	OUT 1
Module B	SUB	e.g. BS30 3.8+
	Input 2	0 dB
	Out 2	B30
	APL4	OUT 2
Module C	SUB	e.g. BS30 3.8+
	Input 3	0 dB
	Out 3	B30
	APL4	OUT 3
Module D	SUB	e.g. BS30 3.8+
	Input 4	0 dB
	Out 4	B30
	APL4	OUT 4



3.5.4. (APL5-L) Frame settings – 4x Tops

PLM 12k44, PLM 20kQ		
Module A	TOP	eg. M10cut 3.8+
	Input 1	0 dB
	Out 1	M10
	APL4	OUT 1
Module B	TOP	eg. M10cut 3.8+
	Input 2	0 dB
	Out 2	M10
	APL4	OUT 2
Module C	TOP	eg. M10cut 3.8+
	Input 3	0 dB
	Out 3	M10
	APL4	OUT 3
Module D	TOP	eg. M10cut 3.8+
	Input 4	0 dB
	Out 4	M10
	APL4	OUT 4



3.6. Creating and storing User Frame (amplifier) preset



In order to create and store User Frame preset -- amplifier must be connected to the Lake Controller Software.

1. Recall and configure modules.

   Modules → Modules Store Recall → (find module file on your PC) → Recall → Output Configuration (create output patch)

2. Unmute modules' inputs and outputs.

   Home → (click on module) Tab "Levels" → unmute all by clicking on every red button

3. Set Input routing, delay, gain, EQ for a module.

   Home → (click on module) Tab "Levels" → switch between Gain and Delay on the bottom and for equalization use tab "EQ"

4. Configure Frame (Clock, Input priority, DANTE, AES Termination, Output Router, Breaker Emulation).

   Home → Modules → (select any modules) I/O Config

5. Make sure amplifier outputs are muted.

   Home → Tab 'ALL' (top left side) → Global Events & Control (bottom right) → Control → All Muted

6. Store Frame preset on preset slot.

   Home → Tab "Main" → Modules → (select any module from the amplifier) Module Store Recall → Frame Presets → (select preset slot) Store with New Name

4. System optimization

4.1. 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 system like Smaart, SysTune etc.

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.

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

c.) if d2 < d1, delay = (d1-d2) x 2,9 [ms],

In 2,9 ms sound travels the distance of 1m.

Speed of sound = 344 m/s (in temperature 20°C)

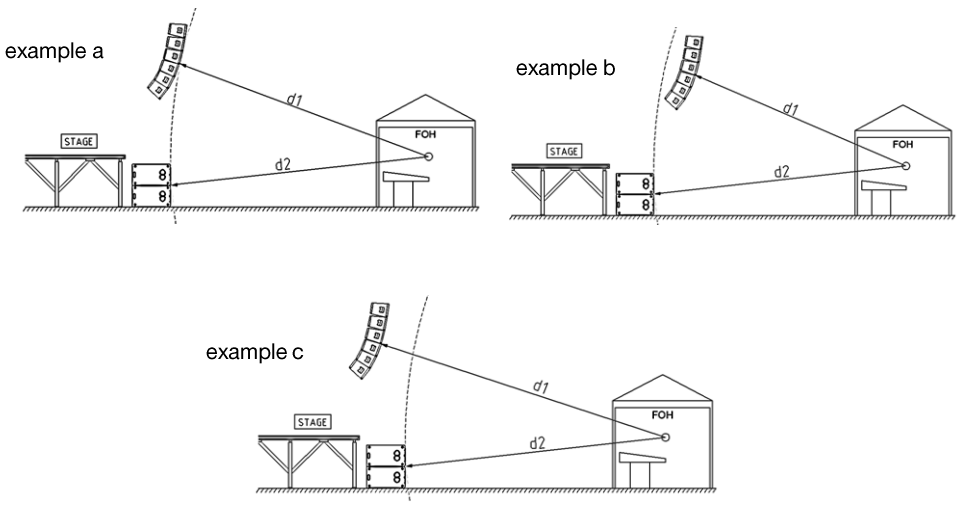


Fig. 12 Time alignment procedure

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.

4.1.3. Time alignment to VERA S33

VERA S33 can operate in cardioid as well as end fired mode. Different delays strategies are applied to the presets. When physical distance measured between VERA S33 and top loudspeaker is the same, please note the following:

- cardioid preset – no additional delay is required,
- end fire preset is 2,5 ms more delayed compared to cardioid, so second source being compared with S33 needs **2,5 ms** additional delay.

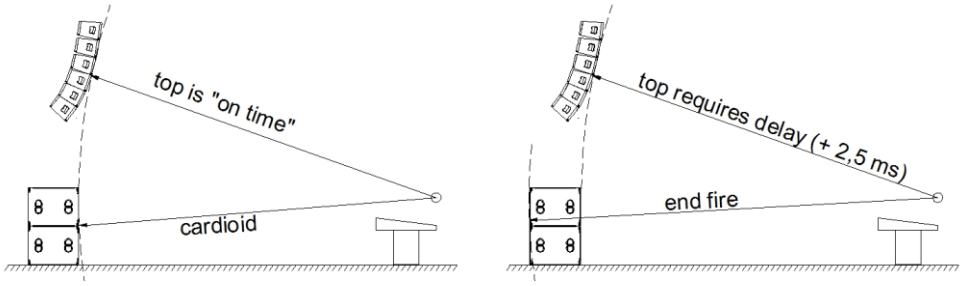


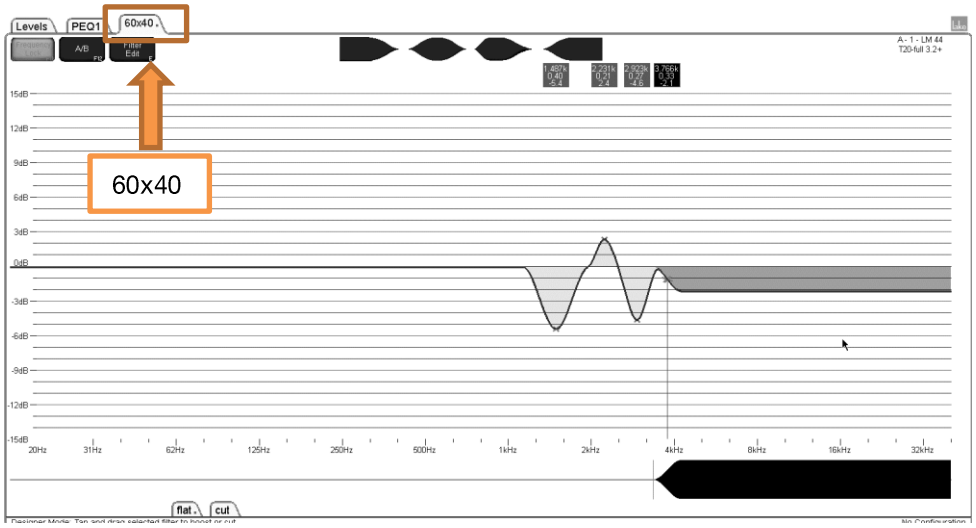
Fig. 13 Time alignment to VERA S33

4.2. Point-Source behaviors

4.2.1. T20 - horn compensation

T20 is equipped with a 90° x 50° horn as a standard option. It is possible to exchange the horn cone to get a more narrow dispersion. As a result the acoustical behaviour in the coverage zone will change. For further information please see section 4.4.5.

To compensate these effects there is an additional overlay EQ in the preset. To switch on the compensation EQ, go to the module EQ and activate the preconfigured “60x40” overlay. As default this overlay is bypassed.



4.3. End fire and cardioid arrays

4.3.1. End fire subwoofer arrays

In an end fire 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. This setup usually doesn't require any (acoustical) measurements.

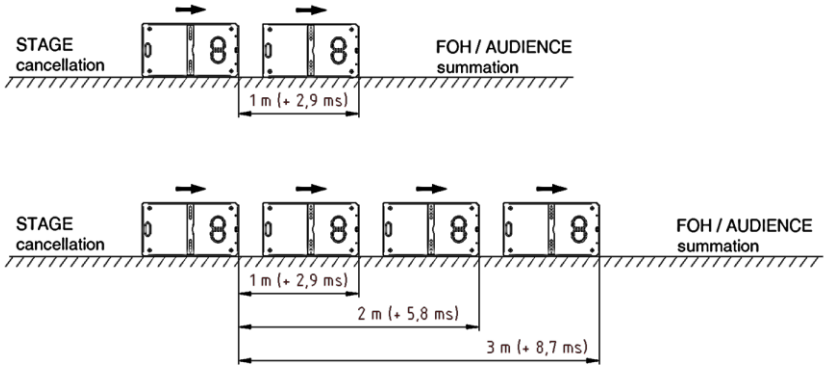


Fig. 14 end-fire array – basic delay strategy

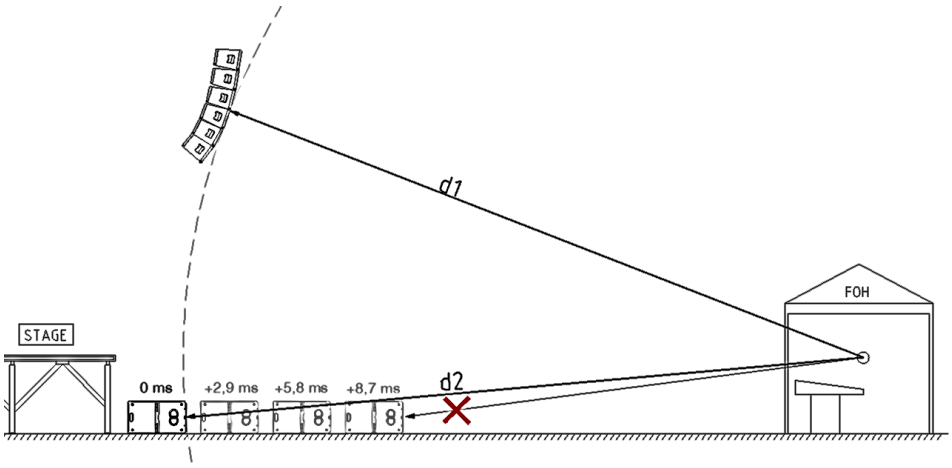


Fig. 15 Time alignment to end fire setup

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 1,2 m. In this case delay value should be recalculated (1,2 m x 2,9 ms) to 3,5 ms

4.3.2. Cardioid subwoofer arrays

Cardioid subwoofer – the cardioid setup is to achieve a maximum cancelation on wide frequency bandwidth at the rear side 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 side 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:

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

VS32/VS33 cardioid preset was optimized with conditions:

- two boxes one top on the other
- each subwoofer uses 15 inch driver facing back and 18 inch driver facing front
- cardioid subwoofer stack was placed directly on the reflecting surface (floor)

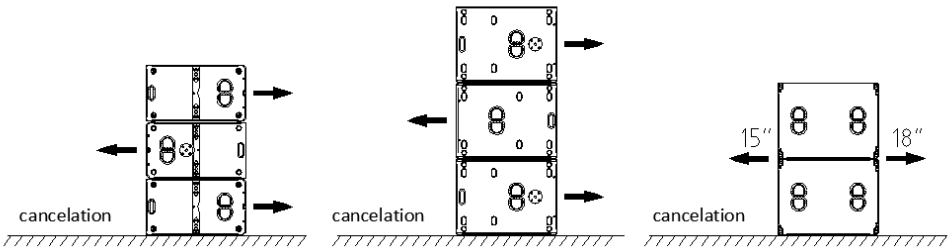


Fig. 16 CSA setup for BS30, BS18, VERA S33

BSX cardioid setup:

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

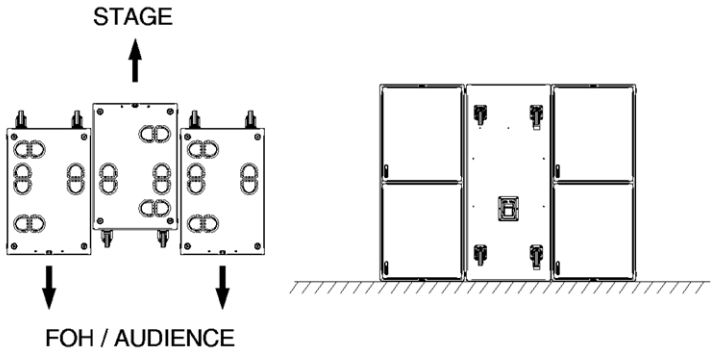


Fig. 17 CSA setup for BSX

In BSX cardioid subwoofer array two facing front subwoofers are driven by standard (full or infra) preset while only rear facing BSX must be driven by preset having in the name suffix “rear”.

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 end-fire choice would be more senseful or further measurements are required.

4.4. Vertical array correction

4.4.1. 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 kHz will gain up because of summation / coupling effect. Fig. 18 shows different frequency response for different arrays size. As might note coupling effect causes unbalanced frequency response between low-mid and high frequency energy.

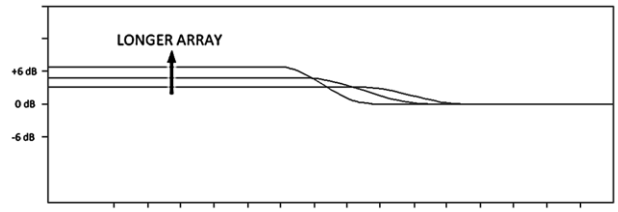


Fig. 18 Coupling effect – the longer the array the more low-mid energy below 1 kHz

There are two methods to compensate this effect, one using low-shelving cut filter (Fig. 19) 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 (Fig. 19). These two methods are exchangeable and equal in results.

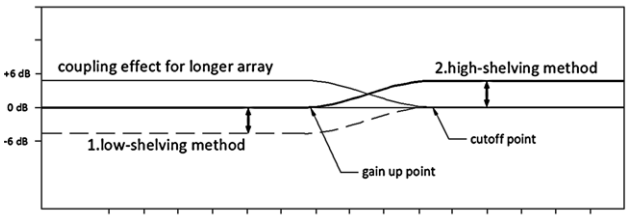


Fig. 19 Coupling effect correction method

Typically coupling filter has center frequency set to 1 kHz, 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. 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 (Fig. 18). 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 range between subwoofers and array is maintained.

As already described coupling effect impacts to frequencies below 1 kHz (Fig. 18). In order to achieve balance frequency response should be corrected, mid-high energy in array has to be boosted (Fig. 19)

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.

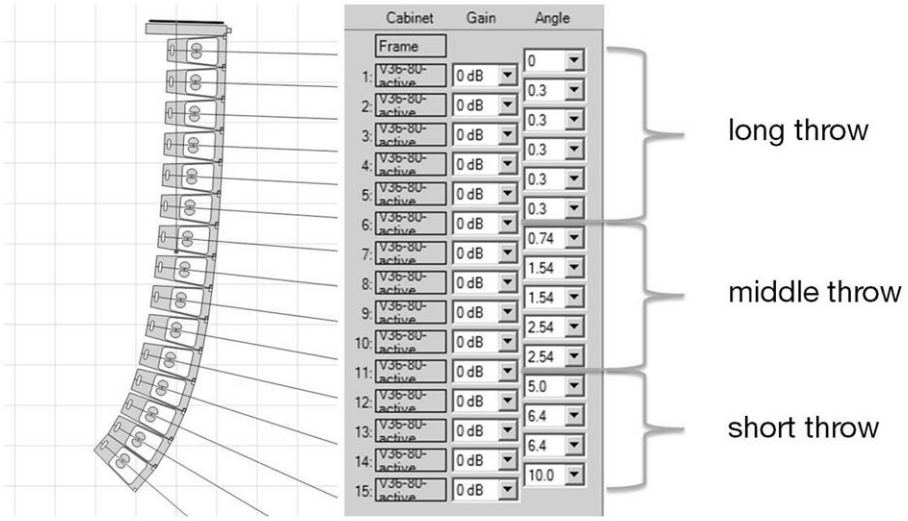


Fig. 20 How to split an array into zones

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

Because of HF attenuation of air at distances larger than 40 m, 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.

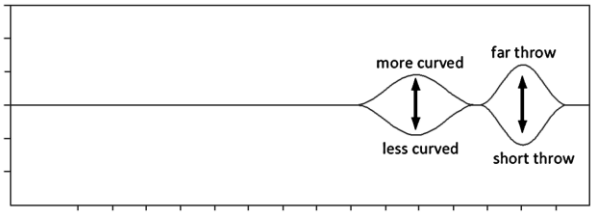


Fig. 21 EQ for zones

For easy tuning and controlling bigger systems there is the possibility to individually group amplifier's channels in Lake software. Using Lake's groups there can be set gains, delays and EQs to all assigned amp channels at once. Amplifier's 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.

Fig. 22 shows system example that can be set in Lake 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 module controlling upper boxes in array.

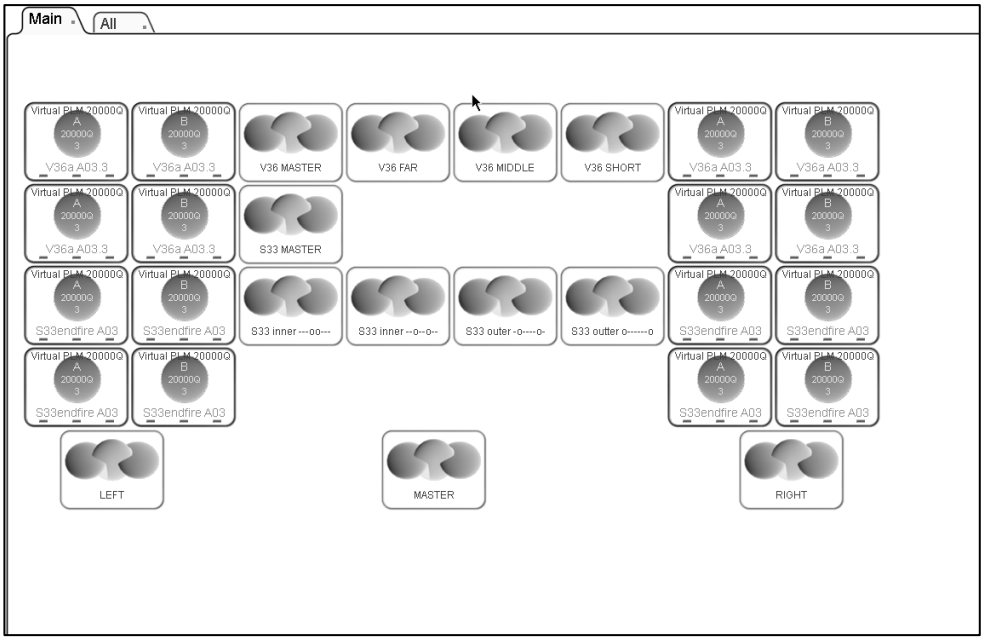


Fig. 22 Example of Lake's group configuration

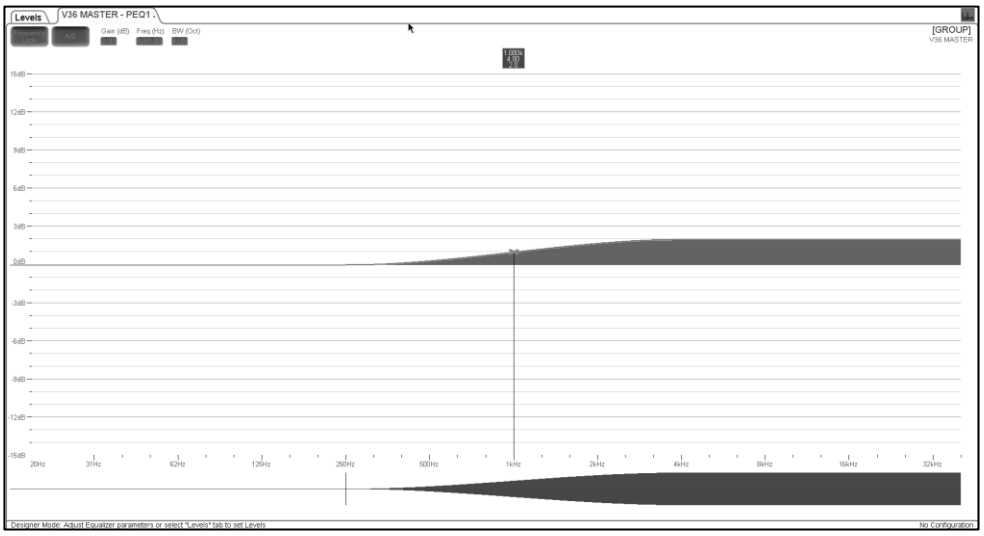


Fig. 23 array size correction filter in Lake, f= 1kHz, slope = 4 octave, gain depends on array size

4.4.2. 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 4.4.1 high-shelving method is applied as preconfigured overlay "array size correction" and stored within the module.

For array size correction go to the module, then to "array size correction" EQ overlay and proceed:

- for array shorter than 6 modules – decrease (🡻) filter's gain
- for array longer than 6 modules – commonly standard preset is used. When coupling effect significantly changes frequency response increase (🡹) filter's gain

Filter gain adjustments depend on array size and application.

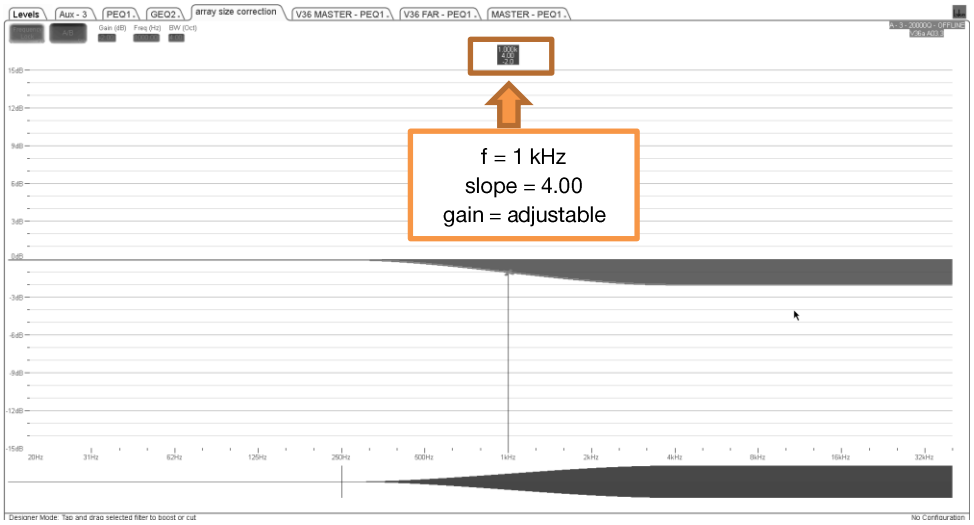


Fig. 24 array size correction by preconfigured module EQ overlay

Array size correction may also be applied using Lake's Groups, what was described in section 4.4.1

4.4.3. 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.

For array size correction go to the module, next "array size correction" EQ overlay and proceed:

- for array longer than 2 modules, mid-high frequencies should be boosted: increase (🡹) filter's gain.

Filter gain adjustments depend on array size and application.

Array size correction may also be applied using Lake's Groups, as described in section 4.4.1.

4.4.4. VERA20/VERA36 – array size correction

For array size correction go to the module, then to “array size correction” EQ overlay and proceed:

- for short array – decrease (🡻) filter’s gain
- for long array – commonly standard preset is used. When coupling effect significantly changes frequency response increase (🡹) filter’s gain



In order to apply “array size correction” EQ to entire arrays at once – overlay from the module can be copied into the group controlling many modules.

1. Go to the “array size correction” inside the module.
2. Select Overlay Functions
3. “Overlay copy”
4. Exit the module
5. Go to the created before group and assigned to all modules driving VERA
6. Select Overlay Functions
7. “Overlay new”
8. “Overlay paste over”
9. Adjust the gain up to application requirements.

4.4.5. VERA - 120 degrees horn preset adjustment

The wider the horn the less MHF energy is produced on axis for the same input signal. Fig. 25 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, according to Fig. 25.

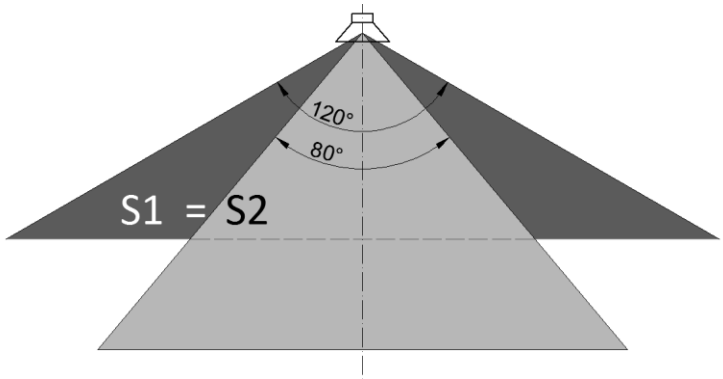


Fig. 25 Horizontal patterns for 120 and 80 degrees horns

VERA (VERA10, VERA20, VERA36) equipped with 120 degrees horns is typically used as short throw cabinets combined to standard 80 degrees horn VERA array. As described 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.

To switch on compensation EQ, go to the module EQ, next import preconfigured “120 degrees” overlay. As default this overlay is bypassed.

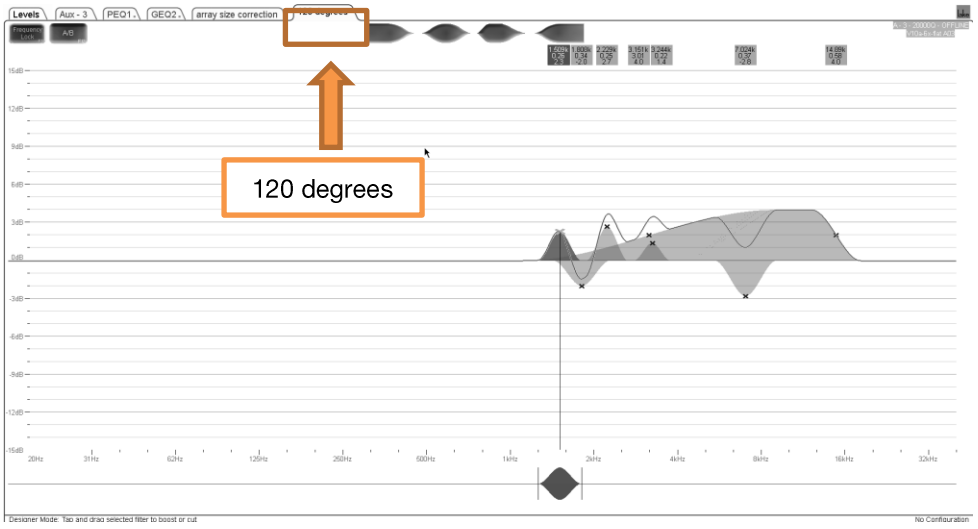


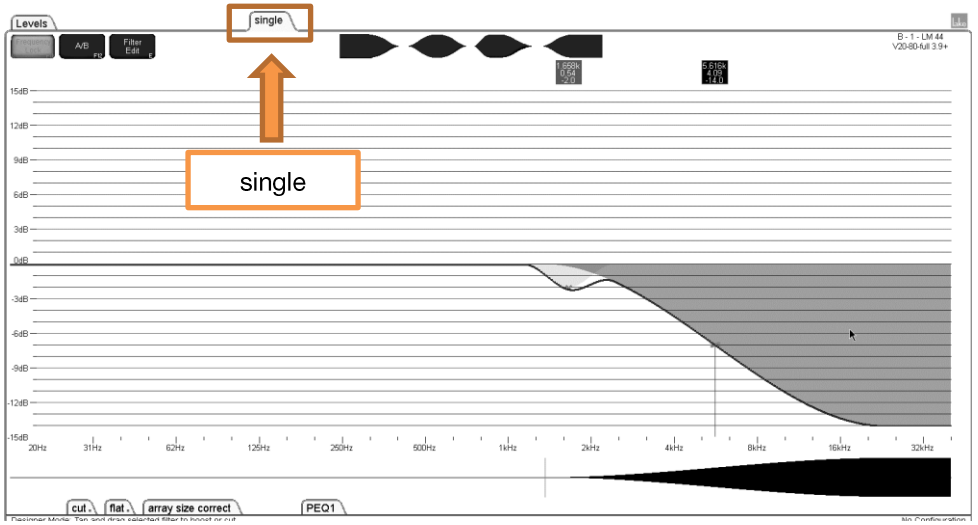
Fig. 26 Compensation EQ for VERA 120 degrees horn

For VERA20 there are no overlay EQs to compensate the different horn flairs. Please use the provided 120 degree presets, e.g. V20-120-full 3.10+.

4.4.6. VERA20 – single element

When using a single line array element it is necessary to compensate the frequency response of high frequencies.

For single element usage of VERA20 please activate the preconfigured overlay EQ “single”. As default this overlay is bypassed.



5. APPENDIX

5.1. Glossary

active — active crossover splits frequency response by 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.

all-pass filter — signal processing filter that passes all frequencies amplitudes equally but changes the phase relationship between those frequencies. Allpass filter for M and C Series TW AUDiO speakers presets adapts phase response to T24/VERA10.

biamp — bi-amplification - dual amplifier channels method of driving the loudspeaker, usually LF driver is driven separately from MHF driver.

biamp / active — bi-amplification - dual amplifier channels method of driving the loudspeaker, active x-over in front of the amplifier channels.

biamp / passive — bi-amplification - dual amplifier channels method of driving the loudspeaker, passive x-over after the amplifier channels.

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.

full / flat / cut mode — three different variants for low frequency responses related to TW AUDiO full-range products

full mode is used as standalone loudspeaker without subwoofer, 50-100Hz is boosted to get more low energy

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

cut mode is used with subwoofer for the best headroom, low frequency is cut off to match to subwoofer response

end-fire 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

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 kHz is reproduced (coupling effect). For coupling filter center frequency is typically set to 1 kHz with 4 octaves bandwidth slope.

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.

5.2. Full / flat / cut

FULL / FLAT / CUT modes are three different loudspeaker frequency response variants:

FULL is used as standalone loudspeaker without subwoofer, 50-100Hz region is gained up by 6 dB.

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

CUT is used with subwoofer for the best headroom; low frequency is cut off to match to subwoofer response. Output is optimized for highest broadband SPL.

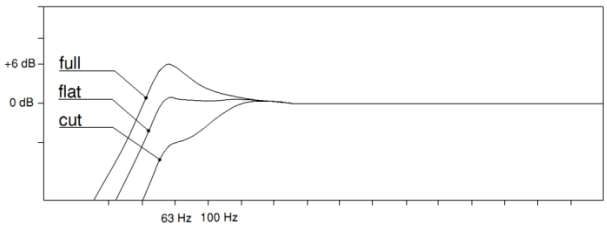
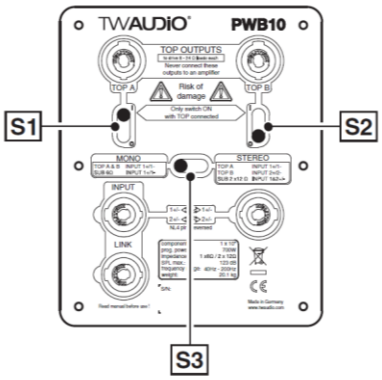
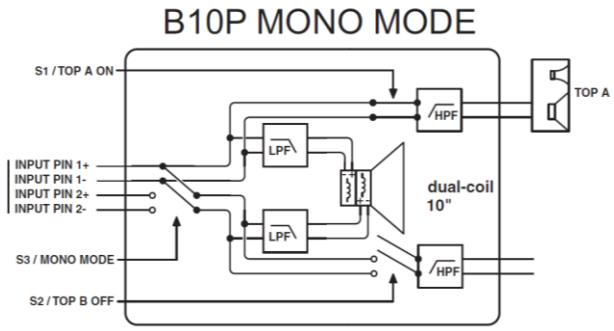
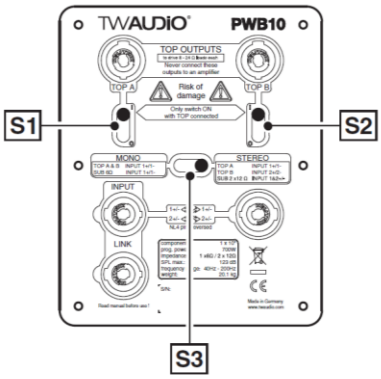


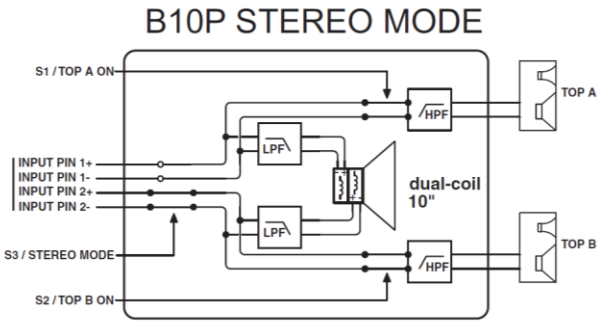
Fig. 27 full / flat / cut preset response variants (M15 example)

5.3. B10 passive X-over PWB10 operation modes

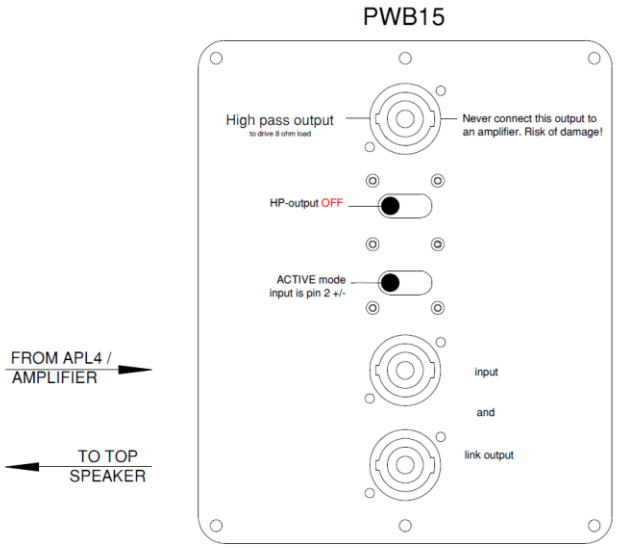








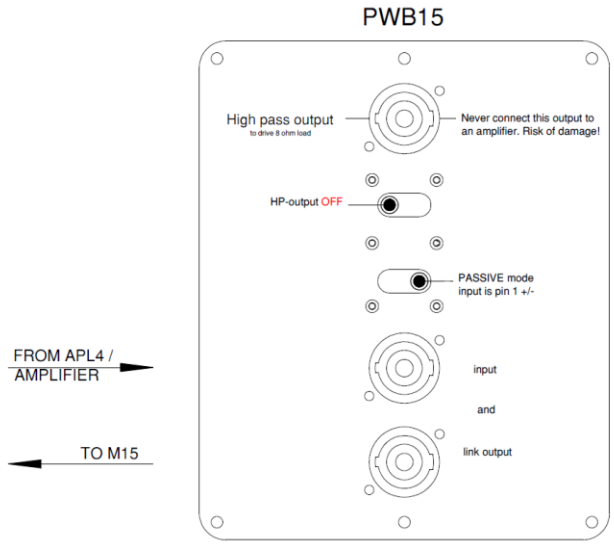
5.4. B15 passive X-over PWB15 operation modes



ACTIVE MODE

biamp
pin 1 +/- TOP speaker
pin 2 +/- B15 subwoofer

2 amplifier channels /
4-wire speaker cable required.



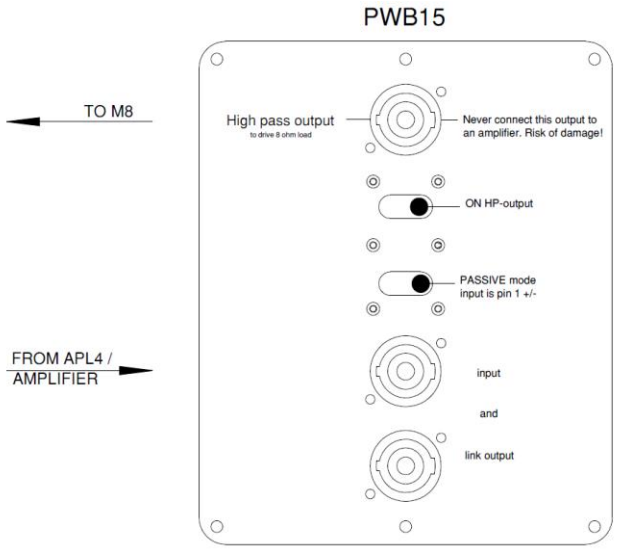
PASSIVE MODE 1

M-SYS-ONE

pin 1+/- B15+M15
pin 2+/- not in use

1 amplifier channel is required

⚠ IMPORTANT!
Be sure HP-output switcher is in **OFF** position.
keepin ON position without any load may cause a damage.



PASSIVE MODE 2

M-SYS-TWO

pin 1+/- B15+M8
pin 2+/- not in use

1 amplifier channel is required.