PS Series

PS10 - PS10TD - LS500

PS15 - PS15TD - LS1000

-

User Manual

I. INTRODUCTION

Thank you for selecting NEXO PS Series equipment. This manual intends to provide you with necessary and useful information about your PS speaker system :

PS10 & optional LS500 subbass

PS15 & optional LS1000 subbass

The PS15 can be used either in passive mode or bi-amped (two-way active). Most of the information within this manual refers to the PS15 used in passive mode. At the date of writing this manual, the specific processor required to use the PS15 in active mode was not yet available.

Please devote some attention to reading this manual. A better understanding of some specific features of the PS series (like the asymmetrical directivity horn configuration) will help you to operate your system to its full potential.

II. LOUDSPEAKERS

II.1. General Setup Instructions

II.1.a. TDcontroller use

Performance, sound quality and reliability of these speaker systems are entirely dependent on proper setup and use of the appropriate TDcontroller :

PS10 TDcontroller for PS10 systems (with or without LS500).

PS15 TDcontroller for PS15 systems (with or without LS1000).

These two controllers are not interchangeable. Each one is precisely matched to the corresponding cabinets.

We strongly recommend to all new users the careful reading of the manual with regard to specific setup and use of the TDcontroller.

II.1.b. Speaker Wiring

The louspeakers are connected with SpeakonNL4FC plugs (not supplied). A wiring diagram is printed on the connection panel located on the back of the cabinets.

The 4 pins of the 2 Speakon plugs identified in / out are paralleled within the enclosure. Each of these connectors can thus be used indifferently and simultaneously receive the power amplifier signals feeding the main PS cabinets and the optional LSub (if present) : a single 4 conductor cable can connect the amplifier rack to 1 or 2 PS plus 1 LSub.

On the PS10, LS500, LS1000 and PS15 (used in passive mode), the connectors wiring is as follows :

Speakon Connector		Signal
pin 1+	⇨	Subbass + (optional)
pin 1-	⇨	Subbass - (optional)
pin 2+	⇨	Main PS system +
pin 2-	⇨	Main PS system -

An additional Speakon connector on the PS15 connection panel is identified as 2 WAY ACTIVE; it is reserved for operation in active mode (biamp) and wired as follows :

Speakon Connector		Signal
pin 1+	⇨	PS15 Bass +
pin 1-	⇨	PS15 Bass -
pin 2+	⇨	PS15 HF +
pin 2-	⇨	PS15 HF -

Cable choice consists mainly of selecting the correct cable section (size) in relation to the load impedance and the cable length. Too small a cable section would increase its serial resistance, this would induce power-loss and response variations (damping factor).

The following table indicates, for 3 common sizes, a cable length with a maximum serial resistance equal to 4% of the load impedance (damping factor = 25).

Cable Section	Maximum Length	
	Impedance = 8 Ohms	Impedance = 4 Ohms
1,5 mm² [AWG # 14]	12 m [40 ft]	6 m [20 ft]
2,5 mm² [AWG #12]	20 m [64 ft]	10 m [32 ft]
4 mm² [AWG #10]	32 m [104 ft]	16 m [52 ft]

II.1.c. Initial Setup Precautions

When starting up a system including brand new cabinets, NEXO recommends gradual power ramp up. The loudspeaker components may need stabilizing during the very first hours of usage. This is particularly true for adhesives within the speakers' moving assemblies.

In all cases it is advisable to connect the loudspeakers only after all the other components have been wired and are operating correctly. This is particularly important for the amplifiers and the TDcontroller. It is good practice to turn down all the amplifiers' gains before connecting the cabinets and to turn them on again individually with a medium level music source fed into the system. The Sense LEDs of the corresponding TDcontroller channel should light up accordingly. This will help to locate cabling errors, particularly Left to Right or LF to HF Sense line inversions which would disable the TDcontroller protections and may invalidate the warranty.

II.2. Asymmetrical Horn Configuration

II.2.a. Principle

The Asymmetrical Dispersion constant directivity horn is an important feature of the PS Series. This concept was only available previously for highly specialized applications; in the general purpose PS it is fully exploited thanks to the possibilities of user configuration.

The proper configurations of the horn for two common applications are shown hereafter. All 4 positions of the horn are usable and can be useful for specialized applications such as complex arrays, systems designed with CAD software and stage monitoring..

The specific dispersion of the PS10 & PS15 horn can be seen on figure 1 ("front of house" configuration) :

as seen on the side view, vertical coverage is narrower above horn axis (+25°) than below (-30°).

as seen on the front view, horizontal coverage is narrower above horn axis (50° Horizontal for +25° Vertical) and wider below (100° Horizontal for -30° Vertical). Between these two extremes horizontal coverage varies according to a specific law ; on axis (0° Vertical) coverage is 75° Horizontal.

Access to the horn for configuration and checking is easily made with the quick release function of the front grille.(just pull it out). To modify horn orientation remove the four Allen screws that maintain the horn (Allen 4 metric). A sticker on the wide dispersion side of the horn shows the correct orientation for wedge monitoring and front of house application : you just have to read the indication on the right side. The arrow indicate the wide dispersion.

II.2.b. « Front of house » Configuration

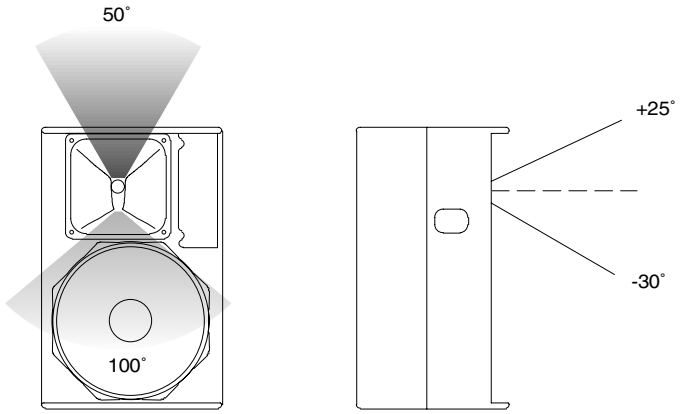

Figure 1 : PS15 used « front of house »

Good coverage of audiences often requires a conflicting combination of wide coverage ("short-throw") for the closest listeners (below cabinet axis) and narrow coverage ("long-throw") for distant areas (on or above axis). The PS Series horizontal horn coverage varies from "short-throw" to "long-throw" along the vertical axis to precisely match these practical requirements in a single system. For the majority of applications the asymmetrical horn should be used with its "wide" dispersion side directed towards the floor (as shown by the arrow) but all four cabinet orientations are usable.

II.2.c. « Stage Monitor » Configuration

For stage monitors the required coverage is always wider when performers are close to the wedge (above the horn axis) than when they move away from it (below the horn axis). For floor monitor use the horn must be rotated with its "wide" dispersion side directed towards the top of the cabinet (as shown by the arrow) in wedge position as shown in the above figure. The specific dispersion pattern, the 2" driver and the very high power handling all contribute to the exceptional performance of the PS15 as a wedge monitor.

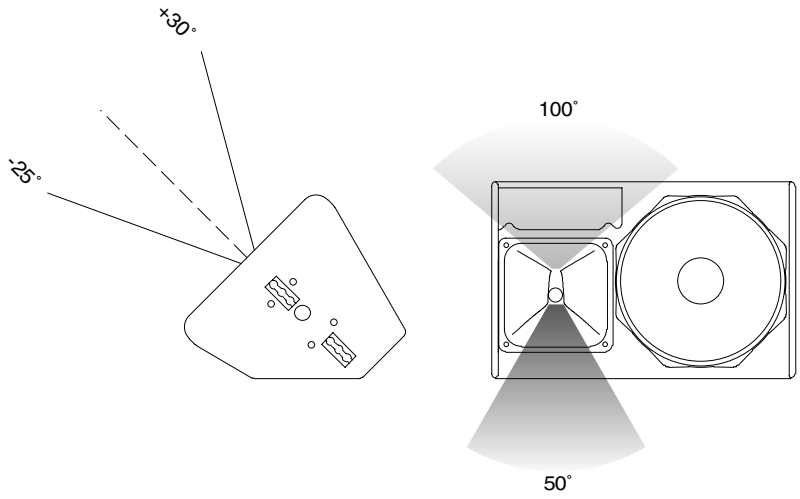

Figure 2 : PS15 used as a stage monitor

II.3. Subbass Use (optional)

II.3.a. General Recommendations

The Subbass section of the TDcontroller is monophonic (a summation of the Left and Right channels is made at the input of the Controller).

If an installation uses subbass in Stereo Subbass (this implies the presence of 2 TDcontrollers) do not forget that when one input only of the Controller is used this will lower the gain of the Sub Output by -6 dB. You can either increase the gain setting of the LSub with the front panel level control or use a Y adapter to feed both inputs of the controller with the same signal.

For best results the LSubs should be as close as possible to the main loudspeakers and aligned with respect to the audience. This is to avoid interference around the crossover point (around 120 Hz for PS10/LS500, 75 Hz for PS15/LS1000).

Although this can be at the expense of the above requirement, LSubs' low frequency performance is enhanced if multiple subs are grouped together. This also applies to Stereo installations using mono LSub output where left and right Subs can be grouped in the center.

The nominal efficiency data for LS500 and LS1000 and the standard Sub level settings on the TDcontroller are for LSubs positioned on the floor (half-space). For other system configurations, and particularly for « flying » subs Subbass:, the low frequency sound pressure can be -3 to -6 dB lower. This will be compensated by a higher setting on the LSub output level control and/or by adding more subbass units.

II.4. Accessories

II.4.a. Stand, Mast & U Coupler

PS10s and PS15s have a built in stand adapter (35 mm diameter). Cabinets can be positioned directly on a general purpose speaker stand or on a mast inserted in the built in stand adapter on top of the LS500 & LS1000. The U-Coupler accessory allows positioning and relative rotation of two cabinets arrayed side by side on top of the mast or on a speaker stand. The mast and U-coupler for the PS10 are available as options (STDUPS10). The U-coupler for the PS15 was not yet available at the time of writing this manual.

II.4.b. Flying rails Accessories & Rings

PS10s and PS15s are equipped with steel anchor plates (standard) that can be fitted with the following fittings(optional) :

PS10

Top : 6 position aircraft flying rail.

Bottom : two single position round aircraft flying rails.

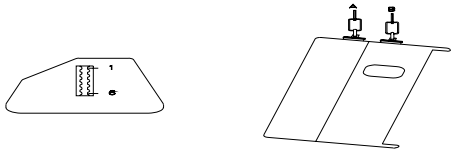

Figure 3

PS15

Top : 9 position aircraft flying rail.

Bottom : two 3 position aircraft flying rails.

These rails are supplied as part of optional flying kits Accessories containing all necessary screws and 4 single stud aircraft flying rings. Heavy duty double stud flying rings can be used in all rails except the bottom PS10 points. Installation requires a metric N°5 Allen key (to remove the original backplate screws) and a metric N°4 Allen key to mount the rails.

Vertical orientation of cabinets is a function of ring position in the top rail. It is imperative for security reasons to use two rings per rail (left figure) linked to two independently fixed straps. Ring B will also be used to stabilize the cabinet rotation and reduce the angle given by the master ring A. Nominal vertical angles relative to the position of ring A (without the influence of ring B) are as follows :

Position	PS10 Angles	PS15 Angles
1 (see Figure 3)	-17°	-20°
2	-12°	-16°
3	-7°	-12°
4	-2°	-8°
5	+3°	-4°
6	+8°	0°
7	NA	+4°
8	NA	+8°
9	NA	+12°

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II.4.c. Omnimount® style clamps

The back and the bottom of the PS10 as well as the bottom of the PS15 are equipped with internal anchor points (M8 metric) to the Omnimount® 100 Series spacing standard. This is particularly convenient when cabinets must be installed permanently in horizontal or vertical position. To remove the original screws a N°4 metric Allen key is required.

II.5. Use & Maintenance

II.5.a. Checking the PS10 & PS15 internal fuses

The function of these fuses is to protect the passive crossover against overheating if a speaker component is accidentally disconnected or goes open circuit. They can also protect amplifiers from current overloading in that event. To preserve sound quality they are not inserted in series with the loudspeakers themselves and do not thus protect them. The fuses are located on the PCB of the internal passive crossover located right behind the connection panel.

If a loudspeaker component gets accidentally disconnected or goes open circuit and needs repairing, the fuses condition must be checked. They can be verified visually and are easy to replace. These fuses are of the common "automotive" type (ATO Blade type) with standard values.

Beware : a broken fuse will degrade sound quality and endanger the loudspeaker components but the cabinet will still operate. It is thus not immediately noticeable. The incidents that can cause fuse break need cabinet opening anyway, it is good practice to quickly check the fuses on that occasion.

To access the fuses, release the 4 or 6 screws holding the connection panel (Allen metric 2.5) and disengage the panel & crossover assembly (an upward rotation movement is required).

II.5.b. Troubleshooting

Simple troubleshooting does not need the measurement equipment necessary for maintenance and can easily be made by users. The first question to be answered is always the identification of the faulty link : source, controller, amplifier, loudspeaker or cable ? Most installations are Stereo, it is often the case that one channel works and the other does not. Permutations of successive left and right elements can usually help locating the fault.

Some cabinet faults can be quite easily located and corrected by the user. A simple sweep with a sine wave generator can be very helpful but it MUST be made at fairly low level not to endanger speakers :

vibrations due to loosened screws.

air-leak noises : check that no screws are missing, particularly on the flying & fixing accessories backplates.

vibrations due to a front grille badly positioned in its quick release fixings.

Some faults require opening the cabinet :

fuses (refer to above paragraph)

alien object fallen into the cabinet after repair or through the port holes.

internal connection wires or absorbing material hitting against the loudspeaker diaphragm : check by removing the bass loudspeaker (Allen metric N°4).

loudspeaker not connected or phase reversed following a previous inspection, test or repair.

II.5.c. Maintenance & Warranty

Actual servicing requires the facilities and approval of the NEXO dealer or distributor. Please contact him for any practical information on maintenance. Warranty conditions, rights and disclaimers may vary from country to country.

III. AMPLIFIERS

III.1. Recommended Power

For best results, NEXO specifies a range of amplifier powers relative to the capacity of the cabinets (see technical specifications for the PS10, PS15, LS500 & LS1000 pages 19&23). The use of amplifiers with lower power ratings has no justification other than budgetary. On the contrary, high power amplifiers (within reasonable limit) present no real technical problem (bearing in mind the servo-control system which limits the delivered power when needed), but may simply represent an unnecessary expense.

III.2. Current Capability

When evaluating an amplifier, it is important to take account of its behavior under low load conditions (current capacity) : a speaker system is highly reactive, with transient signals like music it can require a lot more current than the nominal impedance would indicate. Apart from the manufacturers' specifications, it is possible to test the amplifier with two times the intended number of cabinets (two cabinets per channel in place of one, four in place of two, etc..), and drive the system to the onset of clipping. If there is no noticeable (audible) signal degradation, the amplifier is well suited (do not take much notice of amplifier heating after several minutes but amplifier protection should not appear too quickly).

III.3. Gain

It is very important that all the amplifiers within an installation have closely matched gains ; the variation allowed must be less than +/- 0.5 dB. This precaution is very important for reliability in the case where only one PS TDcontroller is being used for several cabinets. It is also recommended to use the same amplifiers throughout and to check their gain periodically. If some different amplifiers must be mixed (e.g. in rental situations), at least check their gain and adjust as necessary.

NEXO recommends the use of low gain amplifiers whenever possible, 26 dB being the preferred value as it is quite common. The use of high-gain amplifiers has a negative effect in terms of signal to noise ratios : the delivered noise is increased whilst the maximum voltage level remains the same (4.5 V peak at the input is enough to drive a 26 dB gain, 500 W/ 8 Ohm power amplifier to the onset of clipping). The correct use of the back panel PS TDcontroller output level switch prevents excessive degradation of the signal-to-noise ratio by compensating for high gain amplifiers.

IV. TDcontroller USER GUIDE

IV.1. Read before use

The PS TDcontroller is designed to be used with PS and LSub speaker cabinets. Its main functions are :

to optimize the response of the system

when operating with a Sub-bass system (optional), splitting the signal into 2 frequency bands (PS main system and Lsub Sub-bass system)

active protection of the cabinets by dynamic Audio signal processing (Temperature and Displacement servo control)

reduction of amplifier overload (Peak limiter function)

PS TDcontroller also features :

stereo operation (2 independent channels) for the main system

switchable output level according to the amplifier gain

adjustable level on the Sub-bass channel

balanced input and output stages

enhanced protection facility provided for additional safety margin when extended periods of overload are anticipated

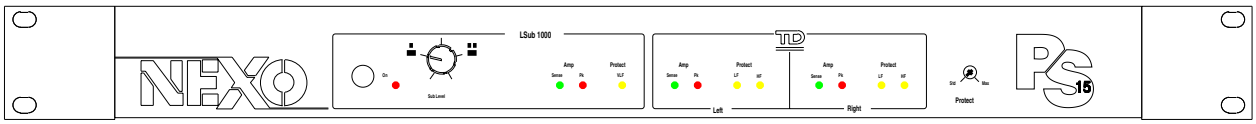
fall-back servo control mode preventing lack of protection when sense lines are disconnected (NB : on PS10TD, this feature is provided only after serial number #361).

compensation of power compression effects on the system response curve (PS15 only).

As with similar devices, the PS TDcontroller is intended to be inserted between the Audio source (console, preamplifier, etc...) and the power amplifier.

Unless stated otherwise, the PS TDcontroller is shipped ready to be used with 220-240 V AC mains voltage. It will also work under 110-120 V AC mains voltage, **but this requires internal adjustment**. (Consult your Nexo dealer or service manual)

IV.2. Front Panel



Most front panel functions and indicators are located inside 2 distinct windows : left-hand areas (with upper label LSub) relates to functions and indicators dedicated to the optional Sub-bass section, while right-hand window (upper label TD) contains indicators concerning servo control operation for the PS.

For more technical details about servo control operation and internal electronic processing, please refer to section V.V.2 of this Manual.

IV.2.a. Turning the LSub channel on (On)

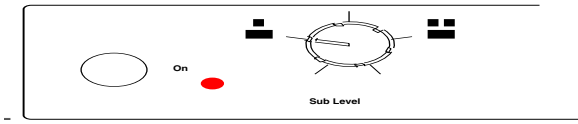
Pushing the button turns the Sub-bass channel on (Sub L + R output), which is intended to feed the amplifier(s) driving the LSub cabinet(s). Signals within the frequency range below 75 Hz (or 120 Hz in case of PS10TD) are then reassigned after Left + Right summation to this output, while the main Left & Right channels are high-pass filtered at this same frequency.

A red LED lighting up indicates that the Sub-bass channel is in operation (button pushed).

When not using Subs this button must be released for proper operation of the PS cabinet.

IV.2.b. Adjusting the LSub level (Sub Level)

The potentiometer adjusts the level on Sub-bass channel, with a 12 dB range allowing a variety of configurations and application conditions to be matched. The 2 standard positions are pictured by icons showing respectively 1 LSub for 1 PS cabinet, and 1 LSub for 2 coupled PS cabinets. Center position of the knob is adequate for 1 LSub used with 2 distant PS.



IV.2.c. Amplifier control on LSub channel (Sense & Pk)

The green Sense LED indicates signal presence at sense input on the Sub-bass channel, allowing visual control of the return connection from the amplifier output.

The red Pk LED indicates Peak limiter action reducing excessive peak voltage or levels capable of overloading the Sub-bass channel amplifier.

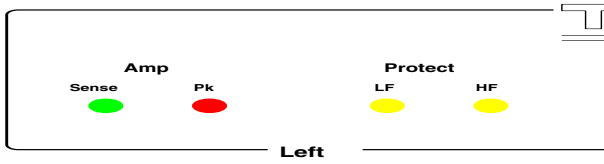
IV.2.d. LSub protection indicator (VLF)

Yellow VLF LED lighting up indicates that temperature or displacement protections for the LSub are in action on the Sub-bass channel.

IV.2.e. Amplifier control on PS channels(Sense & Pk)

Green Sense LEDs indicate signal presence at sense input on Left and on Right channels and allow visual control of the return connection from the amplifiers' outputs. Red Pk LEDs lighting up will indicate for each channel that the Peak limiter is operating to reduce excessive peak output voltages.

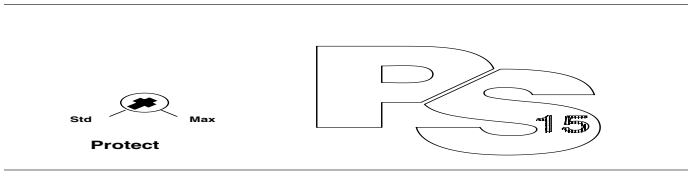
IV.2.f. PS protection indicators (LF & HF)



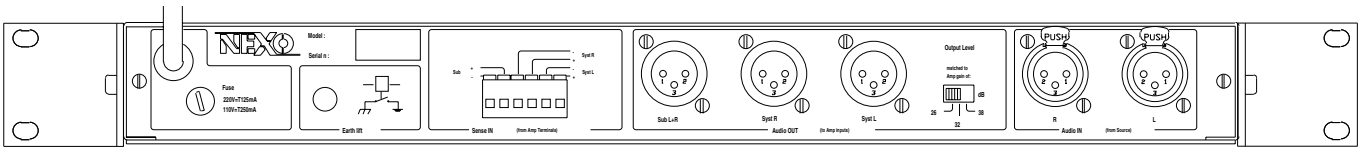
On each side of the TD window, yellow LEDs LF and HF indicate when protection has been activated (temperature or displacement control) for either the Bass or the Top End driver respectively on the Left or Right channel.

IV.2.g. Enhanced protection trimmer (Protect)

The embedded trimmer located on the right side of front panel (outside the window) is used to lower the thresholds of the protection system. When turned fully to the left (marked Std), the speaker protections will be set for normal operation. When turned fully clockwise (marked Max), protections will be increased ; e.g. this setting should be used where the system is operating under badly controlled conditions (identical gain for each amp is not checked, sense lines are not connected,..). Middle positions of the trimmer can also be used and will be recommended in cases of extended periods of overload (e.g. in some discotheque applications).



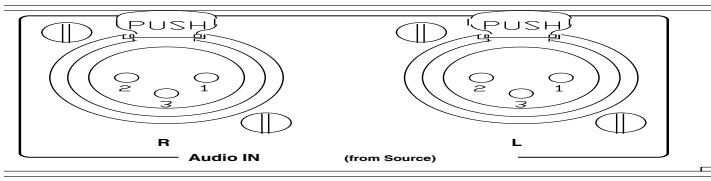
On PS15TD only, the trimmer also affects the operation of the Peak limiters.



IV.3. Rear Panel

IV.3.a. Audio Inputs

The audio inputs are two 3-pin female XLR connectors located in the area labeled Audio IN, L and R being the left and right channels respectively. Signal is applied between pins 2 and 3, pin 1 being grounded. When the Controller is linked to a signal source with balanced outputs, the XLR connections are simply wired pin to pin (1 to 1, etc..). As a result of the balanced nature of the outputs (and providing that balancing is respected by way of the connection to the amplifier), there is no hot or cold pin - the PS TDcontroller being neutral regarding the polarity of the signal.



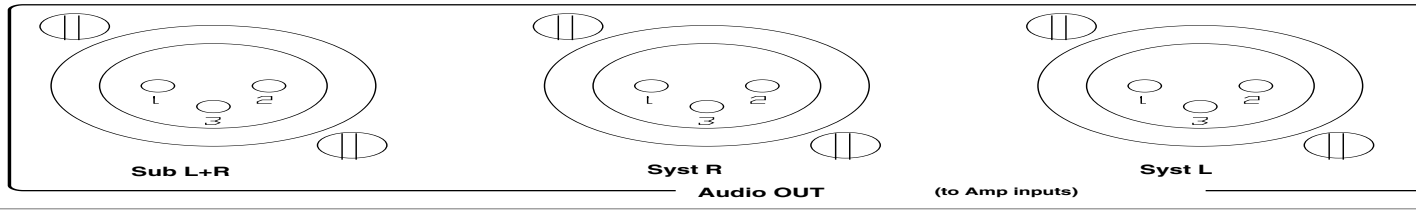
In the case where an unbalanced source is connected to the inputs, the connections should be made as follows to respect the polarity of the signal :

> if the amplifiers connected to the outputs of the PS TDcontroller are wired pin 3 hot, connect the hot pin of the source to pin 3 of the Audio input XLR of the PS TDcontroller.
>
> if the amplifiers are wired pin 2 hot, connect the hot pin of the source to pin 2 of the Audio input XLR.

In both cases the unused signal pin (2 or 3 respectively) will have to be linked to pin 1 (grounded).

IV.3.b. Audio Outputs

The audio outputs are the three 3-pin male XLRs located in the area labeled Audio OUT. The channel corresponding to each output connector is identified by the labels Syst L (left channel),Syst R (right channel), and Sub L+R (mono Sub-bass).



Signal is applied between pins 2 and 3, pin 1 being connected to ground.

When used with an amplifier with balanced inputs Amplifier, the wiring of the output XLR is simply pin to pin (1 to 1, etc..), the polarity of the signal being thus respected if the source connected to the input is also balanced (see previous section).

Where an amplifier with unbalanced inputs Amplifier is used, the connections shall be as follows :

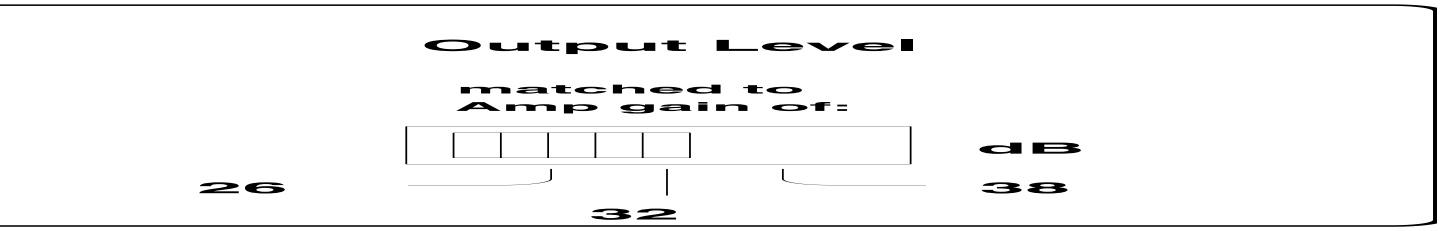
> where the source connected to the PS TDcontroller input is pin 3 hot, connect the hot pin of the amplifier to pin 3 of the PS TDcontroller XLR output connector and the amplifier ground to pin 2.

where the source is wired pin 2 hot, connect the hot pin of the amplifier input to pin 2 of the XLR output connector, and the amplifier ground to pin 3.

leave pin 1 of the output XLR unconnected.

This wiring method avoids any loss of output level, provided always that the ground of PS TDcontroller stays floating relative to that of the amplifier -thus care should be taken with regard to the Earth Lift switch when depressed : the respective signal grounds could possibly be linked together via the mains earth).

IV.3.c. Output Level Switch



The 3 position output level switch has two main purposes :

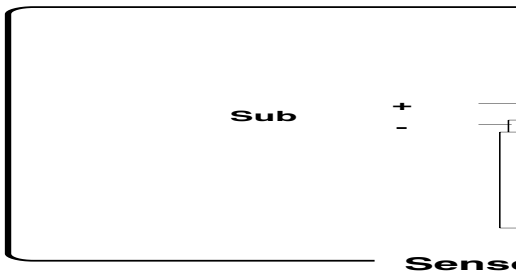
1/ Once the sense lines are connected, this switch is only used to match the processor gain to the amplifier gain for optimum signal to noise ratio. Having selected the appropriate output level, the signal to noise ratio will be preserved whatever the gain of the amplifier (for a broader explanation of this please refer to III.III.3 : **AMPLIFIERS**, **Gain**).

2/ If the sense lines are disconnected, the TDcontroller is operating in fall back mode (see relevant section : IV.V.2 Servo Control section). In this case, **selecting the proper switch setting is absolutely necessary to ensure correct operation of the protection circuits** as protection will directly depend on it.

The three gain values available are 26, 32 or 38 dB and correspond to the positions left, middle and right of the switch respectively. If the effective gain of the amplifiers doesn't correspond to any of the three positions the closest should be selected. In case of doubt the lesser value should be chosen.

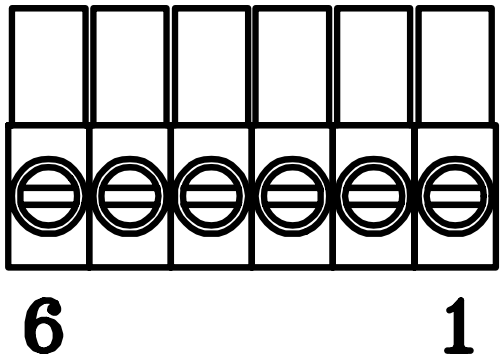
IV.3.d. Sense inputs

The sense inputs of the three channels (left, right and subbass) are arranged on a six pole barrier strip set into the rear panel within the area labeled Sense IN. The Sense inputs are intended for the output signals of the amplifiers driving one cabinet each of the channel being used : PS for the left and right channel, LSub for the subbass channel.
Input sense connection is strongly recommended for proper operation of the servo-control system. On PS10 TDcontrollers with serial numbers before #360 which are not provided with fall-back mode, the cabinets will NOT BE PROTECTED AT ALL if the sense lines are not connected.



Connection is made via the female part - removable - of the connector (supplied with the Controller) as outlined below :

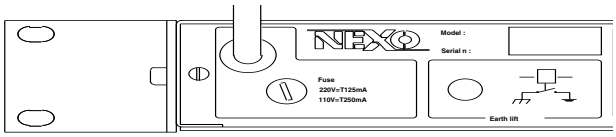
Channel	Amplifier Output Terminal		Barrier strip connector



PS Left (Syst L)	+ (red) - (black)	⇨ ⇨	pin 1 (figure) pin 2
PS Right (Syst R)	+ (red) - (black)	⇨ ⇨	pin 3 pin 4
LSub (Sub)	+ (red) - (black)	⇨ ⇨	pin 5 pin 6

NB : The PS TDcontroller is insensitive to the polarity of the wiring of the inputs, contrary to some other NEXO Controllers. It is highly recommended to read the further information below regarding the wiring of Sense lines (IV.IV.4.IV.4.a : Recommendations for wiring the Sense lines).

IV.3.e.Earth Lift



The push button labeled « Earth Lift » allows connection (depressed position), or disconnection (out position) between the signal ground and the mains earth, which is itself linked to the chassis. Using this button may help to eliminate hum due to ground loops created in the system.

IV.4. Setting-Up Advice

IV.4.a. Recommendations for wiring the Sense lines

The impedance of the sense inputs of the PS TDcontroller being quite high, the currents are low and therefore ordinary line cable can be used. If the unit is housed in the amp racks an unshielded cable can be used.

If the Controller is located remotely - at the mixing position - a shielded cable is recommended, without using the shield as a conductor.

When one of the channels is not being used and the corresponding sense line is disconnected, crosstalk onto the inactive sense line may in some cases produce signals capable of causing the untimely illumination of the Sense LED on that channel ; although this phenomenon has no effect on the internal operation of the Controller, it can be cured by short-circuiting the terminals of the inactive sense line.

Otherwise, it is strongly advised to protect the amplifiers from short-circuits in the sense lines. It is recommended that a 1 kOhm resistor with a power rating of at least three watts be inserted as close as possible to the output terminals of the amps.

IV.4.b. Connecting the audio outputs

Output stages are able to drive several amplifiers in parallel ; however it is not advised to work with loads of less than 1 kOhm. It is best to check with the impedance characteristics of the inputs - supplied by the manufacturer - to check if the number of amplifier channels is not too many. Where precise information is not available (and taking 10 kOhm as the minimum value possible) then ten channels in parallel per output is a sensible maximum.

V. TDcontroller REFERENCE GUIDE

V.1. Linear section

The characteristics of the linear section are independent of signal level, as opposed to the servo control functions described in next paragraph.

V.1.a. Subsonic and VHF filtering

Low and high-pass filters are used to remove signals not of the usable frequency range and so eliminate sub- and ultra-sonic components that could possibly degrade the performance of the Controller and amplifiers. Those filters are optimized for achievement of the target overall system response.

V.1.b. Equalizing acoustical response

This equalizing section achieves the correction required to obtain a flat system response, as the cabinets are acoustically designed for maximum efficiency on the whole frequency range. Active rather than passive attenuation allows lowering amplifier voltages for a given output SPL and therefore increases the maximum SPL achievable with the same amplifier.

Active equalization also extends system bandpass especially at low frequencies where acoustical performance is limited by cabinet size.

V.1.c. PS / LSub Cross-Over

From input signals summed together, the resulting mono signal is low-pass filtered to feed the Sub-bass channel. When the channel is turned on (LSub On), main channels (Left & Right) high-pass filters are reconfigured to filter out signal components below the cross-over frequency. Slopes and other filter characteristics are optimized using techniques that take into account the actual acoustical data of each loudspeaker in the cabinets.

V.1.d. LSub operation and level adjustment

When the LSub channel is off, its signal is grounded just before the output stage. When the channel is in use, the potentiometer adjusts output level by acting on the Sub's VCA control voltage.

V.1.e. Gain. Output stage

For each of the 3 channels gain is set by an attenuation network simultaneously modified according to the position of the rear panel output level switch ; nominal gain is unity for the 26 dB position, -6 dB for the 32 dB position, and -12 dB for 38 dB position (Left & Right channels).

Electronic balance at the output stage reduces spurious noises in case of bad grounding conditions ; an additional feature of the balanced stage is doubling the voltage swing at the output.

V.2. Servo Control section

Servo control of the PS TDcontroller is normally intended to work with amplifier return signals present at the Sense inputs (monitored by front panel LEDs).

(WARNING : the following paragraph does not apply to PS10 TDcontrollers with serial numbers below #361)
However, when no signal is detected on one Sense line, an internal signal is automatically substituted for the actual amplifier signal at the input of the servo control path. This fall-back operation mode allows protection to be maintained even when Sense lines are disconnected. It should be nevertheless emphasized that this operation mode will not perform with the same accuracy and reliability as actual feedback, and is intended to maintain some protection in accidental situations only.

V.2.a. VCAs and VCEQs

Each of the 3 Audio channels (Left, Right and Sub-bass) contains two voltage controlled elements driven by servo signals :

one operates on the whole frequency range (wide band VCA).

the other element works selectively as a dynamic equalizer (LF-VCEQ).

Depending on the nature and origin of the servo signals, either one or the 2 combined elements is used to process the Audio signal. This feature allows a more efficient processing while reducing audible effects.

V.2.b. Displacement control

The signal from the sense input is fed through a shaping filter producing a signal proportional to the voice coil displacement. This control signal is compared to a fixed value and if exceeded, the LF-VCEQ is activated with very short attack time to reduce speaker excursion. For even higher levels the control voltage will also activate the wideband VCA.

V.2.c. Temperature control

Sense input is fed to a shaping filter to create a voltage proportional to the instantaneous voice-coil current. The signal is integrated over time to simulate heat buildup in the specific driver. When the resulting voltage exceeds a preset threshold, the VCA is activated to limit the voice coil temperature within its safety range. Besides, on PS15TD and on PS10TD (serial number above 868), power compression is simulated by lowering the high frequencies when temperature protection is acting on the bass loudspeaker.

V.2.d. Dynamic control

To reduce audible « pumping » effects due to very long time constants of temperature detection signals, an alternate integration is also processed with a shorter time constant. Whilst anticipating the temperature protection and reducing its unwanted effects, action of this signal also improves dynamics control.

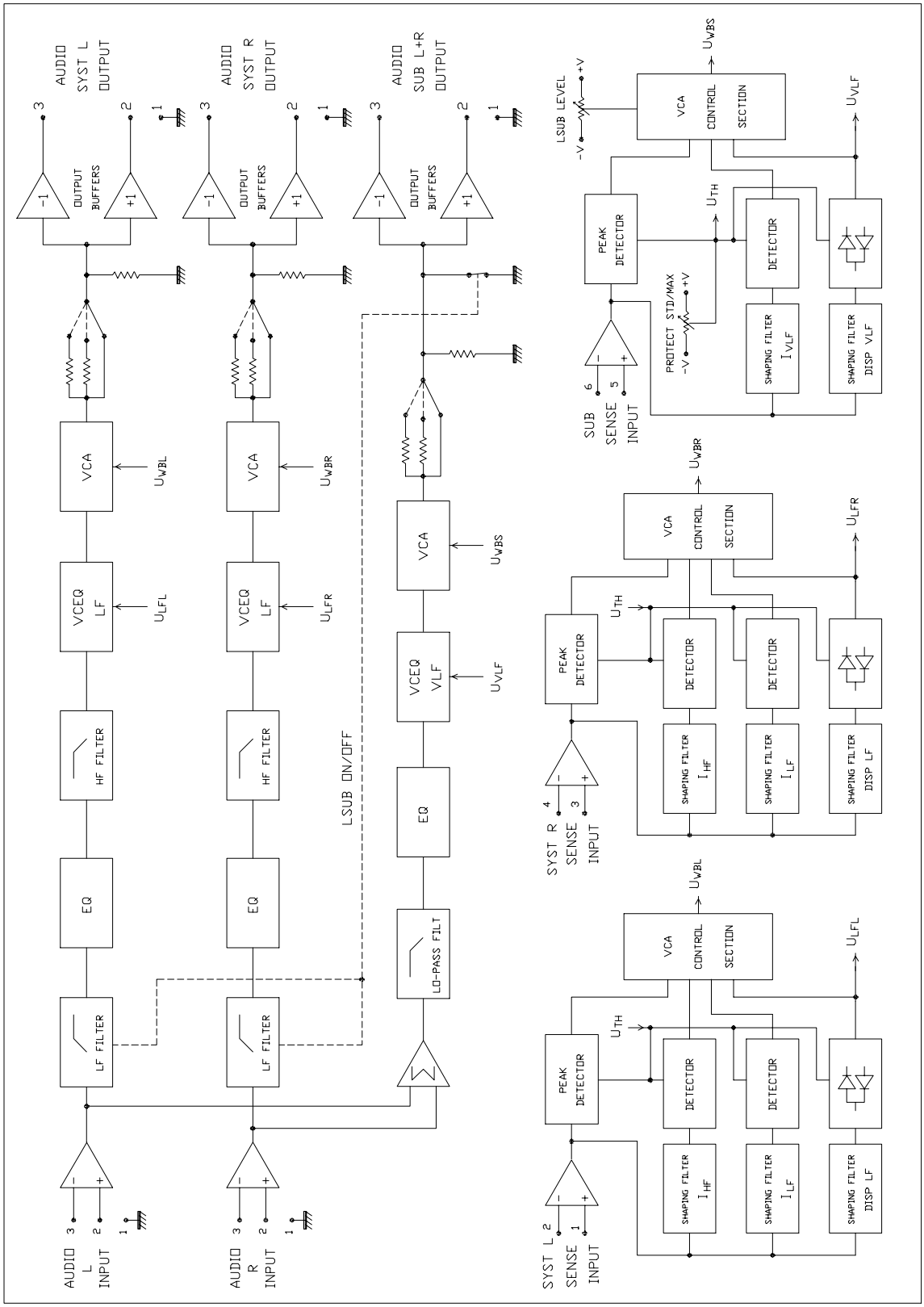
V.2.e. Peak Limiter

The above mentioned devices provide reliable protection against potential speaker over-heating and over-excursion. Nevertheless driving the cabinets at very high peak voltages (with oversized amplifiers) as well as delivering distorted signals might be dangerous for the speakers. The Peak limiter is both useful for :

maintaining good sound quality at high levels (it will reduce amplifier distortion).

increasing protection reliability (limiting peak voltages to levels that speakers can permanently withstand, and reducing the occurrence of subsonic signals delivered by overloaded amps).

V.3. Electronic block diagram



VI. SPECIFICATIONS, CURVES & DIAGRAMS

VI.1. PS10, PS10TD & LS500

VI.1.a. Specifications

SYSTEM SPECIFICATIONS	PS10 with PS10 TDcontroller	LSub 500 with PS10 TDcontroller
Frequency Response [a]	65 Hz - 20 kHz ±3dB	40 Hz - 110 Hz ±3dB
Usable Range @-6dB [a]	58 Hz - 21 kHz	38Hz - 120 Hz
Sensitivity 1W @ 1m [b]	98 dB SPL Nominal - 96 dB SPL Wideband	101 dB SPL Nominal
Nominal Peak SPL @ 1m [b]	124 to 127 dB Peak (for 200 to 500 W RMS Amp.)	131 to 134 dB Peak (300 to 800 W RMS Amp.)
HF Dispersion [c]	50° to 100° Hor. x 55° Vert. Rotatable Horn, 4 positions	-
Directivity : Q & DI [c]	Q : 16 Nominal DI : 12 dB Nominal (f > 3 kHz)	-
Crossover Frequencies	2 kHz Passive	120 Hz Active through PS10 TD
Nominal Impedance	8 Ohms	4 Ohms
Recommended Amplifiers	200 to 500 Watts into 8 Ohms for 1 x PS10 per channel 400 to 1000 Watts into 4 Ohms for 2 x PS10 per channel	300 to 800 Watts into 4 Ohms

SYSTEM OPERATION	
Electronic Controller	The PS10 TDController is precisely matched to the PS10 & LS500 cabinets and includes sophisticated protection systems. Using PS10 & LS500 without a properly connected PS10 TD will result in poor sound quality and can damage the components.
Dispersion configuration	After quick-release of the front grille from its fixings, the HF Horn can be rotated in 4 positions for dispersion configuration.
Subbass	The PS10 can be used without optional LS500 Subbass. Active two-way operation with the LS500 is included in the PS10 TD. One LS500 matches 2 x PS10, additional LS500 may be used for enhanced effect.
Speaker Cables	PS10 are wired 2- & 2+ on Speakon connectors, LS500 on 1- & 1+. Loop through Speakons are present on both. Single identical cables can thus be used to loop through combinations of up to 2 x PS10 & 1 x LS500 in no particular order.

PRODUCT FEATURES		PS10	LSub 500
Components : LF [VLF]		1 x 10" (25cm) 8 Ohm driver	1 x 15" (38cm) long excursion 4 Ohm driver
HF		1 x 1" throat driver + Low Distorsion, Constant Directivity Asymetrical Dispersion Horn.	-
Height x Width x Depth		515 x 316 x 277 mm (20.28"x 12.44"x 10.91")	430 x 689 x 528 mm (16.93"x 27.13"x 20.79")
Weight : Net		15 kg (33 Lbs)	33 kg (73 Lbs)
Connectors		2 x NL4MP Speakon 4 pole	2 x NL4MP Speakon 4 pole
Construction		Baltic Birch Ply finished with structured black coating	Baltic Birch Ply & structured black coating
Fittings:	Handles	2 Metal recessed pockets	2 Metal recessed pockets
	Front finish	Acoustic foam on hex perforated steel grille (77% transparent)	Perforated steel grilles
	Flying Points	1 steel anchor plate for flying track on top (6 positions). 2 steel anchor plates for flying tracks on bottom (1 position)	3 steel anchor plates for flying tracks on sides and back
	Stand fittings	Built in Steel Stand Fitting, 35mm (1"3/8)	Internal Steel Stand Fitting on Top (35mm, 1"3/8) accepts a mast supporting 1 or 2 PS10's.
	Fixed Installation	Two sets of 4 fixing points (Omnimount 100 Std spacing) for Horizontal or Vertical installation.	-

PRODUCT FEATURES	PS10 TDController
Audio Inputs	Two L&R Audio inputs. Electronically balanced, 36 kOhm. Two XLR-3F connectors.
Sense Inputs	Three Amplifier Sense Inputs (PS10 L&R, LS500). 150 kOhm. 6 Pole Removable Strip Terminal.
Audio Outputs	Two L&R PS10 Audio outputs. Electronically balanced, 50 Ohm. Two XLR-3M. One Mono (L+R) LS500 Audio output. Electronically balanced, 50 Ohm. One XLR-3M.
Specifications	Output Level : +20 dBm Max. +19dBm Max on 1kOhm Noise : -88 dBm (22 Hz - 22 kHz, UnWeighted). THD+N : < 0.03% Typ. 0.05 Max for +18dBm Output
Controls & Indicators	Std/Max Protection Trimmer. Gain switch (back panel), 3 positions for Amps with Gain : 26 / 32 / 38 dB. Sub On switch & Sub Gain Control. Speaker Protect LED's. Amp Sense & Peak LED's.
Power Supply	110/220 Volts (internal wiring), 50/60Hz. Earth-Lift (back panel)
Dimensions & Weight	1U 19" Rack. 190mm (7.5") Depth. 2.9 kg (6.6 Lbs) net
SHIPPING & ORDERING	
Packaging	PS10's are packaged as pairs with PS10TD (Ref: PS10P+T) or without PS10TD (Ref : PS10P) in a single box.
Shipping weight & Volume	Ref PS10P : 34 Kg (pair). Ref PS10P+T : 37 Kg (pair+processor). Shipping Volume : 0.169 m3 (5.96 cu feet) Ref LS500 : 38 kg (unit) 0.238 m3 (8.41 cu feet)
Accessories	Flying Kit (Ref: FLYPS10) containing 1 x PS10 Top Rail, 2 x PS10 Bottom Rails, 4 x Single Stud Flying Rings. Mast Adapter Kit (Ref: STDUPS10) containing 1 m (39") long mast & U coupler supporting 1 or 2 PS10 above LS500

As part of a policy of continual improvement, NEXO reserves the right to change specifications without notice.
[a] Response curves & data : Anechoïc Far Field for the PS10 + PS10TD. Half-Space Anechoïc radiation for the LS500 + PS10TD.
[b] Sensitivity & Peak SPL data : these will depend on spectral distribution and crest factor of program material. Measured with band limited Pink Noise. Nominal refers to Voice Decade (300 Hz - 3 kHz), Wideband to the specified ±3dB range. Data are for speaker + processor + recommended amplifier combinations. Peak SPL is at clipping of recommended amplifier.
[c] Directivity curves & data : obtained by computer treatment on off axis response curves.
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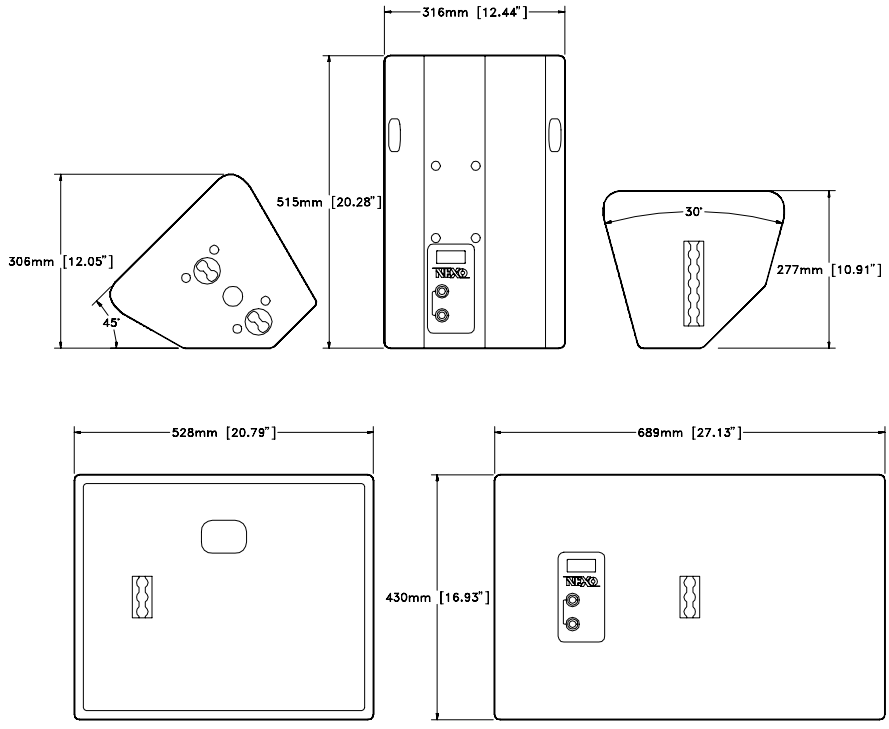
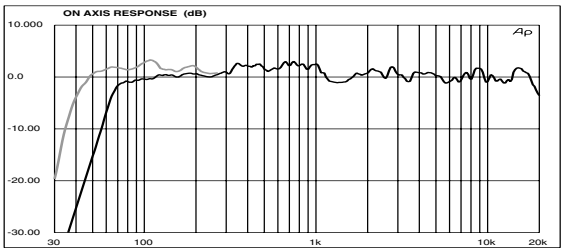
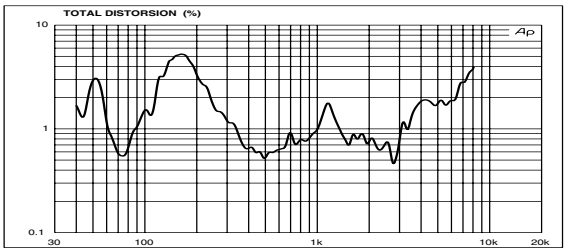
VI.1.b.Dimensions



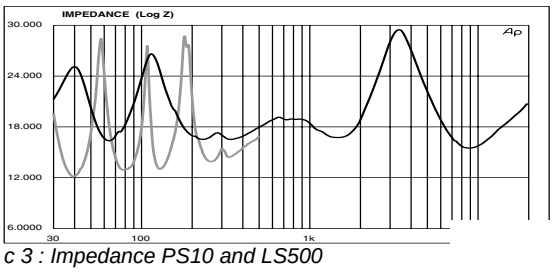
VI.1.c. Curves



c 1 : On axis responses PS10 & PS10 + LS500

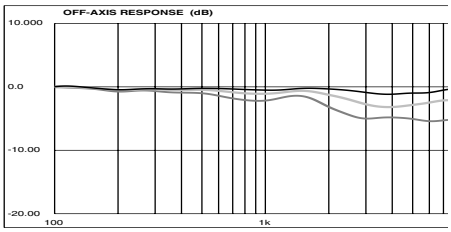


c 2 : PS10 + LS500 : THD for 110 dBSPL @ 1m.

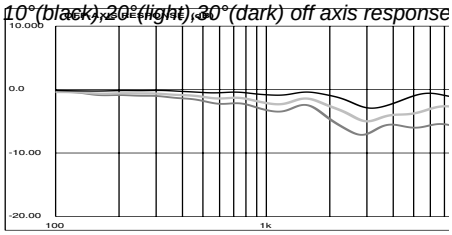


c 3 : Impedance PS10 and LS500

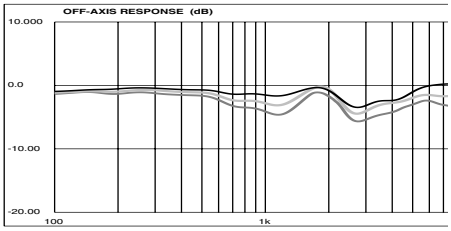
-Horizontal polar plots (left)
upper plot : vertical orientation +25°
center plot : vertical orientation 0°
lower plot : vertical orientation -25°
-Vertical polar plot (right)
5 dB / div



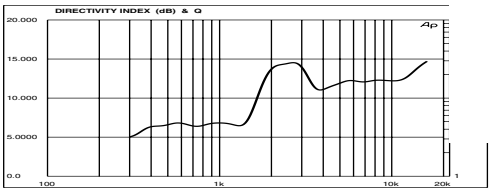
c 4 : Horizontal plane, vertical orientation +25°.
10°(black),20°(light),30°(dark) off axis response



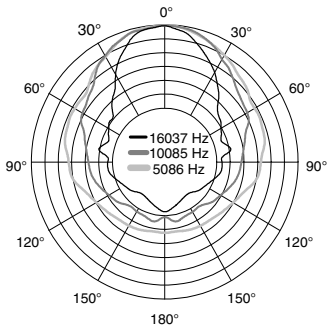
c 5 : Horizontal plane, vertical orientation 0°.
20°(black),30°(light),40°(dark) off axis response

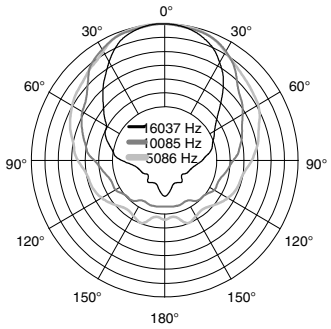


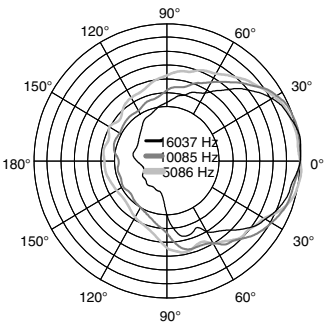
c 6 : Horizontal plane, vertical orientation -25°.
30°(black),40°(light),50°(dark) off axis response

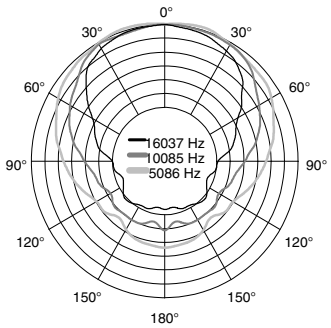


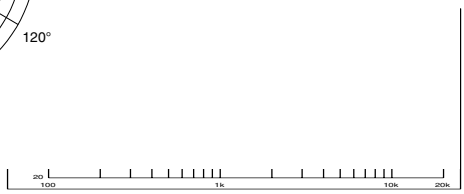
c7 : Directivity index and factor.





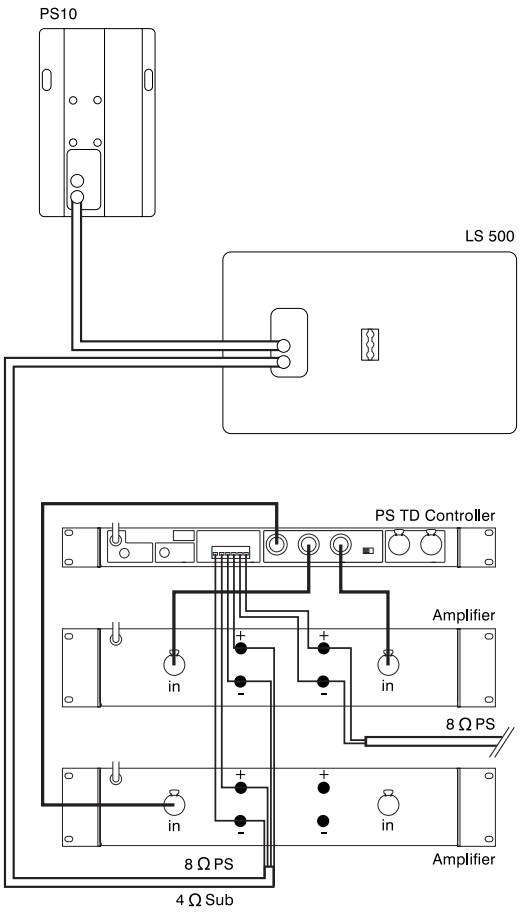




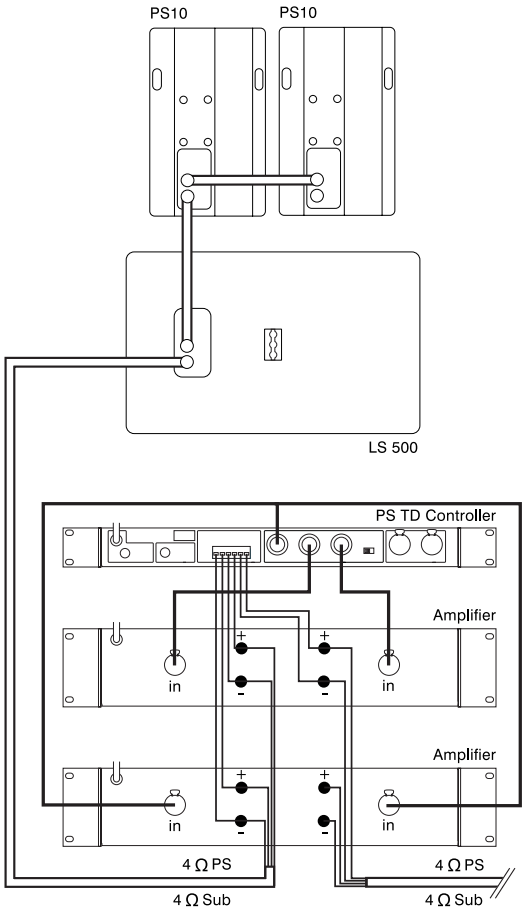


c 8 : Horizontal (light) and vertical (black) coverage angles, -6dB points.

VI.1.d.Connection Diagrams



Configuration with one PS10 per side and one LS500



Configuration with two PS10 per side and one LS500 per side

VI.2. PS15, PS15TD & LS1000

VI.2.a. Specifications

SYSTEM SPECIFICATIONS	PS15 with PS15 TDcontroller	LSub 1000 with PS15 TDcontroller
Frequency Response [a]	50 Hz - 18 kHz ±3 dB	30 Hz - 120 Hz ±3 dB
Usable Range @-6 dB [a]	47 Hz - 18 kHz	29 Hz - 130 Hz
Sensitivity 1W @ 1m [b]	102 dB SPL Nominal. 99 dB SPL Wideband	102 dB SPL Nominal
Nominal Peak SPL @ 1m [b]	131 to 134 dB Peak (for 550 to 1200 W RMS Amp.)	133 to 135 dB Peak (800 to 1200 W RMS Amp.)
HF Dispersion [c]	50° to 100° Hor. x 55° Vert. Rotatable Horn - 4 positions	-
Directivity : Q & DI [c]	Q : 16 Nominal DI : 12 dB Nominal (f > 1.5 kHz)	-
Crossover Frequencies	900 Hz Passive or Active (internally switchable)	80 Hz Active through PS15 TD
Nominal Impedance	Passive : 8 Ohms or Active : LF : 6 Ohms & HF : 8 Ohms	4 Ohms
Recommended Amplifiers	550 to 1200 Watts into 8 Ohms for 1 x PS15 per channel 1000 to 1800 Watts into 4 Ohms for 2 x PS15 per channel	800 to 1200 Watts into 4 Ohms -

SYSTEM OPERATION	
Electronic Controller	The PS15 TDcontroller is precisely matched to the PS15 & LS1000 cabinets and includes protections. Using PS15 & LSub's without a properly connected PS15 TD will result in poor sound quality and can damage the components. **The PS15 TDcontroller cannot be used with PS15's switched to two-way active operation mode. Another type of NEXO processor is required for this application.**
Dispersion configuration	After quick-release of the front grille from its fixings, the HF Horn can be rotated in 4 positions for dispersion configuration.
Subbass	The PS15 can be used without optional Subbass. Active operation of the LS1000 is included in the PS15 TD.
Speaker Cables	PS15 are wired 2- & 2+ on Passive Input Speakons, LS1000 on 1- & 1+. Loop through Speakons are present on both. Single identical cables can thus be used to loop through combinations of PS15 in passive & LS1000 in no particular order.

PRODUCT FEATURES		PS15	LSub 1000
Components :LF [Sub] HF		1 x 15" (38 cm) 6 Ohms proprietary 1 x 2" throat, 3" Titanium diaphragm, driver + Low Distortion, Constant Directivity Asymmetrical Dispersion Horn.	1 x 18" (46 cm) long excursion 4 Ohm driver -
Height x Width x Depth		675 x 434 x 368 mm (26.57"x 17.08"x 14.48")	515 x 791 x 597 mm (20.28"x 31.14"x 23.50") Dimensions of 2 stacked LS1000 = 1 x LS2000
Weight : Net		29 kg (64 Lb.)	45 kg (99 Lb.)
Speakon Connectors		2 x 4 pole (Passive In & Loop Thru) + 1 x 4 Pole (Active In)	2 x 4 pole (In & Loop Thru)
Construction		Baltic Birch Ply finished with structured black coating	Baltic Birch Ply & structured black coating
Fittings:	Handles	2 Metal recessed pockets	2 Metal recessed pockets
	Front finish	Acoustic foam on hex perforated steel grille (77% transparent)	Perforated steel grilles
	Flying Points	1 steel anchor plate for flying track on top (9 positions). 2 steel anchor plates for flying tracks on bottom (3 positions)	3 steel anchor plates for flying tracks on sides and back
	Stand fittings	Built in Steel Stand Fitting, 35 mm (1"3/8)	Internal Steel Stand Fitting on Top (35 mm, 1"3/8) accepts a mast supporting 1 or 2 PS15's.
	Fixed Installation	One set of 4 fixing points (Omnimount 100 Std spacing)	

PRODUCT FEATURES	PS15 TDcontroller
Audio Inputs	Two L&R Audio inputs. Electronically balanced, 36 kOhm. Two XLR-3F connectors.
Sense Inputs	Three Amplifier Sense Inputs (PS15 L&R, LS1000/2000). 150 kOhm. on 6 Pole Removable Strip Terminal.
Audio Outputs	Two L&R PS15 Audio outputs. Electronically balanced, 50 Ohm. On two XLR-3M. One Mono (L+R) LS1000/2000 Audio output. Electronically balanced, 50 Ohm. On one XLR-3M.
Specifications	Output Level : +22 dBm Max. +21 dBm Max. on 1 kOhm Noise : -86 dBm (22 Hz - 22 kHz, Unweighted). THD+N : < 0.03% Typ. 0.05% Max. for +20 dBm Output
Controls & Indicators	Std/Max. Protection Trimmer. Gain switch (back panel), 3 positions for Amps with Gain : 26 / 32 / 38 dB. Sub On switch & Sub Gain Control. Speaker Protect LED's. Amp Sense & Peak LED's.
Power Supply	110/220 Volts (internal wiring), 50/60 Hz. Earth-Lift (switch on back panel)
Dimensions & Weight	1U 19" Rack. 190 mm (7.5") Depth. 2.9 kg (6.6 Lb.) net
SHIPPING & ORDERING	
Packaging	PS15's are sold as pairs with PS15TD (Ref.: PS15P+T) or without PS15TD (Ref.: PS15P).
Shipping weight & Volume	PS15 : 32 Kg (70 lb.) 0.2 cum (7 cu feet). PS15 TD : 3.3 Kg (7 lb.) 0.02 cu m (0.6 cu feet) Ref. LS1000 : 49 kg (108 lb.)0.32 cu m (11 cu feet)
Accessories	Flying Kit (Ref.: FLYPS15) containing 1 x PS15 Top Rail, 2 x PS15 Bottom Rails, 4 x Single Stud Flying Rings. Mast Adapter Kit (Ref.: STDUPS15) containing 1 m (39") long mast & U coupler supporting 1 or 2 PS15 above LS1000.

As part of a policy of continual improvement, NEXO reserves the right to change specifications without notice.
[a] Response curves & data : Anechoic Far Field for the PS15 + PS15TD. Half-Space Anechoic radiation for the LS1000 + PS15TD.
[b] Sensitivity & Peak SPL data : these will depend on spectral distribution and crest factor of program material. Measured with band limited Pink Noise.
Nominal refers to Voice Decade (300 Hz - 3 kHz), Wideband to the specified ±3 dB range. Data are for speaker + processor + recommended amplifier combinations. Peak SPL is at clipping of recommended amplifier. **Measurements made with PS15's in passive operation mode.**
[c] Directivity curves & data : obtained by computer treatment on off axis response curves.
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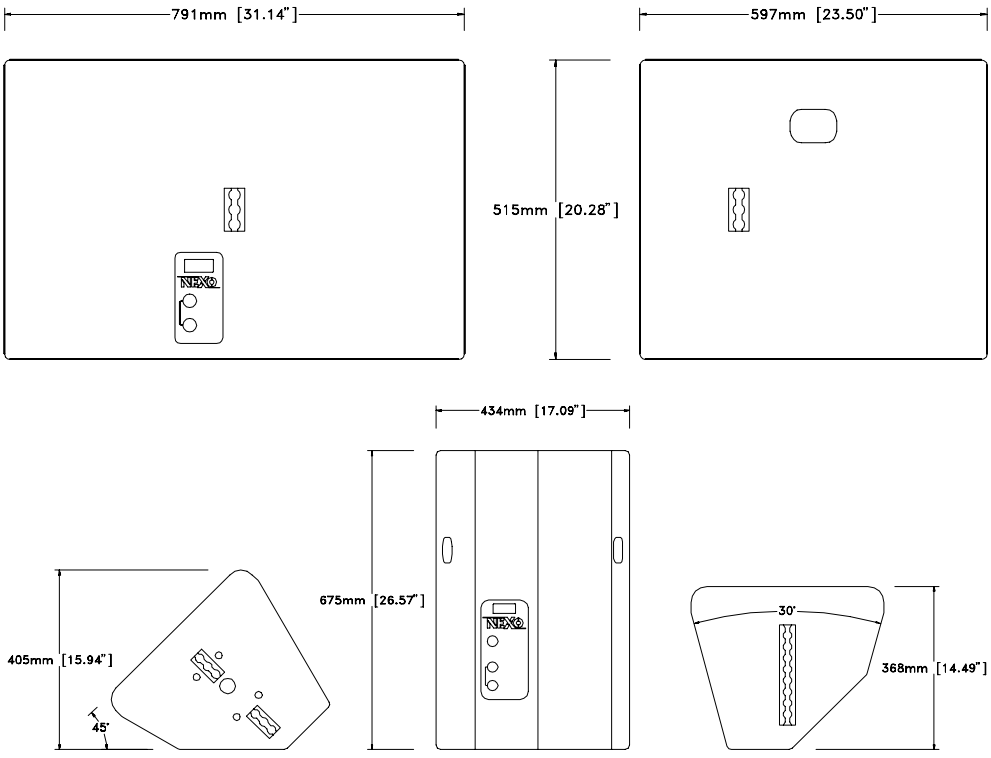
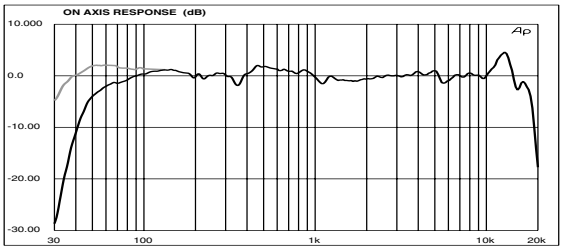
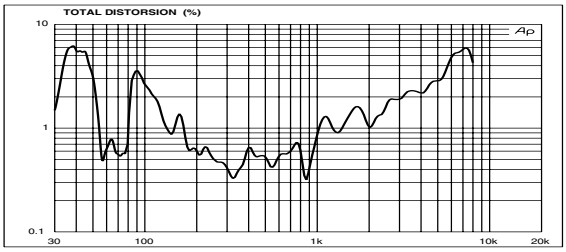
VI.2.b.Dimensions



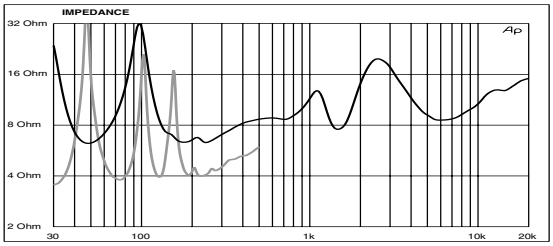
VI.2.c. Curves



c 9 : On axis responses PS15 & PS15 + LS1000

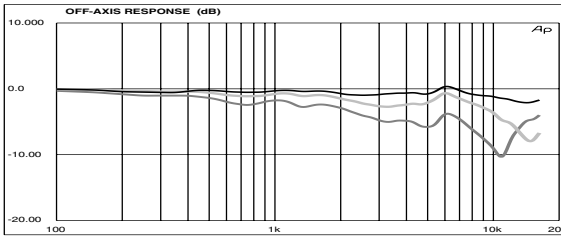


c 10 : PS15 + LS1000 : THD for 115 dBSPL @ 1m.

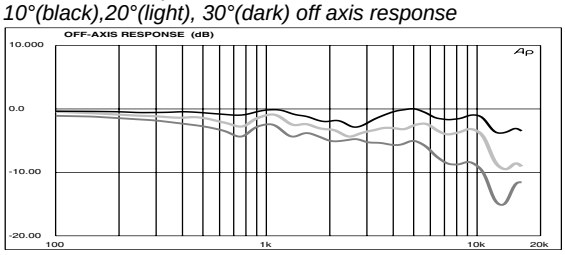


c 11 : Impedance PS15 and LS1000

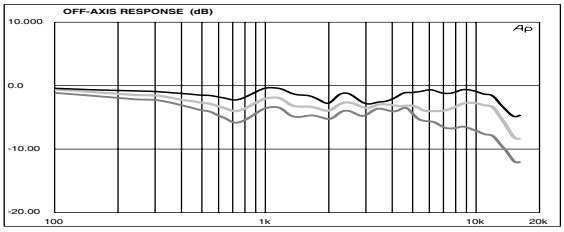
-Horizontal polar plots (left)
upper plot : vertical orientation +25°
center plot : vertical orientation 0°
lower plot : vertical orientation -25°
-Vertical polar plot (right)
5 dB / div



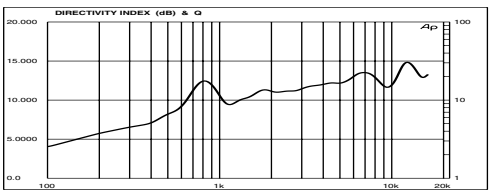
c 12 : Horizontal plane, vertical orientation +25°.
10°(black),20°(light), 30°(dark) off axis response



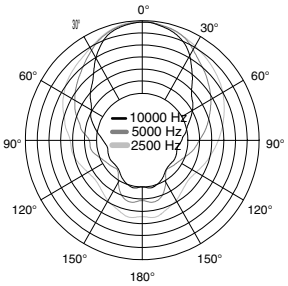
c 13 : Horizontal plane, vertical orientation 0°.
20°(black),30°(light),40°(dark) off axis response

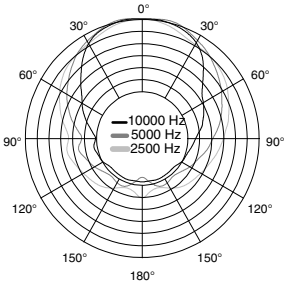


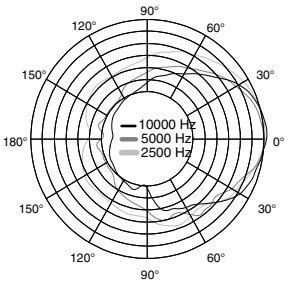
c 14 : Horizontal plane, vertical orientation -25°.
30°(black),40°(light),50°(dark) off axis response

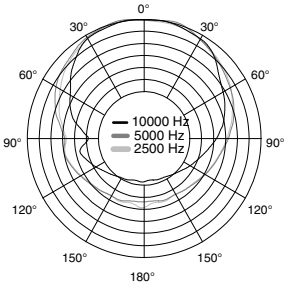


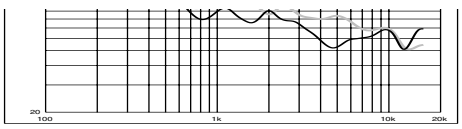
c15 : Directivity index and factor.





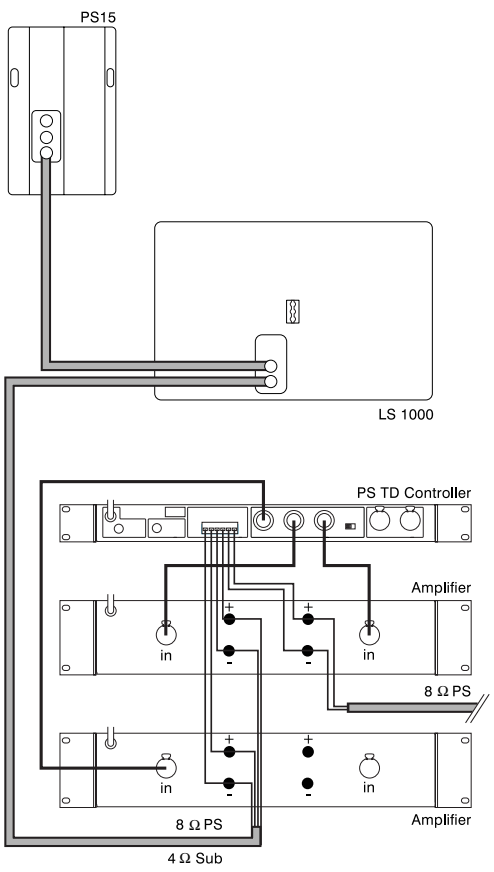




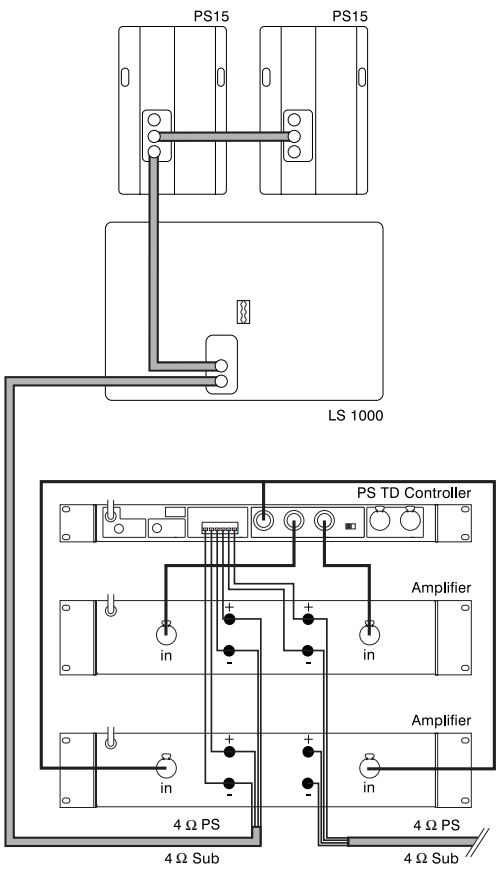


c 16 : Horizontal (light) and vertical (black) coverage angles, -6dB points.

VI.2.d.Connection Diagrams



Configuration with one PS15 per side and one LS1000.



Configuration with two PS15 per side and one LS1000 per side

VII. INDEX