Upturned T

USER'S MANUAL

peecker sound®

SOUND REINFORCEMENT | CONTROLLED RADIATION | ACOUSTIC RESEARCH

TABLE OF CONTENTS

1. SAFETY

When using **Peecker Sound** speakers be aware of the safety standards of your country. These professional audio systems can produce very high sound pressure levels and must be used with caution. Hearing loss is cumulative and can result from long periods of exposure to sound pressure levels exceeding 90 dB. Never stand near electro acoustic speakers at high volumes. For floor-installations, make sure that the foundation floor is level and stable.

2. GENERAL INFORMATION

The **Upturned T** series consists of **5 models** (and suited accessories) of which an overview is given below.

PSUT8TE	Stackable Hybrid-dispersion Sound Column Top Element - RMS Power: 400 W - Musical Power: 800 W Impedance: 16 Ohm - Max SPL (@ 1m): 129 dB - Max SPL (@ 16m): 107 dB - Transducers: 8x4", full range
PSUT8AE	Stackable Wide-dispersion Sound Column Additional Element - RMS Power: 400 W - Musical Power: 800 W Impedance: 16 Ohm - Max SPL (@ 1m): 128 dB - Max SPL (@ 16m): 105 dB - Transducers: 8x4", full range
PSUTBASE/A	Active Professional Subwoofer, base for 1 PSUT8TE or 1 PSUT8TE + 1PSUT8AE - Class D Digital Amplifier Power RMS: 800+800 W - DSP on board: 24 bit, 96 kHz (4 presets) - Max SPL (@ 1m): 132 dB Transducers: 1x12", neodymium magnet
PSUT1	Single Module for stacked clusters (up to 4 elements) RMS Power: 50 W - Musical Power: 100 W Impedance: 16 Ohm - Max SPL (@ 1m): 114 dB Transducers: 1x4", full range
PSUTS	High efficiency ultra-compact Suspendable Subwoofer - RMS Power: 160 W - Musical Power: 320 W Impedance: 8 Ohm - Max SPL (@ 1m): 120 dB Transducers: 2x6"

The Upturned T series has a wide range of applications based on the particular type of audio system under consideration.
The common denominator of the whole series is the use of full-range loudspeakers, that is 4" transducers with Neodymium magnets suitable for the entire frequency range from medium-low up to the highest range of the audio spectrum. Even though they do not reach the same pressure as horn-loaded compression drivers, full-range cone loudspeakers have considerable advantages that become crucial at the acoustic pressure levels of these speakers and for their recommended applications.
In this case, the human voice is reproduced through a single transducer without the aid of a crossover, thereby achieving greater coherence, while the whole medium frequencies range is reproduced more accurately compared to a standard speaker using several small transducers instead of a single, large loudspeaker (as in the case of typical 2-way systems with comparable sound pressure).
These full-range loudspeakers are used for both PSUT8TE and PSUT8AE column speakers (containing up to 8 of them), as well as for the "small" PSUT1 (containing a single loudspeaker).

The **PSUTBASE/A** active subwoofer, with 12" reflex loudspeaker and a 24 bit/96 kHz DSP is associated with PSUT8xx columns (this is how the two **PSUT8TE** or **PSUT8AE** models are referred to in this text) forming compact active systems that look like an *upturned T*.
PSUT8xx loudspeaker systems can be directly inserted on the active subwoofer from which they receive the required power without any signal or power cable. The quality and depth of the reproduced sound, the unique horizontal sound coverage, the long throw typical of the arrays, plus user friendliness and transportability are just some of the features that stand out with this ***active stack*** solution.
The **PSUT1** model is designed for ambient, diffused sound texture and can be combined with "its" PSUTS sub to obtain a higher sound pressure and punch than other audio systems of similar size and target.
The compact **PSUTS** subwoofer (two 6" loudspeakers with reflex coupling) expands the frequency range covered by the PSUT1 towards the lower end, creating various configurations (it is possible to stack various PSUT1s and adjust them one by one) either with a single or a two-channel amplifier.

3. CLOSE-UP VIEW OF THE MODELS

3.1 PSUT8TE and PSUT8AE

Sound columns, composed of 8 x 4" full-range loudspeakers with Neodymium magnet. The impedance of each element is 16 Ohm. They come with sturdy butterfly hinges and electric connectors for direct assembly in stack configurations. In fact, these speakers can be hooked up together and/or to a PSUTBASE/A active subwoofer (figure 5 and 6) so that they can receive and transmit the audio power without using a cable.

The first column, PSUT8TE (*Top Element*), is always at the top of the stack (max. 4 PSUT8xx) while the second one, PSUT8AE (*Additional Element*), is used as an intermediate element, as explained below:

PSUT8TE *TOP ELEMENT passive column speaker with hooks and direct contact input plug positioned on the bottom to receive power from the elements underneath it;*

PSUT8AE *ADDITIONAL ELEMENT passive column speaker with hooks and direct contact input plug positioned on the bottom and output socket on the top, to receive power from the element underneath and transfer it to the one above.*

The maximum performance of PSUT8AE and PSUT8TE column speakers is obtained with ***active stacks*** formed by directly inserting them into a PSUTBASE/A active subwoofer.
This system is extremely musical and tonally balanced and the only connections are power cords and signal cables in the sub at the "base" of the column that looks as an *upturned T*.

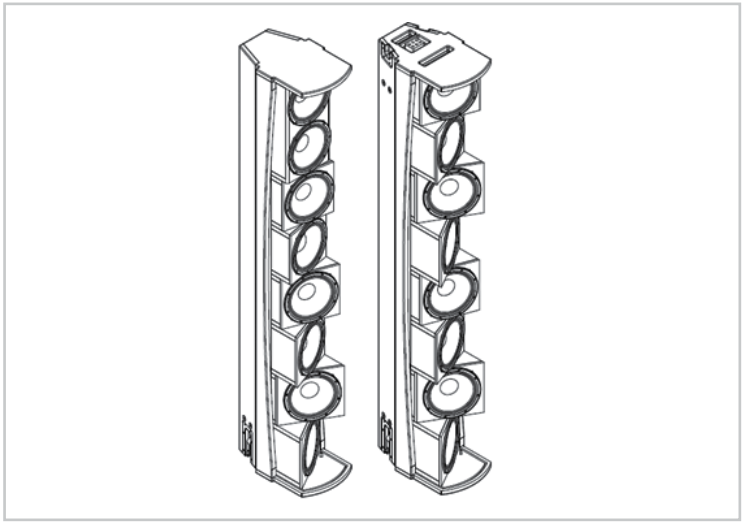

Figure 1. Right hand side: PSUT8TE - left hand side: PSUT8AE, design drawings

3.2 Loudspeakers mixed orientation: a careful study

The 8 loudspeakers in **PSUT8xx** sound column can be arranged - two by two - at *four* different angles (from the bottom: 30°, 20°, 10° and 0° as compared to the front axle) in the PSUT8TE version and at *two* different angles (from the bottom: 30°, 20°, 30°, 20°) in the PSUT8AE version.
The orientation of the transducers was tested by means of detailed simulations starting from the measurements of the individual speaker polarity. These tests were carried out in the R&D lab of Sound Corporation. The purpose of the mixed loudspeakers orientation was to obtain the widest possible horizontal dispersion angle whilst maintaining maximum timbre homogeneity within this angle. This requires, for instance, that individual loudspeakers' emission beams should become as complementary as possible at high frequencies in order to limit the spatial aliasing problem due to the interaction between adjacent loudspeakers (see "*High frequencies and spatial aliasing*" – Section 4.4).

As the centre of rotation of each individual loudspeaker, the Sound Corporation engineers selected the centre of the polar response measurement for which the smallest phase variations occurred when changing the angle at medium-high frequencies.
Due to the different orientation of the two versions (PSUT8AE and PSUT8TE), most of the loudspeakers in a stack configuration will be directed in pairs at alternating angles of 20° and 30° up to the last two sets whose angles are 10° and 0° (figure 2). So, a more acute angle is formed for the loudspeakers at the top only, as they are to generate the strongest pressure component (at high frequencies > 5 kHz) on listeners standing at a distance, whose viewing angle "on the source" is narrow.

Conversely, listeners standing close-by will have wider average "viewing angles" and prevalently perceive the sound from the intermediate loudspeakers, for which reason they are also set to a wider angle (figure 2). Focusing high frequencies to reach audience at distance through a smaller angle will lessen sound absorption and dissipation occurring over long distances.

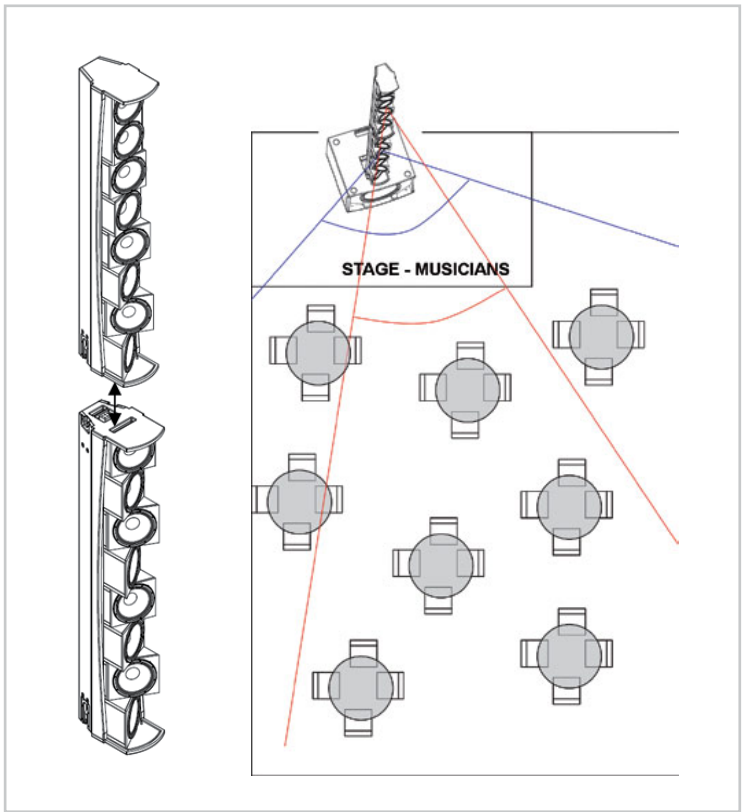

Figure 2. The loudspeakers at the bottom have a wider horizontal sound beam (blue in the figure) and thus ensure adequate coverage for both musicians and the first rows of the audience. The loudspeakers at the top - more aligned - will cover listeners at the far end, thanks to a narrower horizontal angle.

The following pictures (figure 3 and 4) show a simulation of a PSUT8AE model obtained from the directivity measurements of the individual loudspeakers in the octave of the 6 kHz: the first curve represents a hypothetical column with all the loudspeakers facing the front (in-line arrangement), the second curve represents the PSUT8AE model with its typical sound beam distribution. The latter also shows how the lobes of the vertical polar pattern (blue line) are rounded and less intense while the horizontal polar pattern (red line) is significantly wider and more homogeneous.

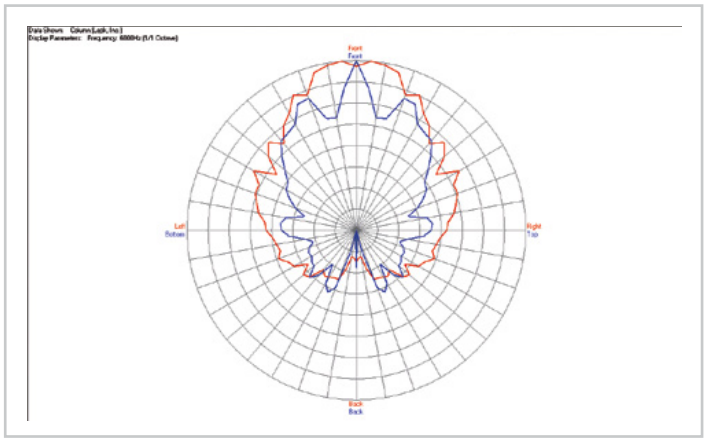

Figure 3. Horizontal (red line) and vertical (blue line) polar patterns of a hypothetical PSUT8xx model with all the loudspeakers directed towards the front (in-line arrangement, 0°)

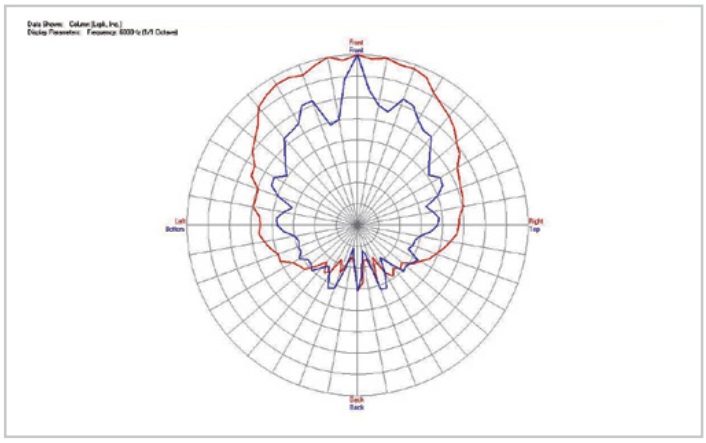

Figure 4. Horizontal (red line) and vertical (blue line) polar pattern of a PSUT8AE model with the real arrangement of the loudspeakers' angles as designed and set up by Peecker Sound engineers

3.3 PSUTBASE/A

The active subwoofer **PSUTBASE/A** with 12" reflex loudspeaker with Neodymium magnet was purposely designed for the formation of active stack systems with PSUT8xx column elements (figure 6).
A plug-in socket and butterfly hinges are provided on the top in order to accommodate various column elements.
It has a powerful DSP (24 bit/96 kHz) on board on a stereo amplifier with 800+800 W switching technology, one channel of which is used to pilot the column elements above it. The internal DSP has 4 standard default presets for each of the possible active stack configurations and the desired timbre (see paragraph 4.9).

Figure 5. PSUTBASE/A, back and front view

Figure 6. PSUTBASE/A with PSUT8TE column hooked on top of PSUT8-ST70 stand holder (active stack)

3.4 PSUT1

The **PSUT1** is a small loudspeaker system fitted with one single 4" full-range transducer with Neodymium magnet and 16 Ohm impedance.
It was designed for fixed installations, for diffused sound reinforcement in stores, coffee lounges, museums and exhibitions. However, it is also very suitable for touring events such as audio installations for musical performances (the concept of many small speakers is highly fitting for spacial sound applications with multi-channel technologies).
A number of PSUT1 can be screwed to each other to form clusters of up to 4 elements that can be differently directed individually by means of an optional, special accessory (STD-PSUT124). Alternatively they can be wall-mounted to the desired angle by means of the STD-WUT1 swivelling bracket. All the PSUT1 units are protected from low frequencies by a passive high-pass filter. Use of classic spring connectors (red/black) ensures fast and easy wiring.

Figure 7. PSUT1 "one-module" micro-loudspeaker system

Figure 8. Two clusters consisting of 2 and 4 PSUT1 modules respectively, complete with wall-mounting accessories

3.5 PSUTS

This subwoofer has two 6" reflex coupling loudspeakers and 8 Ohm overall impedance. **PSUTS** subs are used together with a variable number of PSUT1 modules and can be installed both on the floor or on the wall (better if close to the ceiling) by means of dedicated accessories. It is also possible to screw a PSUT1 speaker or a cluster of them directly on a PSUTS.
PSUTS subwoofers have an internal high-pass filter (12 dB per octave) and can be parallel connected to PSUT1 satellites through the same amplifier channel to form a single full-range system, duly "crossed" and perfectly tuned in the crossover band (centred on 160 Hz).

Figure 9. PSUTS dual subwoofer

Figure 10. PSUTS systems with a "C" (STD-PSUTS) wall-mounting bracket and 2 screwed-on PSUT1s

4. OPERATING INSTRUCTIONS FOR UT ACTIVE STACK SYSTEMS

4.1 Description of the elements in an active stack

We have already covered the application of the PSUTBASE/A subwoofer and PSUT8TE - PSUT8AE column speakers for floor-standing, compact, active systems configurations (more commonly known as active stack systems) in paragraphs 3.1 and 3.2.
The UT active stack systems are made from four basic elements:

PSUTBASE/A	Active subwoofer with butterfly hinges and direct-contact *output socket* on the top for power feeding to the module above
PSUT8-ST70	Extension element with direct-contact *input plug* on the bottom and *output socket* on the top for feeding power from the lower element to the upper one
PSUT8AE	"ADDITIONAL ELEMENT" passive sound column with direct-contact *input plug* on the bottom and *output socket* on the top, to receive power from the lower element and feed it to the module above
PSUT8TE	"TOP ELEMENT" passive sound column with butterfly hinges and direct-contact *input plug* on the bottom, to receive power from the lower element

4.2 Composition of active stack systems

UT **Active Stack 1_1_mono** systems (where "1_1" stands for 1 column speaker and 1 active subwoofer) are composed of 1 PSUTBASE/A + 1 PSUT8-ST70 + 1 PSUT8TE.
This system can be doubled to obtain a traditional left/right configuration called UT **Active Stack 1_1_stereo**.

UT **Active Stack 2_1_mono** systems (where "2_1" stands for 2 column speakers + 1 active subwoofer) are composed of 1 PSUTBASE/A + 1 PSUT8AE + 1 PSUT8TE.
The system can be doubled to obtain a traditional left/right configuration called UT **Active Stack 2_1_stereo**.

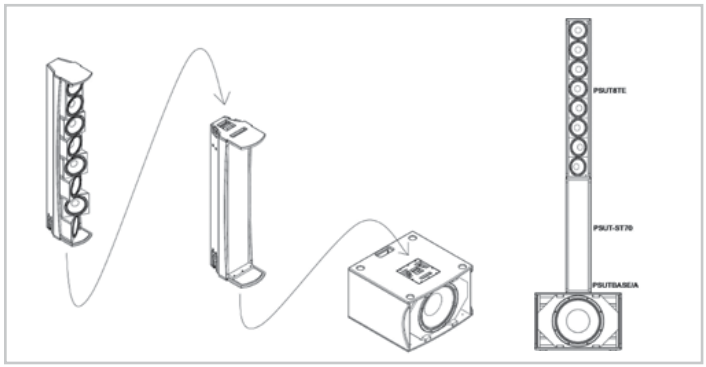

Figure 11. Installation of the basic Active Stack 1_1 system

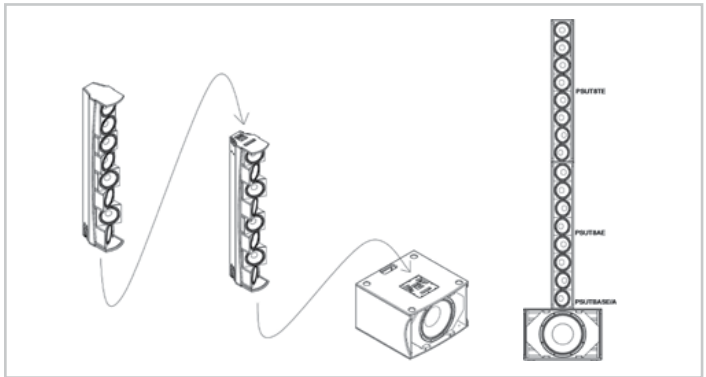

Figure 12. Installation of the Active Stack 2_1 system

4.3 Array effect

UT Active Stack systems fall under the loudspeakers array category. However, they differ from the classical professional modular arrays in the fact that they are compact, straight and strictly vertical; as such, they produce a sound beam that is directed vertically with extreme precision.
Up to a certain distance depending on the frequency, these arrays produce a sound decay of only 3 dB per doubled distance (*cylindrical waves*) as against 6 dB for standard point sources (*spherical waves*). The separation distance between the *near field* (*cylindrical waves*) and the *far field* (*spherical waves*) can be calculated using the following formula:

$$d = \frac{L^2}{2\lambda} = \frac{L^2 f}{2c}$$

where *L* is the length of the linear array, *λ* and *f* are the length of the wave and frequency, and *c* is the speed of sound.
As already mentioned sound starts to spherically decay, just like a punctual source, as the target distance is greater than *d* (6 dB per double distance, in fact). However, the array effect still occurs, taking the form of a pronounced vertical directivity, which also depends on the frequency. When the frequency increases, the separation distance between the two phenomena increases. Thus, the sound pressure decay decreases and the beam of vertical dispersion in the far field is reduced.
To confirm this theory, the directivity balloons are shown below (simulated in the far field starting from the directivity balloons measured on the individual loudspeakers) for a PSUT8TE element at 250 and 1000 Hz frequencies: at 1000 Hz, the vertical array is much more directed (see figures 13 and 14).

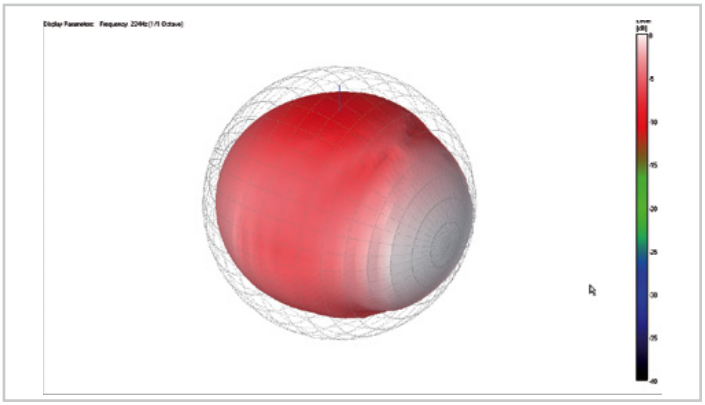

Figure 13. Directivity balloon (simulated in the far field starting from the directivity balloons measured on the individual loudspeakers) for a PSUT8TE element at 250 Hz. The array is positioned vertically, i.e. directed along the blue axis

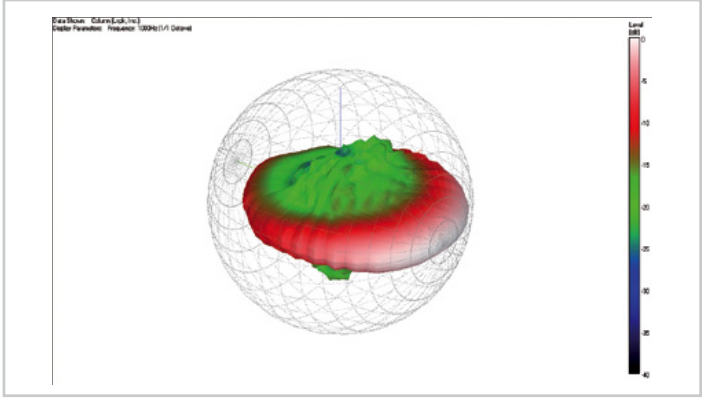

Figure 14. Directivity balloon (simulated in the far field starting from the directivity balloons measured on the individual speakers) for an element at 1000 Hz. The array is positioned vertically, i.e. directed along the blue axis

Note: the resulting strong directivity requires a very accurate use of the active stack systems that are highly suitable for any location with a limited vertical beam (for example, flat-floor or slightly lowered audience stalls), but not for traditional opera houses, for instance, where the stage layout requires a wide vertical coverage. Listeners should always be in the "slice of space" edged by the vertical extension of the array.

The debate on the border between near and far field shows how sound pressure decay, on the axis of a linear array, becomes weaker when the frequency increases (a longer near field - where sound decays by only 3 dB per double the distance - occurs). This generally involves an excess of mid-high frequencies at long distances from the audio systems, but also an excellent intelligibility of speech and singing at a distance and a high ratio of the direct-to-reverberant field due to strong vertical directivity.

4.4 High frequencies and spatial aliasing

The situation we described is merely a model of a continuous, linear sources distribution, while in real conditions the PSUT8xx models, like any real array, have discrete sources streaming by a certain *step*, or central distance, that in this case is equal to 120 mm. Above a certain frequency, a deviation occurs from the ideal behaviour of an array. This is represented by a "sound colour" that is a function of the space, in the near field (due to mutual loudspeaker cancellations in points where a destructive interference prevails) and by the presence of undesired lobes in lateral directions (upward and downward), in the far field.
The following formula shows the minimum frequency above which this phenomenon occurs:

$$f = \frac{c}{2\Delta x sin\varphi}$$

where *C* is the speed of sound, *Δx* is the value of the central distance and *sin φ* is the sine of the angle between the listener and the farthest loudspeaker; this angle is 0° for listeners along the array axis at an infinite distance and approximately 30° for listeners at 2 meters from the sound column, on axis. In this case, the minimum *aliasing frequency* is of approximately *3 kHz*, at 2 meters, and rapidly increases as the distance scales up (thus narrowing the frequency range affected by the aliasing).
The pronounced directivity of each loudspeaker at high frequencies further reduces the spatial aliasing phenomenon. Furthermore, the orientation of the mixed cone loudspeakers typical of the PSUT8xx models boosts this benefit even more: a listener who moves on the horizontal plane, will always approach the axis of a single loudspeaker at a time and at high frequencies the individual contribution of the relevant loudspeaker is predominant, thus limiting the interaction of loudspeakers and, consequently, the aliasing effect. Therefore, the mixed orientation of the loudspeakers widens the horizontal dispersion beam at high frequencies and lessens the problems of interaction between the loudspeakers, but does not optimize the array effect in that area of the spectrum which would be quite unrealistic, considering that, at high-frequencies, transducers no longer have the precision phase they normally display at midrange frequencies. This involves a deviation from the theoretical behaviour of a line array.

Additionally, high frequencies are considerably "restrained" by the presence of obstacles, the audience first and foremost. This is why, as already mentioned, the audience in the last rows will hear the high frequencies especially from the loudspeakers positioned in the top part of the column. This explains why, in a real-life situation, high frequencies are subject to a strong attenuation over distance - due to audience absorption and air dissipation -, while for an ideal (continuous) array these frequencies would spread more efficiently in a free field as compared to the rest of the spectrum.

The theory of arrays combined with the analysis of high frequency behaviours leads to the validated assumption of a slight shortfall in low and very high frequencies at considerable distances in response to active stack systems, while the midrange frequencies are efficiently spread. For this reason the default settings should be used (selecting between *short throw* and *long throw* on the rear panel of the PSUTBASE/A), allowing the user to handle the problem by deciding whether to optimize the near or far frequency response. See more in the following paragraph.

4.5 Presetting

There are two buttons on the back panel of the PSUTBASE/A to select any of the *4* default *presets* for different systems or situations.
The "A" switch is used to select the right equalization for the configuration of the system being operated (*UT Active Stack 1_1 system* or *UT Active Stack 2_1* system). See figure 15.
The "B" switch is used to select between two different timbres for both systems (with 1 or 2 PSUT8xx), thereby introducing a dedicated timbre for the particular system selected with the "A" switch.
For both systems, the near throw results in a transfer function optimized at *7 meters* while the long throw transfer function is optimized at *14 metres*. Normally, the first setting gives a more balanced response in an area up to 10 metres, while the second one is best selected for areas from 10 to 20 metres.

These timbres can also be selected for different reasons, such as the type of music or personal taste, for example. In particular, the timbre produced by the long throw setting could be used for both distant optimization and at close range to obtain a loudness effect, when playing music at low volumes or for dance music reproduction. See figure 16.

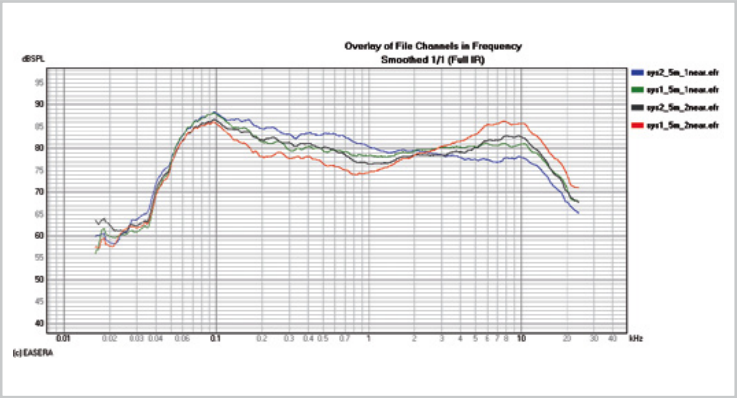

Figure 15. This chart shows the frequency response (distance of 5 meters in a closed environment, with the microphone at a height of 1.6 meters) for two systems: 1) Active Stack 1_1, with the correct presetting (for 1 PSUT8xx) and the incorrect one (for 2 PSUT8xx), respectively the green and the red curve; 2) Active Stack 2_1, with the correct presetting (for 2 PSUT8xx) and the incorrect one (for 1 PSUT8xx), respectively the black and blue line. Please note the importance of selecting the correct presetting for a balanced frequency response (green and black curves)

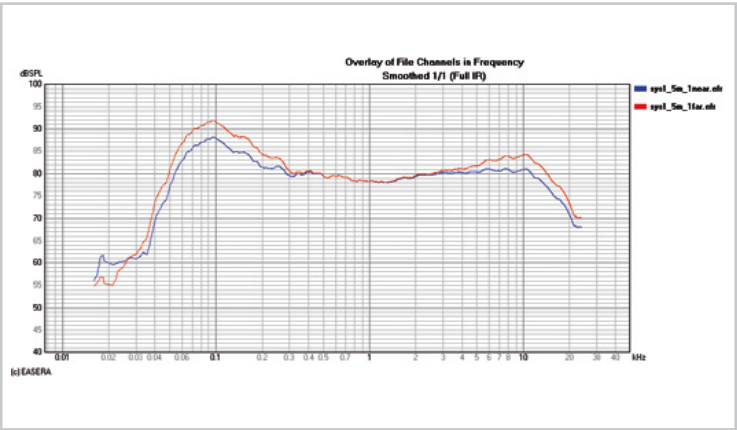

Figure 16. This chart shows the frequency response (distance of 5 meters in a closed environment, with the microphone at a height of 1.6 meters) with the near and long throw presetting, respectively the blue and the red curve

4.6 Concurrent use as stage fill and main P.A.

UT Active Stack systems are perfect for simultaneous use as a *main P.A.* and *stage fill* and can be installed at the back of the musical performance to cover the areas used by the artists and the front audience stalls.
Its main features are: the particular horizontal coverage of the sound field created by the UT Active Stack systems (allowing coverage of the performers in an angled position too); a blander sound decay over distance as compared to the standard point source (due to the vertical array configuration that generates adequate sound pressure levels on the stalls without forcing excessively high levels on stage) and a perfect response of the transducers without excessive resonances (making them extremely "resistant" to the Larsen effect generally triggered by the microphones on the stage).

The PSUT8xx loudspeakers and the PSUTBASE/A self-powered subwoofer are therefore perfect for medium/small clubs where live music is played without the necessary facilities to ensure good listening both on stage and for the public, that is any situation in which there are no on-stage monitoring systems or sound engineers to handle them. A single 1_1 or 2_1 system placed at the back of the stage allows the artists to manage sound, knowing that the sound will be the same as that heard by the audience. This is especially true during jam sessions, which frequently take place without an external p.a. manager. In such cases, this is a winning solution, providing consistently high quality (a good sound to the artists improves their performance) and an extremely user-friendly installation (the system is extremely portable and can be quickly uninstalled, to be used again as required).

We would like to stress that, for live music, the separate use of the two-channel stereo is purely related to marginal considerations about the effects. This system does not perform a sound-related spatial function as for home Hi-Fi reproduced sound (listening from a precise point at the same distance from two L and R loudspeaker systems), hence having a single sound emission point represents no drawback, especially for small-scale live situations. One single sound point covering the entire room is actually rather convenient for places where only two cables are available and usually very short ones: high quality sound that is clear and well-spread right to the back of the venue can be obtained *by adding to the active stack systems a small professional mixer with incorporated ambient effects*.
Two active stacks (sub + sound columns) are only required when the sound coverage provided by a single one is not enough (all the technical details are explained in the table below).

Regardless of these considerations, UT *Active Stack* systems can obviously be positioned at the front of the stage and used in a traditional left/right configuration.

4.7 Live applications: considerations

Upturned T *active stack systems* are perfect for acoustic live performances where they provide an excellent performance/dimensions ratio.

The timbre and the dynamics of active stack systems are highly satisfactory for acoustic guitar amplification, producing a vivid, authentic sound and excellent feedback to the performer. The same applies to acoustic bass or contrabass (which will not require any bulky dedicated amp). Amplification of the human voice is strong and clear and is particularly resistant to the *Larsen effect*.

Active stack systems are also recommended for live sound reinforcement in small indoor venues. In this case, as usual, the sound of guitars and electric bass guitars will come from the single amplifiers while the active stack system will be used for the amplification of voices (and - *why not?* - for bass drum reinforcement). This configuration can once again be placed behind the performer and thus act as a monitor as well.

4.8 Differences between the UT 1_1 and 2_1 Active Stack systems

As explained in paragraph 3.2, the *Active Stack 2_1* system has a longer range as compared to "half-length systems" (*Active Stack 1_1*).
This is due to the greater extension of the array (and therefore greater in-depth penetration of the array effect at lower frequencies) as well as to the higher position of the topmost loudspeakers.

The *2_1* system has more loudspeakers angled at 20 ° and 30 ° and thus the horizontal dispersion is greater in the near-field. Furthermore, the sound beam generated by this system in the near field is wider vertically and allows a greater homogeneity of sound at different heights (e.g. between sitting and standing audience).

For this reason, we recommend the use of *Active Stack2_1* systems when the audience sits near the sound systems, when the stalls are sloping, when the audience is partly seated and partly standing as well as when there is a crowded standing audience and a need for a deep penetration of the high frequencies.

The *2_1* system additionally reaches a higher peak pressure (greater "dynamic") on the medium-low frequencies (150 Hz - 300 Hz) due to the coupling of twice the number of transducers (+ 4-5 dB), which is always useful but especially in cases of music with a strong element of percussion.

The *1_1* system, on the other hand, is best for an audience that is not sitting very close to the systems, for standing audiences that are not crowded over very large areas or do not need high peaks of the medium-low frequencies.

1_1 systems are suitable for creating a small portable dance floor, for example, since the required punch for dance music is supplied by the subwoofer and the PSUT8TE column element is more than adequate for the rest of the signal spectrum.
For a larger system, we recommend doubling this installation, rather, i.e. using the *Active Stack 1_1_stereo* system.

For a small stage with monitors and P.A.s for "acoustic" music and where the size of the audience stall is not excessive, a *1_1* system is just as performing (all the technical details are explained in the table on the right).

4.9 Summary table

The following table refers to the use of active stacks.

SYSTEM	APPLICATION AND USE	COVERAGE AND DISTANCE	REMARKS
UT Active Stack **1_1_mono**	A) Placed at the back of the stage (works as both a monitor and a P.A.) *Jazz/Unplugged music/Jam session* *Rock/Blues indoor* (only voice amplification)	Stage width: **4-5 m** Maximum distance of the furthest listener: **16 m**	A slightly angled and off-centred position can optimize the stage coverage. Dedicated amplifiers for acoustic bass/contrabass are not required
	B) Placed at the front of the stage (main P.A.)	/	Strictly not recommended
	C) Portable system for deejays and entertainers	**40 sqm**	Position in a corner of a square dance floor and direct at 45°
UT Active Stack **1_1 stereo**	A) Placed at the back of the stage (works as both a monitor and a P.A.) *Jazz/Unplugged music/Jam session*	Stage width: **7-8 m** Maximum distance of the furthest listener: **24 m**	Join up the tracking directions, possibly cross them in the middle of the room until a correct coverage of the stage is obtained. Dedicated amplifiers for acoustic bass/double bass are not required
	B) Placed at the front of the stage (main P.A.) *Jazz/Unplugged music* *Rock/Blues indoor*	Maximum distance of the furthest listener: **24 m**	Evaluate the tracking directions based on the width of the audience stall. Lower front-fill requirement as compared to standard systems
	C) Portable system for deejays and entertainers	**80 sqm**	Position in a corner of a square dance floor and direct at 45°
UT Active Stack **2_1_mono**	A) Placed at the back of the stage (works as both a monitor and a P.A.) *Jazz/Unplugged music /Jam session* *Rock/Blues indoor* (only voice amplification)	Stage width: **5-6 m** Maximum distance of the furthest listener: **24 m**	A slightly angled and off-centred position can optimize coverage of the stage. Dedicated amplifiers for acoustic bass/double bass are not required. As compared to the *Active Stack 1_1_mono*: - increased range, especially with a large standing audience; - better listening for musicians in near and lateral positions (i.e. drums); - vertically more extended sound field (musicians sitting and/or sloping audience stalls); - increased medium-low frequency dynamics.
	B) Placed at the front of the stage (main P.A.)	/	Strictly not recommended
UT Active Stack **2_1_stereo**	A) Placed at the back of the stage (works as both a monitor and a P.A.) *Jazz/Unplugged music/Jam session*	Stage width: **8-10 m** Maximum distance of the furthest listener: **32 m**	Join up the tracking directions, possibly cross them in the middle of the room until a correct coverage of the stage is obtained. Advantages as compared to the *Active Stack 1_1_stereo*: - increased range, especially with a large standing audience; - better listening for musicians in near and lateral positions (i.e. drums); - vertically more extended sound field (musicians sitting and/or sloping audience stalls); - increased medium-low frequencies dynamics.
	B) Placed at the front of the stage (main P.A.) *Jazz/Unplugged music* *Rock/Blues indoor*	Stage width: **9-12 m** Maximum distance of the furthest listener: **32 m**	Evaluate the tracking direction based on the width of the audience stall. Lower front-fill requirement as compared to standard systems. Advantages as compared to *Active Stack 1_1_stereo*: - increased range, especially with a large standing audience; - vertically more extended sound field (public sitting and sloping audience stalls); - increased medium-low frequencies dynamics.

5. USER'S GUIDE FOR UT PASSIVE SPEAKERS

The **PSUT8TE**, **PSUT8AE**, **PSUT1** and **PSUTS** passive loudspeaker systems are designed to perform properly even in the absence of external processors. However, the use of a processor is useful in all cases where there is a need to protect the loudspeaker systems and boost their performance to the full as well as provide high sound quality. Managing the amplifier inlet voltage is very important to avoid damaging the passive components with excessively powerful signals or signals that are not suitable for acoustic transducers. *How* and *why* this is done, is explained in the following paragraph.

On the other hand, it is impossible to protect the speakers from harmful phenomena originating from within the amplifier by acting on the incoming audio signal to the amplifier. If a malfunction of the amplifier generates DC or very low frequency voltage current, this could be harmful to the transducer regardless of the input signal. Similarly, the transducers can be damaged by high voltage peaks due to switching ON or OFF devices located upstream of the amplifiers, with the amplification ON. In fact, when powering an electro acoustic system, it is important *to switch on the amplifiers only after the mixer and the control electronics have been turned on* and power supply has stabilized. When turning off the system, the reverse sequence should be carried out by *first turning off the power amplifiers*.

Therefore, we recommend that you protect the inlet signal, control and maintain the audio system and comply with the correct on/off sequence of all devices in the audio chain.

5.1 Amplification and limitations

In most cases, too much power can damage the transducer coil by generating excessive temperatures (high RMS power over an extended period), and/or, more rarely, break the mechanical part of the loudspeaker (diaphragms, suspensions). Furthermore, frequencies below the reflex tuning frequency – for speakers built with this kind of design – could cause excessive and unnecessary excursions in the loudspeaker cone and damage it as a result. So, external processors capable of cutting and limiting the frequency are always recommended to protect the woofers and optimize their efficiency.
It is the user's responsibility not to feed into a passive speaker signals likely to damage the transducers. For this purpose, we recommend the use of Peecker Sound **PS266** digital processor or **PSDSP series** amplifiers with DSP on board.
The purpose of using amplifiers and limiters of the correct size is so that passive speakers can achieve the maximum performance without the risk of damage. For maximum performance, or for maximum transducers' yield at the peak of the signal, a good rule of thumb is to use *a double-power amplifier channel* (so-called "oversized") as compared to the admissible RMS power for transducers. To protect the coil of the transducer, a limiter is required to prevent exceeding RMS power for long periods of time.

In general, *an amplifier with lower power than that one accepted by loudspeakers ("undersized" amplifier) will not provide protection to the transducers unless there is electronic limitation*. Even an undersized amplifier can in fact reach the clip or the "squared" (or "shearing") of the output signal, if the input signals are excessively high - consequently, the power delivered is higher compared to the nominal rating of the amplifier and undesirable time intervals characterized by direct voltage occur; these effects are particularly harmful to acoustic transducers. These fatal conditions for transducers are paradoxically more likely to happen with small amplifiers, since a user who prefers quantity over quality will unconsciously try to drive them beyond their capacity, because of the reduced power output in normal conditions, causing the clip and the above-mentioned conditions. The problem becomes less significant with the presence of anti-clip internal amplifiers, such as Peecker Sound **PS1000** (see paragraph 5.2). To get the most dynamic performance, as explained above, we recommend using over-sized amplifiers with limited input by means of the limiting functions of the external processor.

Please note that with standard music signals, where the *crest factor* (difference between the peak power and RMS) usually averages around 9 dB, the use of over-sized amplifiers (even twice the nominal power handling supported by the speakers) duly piloted without "clip" and without heavy anti-clip limitations is sufficient to protect the transducers, ensuring safe use and enhancing their dynamic qualities to the full.
Please Note: this approach does not protect the transducers from general audio signals and signals with low crest factors such as pure tones (e.g. prolonged *Larsen effects*) that can cause excessive RMS voltage and burn out the transducers.

For configurations involving the use of Peecker Sound external processors and amplifiers, the specific presettings with the required limitations are provided (see *System configuration* section of the Upturned T series). For configurations with the PS1000 amplifier, the anti-clip limiter onboard the amplifier must be activated and a number of basic instructions must be followed at all times. If different amplifiers are used, users are responsible for complying with the foregoing provisions and may contact Sound Corporation service staff for assistance at any time.

5.2 PSUT1 and PSUTS systems with PS1000 amplifiers. Operating instructions

The *full-range* configurations formed by **PSUT1** and **PSUTS** speakers can be correctly driven by using a **PS1000** amplifier (see paragraph 6: "System configurations"). Use of a processor is not normally required for this type of configuration. Therefore, no specific protections are available against failures/damages to the transducers. The PS1000 model provides 450 W per channel on 4 Ohm, and 280 W per channel on 8 Ohm, which is duly over-sized for piloting all the configurations in the table below (see paragraph 5.6).

The *anti-clip* function available on PS1000 amplifiers will protect the system against any distorted signals. However, it is important to maintain the signal so that the red light of the clip will only turn on once in awhile. Note that the clip signal is a precautionary device designed to activate as soon as the signal falls slightly below the real clip - so it will activate even if an anti-clip limiter is installed. Any incorrect use with excessively high input signals will repeatedly and continuously activate the anti-clip, generating low quality sound, weak dynamics, as well as causing overly strong RMS on the PSUT1 loudspeaker or excessive excursion of the PSUTS, with potential breakdown.
We recommend using PS1000 amplifiers with the limiting function activated at all times but within its linear range so as to keep good music quality and protect the transducers at the same time.

Furthermore, PSUT1 and PSUTS loudspeakers, when combined with PS1000, are not protected from stationary audio signals and at a low peak values such as pure tones arising from prolonged *Larsen effect*.

5.3 "Exterenal" presets

For configurations involving the use of Peecker Sound external processors and amplifiers, the specific presettings are provided by the factory together with their reference limits. These default settings can be downloaded from www.peeckersound.com and are also found in the sections dealing with *System configurations* of the Upturned T series.

5.4 Connections

• PSUT8xx
PSUT8TE and PSUT8AE sound columns have a direct-contact plug on the bottom – the PSUT8AE also has a socket at the top – for use in stacked system installations.

The passive versions of these columns (that is without the active subwoofer PSUTBASE/A) can be connected to an amplifier through a 4-pole *SpeakOn* connector (full-range signal on pins 1+ and 1-) using the PSUT8-AC accessory. The PSUT8-AC accessory consists of a wooden base equipped with butterfly hooks and output socket for direct connection to the bottom face of the lowest PSUT8xx element in the stack; it can be also installed on a floor stand and acts as an adapter thanks to a SpeakOn "female" socket on the rear side (see figures 17 and 18).

Figure 17. PSUT8-AC accessory, base for PSUT8xx models, with SpeakOn female connector

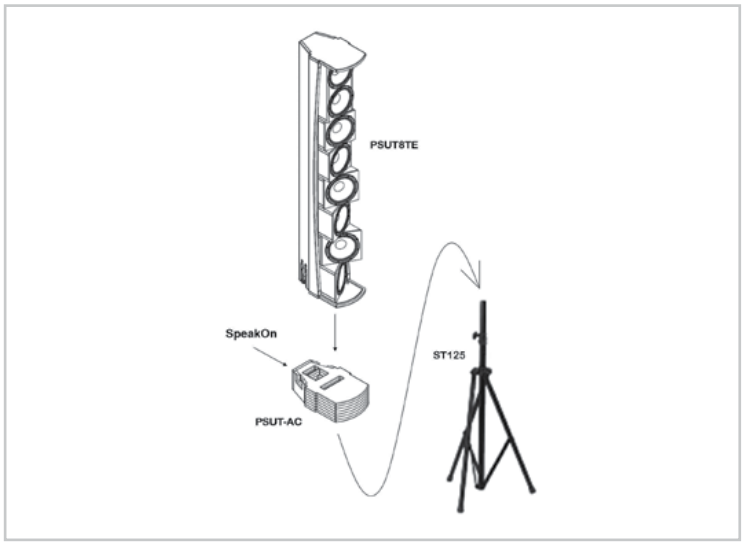

Figure 18. PSUT8TE positioning on stand holder using PSUT8-AC accessory

• PSUT1 and PSUTS
The PSUT1 micro-speakers and the PSUTS subwoofer can be connected - through a set of two standard *red/black* spring clamps - by inserting the speaker cable without use of any connector. The PSUTS subwoofer has two sets of clamps internally wired together to allow for easy parallel connection of another sub and/or a system made up of several PSUT1 micro-speakers. The PSUT1 satellite has only one set of spring connectors to be also used for multiple connections (as shown in figure 19).

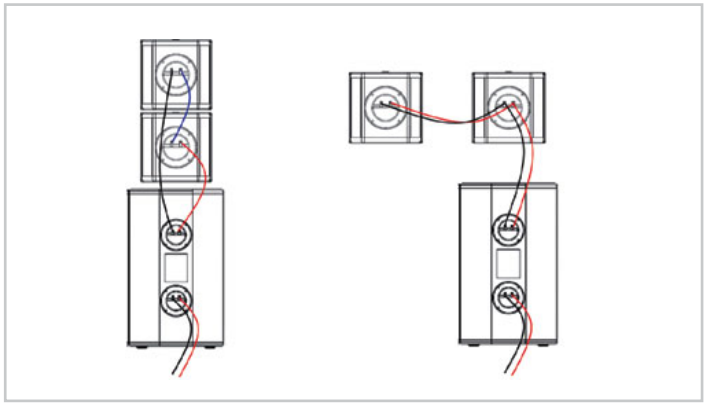

Figure 19. Connections between PSUT1 and PSUTS. 2 PSUT1 in series (left), 2 PSUT1 in parallel (right)

5.5 PSUT1 and PSUTS full-range connection

As an amplifier designed for operating loads of no less than 4 Ohm is highly likely to be used, we list below the possible connections for using PSUT1 and PSUTS in *full-range* (a single amplifier channel for sub and satellite) to obtain a good frequency response (depending on the geometry of the installation) without creating nominal loads below 4 Ohm.
Due to the presence of passive filters, it would be incorrect to calculate the parallel impedance of PSUTS and PSUT1 simply as in the case of two parallel resistors (because we would underestimate it).

The following list of connections is therefore based on the real impedance measured for the systems assembled as stated. Here, we refer to a single - *left*, *right* or *mono* - amplifier channel (with a *stereo* amplifier the related stereo configurations can be obtained by using double the number of speakers).

Number of PSUTS and type of connection	Number of PSUT1 and type of connection
0	UP TO 4 IN PARALLEL
1	1
1	2 IN SERIES
1	2 IN PARALLEL
2 IN PARALLEL	4 WITH A MIXED PARALLEL AND SERIES CONNECTION

Please Note: all the PSUTSs and PSUT1s are always connected **in parallel** using the dual connectors supplied with PSUTS subwoofer.
As shown by the table, configurations with a concurrent presence of (even just) one subwoofer and more than 2 satellites - connected in parallel - on the same amplifier channel are not admissible.

When using bi-amplification, on the other hand, it is possible to connect up to 4 PSUT1 satellites in parallel to one amplifier channel (single load = 16 Ohm) and up to 2 PSUTS subwoofers on the other channel (single load = 8 Ohm). Bi-amplification requires the use of a processor in order to separate the frequencies (crossover), limiting the signal and providing sound optimization.

For stereo configurations, Peecker Sound **PS650-F** 4-channel amplifier with **PS266** processor or a set of two Peecker Sound **PSDSP series** amplifiers can be used (see paragraph 6: "System configurations").

5.6 Installation of passive systems from a functional and acoustic point of view

• PSUT8TE e PSUT8AE

Besides forming active stack configurations together with the active PSUTBASE/A subwoofer, the PSUT8TE and PSUT8AE column speakers can be installed, single or in a stack, without any subwoofer and powered by external amplifiers. For this passive application, please revert to the general description of the PSUT8TE and PSUT8AE speakers under paragraph 3.1. Passive applications require use of a PSUT8-AC unit and dedicated wall-mounting accessories if needed (as shown in paragraph 5.4).

Up to 4 column elements (3 PSUT8AE + 1 PSUT8TE) can be stacked (direct connection, total impedance of 4 Ohm) *and powered with a single amplifier channel of suitable capacity* (see paragraph 6: "*System configurations*").

The UT series passive column speakers are perfect for *speech* or *background music reproduction* in conference rooms, exhibition halls or places of worship. Thanks to the strong vertical confinement of the sound, a single cluster configuration (max. 4 elements) is perfect for creating sound texture in acoustically difficult environments or places where the audience layout is on different levels.

For wall-mounted stacks a dedicated C-shaped support is required for joining two PSUT8xx elements, which is included in all STD-WUT8 wall bracket packages. In this configuration, the PSUT8-AC converter must be hooked to the lowest element for SpeakOn connection (see paragraph 5.4). The system can be vertically tilted up to a certain angle depending on the length of the stack (figure 20).

Sound applications in larger venues with the audience layout on a flat surface may require the use of several sound points made up of individual PSUT8TE elements. In this case, each point must be equipped with one PSUT8-AC unit for SpeakOn connection and one STD-WUT8 unit for wall mounting (see paragraph 5.7 for a description of all rigging accessories).

• PSUT1 e PSUTS

The following list of concepts represents the basic guideline as far as choice, positioning and connection of PSUT1 and PSUTS systems are concerned. The following text is always referred to a single amplifier channel: left, right or mono (if a stereo amplifier is available, stereo configurations can be obtained by doubling the number of the speakers).

All the configurations listed below are designed with the sub on the floor or suspended near the ceiling. The installation of a subwoofer at mid-height of a room is strongly discouraged since it would involve a loss of quantity and quality at low frequencies which would be hard to compensate.

a) A system made up of **1 PSUTS + 1 PSUT1** per channel creates a tonally balanced system. If the two speakers are in contact (e.g. the PSUTS suspended from the ceiling and the PSUT1 screwed under or beside it), the phase relation in the crossover zone will be correct and optimized, ensuring adequate acoustic energy around the crossover frequency;

b) A system consisting of 1 **PSUTS + 2 PSUT1** per channel **with the two PSUT1s screwed together and connected in series** forms a system with optimized timbre as compared to the previous one, thanks to the acoustic coupling between the two PSUT1s. In this case, all the power is distributed over two PSUT1s, improving linearity and protecting the transducers against borderline acoustic pressure of the system. The horizontal coverage will be broader and adjustable through single orientation of each PSUT1. Parallel connection of the 2 PSUT1s is possible with this geometric solution, but we do not recommend it.

   The recommended maximum physical angle between the 2 stacked PSUT1s is 40°-45°: this angle will produce good horizontal dispersion without creating excessive high frequency shortfalls on the bisector.

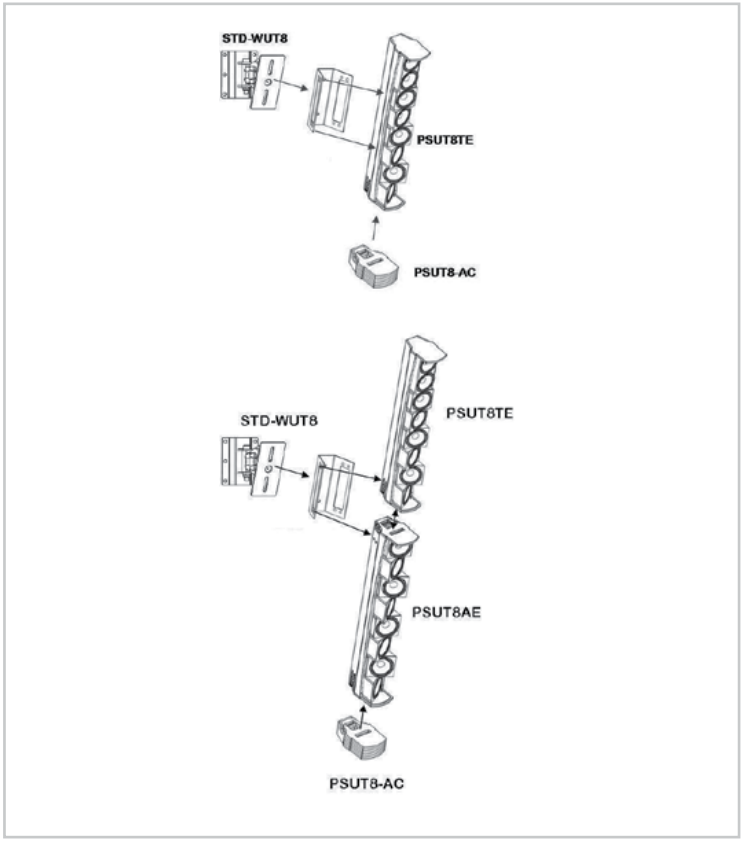

Figure 20. "Wall stack" system (with one and two sound columns) installed using the STD-WUT8 bracket

c) A system made up of **1 PSUTS + 2 PSUT1** per channel **with PSUT1 elements not physically in contact** may be a better solution than the latter for larger areas where various sound emission points are required. In this case, timbre of PSUT1s in parallel connection may possibly be better balanced than the series one, in relation to the geometry of the environment and the installation;

d) The assembly of **PSUT1 4-element clusters** allows for more varied and versatile orientation of the single elements and crates a partial array effect (in other words: it emphasizes vertical directivity) increasing sound intelligibility in reverberant environments. Furthermore, the cluster made of 4 units, without subwoofer, will produce a deeper sound texture, thanks to a better medium-low frequency coupling. The use of clusters without a subwoofer is perfectly suited to speech and background music reproduction.

Below is the same table as the one appearing in paragraph 5.5 with some additional guidelines on installation from an acoustic point of view.

NUMBER OF PSUTS	NUMBER OF PSUT1	INSTALLATION	REMARKS
0	**UP TO 4 IN PARALLEL**	Single, in sets of 2 or clusters of 4 PSUT1	Speech or background music. Various elements in a cluster produce bass reinforcement and hence deeper sound and better clarity at distance
1	**1**	Sub and satellite combined (sub on the ceiling) or sub on the floor	Basic sound reinforcement system
1	**2 IN SERIES**	All combined (sub on ceiling), or sub on the floor and the two satellites combined. The satellites are individually adjustable	Basic sound reinforcement system with improved timbre and better performance at maximum power; also wider coverage on high frequencies thanks to the two individually adjustable PSUT1 modules
1	**2 IN PARALLEL**	Same as above, but with separate satellites spread across the listening environment	Recommended when several sound points are required to cover a large area. The choice between *series* or *parallel* connection will depend on the frequency response obtained in the specific listening environment
2	**4 IN MIXED PARALLEL AND SERIES CONNECTION**	2 subs on the floor, side-to-side, and clusters of 4 satellites in sets of 2 by 2	Increase of 4-5 dB sound pressure as compared to the previous configurations by the same amplification. The choice of the geometric configuration will depend on the room. Angles must be adjusted to the desired timbre/coverage

5.7 Rigging Instructions

Listed below are the dedicated UT series accessories for the fastening of passive systems.

PHOTO	CODE	DESCRIPTION
	**STD-WUT8**	Wall brackets for vertical hanging of PSUT8TE or PSUT8AE loudspeakers
	**STD-WUT1**	Wall bracket for vertical hanging of 1 or 2 PSUT1 loudspeaker systems (H and V rotation of 180°)
	**PSUT8-AC**	Wooden base for PSUT8xx with butterfly hooks. Direct-contact output socket and *SpeakOn* input connector
	**STD-PSUT124**	Bracket for hanging 2 or 4 PSUT1 loudspeaker systems (stacked or set horizontally, side-to-side)
	**STD-PSUTS**	Bracket for hanging one PSUTS subwoofer
	**PS-ST125**	Adjustable tripod stand for one PSUT8TE sound column (requiring the additional PSUT8-AC accessory)

5.8 Power cables - section/length table

It is very important to use power cables of appropriate section. The length of the cable causes a significant impedance that can deplete the audio signal and change the *dumping factor* of the amplifier-speaker couple.

The following table shows the recommended section based on power cable lengths for different transducer impedances.

	Maximum Length	
CSA section	*4 Ohm*	*8 Ohm*
1.0 mm²	**11 m**	**22 m**
1.5 mm²	**17 m**	**34 m**
2.0 mm²	**22 m**	**44 m**
2.5 mm²	**29 m**	**58 m**
4.0 mm²	**44 m**	**88 m**
6.0 mm²	**66 m**	**132 m**

5.9 High-volt lines (100 Volt)

The definition of *high-volt line* stands for conductors in which the audio power signal is transported at high volt and low current ratings (obtained through the high impedance of the transformers available in each loudspeaker), in order to limit power dissipation down the line when small section cables can be used (1.5 - 2.5 mm).
The value of *100 V* is referred to RMS voltage of the audio power signal that is delivered by the amplifier. This high voltage signal is then processed by each speaker and translated into its suitable voltage.

PSUT1 and PSUTS speakers can be installed on 100 Volt network lines (with 100-Volt amplifiers) if equipped with the optional TRA-PSUT1 and TRA-PSUTS transformers. On request, these transformers are installed inside each speaker by the factory, during production process. Alternatively they can be fitted by the installer by carefully removing the transducer as instructed in the user's manual of the manufacturer.

Several speakers can be connected to the same line up to reaching the electric power supplied by the amplifier, without affecting the maximum power delivered by the amplifier or jeopardizing its performance.

6. SYSTEM CONFIGURATIONS

6.1 UT Active Stack configurations

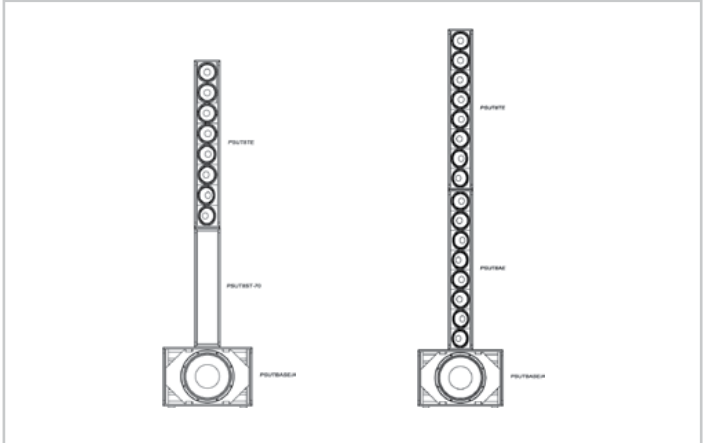

Figure 21. UT Active Stack 1_1_mono system configuration (left), UT Active Stack 2_1_mono system configuration (right)

6.2 UT Passive configuration

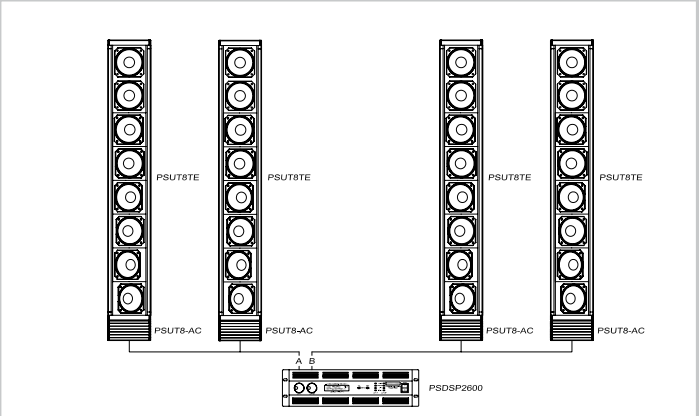

Figure 22. System configuration 2_0_stereo (with PSDSP2600)

6.3 PSUT1 + PSUTS configurations

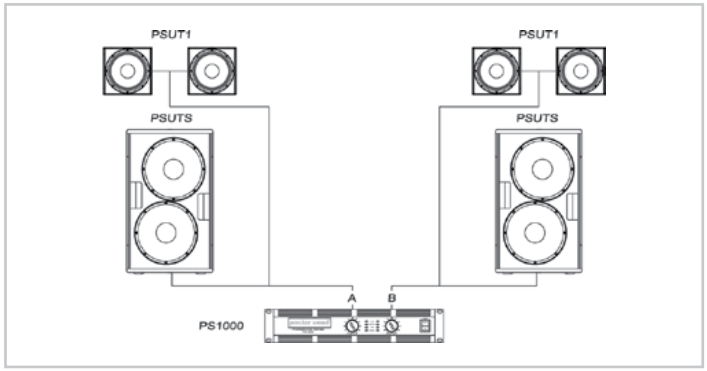

Figure 23. System configuration 2_1_stereo
(Series and Parallel connections, with PS1000)

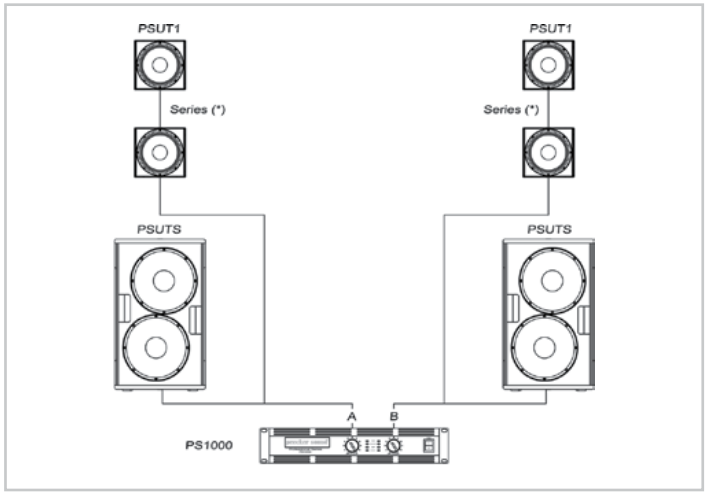

Figure 24. System configuration 4_2_ stereo
(with PS1000)

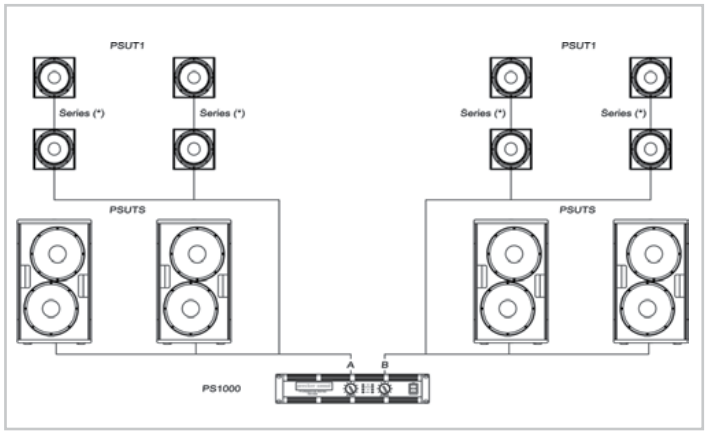

Figure 25. System configuration 4_2_BiAmp_stereo
(with PS650F and PS266)

6.4 Surround configurations

The configuration *Surround 1* is designed for sound reinforcing outdoor cinemas with a portable system, without the need of hanging speakers and with the ability to enjoy the surround sound effect and the L.F.E. (*Low Frequency Effect*) channel present on video supports.
We offer a system that provides a sound quality and coverage definitely better than standard audio solutions on the market for this type of applications, whilst ensuring the comfort of a temporary installation thanks to active stack systems: no floor stand holder, no height adjustments, no heavy weights to carry around and no power cables throughout the front.
In addition, the speaker in the middle is perfectly arranged to deliver a full and rich voice to the whole audience, as explained under paragraph 3.2.

The configuration *Surround 2* is designed for hi-end home theaters, i.e. real halls hosting up to 20-25 people where high and accurate sound pressure levels are required. As compared to *Surround 1*, the middle speaker should be a little lower in this configuration, as it must fit right above or below the screen, if the latter is assumed to lack acoustical transparency.
The solution we propose is a cluster of PSUT1 micro-speakers radially arranged, so as to create the right opening of the sound beam and cover the entire audience. Two cluster of 4 PSUT1 elements are proposed as surround speakers.

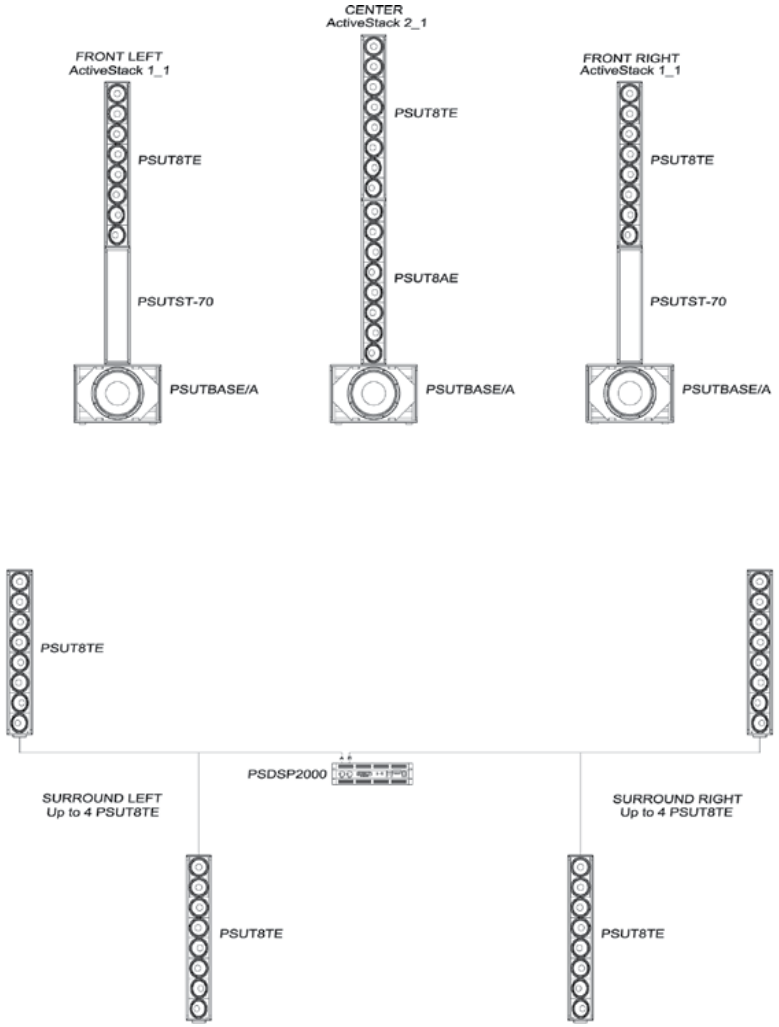

Figure 26. Surround 1 configuration with PSUT8TE, PSUT8AE and PSUTBASE/A

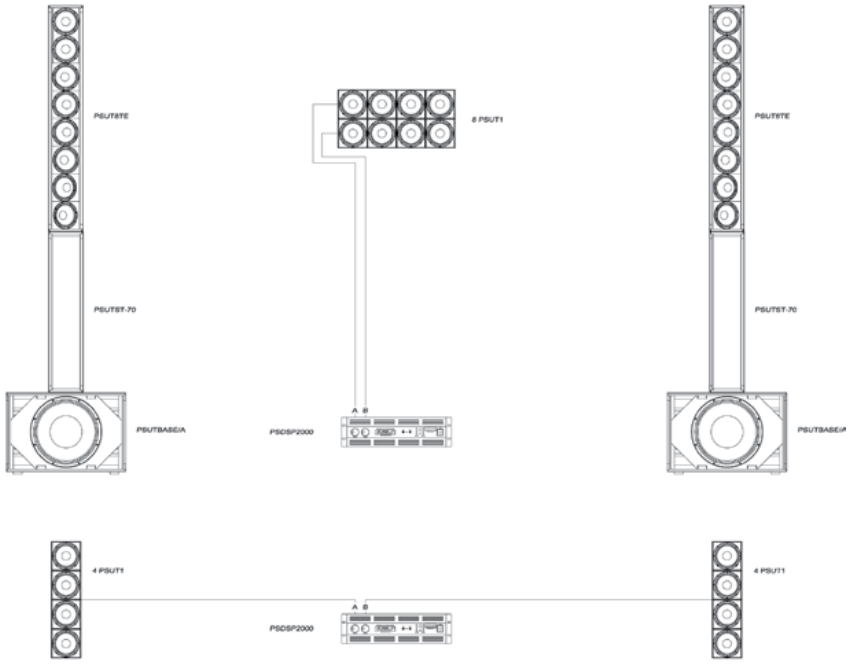

Figure 27. Surround 2 configuration with PSUT8TE, PSUTBASE/A and PSUT1