Version 3.0
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dV-DOSC
dV-SUB
OPERATOR MANUAL

FOREWORD

This manual is intended for sound engineers who are responsible for the installation and operation of the dV-DOSC sound reinforcement system. It is also intended to provide interested sound designers, consultants and installers with information regarding the fundamental principles of Wavefront Sculpture Technology® and how these principles are embodied within dV-DOSC. Specifications, installation procedures and general guidelines for sound design and system operation are also discussed in this document.

MANUAL ORGANIZATION

- The Introduction gives a brief presentation of dV-DOSC and presents the fundamentals of Wavefront Sculpture Technology
- Chapter 1 introduces the elements of the dV-DOSC system standard
- Chapter 2 describes dV-DOSC array performance and coverage prediction
- Chapter 3 discusses sound design issues including subwoofer arraying techniques
- Chapter 4 gives detailed procedures for stacking and rigging dV-DOSC
- Chapter 5 lists recommended installation and maintenance tools
- Chapter 6 provides dV-DOSC system specifications
- Appendices elaborate on a number of technical aspects and provide additional theoretical details

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INTRODUCTION

The small "d" in dV-DOSC refers to the mathematical terminology for the derivative function since dV-DOSC can be considered as a derivative of V-DOSC. dV-DOSC provides the same benefits of Wavefront Sculpture Technology as V-DOSC except in a much smaller format.

We hope this manual will help you to understand the basic theoretical principles behind how the dV-DOSC system works. Understanding these principles will help you to optimally use dV-DOSC and dV-SUB in sound design – whether for touring or fixed installation. Understanding the concepts behind dV-DOSC and Wavefront Sculpture Technology are just as important as learning the many operational details related in this manual – the more you understand the big picture, the more effectively you will use the system.

dV-DOSC is a complete system approach – starting from the basic scientific question of how to effectively couple sound sources then including all aspects of performance prediction, sound design, system installation, rigging, cabling, signal distribution, digital signal processing and system tuning. This turnkey system approach allows for accurate and predictable results, however, in order to achieve the best results you need to understand the theoretical concepts behind how the system works and adopt a methodical approach to sound design and installation. For these reasons, specialized training is necessary to obtain the best results with the system. Some people think that working with dV-DOSC is complicated but once you understand the procedures involved, you save time and - more importantly - obtain better, more predictable results.

Apart from sound quality and the turnkey system approach, there are many other benefits to dV-DOSC. Many readers are already aware of these – if not, hopefully they will become apparent throughout the course of this manual.

WAVEFRONT SCULPTURE TECHNOLOGY™ FUNDAMENTALS

The Sound Reinforcement Problem

The first task of sound engineers and audio consultants is to design sound reinforcement systems for a given audience area. Performance expectations in terms of sound quality, sound pressure level (SPL) and coverage consistency have progressively increased over the years while at the same time the size of the audience has grown, inevitably leading to an increase in the number of loudspeakers.

In the past, conventional horn-loaded trapezoidal loudspeakers were typically assembled in fan-shaped arrays according to the nominal horizontal coverage angle of each enclosure in an attempt to reduce coverage overlap that causes chaotic interference. With this type of arrangement, the optimum clarity available in one direction could only be provided by the individual enclosure facing in this direction. Attempts at "flattening the array" to achieve greater throw and higher SPLs resulted in severe interference in an uncontrolled way, affecting coverage, pattern control, intelligibility and overall sound quality. Even when arrayed according to specification (always an "optimum" compromise since the polar response of individual horns varies with frequency), the sound waves radiated by individual horn-loaded loudspeakers do not couple coherently thus the conventional system approach is fundamentally flawed. Furthermore, the chaotic sound fields created by interfering sound sources waste acoustic energy, thus requiring more power than a single, coherent source would in order to obtain the same SPL.

As an illustration of this, imagine throwing some pebbles into a pool of water. If one pebble is thrown into the water, a circular wave will expand concentrically from the point where it entered. If a handful of pebbles are thrown into the water, we observe the equivalent of a chaotic wavefront. If we throw in a single larger stone, having total size and weight equal to the handful of pebbles, then we again see a coherent circular wave as for the case of the single pebble — only now with a much larger amplitude. If all of the individual pebbles could be glued together, this would provide the same effect as the larger stone...

This illustrates the thinking behind dV-DOSC and V-DOSC: if we can build a single sound source from a number of individual speakers that can be separated for transport and handling, then we have achieved our goal, i.e., to provide a totally coherent, predictable wavefield.

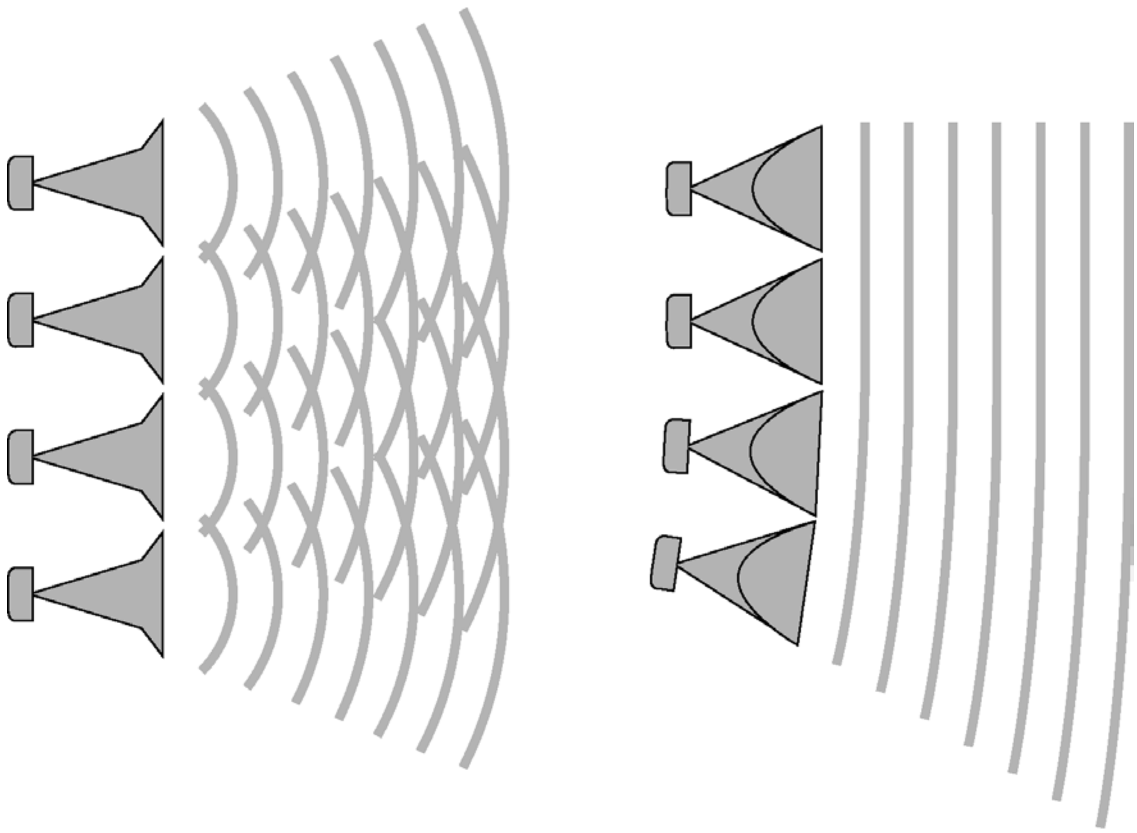

Figure 1: Wavefield interference for a conventional sound reinforcement system compared to a sculptured dV-DOSC wavefield

Wavefront Sculpture Technology Background

As early as 1988, a preliminary system named "Incremental" had proven the feasibility of Wavefront Sculpture Technology. From this experimental concept, further theoretical research was conducted by Professor Marcel Urban and Dr. Christian Heil and findings were published in 1992 ("Sound Fields Radiated by Multiple Sound Source Arrays", AES #3269).

The theory that was developed defines the acoustic coupling conditions for effectively arraying individual sound sources. Relevant parameters include: wavelength, the shape and surface area of each source, the curvature of the wavefront radiated by each source and the source separation.

WST coupling conditions can be summarized as follows:

An assembly of individual sound sources arrayed with regular separation between the sources on a plane or curved, continuous surface is equivalent to a single sound source having the same dimensions as the total assembly if, and only if, one of the two following conditions is fulfilled:

1) Shape: The combined surface area of the wavefronts radiated by the individual sources of the array fills at least 80% of the target radiating surface area (see also Condition 3)

2) Frequency: The source separation, defined as the distance between acoustic centers of the individual sources, is smaller than half the wavelength at all frequencies over the bandwidth of operation (generally, this criteria is satisfied at lower frequencies since wavelengths are sufficiently large)

These two conditions form the basis of Wavefront Sculpture Technology (WST).

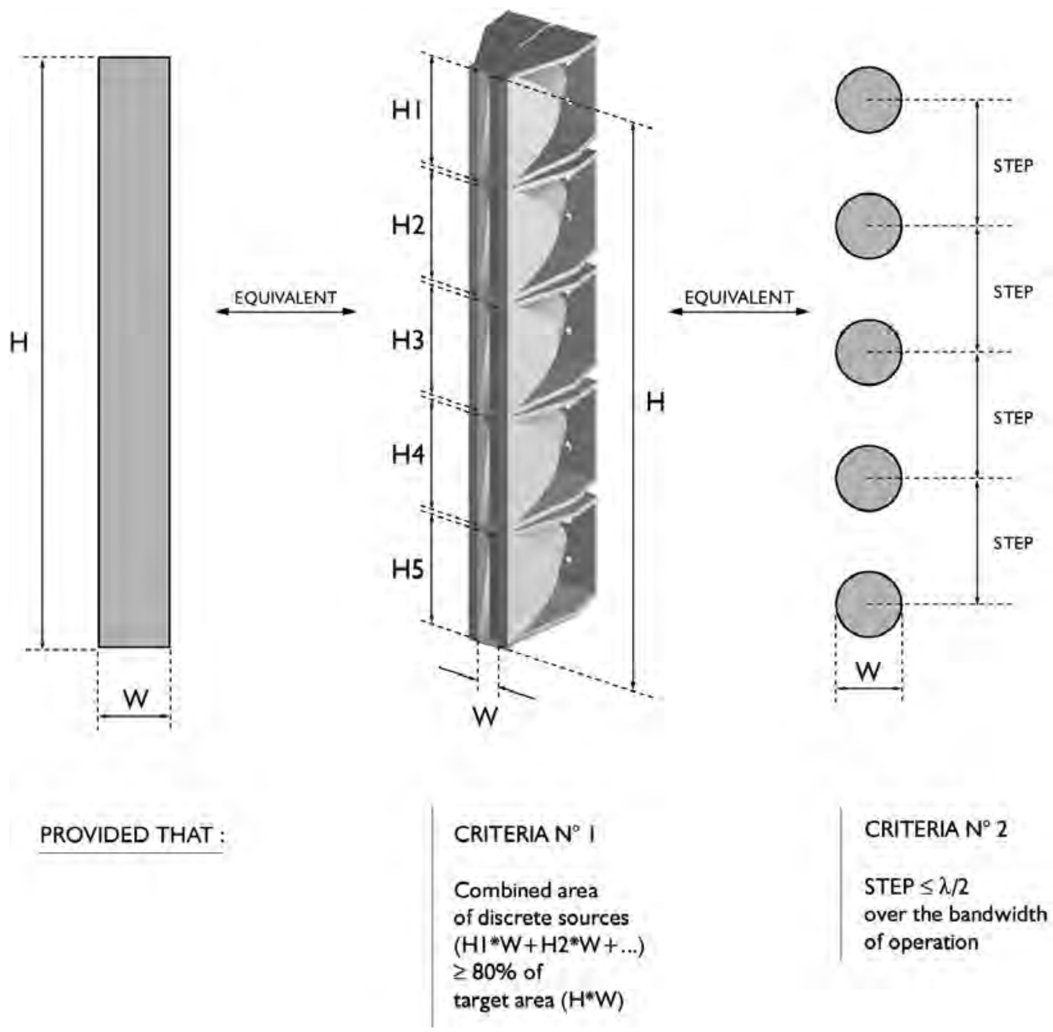

Figure 2: Wavefront Sculpture Technology Criteria 1 and 2

Additional conditions were published in the Audio Engineering Society journal paper "Wavefront Sculpture Technology", JAES Vol. 51, No. 10, October 2003. The first two WST conditions were re-derived (based on an intuitive approach using Fresnel analysis) and in addition it was shown that:

3) Deviation from the ideal, target wavefront (flat or curved) radiated by individual sources of the array must be less than a quarter wavelength at the highest operating frequency (this corresponds to less than 5 mm of variation at 16 kHz)

4) For curved arrays, enclosure site angles should vary in inverse proportion to the listener distance (geometrically this is equivalent to shaping variable curvature arrays to provide equal spacing of individual enclosure site angle impacts on the audience listening plane)

5) Limits exist concerning the vertical height of each enclosure, the minimum allowed listener distance and the angles that are allowed between enclosures.

The key to satisfying WST conditions at higher frequencies is a proprietary waveguide that is used to load a conventional compression driver. This DOSC® waveguide was invented by Dr. Christian Heil and is patented world-wide. DOSC stands for "Diffuseur d'Onde Sonore Cylindrique" – in English this means Cylindrical Sound Wave Generator. Essentially, the DOSC waveguide permits fulfillment of the 1st and 3rd WST conditions at higher frequencies.

First V-DOSC, Now dV-DOSC

V-DOSC is the first loudspeaker system designed based on the principles of WST and can be considered as the first modern generation line source array. Note: the "V" in V-DOSC refers to the V-shaped acoustic lens configuration employed for the mid and high frequency sections. It should be stressed that there is a big difference between a WST-based line source array (such as V-DOSC, dV-DOSC, KUDO or ARCS) and other line arrays on the market today. Whether a line array correctly behaves as a line source array depends on the extent to which the 5 WST conditions outlined in "Wavefront Sculpture Technology", JAES Vol. 51, No. 10, October 2003 are satisfied. This may seem like semantics, but there are scientific and technical reasons why dV-DOSC works (not marketing reasons!)

As stated above, dV-DOSC can be considered a derivative of V-DOSC since it performs according to the same principles except in a smaller format. An important design objective for dV-DOSC was to provide expanded horizontal and vertical coverage and this was achieved in two ways - first, the V-shaped acoustic lens section for the low section (that also acts as a waveguide for the high section) was engineered to provide 120 degree horizontal coverage in comparison with the 90 degree coverage of V-DOSC. Secondly, the innovative construction of dV-DOSC employs minimum thickness top and bottom aluminum plates and the rigging system pivots around the front points of the enclosures - these two features bring the openings of the individual DOSC waveguides (one per enclosure) as close together as possible, allowing dV-DOSC to be used up to a maximum of 7.5 degrees between each enclosure while still satisfying the greater than 80% fill WST criterion. By comparison, V-DOSC enclosures can be arrayed up to a maximum of 5 degrees between enclosures.

dV-DOSC enclosure trapezoidal angles have been engineered so that 7.5 degrees per enclosure is obtained for tightly wrapped arrays. Starting from a tightly wrapped array (7.5 degrees between cabinets) the backs of the dV-DOSC enclosures can be progressively opened up using dV-ANGLEP1 or dV-ANGLEP2 rear angle bars by selecting various hole positions to produce variable curvature arrays. A flat array is obtained using the maximum extension hole position on dV-ANGLEP1 for all enclosures. Array curvature obtained using dV-ANGLEP is described as convex and the array shape corresponds to the positive curvature that we are familiar with.

If dV-ANGLEN rear angle bars are selected, concave or negative curvature arrays can be constructed (to visualize a negative curvature array, think of a satellite dish). A flat array is obtained using the minimum hole position on dV-ANGLEN and the array becomes progressively concave as hole positions with greater spacing are selected. Experimentation in the use of negative curvature arrays is ongoing and it is thought that such arrays will be useful for longthrow applications and for acoustic holography effects where it is possible to create a virtual acoustic source by focussing sound at a defined location in space. The sound will then appear to emanate from a focal line - not from the array itself - allowing for interesting sound design possibilities. Alternatively, dV-ANGLEN can be used to provide negative tilt for a dV-DOSC array when dV-DOSC is stacked on top of subwoofers.

Just as for V-DOSC, dV-DOSC was designed as a system consisting of identical, vertically-arrayable enclosures. Individual transducers are physically arranged within each enclosure so as to meet WST criteria, frequency-band by frequency-band, when the enclosures are arrayed together. Each enclosure radiates a flat isophasic (constant phase) wavefront, allowing the overall assembly of multiple enclosures to produce a single extended sound source. Since the angle between adjacent enclosures is adjustable, the wavefront can be shaped by physically shaping the array. Through successful coupling over the entire audio frequency range, dV-DOSC produces a consistent wavefront over a large area with little variation in frequency response and sound pressure level. Since dV-DOSC couples coherently, enclosures are physically smaller and fewer cabinets are required in comparison with conventional systems. This makes dV-DOSC very cost effective for touring sound applications where transport space and handling time means money and for fixed installation where compact size combined with predictable coverage is important.

The internationally patented[1] DOSC waveguide is the core technology contained in dV-DOSC. Essentially, the DOSC waveguide allows fulfilment of the first WST condition for frequencies higher than 800 Hz, i.e., the wavefronts generated by individual DOSC waveguides are planar and their combined radiating surface area accounts for at least 80% of the total surface area. For conventional horn-loaded systems, coherent summation is simply not possible at higher frequencies since the wavelength becomes progressively smaller than the physical separation between horn and driver assemblies and neither of the two WST criteria can be satisfied. As a result, interference occurs throughout most of the high frequency section's operating bandwidth for a conventional system.

By comparison, a dV-DOSC array is a full-spectrum, coherent loudspeaker system even for the highest frequencies. As with any speaker system, interference does occur, however, the main difference for dV-DOSC is that within the defined coverage region the interference is constructive, while outside of the defined wavefield it is destructive.

One of the key benefits of WST is the predictability of the wavefront's shape. Horizontally, the entire dV-DOSC array has the same directivity as a single enclosure (120°). Vertically, the coverage is determined by the number of arrayed enclosures and the angle of separation between them. Given this predictability, vertical coverage can be quickly optimized to match the audience geometry using either L-ACOUSTICS ARRAY2004 or SOUNDVISION software. These convenient, user-friendly programs help the operator determine how to focus the wavefront so that tonal balance and sound pressure levels are evenly distributed throughout the audience (WST rule #4). Using either of these programs, sound design can be performed and installation parameters determined on a case-by-case basis to optimize coverage for each venue according to the audience geometry.

The configuration of transducers in a dV-DOSC enclosure is symmetrical with respect to the plane of propagation of the wave, i.e., the plane bisecting the horizontal coverage angle. High frequency transducers are located in the middle and low frequency transducers are located on both sides of the high section. Such a configuration is described as having coplanar symmetry.

Coplanar symmetry is the cylindrical domain equivalent of the coaxial arrangement[*] for individual sound sources. Essentially, coplanar symmetry allows for homogeneous coverage of the sound field at any listening angle over the dV-DOSC array’s 120° horizontal coverage window. Coplanar symmetry also eliminates off-axis acoustic cancellations at crossover points so that polar lobing is not an issue. Psychoacoustically, coplanar symmetry is largely responsible for the exceptional imaging properties that are characteristic of dV-DOSC when used in stereo (L/R) configurations.

Apart from coverage precision and predictability, another significant benefit of dV-DOSC is the fact that the system effectively extends the near field region at higher frequencies (the nearfield is defined as the region where cylindrical wavefront propagation applies and the farfield is the region where spherical wavefront propagation occurs). As pictured in Figure 3, cylindrical wave propagation results in a 3 dB reduction in SPL with doubling of distance as opposed to the 6 dB reduction that is typical of conventional systems that radiate spherical wavefronts.

Due to it’s ability to generate cylindrical wavefronts, dV-DOSC has different attenuation properties than conventional systems and should not be evaluated in terms of the classical "$ / kilowatt"-ratio. Comparing SPL predictions according to standard calculations is also not meaningful since dV-DOSC produces a combination of cylindrical and spherical wavefront propagation that must be evaluated using specific calculations.

[*] *Distributed sound reinforcement using coaxial loudspeaker technology is L-ACOUSTICS’ other approach to sound reinforcement. Either we respect WST criteria to obtain coherent coupling between individual sources and create a single coherent line source (as for V-DOSC, dV-DOSC, KUDO, ARCS) or we separate individual, coherent sources (MTD or XT coaxial loudspeakers) in a manner so that desired audience coverage is achieved while the effects of audible interference are reduced. For more details on the benefits of coaxial loudspeaker technology and distributed sound design techniques, please refer to the MTD or XT User Manuals (available for download on: www.l-acoustics.com).*

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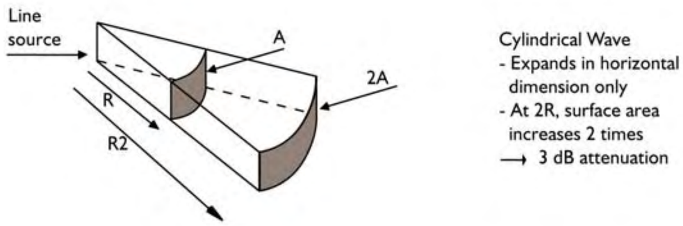
[1] ***The DOSC waveguide is registered under European patent n°0331566 and North American patent n°5163167 Please see Appendix 2 for a description of the DOSC waveguide***



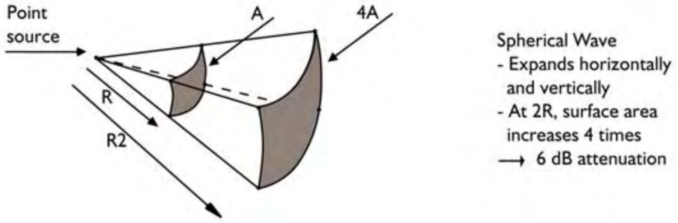


Figure 3: Cylindrical versus spherical wave propagation

Aside: Conventional modeling techniques cannot accurately simulate WST-based systems such as ARCS, KUDO, dV-DOSC or V-DOSC. For WST-based products, L-ACOUSTICS has worked with the developers of EASE and CATT to integrate proprietary SOUNDVISION modeling techniques into these industry-standard room acoustics modeling programs. V-DOSC and dV-DOSC DLLs are available for download on: www.l-acoustics.com

When curved dV-DOSC arrays are employed there is a combination of cylindrical and spherical propagation. This combined propagation, together with the actual shape of the audience allows the wavefront to be focused so that tonal balance and sound pressure levels are evenly distributed throughout the listening area. Although pure cylindrical wave propagation is not always in effect, 3 dB reduction with doubling of distance can still be obtained along with extension of the nearfield if WST Condition 4 is respected - this is an important aspect of WST and the reason why correct focus of dV-DOSC on the audience is so important.

Psychoacoustically, nearfield extension allows one to walk a considerable distance from a dV-DOSC system with only a small difference in SPL due to the system's unconventional attenuation rate. Effectively, more of the audience experiences nearfield listening, enjoying higher fidelity, improved stereo imaging and exceptional clarity. Subjectively, the loudspeakers seem much closer than they are physically and the sound is "in your face". This helps to improve image localization towards the action on stage - not the loudspeaker arrays. Practically, nearfield extension also means that extreme sound pressure levels are not required close to the system in order to obtain acceptable SPLs further back in the venue - this is a highly desirable property that results in reduced potential for hearing loss for both audiences and engineers alike.

Nearfield extension, combined with the precision and predictability of dV-DOSC coverage is also effective in "pushing back" the critical distance in highly reverberant spaces (critical distance is defined as the distance in a venue where the energy of the direct sound coming from the system is equal to the reverberant energy coming from the room). In many situations, it is extremely important to keep energy off the roof, for example in arenas or covered outdoor amphitheatres (sheds). If we can excite less of the reverberant energy in the room and focus more energy on the audience, we can effectively move back the critical distance while offering more of the audience a nearfield listening experience. Given the well-defined vertical coverage of dV-DOSC, the benefits of WST become immediately obvious in comparison with conventional systems when working in difficult, reverberant rooms.

Finally, another benefit of WST is the high degree of SPL rejection obtained outside of the defined coverage pattern. Nominally higher than 20 dB, this permits the installation of a dV-DOSC system behind or above microphones with exceptionally high feedback immunity. Monitor engineers also enjoy working with dV-DOSC front of house (FOH) systems since there is very little backwave on stage - even at lower frequencies. High SPL rejection outside of the defined coverage region also makes dV-DOSC an excellent solution in situations where environmental noise control is an issue, for example, in situations where outdoor venues are located close to residential areas.

Summary of dV-DOSC Applications

As a full range two-way system, dV-DOSC can be used for speech reinforcement in corporate applications, houses-of-worship, television or theatrical productions. In some cases, dV-DOSC can be used standalone for limited bandwidth musical reinforcement (note: for extended bandwidth sound reinforcement, the use of subwoofers is recommended). Another possibility is the use of dV-DOSC in A/B systems for theatre. The compact profile of dV-DOSC is ideal for such installations where visually unobtrusive sound design is an important issue and a small enclosure is required.

dV-DOSC is also well-suited to large scale fixed installations such as multiple distributed arrays for stadium and arena sound reinforcement. For these applications, the generous 120 degree horizontal coverage combined with the seamless transition between short to long throw zones obtained using Wavefront Sculpture principles allows the sound designer to achieve excellent intelligibility and cost effective coverage even under difficult, highly reverberant acoustic conditions.

When combined with subwoofers for extended bandwidth applications, dV-DOSC can be used as a FOH system for small, medium and large venues. For these applications, the 120 horizontal coverage provides excellent stereo imaging in the standard left-right format while the flexibility provided by Wavefront Sculpture allows the sound designer to cover virtually any room geometry. The compact size of dV-DOSC also opens up the possibility for adding a center cluster for LCR reproduction and depending on room geometry, dV-DOSC can be used exclusively for all LCR channels or as a center cluster in conjunction with ARCS, KUDO or V-DOSC FOH L/R systems.

For touring applications, dV-DOSC can be used as a downfill enclosure for flying under V-DOSC or as a long-throw or upfill extension of the system when stacked on top of the V-DOSC rigging bumper. Other applications for use with V-DOSC include stacked stereo infill or distributed front fill systems and flown center cluster or offstage fill dV-DOSC arrays. When operated in conjunction with subwoofers, dV-DOSC can be used for flown or stacked monitor side fill and also for drum monitor applications in either horizontal or vertical orientations.

Figure 4: Flown and stacked dV-DOSC , dV-SUB configurations

dV-DOSC TRAINING AND QUALIFICATIONS

V-DOSC and dV-DOSC are innovative systems which are based on a completely new approach to sound reinforcement. These systems can provide predictable results to the extent that no other existing system is capable of, however, achieving the desired results requires following a methodical procedure which may at first seem unusual to some sound designers and engineers. Hopefully, most of you will embrace this new technology and approach dV-DOSC with an open mind, excited by the possibilities that such a system allows.

However, it can be "hard to teach an old dog new tricks". For those of you in this category, the first step is to forget your experience with other systems, overcome your biases and forget all the tricks you have learned from past experience. Try to accept that THIS SYSTEM BEHAVES DIFFERENTLY! dV-DOSC cannot be left in the hands of someone who has no experience with the system - even if that person has great skills and experience with respect to other systems. A dV-DOSC operator needs specific training and there are two levels of qualification:

QUALIFIED V-DOSC TECHNICIAN (QVT)

The tasks of a "Qualified V-DOSC Technician" are: equipment preparation, array design using ARRAY2004 or SOUNDVISION software (based on room dimensions that are either measured on-site or determined from architectural drawings), system installation (rigging, assembly, cabling, system focus, preset selection and drive rack configuration), system testing/tuning and assisting the FOH mix engineer. The QVT is a sound technician with demonstrated ability who has been chosen for his or her technical expertise by a given V-DOSC Network Partner.

To be considered a Qualified V-DOSC Technician, the candidate must meet the following criteria:

- Participated in a 3 day V-DOSC training session on theory and rigging
- Recommended by a recognized CVE (see below) or an official V-DOSC Network representative

CERTIFIED V-DOSC ENGINEER (CVE)

The higher level of qualification is "Certified V-DOSC Engineer" or CVE. In addition to satisfying the mission statement for QVTs, the CVE has further expertise in the areas of: sound design and system measurement as well as extensive real world experience with V-DOSC. The CVE has a complete theoretical understanding of all WST-based systems (including V-DOSC, ARCS, KUDO, dV-DOSC) with a full grasp of the operating theories and principles behind all systems.

Other requirements include: demonstrated fluency in ARRAY2004 and SOUNDVISION software; use of advanced measurement tools (SMAART, WinMLS, MLSSA or equivalent) for system alignment and tuning; full understanding of the finer points of system focus (e.g. tensioning ratchet straps using digital inclinometers, angle strap calibration); familiar with all preset libraries and software for all supported DSP units; familiar with room measurement procedures using laser rangefinders and inclinometers.

The CVE is capable of recommending, endorsing and supervising QVTs during their apprenticeship period towards becoming a full CVE. In some cases, CVEs may also conduct V-DOSC or dV-DOSC training sessions provided that they have been factory-certified as a trainer.

To be included in the official list that is distributed to members of the V-DOSC Network and Certified dV-DOSC Providers, the CVE candidate must meet the following criteria:

- Participated in a 3 day V-DOSC training session on theory and rigging
- Recommended by a recognized CVE or an official V-DOSC Network representative
- Known and certified by an official representative of L-ACOUSTICS

The Qualified V-DOSC Technician and Certified V-DOSC Engineer are important representatives of the V-DOSC Network and Certified dV-DOSC Providers. While the Certified dV-DOSC Provider provides dV-DOSC on a rental basis, it is the QVT or CVE who accompanies the system at each installation to ensure that system performance is optimal. We hope that you will carefully follow the guidelines presented in this manual - it is in everyone's best interest that dV-DOSC is deployed correctly and optimally in the field.

1. THE dV-DOSC SYSTEM STANDARD

dV-DOSC is a complete, self-contained FOH sound reinforcement system consisting of dV-DOSC enclosures and accessories, rigging hardware, dV-SUB, SB118 or SB218 subwoofers, approved digital signal processors with OEM factory presets, L-ACOUSTICS LA24a or LA48a power amplifiers, power amplifier racks, PADO2a or PADO4a panels, CO6 or CO24/MD24 signal distribution panels, loudspeaker and signal distribution cables. All dV-DOSC system elements have been carefully selected by L-ACOUSTICS for their specific quality and long term reliability.

Benefits of the dV-DOSC standard include:

- Cross rental compatibility compatibility between Certified dV-DOSC Providers
- High standards of quality control
- Consistent system performance worldwide
- Reduced procurement time (no need to build panels, racks, etc)
- Long term, common experience shared by QVTs and CVEs
- Enhanced end user confidence (artist, FOH engineer, production)

The dV-DOSC system does not include chain motors, mains distribution or external handling gear, nor does it include upstream signal mixing and processing equipment. In general, the dV-DOSC system is capable of producing sound from a line-level signal in any concert situation.

System block diagrams are presented below to provide an overview of system connection and signal flow. This is followed by identification of the individual components of the system and more detailed descriptions.

Please note that specific multi-conductor connector selection for system drive remains open for the user to define although L-ACOUSTICS does offer a specific connector type that is supplied with turnkey systems. L-ACOUSTICS recognizes the fact that multi-conductor snakes and connectors represent a significant investment and many users already have their own internal standard that they must adhere to. Therefore, this part of the system standard remains flexible.

System elements that must remain standard in order to ensure compatibility include: digital signal processors; OEM factory presets; channel assignments for signal distribution; L-ACOUSTICS LA power amplifiers; and power amplifier rack panels.

NOTE: dV-DOSC systems that do not comply with the system standard are considered non-approved by L-ACOUSTICS. For the case of non-standard systems, L-ACOUSTICS does not accept responsibility for misuse or misoperation and in some cases warranty coverage may be considered void.

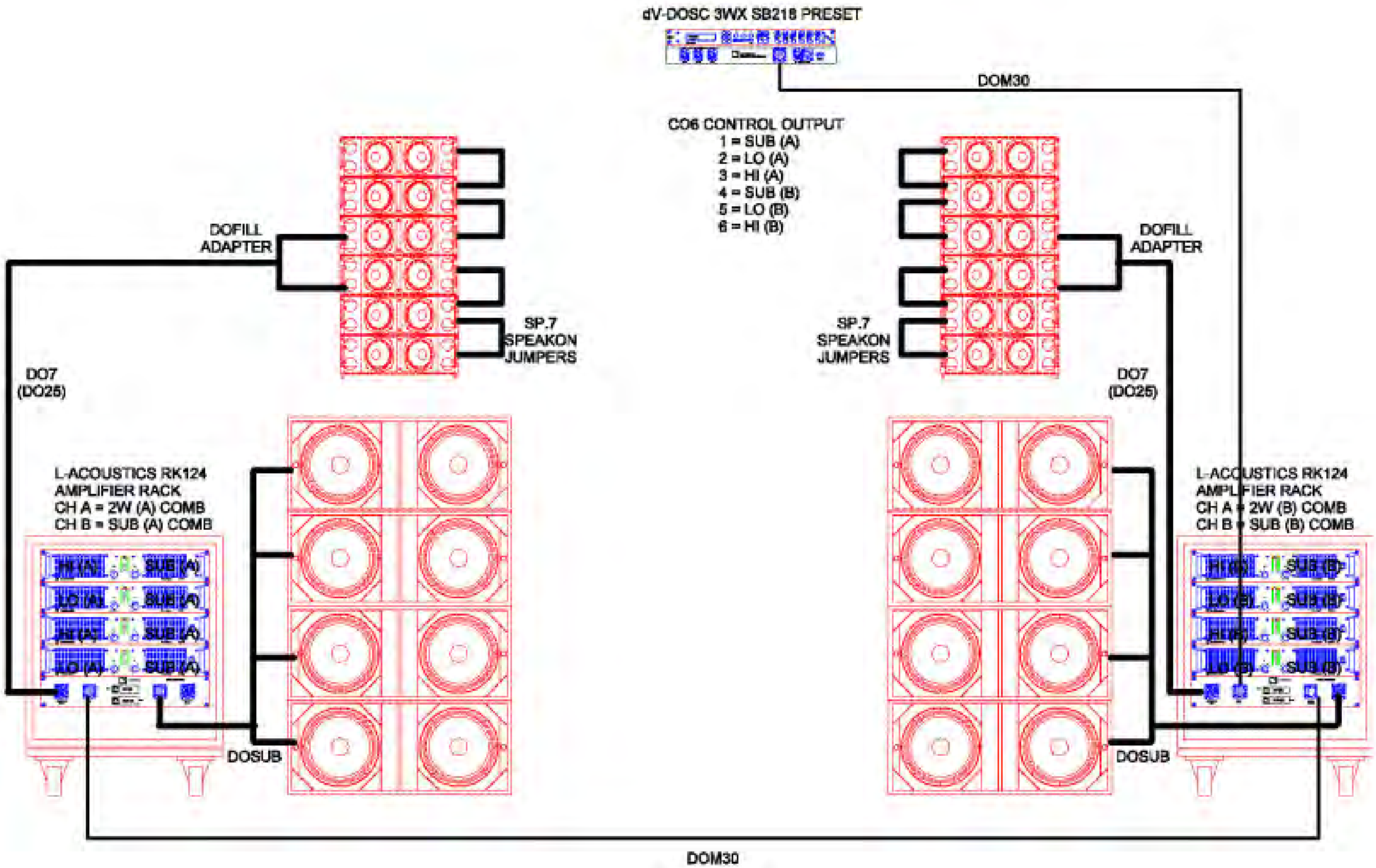


Figure 5: dV-DOSC 3-way system configuration

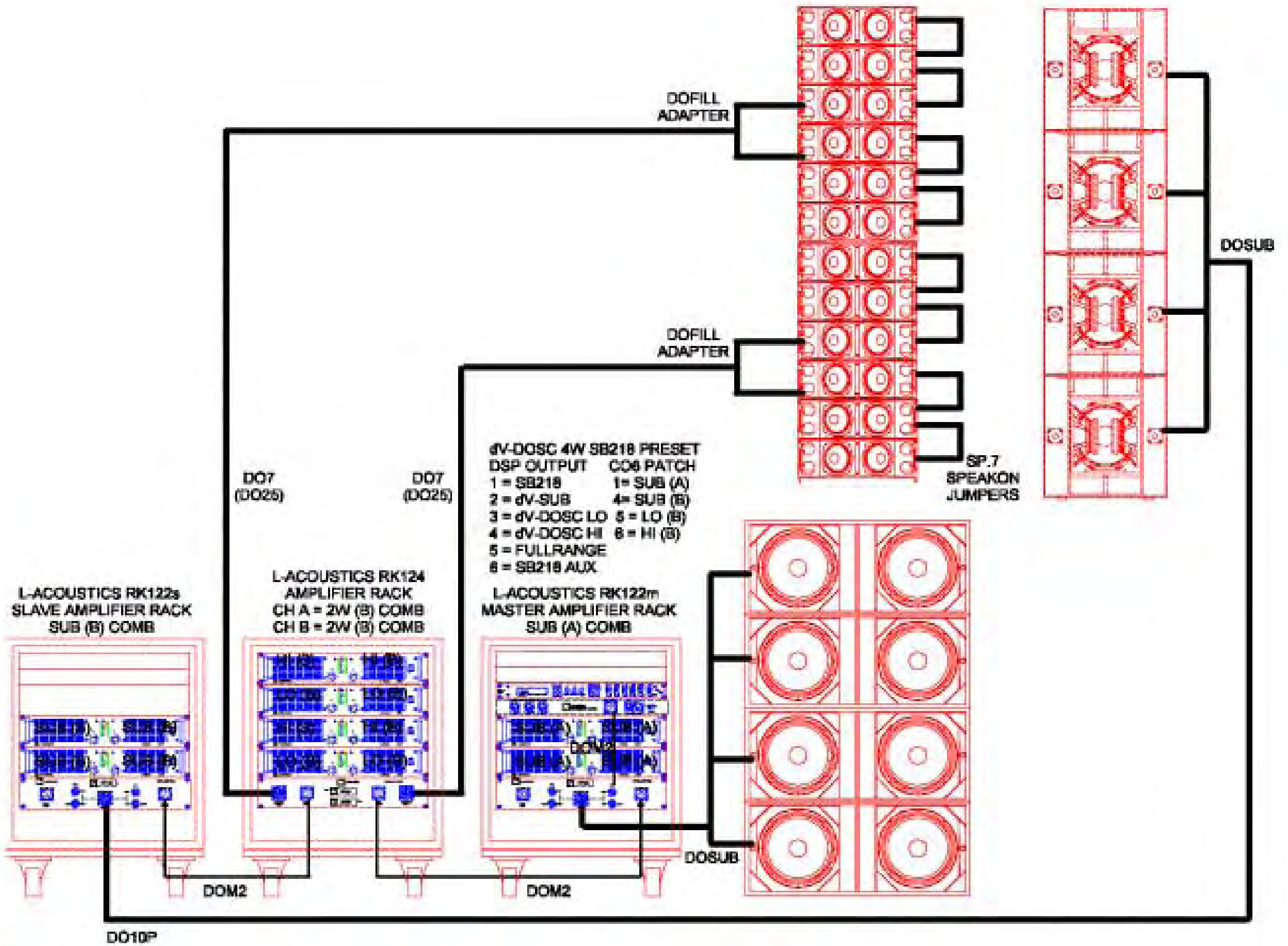


Figure 6a: dV-DOSC 4-way system configuration (option 1 COMB connector / cabling)

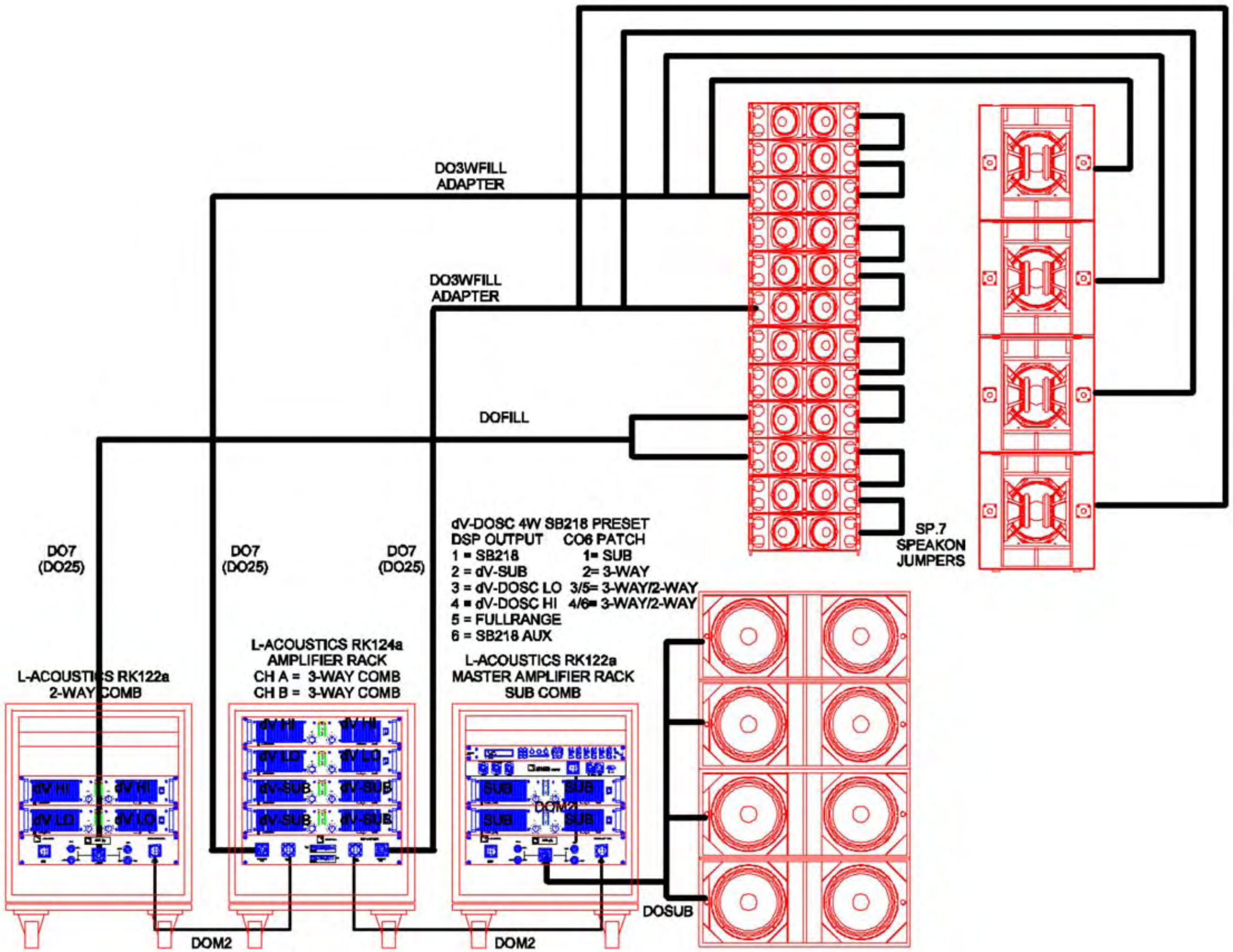


Figure 6b: dV-DOSC 4-way system configuration (option 2 COMB connector / cabling)

1.1 dV-DOSC SYSTEM COMPONENTS

LOUDSPEAKER ENCLOSURES

dV-DOSC

Active 2-way loudspeaker enclosure, meeting Wavefront Sculpture Technology criteria, with coplanar symmetric arrangement of loudspeaker components

FLIGHT-dV

Flight case for transport of three dV-DOSC enclosures

dV-DOSC

FLIGHT-dV

FLIGHT-dV

Figure 7: dV-DOSC plus accessories

RIGGING ACCESSORIES

dV-BUMP

Bumper for rigging dV-DOSC and/or dV-SUB. When combined with V-DOSC BUMP2 (see V-DOSC manual for details), can be used for stacking dV-DOSC on top of V-DOSC (for upfill) or for stacking dV-DOSC standalone

dV-BUMP2

Alternative bumper for rigging dV-DOSC and/or dV-SUB. dV-DOSC can also be stacked on top of dV-BUMP2 with dV-SUB and dV-DOSC flown underneath

dV-DOWN

Pair of rigging adapters for installing dV-DOSC underneath V-DOSC for downfill applications

dV-PIN25

Locking quick release pin (25 mm grip length) for physically connecting dV-DOSC or dV-SUB enclosures. Six dV-PIN25 and 2 dV-ANGLE (P1 or P2) bars are required per 2 dV-DOSC enclosures.

dV-PIN 81

Locking quick release pin (81 mm grip length) for connecting dV-DOSC to dV-DOWN

dV-ANGLEP1, dV-ANGLEP2

Rear angle bar used to form convex (positive curvature) arrays. Available angles include:

P1: 0, 2, 3.75, 5.5, 7.5 degrees
P2: 1, 3, 4.5, 6.5 degrees

dV-ANGLEN

Rear angle bar used to form concave (negative curvature) arrays or for downwards tilt of stacked dV-DOSC systems. Available angles include: 0, -2, -3.75, -5.5 and -7.5 degrees

dV-ANGLESS

Front and rear angle bar used to rig dV-SUB to dV-SUB (i.e., SS=sub to sub)

dV-ANGLESD

Front angle bar used to rig dV-DOSC to dV-SUB (i.e., SD=sub to dV) or dV-SUB to dV-BUMP

dV-ANGLESDP

Rear angle bar used to rig dV-DOSC to dV-SUB (i.e., SDP=sub to dV, positive tilt).

Available angles include: 0, 1.75, 3.75 degrees.

dV-BUMP

dV-BUMP2

dV-DOWN

dV-PIN81

dV-ANGLEP1
(0, 2, 3.75, 5.5, 7.5 deg)

dV-ANGLEP2
(1, 3, 4.5, 6.5 deg)

dV-PIN25

dV-ANGLEN
(0, -2, -3.75, -5.5, -7.5 degrees)

dV-ANGLESS

dV-ANGLESD

dV-ANGLESDP

Figure 8: dV-DOSC rigging accessories

SUBWOOFER ENCLOSURES

dV-SUB
Dual-vented bandpass-loaded, triple 15" subwoofer for high SPL, low frequency extension. Optional removable front dolly (not shown) recommended for touring applications.

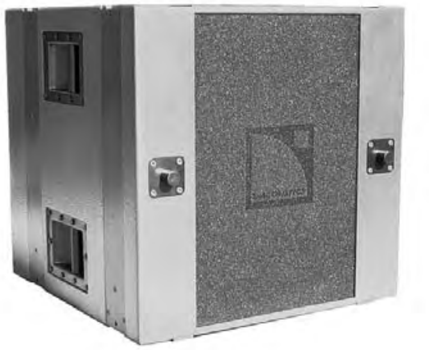
dV-SUBCOV
Protective cover for dV-SUB enclosures (comes in pairs)

SB118
Dual-vented bandpass-loaded, single 18" subwoofer for high SPL, extended bandwidth. Optional removable front dolly (not shown) recommended for touring applications.

SB118COV
Protective cover for SB118 enclosures (comes in pairs)

SB218
Front-loaded, bass-reflex, dual 18" subwoofer for high SPL, extended bandwidth. Optional removable front dolly (not shown) recommended for touring applications.

SUBCOV
Protective cover for SB218 enclosures (comes in pairs)



dV-SUB

dVSUB COV

SB118

SB118 COV

SB218

SUB COV

Figure 9: dV-DOSC Subwoofer Options

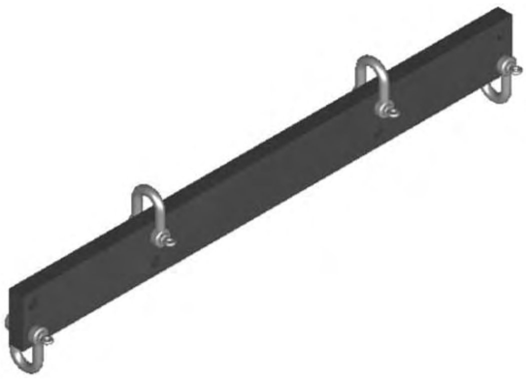
SUBWOOFER RIGGING ACCESSORIES

BUMPSUB

Flying bar for rigging up to eight SB218 enclosures deep in a vertical line array

dV-BUMP2

Flying bumper for rigging up to six dV-SUB enclosures deep in a vertical line array (also an alternative to dV-BUMP for rigging dV-DOSC and/or dV-SUB)



BUMPSUB

dV-BUMP2

Figure 10: Subwoofer Rigging Accessories

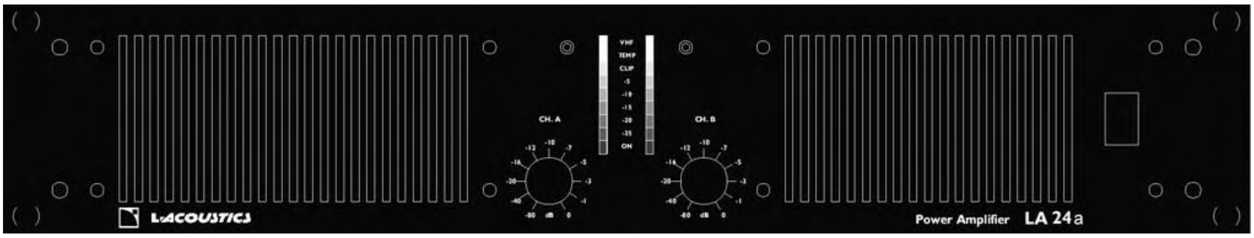
AMPLIFICATION

L-ACOUSTICS LA24a

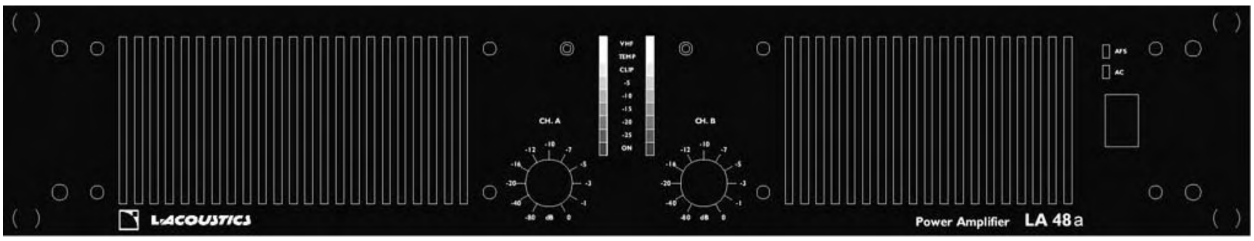
Compact, light weight two-channel power amplifier (2 rack units, 10 kg), 1100 watts per channel into 8 ohms, 1500 watts per channel into 4 ohms.

L-ACOUSTICS LA48a

Compact, light weight two-channel power amplifier (2 rack units, 10 kg), 1300 watts per channel into 8 ohms, 2300 watts per channel into 4 ohms.



L-ACOUSTICS LA24a



L-ACOUSTICS LA48a

Figure 11: L-ACOUSTICS LA24a, LA48a power amplifiers

Note: For full details see the LA24a, LA48a user manuals (available for download on: www.l-acoustics.com)

AMPLIFIER RACKS

RK12U

12 rack unit amplifier rack (empty). Light-weight aluminum space frame construction, internal shock mounting, standard rack rails, provision for rear support of amplifiers, transparent lexan doors that store inside the rack, high impact resistance polyethylene cover (no external case required). Recessed Aeroquip flytrack sections for flown applications.

RK122a

RK12U supplied with PADO2a amp panel, PADOSEC, 2U drawer, 2U blank panel, rear support kit for 2 L-ACOUSTICS LA power amplifiers (power amplifiers not included).

RK124a

RK12U supplied with PADO4a amp panel, PADOSEC, rear support kit for 4 L-ACOUSTICS LA power amplifiers (power amplifiers not included).

PADO2a AMP PANEL

Amplifier panel supplied with RK122a suitable for 2 amplifier rack configuration. Single 8 pin female CA-COM connector for loudspeaker connection (in parallel with 4x NL4 Speakon connectors), two male 19 pin CA-COM connectors for signal distribution (input/through), COMB connector (for selecting 2-way, 3-way or subwoofer operating modes); 4x male XLR and 4x Speakon fanouts on the internal side (for connecting to amplifier inputs and outputs).

Note: PADO stands for PATCH DOSC

PADO4a AMP PANEL

Amplifier panel supplied with RK124a suitable for 4 amplifier rack configuration. Two 8 pin female CA-COM connectors for loudspeaker connection, two male 19 pin CA-COM connectors for signal distribution (input/through), 2x COMB connectors (for selecting 2-way, 3-way or subwoofer operating modes); 2 pairs of 4x male XLR and 4x Speakon fanouts on the internal side (for connecting to amplifier inputs and outputs).

COMB CONNECTOR

Routes desired input lines from the male 19 pin CA-COM connector to the appropriate amplifier inputs allowing RK122a or RK124a amplifier racks to be configured in 2-way (dV-DOSC, ARCS), 3-way (V-DOSC, KUDO) or subwoofer (SB218) operating modes (COMB connectors: D2WAY, D3WAY and DSUB, respectively). Additional COMB connectors are available for use with 2- or 3-way format systems (D2WA, D2WB, D2WSTEREO, D3WA, D3WB, DSUBA, DSUBB) and a COMB connector kit for subwoofer array signal processing or for powering passive enclosures (DSUBTK).

PADOSEC

Mains distribution panel, 32 amp connector, 5x AC receptacles

PADOSEC

RK12U

PADO2a

COMB CONNECTOR

RK122a

PADO4a

RK124a

Figure 12: Amplifier Rack Options and Accessories

SIGNAL DISTRIBUTION AND CABLING

CO6 CONTROL OUTPUT PANEL

Control Output Panel for use with a single 2 in x 6 out (or 3 x 6) digital signal processor (DSP) to create a compact, modular drive rack or for mounting in RK12U amplifier racks along with amplifiers and a DSP unit for standalone master rack packaging. DSP outputs are connected to the 6x female XLR patch bay on the rear side of the CO6 panel and then assigned to the front panel 19-pin CACOM connector to provide a 6 channel multi-conductor return snake system when used with DOM30 Cross Link cables.

CO24 CONTROL OUTPUT PANEL

Control Output Panel for use with four 2 in x 6 out (or 3 x 6) DSPs to create a system drive rack: 1x 84 pin MASS connector; 4x 19 pin male CA-COM connectors; 24x female XLR inputs on the internal side; 1x male/female 4-pin XLR pair for amplifier remote control/monitoring. Used for connecting DSP outputs and amplifier remote control/monitoring to MC28100 MULTI return snake lines.

MD24 MULTI DISTRO PANEL

Stage distribution panel with 1x 84 pin MASS connector (for connection of MULTI return snake from FOH), 4x 19 pin male CA-COM (for distribution of Left-Left, Left, Right, Right-Right signal lines), 1x male/female 4-pin XLR pair (for distribution of amplifier remote control).

MC28100 MULTI-CONDUCTOR CABLE

24 pair multi-conductor return snake, 100 m (325 ft) length, fitted with 84 pin MASS connectors at each end (used for connecting CONTROL OUTPUT panel, typically located at FOH, to MULTI DISTRO panel for signal distribution to the amplifier racks)

PCMCIA CARDS

Contain OEM factory preset data for programming DSP units (PCM224D, PCM226D and PCM366D for XTA DP224, DP226 and BSS 366, respectively). Other approved DSPs are programmed via computer download of preset data (Lake Contour, BSS Soundweb).

DOM2 AMP LINK CABLE

6 pair multi-conductor cable, 2 m (6.5 ft) length, with 2x female 19 pin bayonet CA-COM connectors (for distributing signal from CO6 or MD24 panels to amplifier racks and linking amplifier racks)

DOM30 CROSS LINK CABLE

6 pair multi-conductor cable, 30 m (100 ft) length, with 2x female 19 pin bayonet CA-COM connectors (for cross-stage connection from the MD24 panel to amplifier racks or for use as a return snake for smaller system configurations)

DOMP ADAPTER

19 pin male/male CA-COM adapter (for connecting two AMP LINK or CROSS LINK cables when longer lengths are required)

DOMM LINK BREAKOUT

Multipair cable adapter with 1x female 19 pin CA-COM connector at one end, 6x male XLR connectors at the other (used as a LINK cable breakout for patching and testing purposes)

DOMF LINK-BREAKOUT

Multipair cable adapter with 1x female 19 pin CA-COM connector at one end, 6x female XLR connectors at the other (used as a LINK cable breakout for patching and testing purposes).

Note: Parts nomenclature is as follows:

DOM = DOSC Modulation
DOMP = DOSC Modulation Prolongateur (french for extender)

CO24 CONTROL OUTPUT

MD24 MULTI DISTRO

CO6 CONTROL OUTPUT

MC28100 MULTI

DOM30 CROSS LINK

DOM2 AMP LINK

DOMF LINK BREAKOUT

DOMM LINK BREAKOUT

DOMP LINK EXTEND

PCMCIA CARD

Figure 13: Signal distribution and cabling

LOUDSPEAKER CABLING

DO7

Loudspeaker cable, 8 conductor, 4 mm^2 conductor cross-section, 7 m (20 ft) length, equipped with male/female CA-COM connectors (for use with DOFILL or DO3WFILL)

DO25

Loudspeaker cable, 8 conductor, 4 mm^2 conductor cross-section, 25 m (80 ft) length, equipped with male/female CA-COM connectors (for use with DOFILL or DO3WFILL)

DOSUB SUB CABLE

Subwoofer loudspeaker cable, 5 m (16 ft) length, with male 8 pin CA-COM connector and four NL4 Speakon connectors (for connecting 4 x subwoofers to PADO2a or PADO4a).

DO10P EXTENSION CABLE

Extension cable,10 m length for use with DOSUB, DO7, DO2W or DO3W cables

SP.7 F-LINK CABLE

2-way fill loudspeaker link cable, 4 conductor, 4 mm^2 conductor cross-section, 0.7 m (2 ft) length, equipped with 2x NL4 Speakon connectors (for paralleling dV-DOSC)

SP7 F-CABLE

2-way fill loudspeaker cable, 4 conductor, 4 mm^2 conductor cross-section, 7 m (20 ft) length, equipped with 2x NL4 Speakon connectors (for connecting dV-DOSC or other 2-way fill enclosures to PADO2a or to PADO4a using DO2W and CC4FP)

SP25 F-CABLE

2-way fill loudspeaker cable, 4 conductor, 4 mm^2 conductor cross-section, 25 m (80 ft) length, equipped with 2x NL4 Speakon connectors (for connecting dV-DOSC or other 2-way fill enclosures to PADO2a or to PADO4a using DO2W and CC4FP)

DOFILL

CA-COM (8 pin male line receptacle) to 2x NL4 Speakon connectors (3 m length) for use with DO7 or DO25 cables, PADO2a or PADO4a and 2-WAY, 2W(A), 2W(B) or 2W STEREO COMB connectors for powering 2-way enclosures.

DO3WFILL

CA-COM (8 pin male line receptacle) to 3x NL4 Speakon connectors (3 m length) for use with DO7 or DO25 cables, PADO2a or PADO4a and 3W(A) or 3W(B) COMB connectors for powering 2-way enclosures plus subwoofers.

DO2W

CA-COM (8 pin male - barrel plus coupling ring) to 2x NL4 Speakon connectors (3 m length) for use with PADO2a or PADO4a and 2-WAY, 2W(A), 2W(B) or 2W STEREO COMB connectors for powering 2-way enclosures.

DO3W

CA-COM (8 pin male - barrel plus coupling ring) to 3x NL4 Speakon connectors (3 m length) for use with PADO2a or PADO4a and 3W(A) or 3W(B) COMB connectors for powering 2-way enclosures plus subwoofers.

CC4FP

Female/female 4 conductor Speakon barrel adapter

Figure 14: Loudspeaker cabling options

1.2 dV-DOSC SPECIFICATIONS

Figure 15: dV-DOSC Enclosure - Front and Rear Views

dV-DOSC contains two 8" loudspeakers (connected in parallel) and a 1.4" exit compression driver mounted on a custom DOSC waveguide. The 8" loudspeakers are individually rated at 16 ohms and connected in parallel to provide a nominal impedance of 8 ohms. The nominal operating bandwidth for the 8" section is 100 Hz to 800 Hz. A surface coating is applied to the composite cellulose fibre cone body and all metal parts are corrosion-treated to ensure weather resistant protection. Other 8" features include: rugged kevlar dustcap, 2" diameter edgewound copper voice on a polyimide former, high excursion/reduced fatigue suspension and a compact, high flux density magnetic system.

Nominal impedance for the high section is 8 ohms and the compression driver employed in dV-DOSC features a 1.4" exit, titanium diaphragm, 3" diameter edgewound aluminum voice coil and a lightweight neodymium magnet. These features combine to provide high sensitivity and power handling with low distortion over the entire operating bandwidth (800 - 18k Hz). A removable rear panel allows access to the compression driver for servicing the diaphragm.

Each dV-DOSC enclosure is provided with two Speakon connector sockets for direct connection and paralleling of up to three enclosures. Enclosures are paralleled using SP.7 loudspeaker cables (0.7 m length). Direct connection of enclosures to the amplifier rack is made using SP7 or SP25 (7 m or 25 m length, as required) in conjunction with the DO2W adapter and two CC4F. Alternatively, connection can be made using DO7 or DO25 cables and the DOFILL adapter (8 pin male CA-COM barrel to dual speakon breakout).

The bandwidth of dV-DOSC is 100 Hz to 18 kHz although the system can be used down to 80 Hz. For extended bandwidth applications, the addition of dV-SUB, SB118 or SB218 subwoofers is recommended in order to extend the low frequency response.

Figure 16: dV-DOSC array

1.3 dV-DOSC RIGGING SYSTEM

dV-DOSC features a convenient rigging system where rear mounted angle bars are used to control the angle between enclosures, i.e., cabinets pivot about the front mount points and selecting the desired hole on the rear angle bars adjusts the angle between enclosures. When dV-ANGLE P1 or P2 bars are used, convex (positive curvature) arrays can be constructed ranging from flat up to a maximum of 7.5 degrees between cabinets in increments of approximately 1 degree.

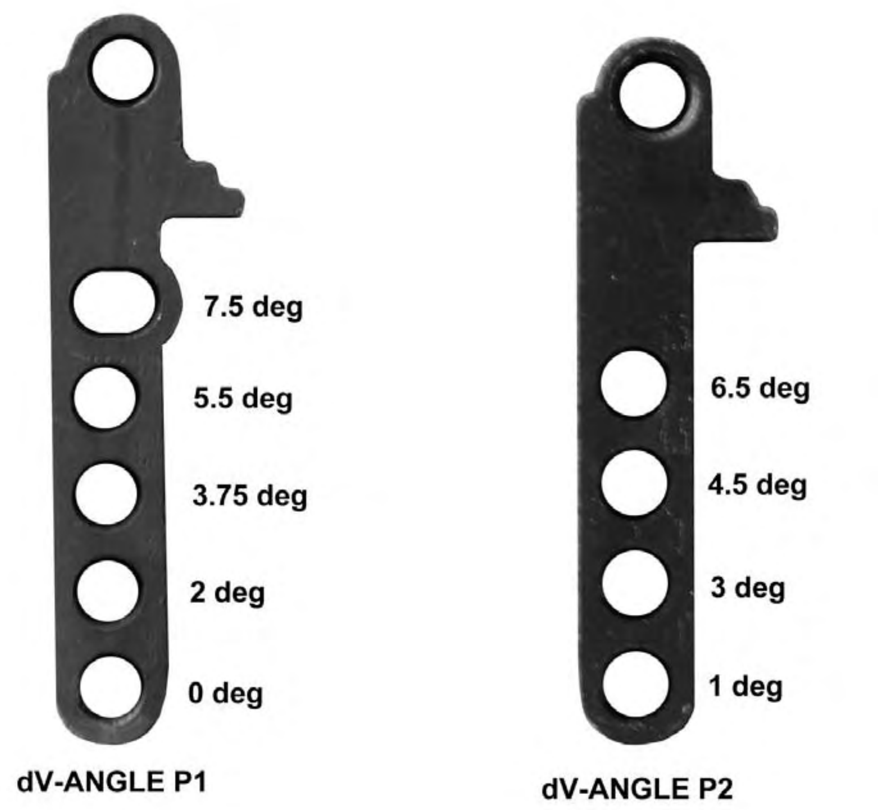


Figure 17: dV-ANGLE P1 and P2 angle values

dV-BUMP or dV-BUMP2 bumpers are used for rigging dV-DOSC standalone or flown below dV-SUB and for a variety of stacking applications. There are 8 pick point holes available on the central spreader bar section of both bumpers for single point hangs (pick point hole numbering is 1-8 from front to rear). An extension bar can be added to provide an additional 8 pick points for single point hangs (pick point hole numbering is 9-16 from front to rear) or to allow for 2 point hangs with front and rear motors. For 2 point hangs, the front motor controls the array trim height while the rear motor controls the array site angle.

For a tightly wrapped array of 12 dV-DOSC, 90 degrees vertical coverage is obtained. For this case, when the rear-most point on the extension bar is used for a single point hang, the 90 degree coverage runs from parallel to the floor to perpendicular to the floor.

Note: For single point hangs, the array site angle will depend on the size and shape of the array since these factors alter the center of gravity of the overall flown system.

dV-BUMP also allows for three different stacking options:

1) stacking platform with variable tilt adjustment for stacked dV-DOSC applications;
2) stacking platform for rigging dV-DOSC on top of V-DOSC;
3) stacking platform for rigging dV-DOSC on top of subwoofers.

Note: Options 1) and 2) are achieved by mechanically connecting dV-BUMP to the V-DOSC BUMPER.

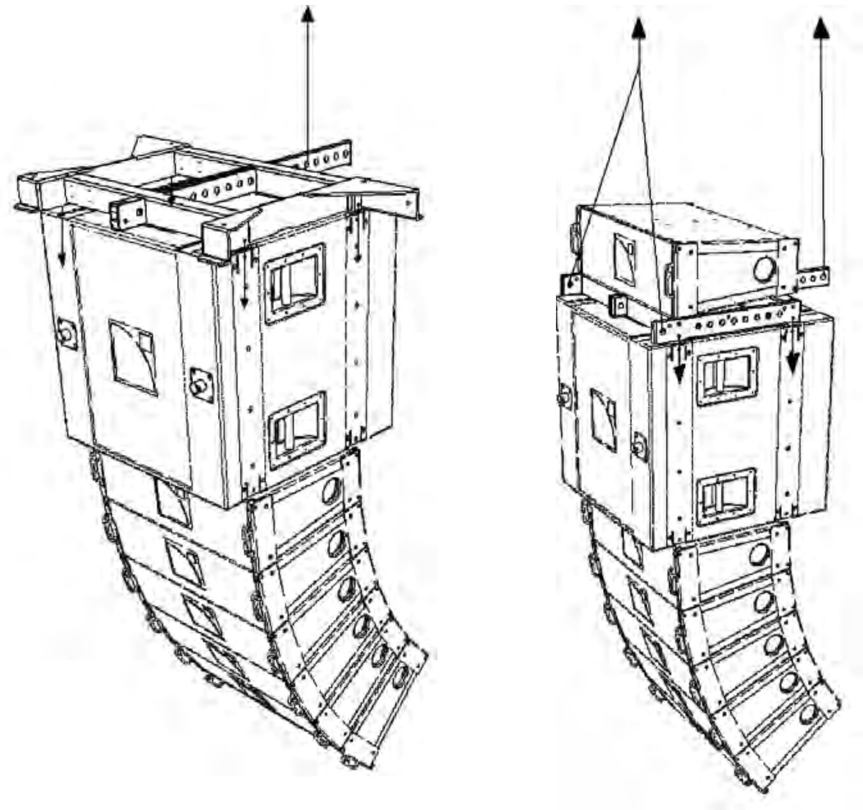


Figure 18: dV-BUMP and dV-BUMP2 rigging bumpers

Maximum recommended flown configurations are summarized as follows:

dV-BUMP or dV-BUMP2 (NO EXTENSION BAR)
(SINGLE OR TWO POINT HANG FROM CENTRAL SPREADER BAR)
- maximum 24 dV-DOSC enclosures

dV-BUMP or dV-BUMP2 + EXTENSION BAR
(SINGLE POINT HANG FROM REAR EXTENSION BAR)
- maximum 12 dV-DOSC enclosures

dV-BUMP or dV-BUMP2 + EXTENSION BAR
(2 POINT HANG FROM FRONT POINT AND EXTENSION BAR REAR POINT)
- maximum 12 dV-DOSC enclosures

Figure 19: dV-DOWN

Up to 6 dV-DOSC can be flown underneath V-DOSC for downfill applications using the dV-DOWN rigging adapter. Three dV-DOSC are equivalent to the weight of one V-DOSC, therefore maximum cabinet combinations include: 15 V-DOSC plus 3 dV-DOSC or 14 V-DOSC plus 6 dV-DOSC.

1.4 dV-SUB ENCLOSURE DESCRIPTION

Figure 20: dV-SUB

dV-SUB contains three 15" loudspeakers mounted in a vented bandpass configuration. Individual 15" loudspeakers are rated at 8 ohms and connected in parallel to provide a nominal impedance of 2.7 ohms.

Note: The two side firing 15" components are wired internally in polarity opposition so that a positive signal causes cone movement in the same direction for all components, i.e., a positive pulse causes all 15" components to pressurize the central chamber, resulting in positive polarity as measured acoustically. When servicing 15" components, 1:1 correspondence in terms of wiring should be followed, i.e., red lead -> red terminal, black lead -> black terminal since the polarity inversion for the side 15" components is taken care of at the input terminal (not at the speakers).

The dV-SUB operating bandwidth is 40 Hz to 200 Hz with a useable bandwidth of 35 to 200 Hz measured under half space loading conditions. The 15" components employed in dV-SUB feature front and rear treatment of the cone body and all metal parts are corrosion-treated to ensure weather resistant protection. Other features include: high strength/low fatigue surround, 3" edgewound copper ribbon voice coil, die cast aluminum basket, massive vented magnet structure and high thermal capacity.

A single Speakon connector socket is provided for connection to the amplifier in order to avoid paralleling of multiple enclosures and subsequent reductions in overall load impedance. dV-SUB cabling is compatible with all existing SB218 subwoofer cabling and sub cable DOSUB (8 pin CACOM to 4 x Speakon) with, or without, sub extension DO10P can be used for connecting dV-SUB to the amplifier racks.

1.5 dV-SUB RIGGING SYSTEM

dV-SUB features two sets of recessed side panels on each side of the enclosure that are used in conjunction with three different types of angle bar for rigging purposes. dV-ANGLESS angle bars are used for rigging sub-to-sub in flown or stacked applications. Four dV-ANGLESS are required per two dV-SUB along with 8 dV-PIN25.

Figure 21: dV-ANGLESS sub-to-sub angle bar

Two other sets of angle bars are provided for attaching dV-SUB to either dV-DOSC or dV-BUMP: dV-ANGLESD and dV-ANGLESDP. For attachment to dV-BUMP, 4 x dV-ANGLESD should be used along with 8 x dV-PIN25. For stacking dV-DOSC directly on top of dV-SUB or when flying dV-DOSC underneath dV-SUB, 2 x dV-ANGLESD are used for attachment of the front dV-DOSC points and 2 x dV-ANGLESDP are used for attachment of the rear dV-DOSC points along with 8 dV-PIN25.

Note: dV-ANGLESS and dV-ANGLESDP have two different holes for connection to the dV-SUB depending on whether dV-DOSC is to be stacked on top of dV-SUB or flown underneath. The closest hole is for stacked applications while the further hole is for flown applications - the need for different attachment points is due to the requirement for physical clearance for the dV-SUB stacking runners when dV-DOSC is flown underneath.

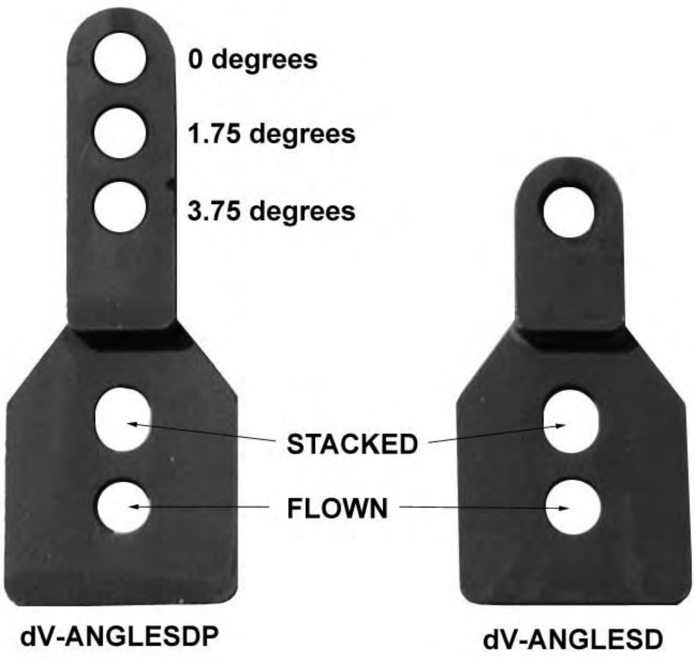


Figure 22: dV-ANGLESDP and dVANGLESD angle bars

Note: the thickness of the dV-ANGLESS, dV-ANGLESD and dV-ANGLESDP is different than that of dV-ANGLEP1 or P2 in order to account for the increased mass of the dV-SUB. Use of separate angle bars for dV-SUB is necessary for safety factor reasons. Always install dV-ANGLESD and dV-ANGLESDP with the fat part of the bar oriented towards the center of the dV-SUB on both sides.

dV-SUB rigging is compatible with dV-BUMP and dV-BUMP2 and the rigging system is rated for up to 6 dV-SUB deep. When flown 6 deep, the overall weight of the system is 552 kg (1217 lbs) and pick point hole number #5 on the central spreader bar will produce a dead hang (nominal zero degree site angle).

When flying combined dV-DOSC/dV-SUB arrays in a single column, dV-SUB is always flown on top. Under no circumstances should dV-SUB be flown beneath dV-DOSC. Maximum rated combinations are summarized in the following tables:

Table 1: Maximum rated dV-SUB / dV-DOSC combinations - dV-DOSC flown below dV-SUB
Single point hang from rear extension bar (holes 9-16)
OR
2-point hang from dV-BUMP front point (hole 0) + extension bar rear point (hole 16)

dV-SUB	0	1	2	3	4	5	6
dV-DOSC	12	6	4	1	0	0	0
Total weight	414 kg 912 lbs	290 kg 639 lbs	316 kg 697 lbs	309 kg 681 lbs	368 kg 811 lbs	460 kg 1014 lbs	552 kg 1217 lbs

Table 2: Maximum rated dV-SUB / dV-DOSC combinations - dV-DOSC flown below dV-SUB
Single point hang from central spreader bar (holes 1-8)

dV-SUB	0	1	2	3	4	5	6	6
dV-DOSC	24	9	8	7	6	4	1	0
Total weight	786 kg 1732 lbs	389 kg 858 lbs	448 kg 988 lbs	507 kg 1118 lbs	566 kg 1248 lbs	592 kg 1305 lbs	585 kg 1290 lbs	552 kg 1217 lbs

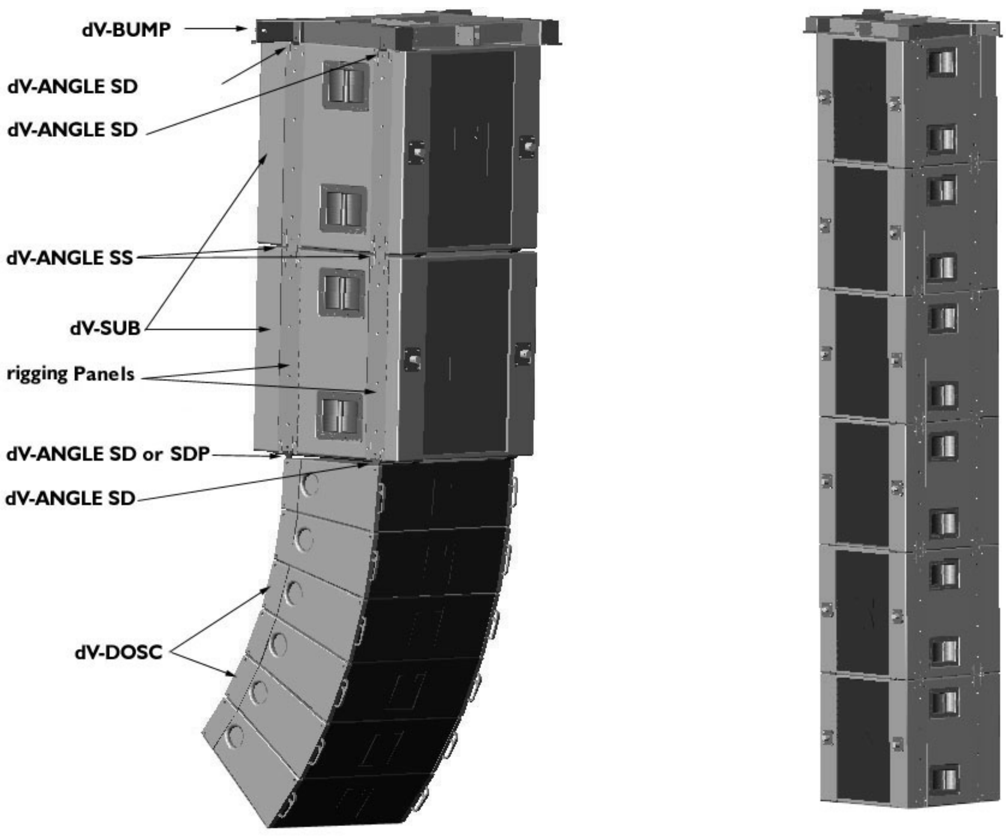


Figure 23: Illustration of dV-SUB rigging configurations

1.6 POWERING dV-DOSC

L-ACOUSTICS LA24a or LA48a power amplifiers are specified for use with dV-DOSC. For full technical details please see the LA24a or LA48a user manuals (available for download on: www.l-acoustics.com). Both amplifiers have 32 dB gain and the input sensitivities are 1.95 Vrms (8.0 dBu) and 2.3 Vrms (9.5 dBu) for the LA24a and LA48a, respectively.

dV-DOSC is an active 2-way enclosure and the load ratings are as follows:

- 1 x 8 ohms high section
- 1 x 8 ohms low section (2 x 16 ohm 8" components connected in parallel)

According to standard L-ACOUSTICS specification practice, minimum power amplifier output ratings are defined as twice the RMS power rating for the low section and equal to the peak power rating for the high section. Power handling for dV-DOSC (single and multiple enclosures in parallel) and recommended power amplifier ratings are summarized in Table 3.

Table 3: dV-DOSC Power Handling and Recommended Power Amplifier Ratings

	ONE dV-DOSC				TWO dV-DOSC				THREE dV-DOSC			
SECTION	LOAD	RMS	PEAK	REC'D	LOAD	RMS	PEAK	REC'D	LOAD	RMS	PEAK	REC'D
dV LOW	8	380	1520	**760**	4	760	3040	**1520**	2.7	1140	4560	**2280**
dV HIGH	8	66	260	**260**	4	130	520	**520**	2.7	200	800	**800**

dV-DOSC LOW SECTION REC'D POWER

LOAD (ohms)	REC'D POWER
2.7	2280
4	1520
8	760

AMPLIFIER OUTPUT POWER (MLS SETTING)

LA 17a	LA 24a	LA 48a
1080 do not use	1635 (0 dB)	**2130 (-2 dB)**
840 do not use	**1500 (0 dB)**	**1600 (-2 dB)**
430 do not use	**1100 (0 dB)**	**820 (-2 dB)**

dV-DOSC HI SECTION REC'D POWER

LOAD (ohms)	REC'D POWER
2.7	800
4	520
8	260

AMPLIFIER OUTPUT POWER (MLS SETTING)

LA 17a	LA 24a	LA 48a
1080 (0 dB)	**1000 (-5 dB)**	**1380 (-5 dB)**
840 (0 dB)	**600 (-5 dB)**	**830 (-5 dB)**
430 (0 dB)	**300 (-5 dB)**	**430 (-5 dB)**

Note: Power handling for the dV-DOSC low section depends on the selected high pass filter frequency for a given preset (80 Hz, 100 Hz, 120 or 200 Hz). Limiter settings are adjusted in the OEM factory presets to account for this.

As seen in Table 3, the LA24a is suitable for powering up to 2 dV-DOSC while the LA48a is recommended for powering 3 enclosures in parallel. Tables 4 and 5 give a cross reference of L-ACOUSTICS LA24a and LA48a power amplifier ratings and MLS switch settings for powering dV-DOSC. For system protection via power matching, recommended MLS switch settings are indicated in bold italics and bold for the low and high sections, respectively. For touring applications, LA24a and LA48a amplifiers can be operated with MLS switches in the 0 dB position and system protection provided by OEM factory preset limiter settings which are calibrated to 2x the RMS power handling for each section. For fixed installations it is recommended that the MLS switch settings tabulated in Tables 4 and 5 are used.

When the L-ACOUSTICS RK124a is equipped with 4 L-ACOUSTICS LA48a power amplifiers, a single power amplifier rack can power: 3+3+3+3 dV-DOSC, 4+4 dV-SUB or SB218, 8+8 SB118.

Table 4: L-ACOUSTICS LA24a MLS Settings for use with dV-DOSC

		MLS SWITCH SETTING			
LOAD	CONFIGURATION	-5 dB	-4 dB	-2 dB	0 dB
8 ohms	Stereo (2 channel)	**300**	400	700	***1100***
4 ohms	Stereo (2 channel)	**600**	750	1300	***1500***
2.7 ohms	Stereo (2 channel)	**1000**	1180	1465	1635

Table 5: L-ACOUSTICS LA48a MLS Settings for use with dV-DOSC

		MLS SWITCH SETTING			
LOAD	CONFIGURATION	-5 dB	-4 dB	-2 dB	0 dB
8 ohms	Stereo (2 channel)	**430**	520	***820***	1300
4 ohms	Stereo (2 channel)	**830**	1000	***1600***	2300
2.7 ohms	Stereo (2 channel)	**1380**	1665	***2130***	2700

1.7 POWERING SUBWOOFERS

Subwoofer power handling and power amplification options are summarized in Tables 6, 7 and 8 for the SB118, dV-SUB and SB218, respectively.

Table 6: SB118 Power Handling and Amplification

SB118 ENCLOSURE RATINGS

ONE SB118				TWO SB118			
LOAD	RMS	PEAK	REC'D	LOAD	RMS	PEAK	REC'D
8	600	2400	**1200**	4	1200	4800	**2400**

RECOMMENDED POWER AMP

LOAD (ohms)	REC'D POWER
4	2400
8	1200

AMPLIFIER POWER (MLS SETTING)

LA 24a	LA 48a
1500 do not use	**2300 (0 dB)**
1100 (0 dB)	**1300 (0 dB)**

Table 7: dV-SUB Power Handling and Amplification

dV-SUB ENCLOSURE RATINGS

ONE dV-SUB			
LOAD	RMS	PEAK	REC'D
2.7	1200	4800	**2400**

RECOMMENDED POWER

LOAD (ohms)	REC'D POWER
2.7	2400

AMPLIFIER POWER (MLS SETTING)

LA 48a
2700 (0 dB)

Table 8: SB218 Power Handling and Amplification

SB218 ENCLOSURE RATINGS

ONE SB218			
LOAD	RMS	PEAK	REC'D
4	1100	4400	**2200**

RECOMMENDED POWER

LOAD (ohms)	REC'D POWER
4	2200

AMPLIFIER POWER (MLS SETTING)

LA 48a
2300 (0 dB)

1.8 dV-DOSC AMP PANELS

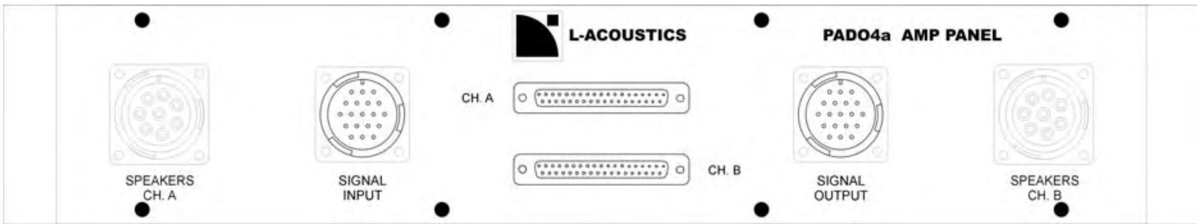


Figure 24: dV-DOSC PADO4a Amplifier Rack Panel

The PADO4a amp panel allows for connection of loudspeakers, input signal and output signal loop through and is suitable for use with 4 LA24a or LA48a power amplifiers. The panel has 2 x female 8-pin CA-COM connectors for loudspeaker connection; 2 x male 19-pin CA-COM connectors for input signal connection and jumping to subsequent amp racks; 2 x 37 pin D-SUB connectors for attaching COMB connectors to configure the amplifier rack in 2-WAY, 3-WAY or SUB operating modes.

Internally, two sets of 4x male XLR fanouts connect the input signal from the COMB connector on PADO4a to the amplifier inputs and two sets of 4x NL4 Speakon line connectors connect the A and B channel amplifier outputs to the two front panel 8-pin female CA-COM connectors.

For the 19-pin CA-COM connectors, channel assignments are as follows:

<u>3-way stereo format presets</u>: Line 1 is reserved for dV-SUB, SB118 or SB218 subwoofers (SUB(A) COMB connector); lines 2 and 3 for dV-DOSC low, dV-DOSC high (2W(A) COMB connector); Line 4 for dV-SUB, SB118 or SB218 subwoofers (SUB(B) COMB connector); lines 2 and 3 for dV-DOSC low and dV-DOSC high (2W(B) COMB connector).

<u>4+2 format presets</u>: Line 1 is reserved for SB118 or SB218 subwoofer drive (SUB COMB connector); lines 2, 3 and 4 are for dV-SUB, dV-DOSC low, dV-DOSC high, respectively (3-WAY COMB connector); lines 5 and 6 are assigned to 2-way fill (low and high, respectively).

<u>5+1 format presets</u>: Line 1 is reserved for SB118 or SB218 subwoofer drive (SUB COMB connector); lines 2, 3 and 4 are for dV-SUB, dV-DOSC low, dV-DOSC high, respectively (3-WAY COMB connector).

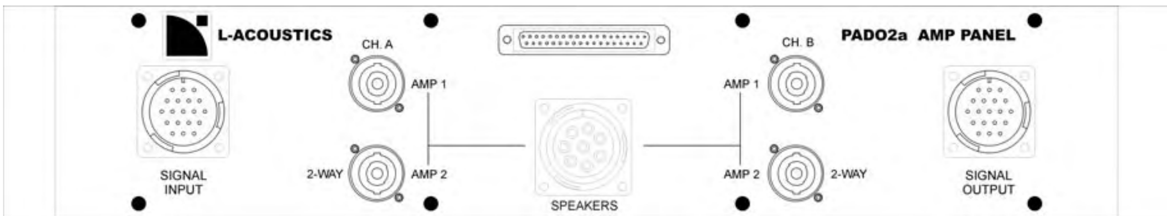


Figure 25: dV-DOSC PADO2a Amplifier Rack Panel

The PADO2a amp panel is suitable for use with 2 LA24a or LA48a power amplifiers and allows for connection of loudspeakers, input signal and output signal loop through. The panel has a single female 8 pin CA-COM connector for loudspeaker connection that is in parallel with 4 x Speakon NL4 connectors; 2 x male 19-pin CA-COM connectors for input signal connection and jumping to subsequent amp racks; 1 x 37 pin D-SUB connector for COMB connector attachment that allows the user to reconfigure the amplifier rack for 2-WAY, 3-WAY or SUB operating modes.

In 3-WAY mode, dV-DOSC and dV-SUB enclosures are connected via the 8-pin CA-COM connector using DO7 or DO25 cables and the DO3WFILL adapter cable. In SUB mode, SB118 or SB218 enclosures can be connected via the four individual NL4 Speakon connectors (using SP7 or SP25 cables) or via the 8-pin CA-COM connector (using DOSUB and optional DO10P cables). In 2-WAY mode, dV-DOSC or 2-way fill enclosures (ARCS, 112XT, 115XT, 115XT HiQ) can be connected via the lower 2 x Speakon NL4 connectors (using SP7 or SP25 cables) or, alternatively, via the 8-pin CA-COM connector (using DO2W cables directly or DO7 / DO25 cables plus DOFILL adapter).

Table 9: PADO4a COMB Wiring Chart

PAD 04a COMB/PANEL/AMPLIFIER WIRING + CHANNEL ASSIGNMENTS

DSP OUTPUT CHANNEL ASSIGNMENTS

	5+1 CONFIG	4+2 CONFIG	3W STEREO	2W STEREO
1	SUB (A)	SUB (A)	SUB(A)	
2	LO (A)	LO (A)	LO (A)	LO (A)
3	MID (A)	MID (A)	HI (A)	HI (A)
4	HI (A)	HI (A)	SUB (B)	
5	FULL (A)	2W LO (B)	LO (B)	LO (B)
6	SUB (B)	2W HI (B)	HI (B)	HI (B)

CA COM -> PAD04a (LINES 14-31)

COMD24	LINE	SIGNAL	SUB D-37
1	K	gnd	23
	L	+	24
	M	-	25
2	G	gnd	20
	H	+	21
	J	-	22
3	D	gnd	17
	E	+	18
	F	-	19
4	A	gnd	14
	B	+	15
	C	-	16
5	S	gnd	29
	T	+	30
	U	-	31
6	N	gnd	26
	P	+	27
	R	-	28

COMB CONNECTOR WIRING (INPUT REASSIGN -> LINES 1-12)

CHANNEL A — 4+2 PRESET CONFIGURATION / 3W STEREO CONFIG / 2W STEREO CONFIG → LINES 1-12 -> AMP CH

3-WAY	SUB	2-WAY	3W ST (A)	3W ST (B)	2W STEREO	2W ST (A)	2W ST (B)	SUB D-37 A	AMP CH
14	23	26	17	26	17	17	26	1	
15	24	27	18	27	18	18	27	2	LA48a (1)
16	25	28	19	28	19	19	28	3	CH A
17	23	29	20	29	20	20	29	4	
18	24	30	21	30	21	21	30	5	LA48a (2)
19	25	31	22	31	22	22	31	6	CH A
20	23	26	23	14	26	17	26	7	
21	24	27	24	15	27	18	27	8	LA48a (3)
22	25	28	25	16	28	19	28	9	CH A
20	23	29	23	14	29	20	29	10	
21	24	30	24	15	30	21	30	11	LA48a (4)
22	25	31	25	16	31	22	31	12	CH A

CHANNEL B — 4+2 PRESET CONFIGURATION / 3W STEREO CONFIG / 2W STEREO CONFIG → LINES 1-12 -> AMP CH

3-WAY	SUB	2-WAY	3W ST (A)	3W ST (B)	2W STEREO	2W ST (A)	2W ST (B)	SUB D-37 B	AMP CH
14	23	26	17	26	17	17	26	1	
15	24	27	18	27	18	18	27	2	LA48a (1)
16	25	28	19	28	19	19	28	3	CH B
17	23	29	20	29	20	20	29	4	
18	24	30	21	30	21	21	30	5	LA48a (2)
19	25	31	22	31	22	22	31	6	CH B
20	23	26	23	14	26	17	26	7	
21	24	27	24	15	27	18	27	8	LA48a (3)
22	25	28	25	16	28	19	28	9	CH B
20	23	29	23	14	29	20	29	10	
21	24	30	24	15	30	21	30	11	LA48a (4)
22	25	31	25	16	31	22	31	12	CH B

Table 10: PADO4a Internal Amp Rack Wiring Chart

CHANNEL A AMP RACK INTERNAL WIRING (SUB D XLRs -> AMPS -> CACOM8)

SUB D-37 A	SIGNAL	XLR COLOR	XLR PIN	AMP CH	AMP OUT	SPEAKON COLOR	CACOM8 A
1	gnd		1				
2	+	BROWN	2	LA 48 (1)	1+	BLUE	G
3	-	AMP1 CH A	3	CH A	1-	AMP1 CH A	H
4	gnd		1				
5	+	VIOLET	2	LA 48 (2)	1+	GREEN	E
6	-	AMP2 CH A	3	CH A	1-	AMP2 CH A	F
7	gnd		1				
8	+	WHITE	2	LA 48 (3)	1+	RED	A
9	-	AMP3 CH A	3	CH A	1-	AMP3 CH A	B
10	gnd		1				
11	+	ORANGE	2	LA 48 (4)	1+	YELLOW	C
12	-	AMP4 CH A	3	CH A	1-	AMP4 CH A	D

AMPLIFIER CHANNEL ASSIGNMENT

3-WAY	SUB	2-WAY	3W ST (A)	3W ST (B)	2W STEREO	2W ST (A)	2W ST (B)
HI	SUB (1)	2W HI	HI (A)	HI (B)	HI (A)	HI (A)	HI (B)
MID	SUB (2)	2W LO	LO (A)	LO (B)	LO (A)	LO (A)	LO (B)
LO	SUB (3)	2W HI	SUB (A)	SUB (B)	HI (B)	HI (A)	HI (B)
LO	SUB (4)	2W LO	SUB (A)	SUB (B)	LO (B)	LO (A)	LO (B)

CHANNEL B AMP RACK INTERNAL WIRING (SUB D XLRs -> AMPS -> CACOM8)

SUB D-37 B	SIGNAL	XLR COLOR	XLR PIN	AMP CH	AMP OUT	SPEAKON COLOR	CACOM8 B
1	gnd	BROWN	1			BLUE	
2	+	+++	2	LA 48 (1)	1+	+++	G
3	-	AMP1 CH B	3	CH B	1-	AMP1 CH B	H
4	gnd	VIOLET	1			GREEN	
5	+	+++	2	LA 48 (2)	1+	+++	E
6	-	AMP2 CH B	3	CH B	1-	AMP2 CH B	F
7	gnd	WHITE	1			RED	
8	+	+++	2	LA 48 (3)	1+	+++	A
9	-	AMP3 CH B	3	CH B	1-	AMP3 CH B	B
10	gnd	ORANGE	1			YELLOW	
11	+	+++	2	LA 48 (4)	1+	+++	C
12	-	AMP4 CH B	3	CH B	1-	AMP4 CH B	D

AMPLIFIER CHANNEL ASSIGNMENT

3-WAY	SUB	2-WAY	3W ST (A)	3W ST (B)	2W STEREO	2W ST (A)	2W ST (B)
HI	SUB (1)	2W HI	HI (A)	HI (B)	HI (A)	HI (A)	HI (B)
MID	SUB (2)	2W LO	LO (A)	LO (B)	LO (A)	LO (A)	LO (B)
LO	SUB (3)	2W HI	SUB (A)	SUB (B)	HI (B)	HI (A)	HI (B)
LO	SUB (4)	2W LO	SUB (A)	SUB (B)	LO (B)	LO (A)	LO (B)

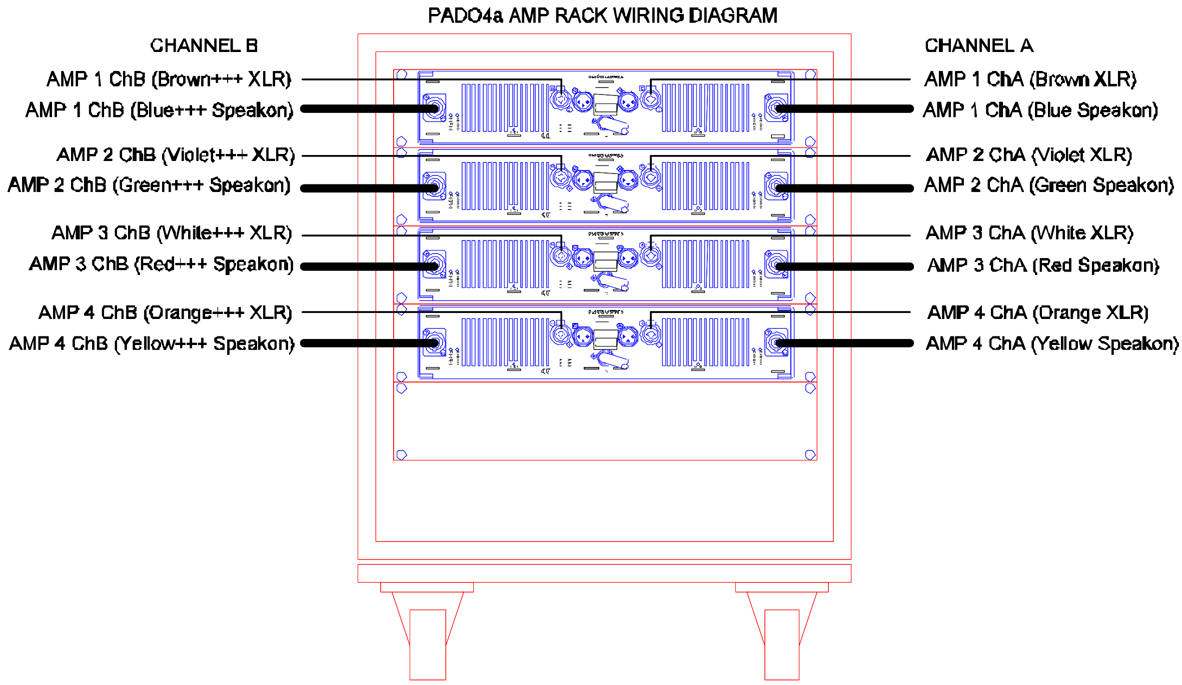


Figure 26: PADO4a amp rack wiring

Table 11: PADO2a COMB Wiring Chart

PAD02a COMB/PANEL/AMPLIFIER WIRING + CHANNEL ASSIGNMENTS

DSP OUTPUT CHANNEL ASSIGNMENTS

	5+1 CONFIG	4+2 CONFIG	3W STEREO	2W STEREO
1	SUB (A)	SUB (A)	SUB(A)	
2	LO (A)	LO (A)	LO (A)	LO (A)
3	MID (A)	MID (A)	HI (A)	HI (A)
4	HI (A)	HI (A)	SUB (B)	
5	FULL (A)	2W LO (B)	LO (B)	LO (B)
6	SUB (B)	2W HI (B)	HI (B)	HI (B)

CACOM -> PAD02a (LINES 14-31)

CO/MD24	LINE	SIGNAL	SUB D-37
1	K	gnd	23
	L	+	24
	M	-	25
2	G	gnd	20
	H	+	21
	J	-	22
3	D	gnd	17
	E	+	18
	F	-	19
4	A	gnd	14
	B	+	15
	C	-	16
5	S	gnd	29
	T	+	30
	U	-	31
6	N	gnd	26
	P	+	27
	R	-	28

COMB CONNECTOR WIRING (INPUT REASSIGN -> LINES 1-12)

4+2 PRESET CONFIGURATION			3W STEREO CONFIG		2W STEREO CONFIG		
3-WAY	SUB	2-WAY	3W (A)	3W (B)	2W STEREO	2W (A)	2W (B)
14	23	26	17	26	17	17	26
15	24	27	18	27	18	18	27
16	25	28	19	28	19	19	28
17	23	29	20	29	20	20	29
18	24	30	21	30	21	21	30
19	25	31	22	31	22	22	31
20	23	26	23	14	26	17	26
21	24	27	24	15	27	18	27
22	25	28	25	16	28	19	28
20	23	29	23	14	29	20	29
21	24	30	24	15	30	21	30
22	25	31	25	16	31	22	31

LINES 1-12 -> AMP CH

SUB D-37	AMP CH
1	AMP 1
2	CH A
3	*(top)*
4	AMP 2
5	CH A
6	*(bottom)*
7	AMP 1
8	CH B
9	*(top)*
10	AMP 2
11	CH B
12	*(bottom)*

Table 12: PADO2a Internal Amp Rack Wiring Chart

AMP RACK INTERNAL WIRING (SUB D XLRs -> AMPS -> CACOM8)

SUB D-37	SIGNAL	XLR PIN	XLR	AMP CH	AMP OUT	SPEAKON	CACOM8
1	gnd	1		AMP 1			
2	+	2	BROWN	CH A	1+	BLUE	G
3	-	3		*(top)*	1-		H
4	gnd	1		AMP 2			
5	+	2	VIOLET	CH A	1+	GREEN	E
6	-	3		*(bottom)*	1-		F
7	gnd	1		AMP 1			
8	+	2	WHITE	CH B	1+	RED	A
9	-	3		*(top)*	1-		B
10	gnd	1		AMP 2			
11	+	2	ORANGE	CH B	1+	YELLOW	C
12	-	3		*(bottom)*	1-		D

AMPLIFIER CHANNEL ASSIGNMENT

3-WAY	SUB	2-WAY	3W ST (A)	3W ST (B)	2W STEREO	2W ST (A)	2W ST (B)
HI	SUB (1)	2W HI	HI (A)	HI (B)	HI (A)	HI (A)	HI (B)
MID	SUB (2)	2W LO	LO (A)	LO (B)	LO (A)	LO (A)	LO (B)
LO	SUB (3)	2W HI	SUB (A)	SUB (B)	HI (B)	HI (A)	HI (B)
LO	SUB (4)	2W LO	SUB (A)	SUB (B)	LO (B)	LO (A)	LO (B)

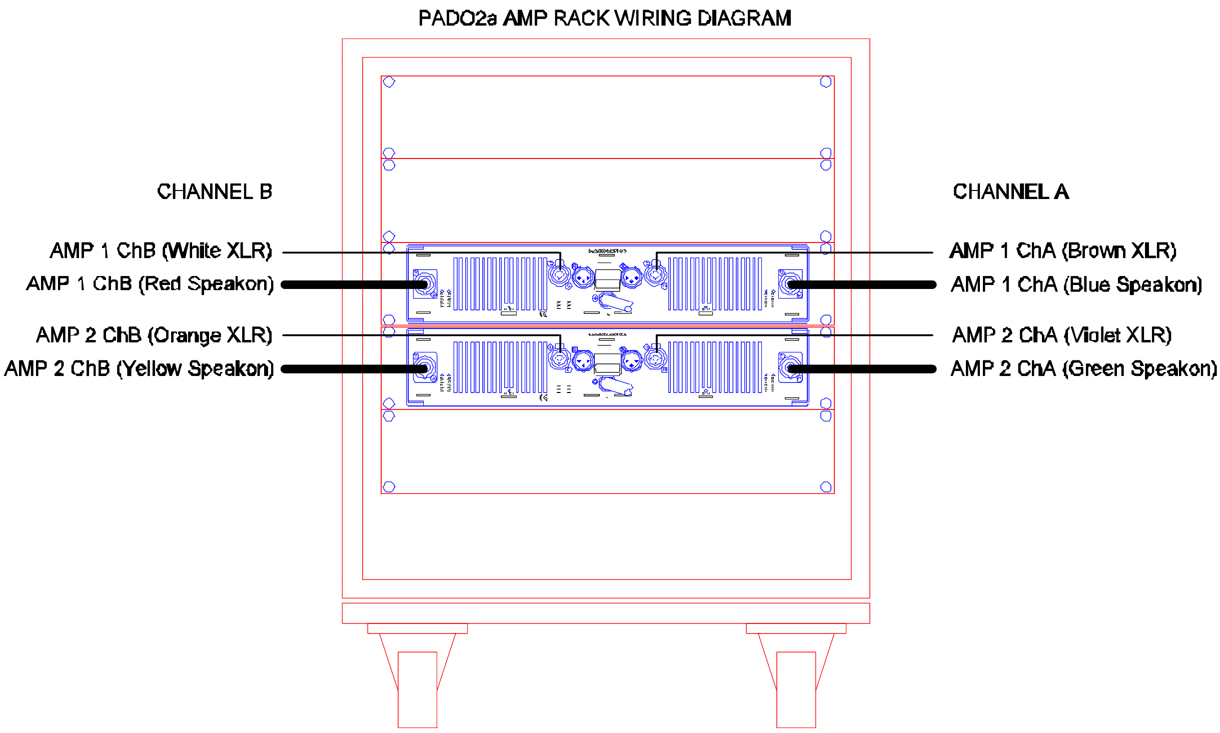


Figure 27: PADO2a amp rack wiring

1.9 dV-DOSC AMPLIFIER RACKS

Figure 28: L-ACOUSTICS AMP RACK RK12-4

The L-ACOUSTICS RK12U amplifier rack is 12 rack units high and can be loaded with up to four L-ACOUSTICS LA24a or LA48a amplifiers. Overall external dimensions are 77 cm high (including casters) x 61 cm wide x 58 cm deep (30.3 x 26.4 x 22.9 inches). Clearance from the front rack rail to the front of the rack is 9.5 cm (3.7 in). Clearance from the rear rack rail to the rear of the rack is 6 cm (2.4 in). The depth from front to rear rack rails is 42.5 cm (16.7 in) and the depth from front rack rail to the rear support points for the LA24a or LA48a amplifier is 39 cm (15.35 in). Due to the switched mode power supply technology employed in the L-ACOUSTICS LA48a, the rack weighs only 98 kg (216 lbs) when loaded with four LA48a amplifiers.

Using the COMB connectors located on the PADO4a amp panel, the rack can be configured so that A and B channels are independent. Depending on how the rack is to be configured 2-WAY, 3-WAY or SUB COMB connectors are selected. Alternatively, SUB(A), SUB(B), 2W(A), 2W(B), 2W STEREO, 3W(A) or 3W(B) COMB connectors can be used. Essentially, COMB connectors route the desired input lines from the 19 pin CA-COM connector to the appropriate amplifier inputs for A and B channels, respectively. Using separate COMB connectors for both channels, it is possible to assign the A channels and B channels independently. When fully-loaded (4 x LA48a plus PADO4a) the RK124a rack can power up to 12 x dV-DOSC, 8 x SB218 or dV-SUB subwoofers or 16 x SB118 subwoofers.

In terms of construction, the amplifier rack is made of a lightweight aluminum space frame with heavy duty bracing, internal shock mounting, standard rack rails and provision for rear support of amplifiers. Transparent (lexan) front and rear doors allow the user to quickly see how racks are configured and can be conveniently stored inside the rack during use (*note: for ventilation purposes, front and rear doors must always be removed during operation*). A high impact resistance polyethylene cover provides protection for the rack during transport so that no external case is required. Four recessed Aeroquip flytrack sections are mounted on both sides of the amplifier rack for flown applications and recesses in the top cover of the amplifier rack allows racks to be stacked on top of each other with the casters still attached. It is also possible to remove the casters on one amplifier rack, place it on top of a second amp rack and then mechanically bolt the two racks together.

Overall the L-ACOUSTICS RK12U amplifier rack provides an extremely efficient package in terms of power versus size and weight while at the same time maintaining flexibility for smaller scale and distributed system applications. Various RK12U packaging options are shown in Fig. 29.

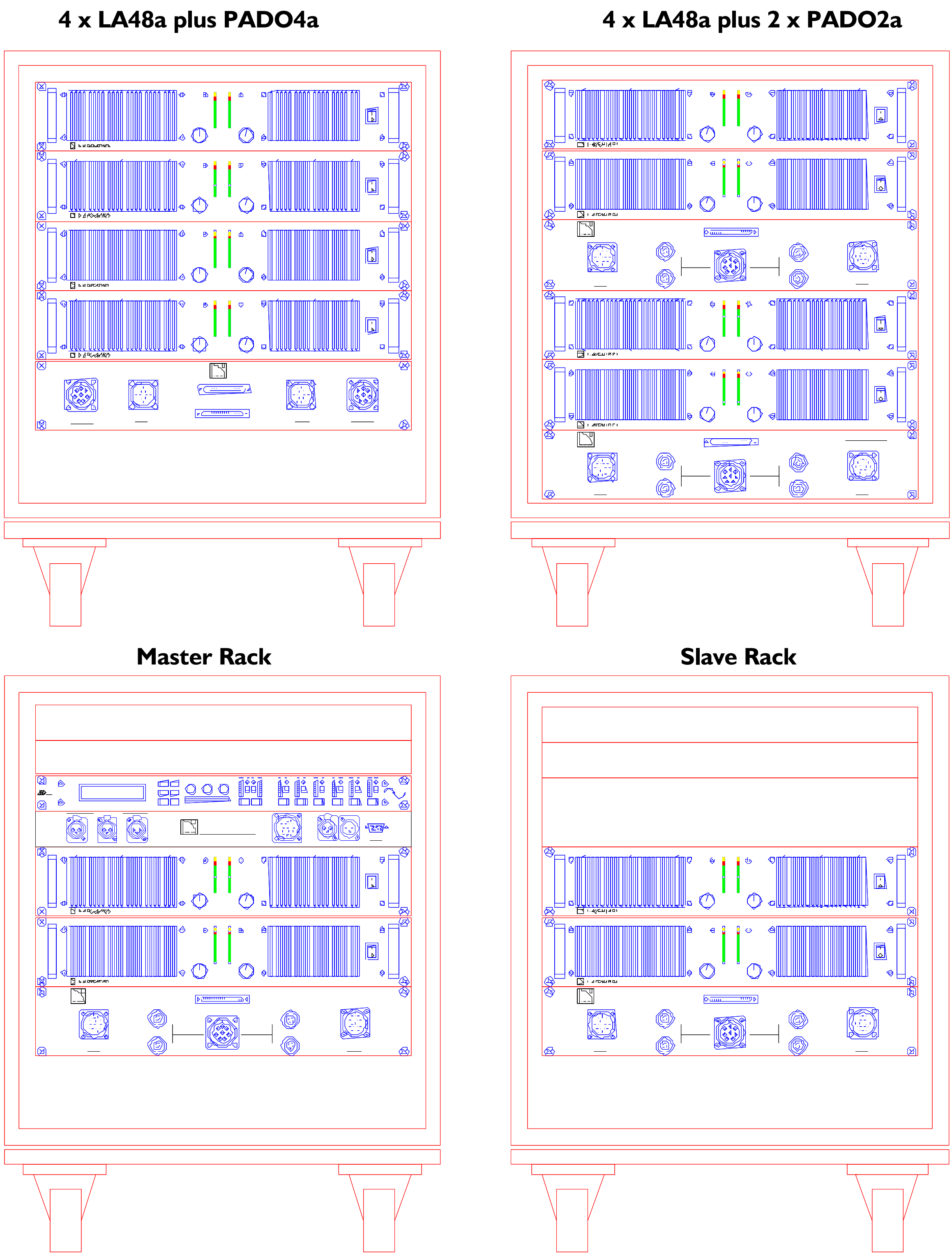


Figure 29: L-ACOUSTICS Amplifier Rack Options: (a) 4x LA48a plus PADO4a; (b) 4x LA48a plus 2x PADO2a; (c) Master Rack with DSP, CO6 Control Output, 2x LA48a, PADO2a; (d) Slave Rack with 2x LA48a, PADO2a

1.10 COMB CONNECTORS

COMB connectors are used in conjunction with L-ACOUSTICS signal distribution panels (CO6, CO24, MD24) to route desired signal lines from the 19-pin CA-COM input connectors on PADO2a or PADO4a amplifier rack panels to the appropriate amplifier inputs. Amplifier racks can be conveniently reconfigured without rewiring internally - simply by changing the COMB connector.

COMB connectors for use with dV-DOSC (4-way+2 or 5-way+1 format presets) are:

DSUB	= SUB	(signal line 1 for SB118 or SB218)
D3WAY	= 3-WAY	(signal lines 2/3/4 for dV-SUB/dV-DOSC low/dV-DOSC high)
D2WAY	= 2-WAY	(signal lines 5/6 for 2-way fill low/high, 4+2 presets only)

Additional COMB connectors are available for use with 2-way or 3-way stereo format presets are:

D2WA	= 2W(A)	(signal lines 2/3 for 2-way low/high)
D2WB	= 2W(B)	(signal lines 5/6 for 2-way low/high)
D2WSTEREO	= 2W(STEREO)	(signal lines 2/3 and 5/6 for stereo 2-way low/high)
D3WA	= 3W(A)	(signal lines 1/2/3 for sub/2-way low/2-way high)
D3WB	= 3W(B)	(signal lines 4/5/6 for sub/2-way low/2-way high)
DSUBA	= SUB(A)	(signal line 1 for sub drive)
DSUBB	= SUB(B)	(signal line 4 for sub drive)

DSUBTK is a set of 6 COMB connectors for implementing electronic arc delay processing of subwoofer arrays or for powering passive enclosures:

SUB T1 = signal line 1
SUB T2 = signal line 2
SUB T3 = signal line 3
SUB T4 = signal line 4
SUB T5 = signal line 5
SUB T6 = signal line 6

For complete details regarding CA-COM line assignments, PADO2a and PADO4a wiring plus COMB connector wiring, please refer to Tables 9-12 in Section 1.8.

DSP output channel assignments for 4+2 and 5+1 format presets, CO6 / CO24 patching and 3-WAY, SUB and 2-WAY COMB connector channel selection are summarized as follows:

Table 13a: dV-DOSC DSP output channel assignment and COMB connector summary (5+1 format presets)

DSP OUTPUT CHANNEL	5+1 FORMAT PRESET	CO6 / CO24 INPUT	COMB CONNECTOR 3-WAY	COMB CONNECTOR SUB
1	SUB (A)	1		SB118 or SB218
2	LO (A)	2	dV-SUB	
3	MID (A)	3	dV-DOSC LO	
4	HI (A)	4	dV-DOSC HI	
5	FULL (A)			
6	SUB (B)			

AUX SUB DRIVE

DSP OUTPUT CHANNEL	5+1 FORMAT PRESET	CO6 / CO24 INPUT	COMB CONNECTOR 3-WAY	COMB CONNECTOR SUB
1	SUB (A)			
2	LO (A)	2	dV-SUB	
3	MID (A)	3	dV-DOSC LO	
4	HI (A)	4	dV-DOSC HI	
5	FULL (A)			
6	SUB (B)	1		SB118 or SB218

Table 13b: dV-DOSC DSP output channel assignment and COMB connector summary (4+2 format presets)

DSP OUTPUT CHANNEL	4+2 FORMAT PRESET	CO6 / CO24 INPUT	COMB CONNECTOR 3-WAY	COMB CONNECTOR SUB	COMB CONNECTOR 2-WAY*
1	SUB (A)	1		SB118 or SB218	
2	LO (A)	2	dV-SUB		
3	MID (A)	3	dV-DOSC LO		
4	HI (A)	4	dV-DOSC HI		
5	2W LO (B)	5			2-way LO
6	2W HI (B)	6			2-way HI

* 2-WAY ENCLOSURES: ARCS, 112XT, 115XT, 115XT HiQ

Operating modes, amplifier rack channel assignments and cabling plus loudspeaker enclosure combinations for the L-ACOUSTICS RK122a amplifier rack (PADO2a plus 2 x LA48a) are as follows:

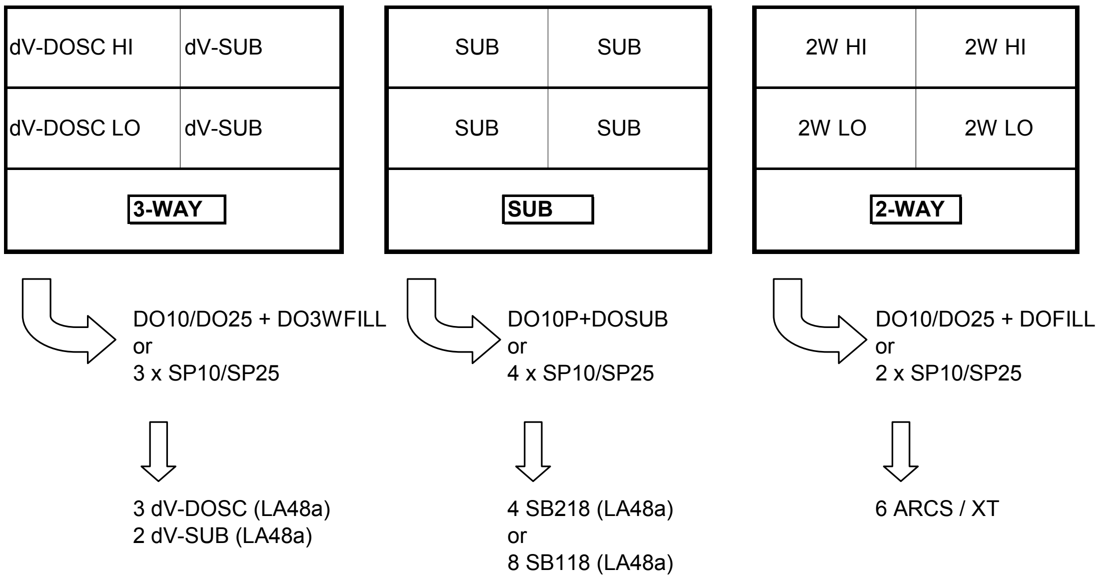


Figure 30: L-ACOUSTICS RK122a amplifier rack channel assignments and cabling

Operating modes, amplifier rack channel assignments and cabling plus loudspeaker enclosure combinations for the L-ACOUSTICS RK124a amplifier rack (PADO4a plus 4 x LA48a) are as follows:

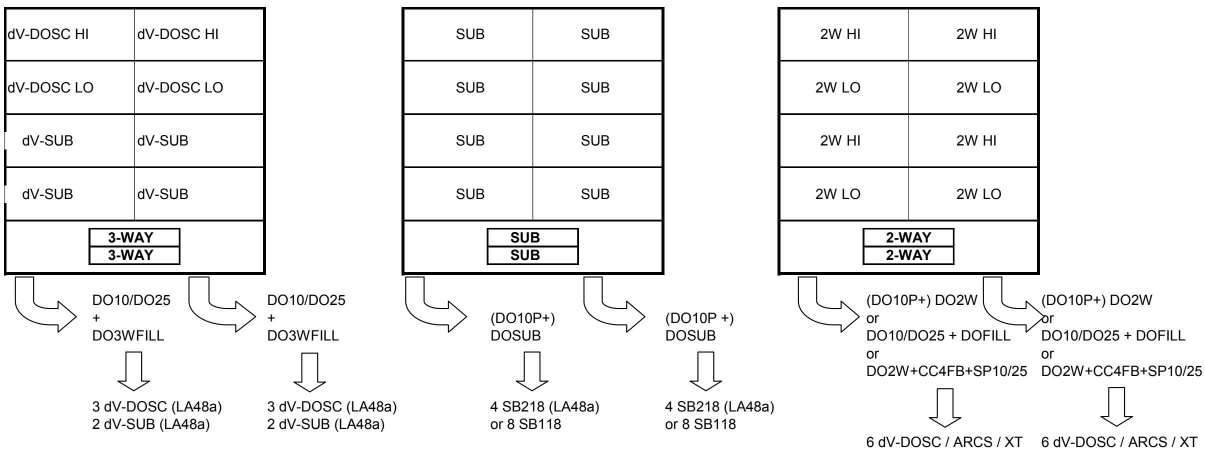


Figure 31: L- L-ACOUSTICS RK124a amplifier rack channel assignments and cabling

To power 2-way fill enclosures or 3-way stereo dV-DOSC, ARCS or XT systems using PADO2a and PADO4a amplifier panels, additional COMB connectors can be employed: 2W(A), 2W(B), 3W(A), 3W(B), SUB(A), SUB(B) or 2W STEREO. DSP output channel assignments for 2-way stereo and 3-way stereo format presets, CO6 or CO24 patching and COMB connector channel selection are summarized as follows:

Table 14: 2-way and 3-way stereo preset DSP output channel assignment and COMB connector summary

DSP OUTPUT CHANNEL	2W STEREO PRESET	3W STEREO PRESET	CO6 / CO24 INPUT	COMB CONNECTOR CHANNEL SELECTION						
				SUB (A)	2W (A)	SUB (B)	2W (B)	2W STEREO	3W (A)	3W (B)
1		SUB(A)	1	SUB (A)					SUB (A)	
2	LO (A)	LO (A)	2		LO (A)			LO (A)	LO (A)	
3	HI (A)	HI (A)	3		HI (A)			HI (A)	HI (A)	
4		SUB (B)	4			SUB (B)				SUB (B)
5	LO (B)	LO (B)	5				LO (B)	LO (B)		LO (B)
6	HI (B)	HI (B)	6				HI (B)	HI (B)		HI (B)

This signal distribution scheme allows for logical patching between digital signal processor outputs and CO6 or CO24 inputs for 2-way stereo and 3-way stereo format presets, i.e., channels are patched 1:1, 2:2, 3:3 etc. This helps eliminate potential sources of error due to mispatching and, in addition, it is not necessary to repatch DSP outputs when changing between stereo 2-way and 3-way presets.

Operating modes, amplifier rack channel assignments and cabling plus loudspeaker enclosure combinations for the L-ACOUSTICS RK122a amplifier rack (PADO2a plus 2 x LA48a) are as follows:

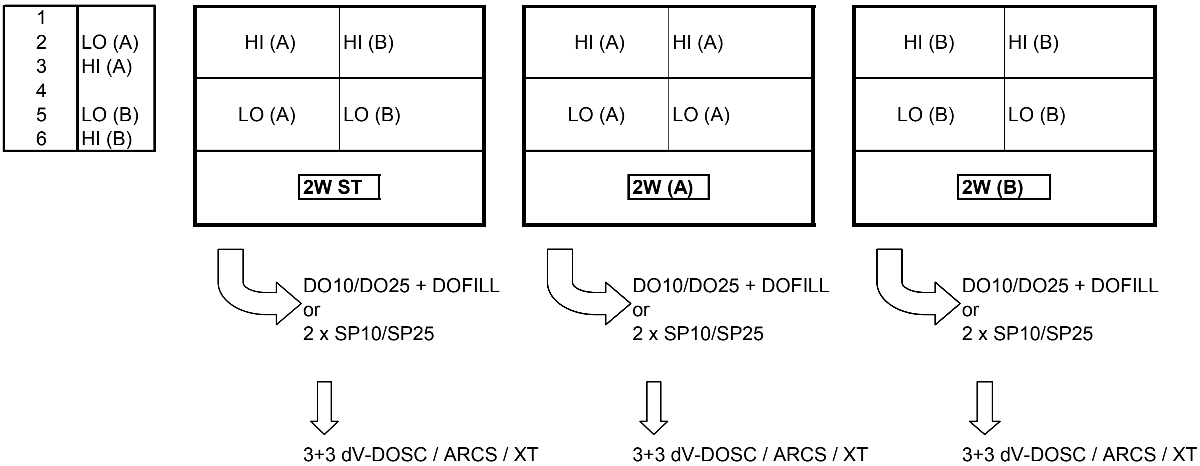


Figure 32: L-ACOUSTICS RK122a amplifier rack channel assignments and cabling for 2-way stereo presets

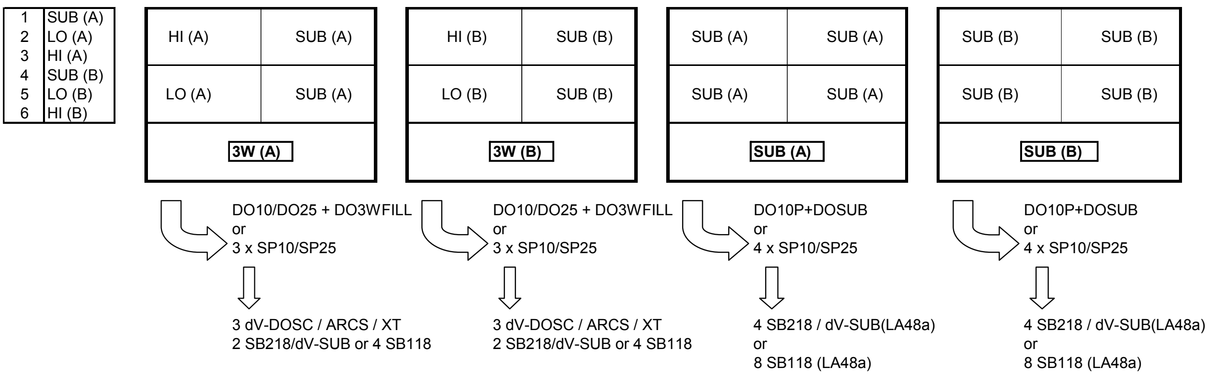


Figure 33: L-ACOUSTICS RK122a amplifier rack channel assignments and cabling for 3-way stereo presets

Operating modes, amplifier rack channel assignments and cabling plus loudspeaker enclosure combinations for the L-ACOUSTICS RK124a amplifier rack (PADO4a plus 4 x LA48a) are as follows:

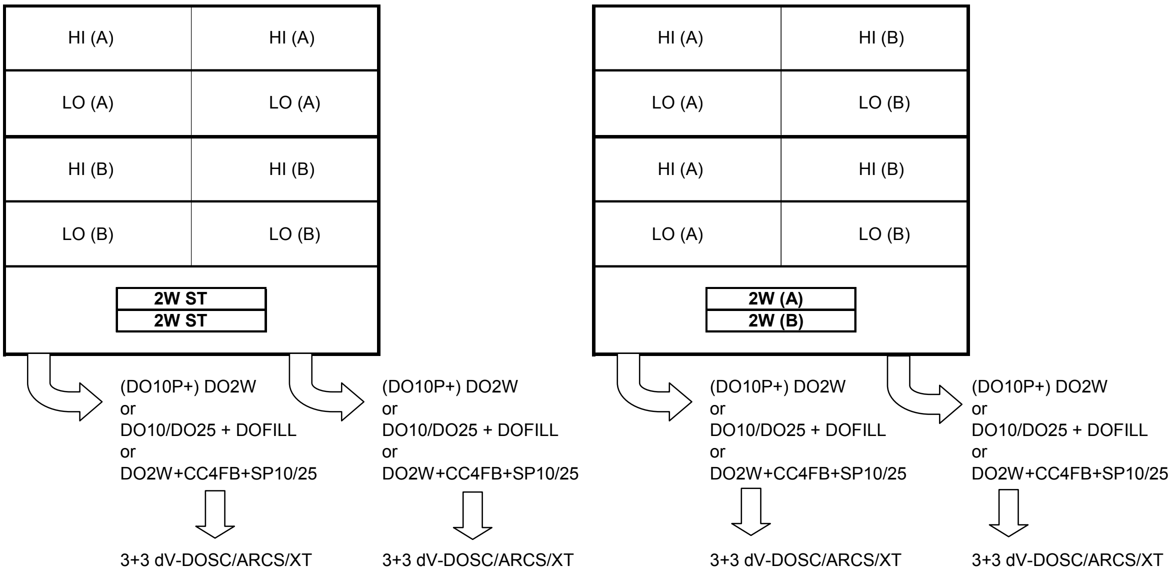


Figure 34: L-ACOUSTICS RK124a amplifier rack channel assignments and cabling for 2-way stereo presets

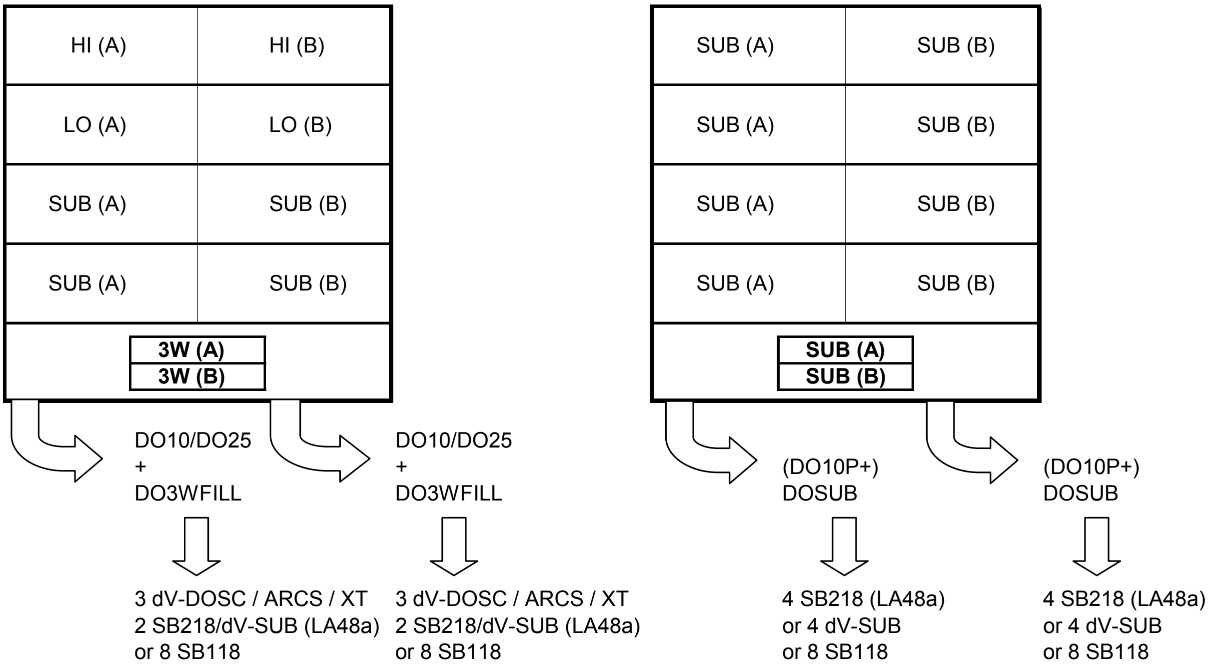


Figure 35: L-ACOUSTICS RK124a amplifier rack channel assignments and cabling for 3-way stereo presets

1.11 CO24 CONTROL OUTPUT PANEL

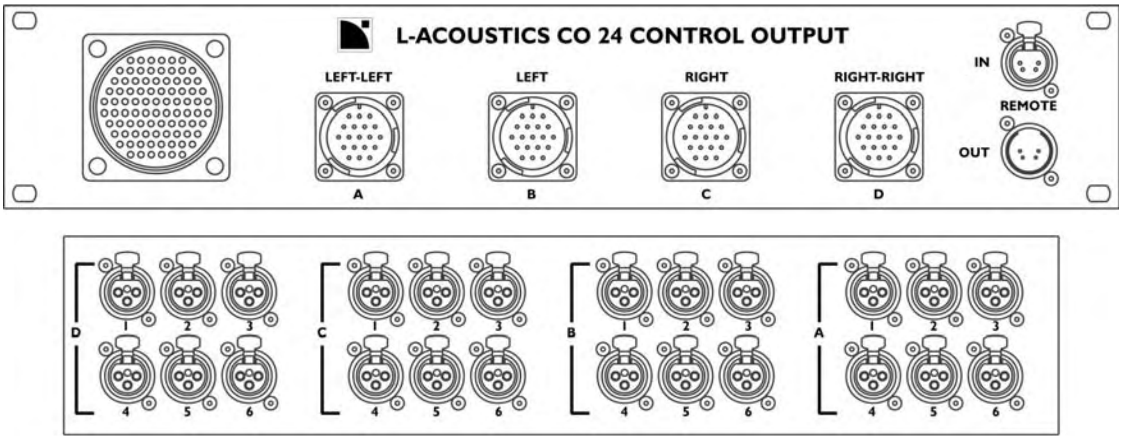


Figure 36: CO24 Control Output Panel

The CO24 control output panel can be used in conjunction with 4 digital signal processors to create a compact, modular drive rack. DSP outputs are patched to the 24 x female XLR patch bay on the internal side of the CO24 panel and assigned to MC28100 MULTI return snake lines. For added flexibility, all MULTI lines are paralleled with individual front panel Left-Left (A), Left (B), Right (C) and Right-Right (D) 19-pin CA-COM connectors.

These individual CA-COM connectors can be used in situations where the drive rack is located onstage (eliminating the need for a MULTI DISTRO panel) or when it is desirable to run separate drive snakes to remotely-located amplifier racks. For example, in some cases, amplifier racks may be located at delay towers behind the FOH location and separate snake runs required, or for smaller club/theatre shows, two DOM30 Cross Link cables can be run for left and right arrays instead of using the MC28100 MULTI. In addition, the availability of individual CA-COM connectors allows a DOMM LINK BREAKOUT cable to be connected to these outputs for testing purposes.

The CO24 control output panel configuration allows for maximum flexibility while providing a scaleable architecture that can be used for small, medium and large systems. Let's consider the largest system application in detail since small and medium systems will adhere to the same channel assignment standards and are considered as subsets of the large scale setup.

A large scale dV-DOSC system can consist of: Left-Left (L-L), Left (L), Right (R) and Right-Right (R-R) arrays. Each of the four arrays can have associated 2-way fill enclosures and SB218 subwoofers. Therefore, each L-L, L, R and R-R array requires 6 drive channels: 2 for dV-DOSC, 1 for dV-SUB, 1 for SB218s or SB118s and 2 for active 2-way fill enclosures. Since there are 4 arrays, this requires 24 drive channels total. The 84 pin Whirlwind MASS W6 connector accomodates these 24 drive channels (72 lines) leaving 14 additional lines available.

It is important to have discrete drive for all four arrays for several reasons: (a) Discrete drive allows for the relative time alignment of all 4 arrays, i.e., typically the L array will act as a time reference for the L-L array while the R array acts as a time reference for the R-R; (b) Different-sized arrays will require different band attenuation and equalization, i.e., typically the L-L and R-R arrays used for offstage coverage are smaller in terms of the number of enclosures; (c) Discrete drive for all four arrays allows for the creation of stereo over larger audience areas, i.e., using the console's matrix outputs the stereo left signal can be applied to the L and R-R arrays while stereo right can be sent to the R and L-L arrays. De-correlating the L-L versus L signals (and R-R versus R) by applying stereo feeds also helps to reduce the effects of audible interference in the coverage overlap region between main FOH and offstage fill arrays.

1.12 MD24 MULTI DISTRO PANEL

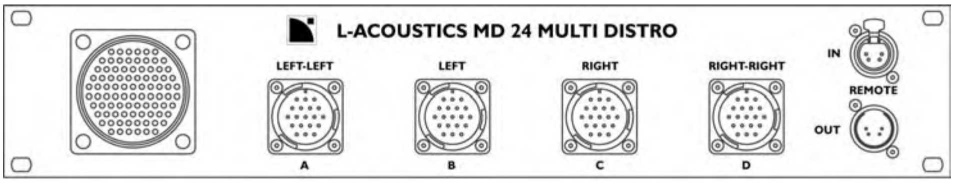


Figure 37: MD24 Multi Distro Panel

The MD24 Multi Distro panel is used onstage for distribution of MC28100 MULTI return snake lines that originate from the CO24 Control Output panel located at FOH. The MD24 panel can be packaged separately and located either stage left or right (depending on physical constraints regarding snake runs) or, alternatively, can be mounted in the amplifier rack that is first in line for patching purposes.

A DOM2 AMP LINK cable is run from the Multi Distro panel to the appropriate 19 pin CA-COM connector of the first amplifier, e.g., B lines for FOH left if the amplifier rack is located stage right. AMP LINK cables are then used to connect subsequent stage right amplifiers so that all receive B lines (including subwoofer and 2-way amplifier racks which are configured using SUB and 2-WAY COMB connectors, respectively). A DOM30 CROSS LINK cable is then used to distribute C lines for FOH right from the MD24 Multi Distro panel cross stage to the stage left amplifiers. These racks are connected in the same way using AMP LINK cables and similar connections are performed for the A and D lines to accommodate Left-Left and Right-Right arrays, as necessary. Separating signal distribution lines to individual L-L, L, R and R-R arrays is also an effective way to avoid potential ground loop problems.

1.13 CO6 CONTROL OUTPUT PANEL

The CO6 Control Output panel is a scaled down 6 channel version of the 24 channel CO24 panel that is suitable for 2-way or 3-way stereo FOH or fill / delay system applications. CO6 is intended for use with a 2 in x 6 out (or 3 x 6) Digital Signal Processor (DSP) for the creation of a compact, modular drive rack or for standalone master amplifier rack packaging. DSP outputs are connected to the 6x female XLR patch bay on the rear side of the CO6 panel and these outputs are in turn assigned to the front panel 19-pin CACOM connector. This provides a 6 channel multicore return snake system when used with a standard 30 metre DOM30 CROSS LINK cable. For longer cable runs, multiple DOM30 cables can be extended using the DOMP adapter (19-pin male-male CACOM adapter).

The CO6 Control Output panel allows for maximum flexibility while providing a scaleable architecture that can be used for small, medium and even large system applications since it is compatible with the dV-DOSC and V-DOSC signal distribution strategy and cabling/connector standards.

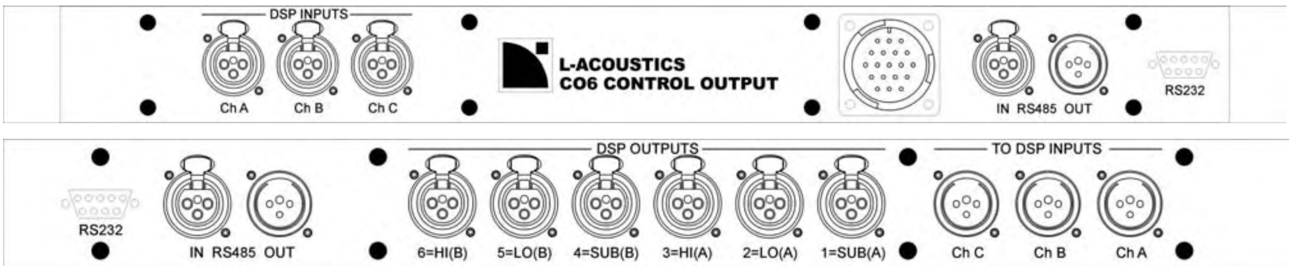


Figure 38: CO6 Control Output Panel

1.14 APPROVED DIGITAL SIGNAL PROCESSORS

Digital signal processing units supported by L-ACOUSTICS for dV-DOSC include: XTA DP224, XTA DP226 (or DP6i = fixed install version of the DP226), BSS FDS 366 (Omnidrive Compact Plus), BSS Soundweb and Lake Contour.

OEM factory presets for these DSP units are distributed via PCMCIA Card (excluding XTA DP6i, BSS Soundweb and Lake Contour – OEM presets for these units are downloaded via computer) and are available from L-ACOUSTICS France, L-ACOUSTICS US, L-ACOUSTICS UK or your local distributor. Preset libraries and upgrades can also be downloaded from www.l-acoustics.com.

Since the XTA DP226 is a 2 input x 6 output unit, the DP224 is 2 x 4, the Lake Contour is 2 x 6 and the BSS 366 is 3 x 6, exact internal wiring of your FOH drive rack and DSP output channel assignments will vary depending on the selected processor and the application. Carefully consider your flexibility requirements before selecting the number and type of DSP units to specify.

For full details on the operational and technical aspects of these DSP units, please refer to their respective user manuals (www.lake.com.au, www.xta.co.uk, www.bss.co.uk).

NOTE: ALWAYS REFER TO THE PRESET DESCRIPTION SHEET (TABLES 16-19) FOR YOUR DSP WHEN SELECTING PRESETS AND CONFIGURING YOUR DRIVE RACK.

1.15 OEM FACTORY PRESETS

According to L-ACOUSTICS company policy, OEM factory preset parameters are software-protected and preset data or passwords are not communicated in order to preserve quality control, confidentiality and to maintain the integrity of presets as part of the dV-DOSC standard.

A lot of engineering and real-world testing goes into determining optimum dV-DOSC presets – detailed polar measurements and weighted spatial averaging are used to determine component equalization, crossover points and time alignment delays, for example. As a result, dV-DOSC presets give the user an optimum starting point – system tuning should be done using band attenuation, subwoofer time alignment and system equalization using input parametric filters – not by altering presets - for the following reason:

Without proper instrumentation and spatial averaging, adjustments made at one location (e.g. the mix position) are not optimum at all other locations within the defined coverage pattern of the system. When made by ear, such adjustments can be misguided – the user may be in a local room mode (low frequency pressure maximum or minimum) and/or may be hearing a cancellation or addition due to crossover misalignment that sounds good at that specific location but what about all others? Meanwhile, a better result could have been achieved while preserving the power response of the system (and satisfying WST conditions) by using the correct OEM factory preset and a simple equalization or output channel gain adjustment or correct time alignment of subwoofers or …

The bottom line is that making sure that dV-DOSC is used properly is in **everyone's** best interest and it is up to the Qualified V-DOSC Technician and Certified V-DOSC Engineer to maintain quality control standards. Quality control starts with a good sound design concept then includes detailed coverage simulation using ARRAY2004 or SOUNDVISION to determine installation parameters, accurate installation, correct preset selection and a solid methodology for system tuning. Restricting access to presets is in no way meant to restrict the creative process – on the contrary, the overall systems approach is intended to enhance it by ensuring quality control and repeatability

1.16 dV-DOSC PRESETS

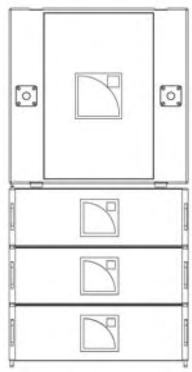
dV-DOSC presets are provided in LO and HI versions with differing amounts of HF shelving equalization. In general, LO presets are flat (smooth) while HI presets have an additional 3 dB of shelving eq (bright).

Stereo 2-way dV-DOSC presets offer the choice between two high pass filters for the low section and two shelving eqs for the high section. For dV-DOSC 2W 100 presets, a 100 Hz, 24 dB/octave slope HPF is applied to the low section and the limiter threshold is set at +7 dBu. For dV-DOSC 2W 80 presets, an 80 Hz 24 dB/octave slope HPF is applied to the low section and the limiter threshold is set at +5 dBu. The dV-DOSC 2W 80 Hz preset also includes optimized LF shelving equalization for standalone applications or for AUX SUB drive using SB218 DELAY ARC 80 Hz or SB218 LCR 80 Hz presets. For either of these presets, LO (smooth) or HI (bright) versions are provided with differing amounts of shelving eq for the high frequency section.

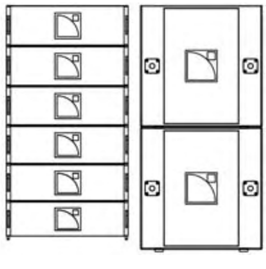
Stereo 3-way presets are provided for dV-DOSC plus dV-SUB with a variety of crossover points available between dV-SUB and the dV-DOSC low section (80, 120 and 200 Hz). The 80 Hz crossover point is intended for applications where dV-SUB and dV-DOSC are physically separated (eg. ground stacked subwoofers with flown dV-DOSC). The 120 Hz crossover point is considered optimal in terms of power bandwidth for both dV-SUB and the dV-DOSC low section and is for closely coupled flown or stacked configurations. The 200 Hz crossover point allows the dV-SUB to function as a combination sub/low enclosure and also provides an operating bandwidth that corresponds to that of the V-DOSC low section. The 200 Hz crossover point is for closely coupled configurations except for coplanar flown configurations, i.e., when dV-SUB arrays are flown on both sides of a dV-DOSC array.

Note: For a ratio of 3:1 dV-DOSC:dV-SUB low frequency extension is provided that results in the same low frequency tonal balance as V-DOSC (without subwoofers)

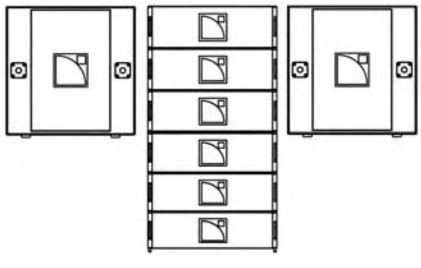
1) dV 3W 80 dVS LO/HI



1) dV 3W 120 dVS LO/HI
2) dV 3W 200 dVS LO/HI
3) dV 3W 80 dVS LO/HI



1) dV 3W 120 dVS LO/HI
2) dV 3W 200 dVS LO/HI
3) dV 3W 80 dVS LO/HI



1) dV 3W 120 dVS LO/HI
2) dV 3W 80 dVS LO/HI

Figure 39: dV-DOSC + dV-SUB 3-way stereo preset recommendations

Stereo 3-way presets are also provided for dV-DOSC plus L-ACOUSTICS SB118 (single 18") and SB218 (dual 18") subwoofers. Two types of presets are provided for each subwoofer: 3W (120 Hz crossover point) and 3WX (80 Hz crossover point). The 3W preset is intended for applications where subwoofers are closely coupled to the dV-DOSC array as an extension of the system and 3WX presets are intended for applications where subwoofers are ground stacked, separate from the flown dV-DOSC arrays. SB118 3-way presets are optimized for a 3:2 dV-DOSC:SB118 cabinet ratio, while SB218 3-way presets are optimized for a 3:1 ratio.

4-way presets are provided for flown dV-DOSC + dV-SUB arrays when used in conjunction with ground stacked SB118 or SB218 subwoofers. Recommended ratios are 3:1:1 dV-DOSC:dV-SUB:SB218 ratio or 3:1:2 dV-DOSC:dV-SUB:SB118. Two types of presets are available – INFRA and X. For INFRA presets, there is a 60 Hz crossover point between SB118 or SB218 subwoofers and dV-SUB. For X presets, the dV-SUB operating bandwidth is extended down to 30 Hz and SB118 or SB218 subwoofers are operated from 26-80 Hz with negative polarity (to account for the phase shift due to the overlap in their operating bandwidths).

For 5+1 format 4-way presets, separate processing is provided for flown versus ground stacked subwoofers. For example, the dV+dVS+SB218 X LO/HI preset has the following output channel assignments:

Output 1	SB218 ground stacked	(input A)
Output 2	dV-SUB flown	(input A)
Output 3	dV-DOSC low section	(input A)
Output 4	dV-DOSC high section	(input A)
Output 5	fullrange	(input A)
Output 6	SB218 ground stacked	(input B)

Note: For all 5+1 format 4-way presets, output 6 can be used for auxiliary sub drive via input B.

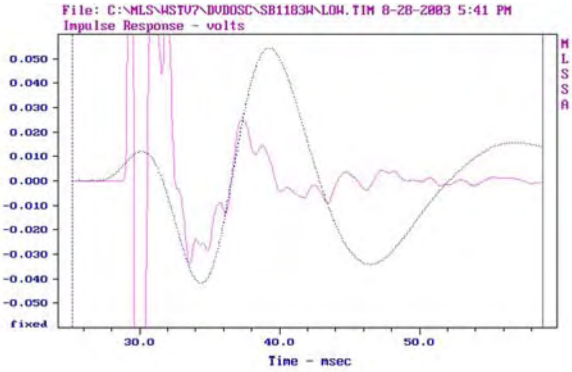
Note: The crossover frequency between the flown dV-SUB and dV-DOSC low section is 120 Hz to optimize the power bandwidth for both sections for all 4-way presets.

Version 7 preset names and descriptions for Lake Contour, XTA 224, 226 and BSS 366 digital signal processors are given below. Full details of channel assignments and user adjustable parameters are provided in the Preset Description sheets that are distributed with PCMCIA cards. Alternatively, preset data along with preset setup sheets can be downloaded from www.l-acoustics.com.

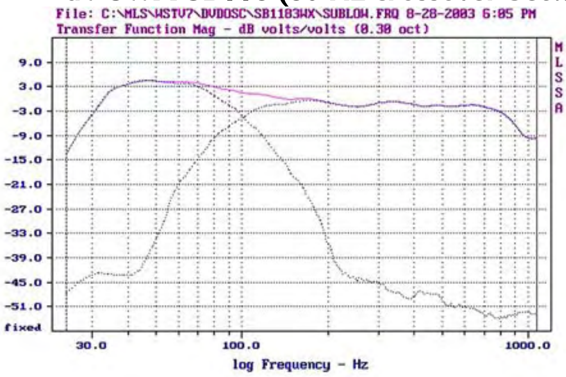
SUBWOOFER TIME ALIGNMENT RECOMMENDATIONS

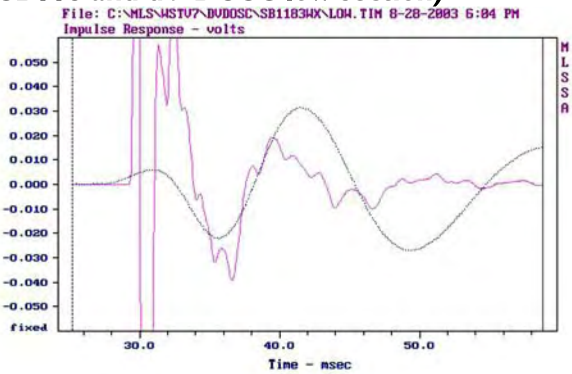
For the dV-DOSC V7 release, sub/low sections are "pre-aligned" for 3-way and 4-way presets in a closely coupled measurement configuration. This way, when dV-DOSC is flown and subs are ground stacked all that is required is to measure the geometric/physical path difference (at your reference point of choice) and add this to the standard pre-aligned sub delay. If using Bushnell Rangefinders to measure the path difference, the accuracy corresponds to +/- 1 meter so the geometric starting point can be varied by +/- 3 msec to verify optimum summation. This provides a quick and easy subwoofer alignment technique for those who don't have the measurement gear required to measure impulse responses. If you have the ability to measure impulse responses, refer to the figures below for the individual presets as a reference for time alignment. Basically, when you look at the separate impulse responses for sub and low sections, there is a "sine wave" signature that needs to be aligned.

dV 3W SB118 (120 Hz crossover between SB118 and dV-DOSC low section)

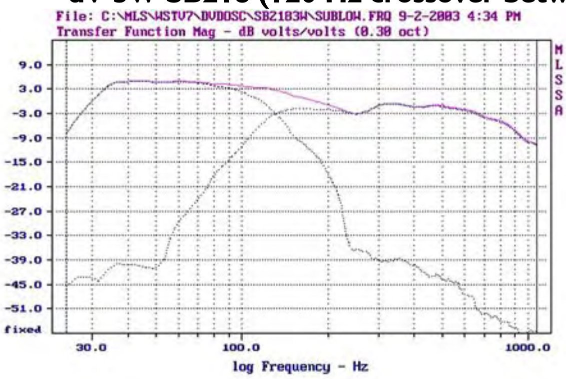


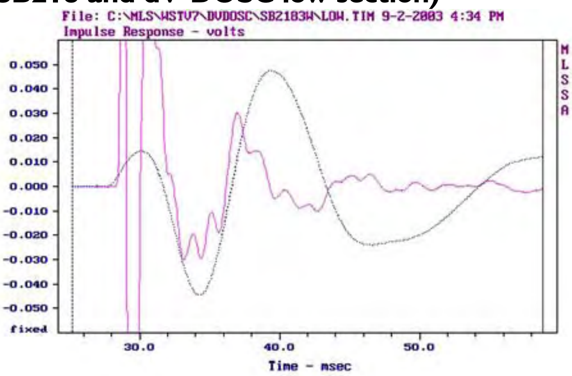
dV 3WX SB118 (80 Hz crossover between SB118 and dV-DOSC low section)



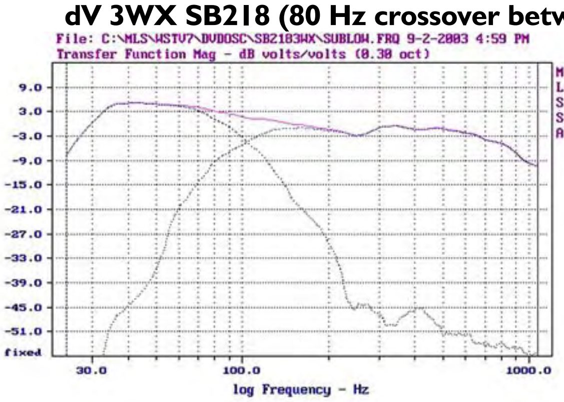


dV 3W SB218 (120 Hz crossover between SB218 and dV-DOSC low section)





dV 3WX SB218 (80 Hz crossover between SB218 and dV-DOSC low section)



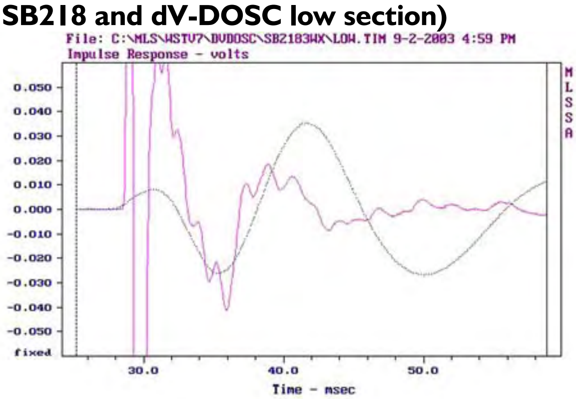
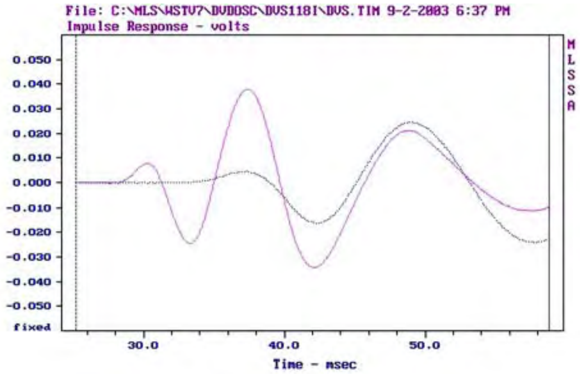
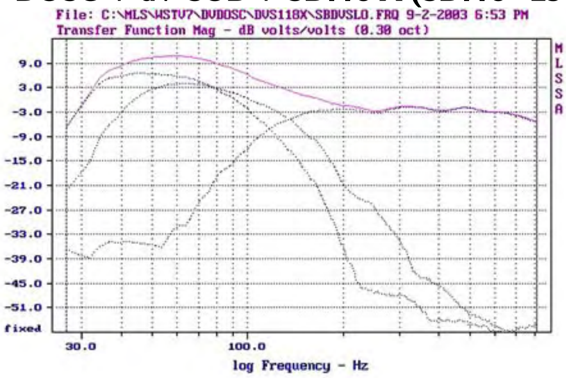


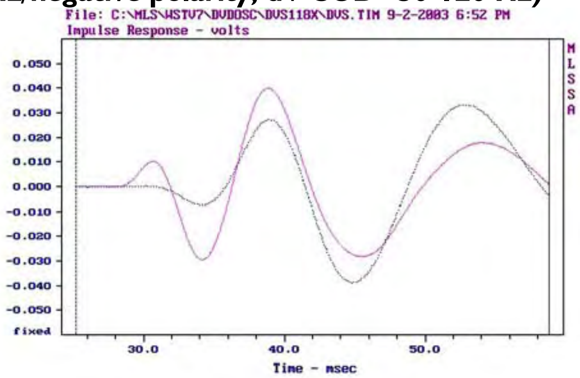
Figure 40: Time alignment guidelines for 3-way SB118 and SB218 presets

dV-DOSC + dV-SUB + SB118 INFRA (60 Hz crossover between SB118 and dV-SUB)

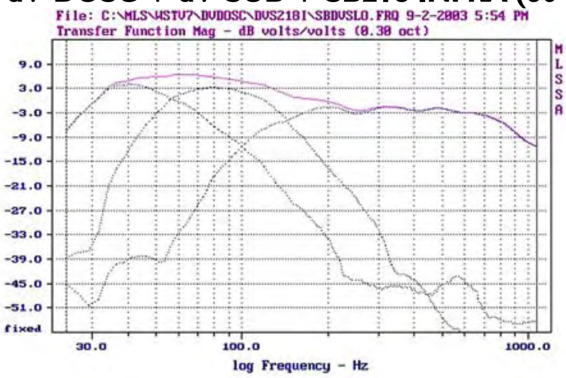


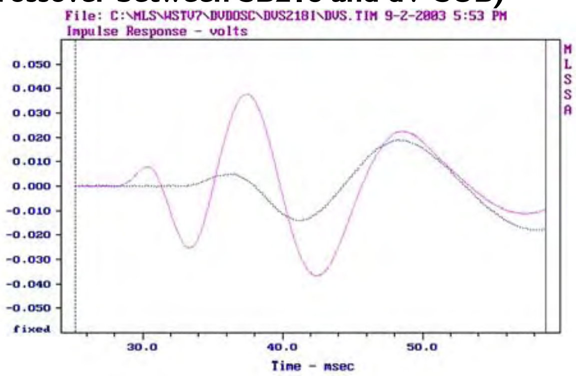
dV-DOSC + dV-SUB + SB118 X (SB118=25-80 Hz/negative polarity, dV-SUB=30-120 Hz)



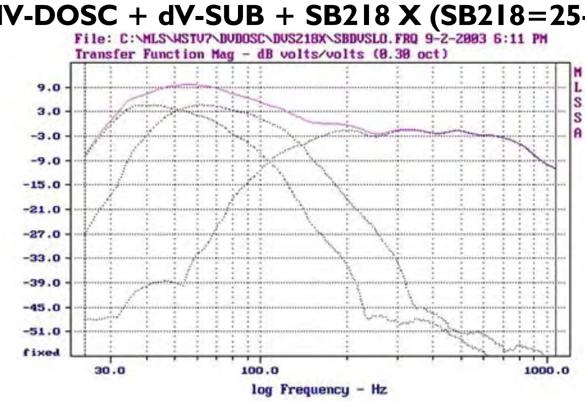


dV-DOSC + dV-SUB + SB218 INFRA (60 Hz crossover between SB218 and dV-SUB)





dV-DOSC + dV-SUB + SB218 X (SB218=25-80 Hz/negative polarity, dV-SUB=30-120 Hz)



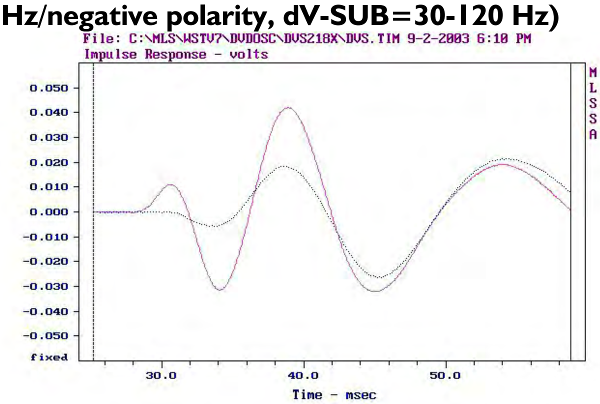


Figure 41: Time alignment guidelines for 4-way presets

General Guidelines Regarding System Protection

Standard limiter thresholds for dV-DOSC are based on twice the RMS power handling for each section and set at +7 dBu (100 Hz HPF) or +5 dBu (80 Hz HPF) for the low section and +1 dBu for the high section. For additional protection, L-ACOUSTICS LA24a and LA48a output power can be matched to dV-DOSC power handling capabilities using MLS switches (refer to tables 3, 4 and 5 for recommended settings).

<u>L-ACOUSTICS recommends that LA power amplifier clip limiters are engaged at all times and power amplifiers must have 32 dB gain</u>.

Limiter thresholds are user accessible and exact settings will depend on individual engineer preferences and the type of music or application which, in turn, determines how hard the dV-DOSC system is being operated. When additional protection is desirable, limiter thresholds can be lowered to match the rms power handling for individual sections according to the tables below:

Table 15: Recommended Limiter Threshold Settings

STANDARD LIMITER THRESHOLDS CALIBRATED TO 2 x RMS POWER HANDLING

ENCLOSURE MODEL	NOM LOAD (ohms)	RMS POWER (W)	PEAK POWER (W)	REC'D POWER (W)	EQUIV Vrms (volts)	dBu EQUIV (32 dB gain)	**LIMITER SETTING ***
SB218	4	1100	4400	**2200**	93.8	**9.62**	**9 dBu**
dV-SUB	2.7	1200	4800	**2400**	80.5	**8.29**	**8 dBu**
dV-DOSC LO	8	380	1520	**760**	78.0	**8.01**	**7 dBu**
dV-DOSC HI	8	66	264	**132**	32.5	**0.41**	**1 dBu**

* AMP CLIP IS AT 9.5 dBu

LIMITER THRESHOLDS CALIBRATED TO RMS POWER HANDLING

ENCLOSURE MODEL	NOM LOAD (ohms)	RMS POWER (W)	PEAK POWER (W)	RMS POWER (W)	EQUIV Vrms (volts)	dBu EQUIV (32 dB gain)	**LIMITER SETTING**
SB218	4	1100	4400	**1100**	66.3	**6.61**	**6 dBu**
dV-SUB	2.7	1200	4800	**1200**	56.9	**5.28**	**5 dBu**
dV-DOSC LO	8	380	1520	**380**	55.1	**5.00**	**5 dBu**
dV-DOSC HI	8	66	264	**66**	23.0	**-2.60**	**-2 dBU**

NOTE: The LA48a has relatively low input sensitivity (9.5 dBu) and, in practice, it can be necessary to equally scale up the individual crossover channel output gains in order to have sufficient drive capability (note: this has been done for Version 7 preset library release). It is far better to use the output drive capability of the DSP digital-to-analog converters (DACs) and analog output section rather than overdrive the input analog-to-digital converters (ADCs) so do not be afraid to increase the channel output gains uniformly in order to achieve a comfortable gain structure. Whether this is necessary will also depend on how "hot or cold" the FOH mix engineer likes to run his console. When in doubt, disconnect all loudspeaker cables and run pink noise from the console at nominal level through the crossover to the power amplifiers and examine crossover input/output levels, crossover limiter indicators and amplifier clip indicators to verify system protection and gain structure.

PRESET NAME	PGM TYPE	MEM	OUT 1 (Source)	OUT 2 (Source)	OUT 3 (Source)	OUT 4 (Source)
dV-DOSC 2W 80 LO	2-way stereo	10	dV-DOSC LO (A)	dV-DOSC HI (A)	dV-DOSC LO (B)	dV-DOSC HI (B)
dV-DOSC 2W 80 HI	2-way stereo	11	dV-DOSC LO (A)	dV-DOSC HI (A)	dV-DOSC LO (B)	dV-DOSC HI (B)
dV-DOSC 2W 100 LO	2-way stereo	12	dV-DOSC LO (A)	dV-DOSC HI (A)	dV-DOSC LO (B)	dV-DOSC HI (B)
dV-DOSC 2W 100 HI	2-way stereo	13	dV-DOSC LO (A)	dV-DOSC HI (A)	dV-DOSC LO (B)	dV-DOSC HI (B)
dV-DOSC 3W 80 dV-SUB LO	3-way (A) + 1 (B)	14	dV-SUB (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	dV-SUB (B)
dV-DOSC 3W 80 dV-SUB HI	3-way (A) + 1 (B)	15	dV-SUB (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	dV-SUB (B)
dV-DOSC 3W 120 dV-SUB LO	3-way (A) + 1 (B)	16	dV-SUB (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	dV-SUB (B)
dV-DOSC 3W 120 dV-SUB HI	3-way (A) + 1 (B)	17	dV-SUB (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	dV-SUB (B)
dV-DOSC 3W 200 dV-SUB LO	3-way (A) + 1 (B)	18	dV-SUB (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	dV-SUB (B)
dV-DOSC 3W 200 dV-SUB HI	3-way (A) + 1 (B)	19	dV-SUB (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	dV-SUB (B)
dV 3W SB118 LO	3-way (A) + 1 (B)	20	SB118 (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	SB118 (B)
dV 3W SB118 HI	3-way (A) + 1 (B)	21	SB118 (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	SB118 (B)
dV 3WX SB118 LO	3-way (A) + 1 (B)	22	SB118 (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	SB118 (B)
dV 3WX SB118 HI	3-way (A) + 1 (B)	23	SB118 (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	SB118 (B)
dV 3W SB218 LO	3-way (A) + 1 (B)	24	SB218 (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	SB218 (B)
dV 3W SB218 HI	3-way (A) + 1 (B)	25	SB218 (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	SB218 (B)
dV 3WX SB218 LO	3-way (A) + 1 (B)	26	SB218 (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	SB218 (B)
dV 3WX SB218 HI	3-way (A) + 1 (B)	27	SB218 (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	SB218 (B)
dV + dVS + SB118 i LO	4-way (A)	28	SB118 (A)	dV-SUB (A)	dV-DOSC LO (A)	dV-DOSC HI (A)
dV + dVS + SB118 i HI	4-way (A)	29	SB118 (A)	dV-SUB (A)	dV-DOSC LO (A)	dV-DOSC HI (A)
dV + dVS + SB118 X LO	4-way (A)	30	SB118 (A)	dV-SUB (A)	dV-DOSC LO (A)	dV-DOSC HI (A)
dV + dVS + SB118 X HI	4-way (A)	31	SB118 (A)	dV-SUB (A)	dV-DOSC LO (A)	dV-DOSC HI (A)
dV + dVS + SB218 i LO	4-way (A)	32	SB218 (A)	dV-SUB (A)	dV-DOSC LO (A)	dV-DOSC HI (A)
dV + dVS + SB218 i HI	4-way (A)	33	SB218 (A)	dV-SUB (A)	dV-DOSC LO (A)	dV-DOSC HI (A)
dV + dVS + SB218 X LO	4-way (A)	34	SB218 (A)	dV-SUB (A)	dV-DOSC LO (A)	dV-DOSC HI (A)
dV + dVS + SB218 X HI	4-way (A)	35	SB218 (A)	dV-SUB (A)	dV-DOSC LO (A)	dV-DOSC HI (A)
ARCS 2W LO	2-way stereo	36	ARCS LOW (A)	ARCS HI (A)	ARCS LOW (B)	ARCS HI (B)
ARCS 2W HI	2-way stereo	37	ARCS LOW (A)	ARCS HI (A)	ARCS LOW (B)	ARCS HI (B)
ARCS 3W SB118 LO	3-way (A) + 1 (B)	38	SB118 (A)	ARCS LOW (A)	ARCS HI (A)	SB118 (B)
ARCS 3W SB118 HI	3-way (A) + 1 (B)	39	SB118 (A)	ARCS LOW (A)	ARCS HI (A)	SB118 (B)
ARCS 3W SB218 LO	3-way (A) + 1 (B)	40	SB218 (A)	ARCS LOW (A)	ARCS HI (A)	SB218 (B)
ARCS 3W SB218 HI	3-way (A) + 1 (B)	41	SB218 (A)	ARCS LOW (A)	ARCS HI (A)	SB218 (B)
ARCS 3W dV-SUB LO	3-way (A) + 1 (B)	42	dV-SUB (A)	ARCS LOW (A)	ARCS HI (A)	dV-SUB (B)
ARCS 3W dV-SUB HI	3-way (A) + 1 (B)	43	dV-SUB (A)	ARCS LOW (A)	ARCS HI (A)	dV-SUB (B)
112XT FILL	2-way stereo	44	112XT LOW (A)	112XT HI (A)	112XT LOW (B)	112XT HI (B)
115XT FILL	2-way stereo	45	115XT LOW (A)	115XT HI (A)	115XT LOW (B)	115XT HI (B)
SB218 DELAY ARC 60 HZ	4-way (A)	46	SB218 DELAY 1 (A)	SB218 DELAY 2 (A)	SB218 DELAY 3 (A)	SB218 DELAY 4 (A)
SB218 DELAY ARC 80 HZ	4-way (A)	47	SB218 DELAY 1 (A)	SB218 DELAY 2 (A)	SB218 DELAY 3 (A)	SB218 DELAY 4 (A)
SB218 LCR 60 Hz	2-way mono sub	48	SB218 (A+B)	SB218 (A)	MONO (A+B)	SB218 (B)
SB218 LCR 80 Hz	2-way mono sub	49	SB218 (A+B)	SB218 (A)	MONO (A+B)	SB218 (B)

Table 16 : XTA DP224 Presets

PRESET NAME	PGM TYPE	MEM	OUT 1 (Source)	OUT 2 (Source)	OUT 3 (Source)	OUT 4 (Source)	OUT 5 (Source)	OUT 6 (Source)
dV-DOSC 2W 80 LO	3-way stereo	10	FULL (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	FULL (B)	dV-DOSC LO (B)	dV-DOSC HI (B)
dV-DOSC 2W 80 HI	3-way stereo	11	FULL (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	FULL (B)	dV-DOSC LO (B)	dV-DOSC HI (B)
dV-DOSC 2W 100 LO	3-way stereo	12	FULL (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	FULL (B)	dV-DOSC LO (B)	dV-DOSC HI (B)
dV-DOSC 2W 100 HI	3-way stereo	13	FULL (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	FULL (B)	dV-DOSC LO (B)	dV-DOSC HI (B)
dV-DOSC 3W 80 dV-SUB LO	3-way stereo	14	dV-SUB (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	dV-SUB (B)	dV-DOSC LO (B)	dV-DOSC HI (B)
dV-DOSC 3W 80 dV-SUB HI	3-way stereo	15	dV-SUB (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	dV-SUB (B)	dV-DOSC LO (B)	dV-DOSC HI (B)
dV-DOSC 3W 120 dV-SUB LO	3-way stereo	16	dV-SUB (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	dV-SUB (B)	dV-DOSC LO (B)	dV-DOSC HI (B)
dV-DOSC 3W 120 dV-SUB HI	3-way stereo	17	dV-SUB (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	dV-SUB (B)	dV-DOSC LO (B)	dV-DOSC HI (B)
dV-DOSC 3W 200 dV-SUB LO	3-way stereo	18	dV-SUB (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	dV-SUB (B)	dV-DOSC LO (B)	dV-DOSC HI (B)
dV-DOSC 3W 200 dV-SUB HI	3-way stereo	19	dV-SUB (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	dV-SUB (B)	dV-DOSC LO (B)	dV-DOSC HI (B)
dV 3W SB118 LO	3-way stereo	20	SB118 (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	SB118 (B)	dV-DOSC LO (B)	dV-DOSC HI (B)
dV 3W SB118 HI	3-way stereo	21	SB118 (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	SB118 (B)	dV-DOSC LO (B)	dV-DOSC HI (B)
dV 3WX SB118 LO	3-way stereo	22	SB118 (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	SB118 (B)	dV-DOSC LO (B)	dV-DOSC HI (B)
dV 3WX SB118 HI	3-way stereo	23	SB118 (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	SB118 (B)	dV-DOSC LO (B)	dV-DOSC HI (B)
dV 3W SB218 LO	3-way stereo	24	SB218 (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	SB218 (B)	dV-DOSC LO (B)	dV-DOSC HI (B)
dV 3W SB218 HI	3-way stereo	25	SB218 (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	SB218 (B)	dV-DOSC LO (B)	dV-DOSC HI (B)
dV 3WX SB218 LO	3-way stereo	26	SB218 (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	SB218 (B)	dV-DOSC LO (B)	dV-DOSC HI (B)
dV 3WX SB218 HI	3-way stereo	27	SB218 (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	SB218 (B)	dV-DOSC LO (B)	dV-DOSC HI (B)
dV + dVS + SB118 i LO	5-way (A) + 1 (B)	28	SB118 (A)	dV-SUB (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	FULL (A)	SB118 (B)
dV + dVS + SB118 i HI	5-way (A) + 1 (B)	29	SB118 (A)	dV-SUB (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	FULL (A)	SB118 (B)
dV + dVS + SB118 X LO	5-way (A) + 1 (B)	30	SB118 (A)	dV-SUB (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	FULL (A)	SB118 (B)
dV + dVS + SB118 X HI	5-way (A) + 1 (B)	31	SB118 (A)	dV-SUB (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	FULL (A)	SB118 (B)
dV + dVS + SB218 i LO	5-way (A) + 1 (B)	32	SB218 (A)	dV-SUB (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	FULL (A)	SB218 (B)
dV + dVS + SB218 i HI	5-way (A) + 1 (B)	33	SB218 (A)	dV-SUB (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	FULL (A)	SB218 (B)
dV + dVS + SB218 X LO	5-way (A) + 1 (B)	34	SB218 (A)	dV-SUB (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	FULL (A)	SB218 (B)
dV + dVS + SB218 X HI	5-way (A) + 1 (B)	35	SB218 (A)	dV-SUB (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	FULL (A)	SB218 (B)
dV 2W 100 LO x 3	2-way stereo + mono	36	dV-DOSC LO (A)	dV-DOSC HI (A)	dV-DOSC LO (B)	dV-DOSC HI (B)	dV-DOSC LO (A+B)	dV-DOSC HI (A+B)
dV 2W 100 HI x 3	2-way stereo + mono	37	dV-DOSC LO (A)	dV-DOSC HI (A)	dV-DOSC LO (B)	dV-DOSC HI (B)	dV-DOSC LO (A+B)	dV-DOSC HI (A+B)
dV 2W 100 LO + MONO	2-way stereo + mono	38	dV-DOSC LO (A)	dV-DOSC HI (A)	dV-DOSC LO (B)	dV-DOSC HI (B)	FULL (A+B)	FULL (A+B)
dV 2W 100 HI + MONO	2-way stereo + mono	39	dV-DOSC LO (A)	dV-DOSC HI (A)	dV-DOSC LO (B)	dV-DOSC HI (B)	FULL (A+B)	FULL (A+B)
dV 2W 80 LO x 3	2-way stereo + mono	40	dV-DOSC LO (A)	dV-DOSC HI (A)	dV-DOSC LO (B)	dV-DOSC HI (B)	dV-DOSC LO (A+B)	dV-DOSC HI (A+B)
dV 2W 80 HI x 3	2-way stereo + mono	41	dV-DOSC LO (A)	dV-DOSC HI (A)	dV-DOSC LO (B)	dV-DOSC HI (B)	dV-DOSC LO (A+B)	dV-DOSC HI (A+B)
dV 2W 80 LO + MONO	2-way stereo + mono	42	dV-DOSC LO (A)	dV-DOSC HI (A)	dV-DOSC LO (B)	dV-DOSC HI (B)	FULL (A+B)	FULL (A+B)
dV 2W 80 HI + MONO	2-way stereo + mono	43	dV-DOSC LO (A)	dV-DOSC HI (A)	dV-DOSC LO (B)	dV-DOSC HI (B)	FULL (A+B)	FULL (A+B)
SB218 DELAY ARC 60 HZ	6-way (A)	44	SB218 (A)	SB218 (A)	SB218 (A)	SB218 (A)	SB218 (A)	SB218 (A)
SB218 DELAY ARC 80 HZ	6-way (A)	45	SB218 (A)	SB218 (A)	SB218 (A)	SB218 (A)	SB218 (A)	SB218 (A)
SB218 LCR 60 Hz + FILL	2-way stereo+mono	46	SB218 (A)	FULLRANGE (A)	SB218 (B)	FULLRANGE (B)	SB218 MONO (A+B)	MONO (A+B)
SB218 LCR 80 Hz + FILL	2-way stereo+mono	47	SB218 (A)	FULLRANGE (A)	SB218 (B)	FULLRANGE (B)	SB218 MONO (A+B)	MONO (A+B)

Table 17: XTA DP226 Presets

PRESET NAME	PGM TYPE	Mem	OUT 1 (Source)	OUT 2 (Source)	OUT 3 (Source)	OUT 4 (Source)	OUT 5 (Source)	OUT 6 (Source)
USER	3(A)+3(B)	1						
DV 2W 80 LO	3(A)+3(B)	2	FULL (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	FULL (B)	dV-DOSC LO (B)	dV-DOSC HI (B)
DV 2W 80 HI	3(A)+3(B)	3	FULL (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	FULL (B)	dV-DOSC LO (B)	dV-DOSC HI (B)
DV 2W 100 L	3(A)+3(B)	4	FULL (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	FULL (B)	dV-DOSC LO (B)	dV-DOSC HI (B)
DV 2W 100 H	3(A)+3(B)	5	FULL (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	FULL (B)	dV-DOSC LO (B)	dV-DOSC HI (B)
DV 3W 80 L	3(A)+3(B)	6	dV-SUB (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	dV-SUB (B)	dV-DOSC LO (B)	dV-DOSC HI (B)
DV 3W 80 H	3(A)+3(B)	7	dV-SUB (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	dV-SUB (B)	dV-DOSC LO (B)	dV-DOSC HI (B)
DV 3W 120 L	3(A)+3(B)	8	dV-SUB (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	dV-SUB (B)	dV-DOSC LO (B)	dV-DOSC HI (B)
DV 3W 120 H	3(A)+3(B)	9	dV-SUB (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	dV-SUB (B)	dV-DOSC LO (B)	dV-DOSC HI (B)
DV 3W 200 L	3(A)+3(B)	10	dV-SUB (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	dV-SUB (B)	dV-DOSC LO (B)	dV-DOSC HI (B)
DV 3W 200 H	3(A)+3(B)	11	dV-SUB (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	dV-SUB (B)	dV-DOSC LO (B)	dV-DOSC HI (B)
DV 3W 118 L	3(A)+3(B)	12	SB118 (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	SB118 (B)	dV-DOSC LO (B)	dV-DOSC HI (B)
DV 3W 118 H	3(A)+3(B)	13	SB118 (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	SB118 (B)	dV-DOSC LO (B)	dV-DOSC HI (B)
DV 3X 118 L	3(A)+3(B)	14	SB118 (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	SB118 (B)	dV-DOSC LO (B)	dV-DOSC HI (B)
DV 3X 118 H	3(A)+3(B)	15	SB118 (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	SB118 (B)	dV-DOSC LO (B)	dV-DOSC HI (B)
DV 3W 218 L	3(A)+3(B)	16	SB218 (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	SB218 (B)	dV-DOSC LO (B)	dV-DOSC HI (B)
DV 3W 218 H	3(A)+3(B)	17	SB218 (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	SB218 (B)	dV-DOSC LO (B)	dV-DOSC HI (B)
DV 3X 218 L	3(A)+3(B)	18	SB218 (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	SB218 (B)	dV-DOSC LO (B)	dV-DOSC HI (B)
DV 3X 218 H	3(A)+3(B)	19	SB218 (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	SB218 (B)	dV-DOSC LO (B)	dV-DOSC HI (B)
DVS118 I L	5(A)+1(B)	20	SB118 (A)	dV-SUB (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	FULL (A)	SB118 (B)
DVS118 I H	5(A)+1(B)	21	SB118 (A)	dV-SUB (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	FULL (A)	SB118 (B)
DVS118 X L	5(A)+1(B)	22	SB118 (A)	dV-SUB (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	FULL (A)	SB118 (B)
DVS118 X H	5(A)+1(B)	23	SB118 (A)	dV-SUB (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	FULL (A)	SB118 (B)
DVS218 I L	5(A)+1(B)	24	SB218 (A)	dV-SUB (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	FULL (A)	SB218 (B)
DVS218 I H	5(A)+1(B)	25	SB218 (A)	dV-SUB (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	FULL (A)	SB218 (B)
DVS218 X L	5(A)+1(B)	26	SB218 (A)	dV-SUB (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	FULL (A)	SB218 (B)
DVS218 X H	5(A)+1(B)	27	SB218 (A)	dV-SUB (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	FULL (A)	SB218 (B)
DV 2W LO x 3	2(A)+2(B)+2(C)	28	dV-DOSC LO (A)	dV-DOSC HI (A)	dV-DOSC LO (B)	dV-DOSC HI (B)	dV-DOSC LO (C)	dV-DOSC HI (C)
DV 2W HI x 3	2(A)+2(B)+2(C)	29	dV-DOSC LO (A)	dV-DOSC HI (A)	dV-DOSC LO (B)	dV-DOSC HI (B)	dV-DOSC LO (C)	dV-DOSC HI (C)
DV 2W L AUX	2(A)+2(B)+2(C)	30	dV-DOSC LO (A)	dV-DOSC HI (A)	dV-DOSC LO (B)	dV-DOSC HI (B)	FULL (C)	FULL (C)
DV 2W H AUX	2(A)+2(B)+2(C)	31	dV-DOSC LO (A)	dV-DOSC HI (A)	dV-DOSC LO (B)	dV-DOSC HI (B)	FULL (C)	FULL (C)
DV 2WX L x 3	2(A)+2(B)+2(C)	32	dV-DOSC LO (A)	dV-DOSC HI (A)	dV-DOSC LO (B)	dV-DOSC HI (B)	dV-DOSC LO (C)	dV-DOSC HI (C)
DV 2WX H x 3	2(A)+2(B)+2(C)	33	dV-DOSC LO (A)	dV-DOSC HI (A)	dV-DOSC LO (B)	dV-DOSC HI (B)	dV-DOSC LO (C)	dV-DOSC HI (C)
DV 2WX L AX	2(A)+2(B)+2(C)	34	dV-DOSC LO (A)	dV-DOSC HI (A)	dV-DOSC LO (B)	dV-DOSC HI (B)	FULL (C)	FULL (C)
DV 2WX H AX	2(A)+2(B)+2(C)	35	dV-DOSC LO (A)	dV-DOSC HI (A)	dV-DOSC LO (B)	dV-DOSC HI (B)	FULL (C)	FULL (C)
ARCS 2W LO	3(A)+3(B)	36	FULL (A)	ARCS LOW (A)	ARCS HI (A)	FULL (B)	ARCS LOW (B)	ARCS HI (B)
ARCS 2W HI	3(A)+3(B)	37	FULL (A)	ARCS LOW (A)	ARCS HI (A)	FULL (B)	ARCS LOW (B)	ARCS HI (B)
A 3W 118 LO	3(A)+3(B)	38	SB118 (A)	ARCS LOW (A)	ARCS HI (A)	SB118 (B)	ARCS LOW (B)	ARCS HI (B)
A 3W 118 HI	3(A)+3(B)	39	SB118 (A)	ARCS LOW (A)	ARCS HI (A)	SB118 (B)	ARCS LOW (B)	ARCS HI (B)
A 3W 218 LO	3(A)+3(B)	40	SB218 (A)	ARCS LOW (A)	ARCS HI (A)	SB218 (B)	ARCS LOW (B)	ARCS HI (B)
A 3W 218 HI	3(A)+3(B)	41	SB218 (A)	ARCS LOW (A)	ARCS HI (A)	SB218 (B)	ARCS LOW (B)	ARCS HI (B)
A 3W DVS LO	3(A)+3(B)	42	dV-SUB (A)	ARCS LOW (A)	ARCS HI (A)	dV-SUB (B)	ARCS LOW (B)	ARCS HI (B)
A 3W DVS HI	3(A)+3(B)	43	dV-SUB (A)	ARCS LOW (A)	ARCS HI (A)	dV-SUB (B)	ARCS LOW (B)	ARCS HI (B)
218 DEL 60	6-way (A)	44	SB218 (A)	SB218 (A)	SB218 (A)	SB218 (A)	SB218 (A)	SB218 (A)
218 DEL 80	6-way (A)	45	SB218 (A)	SB218 (A)	SB218 (A)	SB218 (A)	SB218 (A)	SB218 (A)
218 LCR 60	2(A)+2(B)+2(C)	46	SB218 (A)	FULLRANGE (A)	SB218 (B)	FULLRANGE (B)	SB218 MONO (A+B)	MONO (A+B)
218 LCR 80	2(A)+2(B)+2(C)	47	SB218 (A)	FULLRANGE (A)	SB218 (B)	FULLRANGE (B)	SB218 MONO (A+B)	MONO (A+B)

Table 18: BSS FDS 366 Presets

	OUT 1 (Source)	OUT 2 (Source)	OUT 3 (Source)	OUT 4 (Source)	OUT 5 (Source)	OUT 6 (Source)
2-WAY MODULES						
dV-DOSC 2W 80 LO	dV-DOSC LO (A)	dV-DOSC HI (A)	FULL (A)	dV-DOSC LO (B)	dV-DOSC HI (B)	FULL (B)
dV-DOSC 2W 80 HI	dV-DOSC LO (A)	dV-DOSC HI (A)	FULL (A)	dV-DOSC LO (B)	dV-DOSC HI (B)	FULL (B)
dV-DOSC 2W 100 LO	dV-DOSC LO (A)	dV-DOSC HI (A)	FULL (A)	dV-DOSC LO (B)	dV-DOSC HI (B)	FULL (B)
dV-DOSC 2W 100 HI	dV-DOSC LO (A)	dV-DOSC HI (A)	FULL (A)	dV-DOSC LO (B)	dV-DOSC HI (B)	FULL (B)
3-WAY MODULES						
dV 3W 80 dV-SUB LO	dV-SUB (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	dV-SUB (B)	dV-DOSC LO (B)	dV-DOSC HI (B)
dV 3W 80 dV-SUB HI	dV-SUB (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	dV-SUB (B)	dV-DOSC LO (B)	dV-DOSC HI (B)
dV 3W 120 dV-SUB LO	dV-SUB (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	dV-SUB (B)	dV-DOSC LO (B)	dV-DOSC HI (B)
dV 3W 120 dV-SUB HI	dV-SUB (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	dV-SUB (B)	dV-DOSC LO (B)	dV-DOSC HI (B)
dV 3W 200 dV-SUB LO	dV-SUB (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	dV-SUB (B)	dV-DOSC LO (B)	dV-DOSC HI (B)
dV 3W 200 dV-SUB HI	dV-SUB (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	dV-SUB (B)	dV-DOSC LO (B)	dV-DOSC HI (B)
dV 3W SB118 LO	SB118 (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	SB118 (B)	dV-DOSC LO (B)	dV-DOSC HI (B)
dV 3W SB118 HI	SB118 (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	SB118 (B)	dV-DOSC LO (B)	dV-DOSC HI (B)
dV 3WX SB118 LO	SB118 (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	SB118 (B)	dV-DOSC LO (B)	dV-DOSC HI (B)
dV 3WX SB118 HI	SB118 (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	SB118 (B)	dV-DOSC LO (B)	dV-DOSC HI (B)
dV 3W SB218 LO	SB218 (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	SB218 (B)	dV-DOSC LO (B)	dV-DOSC HI (B)
dV 3W SB218 HI	SB218 (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	SB218 (B)	dV-DOSC LO (B)	dV-DOSC HI (B)
dV 3WX SB218 LO	SB218 (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	SB218 (B)	dV-DOSC LO (B)	dV-DOSC HI (B)
dV 3WX SB218 HI	SB218 (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	SB218 (B)	dV-DOSC LO (B)	dV-DOSC HI (B)
4-WAY MODULES						
dV + dVS + SB118 i LO	SB118 (A)	dV-SUB (A)	dV-DOSC LO (A)	dV-DOSC HI (A)		
dV + dVS + SB118 i HI	SB118 (A)	dV-SUB (A)	dV-DOSC LO (A)	dV-DOSC HI (A)		
dV + dVS + SB118 X LO	SB118 (A)	dV-SUB (A)	dV-DOSC LO (A)	dV-DOSC HI (A)		
dV + dVS + SB118 X HI	SB118 (A)	dV-SUB (A)	dV-DOSC LO (A)	dV-DOSC HI (A)		
dV + dVS + SB218 i LO	SB218 (A)	dV-SUB (A)	dV-DOSC LO (A)	dV-DOSC HI (A)		
dV + dVS + SB218 i HI	SB218 (A)	dV-SUB (A)	dV-DOSC LO (A)	dV-DOSC HI (A)		
dV + dVS + SB218 X LO	SB218 (A)	dV-SUB (A)	dV-DOSC LO (A)	dV-DOSC HI (A)		
dV + dVS + SB218 X HI	SB218 (A)	dV-SUB (A)	dV-DOSC LO (A)	dV-DOSC HI (A)		
+2 MODULES (OUTPUTS 5/6) FOR USE WITH 4-WAY MODULES						
AUX					FULL (B)	FULL (B)
ARCS 2W LO					ARCS LO (B)	ARCS HI (B)
ARCS 2W HI					ARCS LO (B)	ARCS HI (B)
112XT FILL					112XT LO (B)	112XT HI (B)
112XT FRONT					112XT LO (B)	112XT HI (B)
115XT FILL					115XT LO (B)	115XT HI (B)
115XT FRONT					115XT LO (B)	115XT HI (B)
HiQ FILL					115XT HiQ LO (B)	115XT HiQ HI (B)
HiQ FRONT					115XT HiQ LO (B)	115XT HiQ HI (B)
HiQ MONITOR					115XT HiQ LO (B)	115XT HiQ HI (B)
dV-DOSC 2W 80 LO					dV-DOSC LO (B)	dV-DOSC HI (B)
dV-DOSC 2W 80 HI					dV-DOSC LO (B)	dV-DOSC HI (B)
dV-DOSC 2W 100 LO					dV-DOSC LO (B)	dV-DOSC HI (B)
dV-DOSC 2W 100 HI					dV-DOSC LO (B)	dV-DOSC HI (B)
5+1 MODULES						
dV + dVS + SB118 i LO	SB118 (A)	dV-SUB (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	FULL (A)	i AUX SB118 (B)
dV + dVS + SB118 i HI	SB118 (A)	dV-SUB (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	FULL (A)	i AUX SB118 (B)
dV + dVS + SB118 X LO	SB118 (A)	dV-SUB (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	FULL (A)	X AUX SB118 (B)
dV + dVS + SB118 X HI	SB118 (A)	dV-SUB (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	FULL (A)	X AUX SB118 (B)
dV + dVS + SB218 i LO	SB218 (A)	dV-SUB (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	FULL (A)	i AUX SB218 (B)
dV + dVS + SB218 i HI	SB218 (A)	dV-SUB (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	FULL (A)	i AUX SB218 (B)
dV + dVS + SB218 X LO	SB218 (A)	dV-SUB (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	FULL (A)	X AUX SB218 (B)
dV + dVS + SB218 X HI	SB218 (A)	dV-SUB (A)	dV-DOSC LO (A)	dV-DOSC HI (A)	FULL (A)	X AUX SB218 (B)
6 WAY MODULES						
SB218 DELAY ARC 60 HZ	SB218 (A)	SB218 (A)	SB218 (A)	SB218 (A)	SB218 (A)	SB218 (A)
SB218 DELAY ARC 80 HZ	SB218 (A)	SB218 (A)	SB218 (A)	SB218 (A)	SB218 (A)	SB218 (A)

Table 19: Lake Contour Preset Modules

2. dV-DOSC ARRAY SPECIFICATIONS

dV-DOSC can be modelled using L-ACOUSTICS proprietary SOUNDVISION or ARRAY2004 software. Alternatively, custom DLLs for modeling V-DOSC and dV-DOSC are available for CATT-Acoustics or EASE room acoustics modeling sofware.

2.1 COVERAGE IN THE HORIZONTAL PLANE

dV-DOSC has a coverage angle of 120° in the horizontal plane from 1-10 kHz with -6 dB points at +/-60° off axis. Horizontal coverage is independent of both the number of arrayed enclosures and the vertical configuration of the array. Due to the coplanar symmetric arrangement of components, the horizontal coverage is symmetric with respect to the 0° axis.

Note: Although coverage angles are by definition determined by the -6 dB points, the -3 dB coverage angle is more representative of the effective coverage of a system. For a dV-DOSC array of arbitrary size and shape, the –3 dB coverage angle is 100° from 1-10 kHz. This 100° coverage angle also defines the recommended limit for the relative angle between dV-DOSC arrays, for example, when main L/R FOH dV-DOSC arrays are oriented at zero degrees, offstage LL/RR arrays can be oriented at up to 100° relative to the main L/R arrays while maintaining a 6-7 metre separation between arrays in order to maximize overall system coverage while reducing the audible effects of interference (see also 3.3 Multiple Array Concepts).

For sound design purposes, the horizontal coverage of dV-DOSC is represented by using an isobaric (constant sound pressure) curve or isocontour that is obtained by taking the average of individual 1/3 octave polar plots over an 800-20k Hz bandwidth and then re-formatting the information on a linear scale. Unlike a standard polar plot, which corresponds to the SPL versus angle referenced to the on-axis level at a given frequency, the isocontour is more useful for practical coverage prediction.

Note: The 800–20k Hz bandwidth is selected for calculation of the dV-DOSC isocontour since the horizontal coverage is stable over this frequency range due to the system's coplanar symmetry. In addition, this bandwidth is representative of the perceived intelligibility and clarity of the system.

The horizontal projection of the isocontour can then be used to predict the effective coverage of a dV-DOSC array in the horizontal plane. By overlaying or projecting the isocontour on a plan view of the venue, the sound designer can adjust the azimuth angle or panning of each array to get the best coverage results for a given audience layout. Other sound design issues that can be examined using the isocontour include: optimizing stereo imaging (represented by the amount of overlap between FOH L/R isocontours); front fill, stereo infill or offstage fill requirements; avoiding wall reflections.

As seen in Figure 42, at lower frequencies the isocontour becomes more omnidirectional although there is still pattern control maintained in the forward direction and approximately 20 dB of SPL rejection behind the array. For simulation purposes, horizontal isocontour data is provided in the H-ISOCONT sheet in ARRAY 2004. For further details on how to use this data in sound design please see Section 2.3.

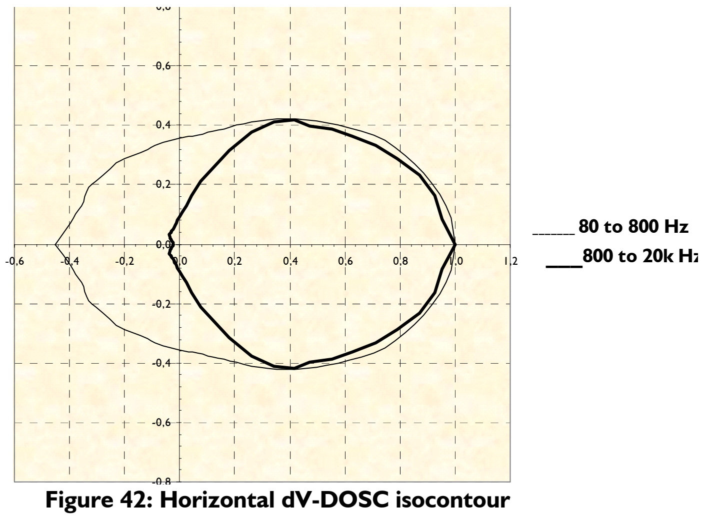
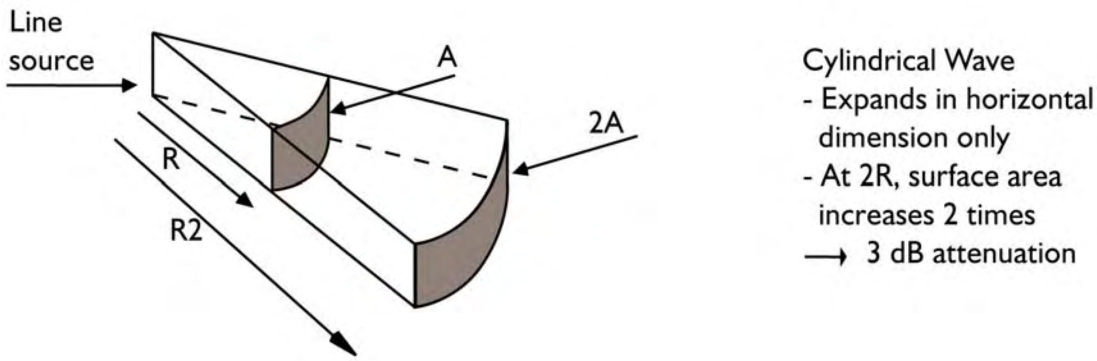


Figure 42: Horizontal dV-DOSC isocontour

2.2 WAVEFRONT SCULPTURE IN THE VERTICAL PLANE

Flat dV-DOSC Array

Flying or stacking dV-DOSC with 0 degree angles between all enclosures produces a flat array that behaves acoustically as a continuous, isophasic line source that radiates a cylindrical wavefront. The cylindrical wavefront expands in the horizontal dimension only and is defined by the section of a vertical cylinder over a given distance. The height of this section corresponds to the height of the array (defined by the top of the upper enclosure and the bottom of the lowest enclosure) and the coverage angle corresponds to the -6 dB horizontal coverage angle of dV-DOSC (try to visualize a 120° cheese wedge or a piece of cake…)



According to Fresnel analysis, a cylindrical wavefront is radiated by a line source array over a certain distance and then transforms into a spherical wavefront. In cylindrical mode, the wavefront expands linearly with distance in the horizontal plane only, thus producing only 3 dB of attenuation when doubling the distance. In spherical mode, the wavefront expands in two dimensions, thus producing a SPL attenuation of 6 dB with doubling of distance. The boundary between cylindrical and spherical wavefront propagation regions depends on the frequency and length of the line source.

Since dV-DOSC is, in essence, more efficient at projecting HF energy than LF, the net result is that for large distances, the tonal balance is progressively tilted by a HF enhancement. For longer throw distances, this tilt in tonal balance is offset by air absorption in open air situations and by both building material absorption and air absorption indoors, resulting in spectrally-balanced sound over the largest area possible. This is an important benefit of dV-DOSC and WST since both SPL and tonal balance are more even with distance.

Since the flat array configuration maximizes energy and intelligibility with distance, it should be used for long throw applications or in reverberant rooms. It is also common to use a flat array section at the top of a variable curvature array for improved throw in arena and stadium installations.

Convex Curvature dV-DOSC Array

A convex or positive curvature dV-DOSC array (stacked or flown) is obtained by using dV-ANGLE P1 or P2 bars to provide the desired angle between each enclosure. If the angle between two adjacent dV-DOSC enclosures is less than 7.5°, WST criteria are satisfied and the array behaves like a continuous, curved radiating ribbon. If the angle between enclosures exceeds 7.5°, WST criteria are no longer valid over the full audio frequency range. Practically, a larger angle produces neither desirable nor predictable results - enclosures radiate individually and the benefits of collective coupling are lost. That is why dV-ANGLE bars and the trapezoidal shape of the dV-DOSC enclosure itself allows up to 7.5° maximum angle between enclosures.

There are two types of convex curvature V-DOSC array: constant curvature and variable curvature. For the first case, the angle between all adjacent enclosures is constant while for the second case, it varies within the defined range of 0° to 7.5°.

Constant Curvature dV-DOSC Array

For a constant curvature array, the vertical directivity is nominally (N-1) x A° where N is the number of enclosures in the array and A° is the constant angle between each adjacent enclosure. Therefore, a curved array of 9 dV-DOSC enclosures can provide a maximum vertical coverage of 8 x 7.5° = 60° while still satisfying WST criteria.

The constant curvature array is the simplest type of convex curvature dV-DOSC array. This configuration should only be used for smaller sized arrays or when the geometry of the audience is unknown. Since an array of constant curvature radiates the same amount of energy in all directions over the nominal vertical coverage angle, this type of array is of practical use only when the entire audience is sitting at the same distance from the array.

However, in most venues, a dV-DOSC array will have to cover an audience sitting at varying distances from the array and a constant curvature array would produce excessive SPLs in the first rows compared to the remote audience. Therefore, a constant angular spacing between enclosures is generally not useful for most applications. If this configuration is used, the gain of the amplifiers powering the high frequency section of the lower dV-DOSC enclosures might need to be progressively reduced (however, such attenuation results in a global loss of energy).

Variable Curvature dV-DOSC Array

Since individual dV-DOSC enclosures radiate a flat, isophasic wavefront it is possible to focus energy in a given direction and increase the SPL by reducing the angles between enclosures. Conversely, by increasing the angle between enclosures (up to a maximum of 7.5°) it is possible to lower the SPL in another direction. This is the basic principle that allows energy to be distributed uniformly throughout the audience and variable curvature arrays are used to adapt both the coverage of the system and the SPL distribution to match the specific audience geometry according to WST Condition #4.

Shaping the VERTICAL ISOCONTOUR is the key to Wavefront Sculpture Technology.

Concave Curvature dV-DOSC Array

If dV-ANGLEN rear angle bars are selected, concave or negative curvature arrays can be constructed. A flat array is obtained using the minimum hole position on dV-ANGLEN and the array becomes progressively concave as hole positions with greater spacing are selected. Experimentation into the use of negative curvature arrays is ongoing and it is thought that such arrays will be useful for long throw applications and for acoustic holography effects where it is possible to create a virtual acoustic source by focussing sound at a point in space. The sound will then appear to emanate from this focal line - not from the array itself - allowing for interesting sound design possibilities.

2.3 COVERAGE PREDICTIONS USING ARRAY2004

L-ACOUSTICS has developed a fast, easy-to-use prediction spreadsheet named ARRAY2004 that operates under EXCEL. ARRAY2004 can predict coverage for flat, constant curvature or variable curvature dV-DOSC arrays.

The first four worksheets represent vertical cut views (section elevations) of the audience in the XZ plane and show a pseudo-3D representation of the intersection of the site angles for each enclosure with the audience (these intersections are termed enclosure site angle impacts). The site angle for each enclosure is calculated according to the user-input angles and all angles are referenced with respect to the site angle of the top enclosure (which should be aimed at the rearmost part of the audience). Cutview sheets are used to shape the vertical isocontour of either V-DOSC or dV-DOSC arrays to match the audience geometry.

The H-ISOCONT sheet displays the horizontal isocontour of all defined arrays projected onto a plan view of the audience area in the XY plane.

The SUBARC sheet is used to calculate delay taps for electronic delay processing of subwoofer arrays

The MTD XT SPACING sheet can be used to calculate optimum spacing for a given throw distance for distributed sound reinforcement using MTD or XT coaxial loudspeakers.

The ROOM DIM sheet can be used to calculate XZ cutview parameters based on room measurements. Room dimension calculation utilities are also available in the V-ARRAY1, V-ARRAY2, dV-ARRAY1 and dV-ARRAY2 sheets.

In general, all input data should be entered into the cells in black. Results are displayed in red.

Note: In order to run ARRAY 2004, Macro Security should be set at "medium" in Excel, i.e., from the main menu bar select: Tools / Macro / Security / Security Level = Medium

Note: A complete description of ARRAY2004 is beyond the scope of this manual. For further information, participation in a dV-DOSC Training Seminar is recommended.

CUTVIEW SHEETS

Four cutview sheets are available: V-ARRAY1, V-ARRAY2, dV-ARRAY1, dV-ARRAY2. Cutview sheets V-ARRAY1 and V-ARRAY2 are used to simulate V-DOSC arrays (including dV-DOSC downfill or upfill enclosures) while dV-ARRAY1 and dV-ARRAY2 are used for simulating dV-DOSC.

dV-ARRAY1, dV-ARRAY2 Input Data

In AUDIENCE GEOMETRY cells, the designer enters the distances and elevations that define the audience area according to a section view along the main zero degree axis of the system (Cutview 1). The origin of the x-axis is referenced to the downstage pick point of dV-BUMP or dV-BUMP2 (hole #0) and the origin of the z-axis is at floor level, i.e., the x-axis is distance or range along the desired array axis and the z-axis is elevation above floor level. A second cutview can also be specified at an off-axis angle within the coverage pattern of the array (Cutview 2). Typically the second cutview is taken at 60° offstage (corresponding to the -6 dB coverage angle of dV-DOSC) in order to confirm coverage throughout all parts of the audience. The ear height relative to floor level should be entered in the "listening level" cell (1.2 metres for a seated audience, approximately 1.8 metres for standing). XZ cells can be used to enter additional room features such as balcony profiles, stage/proscenium details, FOH mix position, etc.

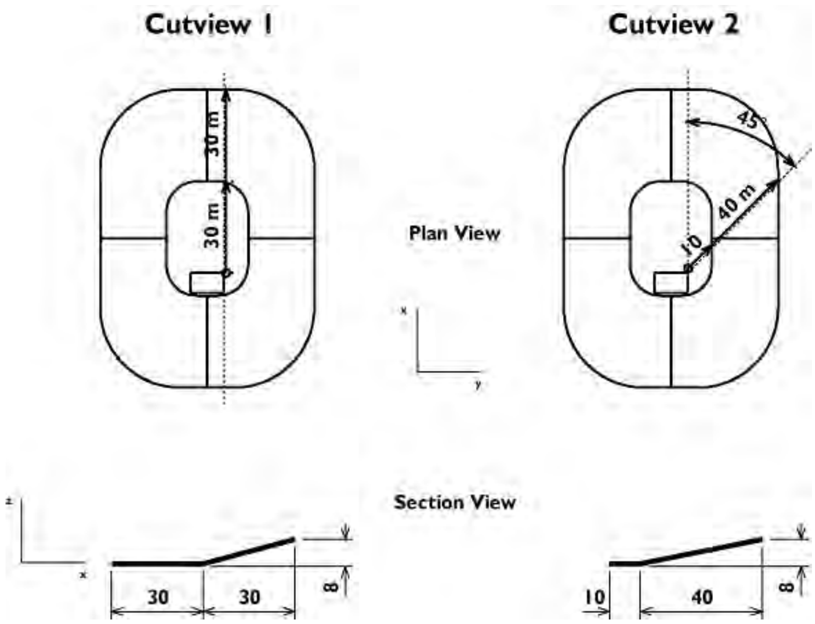


Figure 43: Defining Cutview Dimensions

Although detailed blueprints are not necessarily required, the more information that can be obtained on a venue for defining the audience geometry, the better. Typically, plan and section views are available for most venues upon request. In situations where such documentation is not available, there are a number of options: use a tape measure or laser range-finder (such as the Leica Disto Basic or Hilti PD22) on site to perform dimensional measurements. Alternatively, L-ACOUSTICS has had good results with the Bushnell Yardage Pro 600 for field measurements. Apart from being useful for defining room geometry, this tool can also be used for determining delay time settings during system tuning, for locating laser beams during array trim and angle adjustment (and on the golf course on days off!). In some cases, tribune or balcony elevations can be determined by measuring individual step depth/height and then counting the number of steps to calculate the section depth/elevation.

The ROOM DIM sheet is provided in ARRAY 2004 to assist in calculating cutview data from on site measurements. Room dimension calculation utilities are also available in the V-ARRAY1, V-ARRAY2, dV-ARRAY1 and dV-ARRAY2 sheets.

Note: The calculation of elevation Z2 is susceptible to errors in distance measurements and should always be verified with a tape measure or laser rangefinder whenever possible. Combined distance/angle measurements are typically more accurate than distance only measurements when calculating Z2.

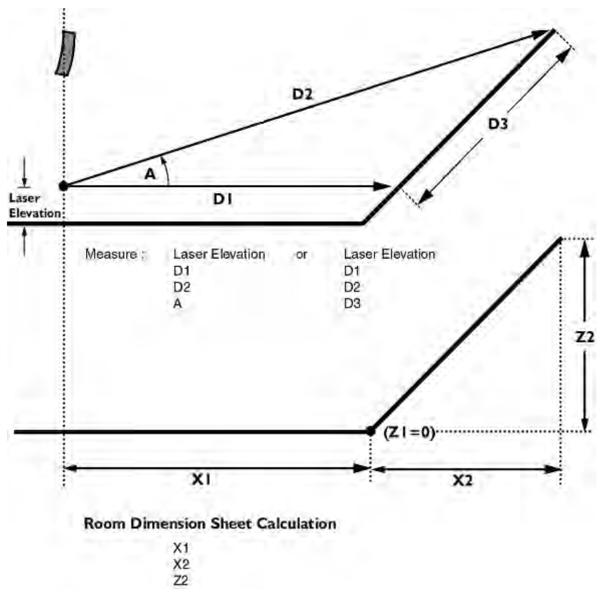


Figure 44: Parameters for the ROOM DIM Utility Sheet in ARRAY

In dV-DOSC ARRAY#1 or dV-DOSC ARRAY#2 cells, the designer enters the number of dV-DOSC enclosures (24 maximum), the offset distance (in the x dimension), elevation of the bumper and the autofocus adjust angle.

By default, ARRAY 2004 automatically focuses the top dV-DOSC enclosure to the rear of the audience geometry defined in Cutview 1. Autofocus adjust can be used to adjust the overall focus of the array and DOES NOT CORRESPOND TO THE TILT ANGLE OF THE dV-DOSC BUMPER.

Note: The site angle for dV-DOSC enclosure #1 is equal to the dV-BUMP site angle provided that a 3.75° angle bar is used at the rear to connect enclosure #1 to the bumper (to compensate for the trapezoidal angle of the enclosure). The 3.75° angle should always be used to attach the top dV-DOSC to dV-BUMP – this allows a laser and/or remote digital inclinometer to be mounted on the dV-BUMP to set the focus of the top enclosure.

The designer then chooses the angular spacing between enclosures from the available values in the pull down menu (0°, 1°, 2°, 3°, 3.75°, 4.5°, 5.5°, 6.5°, 7.5°). The colored lines show the site angles for individual enclosures, where each line is aligned with the middle of its respective dV-DOSC. Note that the displayed top block corresponds to the dV-DOSC bumper, not the first enclosure of the dV-DOSC array.

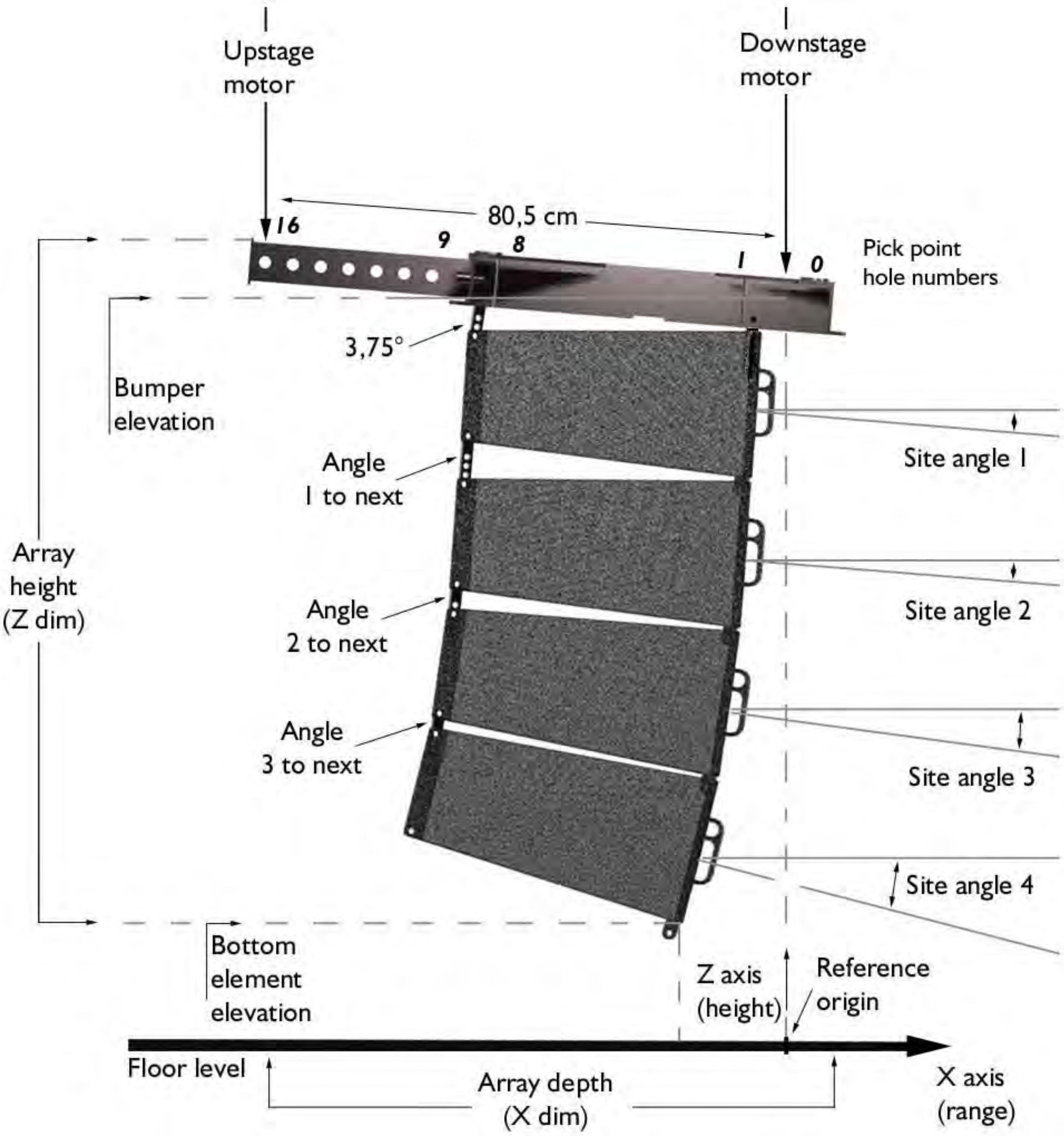


Figure 45: ARRAY 2004 Geometric Data for dV-DOSC

Optimization Procedure

After entering all input data (as described above), press the SCALING button to display the defined audience geometry and vertical coverage of the system. The cutview display shows the intersection of individual dV-DOSC enclosure site angles with the audience (square blocks = site angle impacts) and represents the SPL dispersion over the audience. In accordance with WST Condition #4, the best results are achieved when enclosure site angle impacts have equal spacing between them. In this case, the SPL decreases by 3 dB when doubling the distance (see Figure 46 for details).

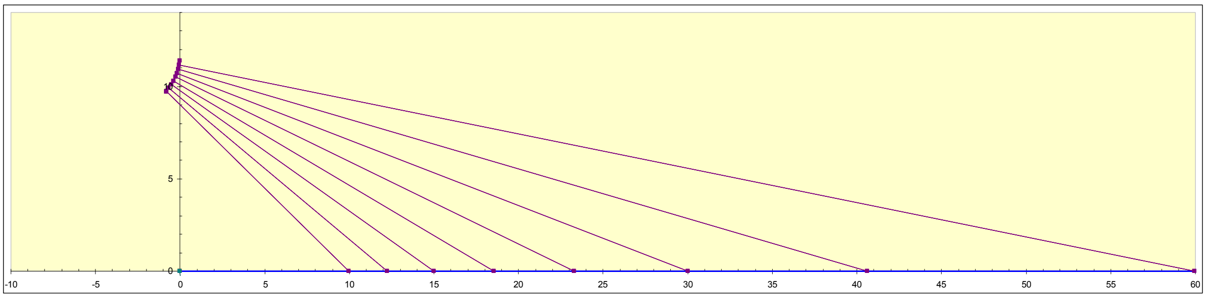


Figure 46 (a): Cutview showing non-constant enclosure site angle impact spacing for an 8 enclosure constant curvature dV-DOSC array (4.5 degrees between all enclosures)

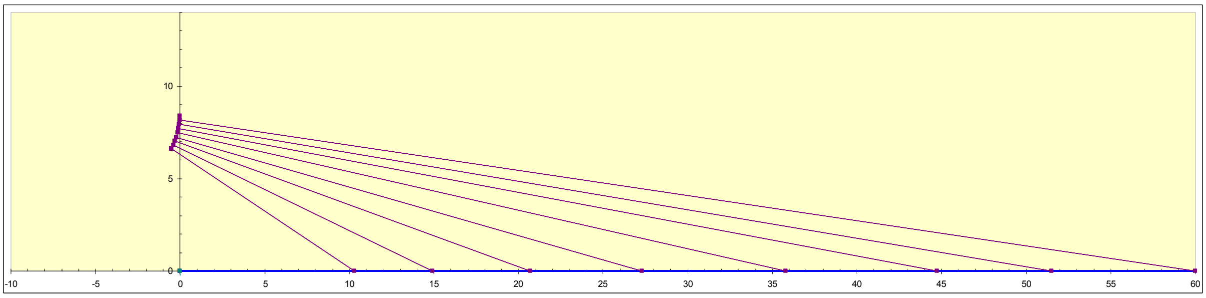


Figure 46 (b): Cutview showing constant enclosure site angle impact spacing for an 8 enclosure variable curvature dV-DOSC array (inter-enclosure angles = 1, 1, 2, 3, 3.75, 5.5, 7.5 degrees)

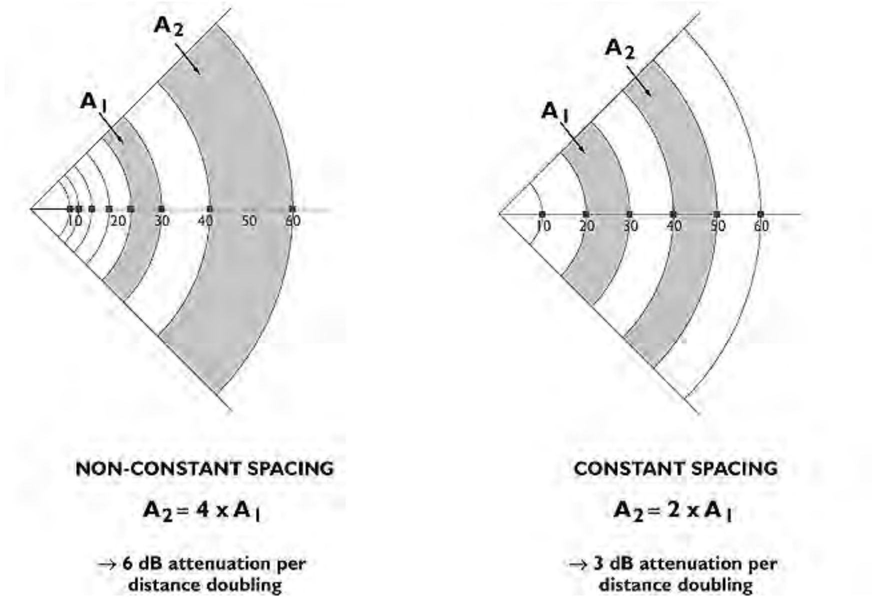


Figure 46 (c): Plan view representation of non-constant (a) versus constant spacing (b)

Optimum coverage is obtained iteratively by varying the height of the array and the inter-enclosure angles (#1 to next, #2 to next, etc). The designer manually performs the optimization by visually referring to the spacing between enclosure site angle impacts after making changes to the array. Once equal spacing has been achieved, the designer has successfully optimized the performance of the system by shaping the array's vertical isocontour to match the audience geometry. Angle values, bottom enclosure elevation, site angles for top and bottom enclosures and trim height parameters are then recorded and used for installation of the system (see Output Data).

dV-DOSC Single Point Hang Utility

A pick point calculation utility is included for single point dV-DOSC array hangs. Pick point holes are numbered 0 to 16 from front-to-rear on dV-BUMP or dV-BUMP2. Hole 0 corresponds to the downstage motor point, holes 1-8 correspond to pick points on the central spreader bar and holes 9-16 correspond to pick points on the rear extension bar. The user varies the pick point number (from 0 to 16) and the bumper elevation while attempting to minimize the "Site Angle Deviation wrt Target" value so that this value is as close to zero as possible. The user can then determine the appropriate pick point and whether the dV-BUMP extension bar is required.

Note: Always verify the actual, obtained array tilt angle using a digital inclinometer during installation. If a 3.75 degree angle is used between the top dV-DOSC and dV-BUMP, then the angle of dV-BUMP corresponds to 'Site #1 to Next" for the selected pick point.

If the actual, obtained site angle (measured with a digital inclinometer during installation) differs from the value predicted in ARRAY2004, use Autofocus Adjust to enter the obtained value and adjust the Bumper Elevation as necessary to ensure that audience coverage is correct.

Note: The smaller and flatter the dV-DOSC array, the larger the error in the Single Point Hang estimate (i.e., there is more error in the centre of gravity calculation for smaller, flatter arrays).

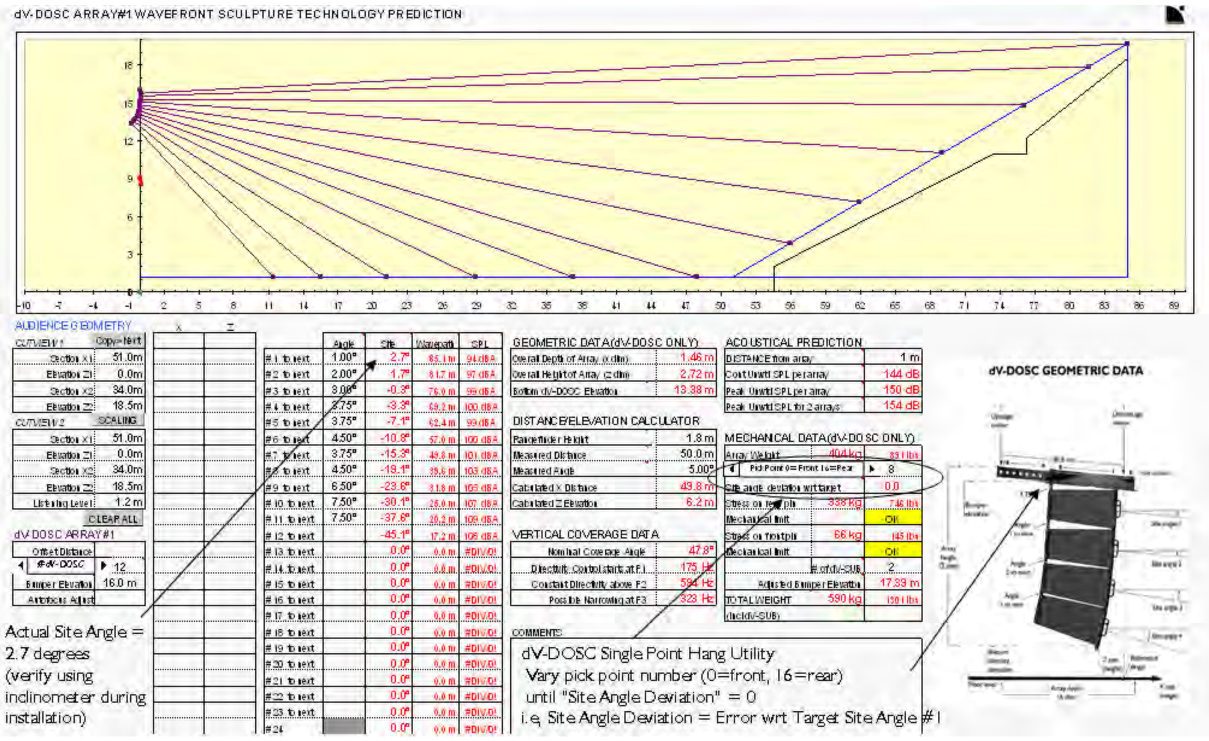


Figure 47: dV-DOSC single point hang simulation

dV-DOSC Downfill / Upfill Simulation

dV-DOSC downfill or upfill enclosures can be conveniently simulated in V-ARRAY1 or V-ARRAY2 sheets using the available cells.

Note: For dV-DOSC downfill simulation, autofocus adjust angle = 0 degrees corresponds to the first dV-DOSC enclosure as tightly wrapped to the bottom V-DOSC (i.e., a relative site angle of 3.75 degrees).

Note: When simulating dV-DOSC downfill or upfill using ARRAY2004 there will appear to be a physical alignment offset with respect to V-DOSC. This is normal and is due to the different coordinate system references used for V-DOSC versus dV-DOSC since the rigging systems are rear-pivoting versus front-pivoting. Even though the display in ARRAY2004 may appear incorrect, DOSC waveguides are physically aligned by the dV-DOWN rigging adapter accessory and the simulated coverage is correct.

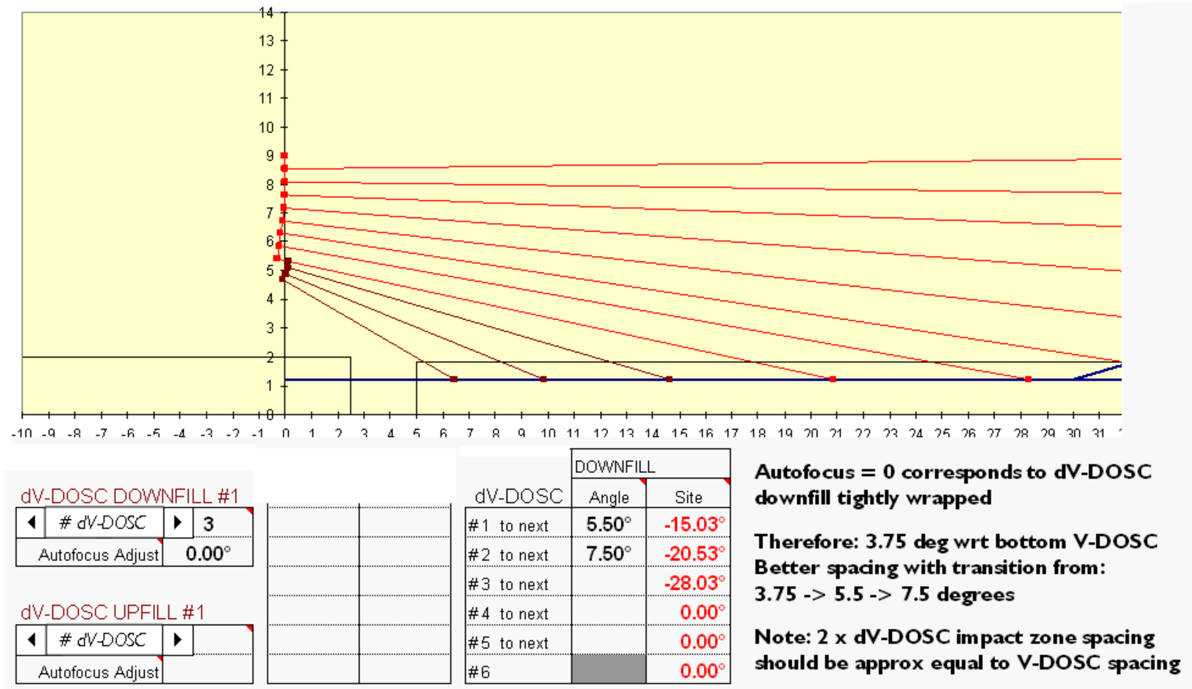


Figure 48: dV-DOSC downfill simulation (tightly wrapped)

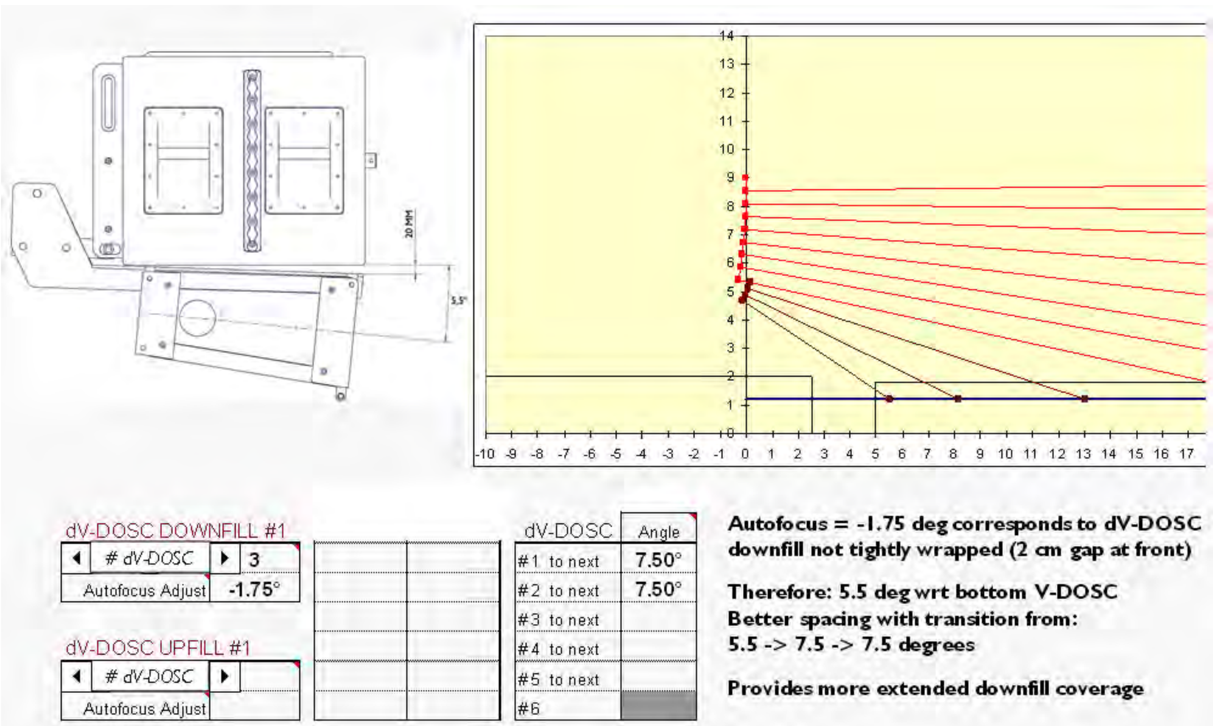
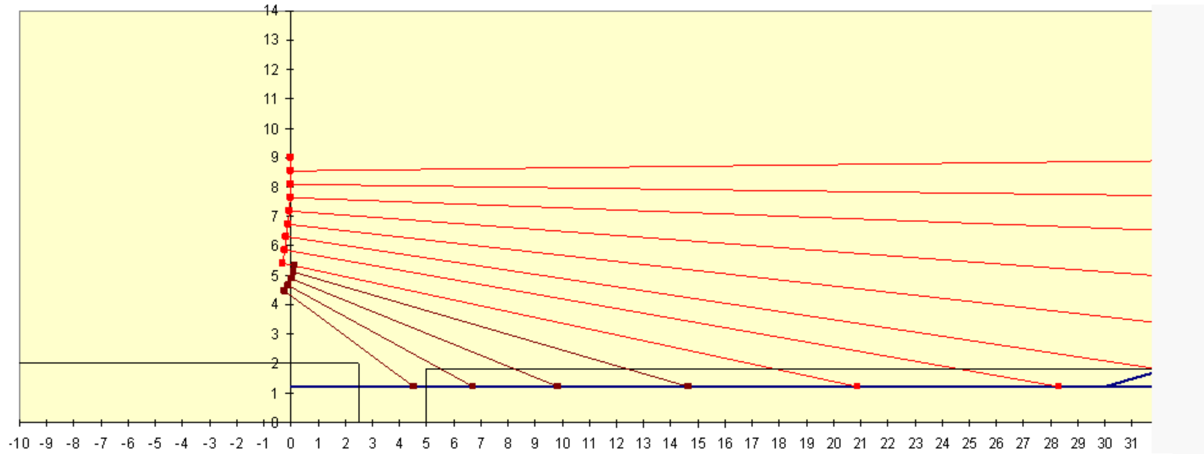


Figure 49: dV-DOSC downfill simulation (extended coverage)



dV-DOSC DOWNFILL #1

# dV-DOSC	4
Autofocus Adjust	0.00°

dV-DOSC UPFILL #1

# dV-DOSC	
Autofocus Adjust	

dV-DOSC	DOWNFILL Angle	DOWNFILL Site
#1 to next	5.50°	-15.03°
#2 to next	6.50°	-20.53°
#3 to next	7.50°	-27.03°
#4 to next		-34.53°
#5 to next		0.00°
#6		0.00°

Circuit 2 +2 dV-DOSC in parallel

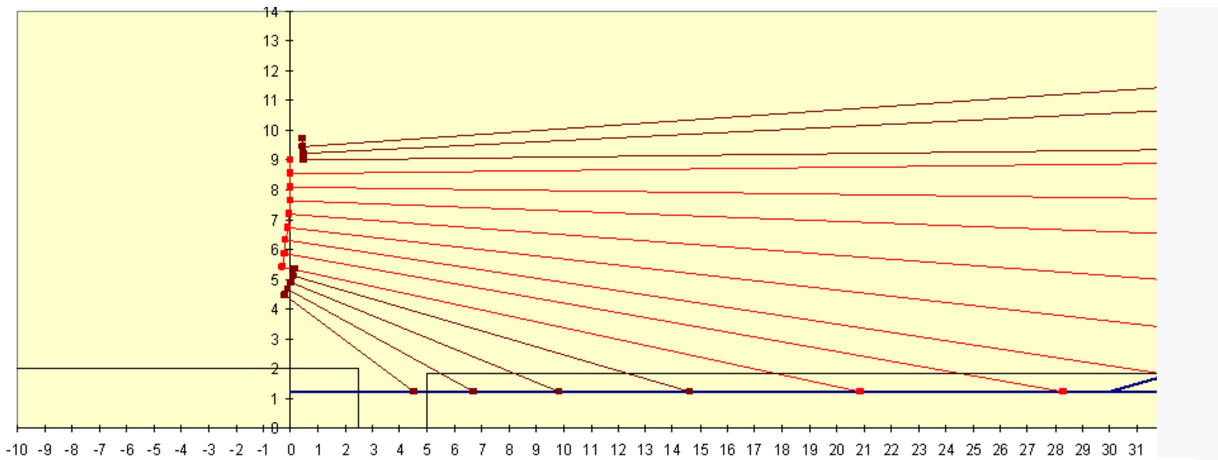
Attenuate HF for bottom 2 dV-DOSC only to compensate for impact zone concentration (throw distance not long enough)

Figure 50: dV-DOSC downfill simulation (circuiting issues)

For dV-DOSC upfill simulation, an autofocus adjust angle of zero degrees corresponds to the first dV-DOSC enclosure as parallel to the site angle of the top V-DOSC.

<u>Note: To obtain the 0 degree relative angle, the 3.75 degree hole on dV-ANGLEP1 must be used during installation</u>.

For upfill purposes, the 5.5 or 7.5 degree holes can also be selected on dV-ANGLEP1. When using 5.5 or 7.5 degree holes, set autofocus adjust = 1.75 degrees or 3.75 degrees, respectively. This is necessary to compensate for the 3.75 degree trapezoidal angle of the first dV-DOSC enclosure.



dV-DOSC DOWNFILL #1

# dV-DOSC	4
Autofocus Adjust	0.00°

dV-DOSC UPFILL #1

# dV-DOSC	3
Autofocus Adjust	0.00°

dV-DOSC	DOWNFILL Angle	DOWNFILL Site	UPFILL Angle	UPFILL Site
# 1 to next	5.50°	-15.03°	1.00°	3.62°
# 2 to next	6.50°	-20.53°	2.00°	2.62°
# 3 to next	7.50°	-27.03°		0.62°
# 4 to next		-34.53°		0.00°
# 5 to next		0.00°		0.00°
# 6		0.00°		0.00°

dV-DOSC Upfill
Autofocus Adjust = 0 deg corresponds to bottom dV upfill site angle parallel to top V-DOSC

Compensate for 3.75 deg trap angle of first dV upfill element
3.75 hole = parallel
5.5 hole = 1.75 deg up
7.5 hole = 3.75 deg up etc

Figure 51: dV-DOSC upfill simulation

Output Data

In the columns adjacent to where angle values are entered, the site angles (i.e., what you would measure if you put a digital inclinometer on each enclosure) and the wavepath (throw distance) for each enclosure are tabulated.

Note: The site angle for enclosure #1 is equal to the dV-BUMP or dV-BUMP2 site angle provided that the 3.75 degree angle is selected for the top dV-DOSC enclosure.

Also tabulated are continuous A-weighted SPL estimates throughout the coverage of the array on an enclosure-by-enclosure basis. These dBA estimates are derived using a Fresnel-type calculation with a 2 kHz reference frequency for a +4 dBu nominal input signal level. Since the dBA calculation considers discrete dV-DOSC enclosures (not sections of the continuous radiating line source) the resolution of this calculation is not sufficient for the user to attempt to design for constant dBA throughout the audience area. Users are advised to refer to the visual spacing between audience impacts and use the dBA estimates as a guideline only.

In ARRAY GEOMETRICAL DATA cells, the physical dimensions of the array are displayed including: the Overall Depth of the Array (in the x dimension), the Overall Height of the Array (in the z dimension), and the Bottom Enclosure Elevation (front corner of the bottom enclosure, referenced to floor level). The bottom enclosure elevation is used as a reference for installing the system and the Depth/Height information is useful to determine if the array will physically fit in a given space (scaffold bay, clearance to proscenium wall etc). Please see Figure 45 for further details.

ACOUSTICAL PREDICTION data gives the unweighted SPL of the array at a user-selected distance (enter the distance in the black cell). This calculation is based on a 200 Hz reference frequency and correlates well with the unweighted SPL (as opposed to the A-weighted enclosure-by-enclosure SPL estimate). The peak unweighted SPL for a single array as well as an estimate of the peak unweighted SPL for 2 arrays is also given.

Note: Unweighted SPL estimates do not include additional contributions due to subwoofers.

The Nominal Vertical Coverage Angle of the array is calculated as the sum of the entered inter-enclosure angles. This coverage becomes effective at F_1 and for all frequencies higher than F_1, the vertical coverage angle is less than this nominal vertical coverage angle. Above F_2, the vertical coverage angle perfectly matches the nominal value. Some beaming (vertical coverage narrowing) may occur at F_3, especially when the array is of constant curvature type.

Finally, MECHANICAL DATA gives an estimate as to the rear versus front motor load distribution and the stress on the front and rear dV-PINS used to attach the top dV-DOSC to dV-BUMP or dV-BUMP2. These load distributions depend on the size and shape of the array as well as the array site angle (equal to Site #1) which, in turn, affect the location of the centre of gravity.

Important things to note:

1) ARRAY WEIGHT includes dV-DOSC enclosures, the dV-BUMP bumper and dV-ANGLE, dV-PIN weights only. Loudspeaker cables, steels and motor weights are not included.

2) Calculation of the REAR LOAD is within 20% error. When the rear motor load goes to zero, Maximum Site Angle is displayed.

3) Calculation of the FRONT LOAD is within 20% error. When the front motor load goes to zero, Minimum Site Angle is displayed.

4) Rear and Front Pin Stress refer to the stress on the dV-PINs used to attach the top dV-DOSC enclosure to dV-BUMP or dV-BUMP2 and is accurate within 20% error.

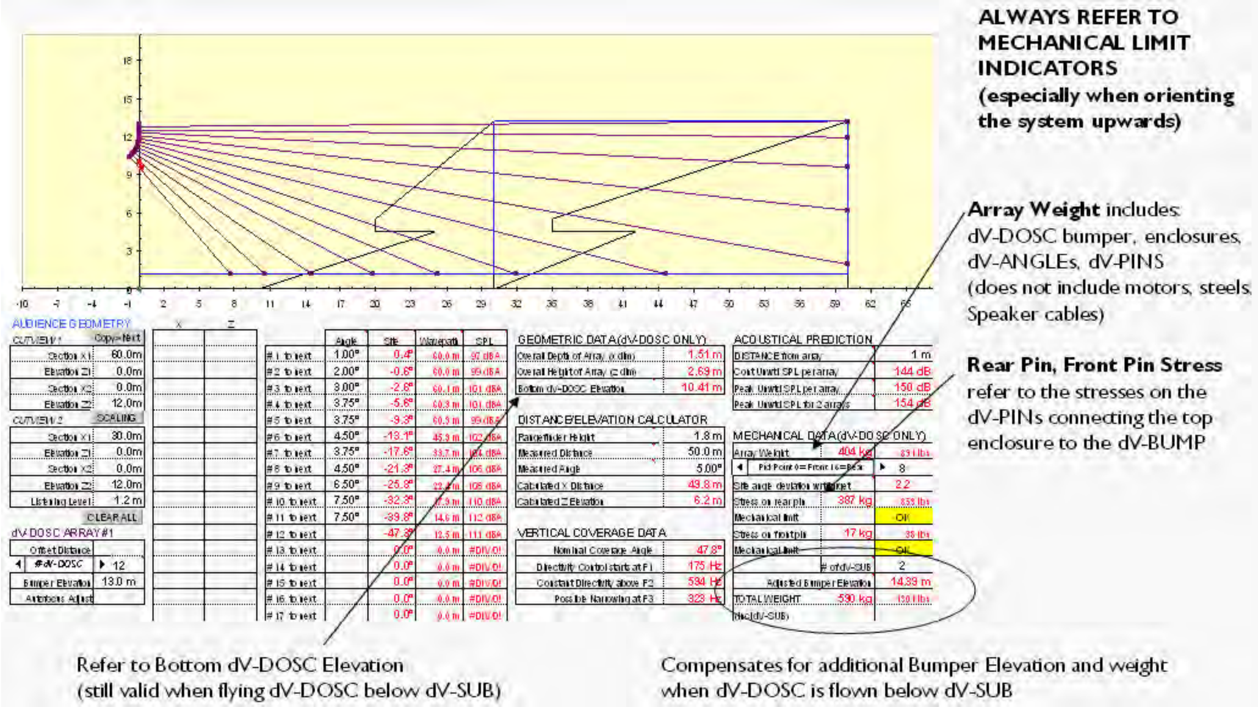


Figure 52: dV-DOSC mechanical data

H-ISOCONT SHEET

The H-ISOCONT sheet is used to check horizontal coverage by mapping a projection of the horizontal isocontour of the defined V-DOSC and dV-DOSC arrays onto the user-defined audience area. By matching horizontal coverage to the audience area, H-ISOCONT can be used to check array placement/aiming and stereo imaging as well as determine whether offstage fill, front fill or center cluster arrays are required. Two audience areas can be defined and the coverage of up to four arrays displayed (4 x V-DOSC, 4 x dV-DOSC). Calculation assumptions include: 3 dB SPL reduction with doubling of distance (i.e., arrays have been designed for constant impact spacing using their respective Cutview sheets); anechoic or reflection-free conditions (direct sound only).

Input Data

Just as for cutview sheets, input data cells are in black and results are displayed in red. To define a plan view of the audience area, the user inputs x (range) and y (distance off-centre) coordinates in the Contour 1 and Contour 2 cells. A mirror image drawing scheme is used (so that only half the room needs to be defined) and after coordinates are entered, the display of the audience area is updated when the SCALING button is pressed. It is only necessary to define Contour 1, however, Contour 2 is useful to represent balconies, stage thrusts, proscenium opening, FOH location etc.

When V-DOSC and dV-DOSC arrays are defined (in V-ARRAY1,2 and dV-ARRAY1,2 Cutview sheets respectively), they are automatically displayed in the H-ISOCONT sheet with the x location of each array referenced to the defined Offset Distance taken from each arrays' respective Cutview sheet. The parameter "Isocontour at Distance (m)" refers to the throw distance for the top enclosure of the respective array and is given relative to the defined Offset Distance.

The user then enters the "Console Output Signal (dBu)" for each array, i.e., output level of the mixing desk (0 VU = +4 dBu) and the Continuous A-weighted SPL is tabulated, corresponding to the SPL that would be obtained along the isocontour for each array. The Console Output Signal can be increased until the amount of headroom available in the system goes to zero and the user has an indication as to the peak A-weighted SPL that will be available along the isocontour. Further increases in the Console Output Signal will produce a CLIP indication reflecting amplifier clip.

The user can also define the y coordinates for each array (off-center distance) and the azimuth angle in degrees (i.e., aiming or panning angle of the array). Note: to simulate a centre cluster, simply set "Y location" equal to zero.

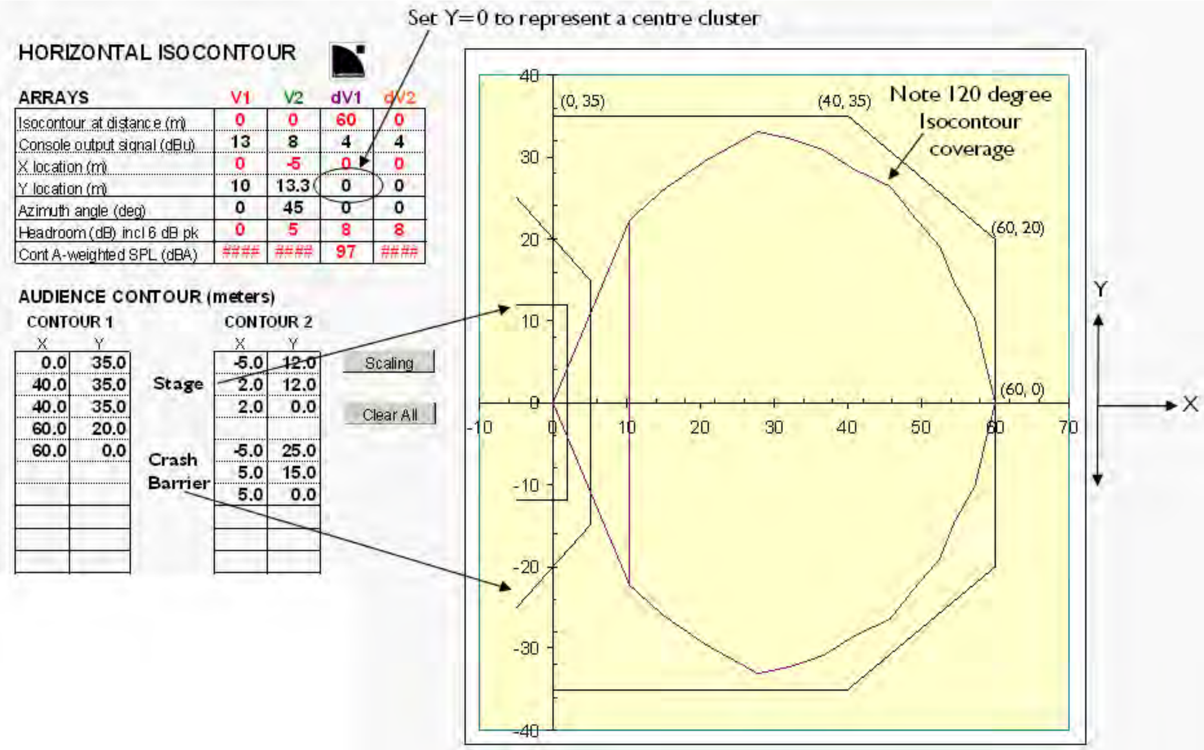


Figure 53: dV-DOSC Isocontour

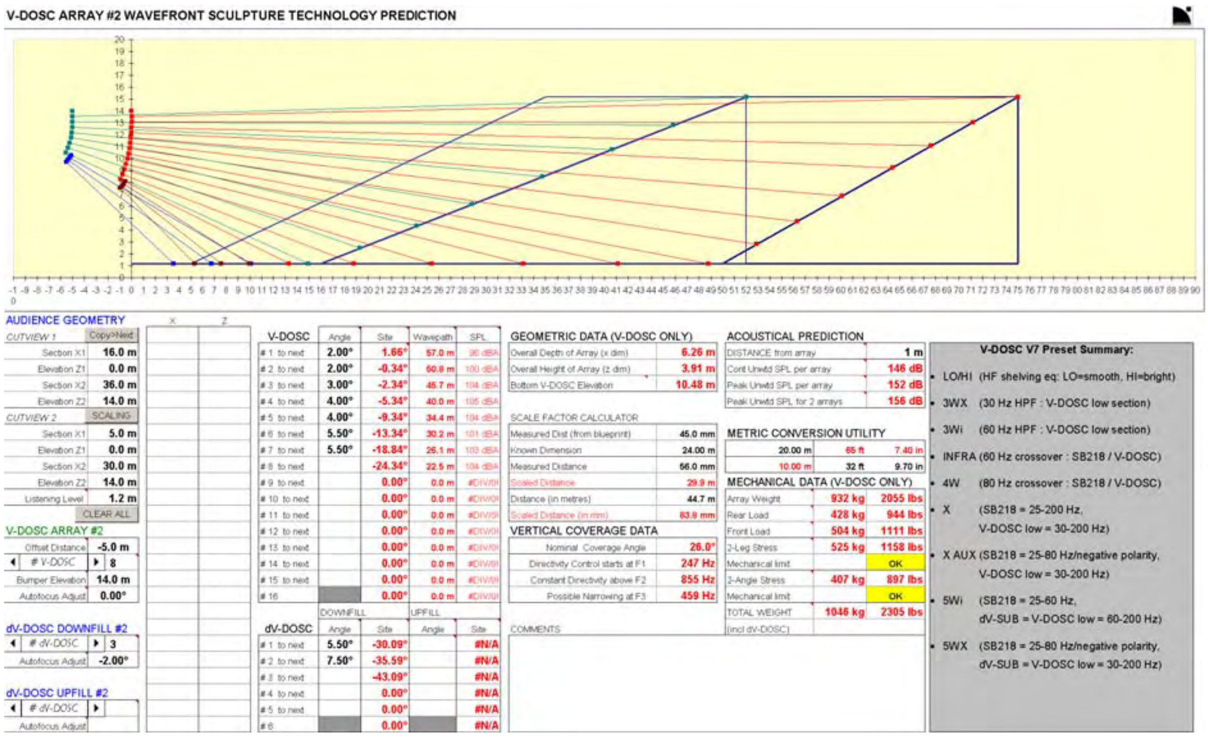
Optimization Procedure

Typically, the optimization procedure begins by using the V-ARRAY1, V-ARRAY2, dV-ARRAY1 or dV-ARRAY2 cutview sheets to determine the number of array enclosures, inter-enclosure angles, etc. H-ISOCONT is then used for adjustment of array separation and azimuth panning angles to ensure adequate audience coverage and stereo imaging at a desired A-weighted SPL. In some cases, when horizontal coverage is an important design issue, simulation can start with the H-ISOCONT sheet first in order to predetermine the 0 and 60 degree axes prior to more detailed cutview simulation.

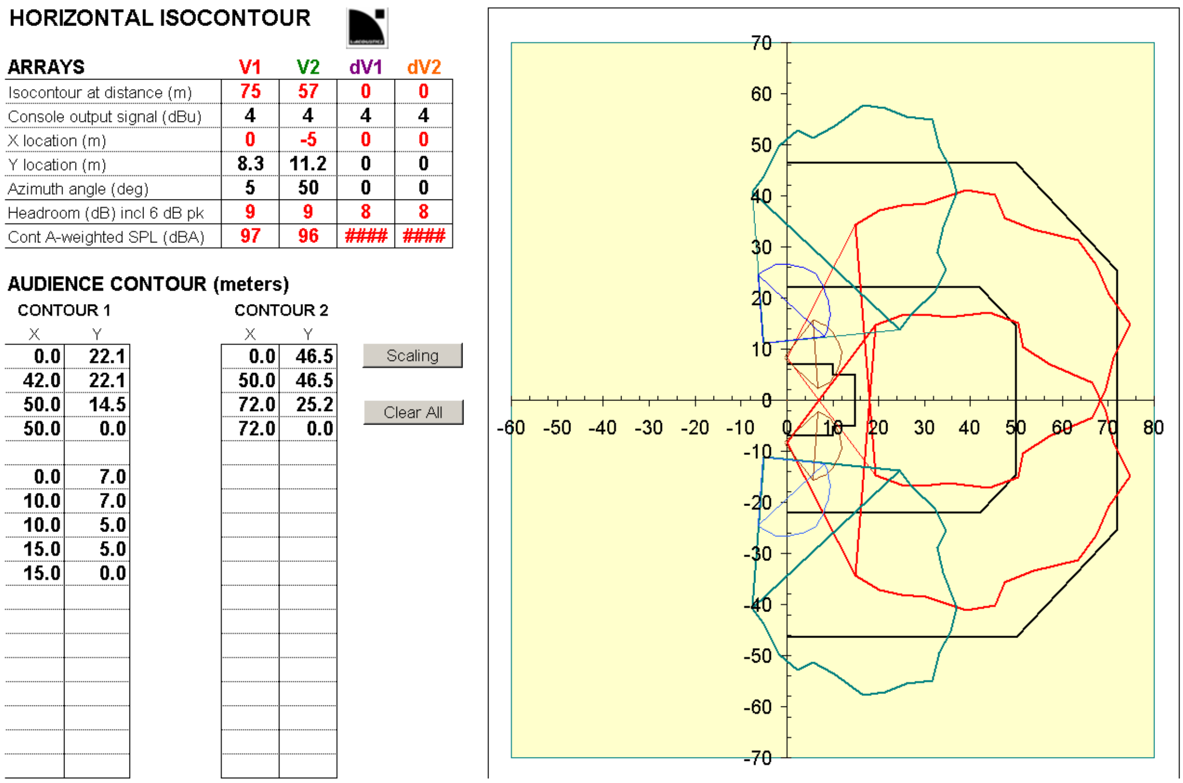
Output Data

Output data is directly displayed as the projection of the horizontal isocontour on the defined audience area. The A-weighted SPL and amount of headroom in the system are given for each array. Note that the displayed isocontour for each array is terminated in a line that is referenced to where coverage starts for the bottom enclosure. Therefore, H-ISOCONT gives a direct indication as to the areas where coverage is lacking and offstage fill, center fill or delay clusters are required. The overlap between L, R arrays illustrates which portions of the audience will experience stereo imaging.

Note: It is not possible to simulate the transition between dV-DOSC to V-DOSC isocontours in ARRAY 2004 when dV-DOSC is used for downfill or upfill in conjunction with V-DOSC. In order to simulate this transition, SOUNDVISION is recommended.



CUTVIEW SHEET



HORIZONTAL ISOCONTOUR SHEET

Figure 54: ARRAY 2004 spreadsheet calculation example

2.4 dV-DOSC COVERAGE MODELING USING SOUNDVISION

SOUNDVISION is a proprietary 3D software program dedicated to the modeling of the entire L-ACOUSTICS product line - including dV-DOSC, V-DOSC, KUDO, ARCS, XT and MTD enclosures. Designed with a convenient, graphical user interface, SOUNDVISION allows for the calculation of sound pressure level (SPL) and coverage mapping for complex sound system or venue configurations.

Room geometry and loudspeaker locations are defined in 3D and simplified operating modes allow the user to work in 2D to rapidly enter data. According to user preference, either horizontal (plan) or vertical (cut) views can be selected to enter room coordinates or to define loudspeaker placement/aiming. SPL plus coverage mapping are then based on direct sound calculations over the defined audience geometry.

SOUNDVISION features a user-friendly interface with multiple toolboxes that allow for convenient entry of room and loudspeaker data while displaying coverage or mapping results along with 2D Cutview, Target and Source Cutview information. All toolboxes can be displayed simultaneously, providing the user with a complete control interface that allows for rapid system optimization.

Using sophisticated modeling algorithms, SOUNDVISION offers several levels of support. Due to its speed and ease-of-use, "Impact" mode is well-suited to the needs of touring sound engineers and touring sound companies. More detailed information is available in "SPL Mapping" mode, providing an invaluable tool for the audio consultant or sound designer. For the installer, physical properties provided in "Mechanical Data" provide useful practical information for fixed installation applications.

Impact mode coverage is based on the -6 dB directivity over a 1-10 kHz operating bandwidth (at 5 degree angular resolution) and allows for visualization of system coverage and SPL distribution. Optimum SPL contours are highlighted within the displayed -6 dB coverage pattern (filled circles correspond to the -3 dB coverage pattern) in order to facilitate the implementation of multiple source installations. For offstage LL/RR V-DOSC or dV-DOSC arrays (or distributed sound reinforcement design using coaxial loudspeakers), the goal is to align filled circles in order to have even coverage.

Mapping mode provides a color-coded representation of the SPL distribution over the defined room geometry and allows for visualization of the coverage of individual loudspeakers as well as the interference between multiple loudspeakers. In mapping mode, the user can select individual 1/3 octave bandwidths, unweighted or A-weighted SPL, or any frequency range between 100 – 10k Hz. Typically the 1-10 kHz bandwidth SPL mapping provides a good representation of system performance since this bandwidth is responsible for perceived system intelligibility and clarity.

To illustrate dV-DOSC coverage, Figure 55 shows SPL mappings at octave band frequencies for an array of 12 enclosures (angles = 5.5, 5.5, 5.5, 5.5, 4.5, 3.75, 3.75, 3, 3, 3, 3). For this example, the dV-DOSC array is perpendicular to a 35 x 100 metre target plane at a 30 metre throw distance (imagine the dV-DOSC array firing at a large wall). Coverage is stable and well-defined above 1 kHz while becoming progressively more omnidirectional at lower frequencies. Figure 56 shows impact mode coverage and band-averaged SPL mappings for the array of 12 dV-DOSC enclosures pictured in Fig. 55. Impact coverage provides a good representation of the octave band mappings seen in Fig. 55 for frequencies higher than 1 kHz. For this reason, impact mode is considered to provide a good indication as to the overall coverage of the array in terms of clarity and intelligibility.

It is also interesting to compare the A-weighted, unweighted and 1-10 kHz SPL mappings of Figure 56 with the individual octave band mappings of Figure 55. The 1-10 kHz SPL mapping is seen to provide a good representation of the overall coverage of the array and corresponds well with the coverage predicted in impact mode. The A-weighted SPL mapping provides a more strict representation of system coverage since there is more emphasis on higher frequencies while the unweighted mapping is more omnidirectional due to the inclusion of lower frequency information in the average.

Note: For color versions of SOUNDVISION figures see the dV-DOSC manual PDF file available for download on www.l-acoustics.com. A complete description of SOUNDVISION is beyond the scope of this manual. For further information, participation in a dV-DOSC or SOUNDVISION Training Seminar is recommended.

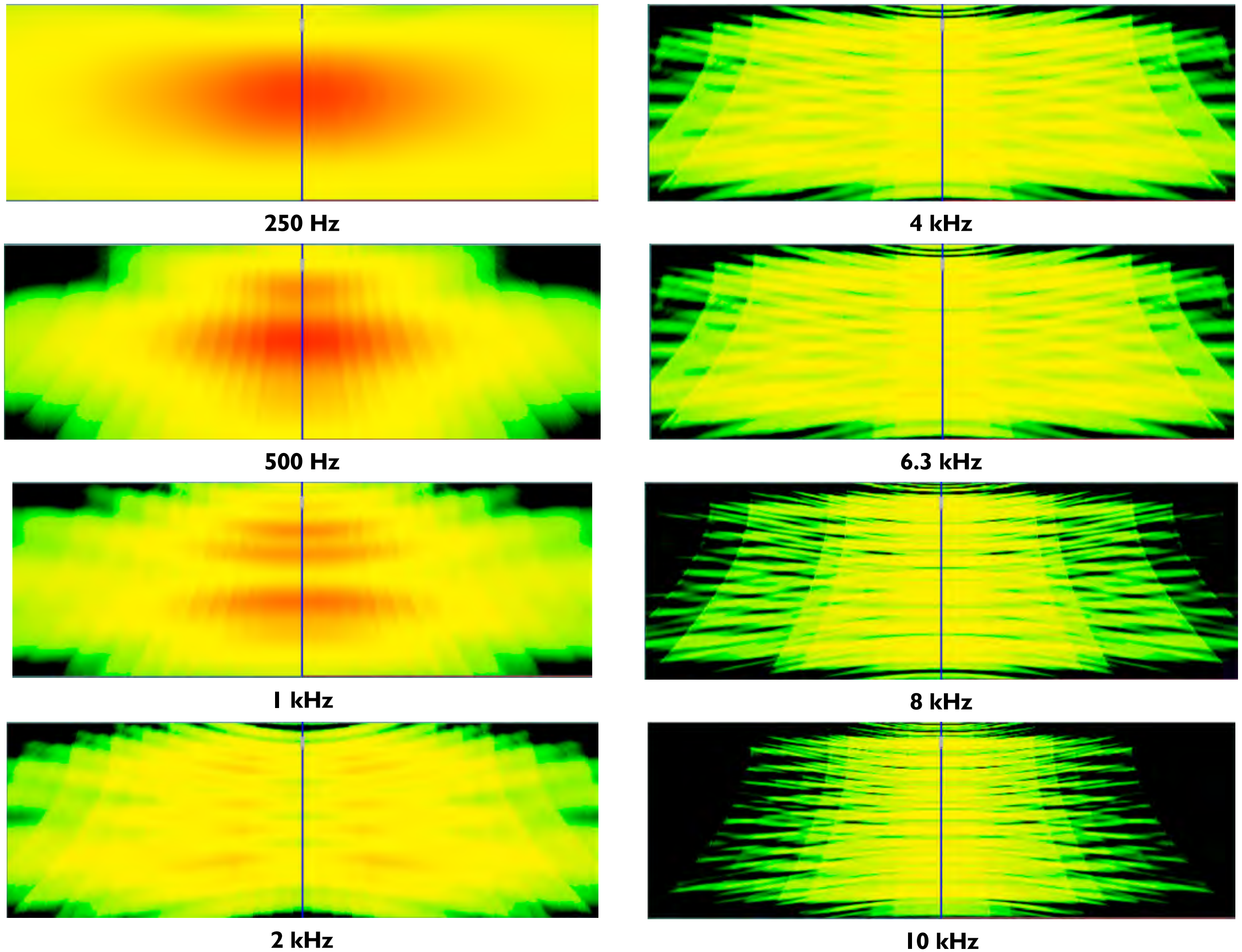
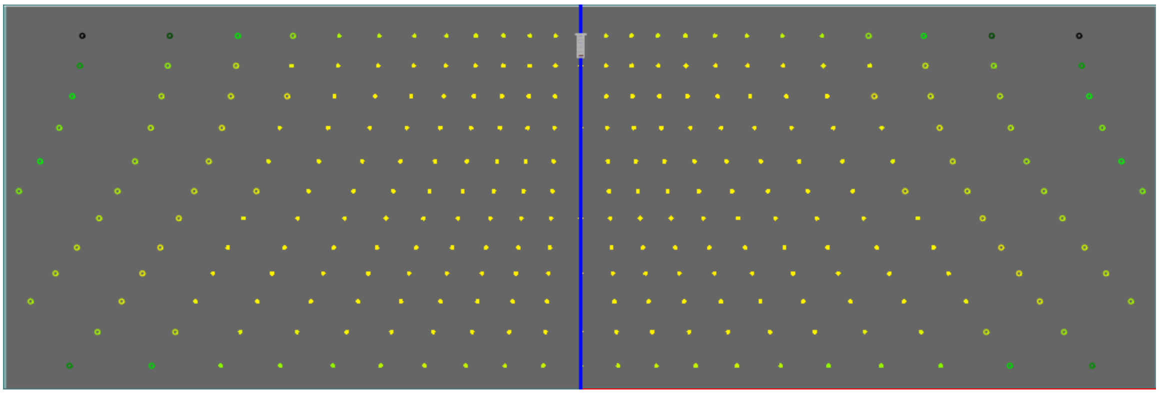
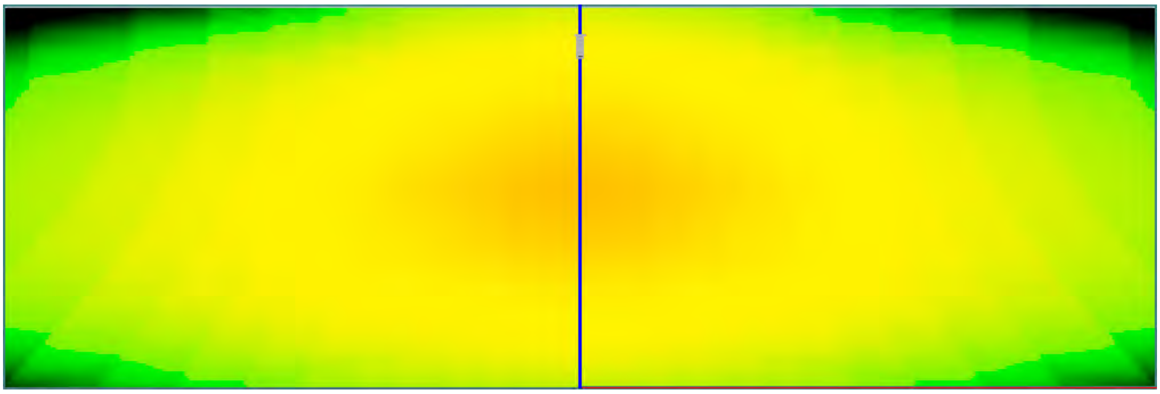


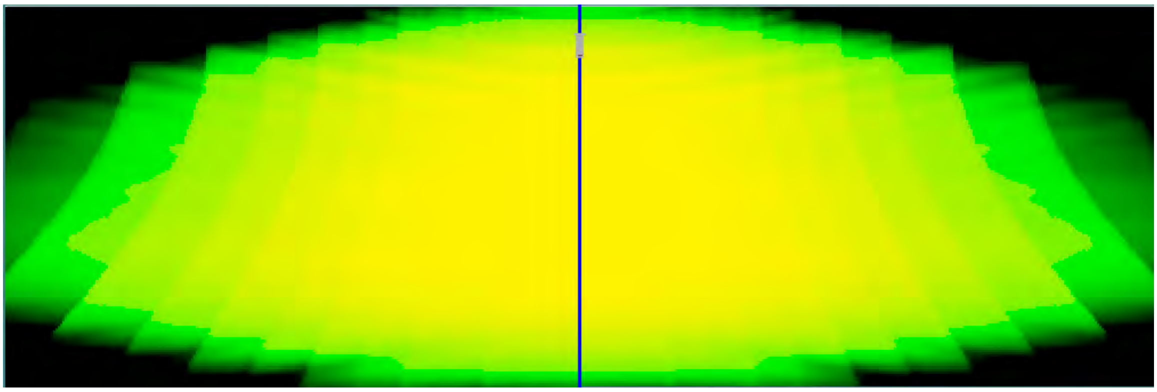
Figure 55: Plan view SPL mappings at octave band frequencies for 12 dV-DOSC (30 metre throw distance, enclosures perpendicular to target plane)



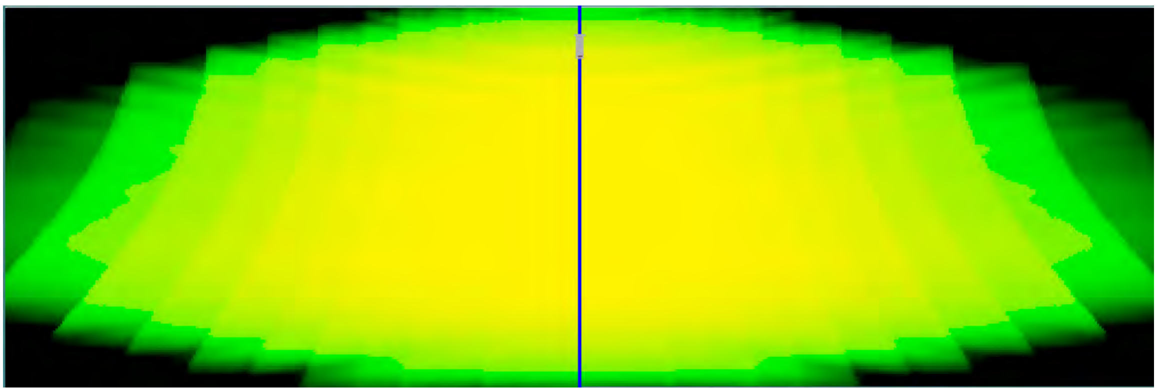
Impact Coverage



Unweighted SPL Map



A Weighted SPL Map



1-10 kHz SPL Map

Figure 56: Impact coverage and SPL mappings (unweighted, A-weighted, 1-10 kHz bandwidth) for 12 dV-DOSC (30 metre throw distance, enclosures perpendicular to target plane)

3. SOUND DESIGN

3.1 STACKED OR FLOWN?

Although flown systems are generally preferred, there are good arguments to support both solutions and, in some cases, the choice is dictated by the venue itself, i.e., sometimes it isn't possible to fly the system since rigging points are not available or weight restrictions apply.

Stacked Systems improve image localization for the audience since the perceived sound image is lowered to stage level. This is beneficial in small venues and stacking also offers more low frequency energy due to enhanced ground coupling. Since dV-DOSC has less SPL attenuation from front-to-rear of the audience than conventional systems, this allows a stacked system to project further and provide better underbalcony penetration in theatres and clubs, for example. In addition, for geometric reasons a stacked system can provide more extended vertical coverage than a flown system - this can be seen using ARRAY 2004 or SOUNDVISION and is simply related to the geometry of the audience to be covered. For example, distributed field level stacked systems are an excellent solution for stadium sound reinforcement – fewer enclosures are required to obtain the necessary audience coverage vertically and, as an additional benefit, the subjective image is lowered to field level.

Stacking is a good solution for applications where up to 12 dV-DOSC enclosures can optimize audience coverage, low frequency response and image localization.

Flown Systems are the best solution to achieve uniform sound pressure level and even tonal balance over the audience provided that the number of arrayed enclosures is sufficient to provide the necessary front-to-rear coverage and that WST Condition 4 is respected (i.e., inter-enclosure angles are selected to obtain equal spacing between enclosure site angle impacts over the audience). Flying is also an excellent solution for sightline problems that commonly occur. Typically, system trim height should be selected to provide a 4:1 ratio between the throw distances to the furthest and closest members of the audience. Such a trim height tends to make it easier to satisfy WST Condition 4 and thus obtain optimum SPL distribution. Offstage coverage is another consideration when selecting array trim height – in general, the best results are obtained when the top dV-DOSC enclosure has a zero degree site angle and is flown at the same height as the highest audience elevation.

For flown systems, additional speakers are typically necessary to cover center fill, front fill or offstage fill requirements. Good candidates include ARCS, KUDO or additional dV-DOSC arrays (see Multiple Arrays). Other distributed front fill or stereo infill enclosures include: L-ACOUSTICS MTD108a, MTD112b, MTD115b, 112XT, 115XT or 115XT HiQ loudspeakers.

Hybrid Stacked/Flown Systems are a good solution for theatrical installations where the flown system provides balcony (circle) and upper balcony (upper circle) coverage and the stacked system provides floor (orchestra level) coverage. Most theatres have significant vertical coverage requirements due to a relatively short throw distance of 20-35 metres combined with a high audience elevation of 12-15 metres in the upper circle. In addition, many theatres have rigging points with weight load restrictions that limit the number of loudspeakers that can be flown. For these reasons, the hybrid stacked/flown sound design approach is practical in reducing the number of enclosures required and at the same time this sound design approach can help improve image localization (especially with the addition of centre cluster, front fill and underbalcony delay systems combined with judicious time alignment and relative level adjustment between all elements of the sound design).

Note: For hybrid stacked/flown systems, the trim height of the flown system should be selected so that the bottom dV-DOSC cabinet has a zero degree site angle and is at the same height as the listening level for the first row of the balcony audience. This helps avoid reflections from the balcony face while providing more even off-axis coverage for the first row of the balcony.

Stacking Guidelines

The stacking system is rated for a maximum of 12 dV-DOSC enclosures

For stacked systems, the well-defined vertical coverage of dV-DOSC allows little margin for error. Whether the audience is standing or seated is an important consideration and the system should be stacked on a riser of suitable height (or on top of subwoofers) so that the system is higher than the listening level of the first row of the audience. In addition, the entire array should be tilted downwards to obtain better high frequency penetration into the audience.

If the bottom of the array is too low, the first rows receive too much SPL and audience members directly in front of the system will shadow the following rows acoustically. An additional technique to avoid build up for the closest members of the audience is to install the system further upstage – the initial distance-attenuation loss to the first few rows will help provide better SPL distribution throughout the entire audience without the need to attenuate the mid or high sections of lower enclosures (which will affect the overall output of the system). To summarize, the bottom of the stacked array should be higher than the audience (more than 2 m or 6.5 ft above floor level), with the lowest enclosure tilted downwards as necessary.

Note: A vertical stack of 4 SB218 subwoofers provide a stacking height of 2.2 m above ground level. Alternatively, 3 dV-SUBs provide a stacking height of 2.1 m above ground level.

Tilting the system downwards is not necessary for field level distributed systems since the audience is seated on a tribune gradient and there are reduced shadowing effects. For more details on stacking procedures, please refer to Section 4.1.

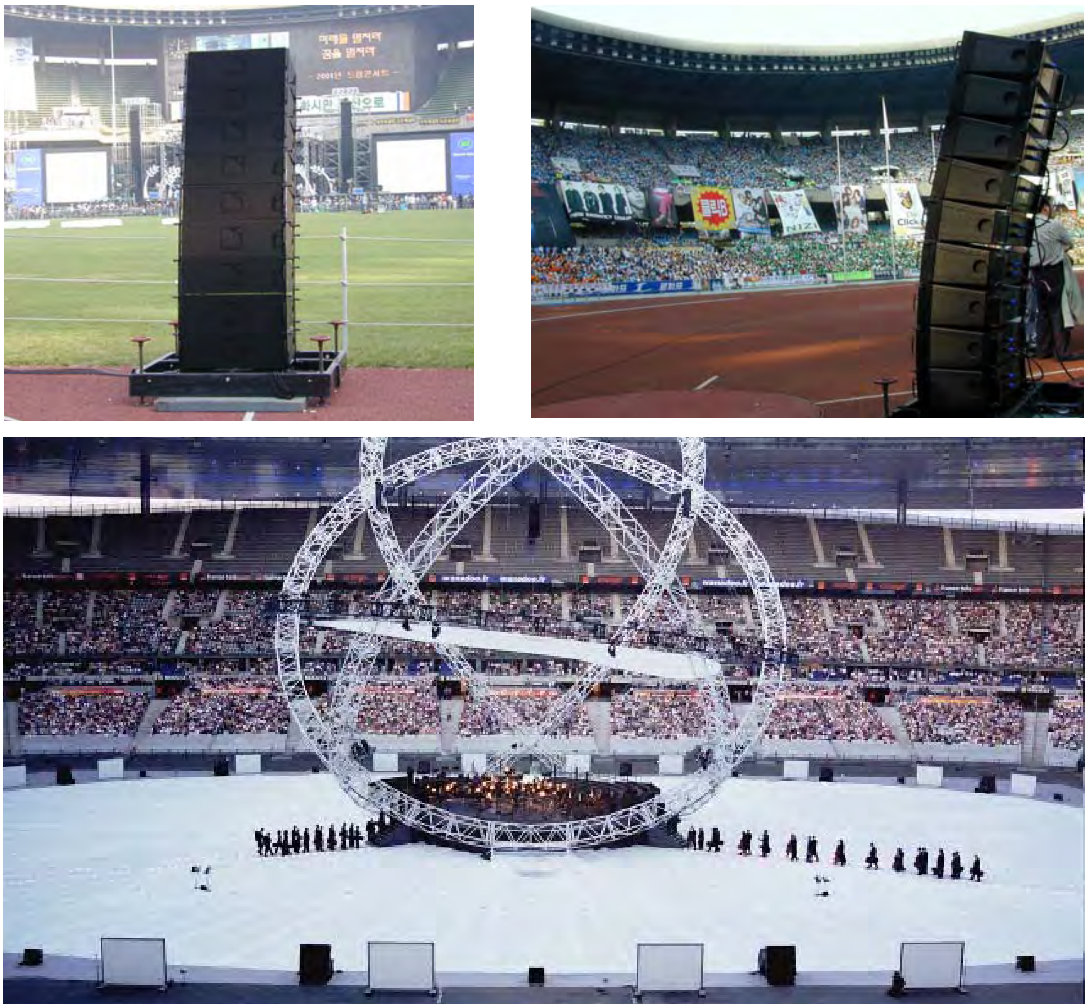


Figure 57: Distributed, field level stacked dV-DOSC systems for stadium sound reinforcement (sound designers: Ki Sun Choi, Seoul Sound; A. Francais, DePreference)

Rigging Guidelines

The rigging system is rated for a maximum of 24 dV-DOSC enclosures without the extension bar and 12 dV-DOSC enclosures with the extension bar

When simulating system coverage using ARRAY2004 or SOUNDVISION, the goal is to select dV-DOSC inter-enclosure angles so that equal spacing is obtained between enclosure site angle impacts over the audience geometry (WST Condition 4). Particular attention should be paid to the height at which the array is flown when predicting the vertical coverage in ARRAY2004 or SOUNDVISION. Typically, system trim height should be selected to provide a 4:1 ratio between the throw distances to the furthest and closest members of the audience.

Inter-enclosure angles should not be selected by considering the on-axis cutview only – always consider audience coverage off the main axis, especially from 50° to 60° on the offstage side. It is important to check that you are not lacking in offstage coverage and require additional fill systems (see Multiple Arrays). For improved offstage coverage in arenas, it is best to have the system flown so that the bumper elevation is at the same height as the highest audience elevation and the top dV-DOSC enclosure has a zero degree site angle. Conversely, for the hybrid flown/stacked configuration (theatre sound reinforcement), the trim height of the flown system should be selected so that the bottom dV-DOSC cabinet has a zero degree site angle and is at the same height as the listening level for the first row of the balcony audience. This helps avoid reflections from the balcony face while providing more even off-axis coverage for the first row of the balcony.

It is also common to have two sections of the audience area that have different slopes, for example, the transition between floor level and the tribune gradient in arenas. In this case, coverage of the areas at the transition between the two slopes should be examined carefully and angles selected accordingly.

Finally, to effectively complete any dV-DOSC installation - stacked or flown - during the actual installation, it is important to verify that the parameters calculated in ARRAY 2004 or SOUNDVISION have been implemented correctly. Tools that are useful for this purpose are described in Chapter 5.4. Detailed rigging and system focussing procedures are described in Section 4.2.

Figure 58a: Flown dV-DOSC + dV-SUB arrays for large format 5.1 sound reinforcement (Jean Michel Jarre 2005 Beijing, sound designer: C. Dupin)

Figure 58b: Flown dV-DOSC delay positions (2002 Olympics - Salt Lake City, Turandot Stade de France 2005)

3.2 ACHIEVING OPTIMUM COVERAGE

ARRAY 2004 or SOUNDVISION are convenient simulation tools for optimizing the coverage for a complete system consisting of multiple dV-DOSC arrays and complementary fill systems. Parameters for each array such as spatial coordinates, azimuth angle (i.e., horizontal panning), number of enclosures and inter-enclosure angles are entered by the sound designer and individual elements of the sound design are optimized with respect to the vertical cutview geometry of the audience in accordance with WST Condition 4.

In the horizontal plane, the displayed isocontours (ARRAY2004) or impact coverage (SOUNDVISION) should overlap to a certain extent and cover the majority of the audience. For the amount of overlap see below for a discussion of the tradeoffs between stereo perception versus intelligibility. The remaining uncovered areas should be covered with fill speakers such as ARCS, KUDO or additional dV-DOSC arrays. Additional distributed front fill or stereo infill systems using L-ACOUSTICS MTD108a, MTD112b, MTD115b, 112XT, 115XT or 115XT HiQ loudspeakers are also highly effective in complementing dV-DOSC system coverage.

3.2.1 THE LEFT/RIGHT CONFIGURATION

Although not the best technical solution, the left/right configuration meets both visual and practical criteria and is most commonly used. dV-DOSC is a dramatic improvement over conventional systems but, by nature, the stereo imaging of any left/right system is limited for a large part of the audience and there are compromises with respect to the consistency of tonal balance in the horizontal plane.

The biggest problem for any left/right system is non-uniformity of tonal balance horizontally. Typically, an excess of low frequency energy builds up in the middle, accompanied by reduced intelligibility. The net result is that the system sounds bass-heavy or “thick” in the middle, “harsher or more aggressive” when directly on-axis with one side of the system, and “thin” offstage. These effects are due to the path length difference interference effects that are inherent in any left/right system which, in turn, produce frequency- and position-dependent peaks and dips.

Figure 58c: Main Stage FOH L/R system = 12+12 dV-DOSC, 4+4 SB218 (75 m throw distance); Tent System FOH L/R = 7+7 dV-DOSC, 3+3 dV-SUB (Toronto Jazz Festival 2002, sound design: M. Vincent)

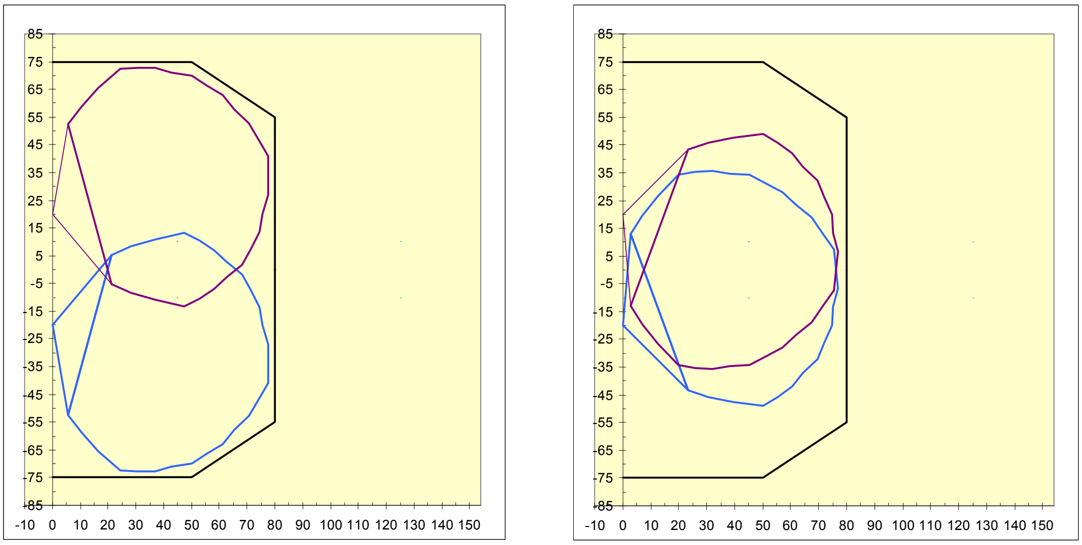
Tradeoffs Between Intelligibility and Stereo Imaging

The left/right configuration has the advantage of being able to reproduce effects of spatialization and localization. The area over which these effects is audible depends on the separation of the two arrays and the orientation of the left array with respect to the right array, defined by the intersection of the isocontours for both arrays. The more the arrays are rotated or panned onstage ("toed in"), the greater the area over which stereo imaging is experienced. The less they are rotated onstage and the more they are aimed offstage, the less stereo imaging is audible. Typically, for concert applications L/R arrays are separated 15-20 meters and used at zero degrees. Experience has shown that this provides the best tradeoff between stereo imaging, evenness of horizontal coverage and reduction of the potential for build up of low frequency and upper mid bass energy in the centre.

Note: Use of the BUMPDELTA delta plate rigging accessory provides a convenient way to vary the panning angles of flown L/R systems and adjust the amount of overlap and stereo imaging (see the V-DOSC manual for further details).

There are also tradeoffs with respect to intelligibility when aiming arrays. Psychoacoustically, improved intelligibility is obtained when the isocontours of both arrays do not overlap too much. Provided that audience coverage is correct, intelligibility is optimal when only one array radiates on a given audience area. If two arrays are to cover a common area, intelligibility losses result when the distance separating the two arrays becomes too great. A standard distance of 20 m (65 ft) is acceptable, however, if greater separation is specified, one should avoid rotating the arrays onstage too much - this emphasizes arrival time differences between the arrays, thus degrading intelligibilty.

The decision whether to emphasize intelligibility or stereo imaging mainly depends on the application. For music applications, more overlap is desired and for speech reinforcement less is more appropriate.



Optimizing coverage and intelligibility   Optimizing stereo imaging

Figure 59: Tradeoffs between intelligibility versus stereo imaging

3.2.2 LEFT/CENTRE/RIGHT (LCR) CONFIGURATIONS

Although it can be sometimes difficult to negotiate the centre position (from a visual standpoint), LCR systems offer more flexibility in optimizing audience coverage with the potential for improved intelligibility, more even horizontal tonal balance and better image localization compared with standard LR configurations. For more details, the interested reader is referred to "Mixing Left-Centre-Right, Managing Shed Sound – the evolution of PA Methodology Solutions, including LCR" by Robert Scovill (Live Sound International, Nov/Dec 2002).

When using the LCR configuration for live music applications, three dV-DOSC arrays can be installed with the C array at 0 degrees and the L/R arrays panned offstage up to 50 degrees (for speech reinforcement, L/R arrays can be panned offstage up to 100 degrees to optimize coverage and intelligibility). For theatrical sound reinforcement, the 120 degree coverage of dV-DOSC is highly-suited to centre cluster applications since there is a good match between C system coverage and overall L/R coverage for the typical 12-15 metre L/R array separation that occurs in theatres.

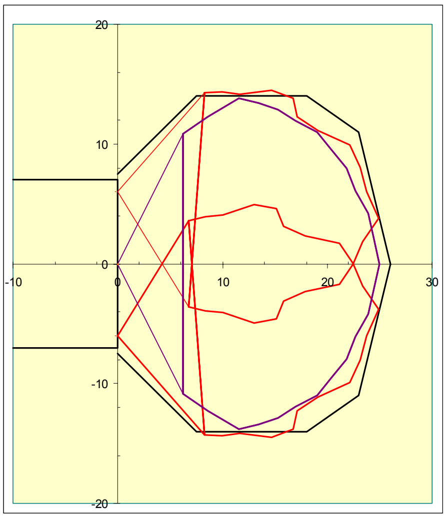


Figure 60: LCR Configuration for theatrical sound reinforcement (L/R=V-DOSC, C=dV-DOSC)

Note: As Scovill points out, mixing console choice is a key element for making the LCR configuration work, i.e., the console must be capable of generating an LCR mix suitable for live music sound reinforcement. (Console requirements for theatrical sound reinforcement are different since the centre cluster is typically used for speech reinforcement and the L/R arrays for music)

Figure 61: LCR Configuration: 3 x 9 dV-DOSC, 4+4 SB218, 3+3 dV-SUB FOH system; 2+2 ARCS, 2+2 SB218 sidefill monitor system (Nine Inch Nails 2005 US tour, sound designers: F. Bernard; M. Prowda)

3.3 MULTIPLE ARRAY CONCEPTS

When the horizontal coverage of a dV-DOSC array (120° nominal, 100° effective) is insufficient, it is not recommended to place a second array directly beside the first one. The best approach is to utilize a second array which is focused on another portion of the audience (typically at 60° - 100° relative to the first array) and spaced at least 6-7 meters (approximately 20 ft) from the first array.

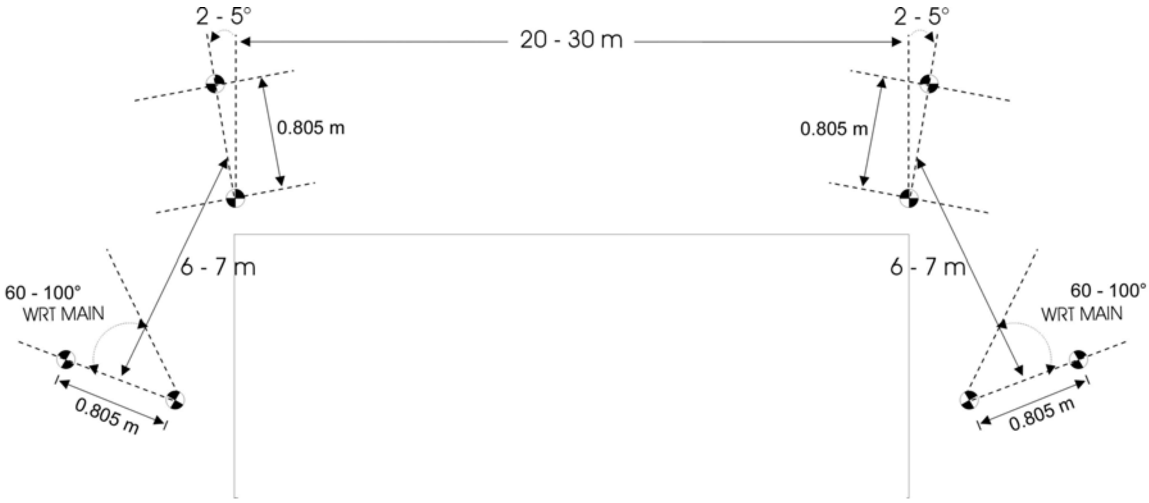


Figure 62: Generic rigging plot for a dV-DOSC system consisting of main L/R FOH and LL/RR offstage fill arrays

Given this separation, interference only occurs in the low frequency range and there are no audible intelligibility losses for the following reasons: 1) the first octave-wide comb filtering cancellation is shifted lower in frequency outside the dV-SUB (if flown with dV-DOSC) or dV-DOSC low section operating bandwidth, for example, 24 Hz for two arrays of the same size, spaced 7 metres; 2) low frequency cancellations from 50-200 Hz tend to be masked or “filled in” by room reverberation; and 3) the ear cannot resolve tightly-spaced comb filtering notches at higher frequencies throughout the overlap region of the two arrays.

In addition, by focussing main and offstage fill arrays at different panning angles, audible comb filtering interaction is lessened since the overlap region between the two arrays is reduced. In some situations, more overlap may be desirable and cross-panning arrays will help provide stereo to a greater portion of the audience while de-correlating the signals between adjacent arrays to further reduce audible interference effects, i.e., arrays can be run in cross-panned stereo and fed as follows: L-L (right program signal), L (left program signal), R (right program) and R-R (left program).

The main L/R FOH arrays are normally physically larger than the LL/RR offstage fill arrays and act as the reference for time alignment. Typically, a measurement microphone is located in the overlap region of the L and LL arrays and the LL array is delayed with respect to the L array (same for the RR versus the R array). To geometrically improve time alignment in the overlap region between the main and offstage arrays, the location of the offstage array should follow the arc of a circle with the radius of the circle at upstage center as shown in Figure 62.

Experience has shown that this is a very flexible approach that can cover any type of audience and an additional advantage of multiple arrays is improved resistance to wind effects in open-air situations. Beyond the basic solution of coverage problems, multiple source arrays open up many possibilities for creating a spatial soundscape, thus providing a powerful tool for sound design.

Note: This sound design approach is similar to distributed sound reinforcement using coaxial loudspeakers, i.e., separating dV-DOSC arrays in a manner so that desired audience coverage is achieved while the effects of audible interference are reduced. For more details on the benefits of coaxial loudspeaker technology and distributed sound design techniques, please refer to the MTD or XT User Manuals available for download on: www.l-acoustics.com

3.4 SUBWOOFERS

dV-DOSC is capable of radiating frequencies down to 80 Hz with good vertical directivity control (the low frequency pattern control limit depends on the size of the array). To extend low frequency response to 40 Hz, dV-SUB enclosures are added to create a 3-way system. SB118 or SB218 subwoofers can also be added to further extend frequency response down to 27 Hz and increase the overall unweighted SPL. Techniques for maximizing 3-way system performance and the combined response of dV-SUB and SB subwoofers for 4-way operation are discussed in the following along with subwoofer arraying techniques. Please refer to Section 1.16 for details on sub/low preset processing.

General Guidelines for the Use of Subwoofers

The number of subwoofers required depends on 3 parameters:

- *Number of dV-DOSC Enclosures:*
  3-way system operation – standard subwoofer ratios:
  3 dV-DOSC : 1 dV-SUB
  3 dV-DOSC : 1 SB218
  3 dV-DOSC : 2 SB118

  4-way system operation:
  3 dV-DOSC : 1 dV-SUB : 1 SB218 (normal) 6 dV-DOSC : 2 dV-SUB :3 SB218 (extra)
  3 dV-DOSC : 1 dV-SUB : 2 SB118 (normal) 6 dV-DOSC : 2 dV-SUB :6 SB118 (extra)

- *Type of Program Material, Desired Sub/Low Frequency Contour:*
  For speech reinforcement or classical music, a 6:1 dV-DOSC:dV-SUB ratio will provide nominally flat frequency response.

  When operated as a 3-way system, standard subwoofer ratios provide a 6 dB low frequency contour and the subwoofers act as a low frequency extension for dV-DOSC. Such a low frequency contour can be suitable for sound reinforcement of pop music or corporate events.

  For more demanding music program material (rock, rap, techno etc), SB218 or SB118 subwoofers should be added and the system operated in 4-way mode to provide a more suitable low frequency contour.

- *Type of Installation:*
  Recommended quantities remain standard when the system is ground stacked. When dV-SUBs are flown with dV-DOSC as a low frequency extension, additional ground stacked subwoofers are required (see below – hybrid flown/stacked subwoofers).

For 4-way system operation, two cases can be considered depending on FOH mix engineer preference and the intended purpose of the subwoofers. For some applications, subwoofers are used as an effect and are not driven with the same signal as the dV-DOSC/dV-SUB system (separate auxiliary send). The other option is to use subwoofers as a low frequency extension of the dV-DOSC/dV-SUB array and drive subs with the same signal (4-way mode). INFRA and X presets will function with aux sub drive or in 4-way mode, however, the user should be aware of the operating bandwidths and select the preset that is most appropriate for the installed configuration.

Subwoofers as a Low Frequency Extension

Subwoofers are driven in 4-way mode with the same signal sent to the dV-DOSC /dV-SUB array.

All 5+1 presets are optimized for 4-way system drive via input A

Input A / Outputs 1,2,3,4 = SB218 or SB118, dV-SUB, dV-DOSC LO, dV-DOSC HI

Subwoofers as an Effect

Subwoofers are driven using a separate aux send, independent from the signal sent to the dV-DOSC/dV-SUB array.

All 5+1 format presets allow aux sub drive using input B / output 6

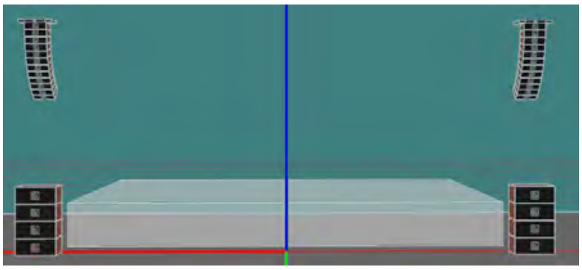
Input A / Outputs 2,3,4 = dV-SUB, dV-DOSC LO, dV-DOSC HI
Input B / Output 6= SB218 or SB118

Please refer to the preset setup sheets in Tables 16-19 when patching your signal distribution system.

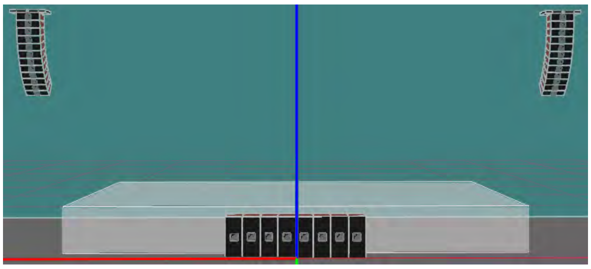
3.4.1 Flown dV-DOSC, Ground Stacked SB Subwoofers (3-way system operation)

SB218 or SB118 subwoofers are normally ground stacked to take advantage of the 6 dB SPL enhancement obtained due to floor coupling (effectively, there is a mirror image that doubles the number of subwoofers). Various flown dV-DOSC and ground stacked subwoofer combinations are shown in Figure 63 (see also Subwoofer Arraying Techniques).

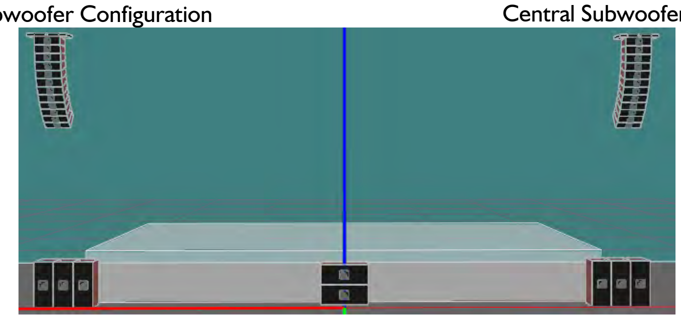
Note: When SB subwoofers are physically separated from flown dV-DOSC arrays, 3WX presets are recommended (80 Hz crossover point)



Left/Right Subwoofer Configuration



Central Subwoofer Line Array



LCR Configuration

Figure 63: Flown dV-DOSC and ground stacked SB218 3-way system configurations

As illustrated in Figure 64, for flown dV-DOSC and ground stacked subwoofers, time alignment of subwoofers is required due to the geometric path difference between the two systems. The distance from the measurement microphone to the subwoofers is d_{SUB} while the distance to the flown dV-DOSC system: distance(dV-DOSC) = distance(SUB) + PATH DIFFERENCE. Delaying subwoofers by the geometric path difference is necessary to time align the subwoofers at the reference position.

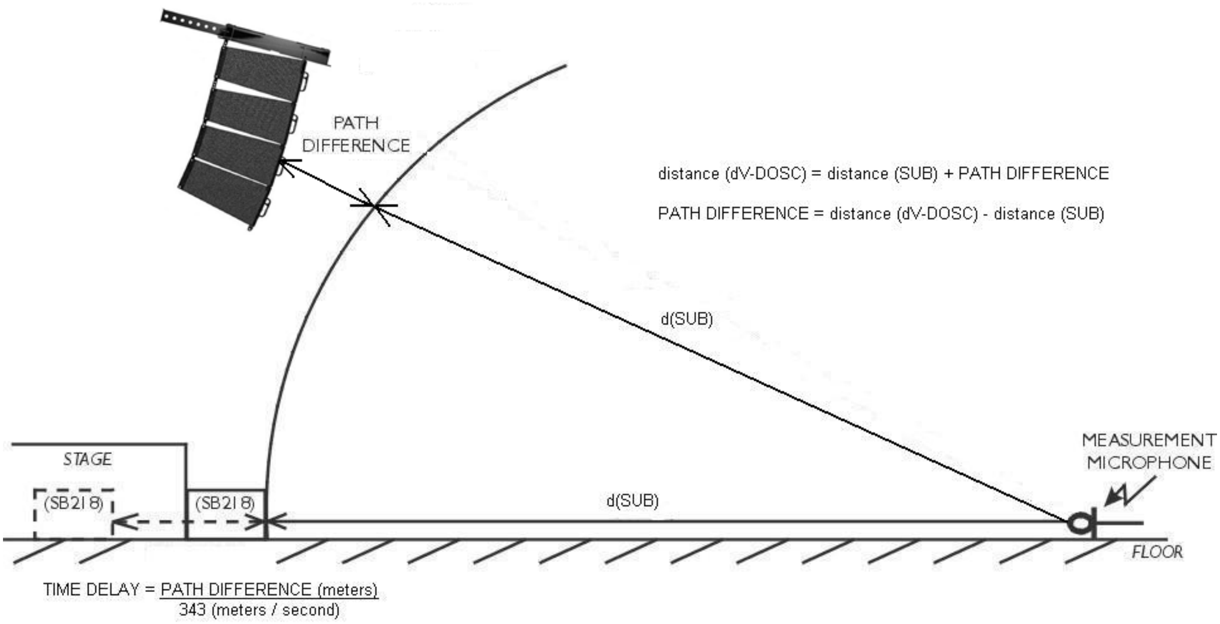


Figure 64: Flown dV-DOSC and ground stacked subwoofer time alignment

Note: The geometric path difference should be added to the pre-alignment delay that already exists in the standard presets (see Section 1.16 for further details).

3.4.2 Physically Coupled dV-SUB/dV-DOSC (3-way system operation)

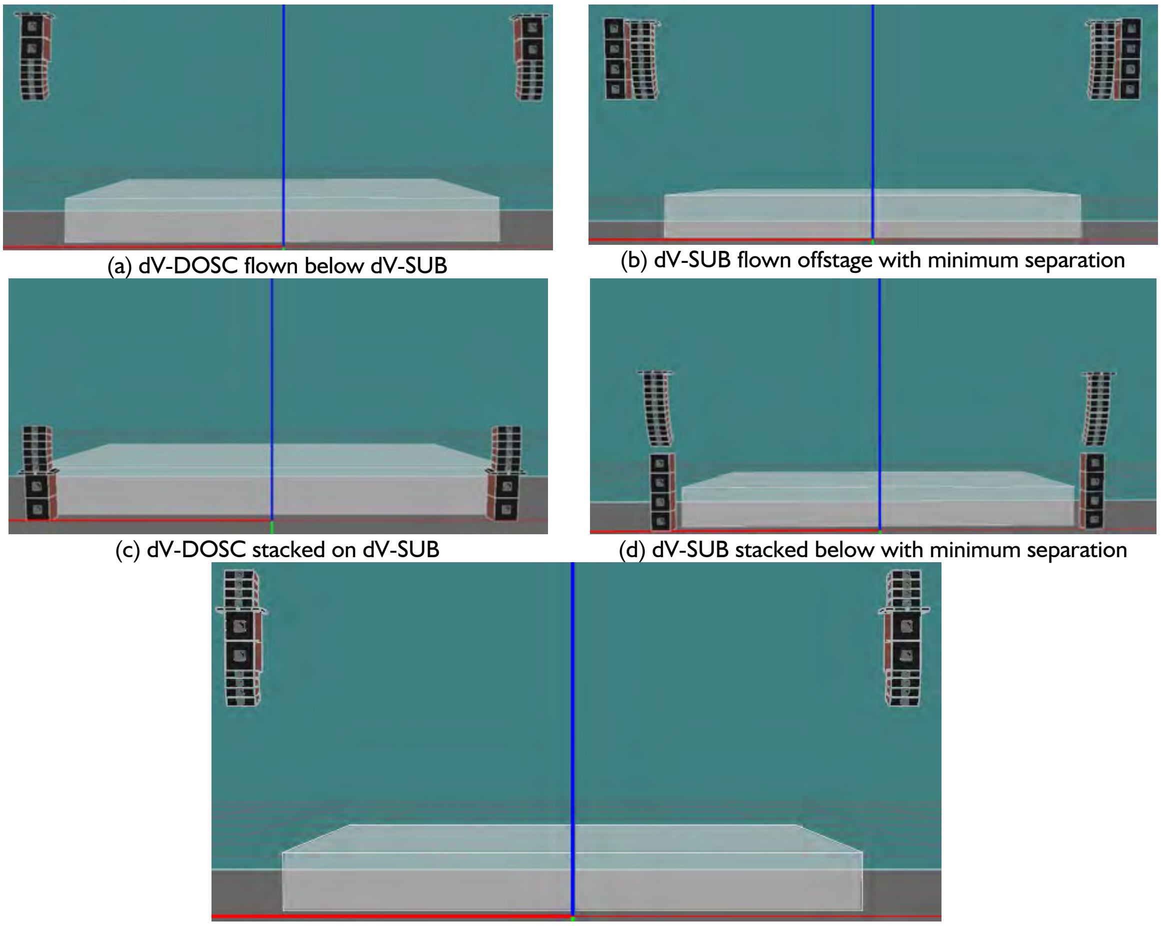
dV-SUBs can be physically coupled with the dV-DOSC array by rigging dV-DOSC underneath, stacking dV-DOSC on top of dV-SUB, flying a separate dV-SUB array offstage with minimum physical separation, or stacking dV-SUB below a flown dV-DOSC array with minimum separation. For these configurations, the system is normally operated in 3-way mode and three preset options are available (80, 120 or 200 Hz crossover points between dV-SUB and the dV-DOSC low section).

The 80 Hz crossover point is intended for applications where dV-SUB and dV-DOSC are physically separated (eg. ground stacked subwoofers with flown dV-DOSC) but this preset will also work for closely coupled configurations. In some cases (e.g., theatrical sound reinforcement), it can be desirable to use the 80 Hz crossover point to benefit from the horizontal pattern control of the dV-DOSC low section, i.e., the dV-SUB is more omnidirectional than dV-DOSC at lower frequencies and if used up to 120 Hz or 200 Hz, reduced gain before feedback may result.

The 120 Hz crossover point is optimal in terms of power bandwidth for both dV-SUB and the dV-DOSC low section and is intended for all closely coupled flown or stacked configurations.

Note: For the same reason, 3W presets are recommended for all closely coupled dV-DOSC and SB118 or SB218 configurations (i.e., due to the 120 Hz crossover point between SB218 or SB118 subwoofers and the dV-DOSC low section).

The 200 Hz crossover point allows dV-SUB to function as a combination sub/low enclosure (for improved bass guitar definition) and also provides an operating bandwidth that corresponds to that of the V-DOSC low section. The 200 Hz crossover point is for closely coupled configurations except for coplanar flown configurations, i.e., when dV-SUB arrays are flown on both sides of a dV-DOSC array.



(a) dV-DOSC flown below dV-SUB

(b) dV-SUB flown offstage with minimum separation

(c) dV-DOSC stacked on dV-SUB

(d) dV-SUB stacked below with minimum separation

(e) dV-DOSC stacked on top/flown below dV-SUB using dV-BUMP2

Figure 65: Physically coupled subwoofer configurations

The benefits of flown subwoofers include:

- Improved low frequency summation, impact and throw.
- Improved time alignment since the physical path length difference problem of ground stacked subwoofers versus flown dV-DOSC is no longer an issue. Overall, this improves low frequency summation and coherency.
- Elimination of local low frequency buildup for the audience down front in the first few rows. Adding several ground stacked subwoofers per side or a centre position will provide sufficient low end impact for the first 15-20 metres (see Section 3.4.3).
- Cleaner staging and better audience sightlines.

For smaller systems, dV-DOSC is normally flown under dV-SUBs (for example 6+2, Fig 65a) and for larger systems, dV-SUBs are flown beside the dV-DOSC array (for example 12+4, Fig 65b). As alternatives to Fig. 65b, dV-SUB arrays can also be flown behind the dV-DOSC array or in a coplanar configuration (see Fig. 69).

The stacked system pictured in Fig 65c works well for club and theatre applications since this configuration provides good throw and underbalcony penetration. For theatrical sound reinforcement, a hybrid approach is often adopted with a flown balcony system (Fig 65a) used in conjunction with a stacked floor system (Fig 65c).

Alternatively, the dV-BUMP2 accessory allows dV-DOSC to be stacked on top of the bumper to provide balcony coverage and dV-DOSC flown underneath dV-SUBs to provide floor coverage (Fig 65e). In this case, the two dV-DOSC arrays individually provide balcony and floor coverage while both benefit from the low frequency energy provided by dV-SUBs.

Note: For hybrid stacked/flown systems (as seen in Fig. 65e), the trim height of the system should be selected so that the bottom cabinet of the stacked dV-DOSC system has a zero degree site angle and is at the same height as the listening level for the first row of the balcony audience. This helps avoid reflections from the balcony face while providing more even off-axis coverage for the first row of the balcony.

As shown in Fig 65d, when subs are stacked in a column below dV-DOSC with minimum physical separation, extended vertical pattern control is obtained at low frequencies. Improved coupling is obtained since there is almost no discontinuity in low frequency radiation from the top of the array to the ground. This configuration is recommended for flat, open air applications since extended vertical pattern control and coherent coupling provides improved low frequency throw.

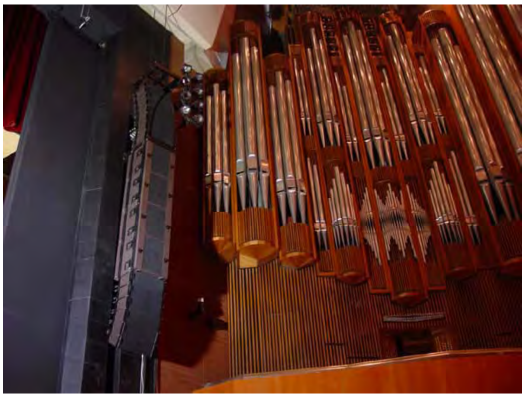
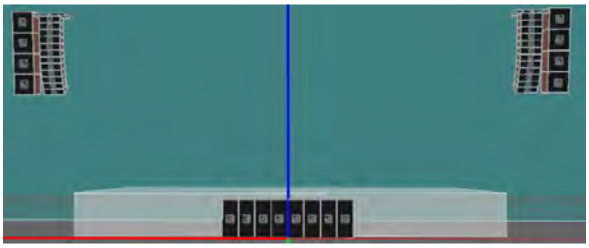
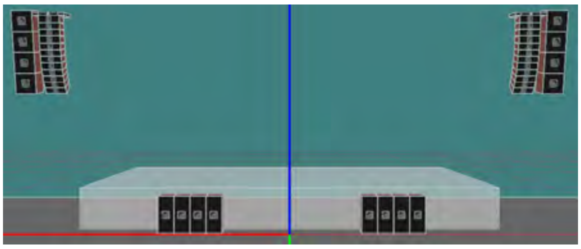


Figure 66: Hybrid stacked/flown dV-DOSC/dV-SUB arrays and centre cluster (Saejong Cultural Centre, Seoul, Korea fixed installation – note: custom rigging employed. Sound design: Dream Sound)

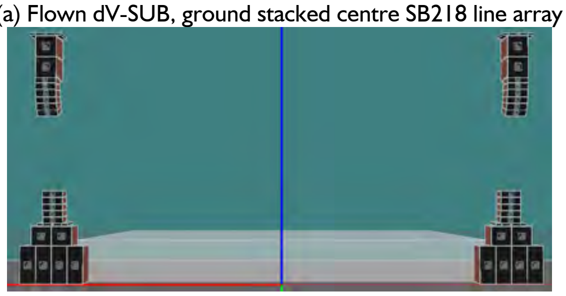
3.4.3 Hybrid Flown/Ground Stacked Subwoofers (4-way system operation)



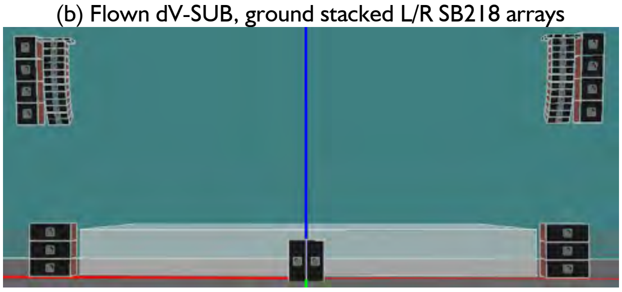
(a) Flown dV-SUB, ground stacked centre SB218 line array



(b) Flown dV-SUB, ground stacked L/R SB218 arrays



(c) Flown and ground stacked dV-DOSC/dV-SUB, ground stacked L/R SB218 arrays



(d) Flown dV-SUB, ground stacked LCR SB218 arrays

Figure 67: Hybrid flown/stacked subwoofer configurations

As seen in Figure 67, dV-SUB enclosures can be flown offstage beside L/R dV-DOSC arrays or as part of the array to provide low frequency extension and ground stacked subwoofers added to provide additional low end impact.

Figure 67 shows several options for the ground stacked subwoofers – SB218 enclosures are standing vertically (on their side) or stacked in columns. This orientation is beneficial for two reasons: 1) all of the central ports are aligned - this provides optimum port coupling and low frequency output at the 32 Hz port tuning frequency; 2) when oriented in this manner, the SB218 is at a convenient height to serve as a stacking platform for front fill or stereo in fill enclosures.

As seen in Fig. 67a, a central line array of SB218s will radiate omnidirectionally into half space (vertically). This is of interest for indoor venues in order to obtain low frequency impact throughout an audience tribune gradient. Horizontal coverage of the central line array can be adjusted with electronic delay processing (see Section 3.5.2) and experiments are also ongoing into the use of additional rear channel subwoofers (located at the focal point of the delay processed central line array) to provide improved flexibility and control.

Note: As an alternative to the central line configuration shown in Fig. 67a, individual SB218s can be spaced apart and used as part of a distributed front fill system.

The stacked L/R subwoofer configuration shown in Fig. 67b proves a convenient location for stereo front fill enclosures (for example, dV-DOSC, ARCS or MTD/XT coaxial enclosures). Provided that the separation between the stacked L/R subwoofer arrays is approximately 4.5-6 metres, they will also act as a centre channel in conjunction with the flown L/R subwoofers to create an LCR configuration with the accompanying benefits of more even horizontal coverage (see also Section 3.5.3). As a time alignment reference (for FOH L, for example), the measurement microphone should be located between the flown L and stacked L subwoofers and at a distance where the energy from the flown and stacked subwoofers is identical. Such a time alignment reference provides the most even horizontal coverage combined with a smooth transition between flown versus ground stacked subwoofers with distance.

Figure 67c shows a hybrid/flown stacked subwoofer configuration suitable for theatrical sound reinforcement – particularly for touring applications.

Figure 67d shows a ground stacked LCR subwoofer configuration that also provides locations for stereo infill and/or stacked centre fill enclosures (see also Section 3.5.3).

Overall, the flown L/R plus ground stacked subwoofer configurations of Figs 67 a,b and d create an LCR configuration with the potential for improved low frequency coverage in both horizontal and vertical planes. Figure 67c is acceptable in narrower venues where centre build up is less problematic.

3.4.4 Time Alignment: Flown/Ground Stacked Subwoofers

As seen in Fig. 64, selection of the time alignment reference location in the vertical plane is always a compromise since the geometric path difference varies with position (note: this also occurs in the horizontal plane and time alignment must be considered in 3D). Time aligning at a distance where the SPL from ground stacked subwoofers equals the SPL from flown dV-SUBs is recommended as an optimum compromise (for time alignment in the vertical plane). Horizontally, the reference position should be mid-way between flown dV-SUB and ground stacked subwoofer arrays. Time aligning in the middle is not recommended in order to help reduce centre build up and one side should be time aligned at a time (FOH L as shown in Fig 68).

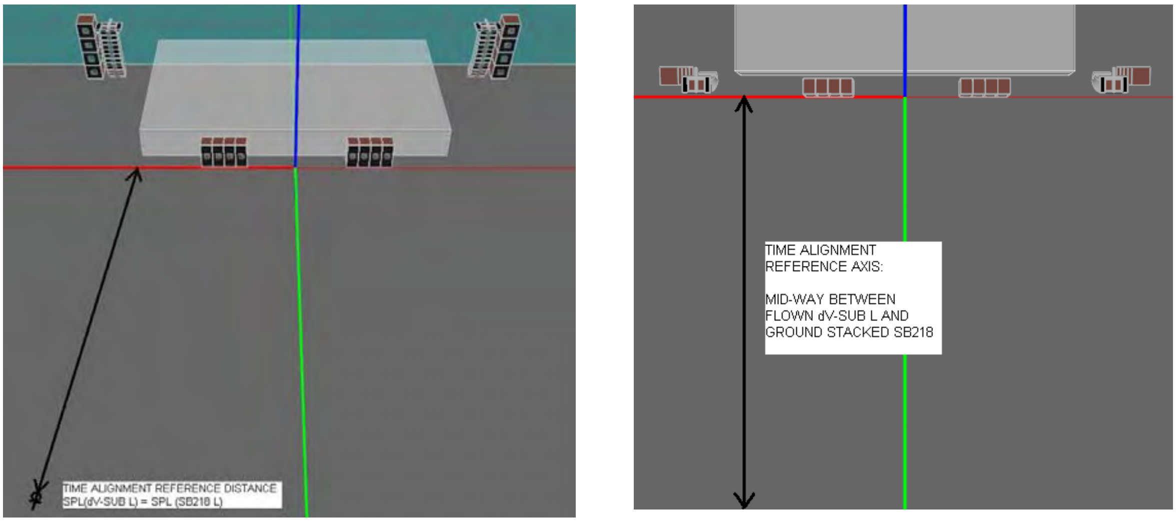


Figure 68: Recommended time alignment reference location for flown dV-SUB, ground stacked L/R subwoofers

For ground stacked LCR subwoofer arrays (as shown in Fig. 67d), it is recommended that the L subwoofer array is delayed with respect C array with the measurement microphone on axis to the L array. Following this, the flown dV-SUB/dV-DOSC array should be time aligned with respect to the L array using the technique shown in Figure 68.

3.4.5 Preset Selection: Flown/Ground Stacked Subwoofers

For 4-way mode operation, two types of presets are available – INFRA and X. Separate processing is provided for flown versus ground stacked subwoofers and presets have the following output channel assignments:

Output 1	SB118 or SB218 ground stacked	(input A)
Output 2	dV-SUB flown	(input A)
Output 3	dV-DOSC low section	(input A)
Output 4	dV-DOSC high section	(input A)
Output 5	fullrange	(input A)
Output 6	SB118 or SB218 ground stacked	(input B)

Note: For all 4-way mode presets, output 6 can be used for auxiliary sub drive via input B.

Note: The crossover frequency between the flown dV-SUB and dV-DOSC low section is 120 Hz to optimize the power bandwidth for both sections for all 4-way presets.

For INFRA presets, there is a 60 Hz crossover point between SB118 or SB218 subwoofers and dV-SUB. Complementary 60 Hz crossover filtering helps to avoid phase problems due to overlapping sub and dV-SUB operating bandwidths so that subwoofers can be operated with positive polarity whether the system is driven in 4-way mode or with aux sub drive. An additional benefit of the INFRA preset is that time alignment is more forgiving for a greater part of the audience (due to the longer wavelengths at 60 Hz) and, subjectively, the subs become more of a delocalized effect due to the lower crossover point.

For X presets, the dV-SUB operating bandwidth is extended down to 30 Hz and SB118 or SB218 subwoofers are operated from 26-80 Hz with negative polarity (to account for the overlap in sub/low section operating bandwidths, i.e., the 24 dB per octave low pass filter for the SB218 or SB118 generates a phase shift of 180°). The X preset takes full advantage of dV-SUB resources and provides maximum sub/low output.

As an alternative to the X preset, the flown dV-DOSC/dV-SUB system can be operated as a 3-way stereo system using either dV 3W 80 dV-SUB, dV 3W 120 dV-SUB, dV 3W 200 dV-SUB presets and aux sub drive performed using SB218 DELAY ARC 80 Hz or SB218 LCR 80 Hz presets (subs with negative polarity). This approach is particularly useful when implementing delay processed subwoofer arrays, LCR subwoofer arrays or for larger subwoofer array configurations where it is desirable to dedicate a DSP unit to subwoofer drive for additional control and flexibility.

3.4.6 Large Format Flown/Ground Stacked Subwoofer Configurations

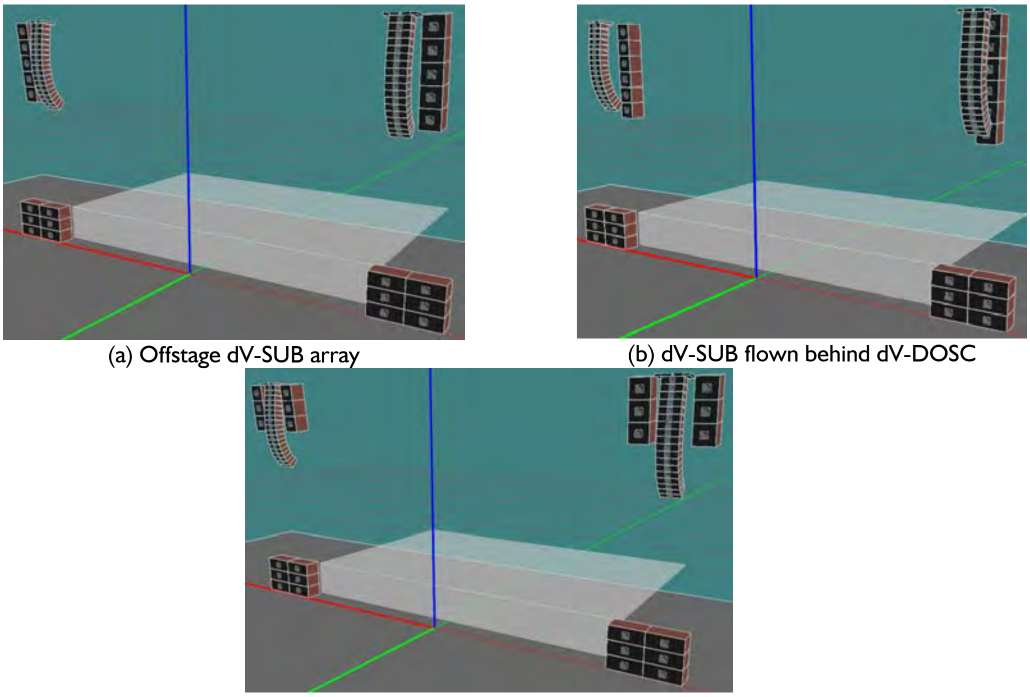
For larger configurations, it is important to ensure that the flown dV-SUB array does not physically interfere with dV-DOSC array coverage. Techniques for minimizing this effect are shown in Figure 69 where the flown L/R system consisits of 18+18 dV-DOSC enclosures and 6+6 dV-SUB (3:1 ratio).

In Fig. 69a. the dV-SUB array is tilted downwards (by the relative action of front and rear motors for a 2-point hang, or by using holes 6,7 or 8 for a single point hang). In addition, the trim height is carefully selected and rigging points physically offset relative to the dV-DOSC array in order to prevent lower dV-DOSC enclosures from firing into lower dV-SUB enclosure walls. Standard 4-way presets (INFRA or X) can be used for this configuration.

In Fig. 69b, the dV-SUB array is flown behind the dV-DOSC array. Pre-delay is applied to the dV-DOSC array in order to time align the two flown systems and the 3-way stereo preset dV 3W 80 dV-SUB is recommended in conjunction with aux sub drive for the ground stacked subwoofers (X mode, i.e., 80 Hz low pass filter, negative polarity for SB118 or SB218 subwoofers).

In Fig. 69c, individual L/R dV-SUB arrays are split into 2 arrays of 3 and flown in a coplanar configuration on either side of dV-DOSC. Trim height is set to align the dV-SUBs with the flattest part of the array in order to minimize physical interference and optimize time alignment aspects. Standard 4-way mode presets can be used for this configuration.

The choice between the options pictured in Figure 69 will largely depend on the size and shape of the dV-DOSC array. For example, for flat open air festival applications, normally the dV-DOSC array is flat at the top, has reduced overall curvature and is oriented downwards so Fig. 69a would be appropriate. Options shown in Figs. 69b and 69c would be more suitable for arena sound reinforcement.



(a) Offstage dV-SUB array

(b) dV-SUB flown behind dV-DOSC

(c) Coplanar dV-SUB arrays

Figure 69: Flown L/R dV-SUB options for larger system configurations

3.5 SUBWOOFER ARRAYING TECHNIQUES

3.5.1 LEFT/RIGHT CONFIGURATIONS

Any L/R subwoofer configuration will have problems with the so-called "power alley" effect, i.e., a build up of low frequency energy in the centre accompanied by uneven low frequency response and impact off-axis in the horizontal plane. This is easy to understand using Fresnel analysis, i.e., in the centre, the distance to L/R arrays is identical so that signals arrive in phase and sum while destructive or constructive interference will occur off-axis, depending on listener position and the frequency of interest. For example, if on-axis to the L array and a series of Fresnel rings is drawn, the R array could fall in a destructive ring and cause cancellation. In general, L/R subwoofer arrays are only desirable for long, narrow audiences where the centre build up effect is less of a problem (since the venue is narrow and we don't mind focusing energy up the middle).

Past attempts at reducing the power alley effect for L/R arrays have included complementary comb filtering applied to the left and right signal feeds for the subwoofer arrays (see: "Use of Stereo Synthesis to Reduce Subjective/Objective Interference Effects: The Perception of Comb Filtering", Augspurger et. al. AES preprint 2862, New York 1989). The main limitations of this approach are reported to be changes in timbre and a potential loss of overall energy. The preferred option is either an LCR configuration or electronic delay processed systems (see Sections 3.5.2 and 3.5.3).

Despite the fundamental limitations of L/R subwoofer arrays, some recommendations and basic guidelines are made in the following. Figures 70 (a), (b), (c) and (d) show techniques for optimizing low frequency tonal balance over the audience while 70 (e) shows a non-recommended configuration.

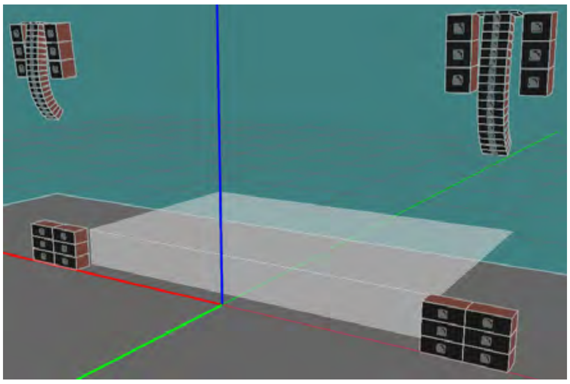
In Figure 70a, ground stacked L/R subwoofers are arranged in a block with minimum frontal surface area and are physically separate from the flown dV-DOSC/dV-SUB arrays. When subwoofers are configured in the manner (i.e., with minimum front surface area or in a vertical column as in Fig 70b there is reduced center build up and fewer horizontal lobing problems compared with the results obtained using two L/R horizontal subwoofer line arrays as shown in Fig. 70e (not recommended). Basically, interference effects between two omnidirectional sources (Figs. 70 a,b) are less dramatic than between two directive sources (Fig 70e). For the vertical column configuration (Fig 70b) there is the added advantage of effectively extending the length of the dV-SUB array at low frequencies for improved low frequency pattern control and throw in outdoor open air applications (X preset recommended).

In Figure 70(c), the L/R subwoofer arrays are configured in an L-wrap around the stage corner in an attempt to direct low frequency energy offstage and reduce centre build up. Physically curved L/R subwoofer arrays as shown in Fig. 70(d) are a variation on this configuration.

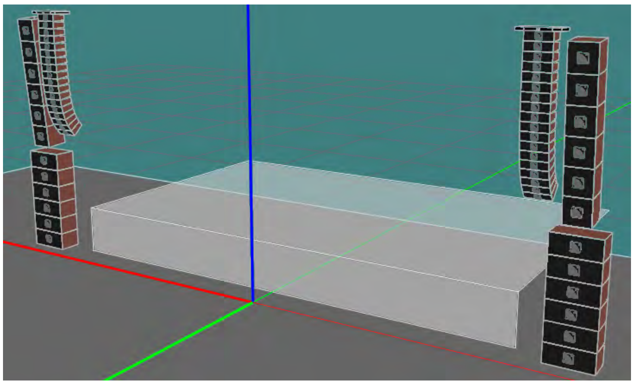
Figure 70(e) shows a non-recommended configuration since two L/R horizontal subwoofer line arrays emphasize the center build up problem. In this case, the individual L/R arrays are more directive in the horizontal plane than the configurations of Figs 70(a,b) so that center build up is greater and there are more pronounced horizontal lobing effects. However, this configuration can be used if electronic delay processing is applied to the individual columns of the L/R arrays in order to obtain the equivalent performance of Fig 70(d).

Figure 69 shows a variation for the flown coplanar dV-SUB configurations pictured in Figs 70(a,c,d) that is suitable for arena sound reinforcement. In this case, both dV-SUB arrays are flown offstage to the main FOH L/R dV-DOSC arrays and the arrays furthest offstage are angled 45 degrees. Arraying dV-SUB in this manner (80 Hz preset, less than 2.1 metre separation between columns recommended) allows coupling between the dV-SUB arrays while helping to provide low end impact for both main FOH L/R and offstage LL/RR dV-DOSC arrays (plus for nostalgics, there is the added benefit that it resembles a conventional PA system!).

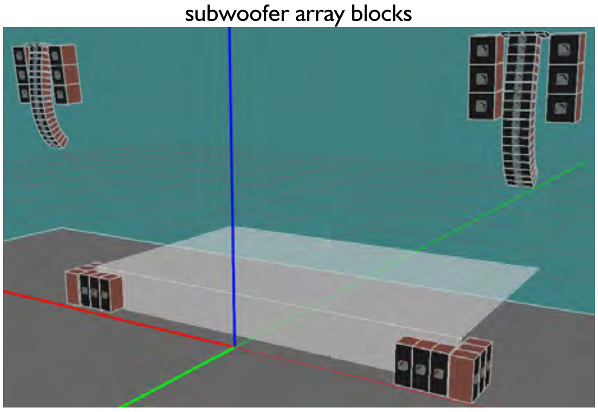
Note: The rigging plot should be adjusted to provide 6-7 metre spacing between L/R and LL/RR arrays (see also Section 3.3 Multiple Arrays)



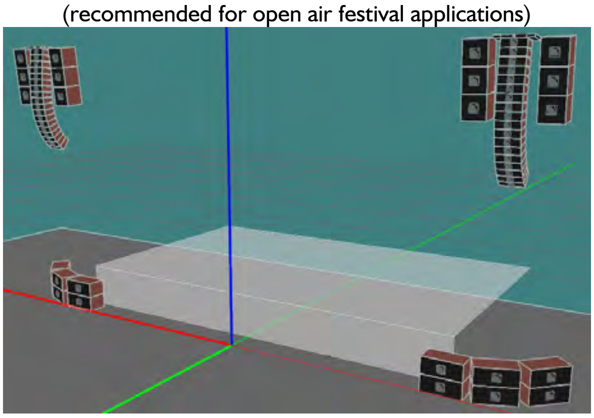
(a) Minimum front surface area L/R ground stacked subwoofer array blocks



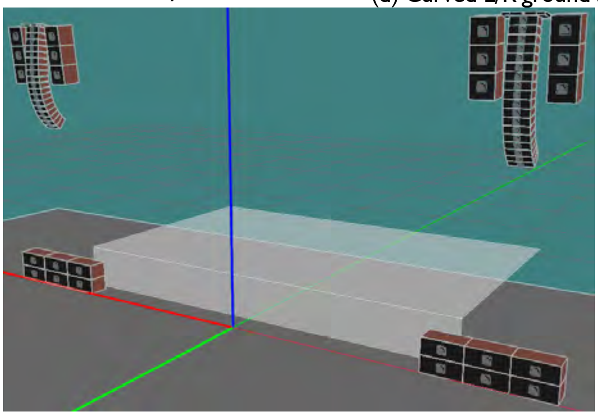
(b) Vertical column L/R ground stacked subwoofer arrays (recommended for open air festival applications)



(c) L-Wrap L/R ground stacked subwoofer arrays



(d) Curved L/R ground stacked subwoofer arrays



(e) L/R horizontal line arrays

Figure 70: L/R Ground stacked subwoofer arraying techniques

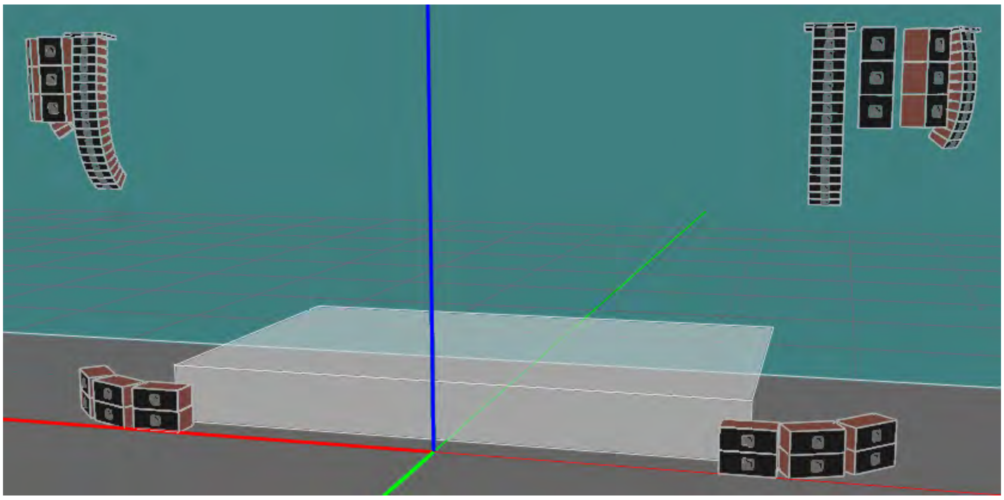


Figure 71: Flown L/R subwoofers integrated with dV-DOSC offstage fill arrays

3.5.2 CENTRAL LINE ARRAY WITH ELECTRONIC DELAY PROCESSING

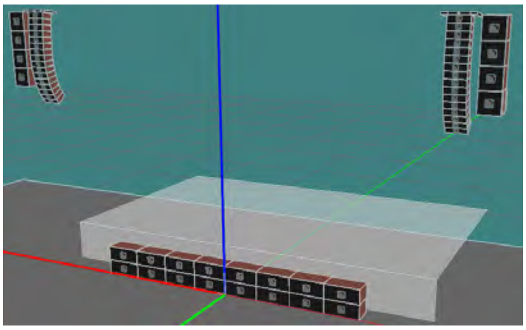
A central ground stacked line array optimizes low frequency SPL output since all subwoofers couple acoustically and the mirror image ground plane effect doubles the number of subs. Given the same number of subwoofers, the overall SPL obtained by ground stacking in this manner is higher than any other configuration. An additional advantage of the centre line array is that the vertical directivity is omnidirectional (into half space) - this is useful for venues where there is an audience tribune. Since subwoofers are physically separate from the flown dV-DOSC arrays they are normally driven via aux send (although the system can also be operated in 4-way mode).

Limitations of the central ground stacked line array configuration are as follows:

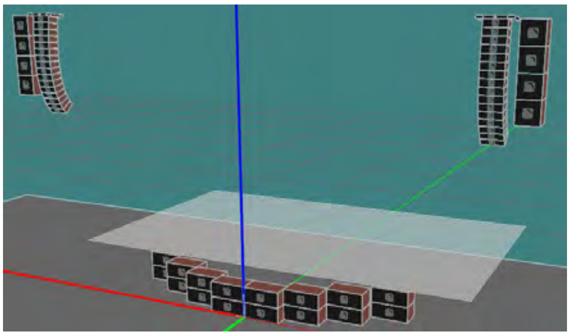
- Tonal balance has an exaggerated low frequency contour for the closest members of the audience (integrating distributed front fill loudspeakers or a stereo infill system with the central line array of subwoofers can help offset this).
- Increased amount of low frequency energy behind the central line array which can cause feedback problems on stage
- Unless electronic delay processing is applied, the horizontal directivity will narrow (the extent of narrowing depends on the length of the central line array)
- Potential for reduced throw due to audience absorption (this problem is likely to occur with any ground stacked configuration).

A good technique for controlling the directivity of a central ground-stacked horizontal line array is to use delay processing to electronically arc the array. Electronic delay processing in this manner will decouple sections of the array so that tonal balance is improved up close while at the same time low frequency coverage is smoother throughout the audience in the horizontal plane. The optimum arc radius is typically equal to half the length of the central line array - delay taps are calculated geometrically based on this arc radius and the physical distance to the centre of a given subwoofer group off the center line reference.

Note: Experiments into the use of additional rear channel subwoofers (located at the focal point of the delay processed central line array) to provide energy cancellation behind the array and enhanced control flexibility are ongoing.



(a) Horizontal line array



(b) Delay processed horizontal line array

Figure 72: Centre subwoofer line array (a) without and (b) with electronic delay processing

To implement electronic delay processing, a 4- or 6-channel DSP is dedicated to subwoofer drive and the SB218 DELAY ARC 80 Hz preset (subs with negative polarity) used in conjunction with X preset processing or 3W stereo presets for the flown dV-DOSC/dV-SUB arrays. Alternatively, the SB218 DELAY ARC 60 Hz preset (subs with positive polarity) can be used in conjunction with INFRA preset processing for the flown dV-DOSC/dV-SUB arrays (60 Hz crossover point).

For field implementation, SB218s are circuited in blocks of four symmetrically about the centre axis and powered by half of an RK124 amplifier rack. The appropriate delay tap for each half of an amp rack is then selected using the DSUBTK comb connector kit (set of 6 COMB connectors for T1-T6).

An EXCEL spreadsheet tool to perform delay and offset calculations is available in ARRAY2004 (SUB ARC). Several examples are given in Figure 73 (for further details on the SUBARC sheet please see the V-DOSC manual).

HORIZONTAL SB218 (16 TOTAL)

T4	T3	T2	T1	T1	T2	T3	T4
T4	T3	T2	T1	T1	T2	T3	T4

T1 = 0 msec
T2 = 1.167 msec
T3 = 3.036 msec
T4 = 5.495 msec

VERTICAL SB218 (8 TOTAL)

T4	T3	T2	T1	T1	T2	T3	T4

T1 = 0 msec
T2 = 0.493 msec
T3 = 1.282 msec
T4 = 2.320 msec

HORIZONTAL SB218 (24 TOTAL)

T6	T5	T4	T3	T2	T1	T1	T2	T3	T4	T5	T6
T6	T5	T4	T3	T2	T1	T1	T2	T3	T4	T5	T6

T1 = 0 msec
T2 = 0.761 msec
T3 = 2.052 msec
T4 = 3.863 msec
T5 = 6.088 msec
T6 = 8.634 msec

VERTICAL SB218 (12 TOTAL)

T6	T5	T4	T3	T2	T1	T1	T2	T3	T4	T5	T6

T1 = 0 msec
T2 = 0.322 msec
T3 = 0.867 msec
T4 = 1.632 msec
T5 = 2.572 msec
T6 = 3.649 msec

Figure 73: Electronic delay processing examples using a 4- or 6-channel DSP

3.5.3 LEFT/CENTRE/RIGHT CONFIGURATIONS

When properly time aligned, LCR subwoofer arrays can provide more even low frequency impact and horizontal coverage combined with reduced centre build up in comparison with L/R subwoofer arrays. In effect, LCR subwoofer arrays act as an approximation to an electronic delay processed horizontal line array of subwoofers (Section 3.5.2). Since time alignment must be considered in both vertical and horizontal planes, LCR subwoofer arrays provide more flexibility in comparison with L/R ground stacks - especially given the additional contribution of flown dV-SUB arrays.

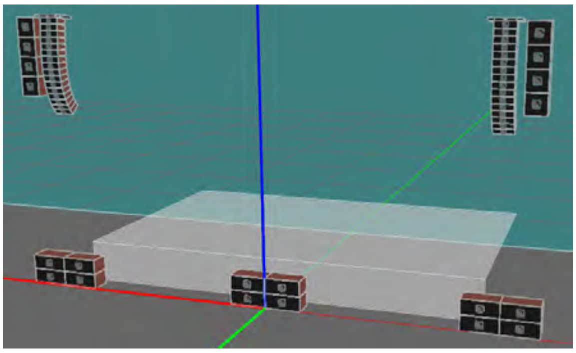
Figure 74(a) shows a ground stacked LCR configuration. In this case, time alignment should be performed as follows: (i) time align L with respect to C with the measurement microphone on-axis to L at a distance where the SPL from C and L arrays is identical; (ii) time align dV-DOSC/dV-SUB FOH L with respect to L with the measurement microphone located between FOH L dV-SUBs and ground stacked L subwoofers at a distance where the SPL from the low section of the flown system equals the SPL from the ground stacked subwoofers; (iii) duplicate time alignment settings for R subwoofers and FOH R; (iv) if applicable, time align LL and RR arrays to L and R, respectively, performing measurements in a representative location where main and off-stage fill system coverage overlaps.

Figure 74(b) shows a variation on the ground stacked LCR system of Fig. 74(a). For this example, the L/R subwoofers are stacked 4 high (to provide a location for stacked stereo infill dV-DOSC or ARCS enclosures) and the C position is split into 2 points to provide a location for centre stereo infill enclosures (for example, ARCS or MTD/XT coaxial enclosures). Provided that the separation between the split C subwoofer arrays is less than 4.5-6 metres, they will also act as a centre channel in conjunction with the ground stacked L/R vertical columns to create an overall LCR configuration.

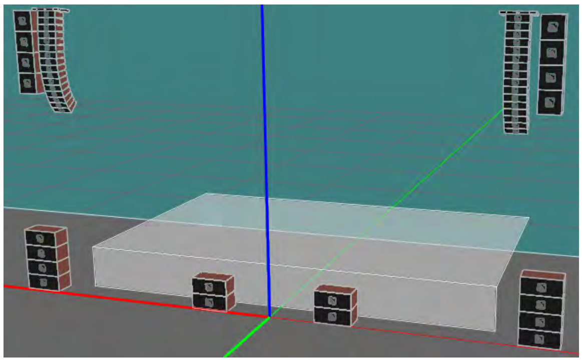
Figure 74(c) shows a variation on the Fig 74(b) configuration where the L/R SB218 subwoofer arrays are flown offstage of the FOH L/R dV-DOSC/dV-SUB arrays.

Figure 74(d) shows a hybrid ground stacked LR / flown C configuration. In this case, a stereo infill system (using ARCS or dV-DOSC, for example) can be combined with the ground stacked LR subwoofer arrays and a centre cluster downfill system integrated with the flown C subwoofer array. Time alignment should be performed in multiple steps: (i) time align L with respect to C with the measurement microphone in between L and C at a distance where the SPL from C and L arrays is identical; (ii) time align dV-DOSC/dV-SUB FOH L with respect to L subwoofers with the measurement microphone located midway between FOH L and ground stacked L subwoofers at a distance where the SPL from the low section of the flown system equals the SPL from the ground stacked subwoofers; (iii) duplicate the time alignment settings for R subwoofers and FOH R; (iv) if applicable, time align LL and RR to L and R, respectively, using a measurement location in a representative location where the coverage of the main and off-stage fill systems overlaps.

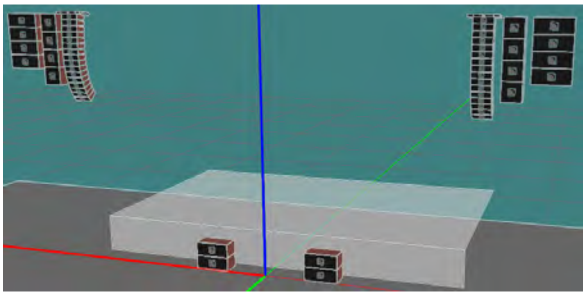
Figure 74(e) shows a central subwoofer line array with electronic delay processing; Fig. 74(f) shows a distributed ground stacked subwoofer configuration which can also be used with electronic delay processing. For further details on electronic delay processing, please see Section 3.5.2 and the V-DOSC manual.



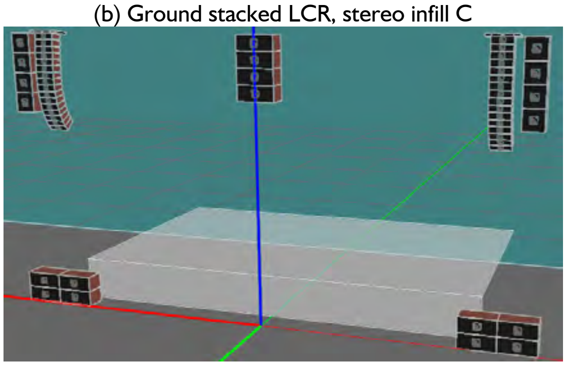
(a) Ground stacked LCR



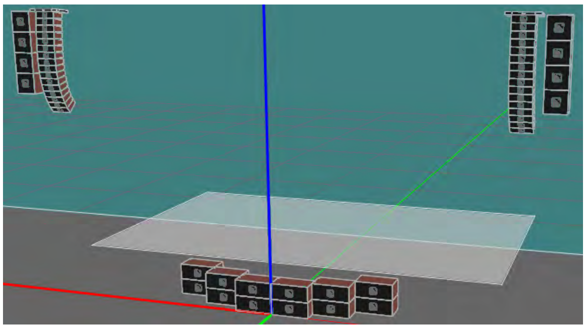
(b) Ground stacked LCR, stereo infill C



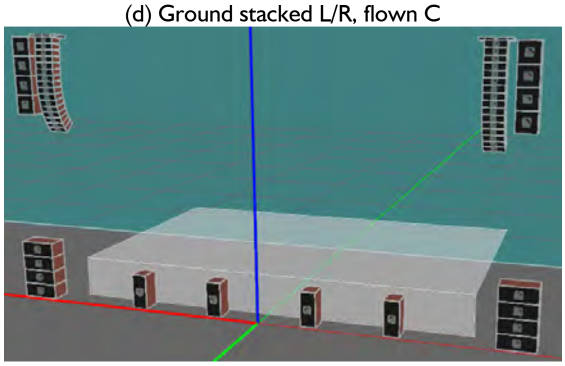
(c) Flown L/R, ground stacked stereo infill C



(d) Ground stacked L/R, flown C



(e) Centre line with electronic delay processing (FOH L/R dV-SUB arrays act as L/R)



(f) Ground stacked L/R plus distributed ground stacked subwoofers

Figure 74: LCR Subwoofer arraying techniques

4. INSTALLATION PROCEDURES

In the following sections, detailed procedures for stacking or rigging dV-DOSC and dV-SUB are presented. Please follow these procedures carefully and remain safety-conscious at all times.

In addition:

- Only users with sufficient rigging knowledge should attempt to install any L-ACOUSTICS loudspeaker system intended for overhead suspension.
- Users should be familiar with the rigging techniques and safety considerations outlined in this manual prior to installation.
- dV-DOSC and dV-SUB rigging systems are designed to comply with European Community regulations (please see the CE conformity declarations in the appendix for specific recommendations).
- Some countries require higher safety factors and specific rigging approvals. It is the responsibility of the user to ensure that any overhead suspension installation of L-ACOUSTICS systems is made in accordance with all applicable local or state regulations.
- L-ACOUSTICS is not responsible for any rigging equipment or accessories that are not manufactured by L-ACOUSTICS.

4.1 STACKED SYSTEMS

Stacking dV-DOSC Standalone

For stability reasons, the maximum number of dV-DOSC enclosures that can be stacked is 12. When the V-DOSC bumper is used in conjunction with dV-BUMP as a stacking platforn for 12 dV-DOSC, each screwjack can present a load of 95 kg (210 lbs). The strength of the supporting floor should be carefully examined to determine if such a load can be supported - sheets of plywood or steel plates can be placed under individual screwjack feet to help distribute the load. For improved stability and load distribution, the front two screwjacks can be omitted and the two rear screwjacks only used for downwards tilt adjustment. For improved stability in outdoor situations, ratchet strap the dV-BUMP and V-DOSC bumper assembly to the stacking platform whenever possible.

Once the floor location for the stacked array has been determined, dV-BUMP is attached to the V-DOSC BUMPER by mating the two locating studs on dV-BUMP with the corresponding holes on the center cross bar section of the V-DOSC BUMPER. A steel stud and dV-PIN81quick release pin are then used to mechanically secure dV-BUMP to the V-DOSC BUMPER at the central hole position.

Aim the stacking platform in the correct direction to provide the desired amount of array rotation on- or off-stage. For downwards tilt, attach two screwjacks to the rear of the V-DOSC BUMPER by setting the height adjustment blocks on the two screwjacks to the minimum position then sliding these blocks into the locating slots on dV-BUMP (front two screwjacks are optional when the array is tilted downwards).

Referring to the simulation results obtained in ARRAY2004 or SOUNDVISION, the screwjacks are then adjusted to provide the required site angle for the lowest enclosure. NOTE: A digital inclinometer is useful for performing angle measurements. If this is not available, visually sight down dV-BUMP to ensure that the closest members of the audience will be covered.

In preparation to begin stacking, pre-attach dV-ANGLE P1 to the two rear mount points on dV-BUMP. Select the 3.75 degree hole (middle position) and pin dV-ANGLE P1 into position using dV-PIN25. As a reference, the tab stop of dV-ANGLE P1 should always face outwards. By selecting the 3.75 degree hole, this sets dV-BUMP perpendicular to the face of the bottom cabinet and allows the site angle of dV-BUMP to serve as an aiming reference for correct focus.

Orienting dV-DOSC with the rigging tabs down (i.e., grille logo in the correct orientation), place the bottom enclosure on dV-BUMP by mating the front rigging tabs and rear locator slots with the locator slots and rear dV-ANGLE bars that were previously attached to dV-BUMP. Attach all four points using four dV-PIN25 (front first, rear last) to secure the bottom dV-DOSC to dV-BUMP. Verify the tilt angle for the first enclosure and perform any required tilt adjustments using the rear screwjacks.

Note : Compensate for the 3.75 degree trapezoidal angle of dV-DOSC versus the actual site angle by using a 3.75 degree angle between the rear of the bottom enclosure and dV-BUMP.

The next step is to connect two more dV-ANGLE bars to the rear locator slots of the bottom dV-DOSC enclosure using two dV-PIN25. Pre-select the appropriate hole position to give the desired tilt angle for the second enclosure.

Note: As a reference for dV-ANGLE bar orientation, the ball/tab of the angle bar should always be facing outwards.

Place the second dV-DOSC on top of the bottom enclosure by mating the two front rigging posts on the second enclosure and the dV-ANGLE bars that were previously mounted on the bottom enclosure with the available locator slots. Attach the two front points using two dV-PIN25 to secure the second dV-DOSC enclosure's front rigging tabs to the bottom enclosure. Tilt the rear of the second enclosure if necessary and secure the rear points using two dV-PIN25.

The same procedure is followed for all subsequent dV-DOSC enclosures until stacking is completed.

The correct angle for the entire array is then obtained by fine adjustment of the V-DOSC bumper screwjacks. Focus of the top enclosure can be checked by sight from behind the array - but you must compensate for the 3.75 degree trapezoidal angle of dV-DOSC since the wavefront is radiated parallel to the front of the cabinet (not perpendicular to the trap angle). As a sighting guide, attach a dV-ANGLE bar with 3.75 degrees at the rear of the top enclosure and a second dV-ANGLE with 7.5 degrees at the front of the top enclosure. Visually lining up the tops of the two dV-ANGLE bars provides a sighting guide that is perpendicular to the front of the top enclosure.

Looking from the rear of the array and sighting along the two dV-ANGLE bars, the tilt of the array should be aligned so as to cover the rearmost seats of the audience. Alternatively, from the highest section of audience area, if you can see the upper wall of the top dV-DOSC enclosure, you are 3.75 degrees out of the coverage pattern. More precise aiming can be accomplished by placing a laser pointer or similar device on the upper wall of the top enclosure (and compensating for the 3.75 degree trap angle). A similar visual check should also be made with respect to the lower wall of the bottom enclosure of the array to ensure that the closest members of the audience are covered.

Safety Rules

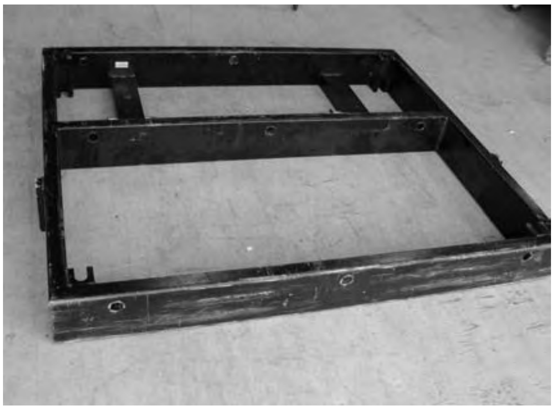
CAUTION: NO MORE THAN 12 dV-DOSC ENCLOSURES SHOULD BE STACKED ON ONE dV-BUMP/V-DOSC BUMPER ASSEMBLY. INSTABILITY CAN OCCUR EITHER WHEN TILTING THE ARRAY OR UNDER HARD WIND CONDITIONS.

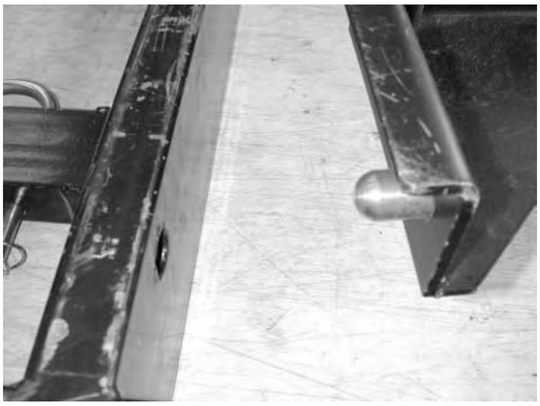
FOR STABILITY REASONS, THE dV-DOSC ARRAY MUST BE PHYSICALLY CONTAINED WITHIN THE VERTICAL FOOTPRINT OF THE V-DOSC BUMPER.

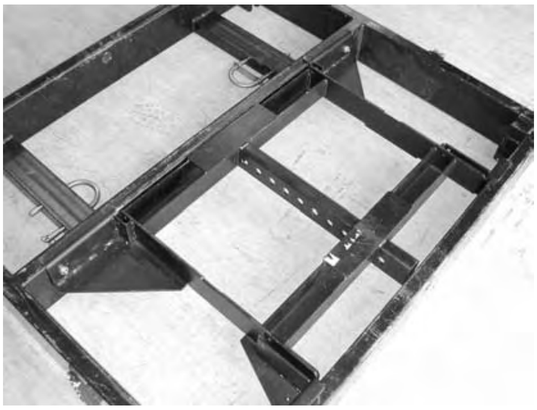
Always test the strength of the supporting floor - for 12 enclosures each screwjack can produce up to a 95.5 kg load (210 lbs). If necessary, use plywood sheets or steel plates under individual screwjack feet in order to help distribute the load.

Verify that all dV-DOSC enclosures are securely interconnected with dV-PIN25.

For improved stability in outdoor situations, ratchet strap the dV-BUMP and V-DOSC BUMPER assembly to the stacking platform whenever possible.


(i) Place V-DOSC bumper into position

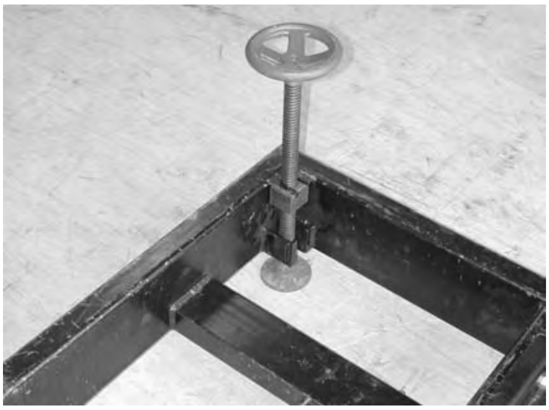

(ii) dV-BUMP locator studs mate with holes


(iii) dV-BUMP mounted inside V-DOSC BUMP


(iv) Insert locator pin


(v) Use dV-PIN81 to secure locator pin

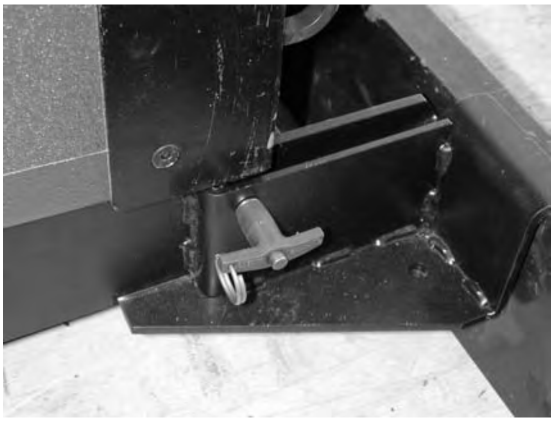

(vi) Overview of dV-BUMP secured to V-DOSC BUMP


(vii) Attach rear screwjacks to V-DOSC BUMP

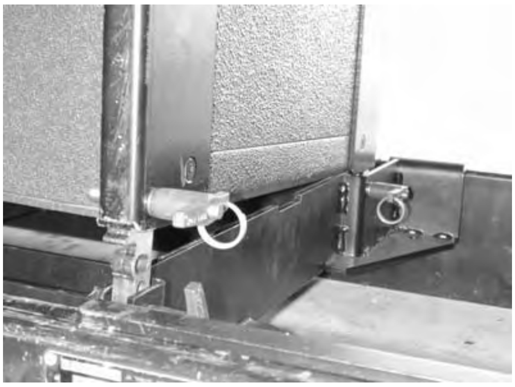

(viii) Select 3.75 deg for rear points

(ix) dV-ANGLE pre-attached in the 3.75 degree position

(x) Front rigging tabs mate with locator slots on dV-BUMP

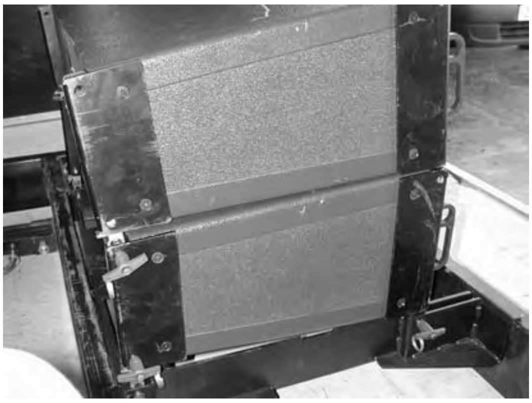


(xi) Pin front points first using dV-PIN25

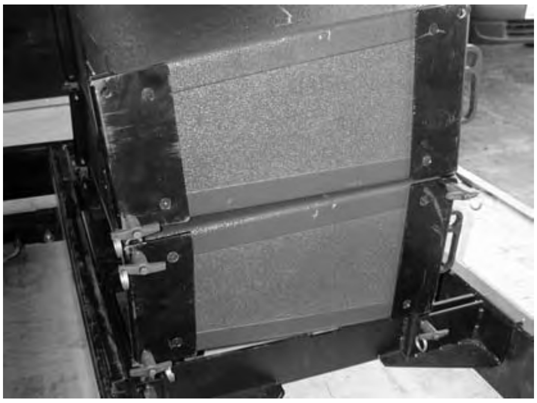


(xii) Then pin rear points - note: by pre-selecting the angle, the tab on dV-ANGLEP1 acts as a stop

(xiii) Pre-attach two more dV-ANGLE bars at desired angle



(xiv) Stack the second dV-DOSC enclosure



(xv) Pin front points first, rear points last using dV-PIN25

(xvi) Use dV-ANGLE at 3.75 (rear) and 7.5 (front) as a site for adjusting the focus of the stacked system

Figure 75: Stacking dV-DOSC using dV-BUMP plus the V-DOSC bumper

Stacking on top of V-DOSC

For dV-DOSC upfill applications, dV-BUMP is attached to the V-DOSC bumper to act as a stacking platform using the same stacking procedures outlined above.

For stability reasons, the maximum number of dV-DOSC enclosures that can be stacked on top of V-DOSC is 6. Typically, allowable trim height and chain motor clearance issues will be the determining factors with respect to the number of cabinets that can be used.

Standard rigging procedures for V-DOSC are followed (please see the V-DOSC manual for complete details). For the front motor point, bridling should be performed using the outer points on the V-DOSC bumper in order to ensure that steel or motor chain does not interfere with the high frequency section of dV-DOSC once it is stacked on top of V-DOSC.

Once all standard V-DOSC flying preparations are complete, the first step is to raise the front motor so that the V-DOSC BUMPER rotates upwards to a horizontal position. If necessary take any slack out of the rear motor so that the V-DOSC BUMPER is securely supported in the horizontal position.

Attach dV-BUMP to the V-DOSC BUMPER by mating the two locating studs on dV-BUMP with the corresponding holes on the center cross bar section of the V-DOSC BUMPER. A steel stud and dV-PIN81 quick release pin are used to mechanically secure dV-BUMP to the V-DOSC BUMPER at the central hole position.

In preparation to begin stacking, pre-attach two dV-ANGLEP1 bars to the two rear mount points on dV-BUMP using two dV-PIN25. Selecting the 3.75 degree hole (middle position) will set the bottom dV-DOSC enclosure parallel to the top V-DOSC enclosure for long throw applications. For upfill applications, selecting the minimum 7.5 degree hole position (tightly wrapped) will provide 3.75 degrees tilt upwards with respect to the top V-DOSC enclosure while selecting the 5.5 degree hole position will provide 1.75 degrees.

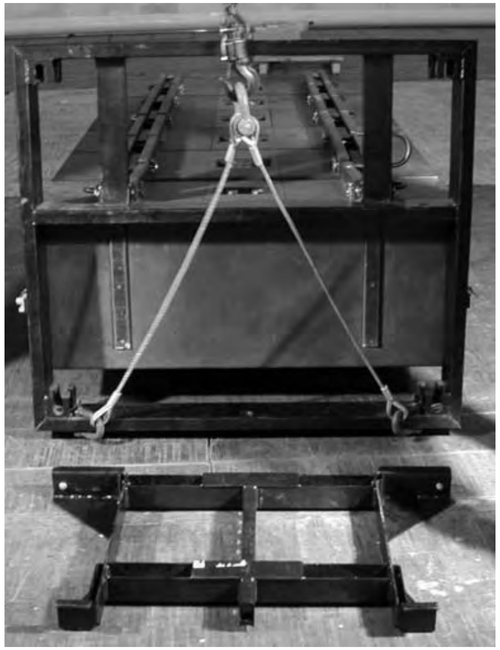
Note: For upfill applications, the trapezoidal angle of the bottom dV-DOSC enclosure must be taken into account. The 3.75 degree angle provides the same site angle for the bottom dV-DOSC as the top V-DOSC (0 deg relative site angle). Subtract 3.75 from all other dV-ANGLE values to obtain the correct site angle for the bottom dV-DOSC relative to the top V-DOSC, i.e., the 7.5 degree hole provides 3.75 degrees relative (upwards).

Orienting dV-DOSC with the rigging tabs down (grille logo in the correct orientation), place the first dV-DOSC on dV-BUMP by mating the front rigging tabs and rear locator slots with the locator slots and rear dV-ANGLE bars that were previously attached to dV-BUMP. Attach all four points using four dV-PIN25 (front first, rear last) to secure the bottom dV-DOSC to dV-BUMP.

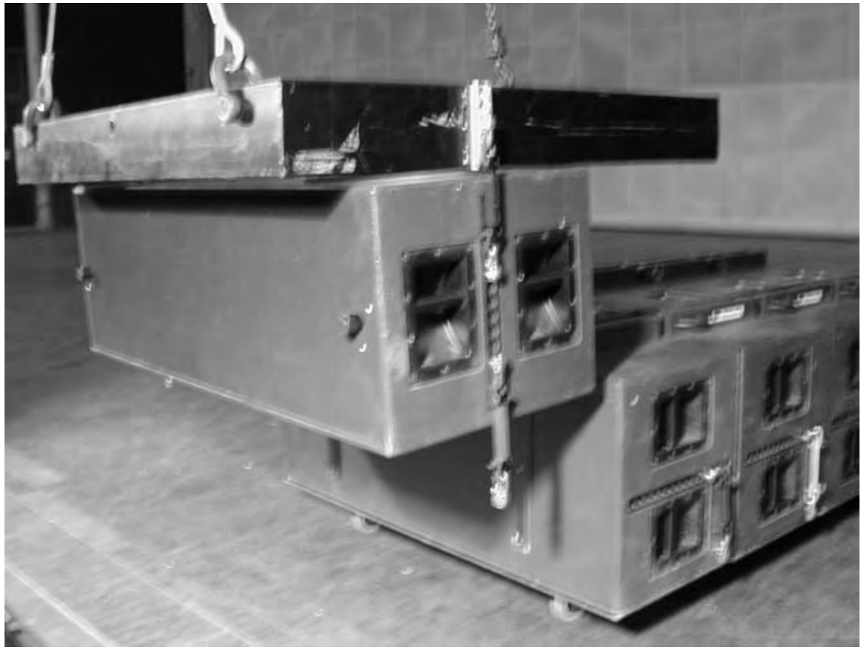
The next step is to connect two dV-ANGLE (P1 or P2) bars to the rear locator slots of the bottom dV-DOSC enclosure using two dV-PIN25. Pre-select the appropriate hole position to give the desired tilt angle for the second enclosure. Note: As a reference for dV-ANGLE bar orientation, the ball/tab of the angle bar should always be facing outwards.

Place the second dV-DOSC on top of the bottom enclosure by mating the two front rigging posts on the second enclosure and the dV-ANGLE bars that were previously mounted on the bottom enclosure with the available locator slots. Attach the two front points using two dV-PIN25 to secure the second dV-DOSC enclosure's front rigging posts to the bottom enclosure. Tilt the rear of the second enclosure if necessary and secure the rear points using two dV-PIN25.

The same procedures are followed for all other dV-DOSC enclosures of the array until stacking is completed.



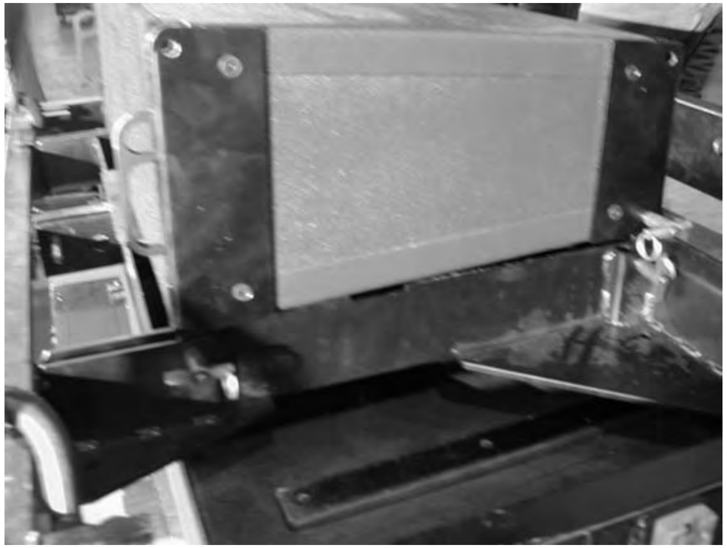
(i) dV-BUMP and V-DOSC BUMPER



(ii) Raise and level the V-DOSC BUMPER

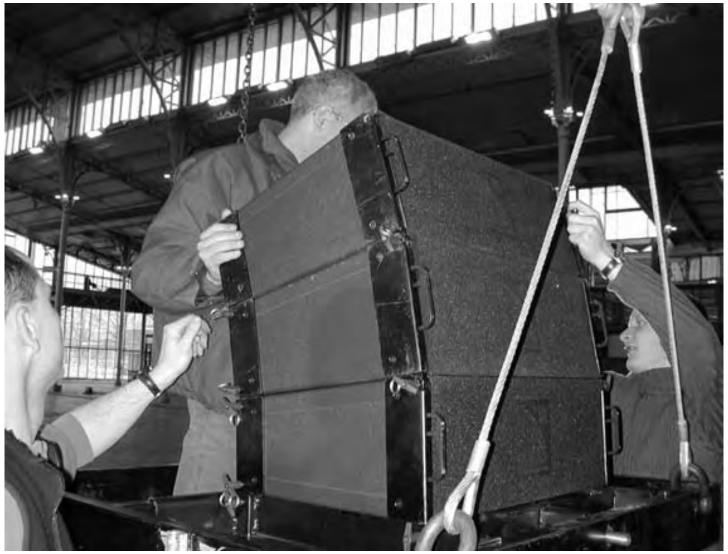
(iii) Place dV-BUMP inside V-DOSC BUMPER

(iv) Attach locator pin into position using dV-PIN81

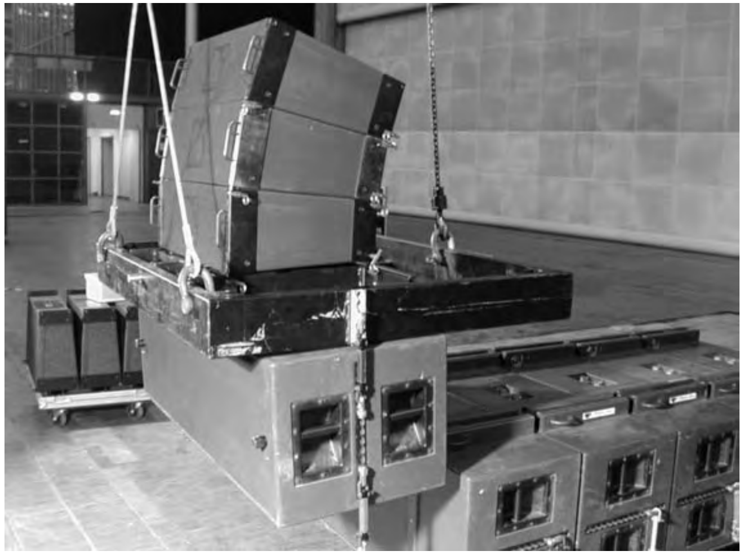


(v) Attach rear dV-ANGLE and mount the first enclosure

(vi) Continue to build the stack



(vii) Note bridling arrangement in front



(viii) Entire system is now ready to fly

Figure 76: Stacking dV-DOSC on top of V-DOSC for upfill/longthrow

Stacking on top of SB218 Subwoofers

For this application, four circular pads are provided on dV-BUMP that mate with the stacking runner recesses on top of the SB218 subwoofer. Side notches in dV-BUMP are also available that allow a ratchet strap to be used to secure dV-BUMP to the SB218 for added stability.

Start by building a stack of SB218 subwoofers. From ground level, stacking at least four SB218 enclosures high puts dV-DOSC at a good height so that the bottom cabinet will be angled down into the audience. Before stacking secure the SB218 stack and dV-BUMP (or dV- BUMP2) using a ratchet strap running around the entire stack. Physically securing SB218s will provide extra stability during the dV-DOSC stacking procedure and will also prevent subs from moving during the show.

Place dV-BUMP into position on top of the upper SB218 by mating the pads with the stacking runner recesses. Attach two double stud to ring fittings in the fly track sections on the sides of the SB218. Run a ratchet strap between these fittings through the side notches on dV-BUMP to secure dV-BUMP to the top subwoofer. Tighten the ratchet strap securely but do not overtighten to the extent that flytrack sections or double stud fittings are damaged. Alternatively, a ratchet strap can be run around the entire subwoofer stack, including the dV-BUMP.

Pre-attach two dV-ANGLE bars at the rear points on dV-BUMP and select the desired tilt angle downwards. Note: dV-ANGLE N bars can be selected if greater than 3.75 degrees downwards tilt is required (this is provided by the 0 degree hole position on the dV-ANGLE P1 bar - note that the site angle is referenced perpendicular to the front of dV-DOSC and not the trap angle of the enclosure).

Orienting the first dV-DOSC enclosure with the rigging tabs down (grille logo in the correct orientation), place the enclosure on dV-BUMP by mating the front rigging tabs and rear locator slots with the locator slots and rear dV-ANGLE bars that were previously attached to dV-BUMP. Attach all four points using four dV-PIN25 (front first, rear last) to secure the bottom dV-DOSC to dV-BUMP.

The next step is to connect two more dV-ANGLE bars to the rear locator slots of the bottom dV-DOSC enclosure using two dV-PIN25. Pre-select the appropriate hole position to give the desired tilt angle for the second enclosure. Note: As a reference for ANGLE bar orientation, the ball/tab of the angle bar should always be facing outwards.

Place the second dV-DOSC on top of the bottom enclosure by mating the two front rigging posts on the second enclosure and the dV-ANGLE bars that were previously mounted on the bottom enclosure with the available locator slots. Attach the two front points using two dV-PIN25 to secure the second dV-DOSC enclosure's front rigging posts to the bottom enclosure. Tilt the rear of the second enclosure if necessary and secure the rear points using two dV-PIN25.

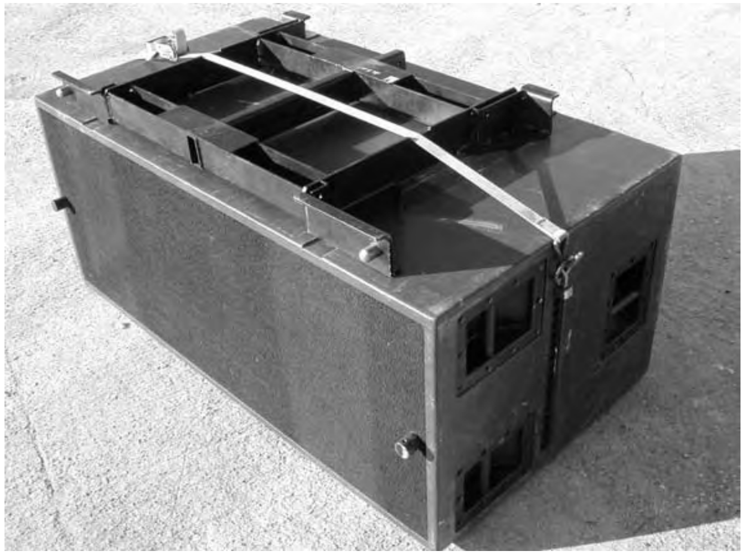
The same procedures are followed for all other dV-DOSC enclosures of the array until stacking is completed.

(i) Note circular discs on dV-BUMP

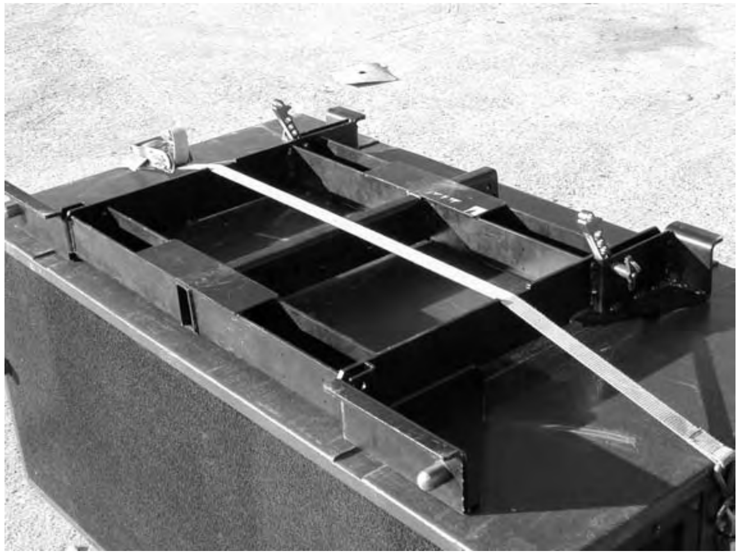
(ii) These mate with stacking runner recesses on SB218

(iii) dV-BUMP placed into position

(iv) Double stud to ring fitting attached to SB218 flytrack (alternative: run a ratchet around the entire stack)



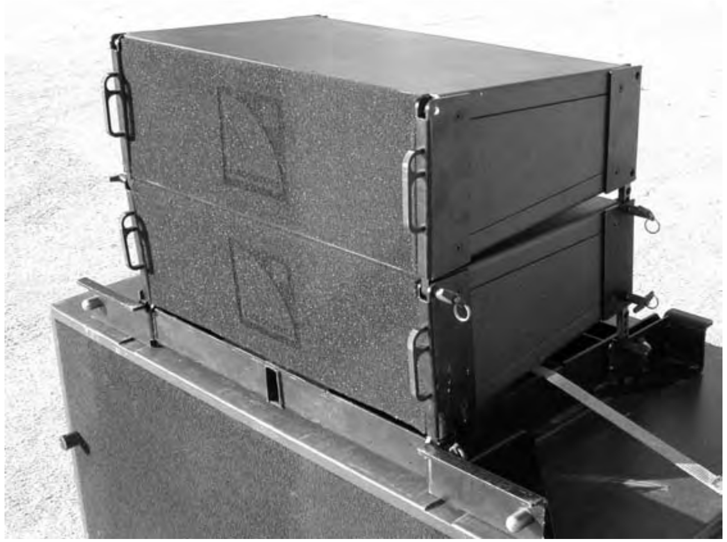
(v) Ratchet strap secures dV-BUMP to the SB218



(vi) Rear dV-ANGLE pre-attached at desired angle

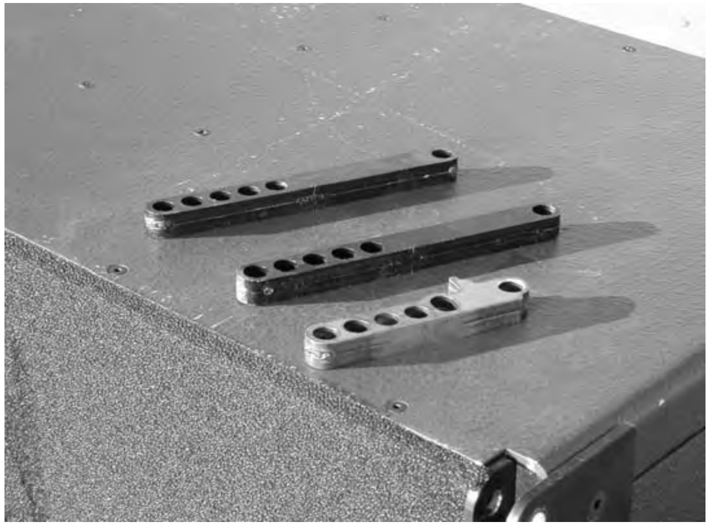
(vii) Bottom dV-DOSC mounted, attached using dV-PIN25

(viii) Pre-attach next set of dV-ANGLE



(ix) Second dV-DOSC placed into position

(x) then secured using dV-PIN25 (front first then rear)



(xi) Use dV-ANGLE N instead of dV-ANGLE P1…

(xii) for more downwards tilt

Figure 77: Stacking dV-DOSC on top of SB218 subwoofers

Stacking dV-SUB Subwoofers

When stacking dV-SUB, the stacking runners on the bottom of enclosures mate with the recesses on the tops of adjacent enclosures while the stack is being built. There are two options for securing a stack of dV-SUBS: 1) use a ratchet strap around the entire stack or 2) use dV-ANGLESS (sub-to-sub) angle bars between adjacent dV-SUB enclosures. Either of these options is recommended, especially if dV-SUB will serve as a stacking platform for dV-DOSC (see the following section).

If dV-ANGLESS (sub-to-sub) angles are used, it is best to place the first enclosure in the desired stacking location and pre-attach four dV-ANGLESS using dV-PIN25 quick release pins to the second enclosure before stacking. If two people lift the second dV-SUB and crown the bottom front edge (once stacked), it is then possible to rotate/lower the dV-SUB into position by using the dV-ANGLESS as locators that mate with the slots on the dV-SUB rigging panels of the first enclosure.

Note: This procedure is recommended as opposed to placing dV-ANGLESS on the first enclosure then lowering the second into position. Due to the weight of the second cabinet and the subsequent difficulty in lining up rigging slots with dV-ANGLESS, it is possible to damage the second enclosure's paint/finish.

For more details on stacking dV-SUBS using dV-ANGLESS, please refer to the following photo sequence:

Bottom dV-SUB in position, second dV-SUB with dV-ANGLESS pre-attached

Crown the bottom front edge of the second dV-SUB

Rotate/lower the second dV-SUB into position and position all four dV-ANGLESS in the corresponding slots of the bottom enclosure's rigging panels

Use 4 x dVPIN25 to attach the second enclosure to the bottom dV-SUB

Repeat the same procedure to stack 3 dV-SUBs high

The stack - secured using 8 dV-ANGLESS and 16 dVPIN25

Figure 78: Stacking dV-SUB subwoofers

Stacking dV-DOSC on top of dV-SUBS

There are two options for stacking dV-DOSC: with, or without dV-BUMP.

Procedure 1: Stacking without dV-BUMP

When stacking on stages or risers, reduced downwards tilt requirements for the stacked dV-DOSC system may allow for the direct installation of dV-DOSC on top of dV-SUB without use of dV-BUMP. Similarly, for stacked field level distributed systems, systems are normally oriented upwards and downwards tilt is not required.

For stacking without dV-BUMP, two dV-ANGLESD (sub to dV-DOSC) angles are used for the front attachment points and two dV-ANGLESDP (sub to dV, positive tilt) are used for the rear attachment points of the first dV-DOSC. The dV-ANGLESDP angle bar provides tilt angles of 0 (dV-DOSC flat with respect to dV-SUB- furthest hole position), 1.75 (intermediate) and 3.75 degrees (tightly wrapped - minimum hole position).

Note: For additional upwards tilt, the dV-ANGLESD and dV-ANGLESDP can be reversed (i.e., dV-ANGLESDP installed at the front, dVANGLE-SD at the rear).

Before stacking dV-DOSC, build the dV-SUB stack and physically secure the enclosures using dV-ANGLESS angles between cabinets (and/or a ratchet strap around the entire stack). Physically securing dV-SUBs will provide extra stability during the dV-DOSC stacking procedure and will also prevent subs from moving during the show.

With reference to the photo sequence that follows, pre-attach 2 x dV-ANGLESD at the front of the top dV-SUB and 2 x dV-ANGLESDP at the rear using 4 x dV-PIN25. The closest holes on these angle bars are used for stacked applications and the "fat" part of the angle bars is oriented towards the center of dV-SUB in order to mate properly with the dV-DOSC rigging panels.

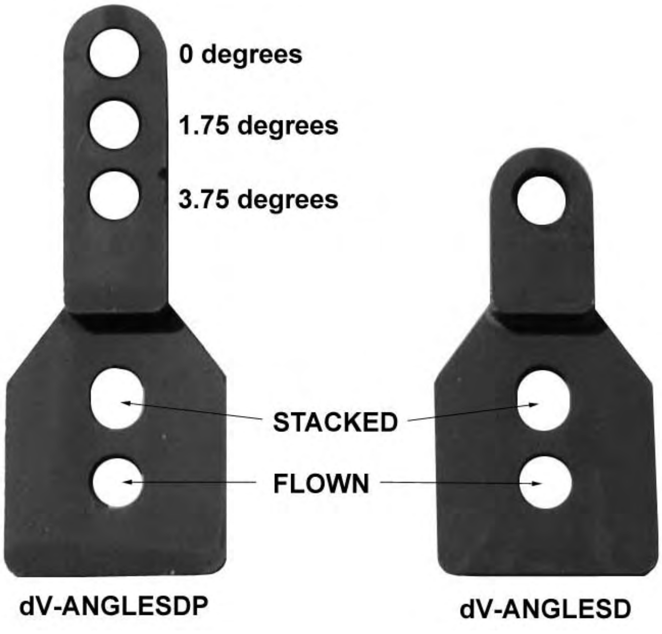
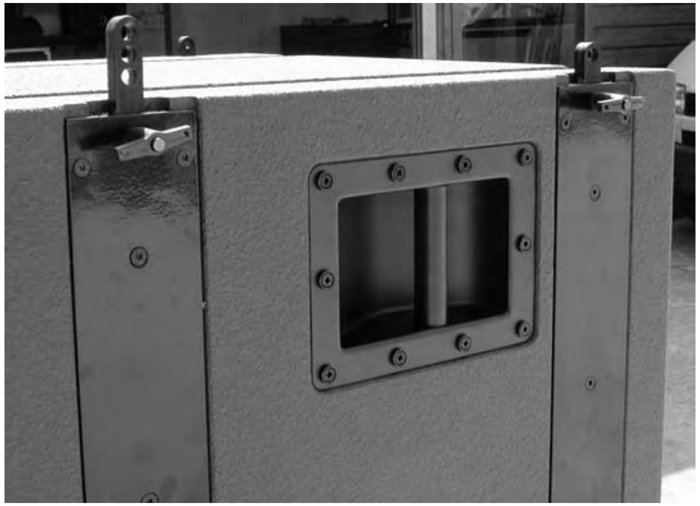


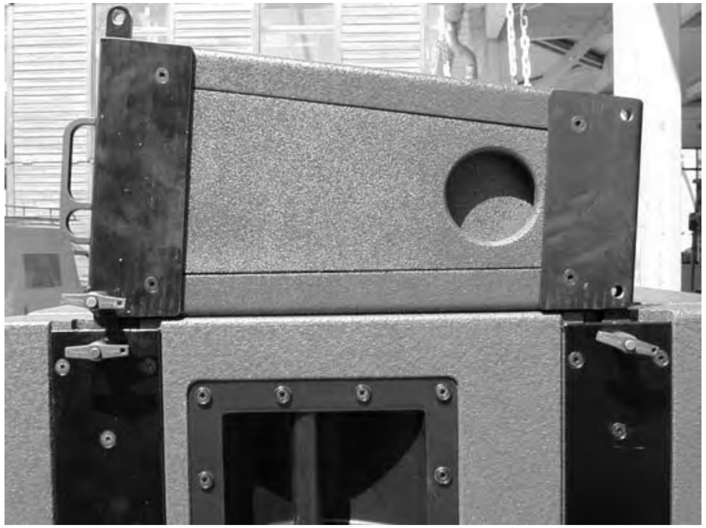
Figure 79: dV-ANGLESD, dV-ANGLESDP angle bars

The first dV-DOSC is inverted and placed in position by mating the rigging recesses on the dV-DOSC rigging panels with the pre-attached dV-ANGLESD and dV-ANGLESDP angle bars. Secure the front two attachment points using 2 x dV-PIN25 then raise the dV-DOSC at the rear and select the desired tilt angle on dV-ANGLESDP (0, 1.75 or or 3.75 degrees), again securing the two rear points using 2 x dV-PIN25. Continue to build the stack by pre-attaching dV-ANGLE P1 or P2, pre-selecting the desired tilt angle and securing with dV-PIN25 before installing additional dV-DOSC enclosures.



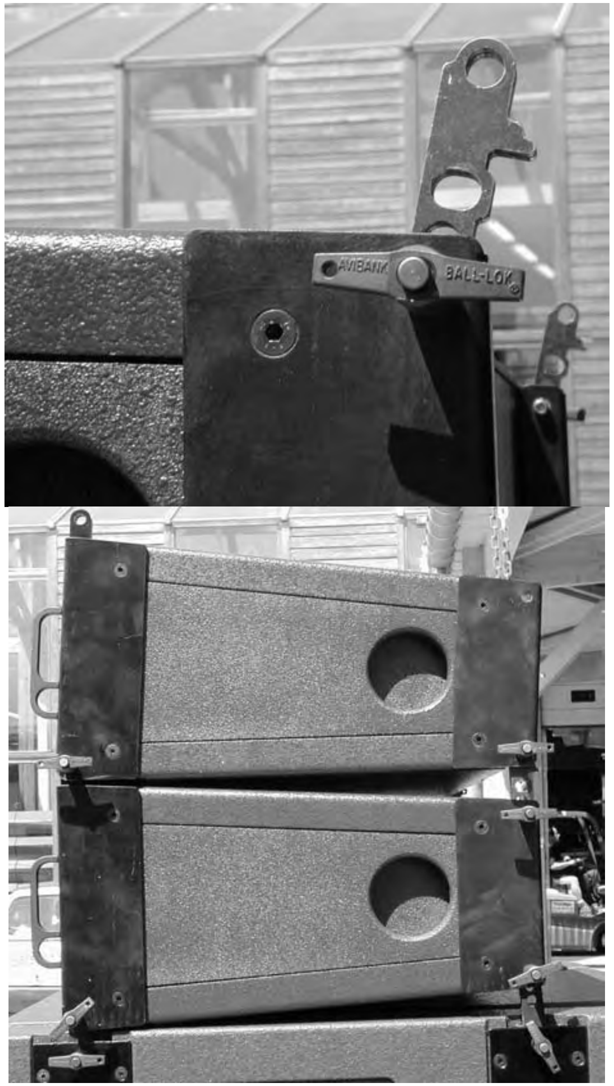
(i) Pre-attach dV-ANGLESD (front) and dV-ANGLESDP (rear) to dV-SUB

(ii) Note: The "fat" part of dV-ANGLESD and dV-ANGLESDP is oriented towards the center of dV-SUB on both sides

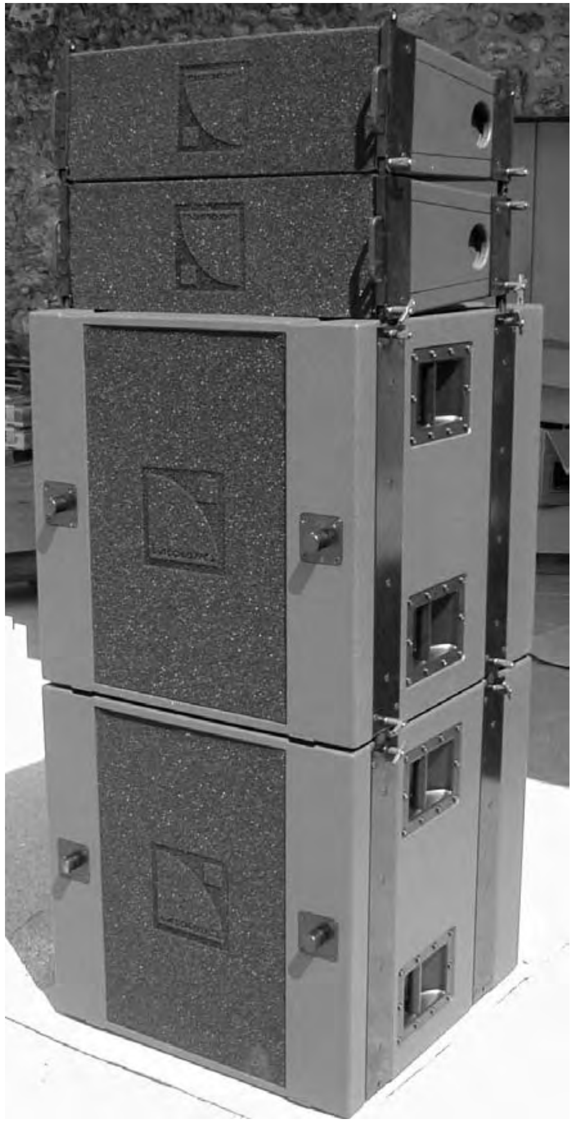


(iii) Place dV-DOSC in position (inverted) and secure the front 2 points

(iv) Lift dV-DOSC into position and secure with dV-PIN25



(v) Pre-select the angle / pre-attach dV-ANGLE P1 or P2 for the second dV-DOSC enclosures and continue to build the stack



(vi) The finished stack of dV-SUB and dV-DOSC

Figure 80: Stacking dV-DOSC on top of dV-SUB subwoofers (without dV-BUMP or dV-BUMP2)

Procedure 2: Stacking with dV-BUMP or dV-BUMP2

In this case, dV-BUMP or dV-BUMP2 is placed on top of the upper dV-SUB to serve as a stacking platform for dV-DOSC. dV-ANGLEN bars can be used for downwards tilt and from ground level, stacking 3 dV-SUB enclosures high puts dV-DOSC at a good height so that the bottom cabinet will be angled down into the audience. Typically downwards tilt is necessary to reduce audience shadowing effects and to improve HF penetration into the audience.

Before stacking dV-DOSC, build the dV-SUB stack and physically secure the enclosures using dV-ANGLESS angles between cabinets (and/or a ratchet strap around the entire stack). Physically securing dV-SUBs will provide extra stability during the dV-DOSC stacking procedure and will also prevent subs from moving during the show.

Place dV-BUMP into position on top of the upper dV-SUB and secure in place using a ratchet strap around the entire stack. If dV-BUMP2 is used, use dV-ANGLESD and dV-PIN25 to secure the front and rear attachment points.

Pre-attach two dV-ANGLE P1 or P2 bars at the rear points on dV-BUMP and select the desired tilt angle or, alternatively, use dV-ANGLEN bars if greater than 3.75 degrees downwards tilt is required

Orienting the first dV-DOSC enclosure with the rigging tabs down (grille logo in the correct orientation), place the enclosure on dV-BUMP by mating the front rigging tabs and rear locator slots with the locator slots and rear dV-ANGLE (P1, P2 or N) bars that were previously attached to dV-BUMP. Attach all four points using four dV-PIN25 (front pair first, rear pair last) to secure the bottom dV-DOSC to dV-BUMP.

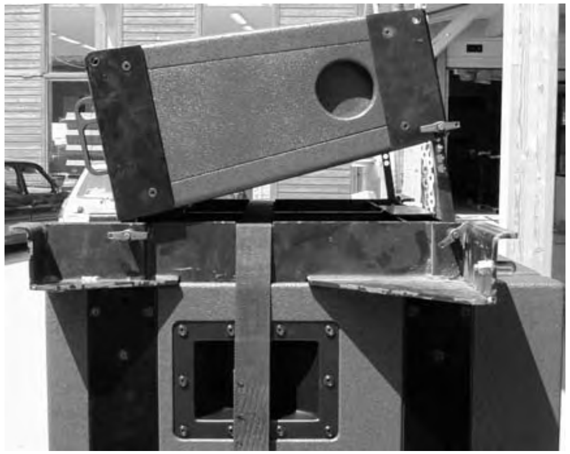
The next step is to connect two more dV-ANGLE P1 or P2 bars to the rear locator slots of the bottom dV-DOSC enclosure using two dV-PIN25. Pre-select the appropriate hole position to give the desired tilt angle for the second enclosure.

Note: As a reference for ANGLE bar orientation, the ball/tab end of the angle bar should always be facing outwards. The advantage of pre-selecting the angle is that the dV-ANGLE P1 or P2 acts as a stop when the next dV-DOSC enclosure is placed. This makes it easier to secure the rear points since less lifting is required.

Place the second dV-DOSC on top of the bottom dV-DOSC enclosure by mating the two front rigging posts on the second enclosure and the dV-ANGLE bars that were previously mounted on the bottom enclosure with the available locator slots. Attach the two front points using two dV-PIN25 to secure the second dV-DOSC enclosure's front rigging posts to the bottom enclosure. Tilt the rear of the second enclosure to the desired angle and attach the second dV-DOSC to dV-ANGLE using two dV-PIN25.

The same procedures are followed for all other dV-DOSC enclosures of the array until stacking is completed.

(i) dV-BUMP secured to dV-SUB stack using a ratchet strap. dV-ANGLEN preinstalled for rear attachment points



(ii) dV-DOSC installed - note how dV-ANGLEN provides downwards tilt

(iii) 3 high dV-SUB stack provides a good height as a stacking platform. With the bottom enclosure at maximum downwards tilt, coverage starts from 2 metres onwards.

Figure 81: Stacking dV-DOSC on top of dV-SUB subwoofers with dV-BUMP (or dV-BUMP2)

4.2 FLOWN SYSTEMS

Standalone Rigging with dV-BUMP or dV-BUMP2

Flying a dV-DOSC array is fast and easy. When properly prepared and organized, handling time can be significantly reduced in comparison with conventional systems. Installation is optimum when 2-3 people are available although it is possible for a single person to fly dV-DOSC.

Preliminary Preparations:

- All geometrical data for installing the array (i.e., trim height, bottom enclosure elevation, inter-enclosure angles) has been pre-calculated using ARRAY2004 or SOUNDVISION
- Two independent rigging points are available, directly in line and with the desired pan angle for the array as determined using ARRAY2004 (ISOCONTOUR sheet) or SOUNDVISION
- Alternatively, a single point hang can be performed using the points available on the central spreader bar section of dV-BUMP / dV-BUMP2 or the rear extension bar
- Access is available beneath the flying points, i.e., a flat surface where it is possible to assemble dV-DOSC enclosures

Given the above conditions:

The first step is to unpack and organize all dV-DOSC enclosures and rigging hardware at the flying location. As a reference for cabinet orientation, the front grill logos should all be in the correct orientation and the bottom rigging tabs facing down once the system is flown.

Line up all dV-DOSC enclosures in their flight cases (3 per case). Mate the bottom rigging tabs from the first group of 3 cabinets with the top locator slots of the next group of cabinets. Repeat until all dV-DOSC flight cases are physically lined up.

Physically connect the fronts of all dV-DOSC enclosures by attaching the front points using dV-PIN25. The entire assembly will then be physically linked, similar to how V-DOSC is attached using rotating legs and U-pins (except the attachment points are at the front in this case).

Place dV-BUMP or dV-BUMP2 at the top of the array, oriented so that the rear extension bar slot is facing upwards. If desired, attach the extension bar to dV-BUMP using an 18 mm shackle at pick point hole number 8 on the central spreader bar section. The extension bar allows the use of two motors for tilt adjustment or single point hangs of up to 12 enclosures from the 8 additional points available on the extension bar. Note: 12 enclosures, tightly wrapped at 7.5 degrees provide 90 degree coverage focussed from vertical to horizontal when the rearmost pick point of the extension bar is used. If the extension bar is not used, 8 pick point positions are available on the central spreader bar section of dV-BUMP or dV-BUMP2 for single point hangs and up to 24 dV-DOSC can be flown.

NOTE: Hole #8 is used to secure the extension bar. Therefore, for 2 motor hangs off holes 0 and 16, three 18 mm shackles are required.

Pre-attach dV-ANGLE P1 at the 3.75 degree (middle hole) position to the two rear points on dV-BUMP or dV-BUMP2 using dV-PIN25. Pre-attach dV-ANGLE P1 at the 7.5 degree (smallest gap) position to the front points on dV-BUMP or dV-BUMP2. As a reference, the ball/tab end of all four dV-ANGLE bars should be facing outwards.

Note: The 3.75 degree angle between the rear of the top enclosure and dV-BUMP is necessary to compensate for the trapezoidal angle of dV-DOSC (the actual site angle of the enclosure which is perpendicular to the front of the enclosure). Using a 3.75 degree angle at the rear allows focus to be verified with a laser attached to dV-BUMP since this will be parallel to the site angle of the top enclosure.

The next step is to attach dV-BUMP or dV-BUMP2 to the top enclosure by mating the pre-attached dV-ANGLE bars to the locating slots of the top enclosure. Use four dV-PIN25 to physically connect dV-BUMP or dV-BUMP2 to the top enclosure.

Referring to the angle values that were pre-calculated using ARRAY2004 or SOUNDVISION, pre-attach pairs of dV-ANGLE bars at the rear of all dV-DOSC enclosures of the array (while they are still face down in their flight cases). Remember to keep the ball/tab end up as a reference. Be careful to select the correct angle for each enclosure (generally, it is better if one person performs this operation to avoid mistakes). Note that pre-selecting angles will allow the dV-ANGLE tab to act as a stop while the array is being lifted, facilitating attachment using dV-PIN25.

Connect the rears of dV-DOSC enclosures in blocks of three (while they are still face down in their flight cases) by pulling the cabinets together at the rear and inserting dV-PIN25. This operation is facilitated by the fact that all fronts are pinned together and can pivot, plus all rear angles were pre-attached in the previous step.

Connect all enclosures to the AMP RACKS using the appropriate cables and adaptors (SP and DO2W or DO plus DOFILL) and SP.7 jumpers between enclosures for parallel operation. Long cable runs should be dressed and tied off to dV-BUMP for strain relief. Be careful not to connect more than 3 dV-DOSC enclosures in parallel.

Conduct a final inspection to make sure all cabling is correct, proper inter-enclosure angles have been selected and that all dV-PIN25 are in place and securely seated.

Connect the front and rear motors (or single motor) to dV-BUMP or dV-BUMP2.

Slowly begin to raise the array. As the array lifts off, the rear gaps between blocks of 3 cabinets will close, allowing you to progressively pin the blocks together as system goes up.

Be careful to steady the array as it lifts off the ground in order to prevent it from swinging. Gradually lift the array until it is freely floating in air. If you are doing a single point hang, use a digital inclinometer to verify that the tilt angle of the top enclosure is correct before taking the array up to trim. If adjustment is required, lower the array and change the pick point until the desired tilt is obtained. Re-calculate the trim height in ARRAY2004 or SOUNDVISION based on the actual obtained site angle and re-optimize angles, if necessary.

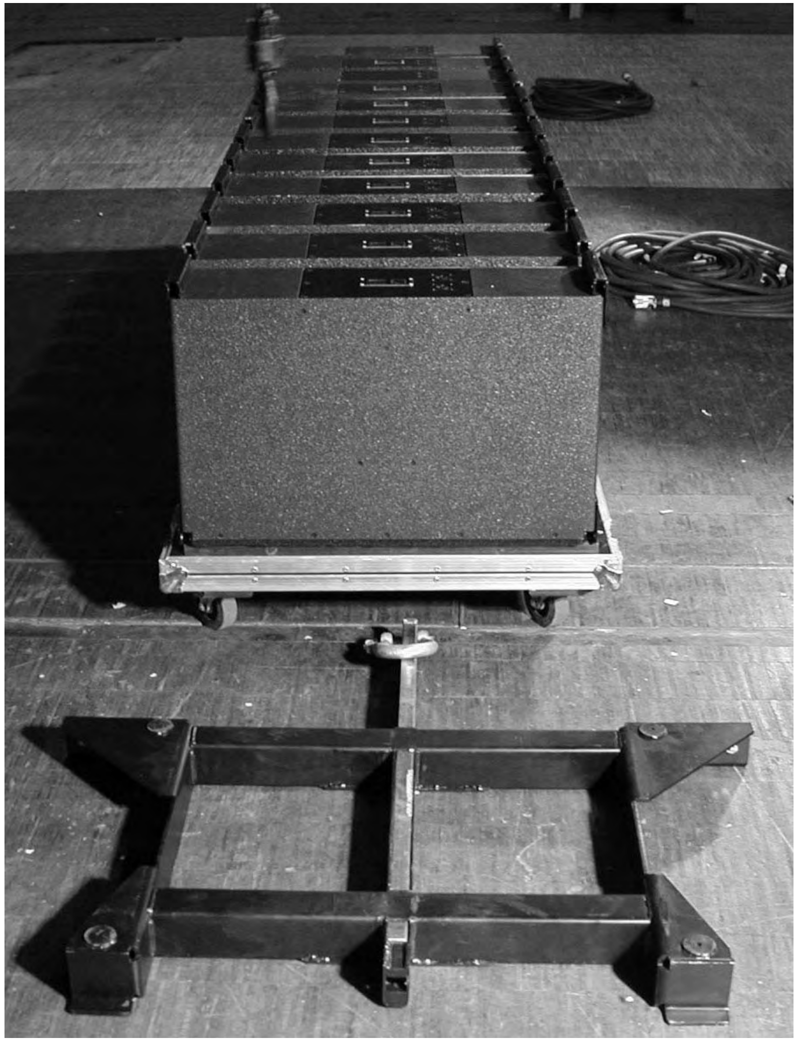
Attaching rear dV-ANGLE bars and shackles to the bottom enclosure of the array then running a ratchet strap up to the single point hang location can provide an additional degree of tilt adjustment (down only) and also help to stabilize the array from spinning. Alternatively, the bottom two points on dV-DOSC can also be used for attaching tie lines.

If you have 2 motors available, more detailed focus can be achieved by mounting a laser on top of dV-BUMP (provided that you have used a 3.75 degree angle for the rear of the top enclosure so that dV-BUMP is parallel to the site angle).

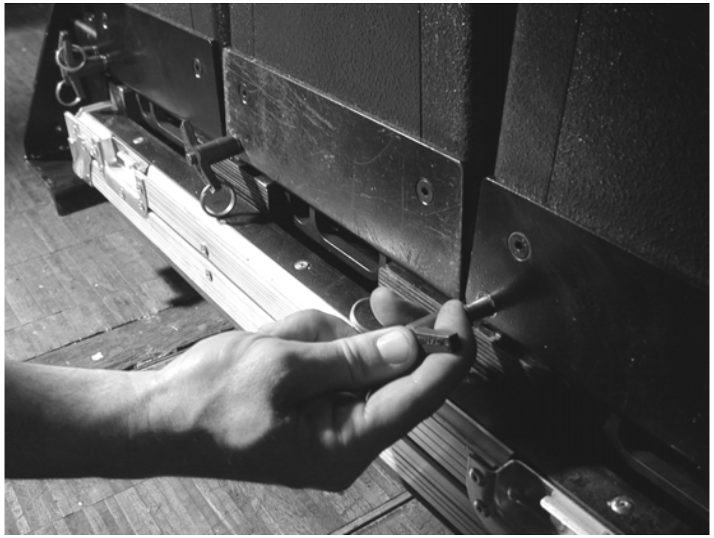
Note: Since the rigging system for dV-DOSC is front pivoting, coordinates are referenced to the front of the top enclosure and the bottom enclosure elevation is referenced to the front of the bottom enclosure. This means that when focussing a dV-DOSC array the front motor controls the trim height while the rear motor controls tilt.

For demounting, lower the array and remove the front dV-PIN25 pins on the bottom three enclosures. Roll a FLIGHT-dV case into position and land the three enclosures face down in the case. Disconnect the rear dV-PINs of the third enclosure and wheel the block of 3 out of the way for further hardware de-installation. Repeat this procedure in blocks of three at a time.

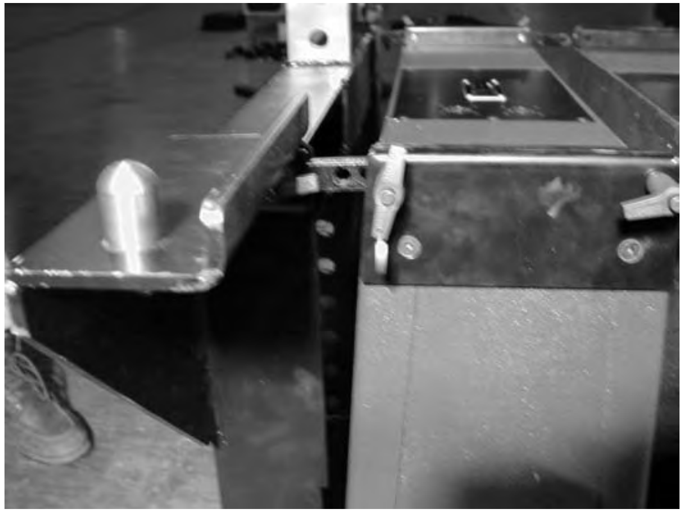
NOTE: WHILE LOWERING THE SYSTEM, ALWAYS BE SURE TO REVERSE THE SYSTEM (I.E., PULL THE SYSTEM BACKWARDS) SO THAT dV-ANGLE BARS ARE NOT PHYSICALLY DAMAGED.



(i) dV-DOSC lined up in FLIGHT-dV cases

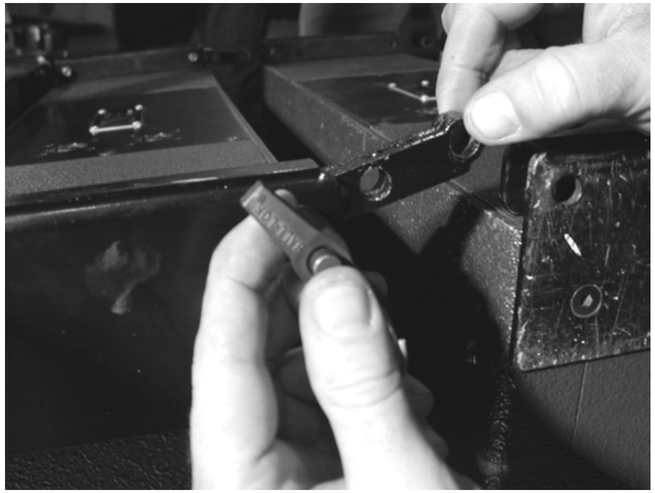


(ii) Pin the fronts of all dV-DOSC using dV-PIN25

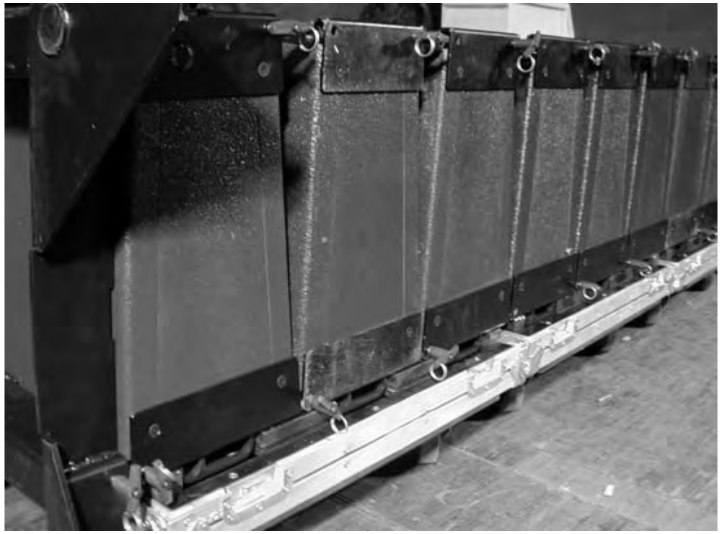


(iii) Use 3.75 degree for rear when attaching dV-BUMP

(iv) Pre-attach all rear dV-ANGLE (ball/tab end up)

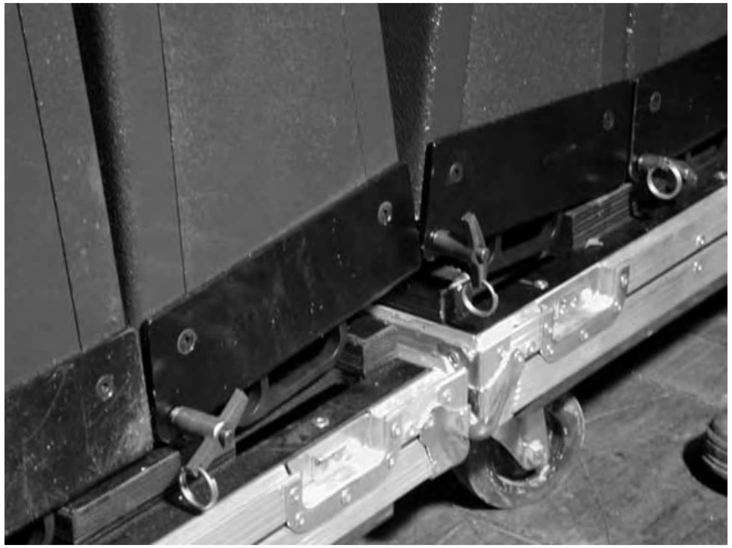


(v) Pre-select the desired angle

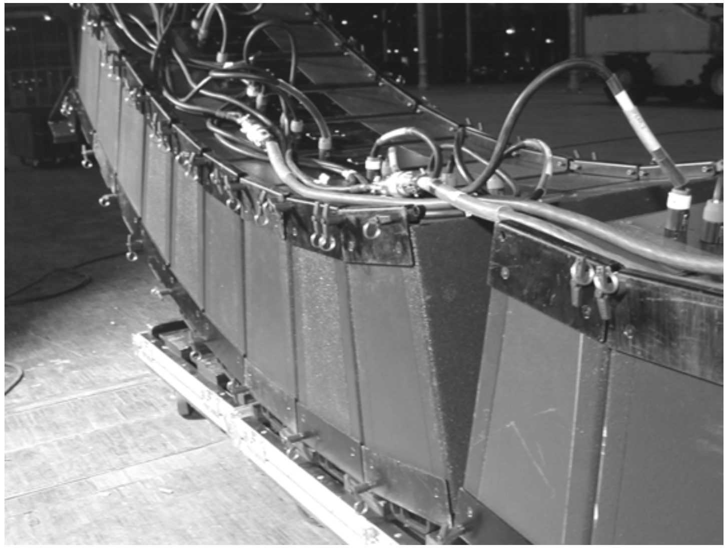


(vi) dV-BUMP attached, dV-ANGLE pre-attached

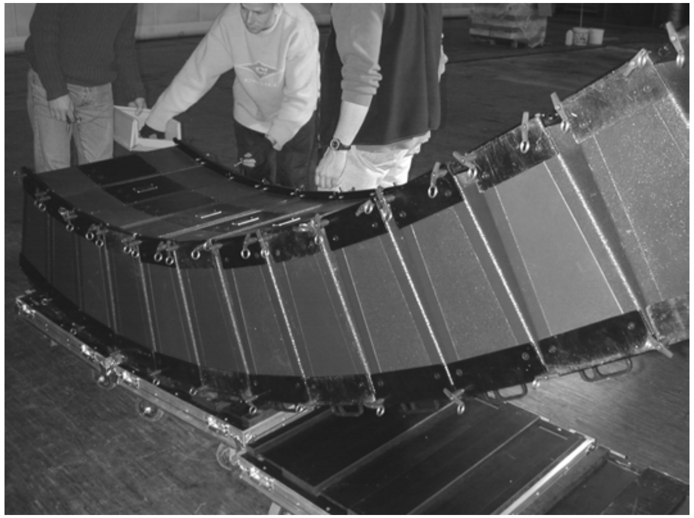
(vii) Connect dV-DOSC enclosures in groups of three

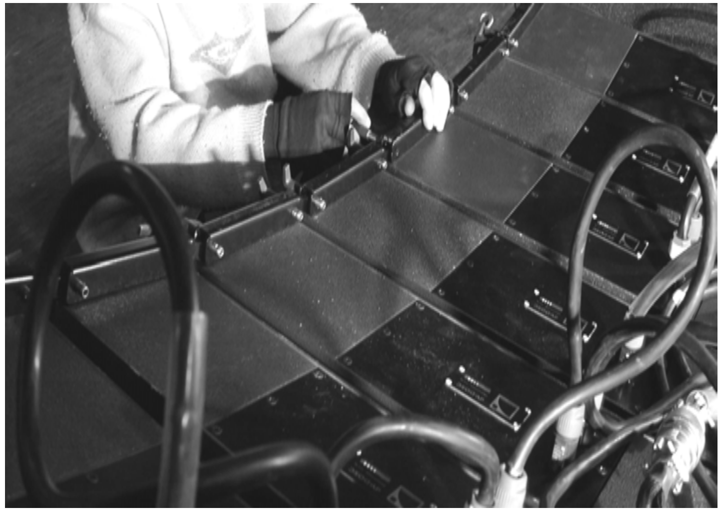


(viii) Lower detail between adjacent blocks of 3 dV-DOSC



(ix) As cabinets lift off …





(x) Pin adjacent blocks of 3 together as the gaps close

(xi) Note: single point hang from spreader bar section on dV-BUMP

(xii) Front view of the flown array

(xiii) Single point hang from rear point on extension bar gives 90 degrees coverage with 12 dV-DOSC

(xiv) 90 degrees vertical coverage running from parallel to vertical with respect to floor level

Figure 82: Rigging dV-DOSC standalone with dV-BUMP (or dV-BUMP2)

Trim and Angle Adjustments

At this point there are only two adjustments left - trim height of the array and tilt angle of the entire flown system. If two motors are used for rigging the system, the front motor is used to set the proper height of the whole array. Controlling the tilt angle is then performed by the relative action of the two chain-motors, i.e., once the proper height has been set the front motor is fixed and activating the rear motor only varies the tilt angle.

Note: For dV-DOSC, do not use the top and bottom of the cabinet as a visual reference (as for V-DOSC). The radiated wavefront is parallel to the front of the cabinet and is not defined by the trapezoidal enclosure walls. Adding a 3.75 degree angle at the rear of the top enclosure allows dV-BUMP to be used as a site angle reference for the top enclosure.

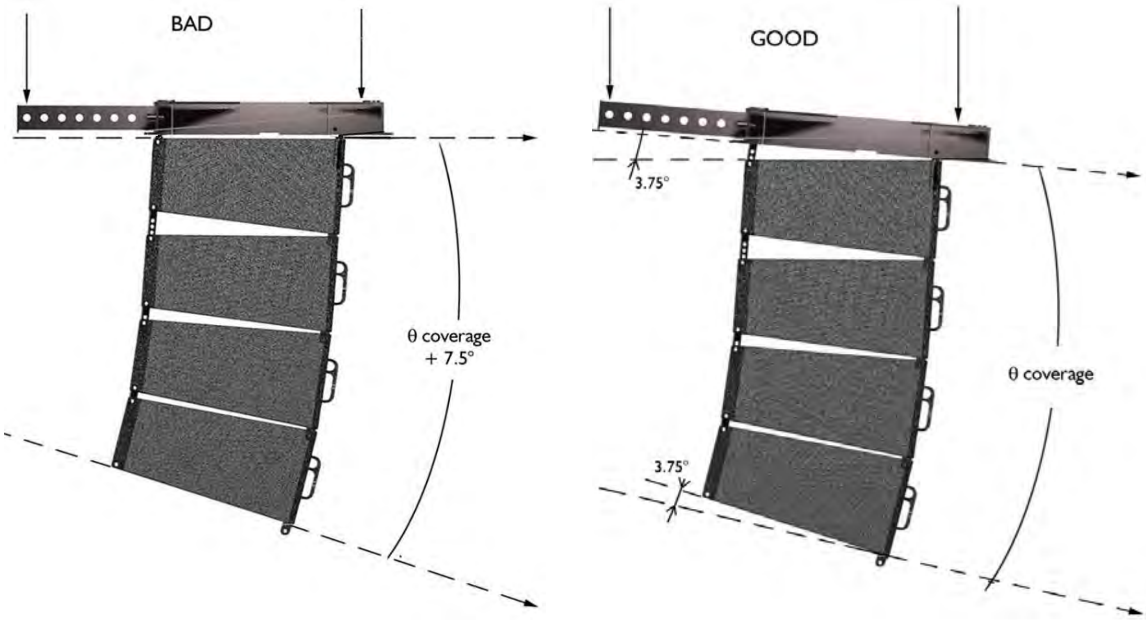


Figure 83: Flown dV-DOSC array trim and site angle adjustment

Depending on the tools available, there are a number of possible techniques for trimming and angling the array. For trim height measurement, one end of a tape measure can be fixed to the lower wall of the bottom dV-DOSC enclosure at the front of the enclosure (by using some duct tape). The tape measure is then used to raise the array to the proper height (referenced to the floor) based on the bottom enclosure elevation which was pre-calculated using ARRAY2004 or SOUNDVISION. Once the array is at trim and focussed, the tape measure can be pulled free.

Under dark conditions (indoors), a small flashlight can be attached at the junction between the top and the second enclosures. The final trim angle adjustment can then be checked from the rearmost seats of the audience: when the light can be seen through the small gap separating the first and the second enclosures, the angle of the array is correct.

A more precise focusing technique is to use a laser attached to dV-BUMP (provided that a 3.75 degree angle is used at the rear of the top dV-DOSC). Trim angle adjustments are then directly given by the focus of the laser on the audience (no walking to the back of the venue is required although a set of binoculars or laser sunglasses can be useful in locating the laser beam). Obviously, array focus using lasers is difficult to perform outdoors under daylight conditions.

For both alternatives, two pieces of light rope can be run from the floor, one over dV-BUMP and the other routed through a hole in dV-BUMP. Both lines attach to the Maglite or laser device in order to pull the instrument free then lower it after measurements have been performed (one string is a pull line, the other is used to lower the instrument). As a final check, mute mid and low channels and run pink noise through the system and listen to the high section coverage throughout the venue to verify that installation is correct.

Under daylight conditions (outdoors), the trim angle can be visually checked from the rearmost audience section. If the gap between the top and second enclosures is clearly visible then the focus is correct. At long distances, binoculars can help to visualize this gap and for final angle adjustments, a pair of radios is useful while one person walks the room and visually inspects the array while a second person operates the motors. Alternatively, a digital inclinometer with remote display of array tilt angle (example: Lucas Control Systems Model 0256-01 or Rieker RAD2-70-B2) can be placed on top of the array and used to set the array tilt equal to the value calculated for Site Angle #1 in ARRAY 2004 or SOUNDVISION.

Verifying coverage down front is more difficult since the trapezoidal angle of dV-DOSC cannot be used as a reference. If you can see the bottom of the bottom dV-DOSC you are definitely outside the coverage pattern (more so than for V-DOSC). Attaching an extra dV-ANGLE at the rear of the bottom cabinet at 3.75 degrees and using this as a site reference with the front rigging post can help avoid this problem.

Use the above described techniques to verify that L and R arrays are matched (plus L-L and R-R arrays, if installed). Walk to the back of the venue and by looking at the gaps between cabinets of each array, visually confirm that L and R are matched as you walk forwards toward the system.

Rigging dV-DOSC under V-DOSC with dV-DOWN

Typically, 3-4 dV-DOSC are recommended for flying under V-DOSC for downfill applications and the maximum number of dV-DOSC that can be flown under V-DOSC is 6. In most cases, dV-DOSC enclosures will be used at the maximum angle between cabinets, i.e., 7.5 degrees, and the enclosures will be tightly wrapped according to the trapezoidal angle of the enclosures (although selecting 3.75/5.5/7.5 degrees tends to provide the best site angle impact spacing transition).

Standard rigging procedures for V-DOSC are followed (please see the V-DOSC manual for complete details). Fly the V-DOSC array in the normal manner but do not connect the angle straps of the bottom V-DOSC enclosure. Flip down the rotating legs (balanciers) of the bottom V-DOSC enclosure in preparation for attachment to dV-DOWN.

Remove the FLIGHT-dV case cover and wheel 3 dV-DOSC into position (face down). As a reference for cabinet orientation, the logos will be in the correct orientation and the bottom rigging tabs pointing down once the system is flown. Pin the fronts of all dV-DOSC together using dV-PIN25 (four required).

Pre-attach pairs of dV-ANGLE bars at the rear of all dV-DOSC enclosures of the array. Remember to keep the ball end of dV-ANGLE up as a reference and be careful to select the correct angle. Typically, for downfill applications the 7.5 degree position (minimum hole separation) will be selected to produce a tightly wrapped array for maximum vertical coverage.

Connect the rears of all 3 dV-DOSC enclosures while they are still face down in their flight cases by pulling the cabinets together at the rear and inserting dV-PIN25. This operation is facilitated by the fact that all fronts are pinned together and can pivot, plus all rear angles were pre-attached in the previous step.

Attach L/R dV-DOWN rigging adapters to the top enclosure using four dV-PIN81.

Loosen the screwjacks on dV-DOWN so that they do not interfere while dV-DOWN is attached to the V-DOSC rotating legs. Since the angle strap for the bottom V-DOSC has not been attached, this helps to facilitate alignment of the holes on the rotating legs with the corresponding holes on dV-DOWN (when the holes are aligned, the V-DOSC rotating leg will be oriented vertically). Once aligned, attach dV-DOWN to the V-DOSC rotating legs using two U-PINS. Install the locking safety pins on the U-PINS.

Proceed to raise the system. The dV-DOSC enclosures will automatically lift off from the flight case. Fly the system until dV-DOSC is floating above floor level.

At this point the angle straps for the bottom V-DOSC enclosure can be connected, i.e., one person on either side can lift the bottom V-DOSC cabinet upwards and attach the angle strap on each side.

Once flown, there will be a gap between dV-DOSC and the bottom V-DOSC enclosure. To remove this gap, the two dV-DOWN screwjacks are tightened to firmly secure dV-DOWN and the first dV-DOSC enclosure to the V-DOSC enclosure, i.e., as the screwjacks are tightened, the underhung dV-DOSC array will swing upwards. Do not overtighten the screwjacks.

At this point, the system is ready to be taken up to trim and the installation completed by verifying trim height and focus. During de-installation, the procedure is reversed. Loosen the screwjacks, remove the bottom V-DOSC enclosure angle straps and then land the dV-DOSC enclosures face down in their flight case as the system is lowered.

(i) Pre-attach dV-DOWN on either side of dV-DOSC

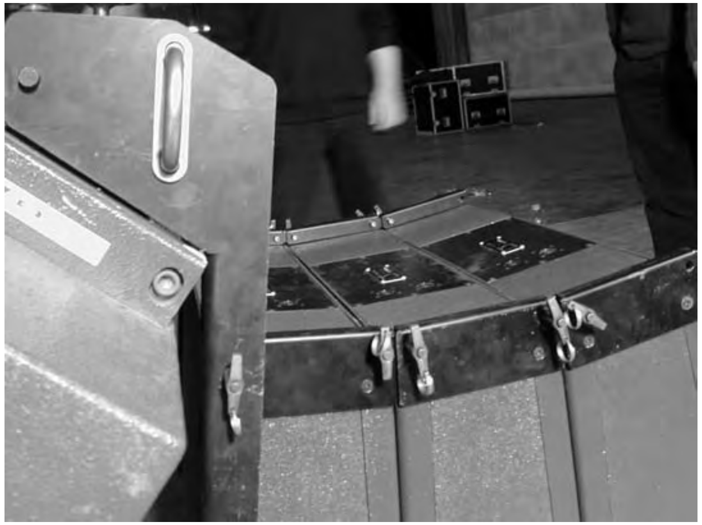
(ii) Use dV-PIN25 to connect front points of all dV-DOSC

(iii) Rotating leg on bottom V-DOSC flipped down, ANGLE strap not attached on bottom enclosure

(iv) Align rotating leg with holes on dV-DOWN

(v) Attach dV-DOWN using U-PIN and locking safety

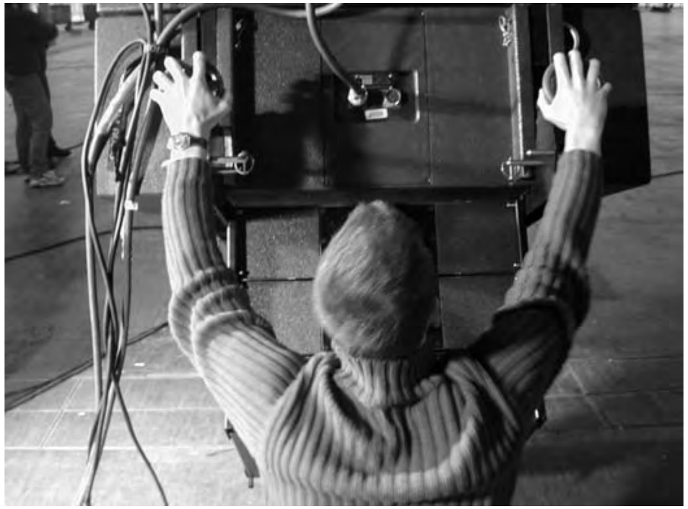
(vi) Preconnect all dV-ANGLE at the rear of dV-DOSC



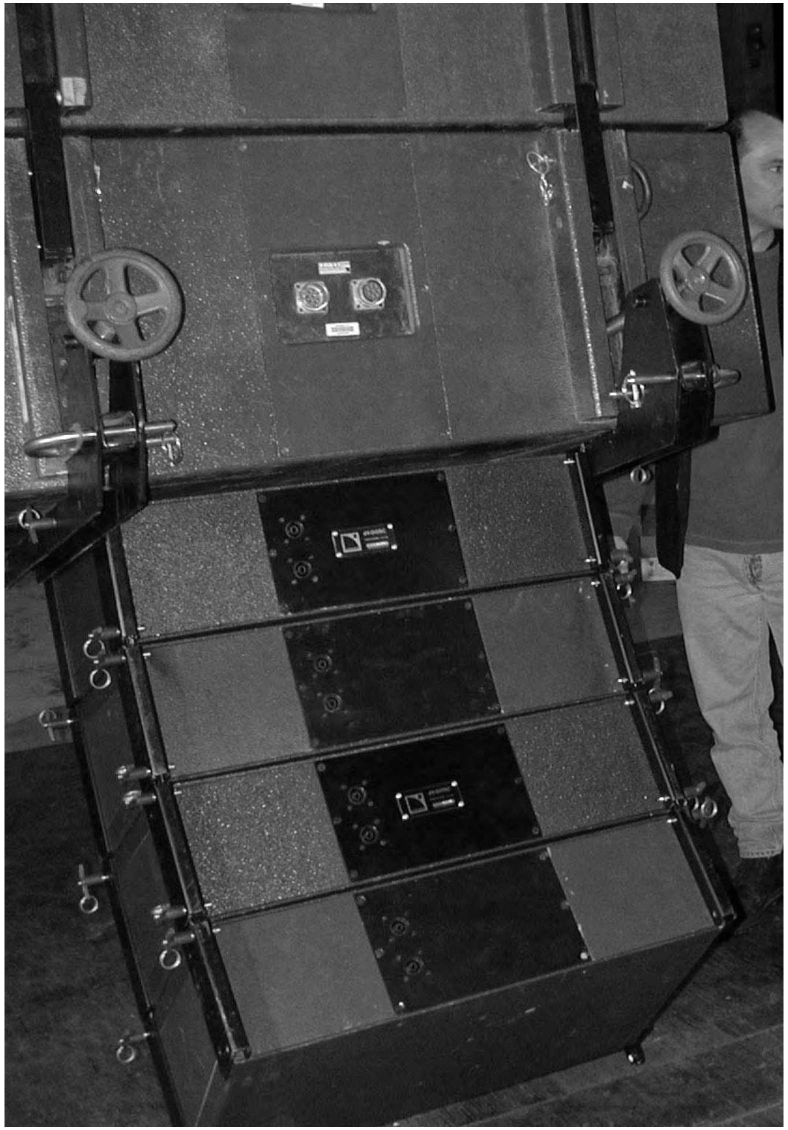
(vii) Pin all dV-DOSC at the rear using dV-PIN25

(viii) Connect ANGLE straps on bottom V-DOSC

(ix) Raise the ARRAY - note the gap



(x) Tighten screwjacks to remove this gap



(xi) dV-DOSC flown under V-DOSC

Figure 84: Rigging dV-DOSC below V-DOSC for downfill

Rigging dV-SUB Standalone

When rigging dV-SUB standalone, up to 6 enclosures deep can be flown from dV-BUMP or dV-BUMP2 (single or two point hang). Please refer to the photo sequence below in addition to the following description of dV-SUB rigging procedures.

To fly the system, the first dV-SUB enclosure is located at the rigging location and flipped onto it's stacking runners in the normal orientation. Four dV-ANGLESD are pre-attached to the dV-SUB using 4 x dV-PIN25, in preparation for attaching dV-BUMP. The "fat" part of the dV-ANGLESD is oriented towards the center of dV-SUB on both sides.

Note: Since there are no stacking runners on the top of dV-SUB, it is possible to select the stacked hole position on the dV-SUB end of dV-ANGLESD.

The next step is to place dV-BUMP or dV-BUMP2 into position and secure using 4 x dV-PIN25.

Attach the motor to dV-BUMP using an 18 mm shackle.

Note: Hole number 5 (from the front) on the central spreader bar will produce a "dead hung" array (i.e., approximately zero degree tilt angle). Hole numbers 6, 7 or 8 can be used for downwards tilt.

Raise the first dV-SUB enclosure off the ground with sufficient clearance to position the next dV-SUB enclosure underneath.

Pre-attach 4 x dV-ANGLESS to the second dV-SUB enclosure using 4 x dV-PIN25.

Slowly lower the first dV-SUB into position by mating the pre-attached dV-ANGLESS to the corresponding rigging slots on the first enclosure. Secure the two dV-SUBs using 4 x dV-PIN25.

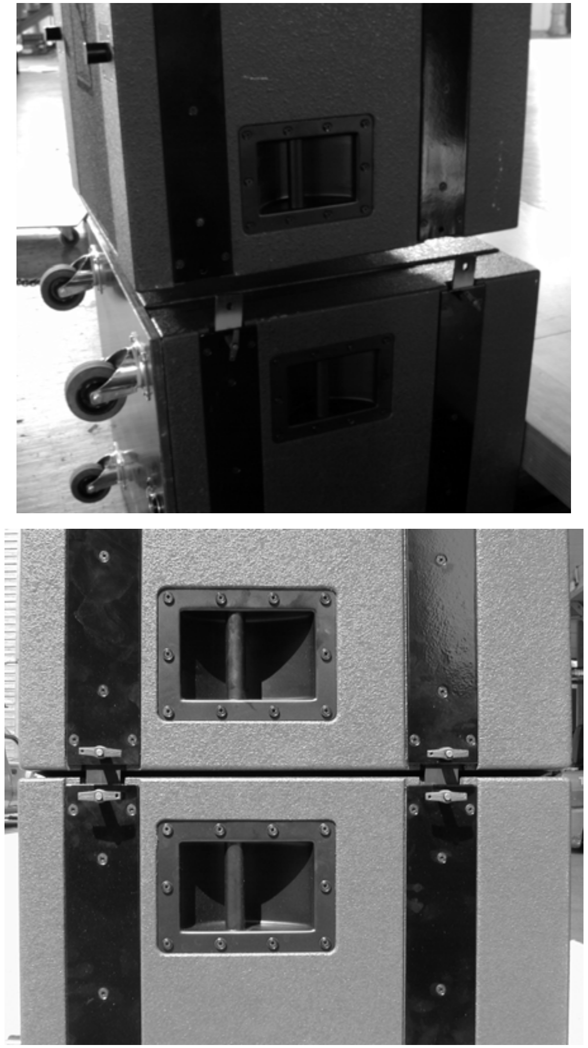
Repeat this procedure as the dV-SUB array is progressively flown.

(i) dV-ANGLESD pre-attached - note that the stacked hole position has been selected and the "fat" part of the angle bar is oriented towards the center

(ii) dV-BUMP placed into position and secured using 4 x dV-ANGLESD and 8 x dV-PIN25

(iii) Fly the first enclosure, pre-attach 4 x dV-ANGLESS, land on the second enclosure, secure using dV-PIN25 then repeat this procedure

(iv) Pick point hole #5 (from the front) on the central spreader bar section of dV-BUMP produces a dead hang (approx zero degree tilt)



Lower 1st dV-SUB into position and attach using 4 dV-PIN25

Figure 85: Rigging dV-SUB Standalone

Rigging dV-DOSC Under dV-SUB (3+1 configuration)

When rigging small configurations of dV-DOSC under a single dV-SUB (e.g., 1 dV-SUB with 3 dV-DOSC underneath), it is possible to fly the system in the same manner as dV-DOSC standalone, i.e., assemble the enclosures while they are face down on their dollies and fly the system as a whole.

Note: For larger configurations with more than 3 dV-DOSC flown under multiple dV-SUBs, see the following section for rigging procedures.

To fly the system, the dV-SUB enclosure is located at the rigging location (face down on it's dolley) and four dV-ANGLESD are pre-attached to the dV-SUB using 4 x dV-PIN25 (in preparation for attaching dV-BUMP). The "fat" part of the dV-ANGLESD is oriented towards the center of dV-SUB on both sides.

Note: Since there are no stacking runners on the top of dV-SUB, it is possible to select the stacked hole position on the dV-SUB end of dV-ANGLESD.

Place the dV-BUMP into position on dV-SUB and secure using 4 x dV-PIN25. The dV-BUMP is positioned so that the rear extension bar receptacle is oriented upwards. If desired, attach the extension bar to dV-BUMP using an 18 mm shackle at pick point hole #8 on the central spreader bar section of dV-BUMP. The extension bar allows the use of two motors for tilt adjustment or single point hangs from the 8 additional points available on the extension bar. If the extension bar is not used, 8 pick point positions are available on the central spreader bar section of dV-BUMP for single point hangs.

Pre-attach 2 x dV-ANGLESD at the (bottom) front and 2 x dV-ANGLESDP at the (bottom) rear of the dV-SUB using 4 x dV-PIN25. Recall that the outermost holes on these angle bars are used for flown applications (to provide clearance for the stacking runners) and the "fat" part of the angle bars is oriented towards the center of dV-SUB in order to mate properly with the dV-DOSC rigging panels.

Line up the 3 dV-DOSC enclosures in their flight case (3 per case) at the rigging location. Physically connect the fronts of all dV-DOSC enclosures by attaching the front points using pairs of dV-PIN25. The entire assembly is then physically linked, similar to how V-DOSC is attached using rotating legs and U-pins (except the attachment points are at the front in this case).

Referring to the angle values that were pre-calculated for each enclosure using ARRAY 2004 or SOUNDVISION, pre-attach pairs of dV-ANGLE bars at the rear of all dV-DOSC enclosures of the array (while they are still face down in their flight cases). Remember to keep the ball/tab end up as a reference and be careful to select the correct angle for each enclosure (generally, it is better if one person performs this operation to avoid mistakes).

Connect the rears of the 3 dV-DOSC enclosures (while they are still face down in their flight cases) by pulling the cabinets together at the rear and inserting dV-PIN25. This operation is facilitated by the fact that all fronts are pinned together and can pivot, plus all rear angles were pre-attached in the previous step.

Pre-connect the rear point for the first dV-DOSC to the dV-SUB, i.e., use 2 x dV-PIN25 to secure dV-DOSC to the dV-ANGLESDP that was pre-attached at the (bottom) rear of dV-SUB

Note: Selecting the 0 degree angle on dV-ANGLESDP (between the rear of the top dV-DOSC enclosure and dV-SUB) is necessary to compensate for the 3.75 degree trapezoidal angle of dV-DOSC versus the actual site angle of the enclosure which is perpendicular to the front. Selecting the 0 degree angle allows focus to be verified visually or with a laser attached to the bottom of dV-SUB since this will then be referenced to the actual site angle of the top dV-DOSC enclosure.

Connect all enclosures to the AMP RACKS using appropriate cables and adaptors (SP and DO2W or DO plus DOFILL) and SP.7 jumpers between enclosures for parallel operation. Long cable runs should be dressed and tied off to dV-BUMP for strain relief. Be careful not to connect more than 3 dV-DOSC enclosures in parallel.

Conduct a final inspection to make sure all cabling is correct, proper inter-enclosure angles have been selected and that all dV-PINs are in place and securely seated.

Connect the front and rear motors (or single motor) to dV-BUMP.

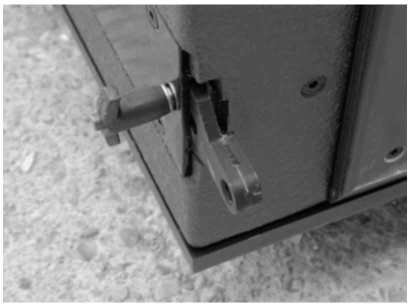
Slowly begin to raise the array. As the array lifts off, there will be a gap between the dV-SUB and dV-DOSC. One person on either side can lift/rotate the block of 3 dV-DOSC into position and then secure the front attachment points to dV-ANGLESD using 2 x dV-PIN25.

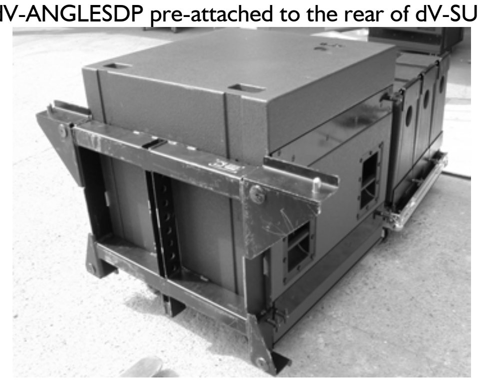
Steady the array as it lifts off the ground in order to prevent it from swinging and continue to lift the array until it is freely floating in air. For single point hangs, use a digital inclinometer to verify that the tilt angle of the top enclosure is correct before taking the array up to trim. If adjustment is required, lower the array and change the pick point until the desired site angle is obtained.

Table 20: EXAMPLE PICK POINT REFERENCE CHART
(1 dV-SUB, 3 dV-DOSC, 7.5 deg between all dV-DOSC)

dV-BUMP Hole # (0=front, 16=rear) 1-> 8 = center 9 -> 16 = ext bar	**dV-BUMP Site Angle** (= top dV-DOSC site angle provided 3.75 deg selected between top dV-DOSC and dV-SUB)
1	+14.7 deg
2	+11.1 deg
3	+7.7 deg
4	+3.7 deg
5	+0.5 deg
6	-4.5 deg
7	-8.25 deg
8	-11.9 deg
9	-20.8 deg
10	-24.0 deg
11	-27.2 deg
12	-30.3 deg
13	-33.1 deg
14	-35.7 deg
15	-38.2 deg
16	-40.6 deg

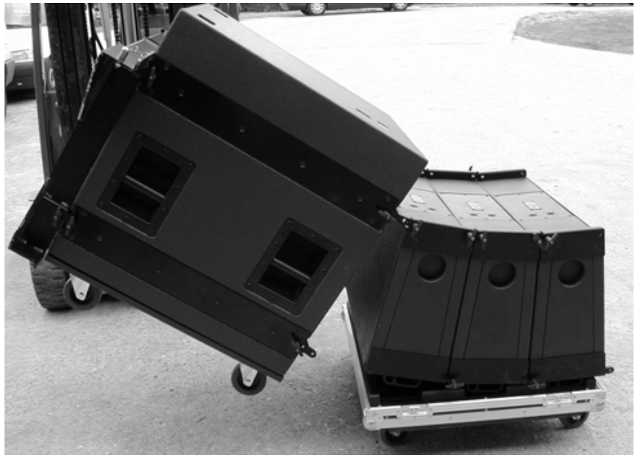

(i) dV-ANGLESDP pre-attached to the rear of dV-SUB


(ii) dV-ANGLESD pre-attached to the front of dV-SUB


(iii) dV-BUMP attached to dV-SUB using
4 x dV-ANGLESD and 8 x dV-PIN25

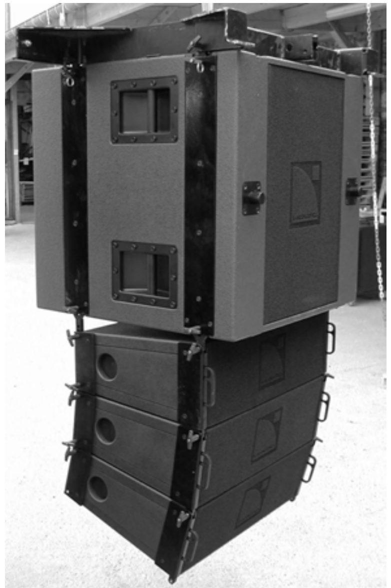

(iv) dV-DOSC located behind the array

(v) Attach rear points only (dV-SUB to dV-DOSC)



(vi) Houston - we have liftoff…

(vii) Lift dV-DOSC into position, secure front points using 2 x dV-PIN25



(viii) The flown array

Figure 86: Rigging dV-DOSC under dV-SUB (small configuration)

Rigging dV-DOSC Under dV-SUB (larger configurations)

When rigging larger configurations of dV-DOSC under dV-SUB (e.g., 2 dV-SUB with 6 dV-DOSC underneath), there are 2 possible procedures: 1) fly the system in the same manner as dV-DOSC standalone, i.e., assemble the enclosures face down on the ground and fly the system as a whole or 2) follow the dV-SUB standalone rigging procedure then fly dV-DOSC in blocks of three.

For both procedures, refer to the photo sequences below in addition to the following descriptions:

Procedure 1 (2 dV-SUB + 6 dV-DOSC)

dV-SUB enclosures are located at the rigging location (face down on their dolley boards) and four dV-ANGLESD are pre-attached to the dV-SUB using 4 x dV-PIN25 (in preparation for attaching dV-BUMP). The "fat" part of the dV-ANGLESD is oriented towards the center of dV-SUB on both sides.

Note: Since there are no stacking runners on the top of dV-SUB, it is possible to select the stacked hole position on the dV-SUB end of dV-ANGLESD.

Place dV-BUMP or dV-BUMP2 in position (oriented so that the rear extension bar is facing upwards) and secure using 4 x dV-PIN25. If desired, attach the extension bar to dV-BUMP using an 18 mm shackle at pick point #8 on the central spreader bar section. The extension bar allows the use of two motors for tilt adjustment or single point hangs from the 8 additional points available on the extension bar. If the extension bar is not used, 8 pick point positions are available on the central spreader bar section of dV-BUMP for single point hangs.

Pre-attach 4 x dV-ANGLESS on the second dV-SUB enclosure (still face down on its dolley) then physically connect to the first dV-SUB using 8 x dV-PIN25 total.

Pre-attach 2 x dV-ANGLESD at the (bottom) front and 2 x dV-ANGLESDP at the (bottom) rear of the second dV-SUB using 4 x dV-PIN25. Recall that the outermost holes on these angle bars are used for flown applications (to provide clearance for the stacking runners) and that the "fat" part of the angle bars is oriented towards the center of dV-SUB in order to mate properly with the dV-DOSC rigging panels.

Line up all dV-DOSC enclosures in their flight cases (3 per case). Mate the bottom rigging tabs from the first group of 3 cabinets with the top locator slots of the next group of cabinets. Repeat until all dV-DOSC flight cases are physically lined up.

Physically connect the fronts of all dV-DOSC enclosures by attaching the front points using pairs of dV-PIN25. The entire assembly will then be linked, similar to how V-DOSC is attached using rotating legs and U-pins (except the attachment points are at the front in this case).

Referring to the angle values that were pre-calculated for each enclosure using ARRAY2004 or SOUNDVISION, pre-attach pairs of dV-ANGLE bars at the rear of all dV-DOSC enclosures of the array (while they are still face down in their flight cases). Remember to keep the ball / tab end up as a reference and be careful to select the correct angle for each enclosure (generally, it is better if one person performs this operation to avoid mistakes).

Pre-connect <u>the front and rear points</u> for the first dV-DOSC to the dV-SUB, using 4 x dV-PIN25. Do not connect the rear of dV-DOSC #2 to #1 (this will be done as the system is flown). Do connect the rear of dV-DOSC #2 to #3.

Note : Selecting the 0 degree angle on dV-ANGLESDP (between the rear of the top dV-DOSC enclosure and dV-SUB) is necessary to compensate for the 3.75 degree trapezoidal angle of dV-DOSC versus the actual site angle of the enclosure which is perpendicular to the front. Selecting the 0 degree angle allows focus to be verified visually or with a laser attached to the bottom of dV-SUB since this will then be referenced to the actual site angle of the top dV-DOSC enclosure.

Except for the first block of 3 dV-DOSC, connect the rears of all other dV-DOSC enclosures in blocks of three (while they are still face down in their flight cases) by pulling the cabinets together at the rear and inserting dV-PIN25. This operation is facilitated by the fact that all fronts are pinned together and can pivot, plus all rear angles were pre-attached.

Connect all enclosures to the AMP RACKS using appropriate cables and adaptors (SP and DO2W or DO plus DOFILL) and SP.7 jumpers between enclosures for parallel operation. Long cable runs should be dressed and tied off to dV-BUMP for strain relief. Be careful not to connect more than 3 dV-DOSC enclosures in parallel. Conduct a final inspection to make sure all cabling is correct, proper inter-enclosure angles have been selected and that all dV-PINs are in place and securely seated.

Connect the front and rear motors (or single motor) to dV-BUMP. Slowly begin to raise the array. As the array lifts off, the rear gaps between dV-DOSC #1 to #2 and then between blocks of 3 cabinets will automatically close, allowing you to progressively pin the blocks together as system goes up.

Be careful to steady the array as it lifts off the ground in order to prevent it from swinging. Gradually lift the array until it is freely floating in air. For single point hangs, use a digital inclinometer to verify that the tilt angle of the top enclosure is correct before taking the array up to trim.

Procedure 2 (larger configurations)

For larger configurations it is best to follow the dV-SUB standalone rigging procedure (see above) and then fly dV-DOSC in blocks of 3 underneath the pre-flown dV-SUB array.

The first dV-SUB enclosure is located at the rigging location and flipped onto it's stacking runners in the normal orientation. Four dV-ANGLESD are pre-attached to the dV-SUB using 4 x dV-PIN25, in preparation for attaching dV-BUMP. The "fat" part of the dV-ANGLESD is oriented towards the center of dV-SUB on both sides and since there are no stacking runners on the top of dV-SUB, it is possible to select the stacked hole position on the dV-SUB end of dV-ANGLESD. The dV-BUMP is then placed in position and secured using 4 x dV-PIN25.

The chain motor is attached to dV-BUMP using an 18 mm shackle and the first dV-SUB enclosure is raised off the ground with sufficient clearance to position the next dV-SUB enclosure underneath.

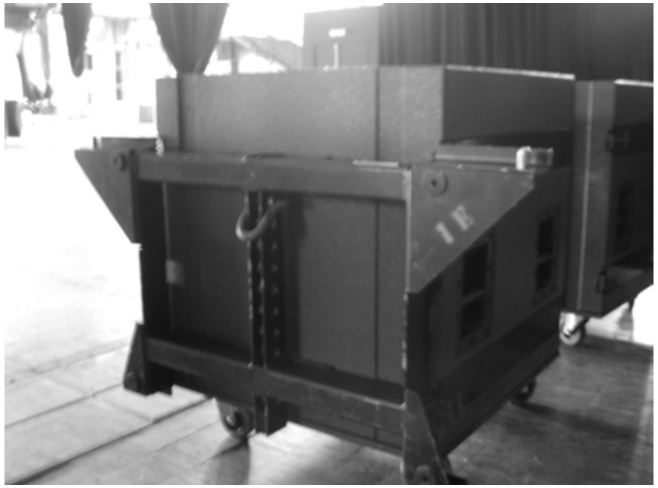
4 x dV-ANGLESS are pre-attached to the second dV-SUB enclosure (using 4 x dV-PIN25) and the first dV-SUB is slowly lowered into position by mating the pre-attached dV-ANGLESS to the corresponding rigging slots on the first enclosure. The two dV-SUBs are secured using 4 x dV-PIN25 and this procedure is repeated as the dV-SUB array is progressively flown.

Blocks of 3 dV-DOSC are then pre-assembled using the angles calculated in ARRAY2004 or SOUNDVISION. These blocks are then flipped out of their flight cases onto dV-SUB dolleys in order to position them under the dV-SUB array. Using dV-ANGLESD and dV-ANGLESDP for attachment of the first dV-DOSC, the dV-SUB array is lowered into position so that the front points can be attached. The system is then lifted and the first block of 3 dV-DOSC is raised/rotated into position and pinned at the rear. This procedure is then repeated for subsequent blocks of 3 dV-DOSC.

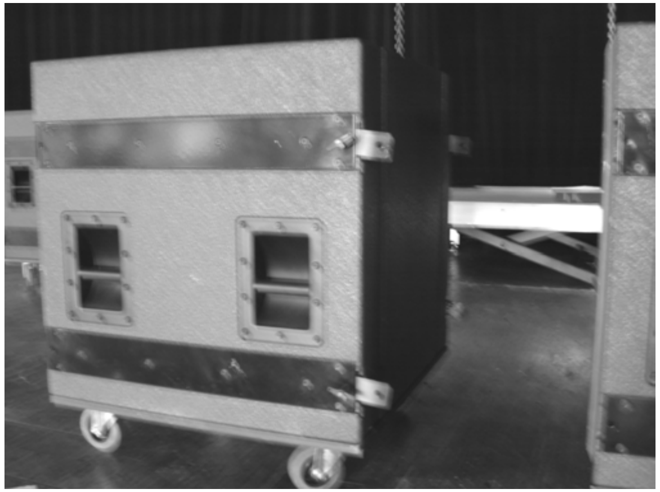
Table 21: EXAMPLE PICK POINT REFERENCE CHART

(2 dV-SUB, 6 dV-DOSC, 7.5 deg between all dV-DOSC)

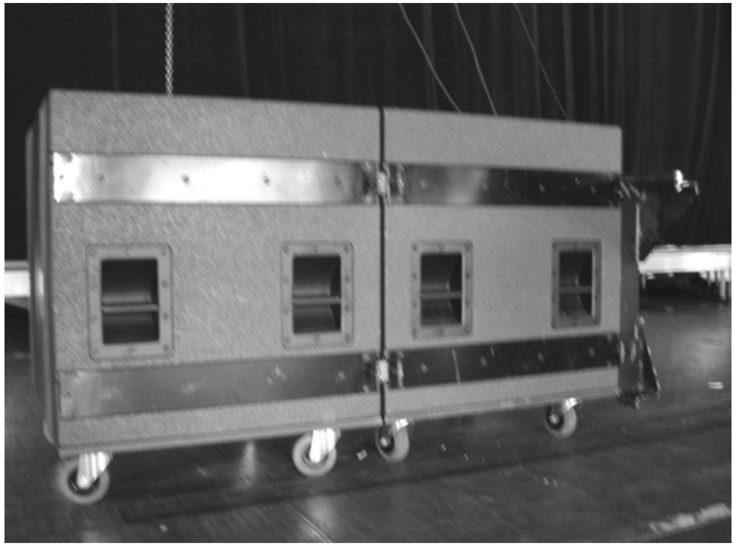
dV-BUMP Hole # (0=front, 16=rear) 1-> 8 = center 9 -> 16 = ext bar	**dV-BUMP Site Angle** (= top dV-DOSC site angle provided 3.75 deg selected between top dV-DOSC and dV-SUB)
1	+9.5 deg
2	+7.8 deg
3	+5.9 deg
4	+4.1 deg
5	+2.0 deg
6	0 deg
7	-1.9 deg
8	-4.1 deg



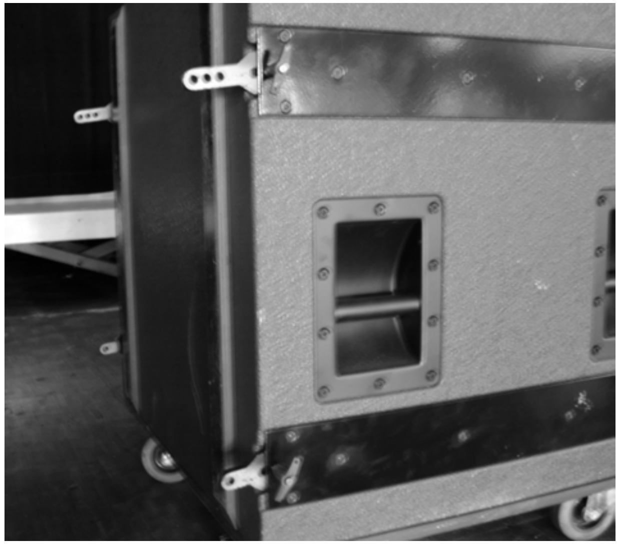
(i) dV-SUB with dV-BUMP attached using 4 x dV-ANGLESD and 8 dV-PIN25



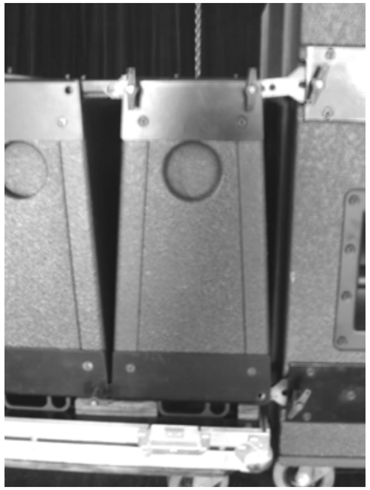
(ii) Second dV-SUB with 4 x dV-ANGLESS pre-attached



(iii) 2 x dV-SUB physically connected



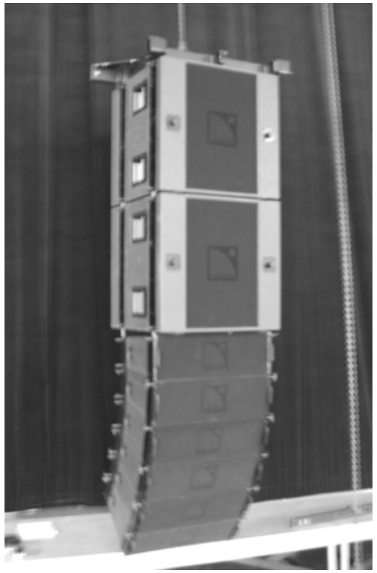
(iV) dV-ANGLESD (front) and dV-ANGLESDP (rear) pre-attached



(v) Preconnect the first dV-DOSC to dV-SUB, front and rear.
(Do not attach the dV-DOSC #2 to dV-DOSC #1)

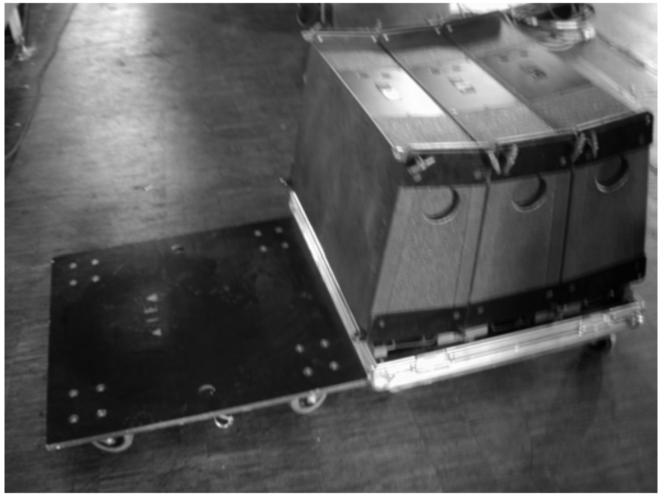
(vi) All dV-DOSC attached at front, in blocks of 3 at the rear
(except for dV-DOSC #1 to #2)

(vii) dV-DOSC #2 to #1 then blocks of 3 are attached as the array is raised



(viii) The flown system (2 dV-SUB + 6 dV-DOSC)

Figure 87: Rigging dV-DOSC under dV-SUB (larger configuration – procedure 1)

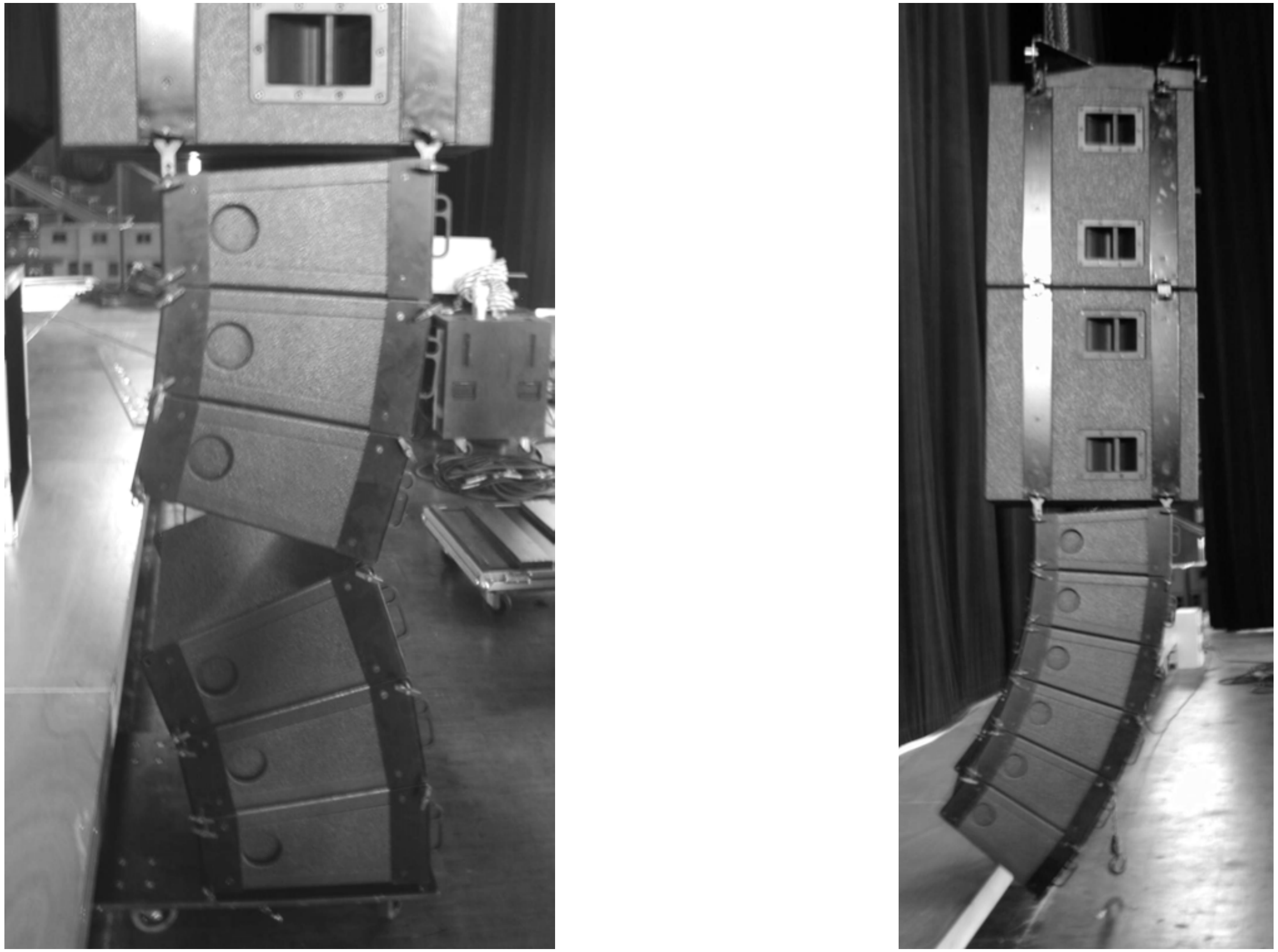


(i) dV-DOSC are pre-attached in blocks of 3

(ii) Flip dV-DOSC onto dV-SUB dolleys to position under the dV-SUB array

(iii) Standalone dV-SUB techniques (see above) are used to fly the dV-SUB array

(iv) dV-DOSC front point attachment using dV-ANGLESD.
The array is raised and rear points attached using dV-ANGLESDP



(v) The procedure is repeated for subsequent blocks of 3 dV-DOSC

Figure 88: Rigging dV-DOSC under dV-SUB (larger configuration – procedure 2)

SAFETY RULES

CAUTION: PLEASE FOLLOW THE GUIDELINES BELOW WHEN FLYING dV-DOSC AND dV-SUB

dV-BUMP OR dV-BUMP2 ONLY
(SINGLE OR TWO POINT HANG FROM CENTRAL SPREADER BAR POINTS)
- maximum 24 dV-DOSC enclosures

dV-BUMP OR dV-BUMP2 + EXTENSION BAR
(SINGLE POINT HANG FROM EXTENSION BAR POINTS)
- maximum 12 dV-DOSC enclosures

dV-BUMP OR dV-BUMP2 + EXTENSION BAR
(2 POINT HANG FROM dV-BUMP FRONT POINT AND EXTENSION BAR REAR POINT)
- maximum 12 dV-DOSC enclosures

dV-DOSC FLOWN UNDER V-DOSC USING dV-DOWN
- maximum 6 dV-DOSC enclosures
- 15 V-DOSC + 3 dV-DOSC maximum
- 14 V-DOSC + 6 dV-DOSC maximum

GROUND STACKED dV-DOSC (STANDALONE)
- 12 maximum using dV-BUMP + V-DOSC BUMPER provided that the dV-DOSC array is physically contained within the vertical footprint of the V-DOSC BUMPER.

dV-DOSC STACKED ON TOP OF V-DOSC - 6 maximum

Table 22: Maximum rated dV-SUB / dV-DOSC combinations (dV-DOSC flown below dV-SUB)
Single point hang from rear extension bar
or 2-point hang from dV-BUMP front point + extension bar rear point

dV-SUB	0	1	2	3	4	5	6
dV-DOSC	12	6	4	1	0	0	0
Total weight	414 kg 912 lbs	290 kg 639 lbs	316 kg 697 lbs	309 kg 681 lbs	368 kg 811 lbs	460 kg 1014 lbs	552 kg 1217 lbs

Table 23: Maximum rated dV-SUB / dV-DOSC combinations (dV-DOSC flown below dV-SUB)
Single point hang off central spreader bar

dV-SUB	0	1	2	3	4	5	6	6
dV-DOSC	24	9	8	7	6	4	1	0
Total weight	786 kg 1732 lbs	389 kg 858 lbs	448 kg 988 lbs	507 kg 1118 lbs	566 kg 1248 lbs	592 kg 1305 lbs	585 kg 1290 lbs	552 kg 1217 lbs

- All rigging should be performed by certified, trained personnel.
- Proper chain motor installation and operation is absolutely necessary under all circumstances.
- L-ACOUSTICS recommends the use of safeties at all times.
- Always refer to MECHANICAL DATA in ARRAY2004 or SOUNDVISION to ensure that safe rigging conditions apply before installation.
- Ensure that the immediate area is clear of people and obstacles whenever raising or lowering the array. Announce (in a loud voice) whenever the array is being moved to get people's attention. Always look up while moving the array to be sure that movement remains unimpeded and to check cable tension. Once flown to trim and correctly angled, remove motor control cables so that the array cannot be tampered with by unauthorized people. Always cover motors with plastic if motors might be exposed to rain.
- When flying dV-DOSC and/or dV-SUB, determine the overall weight of the system to be flown and determine chain motor ratings accordingly.
- When dV-DOSC is flown on top of, or below V-DOSC account for the additional weight and adjust your chain motor ratings accordingly.

5. MAINTENANCE AND INSTALLATION TOOLS

5.1 RECOMMENDED MAINTENANCE PROCEDURES

Regular maintenance procedures (monthly) include:

- component sweep (using sine wave generator or other suitable test system) and polarity check to ensure that all speakers and drivers are in good working order
- cable continuity test
- clean power amplifier filters

Periodic maintenance procedures (every 6-12 months) include:

- verify OEM factory presets up to date
- tighten high frequency diaphragm mounting fasteners
- inspect all rigging components for wear and replace as necessary
- inspect wiring harnesses, internal connections for all panels

Occasional (as necessary) maintenance procedures include:

- refoam grilles
- repaint cabinets

5.2 RECOMMENDED MAINTENANCE TOOLS

Table 24: Recommended Maintenance Tools

APPLICATION	dV-DOSC SERVICE TOOLS
As Required	#2 Phillips screwdriver
MF Speaker Mount	4 mm hex key
HF Diaphragm Mount	4 mm hex key
DOSC Waveguide Mount Bolt	10 mm socket

5.3 SPARE PARTS

Speakers

dV-DOSC HF driver (complete)	HP BC22
dV-DOSC HF diaphragm	HS BC22
dV-DOSC 8" loudspeaker	HP PH81
dV-DOSC 8" recone kit	HS PH81
dV-SUB 15" loudspeaker	HP PH153
dV-SUB 15" recone kit	HS PH153

Connectors

Female Panel Mount Speaker Connector (8 conductor)	CC 8B EF
Male Panel Mount Speaker Connector (8 conductor)	CC 8B EM
Female Speaker Connector – Line (8 conductor)	CC 8B FF
Male Speaker Connector – Line (8 conductor)	CC 8B FM
Male Panel Mount Link Connector (19 conductor)	CC 19B EM
Female Link Connector – Line (19 conductor)	CC 19B FF
Speakon Connector – Line (4 conductor)	CC 4 F
Speakon Connector – Panel Mount (4 conductor)	CC 4 ER
COMB Connector	CC 25SUBDM

Accessories

dV-BUMP shackle (18 mm)	CA-MAN 18
Front foam replacement	CM dV-DOSC, CM dV-SUB
Front grille	MC GRdV-DOSC, MC GRdV-SUB

5.4 RECOMMENDED INSTALLATION TOOLS

FOR SYSTEM FOCUS

Digital Inclinometers

- Handheld : Digital Protractor PRO 3600 (or equivalent)
  (check single point hangs, measure room dimensions)
- Remote: Lucas Anglestar or Rieker RAD2-70-B2
  (mount on top of the array to set site angle)

Laser Levels Laserline XPRO (or equivalent) – one for each array required

FOR DISTANCE MEASUREMENTS

- Laser Rangefinder Binoculars - Bushnell Yardage Pro (or equivalent)
- Laser Rangefinder - Leica Disto Classic or Hilti PD22 (or equivalent)
- 20 m (50 ft) tape measure (for setting array trim height)

PORTABLE COMPUTER

SOUNDVISION, Excel (for ARRAY 2004), WinMLS, SMAART or MLSSA measurement software, sound card, measurement mic/preamp, DSP control/programming software (Lake Contour, XTA Audiocore, BSS Soundbench2, BSS Soundweb)

Figure 89: Recommended Installation Tools

6. SPECIFICATIONS

6.1 dV-DOSC SPECIFICATIONS

L-ACOUSTICS specifications are based on measurement procedures which produce unbiased results and allow for realistic performance prediction and simulation. Some of these specifications will appear conservative when compared with other manufacturer's specifications. Measurements are conducted under free field conditions and scaled to a 1 m reference distance unless otherwise specified.

Frequency response (+/-3 dB)		160 Hz - 18 kHz (single unit)		
		100 Hz - 18 kHz (coupled array)		
Full system bandwidth with SB218		25 Hz - 18 kHz		
Sensitivity (average SPL over component's rated bandwidth, equivalent to 2.83 Vrms at 1 metre)				
MF		99 dB SPL	(100 - 800 Hz)	
HF		109 dB SPL	(800 - 18k Hz)	
Long Term Power Rating (100 Hz HPF for low section, pink noise with 6 dB crest factor)				
MF	55 Vrms	380 Wrms	1520 Wpeak	8 ohms
HF	23 Vrms	66 Wrms	260 Wpeak	8 ohms
Horizontal Directivity		120° (-6 dB points, symmetrical about main axis)		
		100° (-3 dB points, symmetrical about main axis)		
Vertical Directivity		defined by the shape of the array		

System Data	**Continuous SPL (flat array)**	**Continuous SPL (max curvature array)**
1 enclosure	127 dB	127 dB (vertical coverage not defined)
2 enclosures	133 dB	131 dB (15 degrees vertical coverage)
4 enclosures	139dB	135 dB (30 degrees vertical coverage)

COMPONENTS

MF	2 x 8" weather resistant loudspeaker, 2" voice coil, bass-reflex loaded
HF	1 x 1.4" neodymium compression driver, patented DOSC waveguide

CONSTRUCTION

Material	Baltic birch plywood, folded construction with aluminum top and bottom plates and metal reinforcement. Sealed, screwed cabinet construction. 3.75 degrees trapezoidal angle.
Finish	Maroon-gray™
Grill	Black epoxy-coated perforated steel, acoustically transparent foam
Features	Integrated flying hardware and handles
Dimension (WxHxD):	695 mm x 257 mm (front) x 171 mm (rear) x 476 mm (27.4 in x 10.1 in x 6.7 in x 18.7 in)
Weight:	31.8 kg (70.1 lbs)
Shipping Dimensions:	800 mm x 360 mm x 560 mm (31.5 in x 14.2 in x 22 in)
Shipping Weight:	35 kg (77.2 lbs)

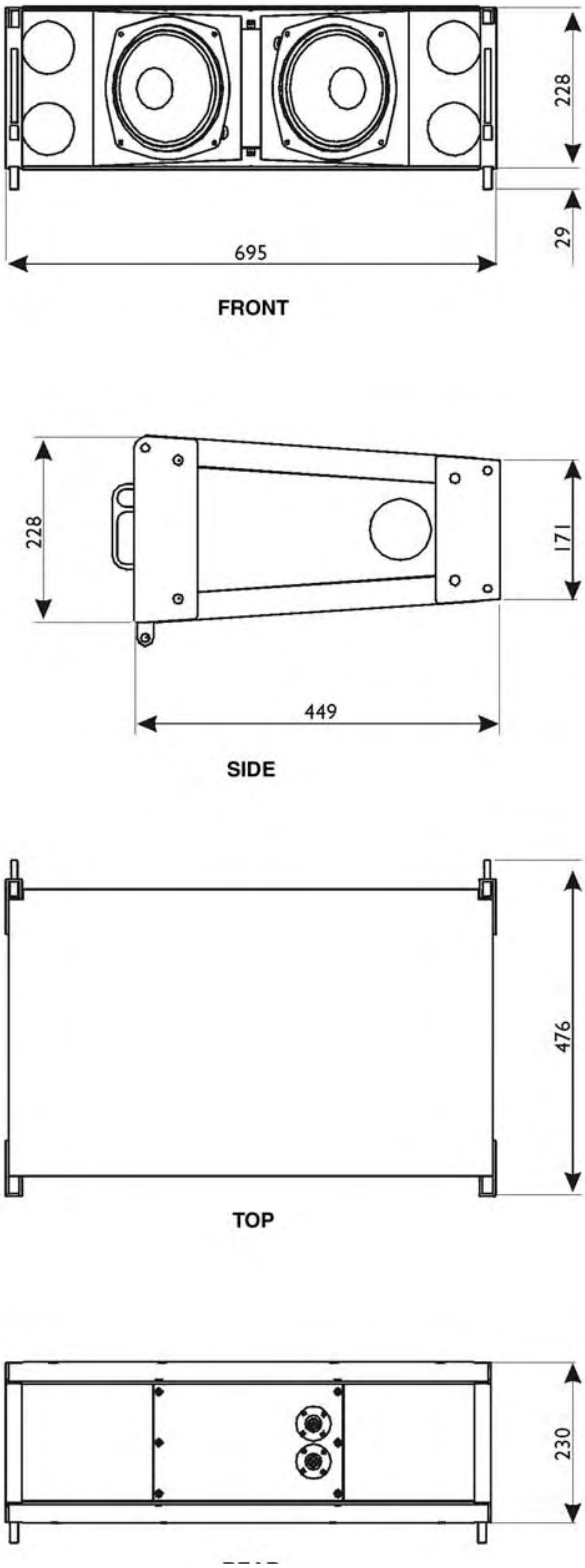


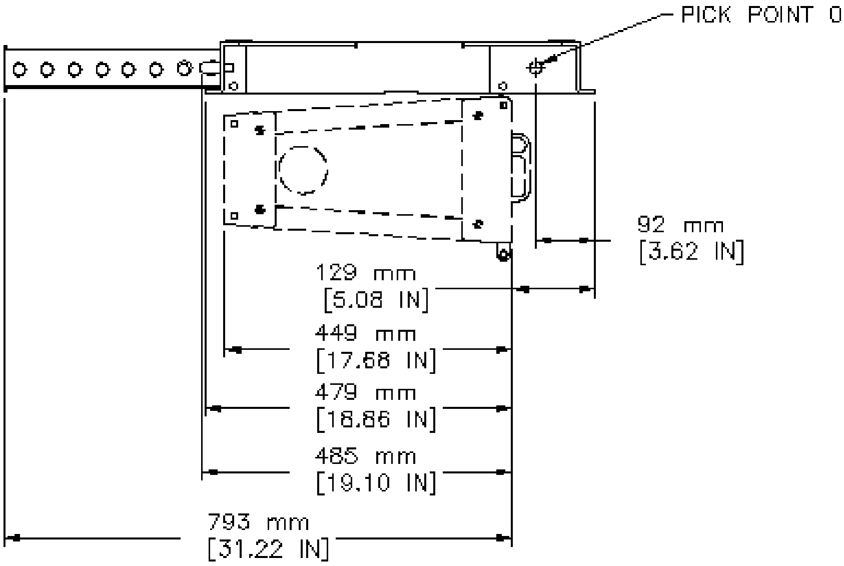
Figure 90: dV-DOSC Enclosure – Line Drawing

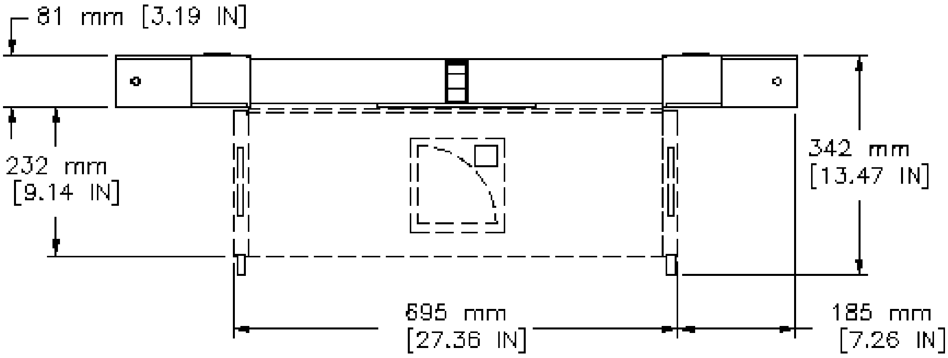
Number of dV-DOSC Cabinets	Cabinet Weight (kg)	Cabinet Weight (lbs)
2	63.6	140.2
3	95.4	210.3
4	127.2	280.4
5	159.0	350.5
6	190.8	420.6
7	222.6	490.7
8	254.4	560.9
9	286.2	631.0
10	318.0	701.1
11	349.8	771.2
12	381.6	841.3
13	413.4	911.4
14	445.2	981.5
15	477.0	1051.6
16	508.8	1121.7
17	540.6	1191.8
18	572.4	1261.9
19	604.2	1332.0
20	636.0	1402.1
21	667.8	1472.2
22	699.6	1542.3
23	731.4	1612.4
24	763.2	1682.6

Table 25: dV-DOSC weight per number of cabinets

dV-BUMP

Net Weight: 22.5 kg without extension bar (49.6 lbs)
32.0 kg with extension bar (70.5 lbs)





DISTANCE BETWEEN PICK POINTS		
PICK POINTS	X	
	MM	INCH
0-1	102	4.02
0-2	145	5.71
0-3	188	7.40
0-4	231	9.09
0-5	274	10.79
0-6	317	12.48
0-7	360	14.17
0-8	403	15.87
0-9	505	19.88
0-10	548	21.57
0-11	591	23.27
0-12	634	24.96
0-13	677	26.65
0-14	720	28.35
0-15	763	30.04
0-16	806	31.73

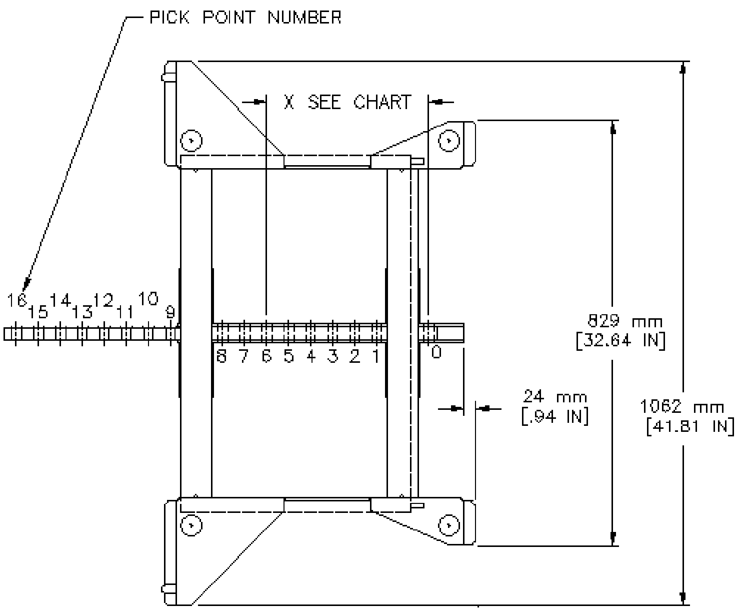


Figure 91: dV-BUMP – Line Drawing

6.2 dV-SUB SPECIFICATIONS

Frequency response (+/-3 dB)	40 - 200 Hz
Usable bandwidth	35 - 200 Hz
Recommended Filtering	80 to 200 Hz (4th order low pass filter)
	30 Hz (4th order high pass filter)

Sensitivity (average SPL over rated bandwidth, freefield conditions, without equalization, equiv to 2.83 Vrms at 1 metre)

104.5 dB SPL (40 - 200 Hz)

Long Term Power Rating (pink noise with 6 dB crest factor over rated bandwidth)			**Amplification**	**Impedance**
57 Vrms	1200 Wrms	4800 Wpeak	2400 W recommended	2.7 ohms

System Data	**SPL**	
1 enclosure	133 dB (cont)	139 dB (peak)
2 enclosures	139 dB (cont)	145 dB (peak)
4 enclosures	145 dB (cont)	151 dB (peak)

COMPONENTS

3 x 15" weather-resistant loudspeaker, 3" edgewound copper ribbon voice coil, vented bandpass loaded, die cast aluminum basket, massive vented magnet structure, high thermal capacity

CONSTRUCTION

Dimension (WxHxD):	695 mm x 708 mm x 695 mm (27.4 in x 27.9 in x 27.4 in)
Weight:	93 kg (205 lbs)
Shipping Dimensions: (including dV-SUBPLA)	795 mm x 790 mm x 890 mm (31.3 in x 31.1 in x 35 in)
Shipping Weight:	107 kg (235.9 lbs)
Connector	1x 4 pin Neutrik Speakon (1+/1-)
Material	24 mm Baltic birch plywood (sealed, screwed and rabbeted angles, internally braced)
Finish	Maroon-gray™
Grill	Black epoxy-coated perforated steel, acoustically transparent foam
Rigging	Integral flying hardware and handles

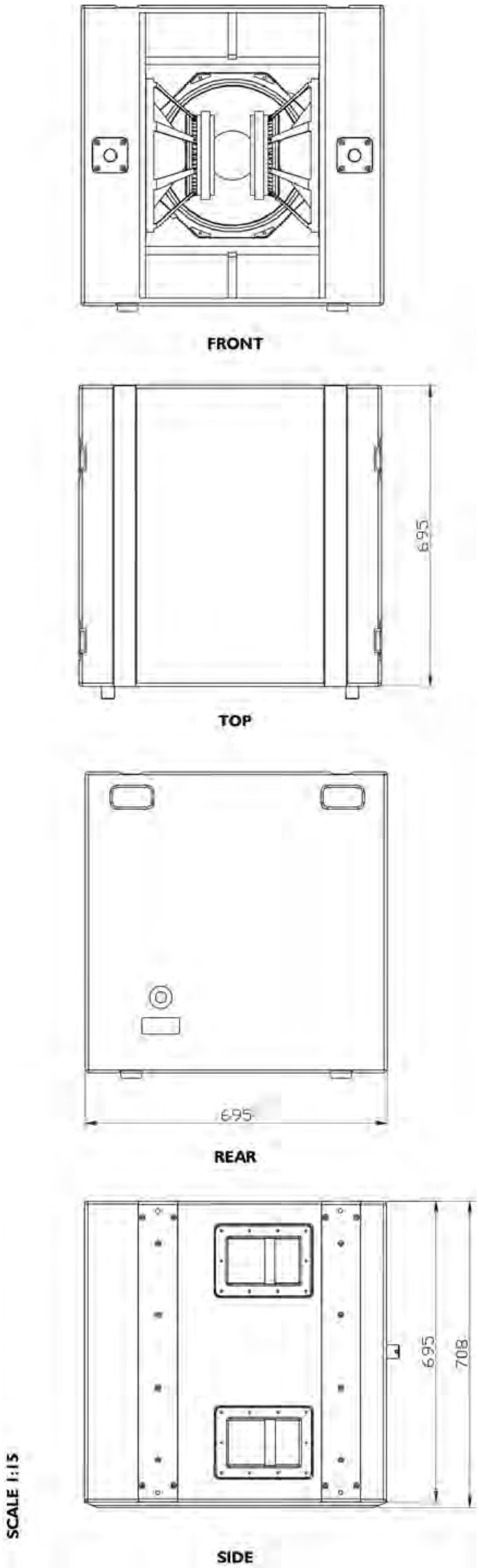


Figure 92: dV-SUB Line Drawing

APPENDIX 1:
HOW DOES dV-DOSC BEHAVE WITH RESPECT TO WST CRITERIA

The second Wavefront Sculpture Technology criterion: STEP $< \lambda/2$ over the frequency range of operation is fulfilled by a dV-DOSC array at low/mid frequencies.

With reference to Figure 93:

Acoustic centers between 8" speakers are separated by 25cm horizontally and 23 cm vertically. The 800 Hz crossover frequency utilitized for the low section corresponds to $\lambda/2 =$ 21.5 cm so that WST criteria is satisfied over the majority of the 8" operating bandwidth.

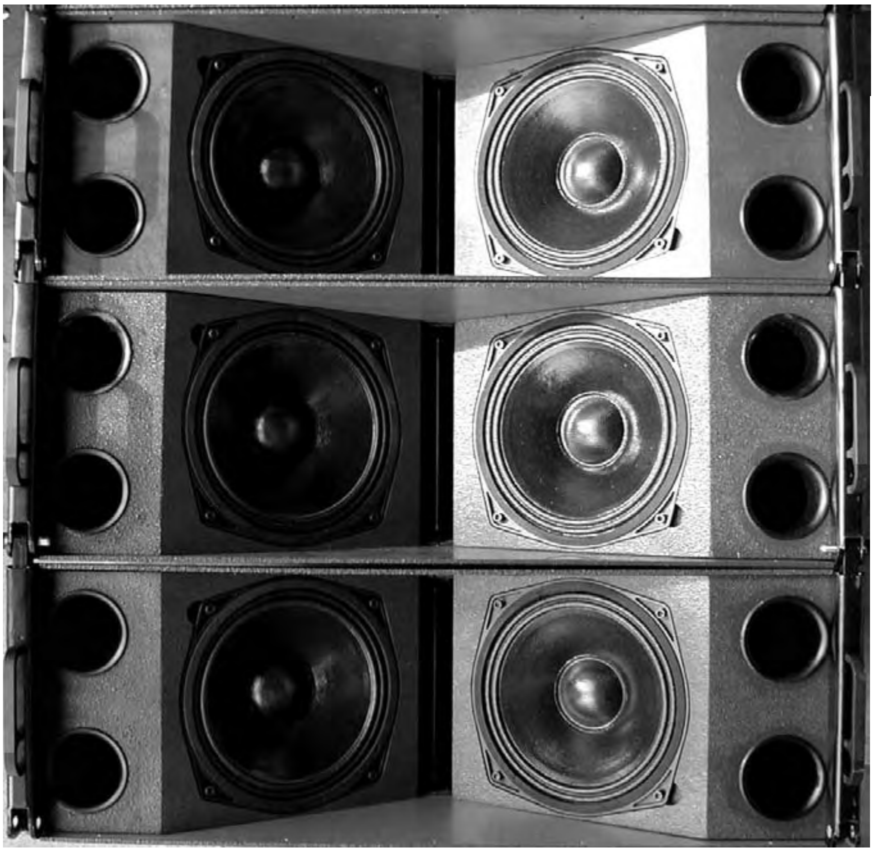
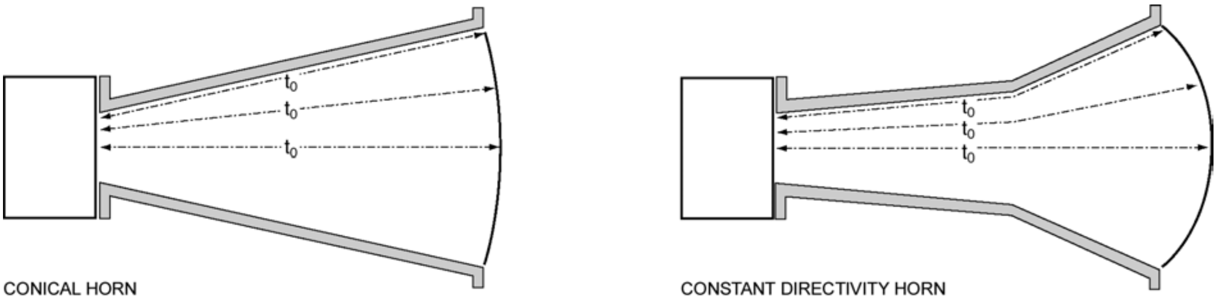


Figure 93: Front view of dV-DOSC array and vertically stacked DOSC waveguides

We have to fulfil the first WST criterion at higher frequencies since it is not possible to satisfy the second WST criterion, i.e., the wavelengths are too small to have the acoustic centers of adjacent components within $\lambda/2$. This is achieved by mounting a DOSC waveguide on the exit of each compression driver – this shapes the wavefront into a flat, rectangular constant phase source. Arraying DOSC waveguides and drivers then creates a flat isophasic ribbon that fulfils the first WST criterion (greater than 80% fill up to a maximum of 7.5 degrees between enclosures).

APPENDIX 2:
HOW DOES THE DOSC WAVEGUIDE WORK?

The DOSC waveguide is the result of careful analysis of the wave path from the exit of a compression driver, through the waveguide and the resulting wavefront shape at the exit of the device.



The wavefront emerging from a conical or constant directivity horn is the result of constant time arrivals for all possible wave paths radiated by the driver exit. The two examples shown above produce more or less curved wavefronts that obviously cannot meet the first WST criterion.

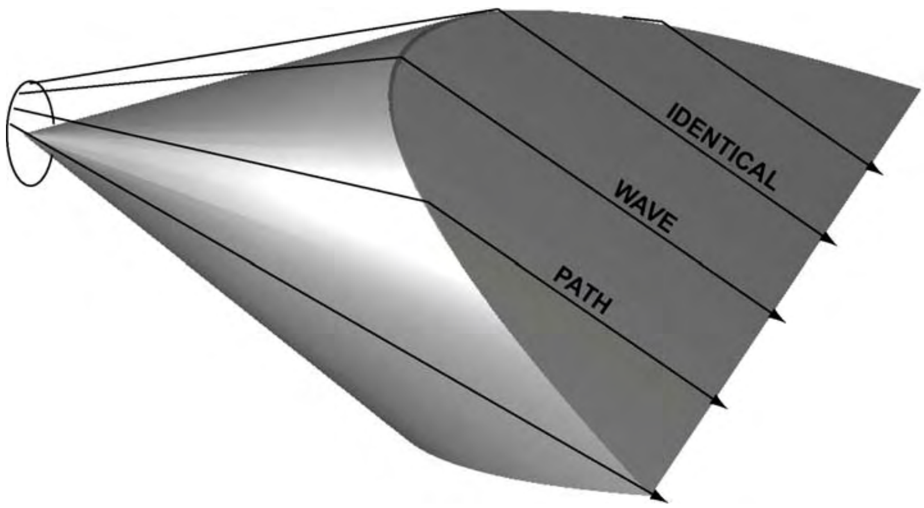


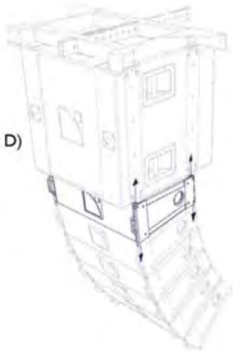
Figure 94: DOSC Waveguide – Internal Section

By comparison, the DOSC waveguide acts as a time alignment plug, delaying the arrival times of every possible wave path to be the same value at the rectangular exit of the device. The internal plug is a truncated conical piece that looks like a "tomahawk". This plug and its outer housing are precisely constructed according to specific ratios between depth, height and cone angle in order to produce a flat constant phase wavefront. Tight manufacturing tolerances are obtained through the use of computer aided design and manufacturing (CAD/CAM) techniques in the fabrication of the DOSC waveguide. As shown in the AES journal paper entitled "Wavefront Sculpture Technology", the deviation from a flat wavefront must be less than $\lambda/4$ at the highest operating frequency - this corresponds to less than 5 mm of curvature at 16 kHz and experiments have shown that the DOSC waveguide provides less than 4 mm of curvature at this frequency.

DOSC waveguide technology is patented on an international basis.
(n°0331566 in Europe, n°5163167 in North America)

DECLARATION OF CE CONFORMITY

For the product:



Catalog Item: dV-DOSC™

Description: L-ACOUSTICS® dV-DOSC loudspeaker enclosure

Dimensions: 695 mm x 257 mm x 476 mm (W x H x D)

Material: Baltic birch plywood
Aluminum top & bottom plates
External steel rigging plates

Optional accessories:
- dV-ANGLEP1 – angle bar (0, 2, 3.75, 5.5, 7.5°)
- dV-ANGLEP2 – angle bar (1, 3, 4.5, 6.5°)
- dV-ANGLEN – angle bar (0, -2, -3.75, -5.5, -7.5°)
- dV-PIN25 – locking quick release pin

Product Origin

Country of origin of the product: France
Country of origin for components of the product: EEC

Technical Specifications :

The dV-DOSC loudspeaker enclosure is intended for overhead suspension below the dV-BUMP or dV-BUMP2 rigging structure or stacking on top of the dV-BUMP or dV-BUMP2 rigging structure. dV-DOSC can also be suspended below the dV-SUB enclosure. The following chart indicates the safety factor when using the dV-DOSC system according to the conditions described in the dV-DOSC dV-SUB OPERATOR MANUAL, Version 2 or later :

dV-DOSC	
Weight	32 Kg / 70.6 lbm
WLL	768 daN / 1726 lbf
Ultimate Strength Safety Factor	>5

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e-mail : info@l-acoustics.com
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330 596 800 RCS EVRY
TVA (VAT) : FR 41330596800

Standards Conformity

dV-DOSC loudspeaker enclosures are designed to be suspended from the rigging structures dV-BUMP or dV-BUMP2 only, in accordance with published L-ACOUSTICS instructions.

Up to 24 dV-DOSC can be suspended in a vertical column below the dV-BUMP or dV-BUMP2 rigging structure when used as a suspension frame with 1 or 2 rigging points located inside the dV-BUMP or dV-BUMP2 frame.
Up to 12 dV-DOSC can be suspended in a vertical column below the dV-BUMP or dV-BUMP2 rigging structure when used as a suspension frame with 1 rigging point located on the extension bar of the dV-BUMP or dV-BUMP2.
Up to 12 dV-DOSC can be stacked when the dV-BUMP is used as a stacking platform (in combination with the BUMP2 rigging structure, please refer to the user manual for details about this configuration).

Mixed configurations can be achieved when rigging dV-DOSC below the dV-SUB enclosure, please refer to the user manual for details about possible configurations.

Adjacent dV-DOSC enclosures are securely attached to each other and to the dV-BUMP/dV-BUMP2 rigging structure using the angle bars dV-ANGLEP1 and dV-ANGLEP2. Locking quick release pins secure the attachment of the angle bars to the dV-DOSC enclosure.

L-ACOUSTICS has engineered the dV-DOSC loudspeaker enclosure using state of the art modeling and calculation software. The rigging parts of the dV-DOSC enclosure have been destructively tested to validate the final design using a pulling bench equipped with laboratory calibrated measuring cells.

L-ACOUSTICS hereby declares that the above products conform to :
1. **The Machinery Directive 98/37/CE**, Part 4 : Lifting Accessories
2. **Low Voltage Directive 73/23/CE** (harmonized standard EN60065).

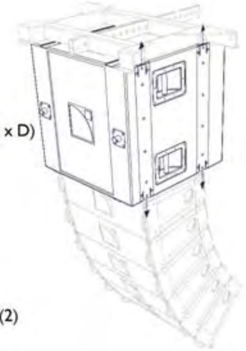
Established at Marcoussis, France, on the 21st of September, 2004

Signature of L-ACOUSTICS representative :

Jacques Spillmann
Chief Engineer - Manufacturing

DECLARATION OF CE CONFORMITY

For the product:



Catalog Item: dV-SUB

Description: L-ACOUSTICS® dV-SUB loudspeaker enclosure

Dimensions: 695 mm x 708 mm x 695 mm (W x H x D)

Material: Baltic birch plywood
External steel rigging plates

Optional accessories:
- dV-ANGLESS – angle bar dV-SUB / dV-SUB
- dV-ANGLESD – angle bar dV-SUB / dV-DOSC™ or dV-SUB / dV-BUMP(2)
- dV-ANGLESDP – angle bar dV-SUB / dV-DOSC™
- dV-PIN25 – locking quick release pin

Product Origin

Country of origin of the product: France
Country of origin for components of the product: EEC

Technical Specifications :

The dV-SUB loudspeaker enclosure is intended for overhead suspension below the dV-BUMP or dV-BUMP2 rigging structure or stacking on the ground. The following chart indicates the safety factor when using the dV-SUB system according to the conditions described in the dV-DOSC dV-SUB OPERATOR MANUAL, Version 2 or later :

dV-SUB	
Weight	93 Kg / 205 lbm
WLL	850 daN / 1910 lbf
Ultimate Strength Safety Factor	>8

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Standards Conformity

dV-SUB loudspeaker enclosures are designed to be suspended from the rigging structures dV-BUMP or dV-BUMP2 only, in accordance with published L-ACOUSTICS instructions.

Up to 6 dV-SUB can be suspended in a vertical column below the dV-BUMP rigging structure when used as a suspension frame with 1 or 2 rigging points located inside the dV-BUMP frame. The dV-BUMP2 rigging structure allows the suspension of 9 dV-SUB in the same conditions.

Up to 6 dV-SUB can be suspended in a vertical column below the dV-BUMP or dV-BUMP2 rigging structure when used as a suspension frame with 1 rigging point located on the extension bar of the dV-BUMP or dV-BUMP2.

Mixed configurations can be achieved when rigging dV-DOSC below the dV-SUB enclosure, please refer to the user manual for details about possible configurations.

dV-SUB enclosures are attached to dV-BUMP/dV-BUMP2 using dV-ANGLESD angle bars. Adjacent dV-SUB enclosures are attached using dV-ANGLESS angle bars. dV-DOSC is attached to dV-SUB using dV-ANGLESD and dV-ANGLESDP angle bars. All angle bars are secured using locking quick release pins.

L-ACOUSTICS has engineered the dV-SUB loudspeaker enclosure using state of the art modeling and calculation software. The rigging parts of the dV-SUB enclosure have been destructively tested to validate the final design using a pulling bench equipped with laboratory calibrated measuring cells.

L-ACOUSTICS hereby declares that the above products conform to :
1. **The Machinery Directive 98/37/CE**, Part 4 : Lifting Accessories
2. **Low Voltage Directive 73/23/CE** (harmonized standard EN60065).

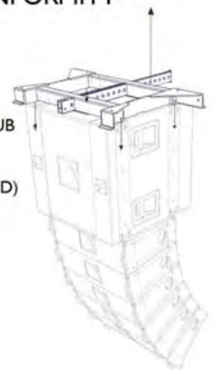
Established at Marcoussis, France, on the 21st of September, 2004

Signature of L-ACOUSTICS representative :

Jacques Spillmann
Chief Engineer - Manufacturing

DECLARATION OF CE CONFORMITY

For the product:



Catalog Item: dV- BUMP

Description: L-ACOUSTICS® dV-DOSC™ and dV-SUB Rigging Structure

Dimensions: 1062 mm x 79 mm x 608 mm (W x H x D)

Material: Steel

Supplied with the following accessories :
- 3 x 18 mm shackle WLL 1T - CA_MAN18
- 8 x Locking quick release pin – CA_DVPIN25
- 1 x Locking quick release pin – CA_DVPIN81
- 4 x Angle bar - MC_DVANGLP1
- 1 x Pin – MC_DVGOUP
- 1 x Extension bar MC_DVRAL

Product Origin

Country of origin of the product: France
Country of origin for components of the product: EEC

Technical Specifications :

The dV-BUMP rigging structure allows for suspension of dV-DOSC and dV-SUB loudspeaker enclosures and can also be used as a stacking platform for dV-DOSC loudspeakers. The following chart indicates the safety factor when using the dV-DOSC system according to the conditions described in the dV-DOSC dV-SUB OPERATOR MANUAL, Version 2 or later :

dV-BUMP	NO extension bar	WITH extension bar
Weight	23 Kg / 50.7 lbm	32 Kg / 70.6 lbm
WLL	768 daN / 1726 lbf	384 daN / 863 lbf
Ultimate Strength Safety Factor	>5	>4

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330 396 800 RCS EVRY
TVA (VAT) : FR 41330596800

Standards Conformity

dV-DOSC and dV-SUB loudspeaker enclosures are designed to be suspended from the rigging structure dV-BUMP or dV-BUMP2 only, in accordance with published L-ACOUSTICS instructions.

Up to 24 dV-DOSC can be suspended in a vertical column below the dV-BUMP rigging structure when used as a suspension frame with 1 or 2 rigging points located inside the dV-BUMP frame.
Up to 12 dV-DOSC can be suspended in a vertical column below the dV-BUMP rigging structure when used as a suspension frame with 1 rigging point located on the extension bar of the dV-BUMP.
Up to 12 dV-DOSC can be stacked when the dV-BUMP is used as a stacking platform (in combination with the BUMP2 rigging structure, please refer to the user manual for details about this configuration).

Mixed configurations can be achieved when rigging dV-DOSC below the dV-SUB enclosure, please refer to the user manual for details about possible configurations.

Adjacent dV-DOSC enclosures are securely attached to each other and to the dV-BUMP rigging structure using the angle bars dV-ANGLEP1 and dV-ANGLEP2. Locking quick release pins secure the attachment of the angle bars to the dV-DOSC enclosure.

L-ACOUSTICS has engineered the dV-BUMP rigging structure using state of the art modeling and calculation software. The dV-BUMP rigging structure has been destructively tested to validate the final design using a pulling bench equipped with laboratory calibrated measuring cells.

L-ACOUSTICS hereby declares that the above products conform to :
1. **The Machinery Directive 98/37/CE**, Part 4 : Lifting Accessories
2. **Rules for the Design of Hoisting Appliances,** European Federation of Materials Handling and Storage Equipment (FEM 1.001).

Established at Marcoussis, France, on the 21st of September, 2004

Signature of L-ACOUSTICS representative :

Jacques Spillmann
Chief Engineer - Manufacturing

DECLARATION OF CE CONFORMITY

For the product:

Catalog Item: dV- BUMP2

Description: L-ACOUSTICS® dV-DOSC™ and dV-SUB Rigging Structure

Dimensions: 693 mm x 73 mm x 541 mm (W x H x D)

Material: Steel with high yield limit
Aluminum (Extension Bar)

Supplied with the following accessories :
- 3 x 18 mm shackle WLL 1T - CA_MAN18
- 8 x Locking quick release pin – CA_DVPIN25
- 4 x Angle bar - MC_DVANGLP1
- 1 x Extension bar MC_DVRALET

Product Origin

Country of origin of the product: France
Country of origin for components of the product: EEC

Technical Specifications :

The dV-BUMP2 rigging structure allows for suspension of dV-DOSC and dV-SUB loudspeaker enclosures and can also be used as a stacking platform for dV-DOSC loudspeakers. The following chart indicates the safety factor when using the dV-DOSC system according to the conditions described in the dV-DOSC dV-SUB OPERATOR MANUAL, Version 2 or later :

dV-BUMP2	NO extension bar	WITH extension bar
Weight	12.5 Kg / 27.6 lbm	15.8 Kg / 34.8 lbm
WLL	855 daN / 1922 lbf	570 daN / 1281 lbf
Ultimate Strength Safety Factor	>8	>4

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Standards Conformity

dV-DOSC and dV-SUB loudspeaker enclosures are designed to be suspended from the rigging structure dV-BUMP or dV-BUMP2 only, in accordance with published L-ACOUSTICS instructions.

Up to 24 dV-DOSC can be suspended in a vertical column below the dV-BUMP2 rigging structure when used as a suspension frame with 1 or 2 rigging points located inside the dV-BUMP or dV-BUMP2 frame.
Up to 12 dV-DOSC can be suspended in a vertical column below the dV-BUMP2 rigging structure when used as a suspension frame with 1 rigging point located on the extension bar of the dV-BUMP2.
Up to 6 dV-DOSC can be stacked on top of the dV-BUMP2 as long as the total system weight does not exceed the Working Load Limit of the dV-BUMP2.

Mixed configurations can be achieved when rigging dV-DOSC below the dV-SUB enclosure and for stacking dV-DOSC on top of dV-SUB using dV-BUMP2, please refer to the user manual for details about possible configurations.

Adjacent dV-DOSC enclosures are securely attached to each other and to the dV-BUMP2 rigging structure using the angle bars dV-ANGLEP1 and dV-ANGLEP2. Locking quick release pins secure the attachment of the angle bars to the dV-DOSC enclosure.

L-ACOUSTICS has engineered the dV-BUMP2 rigging structure using state of the art modeling and calculation software. The dV-BUMP2 rigging structure has been destructively tested to validate the final design using a pulling bench equipped with laboratory calibrated measuring cells.

L-ACOUSTICS hereby declares that the above products conform to :
1. **The Machinery Directive 98/37/CE**, Part 4 : Lifting Accessories
2. **Rules for the Design of Hoisting Appliances,** European Federation of Materials Handling and Storage Equipment (FEM 1.001).

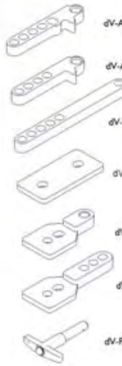
Established at Marcoussis, France, on the 21st of September, 2004

Signature of L-ACOUSTICS representative :

Jacques Spillmann
Chief Engineer - Manufacturing

DECLARATION OF CE CONFORMITY

For the product :



Catalog Item : dV-DOSC™ ANGLE BARS :
- dV-ANGLEP1 (0, 2, 3.75, 5.5, 7.5°)
- dV-ANGLEP2 (1, 3, 4.5, 6.5°)
- dV-ANGLEN (0, -2, -3.75, -5.5, -7.5°)

dV-SUB ANGLE BARS :
- dV-ANGLESS
- dV-ANGLESD
- dV-ANGLESDP

dV-PIN25 – locking quick release pin

Description: Accessories for the L-ACOUSTICS® dV-DOSC / dV-SUB system

Material : Steel (BARS)
Treated stainless steel (PIN)

Product Origin

Country of origin of the product : France
Country of origin for components of the product : EEC and USA

Technical Specifications :

Ultimate Strength Limit *	
dV-DOSC ANGLE BARS	>2200 daN / 4945 lbf
dV-SUB ANGLE BARS	>3500 daN / 7868 lbf
LOCKING QUICK RELEASE PIN	>9000 daN / 20232 lbf

** obtained by Destructive Testing using a pulling bench equipped with laboratory calibrated measuring cells.*

Standards Conformity

L-ACOUSTICS hereby declares that the above product conforms to :
1. **The Machinery Directive 98/37/CE**, Part 4 : Lifting Accessories

Established at Marcoussis, France, on the 21st of September, 2004

Signature of L-ACOUSTICS representative :

Jacques Spillmann
Chief Engineer - Manufacturing

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