VTC PRO AUDIO

Elevation Series ELS212

Subwoofer

Features:

- Tapped Horn Subwoofer Design (patent pending)
- Extremely High SPL for Cabinet Size
- Low Distortion Down to 35Hz
- Solid Marine Grade Plywood Cabinet Construction
- Available in Touring and Fixed Installation Versions
- Excellent for All Throw Distances

Description:
The Elevation Series ELS212 Subwoofer uses an innovative new technology developed by Tom Danley called a Tapped Horn design (patent pending). The Tapped Horn maximizes driver efficiency by allowing radiation from the rear of the driver to enter the system at a tap, located further down the horn flare towards the mouth.

Built for long term reliability in even the most demanding touring application (ELS212t) or fixed installation (ELS212i), the Elevation Series Tapped Horn subwoofers use high quality proprietary 12-inch neodymium drivers by 18 Sound and are built in North America using a solid void-free marine grade Baltic birch plywood cabinet construction.

The Application of Tapped Horn Technology

ELS212 Subwoofer
The Elevation Series Tapped Horn Subwoofer (patent pending) allows the radiation from the rear side of the twin 12-inch long excursion drivers used in the ELS212 to enter the horn at the tap, as well as the throat of the horn.

Since the rear of the drivers are much closer to the mouth of the horn, at very low frequencies they are effectively de-coupled from the system and this radiation does not affect the total output. As frequency increases the situation changes and the rear of the drivers begin to be coupled to the horn.

When the frequency is such that the horn is one-half wavelength long the rear of the driver is fully coupled to the horn. The pressure from the front and rear of the driver are of reverse polarity; a 180° phase shift at all frequencies. The pressure from the front of the drivers (at the throat) and the pressure from the rear of the drivers (close to the mouth) are now approximately one-half wavelength apart. This represents a phase shift of 180°. At this frequency both the front and rear of the drivers are driving the horn in phase. When this happens the drivers' radiating surface area (Sd), as far is the horn is concerned has almost doubled since the driver radiates from the front and back of the diaphragm.

In real world applications where the measured SPL is comparable for a conventional vented horn and a tapped horn design, the diaphragm excursion of the drivers are greatly reduced due to the acoustical loading of the horn. This decrease in excursion will translate directly into lower distortion and far higher output capability from the Tapped Horn.

Specifications:

Configuration	Tapped Horn Passive Subwoofer
Driver Components	12-inch Long Excursion Neodymium Woofers (x2)
Frequency Response:	40Hz-200Hz (-3dB)
	35Hz-260Hz (-10dB)
Continuous Power	1600 watts Program
Sensitivity (measured 1w/1m)	103dB
Maximum SPL	134 dB
Nominal Impedance	4 Ohms
Recommended Processing	20Hz High pass @ 24dB/Octave Linkwitz – Reilly
	90Hz to 100Hz Low pass @ 24dB/Octave Linkwitz – Reilly
Connectors	Neutrik Speakon® NL4MPR in parallel (x2)
Enclosure Material	5/8-inch 11-ply Baltic birch
Finish	Black ultrathane paint
Grille:	Perforated formed powder coated steel
Dimensions (DWH x backW, inches)	33 x 28.4 x 22.5
Dimensions (DWH xbackW, cm)	83.8 x 72.1 x 57.2
Weight (lbs/kg)	169.5 / 77

Specifications subject to change without notice.

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The Theory behind Tapped Horn Technology
(*Patent Pending*)

Horns have been used for decades in sound reinforcement to increase the loading on the loudspeaker driver. This is done to increase the power transfer from the driver to the environment in which the sound is radiated. For maximum power transfer to occur an impedance match between the loudspeaker driver and the free air in which it is operating must be established. A horn is the means to this impedance match. For a horn to operate properly it must not be acoustically small compared the frequencies (wavelengths) it is to radiate.

Conventional horn design is based on this assumption. To meet this requirement the horn needs to be at least one-half wavelength long at the low frequency cut-off of the horn and the circumference of the mouth must be at least one wavelength. When used for low frequency (long wavelength) reproduction this can make for a very large unwieldy horn that can become impractical to build or to move in real world applications.

A common practice used in conventional subwoofer design is to reduce horn size to only one-quarter of a wavelength long at the low frequency cut-off. This “short cut” has some very interesting and not entirely desirable effects on a horn’s performance. The net result is that, while there is output from a “short cut” subwoofer horn design in its low frequency range, the horn will not yield efficient power transfer until it begins to reproduce higher frequencies closer to one-half wavelength long relative to the horn dimensions.

In order for a quarter wavelength horn design to be driven efficiently, it is imperative that we understand the conditions presented to the driver at the horn’s throat and match these conditions for maximum power transfer.

A quarter wavelength resonance will have a velocity minimum at the throat compared to the half wavelength resonance that will have a velocity maximum at the throat. The velocity minimum condition requires that the proper loudspeaker driver have a much stronger motor (larger magnet) and a larger moving mass than conventional horn theory dictates. The downside is that this driver is not at all well suited to drive a conventional horn, and once the frequencies present in the audio program increase to the point that the horn is at least one-half wavelength a conventional horn is exactly what we have. Any efficiencies gained in the extremely low end with a heavier driver is quickly lost as frequency rises.

Since it is obvious that no loudspeaker driver that can change physical size, weight and mechanical parameters depending on frequency, the solution is to reinvent the horn, not the driver.

Elevation Series ELS212

Flying Details – Touring Version (ELS212t)

Rigging, Flyware & Bumpers
The custom designed Elevation Series' rigging hardware provides a rugged, extremely secure suspension system for large-scale flown arrays. Individual cabinets are attached together and angled using quick-attach pins, included with the frame.

Two optional Elevation Series flying bumpers are available for Elevation Series line array cabinets. The ELB16 bumper can handle up to 18 EL210t boxes in a flown in a vertical array, and is the ideal large format bumper for full scale touring systems and J-Arrays from trussing or roof rigging. Elevation Series ELS212t subwoofers can be flown in the same vertical array with the EL210t full range enclosures for convenient fully flown touring systems with the ELB16.

The ELB8 bumper can handle up to 12 EL210t boxes in a flown straight vertical array, or any combination of ELS212t subwoofers and EL210t cabinets not exceeding 1500lbs (681kg). Compact and more cost effective than the full sized ELB16, the ELB8 is the ideal platform for flying Elevation Series cabinets from portable or telescoping tower lifts where full scale truss rigging is not available.

Either the ELB8 or ELB16 can be used as a secure level platform for vertical ground stacking of Elevation Series cabinets in venues where a flown array is not the most cost effective practical system solution.

Additional Information on Flying Systems
Use only VTC flyware and bumper for any large-scale flown arrays and do not exceed the maximum cabinet configurations listed. Correctly knowing how to use all of the suspension hardware and components is imperative in sound system rigging and deployment.

Research local codes and regulations to fully understand the requirements for suspended loads in the venue in which the equipment is to be suspended. Always calculate suspended loads before lifting array to ensure suspension components and hardware being used are well within their respective load limits.

Consult a professional mechanical or structural engineer licensed in the jurisdiction where the sound system will be used to review, verify and approve all attachments to the building or structure.

Never assume owner or third-party supplied suspension or attachment points are adequate for the loads to be suspended.

Be absolutely certain of the integrity of any structural member intended to support suspended loads. Hidden structural members can have hidden structural weakness, modifications or other defects.

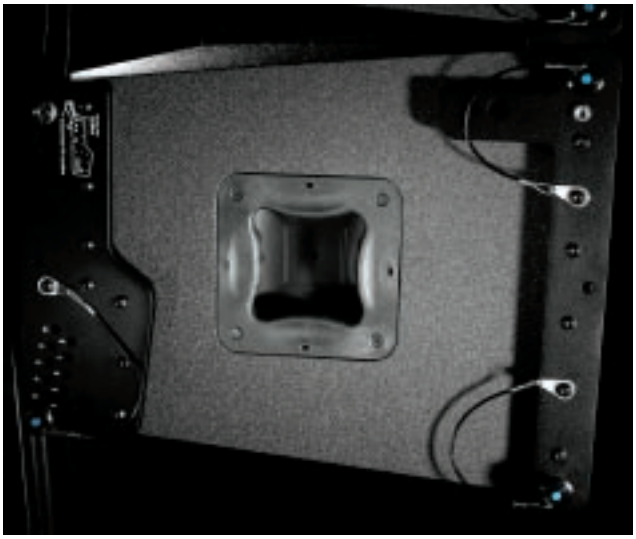
Always employ the services of a professional rigger for hoisting, positioning, and attaching the equipment to any supporting structure, building or mobile trussing.

Refer to local building codes and regulations regarding flown hardware or fixtures and strictly adhere to them.

EL16B bumper should only be attached to a flying rig with Crosby 5/8th-inch shackles or approved equivalent (Crosby 1/2-inch shackle or equivalent on the ELB8). In either case, use only shackle holes in bumper for suspension of array.

Always inspect all components (enclosures, suspension brackets, pins, frames, bolts, nuts, slings, shackles, etc.) for cracks, wear, deformation, corrosion, missing, loose, or damaged parts that could reduce the strength of the assembly before lifting. Discard any worn, defective, or suspect part and replace them with the appropriate load-rated replacement part

Please Note: Elevation Series Cabinets can ONLY be fixed to ELB16 with custom Jergens stainless steel pins (Yorkville part #8980) included with the bumper. Cabinets used on ELB8 must be attached with custom Jergens stainless steel pins (Yorkville part #8971) included with the ELB8. Jergens pins connecting cabinets to bumpers in either case must be secured with supplied cotter pins.



Suggested Flying Configurations with ELB16 Bumper:

Maximum Cabinets:	18 x EL210t straight vertical hang
	14 x EL210t J-Array (top 7 cabinets Vertical (straight) and remaining 7 fully splayed at 10° each)
	8 x EL210t Cabinets only if fully splayed at 10° each

Ground Stack Configurations with ELB16 Bumper

Maximum Cabinets:	8 x EL210t splayed maximum 5° each
	2 x ELS212t Subwoofers / 6 x EL210t splayed maximum 5° each

Suggested Flying Configurations with ELB8 Bumper:

Maximum Cabinets:	12 x EL210t
	7 x ELS212t
	Any combination of EL210T and ELS212T cabinets not exceeding a maximum combined weight of 1500lbs.

Ground Stack Configurations with ELB8 Bumper

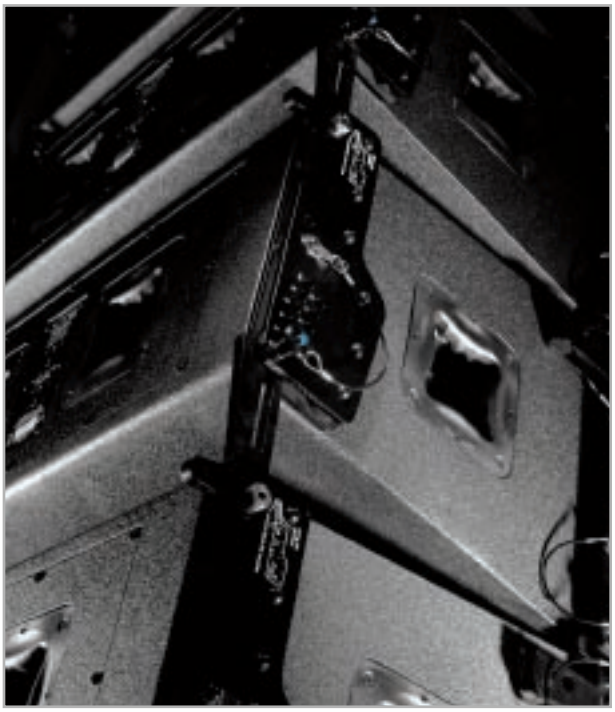
Maximum Cabinets:	4 x EL210t splayed maximum 10° each

Ground Stack Configurations with No Bumper

Maximum Cabinets:	2 x ELS212t Subwoofers and 4 x EL210t splayed maximum 10° each

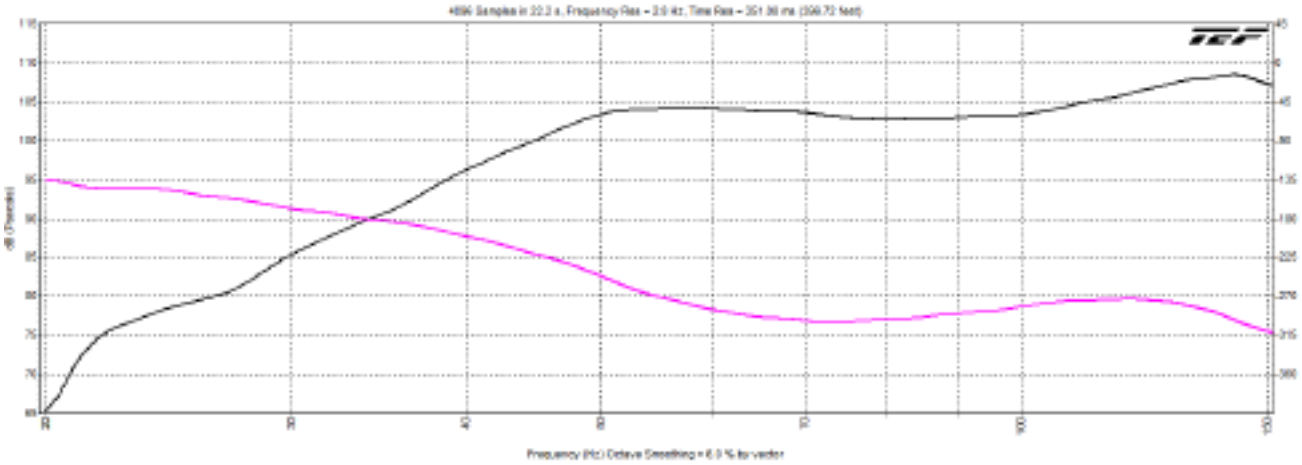
Do not ground stack EL210t cabinets without ELB8, ELB16 or ELS212t subwoofers as foundation.

Tour Hardware Quick Pin

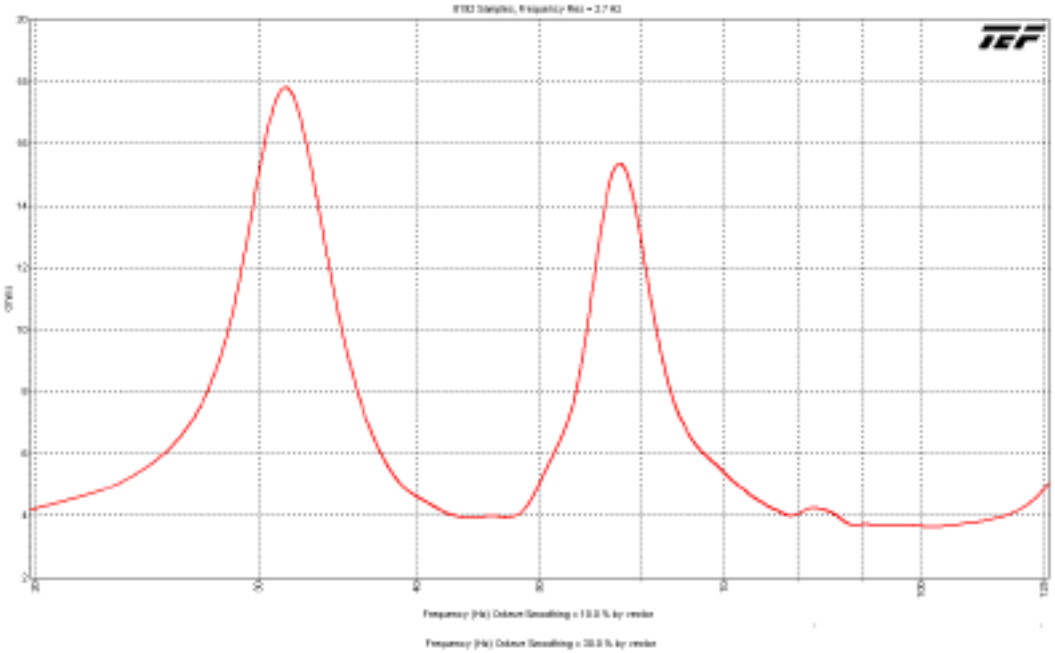


Tour Hardware

Response Unprocessed
1w (2V) 1m Ground Plane



Impedance
Magnitude



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