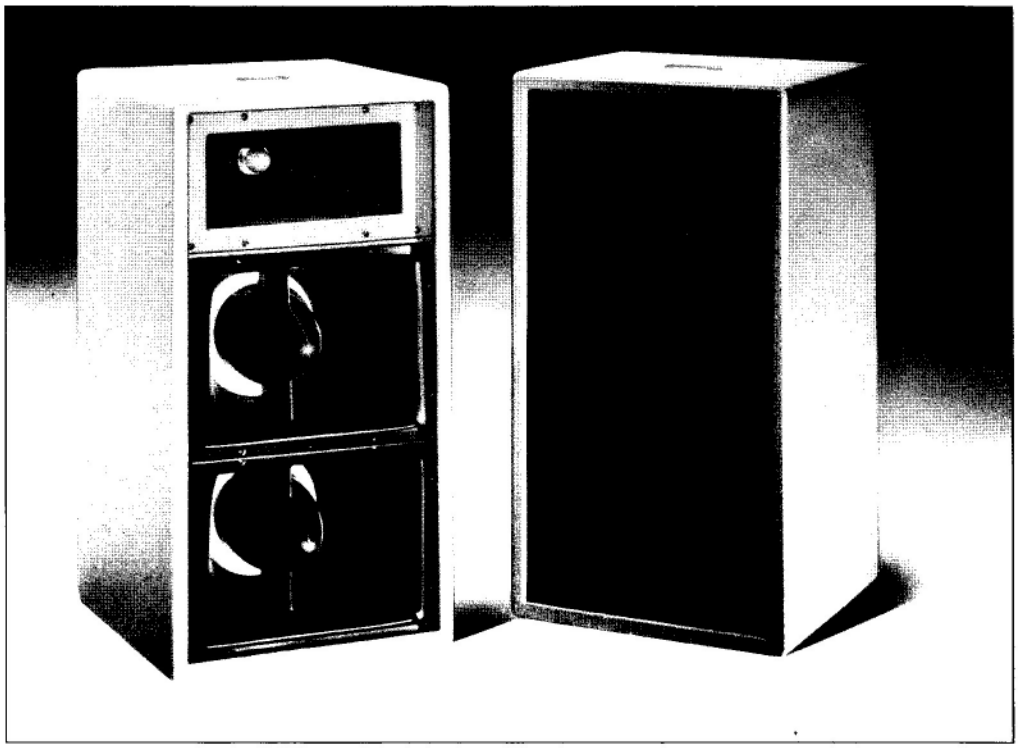


TSE-211

HIGH Q LOUDSPEAKER ENCLOSURE

The TSE-211 is a 2-way mid/high professional loudspeaker enclosure incorporating Turbosound's patented loading principles. It is a long throw, high SPL module designed to cover mid and high frequencies (250Hz – 20kHz) in primary sound reinforcement systems and is one in a series of complementary enclosures principally intended for sound contracting.

The heart of this system is the TurboMid™ device. This uses a unique design, covered worldwide by Principle Patents, which allows it to be used over four octaves(250Hz to 4kHz) - a system designer's dream.

Due to the geometry of the inner workings of the device, the overall directivity is much higher than a "normal" horn of the same frontal area. The small size of the TurboMid device allows multiple units to be placed close together so that they mutually reinforce each other at the lower end of their working range, and create an even curved wavefront. With rising frequency, the unit becomes progressively more directional in order to minimise the problems of multi-source interference associated with arraying constant directivity horns.

This directivity control from such a small unit is a is a very powerful characteristic, as it allows for highly non-interactive arraying in multiple-unit systems and is imperative to achieve intelligible sound coverage in acoustically complex environments.

This enclosure is capable of outstanding electrical to acoustic power conversion (108dB at 1W/1m) and can develop peak sound pressure levels of 132dB. It is the result of meticulous study which compelled Turbosound to re-evaluate established design parameters. The unique developments which followed have enabled Turbosound engineers to construct a compact loudspeaker enclosure which is correctly phase and amplitude aligned without the need for compensating electronics to match or correct for component disparities.

The TSE-211 is switchable between bi-amped active or passive, depending on the application. In the passive mode, a third-order crossover network is incorporated utilizing high-voltage polypropylene capacitors and low-loss air-cored inductors. The circuit includes an externally-adjustable attenuator which allows adjustment of the high-frequency level.

A range of load-certified flying and mounting hardware is available as standard stock items. This allows simple installation and orientation of the enclosures; from a single enclosure up to a full 360° point-source cluster. (Refer to Flying and Lifting section)

The TSE Series comprises seven fully compatible modular enclosures. Each one is designed to address a specific sound reinforcement situation and to defeat the acoustic problems presented to it. The result: a dedicated system producing a natural sound from an unusually compact range of enclosures.

Please refer to the Product Range Catalogue and the individual Engineering Information sheets for further information.

FEATURES

Unprecedented Transient Ability
Precise Dispersion Control
Seamless Midrange (250Hz-4kHz)
High SPL Capability
Universal Flying & Mounting System

APPLICATIONS

Sound Contracting
Public Address Systems
Concert Systems
Delay Towers
Point-source Clusters

TECHNICAL SPECIFICATIONS

Dimensions[1]	844 mm H × 450 mm W × 502 mm D (33¼" H × 17¾" W × 19¼" D)
Weight	48 kg (106 lbs)
Components	2 × 254mm (10") MF drivers on 2 TurboMid™ devices 2 × 25·4 (1") HF drivers loaded with a V-2 device and a custom flare
Frequency Response[2]	150 - 20,000 Hz ± 4dB
Dispersion[3]	70°H x 60°V @ -6dB points
Power Handling	MF: 200W RMS (400W program) HF: 100W RMS (200W program) Passive: 300W RMS (600W program)
Sensitivity[4]	108dB, 1 Watt / 1 meter (Average)
Maximum SPL	127dB (Continuous)[5] 132dB (Peak)[6]
Crossover[7]	Active: Recommended points MF: 250 Hz; HF: 3k7 Hz, 24dB/octave slope, Linkwitz-Riley. Internal switchable passive crossover: 3k7 Hz, third order high-pass only.
Impedance	MF: 8 ohms nominal HF: 8 ohms nominal Passive: 8 ohms nominal
Polarity	Positive voltage applied to pin 2 of the XLR-3 connector causes rearward MF cone movement and rearward HF diaphragm movement.
Construction	15mm Finnish birch ply throughout; rebated, screwed and glued. Finished in TurboBlue semi-matt paint[8]. Two recessed carrying handles.
Grille	1" thick, 30 PPI fully reticulated foam
Connectors	HF Section: 3 pin XLR; 1 male, 1 female MF Section: 3 pin XLR; 1 male, 1 female Wired: pin 1 -ve; pin 2 +ve; pin 3 N/C
Options	FF-211 Flying frame
Spares	FG-211 Replacement foam grille LS-1004 10" MF loudspeaker CD-103 1" HF compression driver RC-1004 Recone kit for LS-1004 RD-103 Replacement diaphragm for CD-103 PX-263 Internal passive crossover network ASC-203 Aerosol can: TurboBlue

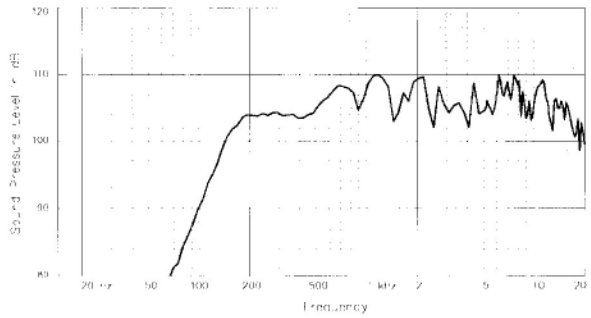
All measurements are actual figures taken from real-time testing using stated inputs, free from any filtering or weighting. Therefore, actual figures may significantly exceed that of other manufacturers with higher published weighted ratings.

Notes

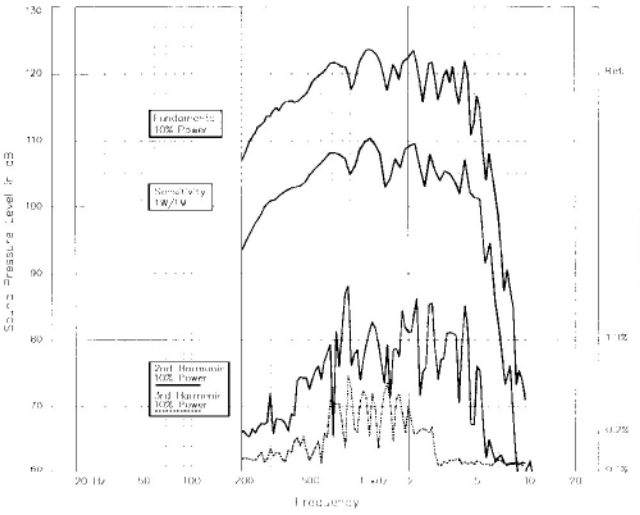
[1] Due to the tolerances of Finnish birch plywood, dimensions may vary by ± 3mm (⅛").
[2] Measured on axis, using swept sine-wave input, in a half-space environment.
[3] Average over stated bandwidth.
[4] Average over stated bandwidth. Measured in a half-space environment at 5 Watts/3 meters, then scaled to represent 1 Watt/1 meter using a swept sine-wave input.
[5] Unweighted diode-clipped pink noise. Measured in a half-space environment at 3 meters, then scaled to represent 1 meter.
[6] Verified by subjective listening tests of familiar program material, before the onset of perceived signal degradation.
[7] Crossover and driver placement optimised for best phase response at crossover point. Polypropylene capacitors and air-cored inductors are used throughout.
[8] Optional black.

TECHNICAL SPECIFICATIONS

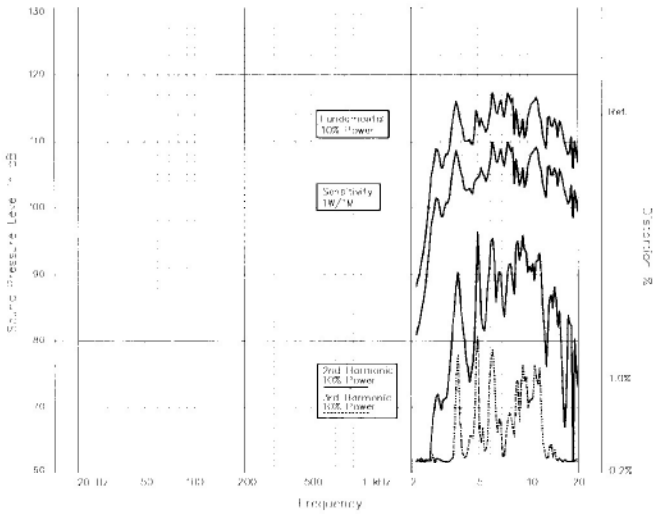
FULL RANGE ENCLOSURE FREQUENCY RESPONSE



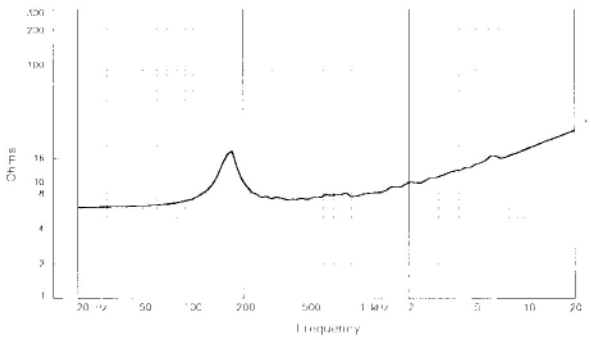
MF SECTION – FREQUENCY RESPONSE; SENSITIVITY & HARMONIC DISTORTION WITH 24dB/OCTAVE CROSSOVER AT 250 Hz



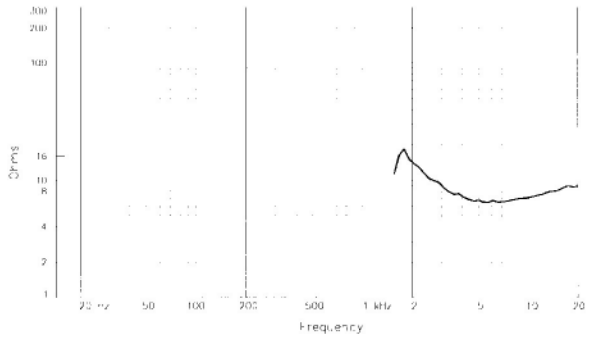
HF SECTION – FREQUENCY RESPONSE; SENSITIVITY & HARMONIC DISTORTION WITH 24dB/OCTAVE CROSSOVER AT 3k7 Hz



MF SECTION – IMPEDANCE



HF SECTION – IMPEDANCE



Notes on Measurement Conditions

Impedance
A common method, constant current circuit was used to measure the impedance.

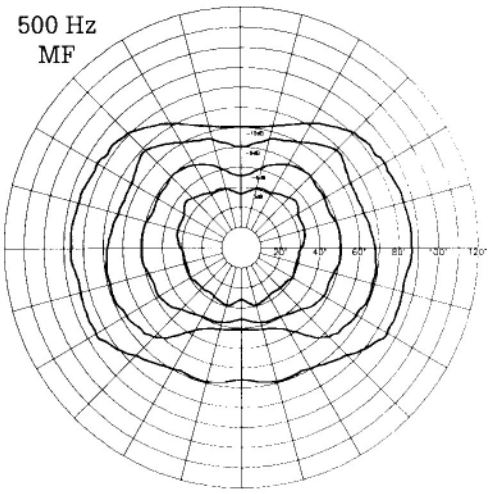
Frequency Response
The frequency response shown was obtained by feeding a swept sine-wave through the system in a half-space envoronment. The position of the microphone was vertically on-axis, horizontally in-line with the MF/HF section at a distance of 3 meters, then scaled to represent 1 meter.

2nd & 3rd Harmonic Distortion
Distortion measurements were obtained using a Brüel & Kjær harmonic distortion analysis system and comply with AES recommendations for enclosure measurement (AES Paper reference: ANSI S4-26-1984).

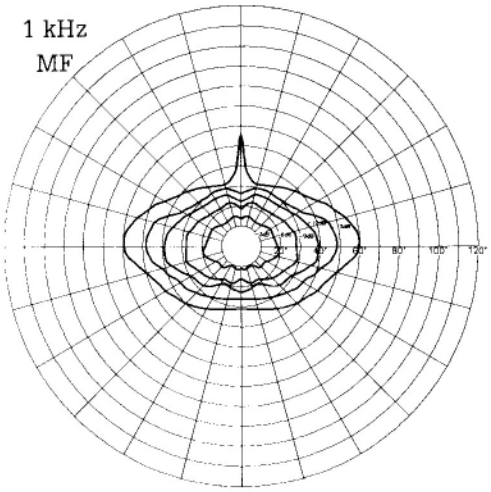
Data Conversion
All graphs are digitally generated using the APEX custom software system, designed to translate data derived from Brüel & Kjær and Audio Precision "System One" test equipment into AutoCAD™. This program enables graphical information to be plotted to an accuracy of more than four decimal places.

DIRECTIVITY
ISOBARS

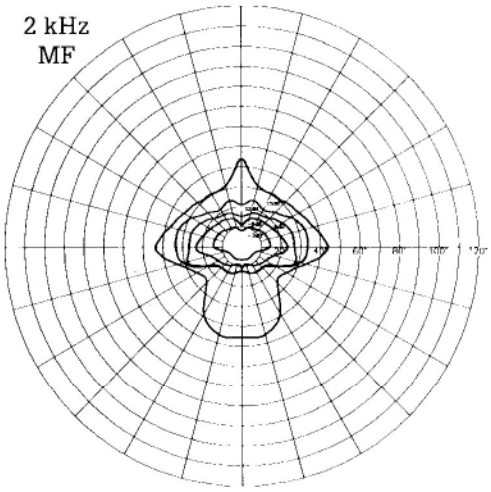
500 Hz
MF



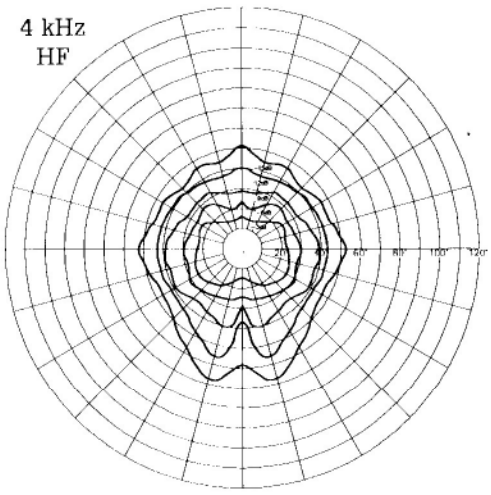
1 kHz
MF



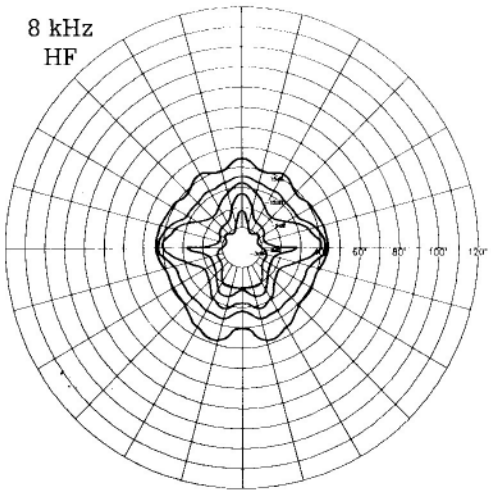
2 kHz
MF



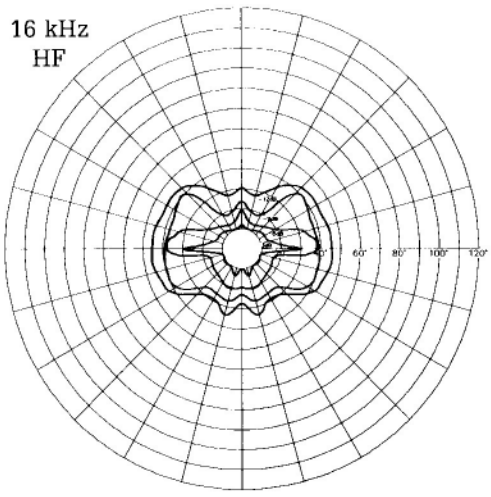
4 kHz
HF



8 kHz
HF



16 kHz
HF

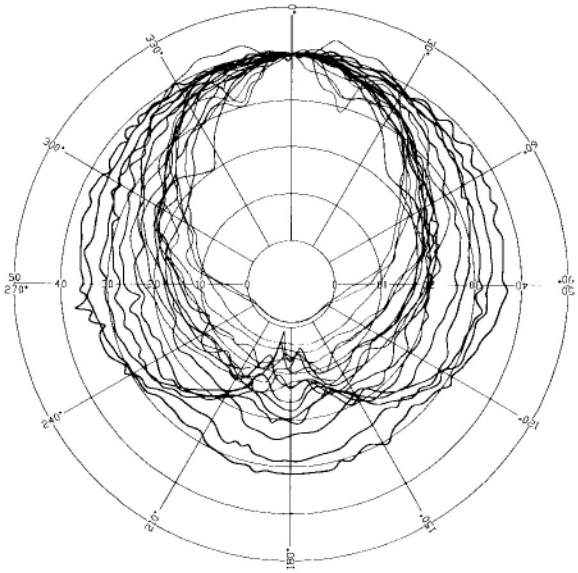


Turbosound Isobar Data

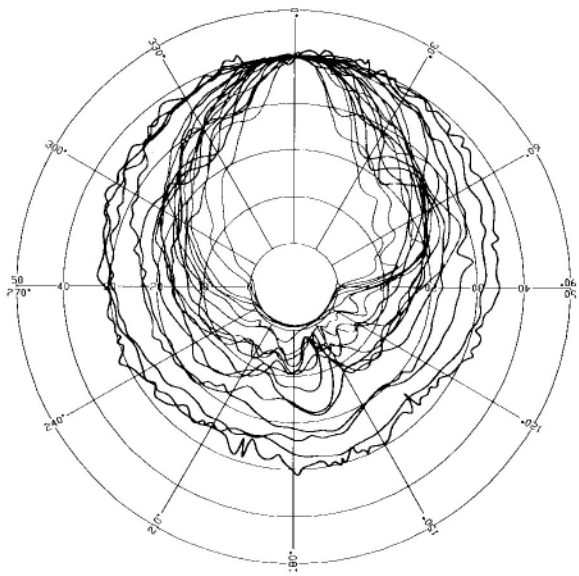
The spherical co-ordinate isobar data was computed from points taken from longitude and latitude polar measurements around the enclosure at 15° increments. Larger scale drawings are available; please consult your dealer. All isobar information was gathered by Mark Engebretson of Summit Audio Laborories, California, USA.

DIRECTIVITY
COMPOSITE POLAR SETS

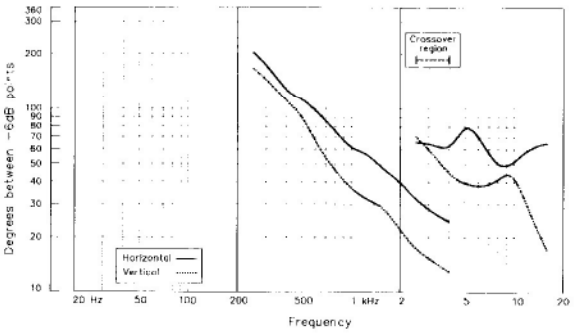
HORIZONTAL



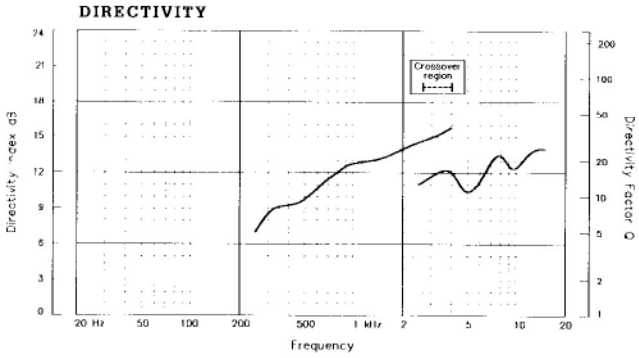
VERTICAL



BEAMWIDTH



DIRECTIVITY



Notes on Measurement Conditions

All the polar measurements were taken using calibrated Brüel & Kjær test equipment, with a microphone placed at a distance of 4 meters from the rotational axis of the loudspeaker enclosure under test. This method reduces the effect that the intereaction between the MF and HF has on the measurements.

For clarity, the polar information is displayed with progressively thinner lines from 250 Hz to 16 kHz in third octave steps. The beamwidth plots were computed from the third octave polars.

The enclosures were measured in free air at ground plane, on a specially constructed surface to minimise ground reflections. All polar information was gathered by Mark Engebretson of Summit Audio Laboratories, California, USA.

A complete flying and arraying system is available for the TSE Series of enclosures. This has been designed to facilitate rapid installation and orientation. All the components are fully load-tested[1], certified and available as stock items.

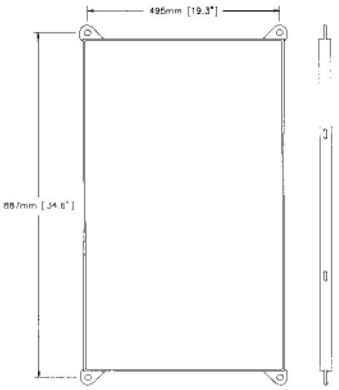
A range of fixing hardware allows the TSE-211 to be installed from a variety of locations giving considerable freedom in the selection of optimum loudspeaker sites. All the components are manufactured from high-grade steel and finished with a black[2] powder-coat.

Notes

[1] UK Government. Individual certification available.
[2] Other colours to order.

FF-211 Flying Frame

The FF-211 flying frame fits around the TSE-211 and is secured to pre-drilled and threaded points. This allows the enclosure to be suspended from wires or chains in the desired position. The FF-211 is also used when the TSE-211 is to be incorporated into arrays or clusters. (Refer to section covering clusters and arrays.)



Clusters and Arrays

The system for clustering and arraying the TSE Series of enclosures is made up of a dedicated amalgam of modular flying hardware. It allows the creation of simple 90° arrays, through to complex 360° circular clusters. The hardware automatically positions the enclosures at the correct horizontal increment to correspond to their optimum dispersion characteristics and to align them at the virtual point-source. (See fig 1)

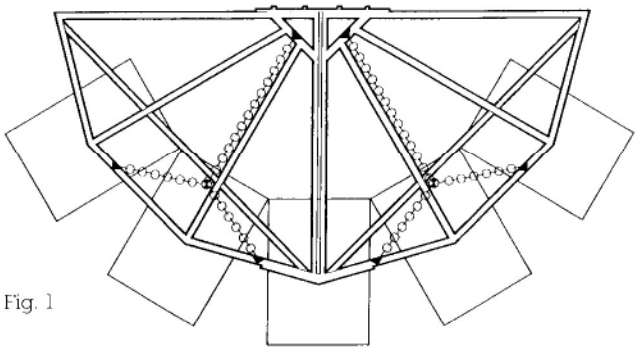


Fig. 1

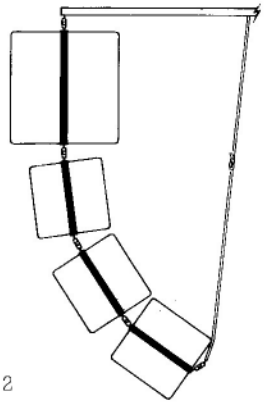


Fig. 2

Each enclosure, when fitted with a flying frame, simulates the link in a chain which forms the vertical column. The required vertical dispersion is set by adjusting a tilting strap attached between the lowest flying frame and the quadrant. One tilting strap is required for each vertical column and is available in 2 different lengths according to the amount of enclosures in each column. (See fig 2)

When TSE-118 enclosures are incorporated in the cluster, it may be desirable to lock them together. This is accomplished using the BB-118 bracing bracket which is secured using the wheel bolt holes on the rear of the enclosure.

Each array or cluster requires different quantities of hardware depending on the application. The main flying-bar is divided into 90° sections. Each will fly 3 columns of TSE enclosures. The addition of wing-plates (WP-15) increases this to 4 TSE enclosures.

Ordering Information

The FB-90C comprises the basic hardware to make up a 90°, 4 column cluster and includes the following components:

1 x FB-90	90° Flying quadrant (frame)
1 x CB-3	3-leg chain bridle used to support the flying quadrant
3 x HC-18	Hanging clamps to attach CB-3 to the FB-90
1 x SB-2	2-leg safety bridle
6 x EC-25	Enclosure clamps to attach flying frames
2 x WP-15	Wing plates
	All necessary high-tensile bolts

In addition to the FB-90C, the following components must be ordered to complete the cluster and will vary according to the particular cluster design:

TS-6	6m Tilting strap
TS-10	10m Tilting strap
QL-75	Quick-links, 2 per enclosure.
FF-211	Appropriate quantity and type of TSE flying frames, to suit cluster design.

For larger clusters (180°, 270°, and 360°) it is necessary to order multiples of the FB-90C. For example: a 270° cluster is made up from three FB-90C sets. These clusters require one additional component to lock the centres of the quadrants together. 180° clusters require a CS-180, 270° and 360° require a CS-360.

We recommend that you have your cluster and array designs verified to ensure that they are feasible and within the rated loading factors. Please contact your dealer for assistance or further information.

ARCHITECTURAL & DESIGN ENGINEERS SPECIFICATIONS

The loudspeaker shall be of the switchable bi-amped/passive, two way type,consisting of two 254mm (10") mid frequency drivers loaded with patented TurboMid™ devices, and two 25·4 (1") high frequency units loaded with a patented V-2 device.

Performance specifications of a typical production unit shall meet or exceed the following:

Frequency response, measured with a swept sine wave input, shall be flat within ± 4 dB from 250 – 20000 Hz. Dispersion, at -6dB points, shall average 70°H × 60°V. Nominal impedance shall be: Active mode: HF 8 ohms; MF 8 ohms, passive mode: 8 ohms. Power handling shall be 300 Watts RMS, 600 Watts RMS program. Sensitivity measured with 1 Watt input at 1 meter distance on axis, mean averaged over stated bandwidth shall be 108dB. Maximum SPL (Peak), measured with music program at stated amplifier power, shall be 132dB

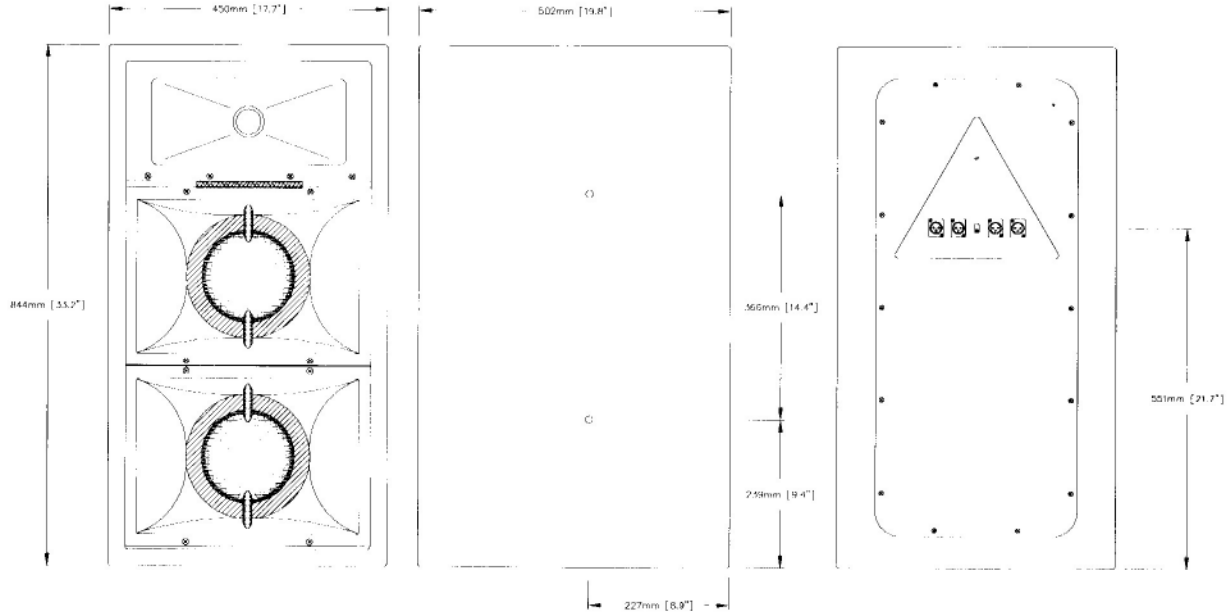
Dimensions: 844mm H × 450mm W × 502 mm D
33 ¼" H × 17 ¾" W × 19 ¾" D

Weight: 48 kg (106lbs)

Total enclosure volume shall not exceed 0.191 cu. meters (6¾ cu. ft.) The loudspeaker system shall be the Turbosound TSE-211. No other loudspeaker shall be acceptable unless submitted data from an independent test laboratory verify that the above combined performance/size specifications are equalled or exceeded.

A complete flying and arraying hardware system shall be available, comprising a range of load-certified components. The system shall be modular and have the facility of installing a single enclosure up to a 360° point-source array.

DIMENSIONS



Dealer Stamp:

Turbosound operate a policy of continuous research and development. The implementation of new materials and/or production methods will always equal or exceed the published specifications which are subject to change without notice.

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TURBOSOUND PATENT INFORMATION: TurboBass™ device; TurboMid™ device; V-Series devices (V-2™); Australia 515,535; Canada 1,076,033; Japan X113424/77; U.K. 1,592,246 1,598,310 & 8,614,434; U.S.A. 4,215,761 RE32,183 & 4,882,562; West Germany P2742600/2. Worldwide patents pending on the TurboConcentric™ device. Other patents pending.

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