



TCS COMPACT SERIES

USER MANUAL

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Introduction

Congratulations, you have just purchased a professional loudspeaker product from the TCS Compact Series sound contracting loudspeaker range, designed to give you the best in audio quality and many years of reliable, trouble free operation. It offers excellent pattern control, superior audio quality, integral rigging and flying hardware options, full technical documentation including EASE data, and a comprehensive warranty against manufacturing defects. Please read through this manual carefully before you attempt to operate the loudspeaker system. It contains valuable information enabling you to quickly and easily connect the loudspeakers to your amplifiers, important system and set-up checks together with positioning and mounting instructions.

Thanks

Thank you for choosing a TURBOSOUND TCS Compact Series loudspeaker product for your application. Please spare a little time to read the contents of this manual, so that you obtain the best possible performance from this unit.

All TURBOSOUND products are carefully engineered for world class performance and reliability.

If you would like further information about this or any other TURBOSOUND product, please contact us. Detailed product information is available on our web site at www.turbosound.com

We look forward to helping you in the near future.

Unpacking

After unpacking the unit please check carefully for damage. If damage is found, please notify the carrier concerned at once. You, the consignee, must instigate any claim. Please retain all packaging in case of future re-shipment.

Product Range Summary

General Features

TCS Compact series loudspeakers are designed for use in a wide variety of fixed installation applications that require professional sound quality, ranging from cafés, pubs, bars and restaurants to retail stores, nightclubs, live music venues and houses of worship.

- Cabinets are constructed from high quality birch plywood; rebated, glued and screwed together for maximum strength and rigidity.
- The enclosures are supplied with a durable black or white semi-matt textured paint finish as standard. Optional finishes include TurboBlue™ and a whole spectrum of other custom colours. Cabinets can also be supplied in raw birch plywood for painting, varnishing or staining on site to match venue décor requirements.
- Powder-coated perforated steel mesh grilles, backed with reticulated foam (or white acoustically transparent cloth on white cabinets) protect the drive units from damage and provide an unobtrusive and aesthetically pleasing appearance.
- Multiple rigging points enable a wide variety of installation methods: with standard eyebolts, OmniMount™ hardware and specifically created Turbosound wall and ceiling brackets. The enclosures are fitted with internal M10 threaded rigging points on the top, sides, bottom and rear, that allow single cabinets to be suspended and angled in fixed installations.
- High quality components are used throughout. Cast-frame low frequency drivers give the combined benefits of high strength and low weight.
- Speakon NL4MP connectors and 4-way terminal / barrier strips are provided on recessed rear panels for input and loop-through / parallel connections to additional TCS Compact series speakers.
- Weather-resistant options, to IP54 rating (protected against dust and sprays of water from all directions), enable the TCS Compact series to be used outdoors or in humid conditions.

General Features for Two Way Enclosures

- High-grade speaker components are matched with an internal passive crossover to ensure a seamless transition between the HF and LF drivers.
- The crossover network incorporates a two-stage thermal overload protection system which prevents damage to the high frequency driver by reacting instantly to large transient peaks while still allowing wide dynamic range to be maintained. The protection system is transparent at normal operating levels and, as the level increases, the signal is gradually and almost imperceptibly compressed once the critical threshold has been reached.
- High frequency drivers have been selected for consistent and reliable performance.
- High power line transformer versions are optionally available for use in 70v or 100v line distributed systems.
- The rigging points on the bottom of the cabinets enable them to be hung upside down in order to position the HF driver closer to the audience.
- TCS Compact Series full-range enclosures are designed to give good pattern control down to crossover frequency, and are fully supported with EASE polar data (available to download from the Turbosound website at www.turbosound.com). This enables accurate and predictable results when specifying sound systems in a given venue.

user manual

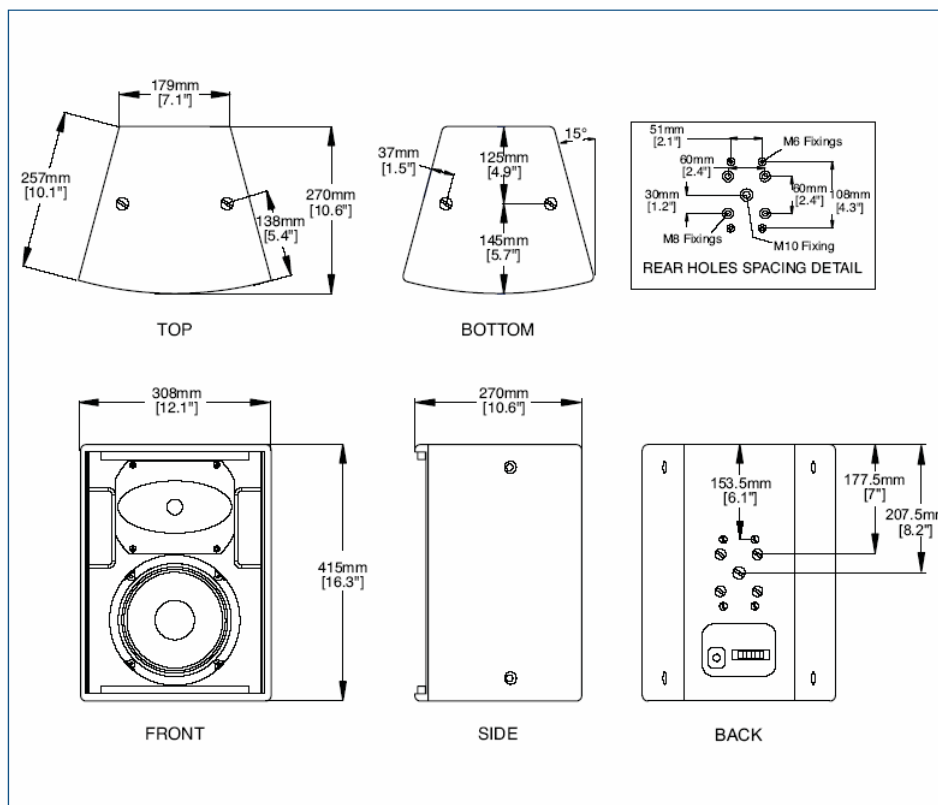
TCS Compact series

Model Information

TCS-081C

The TCS-081C is a compact passive two-way loudspeaker designed for use in a wide range of fixed installations. It consists of an 8" reflex-loaded low frequency driver and a 1" high frequency compression driver on a 100°H x 60°V Converging Elliptical Waveguide™ in an optimally tuned trapezoidal enclosure constructed from 12mm (1/2") birch plywood.

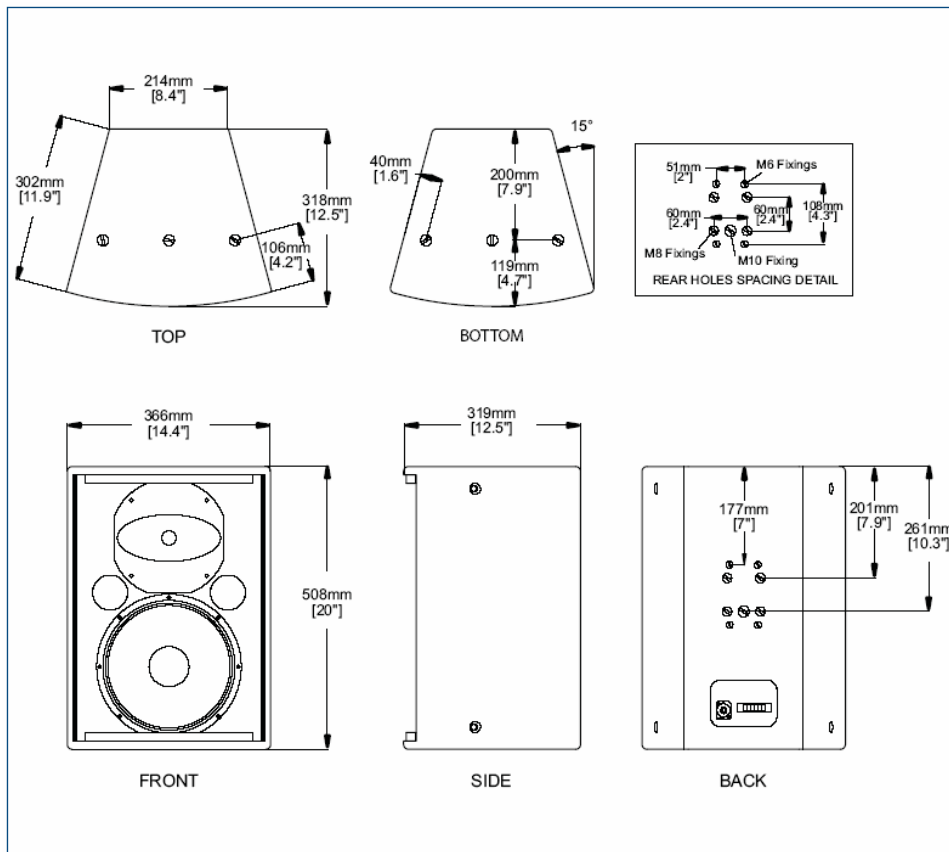
The cabinet is fitted with M8 internal rigging points on the rear panel which enable it to be permanently installed using the Turbosound WB-20 wall bracket, or CB-55 ceiling bracket. Four M6 internal rigging points are also provided for use with OmniMount™ series 30 brackets.



TCS-101C

The TCS-101C is a compact passive two-way loudspeaker enclosure. It consists of a 10" reflex-loaded low frequency driver and a 1" high frequency compression driver on a rotatable 100°H x 60°V Converging Elliptical Waveguide™ in an optimally tuned trapezoidal cabinet constructed from 15mm (5/8") birch plywood.

M8 rigging points are provided on the back panel to enable fixed installation use with optional Turbosound WB-20 wall and CB-55 ceiling brackets. M6 rigging points are provided for use with OmniMount™ 60 series brackets. The SB-101 swivel bracket can be used to mount the cabinet horizontally to walls or ceilings with a wide range of downward angle.

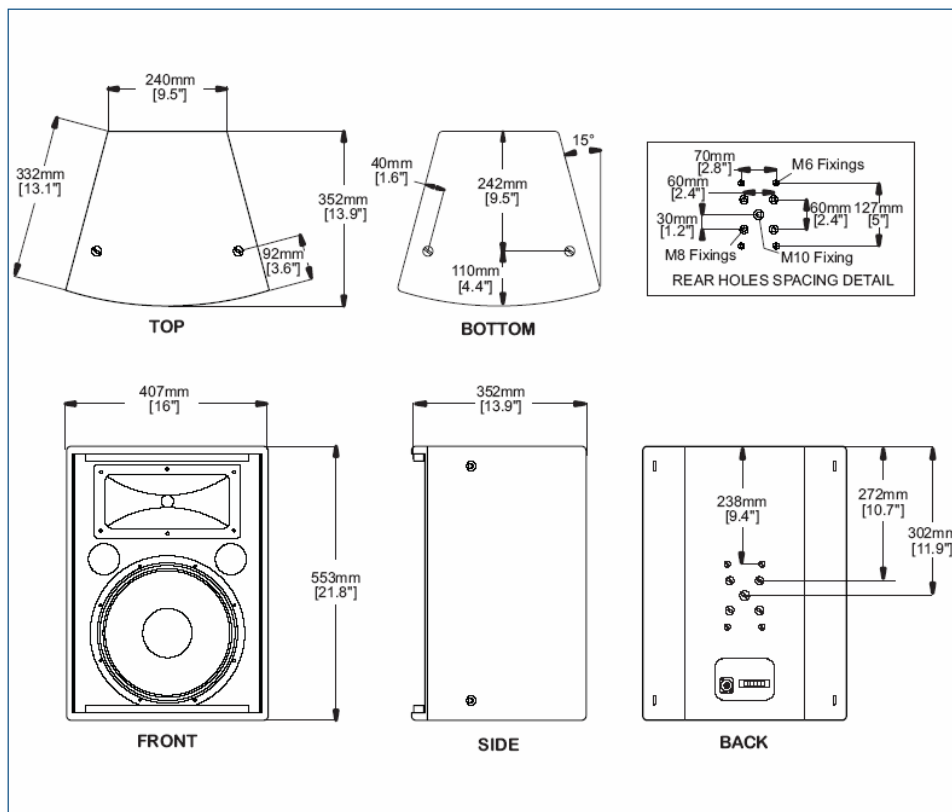


TCS Compact series

TCS-121C

The TCS-121C is a compact passive two-way loudspeaker enclosure designed for use in a wide variety of live sound and fixed installation applications that require professional sound quality. It consists of a 12" reflex-loaded low frequency driver and, a 1" high frequency compression driver on a 70°H x 40°V dispersion HF horn, in an optimally tuned trapezoidal cabinet constructed from 15mm (5/8") birch plywood.

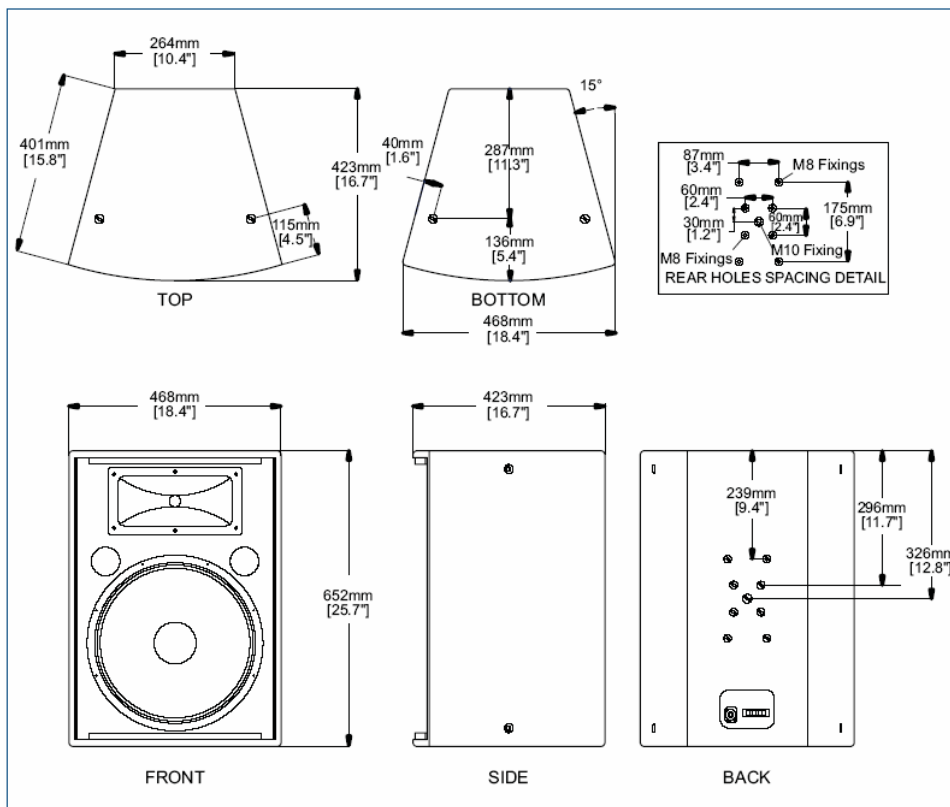
M8 rigging points are provided on the back panel to enable fixed installation use with optional Turbosound WB-20 wall brackets or CB-55 ceiling brackets. M6 rigging points are also provided for use with OmniMount™ 60 series brackets.



TCS-151C

The TCS-151C is a passive two-way loudspeaker enclosure designed for use in a wide variety of fixed installation applications that require professional sound quality. It consists of a 15" reflex-loaded low frequency driver and a 1" high frequency compression driver on a 70°H x 40°V dispersion HF horn in an optimally tuned trapezoidal cabinet constructed from 15mm (5/8") birch plywood.

M8 rigging points are provided on the back panel to enable fixed installation use with the Turbosound WB-55 wall bracket or CB-55 ceiling bracket and OmniMount™ 120 series brackets.

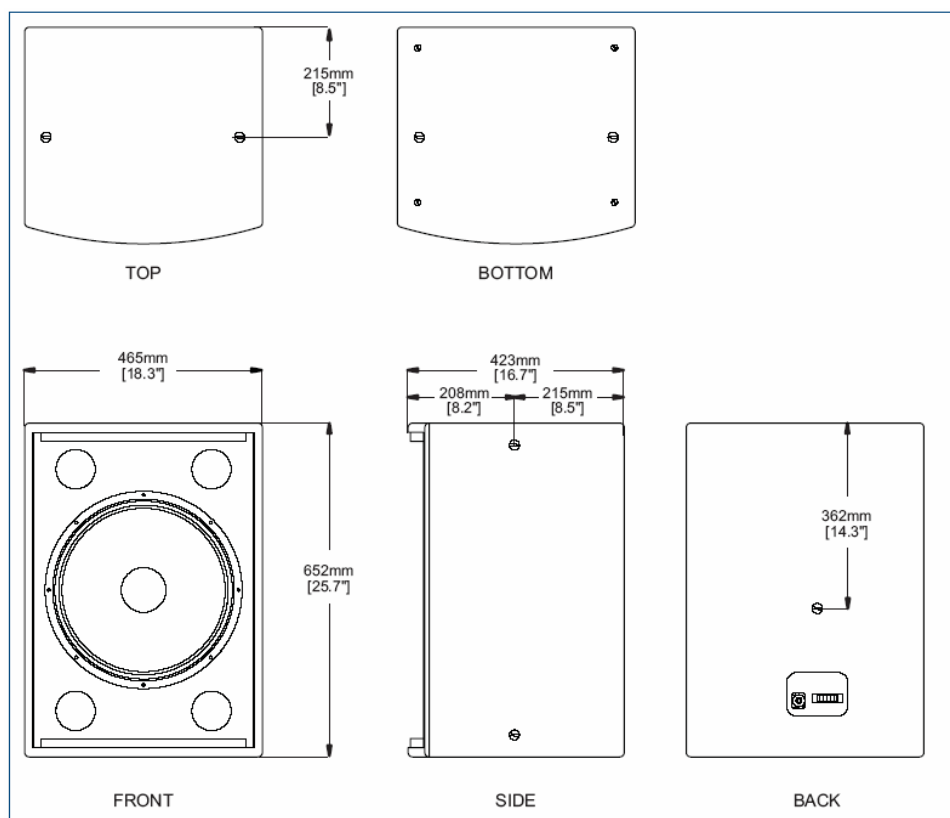


TCS Compact series

TCS-115C

The TCS-115C is a front-loaded, high efficiency low frequency loudspeaker designed to give bass and sub-bass reinforcement to the TCS Compact series two way models. It is envisaged to form part of a two-way active system in conjunction with a Turbosound LMS series loudspeaker management system.

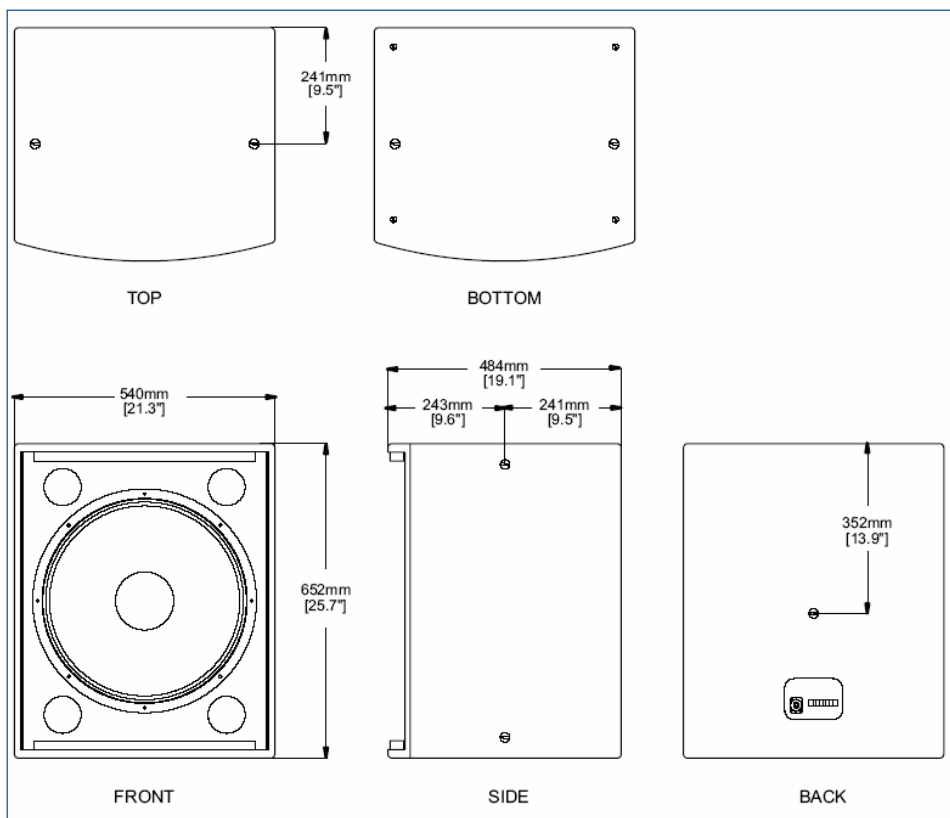
It consists of a single 15" reflex-loaded low frequency driver in an optimally tuned enclosure. The cabinet is constructed from 18mm (3/4") birch plywood. Recommended amplifier power is 600 watts at a nominal impedance of 8 ohms.



TCS-118C

The TCS-118C is a front-loaded, high efficiency low frequency loudspeaker designed to give bass and sub-bass reinforcement to the TCS Compact series two way models. It is envisaged to form part of a two-way active system in conjunction with a Turbosound LMS series loudspeaker management system.

It consists of a single 18" reflex-loaded low frequency driver in an optimally tuned enclosure. The cabinet is constructed from 18mm (3/4") birch plywood. Recommended amplifier power is 600 watts at a nominal impedance of 8 ohms.

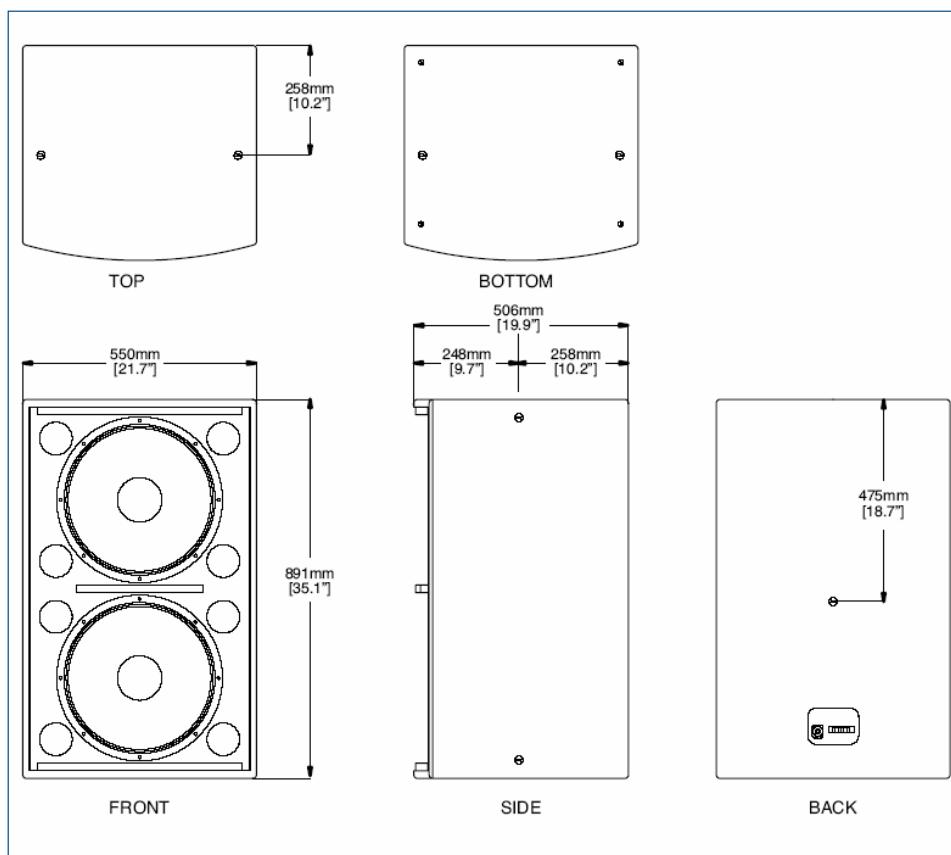


TCS Compact series

TCS-215C

The TCS-215C is a front-loaded, high efficiency low frequency loudspeaker designed to give bass and sub-bass reinforcement to the TCS Compact series two way models. It is envisaged to form part of a two-way active system in conjunction with a Turbosound LMS series loudspeaker management system.

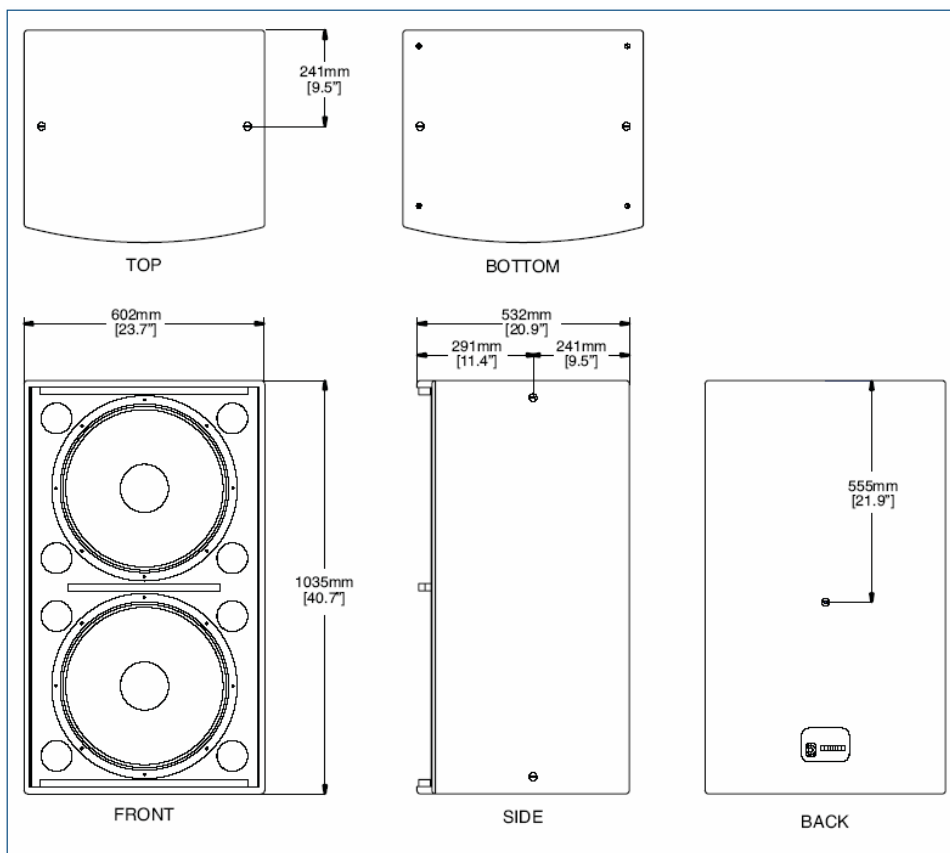
It consists of two 15" reflex-loaded low frequency drivers in an optimally tuned rectangular cabinet constructed from 18mm (3/4") birch plywood. Recommended amplifier power is 1200 watts at a nominal impedance of 4 ohms.



TCS-218C

The TCS-218C is a front-loaded, high efficiency low frequency loudspeaker designed to give bass and sub-bass reinforcement to the TCS Compact series two way models. It is envisaged to form part of a two-way active system in conjunction with a Turbosound LMS series loudspeaker management system.

It consists of two 18" reflex-loaded low frequency drivers in an optimally tuned enclosure constructed from 18mm (3/4") birch plywood. Recommended amplifier power is 1200 watts at a nominal impedance of 4 Ohms.



System Considerations

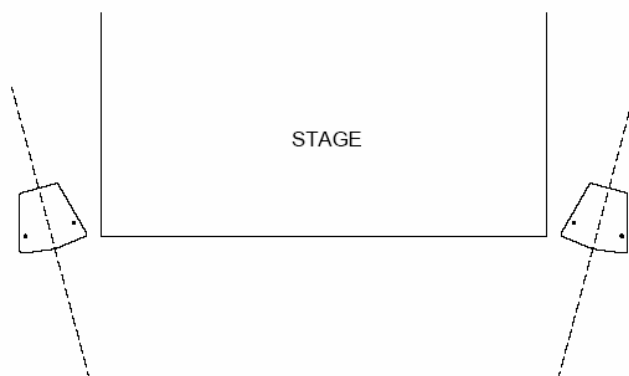
Choosing the best location

When using any loudspeaker system certain room parameters will affect the resultant sound quality and coverage. For example, any boundary like a wall or floor will lift certain frequencies. If you are placing speakers in a corner, then a lift at the bass end is to be expected and it may sound rather 'boomy'. This can be compensated for by moving the speaker or cutting low frequencies with an equaliser.

TCS Compact series speakers are designed to be flown in free space or mounted on specialist wall and ceiling brackets. When speakers are flown in free space then boundary effects are minimised. The result is a smooth frequency response without any boost at odd frequencies, but the bass end may appear subjectively light. In this case increase the sub-bass level to bring the low end up or add sub bass enclosures as necessary.

Dispersion

TCS COMPACT series enclosures are designed to provide respectably wide horizontal coverage; the TCS-151C and TCS-121C offer 70° and the TCS-101C and TCS-081C 100° . This allows the majority of live sound applications to be covered with single enclosures placed individually to take advantage of this performance feature, for example either side of a stage in a pub, or small club environment, as shown below.



Calculating the sound pressure level at a known distance from the PA

Sound intensity reduces rapidly as the distance from the source increases according to the inverse square law which, predicts that a doubling of distance will result in a reduction of $\frac{1}{4}$ the original, equal to a drop of 6dB, providing there are no reflections or reverberation. For every 3dB increase of speaker output you need a doubling of input power.

For example, in an open space where the front seats are 6 meters (20 ft) from the sound source and the back seats are 60m (200 ft) from the sound source, you would expect the sound pressure to drop by a factor of 100 (= 20 decibels) between the front seats and the back seats.

In a 'real world' enclosed auditorium, this reduction is partially mitigated by the effects of reverberation in the distant field and, in the near field, because the speaker looks more like a wall source than a point source. Therefore the sound field in a room only behaves according to the inverse square law in a relatively narrow distanced range.

It should be possible to make considered decisions regarding the particular models of speakers that are required based on their sensitivity and SPL (sound pressure level) in order to achieve the desired coverage and level.

Equalisation

TCS COMPACT series enclosures are designed to provide smooth and even frequency response. They do not need excessive amounts of external equalisation to overcome the sonic deficiencies often found in many lesser designs.

In order to compensate for room acoustics, TCS Compact series enclosures require only minimal equalisation. As in any system, over-equalisation introduces phase shifts, distortion and a reduction in headroom, usually causing more problems than it cures. It is good practice to use as little equalization as possible, aiming to 'cut' frequencies rather than adding large amounts of 'boost'.

Most rooms will have resonances that will be excited at particular frequencies needing some cut to help tame the sound. These problems are most pronounced at the lower frequencies where loudspeakers generally exhibit very little directional control. Under most circumstances a 1/3 or 1/2 octave graphic equaliser will generally be adequate, with the fader settings applied smoothly and sparingly for the required room compensation.

If you find that the system needs a lot of boost at lower frequencies you probably need additional sub-bass units.

Amplifier Requirements

Turbosound loudspeaker enclosures should be driven by high quality power amplifiers designed for true professional use. Such amplifiers will have balanced inputs, DC and RF fault protection, and well designed cooling systems for reliability.

The 'program' power, listed in the loudspeaker's technical specification, is the best guide to the size of amplifier required for general purpose applications. The amplifier should be capable of delivering long term broadband power equal to the loudspeaker's program power rating at the loudspeaker's stated nominal impedance. This approach allows sufficient headroom to generate good dynamic range.

RECOMMENDED AMPLIFIER POWER RATINGS:

The amplifier's rated r.m.s. continuous power output (20Hz – 20kHz, per channel) should be equal to the program power handling of the loudspeaker at its nominal impedance.

It should be understood that overdriving an insufficiently powered amplifier is more likely to cause loudspeaker damage – the total energy in a heavily clipped signal is far higher than in an unclipped signal – than operating a more powerful amplifier within its ratings. In general, the more powerful the amplifier the better it will sound, provided that it is not also driven into sustained clipping.

All the equipment in the system before the system controller should be set up for 0dBV (775mV) maximum output. One controller can be used to feed several amplifiers as long as all the amplifiers are the same (or have the same gain ratings). More than one controller may be required if the amplifiers are of different gain or type. Please contact your dealer if you require help in this area.

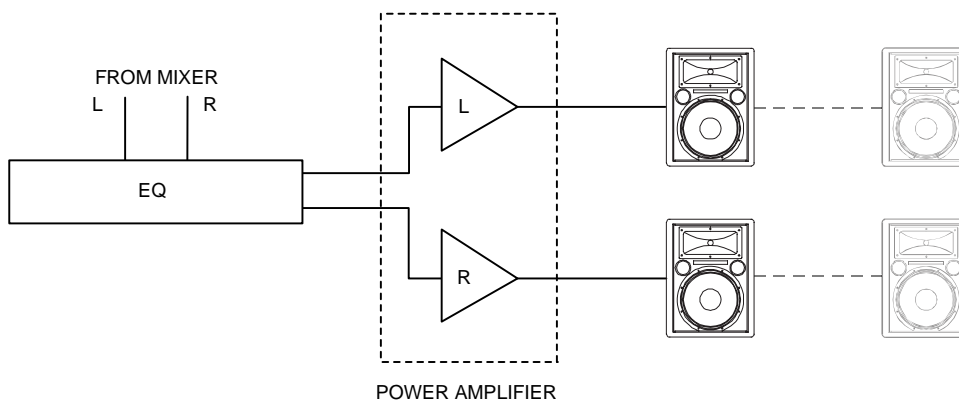
Turbosound recommends the T-series amplifiers for use with the TCS Compact series system.

System Configurations

TCS Compact Series 2-way enclosures are passive loudspeaker systems. This means that they require only one amplifier channel for correct operation, the frequency splitting between the low frequency driver and the high frequency driver being accomplished by the internal passive crossover network in each enclosure. If subwoofers are used in a bi-amplified system in conjunction with TCS Compact Series 2-way enclosures, additional amplifier channels and external electronic crossovers will be required. The Turbosound LMS-D24/26 digital management systems are recommended for this purpose.

Many different system configurations of TCS Compact Series loudspeaker enclosures are possible to suit various installation requirements, ranging from cafes, bars and restaurants to theme parks, theatres and houses of worship. Listed below are a few common examples.

System1 – Basic stereo set up

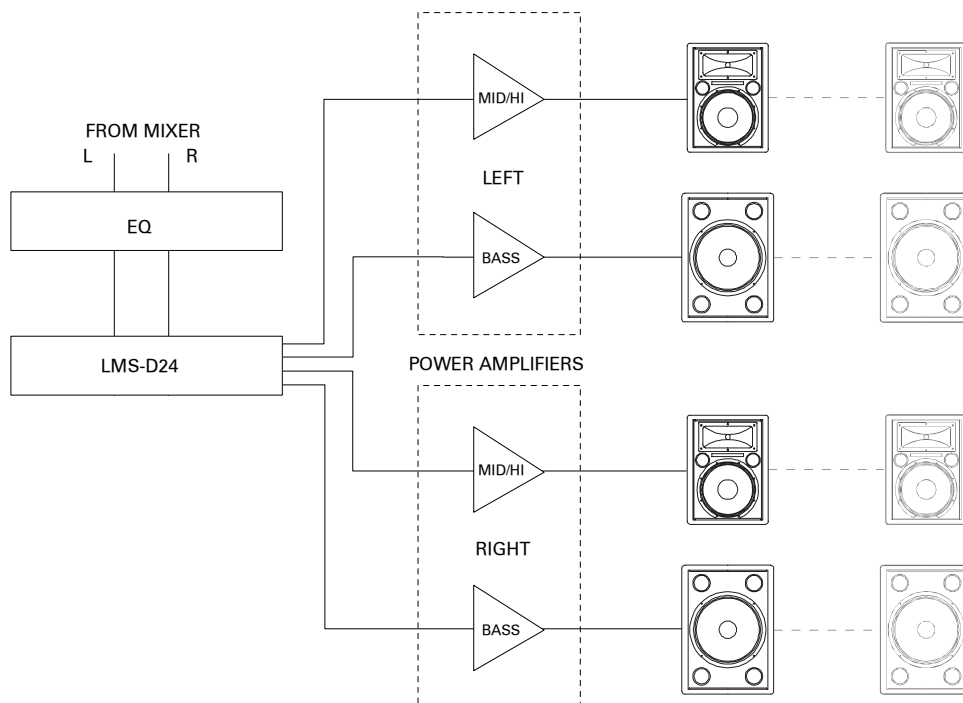


A single amplifier supporting two TCS Compact series 2-way speakers creates a standard stereo system. A further pair of TCS mid/tops could be connected using the loop-through connections, although this will result in a corresponding drop in impedance. With TCS Compact 2-way speakers with a nominal impedance of 8 ohms this would make a combined 4 ohm load that should be suitable for any good quality power amplifier (see amplifier considerations for more information).

NB: A stereo configuration is shown but this system could be run in mono.

NB: The EQ block is shown for tuning the room.

System 2 – Stereo with bass units and Active Crossover



In this case a crossover is needed to separate the bass and mid / high frequencies. The Turbosound LMS series is recommended as the units are preconfigured with presets to match the TCS Compact series requirements.

This system can be scaled up with the addition of further amplifiers and processors. If using the LMS-D26 processor there will be two extra channels available for adding say another pair of mid/top cabinets through an extra stereo power amplifier.

If using TCS-218C or TCS-215C dual-driver bass bins then note that the impedance for each of these is already 4 ohms and only some very powerful amplifiers are capable of driving loads at 2 ohms or below. Consider using extra amplifiers for this purpose rather than the loop through connections. The TCS-115C or TCS-118C bass speakers are 8 ohms so it is possible to run two cabinets from one amplifier, providing the amplifier is powerful enough, although extra amplifiers will still provide the best performance.

It is recommended to use a bass cabinet and a mid/top with each stereo amplifier as this helps distribute the load across the power supplies better.

NB: The EQ shown is for tuning the system to the room / venue.

Crossovers and Processors

In order to correctly set up your sound system a selection of audio processing devices are necessary to divide the frequencies between the speakers, apply equalisation and limit the dynamic headroom. These duties can be performed by proprietary units such as standalone crossovers, graphic equalisers and limiters, and a TCS Compact series installation can be built in this way by paying careful attention to details such as appropriate crossover settings. This information is provided in the Technical Specifications for each TCS Compact series speaker.

Active and Passive systems

Passive crossover networks split the frequency range between drivers after the amplifier. Although this is an economical method for many general purpose applications, problems associated with this approach include the loss of energy (watts) as heat in the components of the crossover. Also, it is not possible to design steep roll-offs, as a broad range of frequencies has to be covered by both components. This causes smearing between the drivers and potentially raises the distortion from the individual components. If the headroom limit of the amplifier is reached the HF component can be heard 'pumping', as large amounts of energy are consumed by the low frequency transients.

In an active system the crossover is placed before the amplifiers to gain particular advantages. More amplifier channels are needed to deal with the split of frequency bands but this separation also helps to deliver a cleaner, more controlled sound from the speakers. The HF cannot be modulated by power drains needed by the LF speakers.

Loudspeaker Management Systems

The concept of a Loudspeaker Management System is to provide all the processing electronics you might need in one box. This typically includes crossover functions, equalisation, limiters, delays and preset memories, that can store different set ups for various applications. A loudspeaker management system offers potentially better audio quality, more precise control and protection against unwanted changes in settings.

Digital processing enables steeper roll-offs through the crossover areas to be designed, allowing more output from the speakers, as they are individually handling more appropriate bandwidths. Also, the addition of delay to the LF signal to match the arrival of the HF can help to make the image more intelligible. Therefore, it is much easier, and more efficient, to manipulate audio digitally in low voltage electronics than in the passive crossover networks found inside speakers.

The TCS Compact series has a range of sub bass units (TCS-115C, TCS-118C, TCS-215C, TCS-218C) that are designed to be used actively with the mid/top cabinets (TCS-081C, TCS-101C, TCS-121C, TCS-151C). The Turbosound LMS-D24 and LMS-D26 loudspeaker management systems contain custom presets for the TCS Compact series along with a world-class audio specification.

Turbosound LMS series loudspeaker management systems

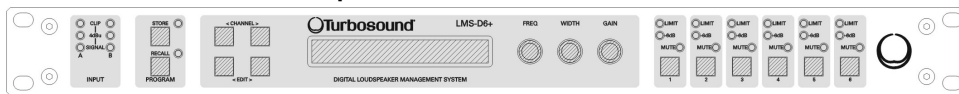
The Turbosound LMS-D24 and LMS-D26 series are powerful DSP-based audio processing units designed for use with Turbosound loudspeaker systems and associated bass enclosures. The functions of multiple conventional products are combined in a compact 1U high 19" rack unit. They offer EQ, both for the room and the drivers, delay to align the wave front, and limiters that can be set for each individual component to ensure against damage and to protect the long term reliability of your speakers.

The LMS-D26 has two inputs and six outputs and the LMS-D24 has four outputs. The units are configured to provide specific equalisation and crossover points aimed at optimizing the performance of these Turbosound loudspeaker systems. In addition, limiters, delays, eq, gain, polarity, and crossover filter controls are accessible to the user in order to match specific operation environments. The LMS series crossovers are designed for quick setup and adjustment via easy-to use front panel controls and, are ideally suited to both live sound and fixed installation.

Features

- Minimal signal path design, providing exceptional audio quality with carefully optimised processing and high performance converters for a >111dB dynamic range.
- Sonically superb ADC / DAC combination; a carefully matched pairing of the best devices from Burr Brown and Wolfson. Analogue Devices SHARC chip for DSP
- Extended bandwidth; 96 kHz sampling frequency provides for a nominally flat response to 40 kHz with minimal filtering.
- Audio-grade capacitors used in the analogue signal path for true audiophile performance and superior accuracy.
- Input delays of up to 400ms and output delays of up to 80ms can be set up on each output (mono) or pair of outputs (stereo) with fine resolution of 21µs steps to ensure perfect driver alignment.
- LF shelving filters to allow adjustment of the response in order to match variations of the acoustic conditions.
- Switching power supply that automatically adjusts to mains input voltages from 85 volts to 240 volts, allowing it be used anywhere in the world without inconvenient mains transformer adjustment.

LMS-D24/6 Quick Reference Set Up



(LMS-D26 shown)

The LMS-D24 and LMS-D26 are designed for quick setup and adjustment via an easy-to-use menu structure accessed by front panel buttons and 3 rotary encoders. A high resolution backlit LCD display provides the user interface to the menu options and parameters being adjusted.

Input Signal Indicators - three pairs of LED's indicate signal present, +4dBu and input clip for both channels. The signal present LED's operate at approximately -40dBu, giving a useful indication of even relatively low input signal levels. The +4dBu LED's are intended to show nominal operating level and can also be useful for setting system gain structure. Clip LEDs warn the user of input overload and operate at +19dBu.

Starting up

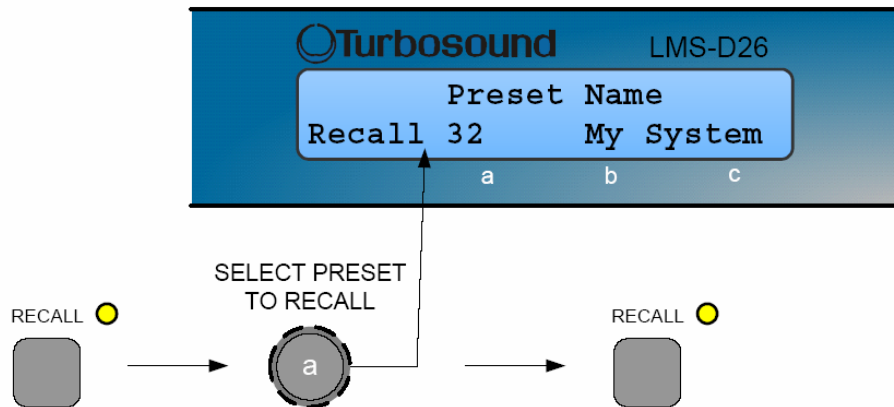
The unit will energise as soon as power is applied to the IEC inlet; there is no power switch. During the start up process the firmware application model number and version numbers are displayed and the outputs are muted until the unit has completed its internal checks. Once the start-up routines are complete and the unit is ready to pass audio, the DSP signal path will be restored to the current settings when it was last powered down and the audio signal is gradually ramped up to its correct level. At this stage the display shows the default screen with the memory location and name of the current Preset on the lower line of text.

About Presets

The unit has 45 memory locations and there is a library of around thirty 'Factory' Presets to suit a range of Turbosound enclosures. Factory Presets are locked so they cannot be over-written although edited versions can be stored in the free preset locations. Details of all the Factory Presets can be found in Appendix A in the LMSD2x pdf in the downloads section of www.turbosound.com.

Factory Presets contain some parameters that are fixed and hidden from view; typically crossover frequencies, output delay and some EQs; those settings that are a function of the loudspeaker cabinet design and should not require adjustment for different applications. The number and type of hidden parameters is dependant on the Factory Preset. The remainder of the DSP parameters are available for user manipulation.

Preset Recall



- To select a Preset, press the **Recall** Button so the indicator above it illuminates.
- Turn the left of the three parameter knobs (a) until the required Preset number is shown on the display.
NB: Factory presets are indicated by a box symbol appearing after the Preset number.
- Press the **Recall** Button again to activate the Preset.
NB: Pressing any other button will cancel the operation.

This process is deliberately in three stages in order to guard against accidental recall of incorrect Presets.

Creating a user defined crossover

In addition to the Factory Presets the unit has two further 'Base Presets' for mono and stereo usage. These Base Presets are stored in locations 1 and 2 respectively, they can be used to develop settings for any loudspeaker combination and are recalled in the same way as the Factory Presets described above. These Presets are also locked but the user can name and store their own edited versions in any free preset location.

Store button

To store a preset in a location, press the store button and use the encoders to select the memory location and name the preset. Pressing the store button again completes the task. Pressing any button other than store during the process cancels the procedure. The store button allows the user to name a preset and choose which memory location it will be held in. Pressing store button again completes the process.

LMS-D24/D26 Audio Connections

Audio Input connectors

These are fully balanced and are wired pin 1 ground, pin 2 hot and pin 3 cold. The two inputs have pin 1 connected directly to the chassis and feed the signal processing chains. If an unbalanced source is used, a connection should be made between the pin 3 'cold' signal and the ground connection of the unbalanced source.

Audio Output connectors

The processed outputs are impedance balanced, and are wired pin 1 ground, pin 2 hot and pin 3 cold. An unbalanced input may be driven by connecting pin 3 'cold' signal to the ground connection of the unbalanced destination input. Note that output pins 1 are ground lifted at audio frequencies but connected to ground at RF for good EMC performance. The intention being that the amplifiers the processor is driving should be responsible for the grounding of their input cable shields.

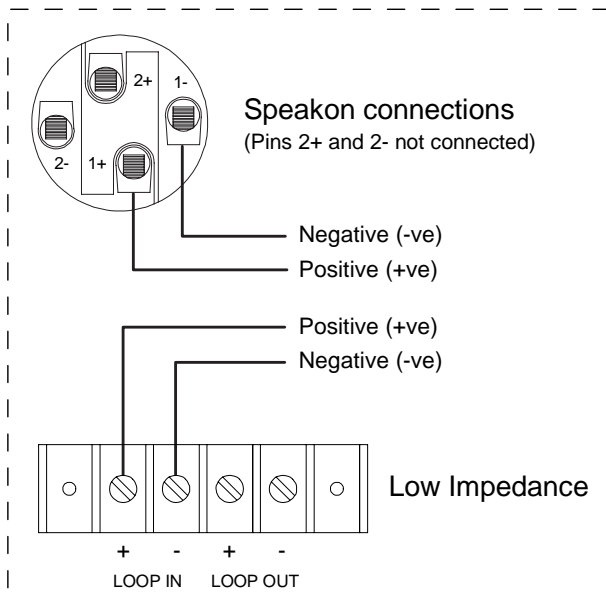
Presets and Secure mode

A momentary button is fitted on the rear panel, between the output XLRs and the RS232 port. When activated, this will disable all the front panel controls so they cannot affect the signal path, making the unit secure against tampering. When in secure mode, the indicators still operate normally however; Presets cannot be stored or recalled. If the unit is not responding then check that Secure Mode is not active.

Note that the communications port is still active in secure mode.

Speaker Connections

TCS Compact Series enclosures are provided with a recessed connector panel housing a single Neutrik Speakon NL4MP connector wired in parallel with a 4-way terminal strip. Either can be used for the input, the other being available as an output for looping to further TCS enclosures.



Note that looping out to additional enclosures has the effect of reducing the load impedance on the amplifier. For example, two 8 ohm cabinets in parallel give a combined total impedance of 4 ohms. Never connect loudspeakers whose total combined impedance is lower than the amplifier's recommended minimum load impedance. Do not use the loop-out connection to connect other types of loudspeaker, especially when their impedance is not known, as permanent damage could result!

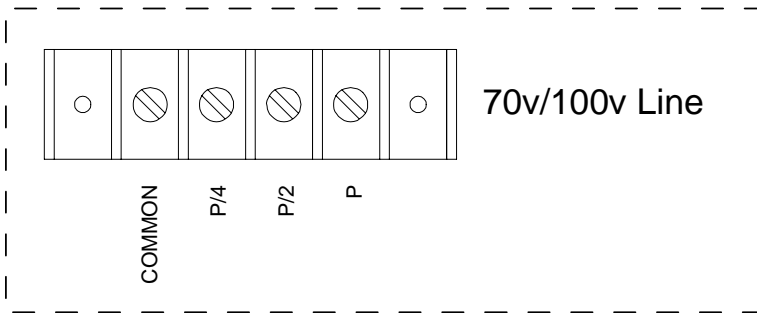
The cable end Speakon NL4 connector should be wired as follows:

Positive output	Pin 1 +
Negative output	Pin 1 -

Please take care if XLRs, binding posts, or other dual connector systems, are used at the amplifier end of the loudspeaker cables (jack plugs/sockets should not be used) where there is a possibility of the cables being reversed. It is highly recommended that Neutrik Speakon or other heavy duty non-reversible connectors are used.

70/100V Line Distributed Systems

Line transformer models are supplied with step-down transformers with voltage taps at P, P/2, and P/4 watts, where P is the maximum power rating of the line transformer, and these are accessed via the 4-way barrier strip only.



TCS Compact series

Cable Recommendations

Heavy duty loudspeaker cable should always be used, with a minimum wire size of 12 gauge (1.5mm²), and preferably 10 gauge (2.5mm²) for longer runs, keeping the run as short as possible. This helps to avoid wasting amplifier power in the resistance of the cable. High cable resistance also lowers the damping factor of the amplifier which affects its ability to control loudspeaker cone movement.

Losses due to undersized cable and long runs are clearly illustrated in the table below. Please use this table to determine the most suitable cable size and maximum run for your particular application.

Nominal Cable Area (mm ²)	Cable Length (m)	Cable Resistance (W)	Voltage Drop (%) 8 ohms		Sensitivity Loss (dB)	
			8W	4W	8W	4W
1.5	5	0.07	0.8	1.6	-0.1	-0.1
	10	0.13	1.6	3.2	-0.1	-0.3
	25	0.33	4.0	7.7	-0.4	-0.7
	50	0.67	7.7	14.3	-0.7	-1.3
	100	1.33	14.3	25.0	-1.3	-2.5
2.5	5	0.04	0.5	1.0	0.0	-0.1
	10	0.08	1.0	2.0	-0.1	-0.2
	25	0.20	2.4	4.8	-0.2	-0.4
	50	0.40	4.8	9.1	-0.4	-0.8
	100	0.80	9.1	16.6	-0.8	-1.6
4.0	5	0.02	0.3	0.6	0.0	-0.1
	10	0.05	0.6	1.2	-0.1	-0.1
	25	0.12	1.5	3.0	-0.1	-0.3
	50	0.25	3.0	5.8	-0.3	-0.5
	100	0.50	5.8	11.0	-0.5	-1.0

note : Figures based on specifications supplied by Van Damme Cables (VDC)

Flying & Lifting / Rigging

A versatile set of rigging parts has been designed for TCS Compact Series enclosures in order to give the installer a cost effective approach to flying and mounting, ranging from a single enclosure up to multi-box arrays and clusters.

All riggable products are fitted with metric internal fixings. It is expected that external parts such as eye nuts, flying bridles, scaffold clamps, safety chains etc. will be obtained locally from the usual suppliers and used with the parts available from Turbosound.

Any installation, whether temporary or permanent, must be securely attached to the structure of the building using chain, steel wires or web straps which are certified and load rated for the purpose. The combined weight of the sound system, its cables and the rigging system must be safely carried by the points at which attachment is made to the building or structure. Great care must be taken in selecting the attachment points and methods, being absolutely sure of the load carrying capacity of points chosen.

IMPORTANT NOTE: The rigging of loudspeaker systems is an extremely serious matter with potentially lethal consequences should anything go wrong. It is of vital importance that you, or other people rigging the system, are suitably qualified to do so and have a full understanding of all the factors involved with safety as a number one priority. Turbosound accept no responsibility for any accident, damage or failure of any rigged system. This rigging information is specifically related to the requirements of the TCS Compact Series products only. For more detailed information on the whole topic of rigging various handbooks are available. If you are in any doubt contact your Turbosound dealer who will be able to refer you to an experienced rigging company.

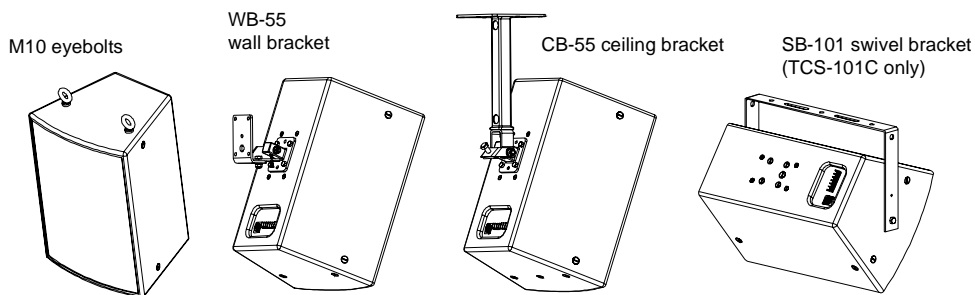
All the sets and parts have been type tested and will be covered by 'certificates of conformity' as to their ability to safely meet their design specification. These certificates are available on request.

user manual

TCS Compact series

Flying Single Enclosures

Single enclosures may be flown using a variety of different methods:



All TCS COMPACT series cabinets, including low frequency enclosures, can be rigged in permanent installations using optional M10 shoulder eyebolts (available from Turbosound or third party suppliers). These can be attached to the rigging points provided on the top and back of the cabinet. The rigging point at the rear of the cabinet is used to alter the downward angle of the enclosure.



As supplied, these rigging points are fitted externally with M10 countersunk slot-head screws. To facilitate rigging of the enclosure simply remove these M10 screws and replace them with M10 x 18mm shoulder eyebolts using a suitable thread locking compound to avoid the possibility of loosening.

Note: Eyebolts must have a thread length of at least 18mm (3/4").

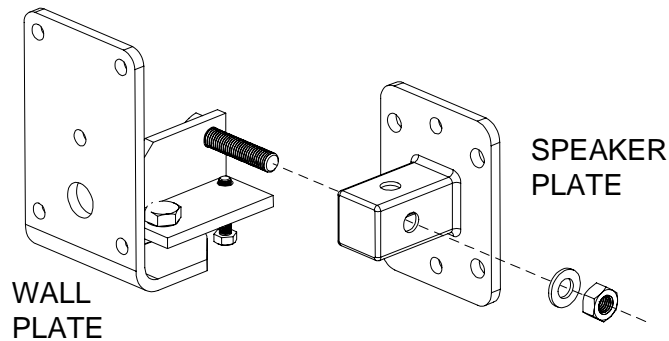
NOTE: The rigging points are designed to suspend single enclosures only. There is no facility to hang an additional cabinet below a flown TCS COMPACT series enclosure.

Flying Accessories

EB-10 M10 x 18mm shoulder eyebolt

Model	TCS-151C	TCS-121C	TCS-101C	TCS-081C
Wall Bracket	WB-55	WB-20	WB-20	WB-20
Ceiling Bracket	CB-55	CB-55	CB-55	CB-55
Swivel Bracket	SB-101			
OmniMount™	120 series	60 series	60 series	30 series
Internal Rigging Points	(9) M10 (4) M8 for WB-55 or CB-55 brackets (4) M8 for OmniMount™ series brackets	(9) M10 (4) M8 for WB-20 or CB-55 brackets (4) M6 for OmniMount™ series brackets	(9) M10 (4) M8 for WB-20 or CB-55 brackets (4) M6 for OmniMount™ series brackets (2) M10 for SB-101	(9) M10 (4) M8 for WB-20 or CB-55 brackets (4) M6 for OmniMount™ series brackets

WB-20 wall bracket (exploded view)



Use of Thread Locking Compounds

When assembling flying hardware to TCS Compact Series loudspeaker enclosures it is advisable to use thread-locking compounds to eyebolts and other bolts in order to avoid any possibility of loosening.

The recommended thread-locking compound is Loctite 222.

The threaded rigging points used in TCS Compact Series enclosures are manufactured from zinc-plated mild steel. Therefore, and additionally if the external bolts used are zinc-plated, zinc-passivated, stainless steel or anodised (as the majority are), then the corresponding activator, Loctite 7471, should be used to achieve 100% performance.

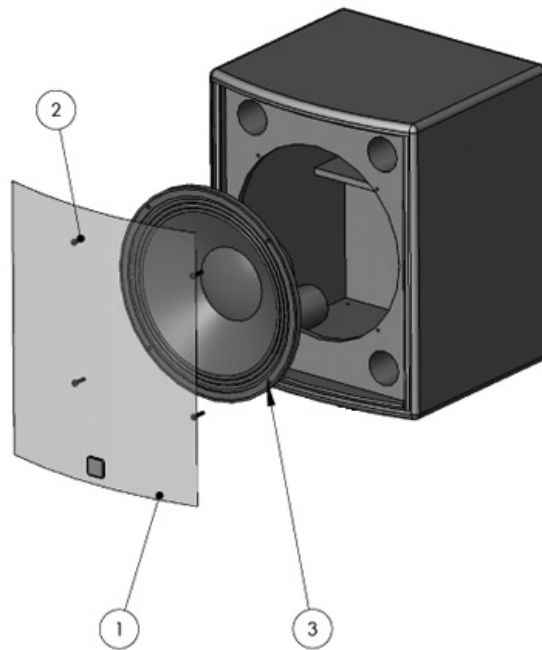
Application: Spray Loctite 7471 into the thread holes and allow to evaporate. Apply Loctite 222 thread locking compound to the bolts prior to fitting, allowing sufficient to fill all the engaged threads. Assemble components and tighten as necessary.

The parts may be disassembled by hand if required.

Servicing Information

If any of the drive units in your TCS COMPACT series cabinet should cease functioning and need a replacement re-cone or diaphragm, you are advised to remove the faulty unit from the cabinet and send it to a professional service centre authorised to repair Turbosound loudspeakers.

Removal of the low frequency driver(s)

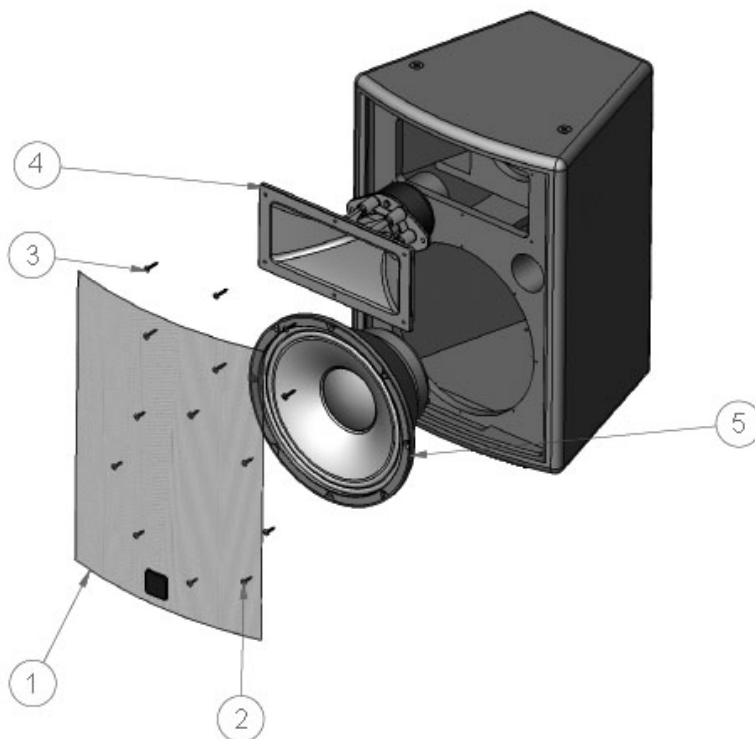


The perforated steel loudspeaker grille (1) is held in place under tension only, fitting into slots at either side of the baffle. There are no screws or other fixings holding the grille in place. Lay the cabinet on its back and, using two small screwdrivers inserted through the mesh of the grille, firmly pull the grille away from the slot at one side of the baffle until it is free. Set the grille aside for later re-assembly.

Undo the screws (2) holding the driver in place and carefully lift it out and away from the cabinet. Make a note of the driver terminal polarity for later reconnection. Disconnect the cables from the drive unit and completely remove the driver from the cabinet being careful not to damage the cone or suspension. Do not place the driver near to any equipment or media that may be adversely affected by strong magnetism, e.g. CRT monitors or magnetic tape of any kind.

To reinstate the speaker simply reverse the above procedure, making sure you observe the correct polarity when reconnecting the cables back into the terminals of the drive units.

Removal of the HF compression driver and LF driver



The perforated steel loudspeaker grille (1) is held in place under tension only, fitting into slots at either side of the baffle. There are no screws or other fixings holding the grille in place. Lay the cabinet on its back and, using two small screwdrivers inserted through the mesh of the grille, firmly pull the grille away from the slot at one side of the baffle until it is free. Set the grille aside for later re-assembly.

Undo the screws (2) holding the driver (5) in place and carefully lift it out and away from the cabinet. Make a note of the driver polarity for later reconnection. Disconnect the cables from the drive unit and completely remove the driver from the cabinet being careful not to damage the cone or suspension. Do not place the driver near to any equipment or media that may be adversely affected by strong magnetism, e.g. CRT monitors or magnetic tape of any kind.

Remove the horn/driver (4) assembly by unscrewing the four screws (3) holding the flange in place. Lift it out and away from the cabinet. The high frequency driver can now be disassembled from the HF horn.

To reinstate the driver(s) simply reverse the above procedure, making sure you observe the correct polarity when reconnecting the cables back into the terminals of the drive units.

About EASE Data

Sound system projects are more likely to go to plan when you have a reliable indicator in advance of how the speaker system will perform in the venue. Turbosound engineers are able to assist you with your system design using the industry-standard EASE program to aid in the quest to find the perfect system for the job. Although we cannot replace the role of an acoustical consultant, we can provide a good indication of system performance to back up the proposal.

Statistically, more jobs are won and more sales are made when a project has been properly and scientifically designed, along with the facility to show the client a convincing visual representation of the finished design. This cuts a large amount of guesswork out of the process, and is the reason why we actively encourage you to make use of our design resources to help you or your customers to win that next job. EASE is also a useful tool for addressing acoustic issues in the venue, for example to justify adding acoustic treatment to a room such as cladding a wall or balcony face. Having a graphical model can strengthen the proposal and ultimately ensure a better result.

Overview

EASE (Enhanced Acoustic Simulator for Engineers) is a sophisticated sound system design tool and acoustic simulation software package for Windows PCs, created by SDA (Software Design Ahmert GmbH, Berlin). It enables extremely accurate acoustic calculations to be realised both for indoor venues and outside spaces. In this way acoustic parameters and properties can be calculated for audience areas or even particular listener seats. EASE is particularly useful where a large number of speakers may be used, i.e. in concert halls, stadiums and public buildings.

The EASE application itself is comprehensive and can account for a wide range of surface properties, i.e. absorption and dispersion and also early reflections, directivity and phase characteristics. 3D acoustical models can be created for computing parameters such as RT (Reverb Time), IR (Impulse Response) and SPL (Sound Pressure Level) distribution for sound reinforcement and speech intelligibility.

There are a variety of module upgrades that enhance EASE's capabilities, such as AURA (Analysis Utility for Room Acoustics) which has become a standard for modelling spaces in three dimensions along with the VISION rendering engine. EASE VIEW loads OpenGL and Mapping files as used in the design

EARS is an auralisation module that allows the determination of audio quality, and the comparison of old against new sound system installs, by locating sound sources in the virtual room, or open air space, using convolving and binaural techniques.

EASERA is used for evaluating and measuring the transmission properties of both spaces and electrical equipment.

EASE FOCUS is a free 2D 'aiming' program that can be used for aligning speaker stacks and particularly arrays. It uses configuration files in ASCII format made using compiler software which have the extension .efo.

Use of Turbosound EASE data

Turbosound provides pre-measured EASE data to aid sound system designers in making appropriate choices with the type and positioning of speakers in the required venue. The suitability of certain models can be assessed and the installation can be improved by adapting the frequency response consequently.

The speakers are measured from the centre of an entire globe with 5 degree resolution and third octave frequency resolution.

EASE data is available from our download FTP server at <ftp://ftp.turbosound.com>

Technical Specifications

Sub Bass Enclosures

Model	TCS-218C	TCS-215C	TCS-118C	TCS-115C
Dimensions HxWxD	1035x602x532mm	891x550x506mm	652x540x484mm	652x465x423mm
	40.7"x23.7"x20.9"	35.1"x21.7"x19.9"	25.7"x21.3"x19.1"	25.7"x18.3"x16.7"
Net weight	54.5kg (119.9lbs)	47kg (103.4lbs)	30kg (66lbs)	25kg (55lbs)
LF Driver Components	2 x 18" (457mm)	2 x 15" (381mm)	1 x 18" (457mm)	1 x 15" (381mm)
Frequency Response ±4dB	36Hz - 150Hz	40Hz - 150Hz	36Hz - 150Hz	43Hz - 150Hz
Power Handling	600 watts r.m.s. 1200 watts program		300 watts r.m.s. 600 watts program	
Recommended Amplifier Power	1200 watts @ 4 ohms		600 watts @ 8 ohms	
Sensitivity 1 watt @ 1metre	101dB	99dB	98dB	96dB
Maximum SPL Continuous-> Peak->	129dB	127dB	123dB	121dB
	135dB	133dB	129dB	127dB
Recommended Crossover	12dB/octave low-pass at 150Hz			
Nominal Impedance	4 Ohms		8 Ohms	
Construction	18mm (3/4") birch plywood			
Grille	Powder coated perforated steel mesh, backed with black reticulated foam on black cabinets and white acoustically transparent cloth on white cabinets.			
Connectors	(1) Neutrik Speakon NL4MP, wired pin1+: positive, pin 1-: negative, pins 2+ and 2- N/C (1) 4-way barrier strip connector			
Flying Hardware	(9) M10 internal threaded rigging points			
Finishes	Black semi-matt textured paint (standard), white, raw birch plywood, and custom colours			
IP54 Weather Resistant Version	TCS-218CW	TCS-215CW	TCS-118CW	TCS-115CW

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2-Way Enclosures

Model	TCS-151C	TCS-121C	TCS-101C	TCS-081C
Dimensions HxWxD	652x468x423mm 25.7"x18.4"x16.7"	553x407x352mm 21.8"x16"x13.9"	508x366x319mm 20"x14.4"x12.5"	415x308x270mm 16.3"x12.1"x10.6"
Net Weight	25.5kg (56.1lbs)	19kg (41.8lbs)	16.5kg (36.3lbs)	12kg (26.4lbs)
LF driver	1 x 15" (381mm)	1 x 12" (305mm)	1 x 10" (254mm)	1 x 8" (203mm)
HF compression driver	1 x 1" (25mm)			
Frequency Response ±4dB	45Hz - 20kHz	60Hz - 20kHz	65Hz - 20kHz	70Hz - 20kHz
Nominal Dispersion	70°H x 40°V @ -6dB points		100°H x 60°V @ -6dB points	
Power Handling	300 watts r.m.s. 600 watts program		250 watts r.m.s. 500 watts program	200 watts r.m.s. 400 watts program
Recommended amplifier power @ 8 Ohms	600 watts		500 watts	400 watts
Sensitivity 1 watt @ 1 metre	99dB	97dB	95dB	93dB
Maximum SPL continuous-> peak->	124dB 130dB	122dB 128dB	119dB 125dB	116dB 122dB
Internal Crossover	1.8kHz		2.2kHz	3kHz
High Pass	24dB/octave		12dB/octave	
Low Pass	12dB/octave low-pass			
Nominal Impedance	8 ohms			
Construction	15mm (5/8") birch plywood enclosure			12mm (1/2")
Grille	Powder coated perforated steel mesh, backed with black reticulated foam on black cabinets; backed with white acoustically transparent cloth on white cabinets			
Connectors	(1) Neutrik Speakon NL4MP, wired pin1+: positive, pin 1-: negative, pins 2+ and 2- N/C (1) 4-way barrier strip connector			
Finishes	Black semi-matt textured paint (standard), white, raw wood and custom colours			
IP54 Weather Resistant Version	TCS-151CW	TCS-121CW	TCS-101CW	TCS-081CW

Notes:

TCS-101C has a rotatable Converging Elliptical Waveguide™ for use with swivel bracket.

TCS-081C has a fixed Converging Elliptical Waveguide™

70v/100v Line Transformer versions

(Specifications as standard models accept for the following)

Model	TCS-151CT	TCS-121CT	TCS-101CT	TCS-081CT
Tappings (Watts)	240, 120 and 60	120, 60 and 30	120, 60 and 30	60, 30 and 15
Frequency Response ±4dB	45Hz - 17kHz	60Hz - 17kHz	65Hz - 17kHz	75Hz - 17kHz
Net Weight	28kg (61.6lbs)	20.5kg (45.1lbs)	18kg (39.6lbs)	13kg (28.6lbs)
Connectors	(1) 4-way barrier strip connector with voltage taps at P, P/2, and P/4 watts			

Technical Specification Notes:

1. Frequency response is measured on axis
2. Nominal Dispersion and sensitivity are an average over stated bandwidth
3. Maximum continuous SPL is measured by using unweighted diode-clipped pink noise in a half space environment.
4. Maximum peak SPL is verified by subjective listening tests of familiar program material, before the onset of perceived signal degradation

NB: Due to continuing product improvement these specifications are subject to change.

TCS Compact series

Spares List

Model	TCS-218C	TCS-215C	TCS-118C	TCS-115C	TCS-151C	TCS-121C	TCS-101C	TCS-081C
LF Driver Complete	LS-1811	LS-1523	LS-1811	LS-1514	LS-1521	LS-1219	LS-1023	LS-8010
Re-cone Kit	RC-1811	RC-1523	RC-1811	RC-1514	RC-1521	RC-1219	RC-1023	RC-8010
1" (25mm) HF Compression Driver	CD-111							
HF Diaphragm	RD-111							
Passive Crossover Network					TXD- TCS- 151-PX- A	TXD- TCS- 121-PX- A	TXD- TCS- 101-PX- A	TXD- TCS- 081-PX- A

Warranty

Limited Warranty

This Turbosound loudspeaker product is warranted to the original end-user purchaser and all subsequent owners for a period of two (2) years from the original date of purchase.

Warranty Coverage

Warranty coverage includes defects in materials and workmanship. It does not include:

- damage caused by accident, misuse, abuse, neglect or modification by any other person other than an authorised Turbosound representative,
- damage caused by overdriving, use with unsuitable amplifiers or amplifier failure,
- damage caused by failure to operate the product in accordance with the instructions contained in the user's manual,
- damage occurring during shipment in transit,
- claims based upon any misrepresentations by the seller,
- products which do not have the original components as specified in the product engineering information,
- products on which the serial number has been removed or defaced.

Shipping

Should any fault develop with a component of your Turbosound system, please return the product, freight pre-paid, in its original packing carton, along with proof of purchase such as the original bill of sale or receipted invoice, and a description of the suspected fault to:

Turbosound Ltd. (Att: Customer Service), Star Road, Partridge Green, West Sussex RH13 8RY, United Kingdom, or your local authorised Turbosound representative.

The product serial number must be quoted in all correspondence relating to the claim. Insurance is recommended, as Turbosound or its representatives are not liable for loss or damage in transit. Turbosound will pay for return freight costs should repairs be covered under warranty.

Incidental and consequential damages

Turbosound's liability is limited to the repair or replacement, at our option, of any defective product, and shall not be liable for any incidental and consequential damages including, without limitation, injury to persons or property or loss of use.

Limitation of implied warranties

All implied warranties, including warranties of merchantability and fitness for a particular purpose, are limited in duration to the length of this warranty.

This warranty is in addition to, and in no way detracts from, your statutory rights as a consumer. No other warranty is expressed or implied.

Please record your purchase information below for future reference:

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Invoice number

Date of purchase

Unit serial number

Notes

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