



## **ASPECT TA-500 SYSTEMS**

**TA-500**

**TA-500DP**

**TA-500t**

**TA-500tDP**

**TA-500H**

**TA-500HDP**

**TA-500HM**

**USER MANUAL**

**Turbosound Ltd.  
Star Road, Partridge Green  
West Sussex RH13 8RY United Kingdom  
Tel: +44 (0)1403 711447 Fax: +44 (0)1403 710155  
web: [www.turbosound.com](http://www.turbosound.com)**

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## EC DECLARATION OF CONFORMITY

### Manufacturer

Turbosound Ltd

Star Road, Partridge Green, West Sussex, RH13 8RY

### Products

TA-500DP

TA-500tDP

TA-500HDP

T-25 Power Amplifier

T-45 Power Amplifier

LMS-D26 Controller

LMS-D24 Controller

### Standards

Safety

EN60065:2003

Relevant Specifications used as basis for tests

EN66103-1:1996

EN55103-2:1996

### Category

Professional apparatus for use in Commercial Light Industrial and controlled EMC environments.

### CE Marking

All products are marked in accordance with the relevant statutory requirements.

## **INTRODUCTION**

### **Turbosound Aspect System Concepts**

The TA-500 system is a modular point source loudspeaker system designed to deliver extremely high fidelity audio. The system is easily scaleable medium scale ground-stacked and flown concert touring down to small clubs and events.

The Aspect system concept centres around the exceptional directivity of the patented Polyhorn™ devices employed in the high frequency and high-mid frequency sections of the mid/high enclosure. In contrast to the majority of conventional horns, Polyhorns develop more consistent frequency response across all seats of an auditorium with minimal interference between adjacent enclosures.

The patented Polyhorn™ devices exhibit a sharp cut-off at the edges of the dispersion pattern, making it possible to achieve seamless coverage of a venue with minimal destructive interference between elements, however many individual enclosures are deployed in the cluster. The Polyhorn™ devices generate phase-coherent and smoothly-curved wavefronts which match the array curvature, whose centre becomes the virtual point source.

The TA-500 trapezoidal enclosure can be ground-stacked or flown in arrays. It can also be integrated with TA-880 or TA-890 systems as a front or side fill cabinet.

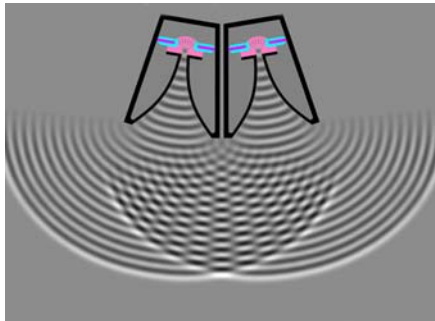
TSW-218 dual 18" horn-loaded low frequency enclosures or B18 single 18" bandpass subwoofers provide ideal sub-bass support for the TA-500.

### The Aspect Polyhorn™ Concept

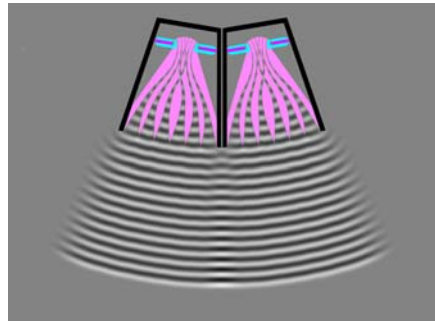
The patented Polyhorn™ design effectively solves the problem of the tendency for exponential horns to beam with increasing frequency. Dividing the multi-cellular horn into multiple tapered waveguides guarantees that the path length of each micro-horn is equal from the surface of the driver diaphragm to the horn mouth, and ensures that all frequencies from all parts of the diaphragm arrive at the horn mouth together. This provides the wavefront with uniformity of phase. A further benefit of the Polyhorn™ geometry is that the sound wave does not suffer from edge-diffraction effects which have a tendency to confuse the directionality of the sound source.

Each cabinet in an array of Aspect loudspeakers contribute to the generation of a single, cohesive, and more or less continuous wavefront without noticeable comb-filtering effects. In addition, the Polyhorn™ design offers the possibility of locating the acoustic centre well behind the motor system and even the enclosure. The wavefront radii can now be arranged to coincide with the array curvature, forming a single virtual point source.

Because of the Polyhorn™ design's sharp cut-off, its array angle can in practice be taken as being the same as the dispersion angle.



**Fig 1. Conventional HF horns produce destructive interference**



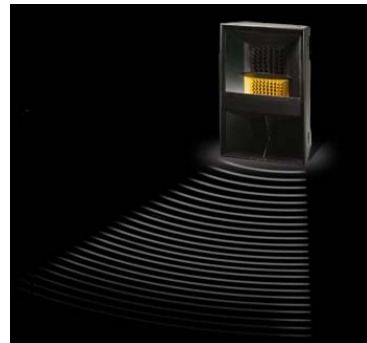
**Fig 2. Polyhorn™ creates smoothly curved and phase-coherent wavefront**



- The TA-500 features approximately twice the horizontal and vertical dispersion as the narrower TA-880 and TA-890 products, making it more suitable for medium- and near-field applications in smaller rooms.
- The Polyhorn™ displays a similarly sharp cut-off at the dispersion edges to the narrower TA-880 and TA-890 products, as illustrated below, and this makes it practical to cover a lot of small to medium venues with only two cabinets per side, giving approximately 100° of horizontal coverage per array.



**TA-880**  
narrow 25° horizontal coverage



**TA-500**  
wider 50° horizontal coverage

### **The Loudspeaker Management System (LMS) Concept**

Turbosound Loudspeaker Management Systems are more than just electronic crossovers. As well as steep slope active filters and high performance limiters, they provide full digital alignment of all components in the Aspect enclosures, to ensure a coherent acoustic output. They also incorporate a number of features which contribute to overall system reliability and ease of setting-up and use.

All system parameters such as crossover frequencies, limiter settings and equalisation can be simply called up from a factory-set menu, making it possible to maintain consistent and repeatable system performance.

Because the power amplifiers can be included as part of the Aspect system, the controllers are able to utilise output limiters which are precisely matched to the system requirements, being pre-set to prevent the amplifiers from clipping. Inputs and outputs are fully balanced, providing isolation between the controller and the amplifier inputs. These factors contribute to high reliability in the adverse circumstances often encountered under arduous touring conditions.

In addition, LMS-D2X series controllers are equipped with built-in network capability, allowing maximum control and flexibility over the loudspeaker system's performance and security.

### **LMS-D2X Loudspeaker Management Systems**

Use of Turbosound loudspeaker management systems ensures accurate time-alignment of the system drive units and also provides a facility for users to select additional delay, either to compensate for physical displacement of ground-stacked bass enclosures relative to flown high packs, or to provide full range delay for correct image localisation or use in distributed systems.

### **Network Capability**

Turbosound LMS series loudspeaker management systems and Turbosound self-powered loudspeaker systems are fully networkable, enabling control and monitoring of all networked devices via the BvNet protocol using Turbosound's TurboDrive™ software, available as a free download from the Turbosound website [www.turbosound.com](http://www.turbosound.com)

For a detailed explanation of TA-500 networking capability please consult the TurboDrive™ User Guide, available in pdf as a download from our ftp site <ftp://ftp.turbosound.com>.

### **Power Amplifiers**

In addition to the Turbosound T-25 and T-45 model amplifiers recommended for use with Aspect systems, the following other power amplifier brands provide sufficient performance and mechanical compatibility to perform well with Aspect loudspeaker systems:

- MC2 E series
- Lab Gruppen FP series
- Crest Pro series
- QSC Powerlight II series

### **Digital Controllers**

In addition to the Turbosound LMS-D24 and LMS-D26 loudspeaker management systems, the following digital crossovers have been tested and are recommended for use with Aspect systems:

- BSS FDS366
- XTA 224, 226 and 428
- Dolby Lake Contour and Dolby Lake controller

### **Self-powered Loudspeakers**

Aspect TA-500 series cabinets are additionally available with integrated networkable Class D amplifier modules, taking consistent performance and ease of use to a new level. Featuring lightweight high-power amplifiers using 96kHz DSP and operating at better than 90% efficiency, self-powered TA-500 products eliminate the need for separate amplifier racks and controllers, as well as the attendant cabling. Powered loudspeakers can be controlled and monitored over a network with a PC running the TurboDrive™ software.

### **Aspect Loudspeaker Components**

All the drive units have been designed in-house specifically for the Aspect system and are manufactured exclusively for Turbosound. This means that they are expressly suited to their intended purpose, and make use of innovative features to ensure premium performance.

Neodymium magnets are used throughout all drive units. This results in higher efficiency, less power compression and reduced overall weight.

Low-mid frequency drivers are designed to be rear-facing in the enclosure, enabling the heatsink / phase plug to be placed in the air flow to aid cooling.

### **TA-500 Three-way Loudspeaker**

The TA-500 trapezoidal enclosure contains a Turbo-loaded neodymium 15" LF driver, a custom 10" MF driver on a Polyhorn™ device, and a custom HF driver on a Polyhorn™ device, covering a frequency range from 60Hz up to 18kHz (with DSP). The two Polyhorn™ devices are designed to generate an exceptionally smooth and accurately defined wavefront across a 50° horizontal by 25° vertical dispersion pattern, and over the entire mid and high frequency bands.

It is configured as a switchable tri-amped or bi-amped (with passive high end) product.

The TA-500 is equipped for flying in fixed installations with an external flying system.



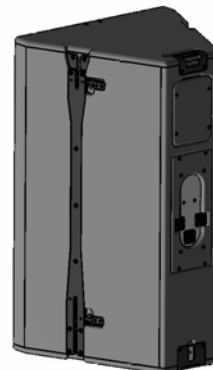
### **TA-500DP Self-powered Three-way Loudspeaker**

The TA-500DP is a networkable, digitally self-powered version of the TA-500, and contains a Turbo-loaded neodymium 15" LF driver, a custom 10" MF driver on a Polyhorn™ device, and a custom HF driver on a Polyhorn™ device, covering a frequency range from 60Hz up to 18kHz. It includes an integrated 2-channel Class D power amplifier and control electronics module with built-in network capability.



### **TA-500t Touring Three-way Loudspeaker**

The trapezoidal TA-500t is fully equipped for flown touring applications with an integrated rigging system designed for quick and easy flying with the minimum of external parts. The rigging system allows speaker clusters up to a maximum of nine enclosures to be assembled to suit a wide range of venues and audience spaces. It contains a Turbo-loaded neodymium 15" LF driver, a custom 10" MF driver on a Polyhorn™ device, and a custom HF driver on a Polyhorn™ device



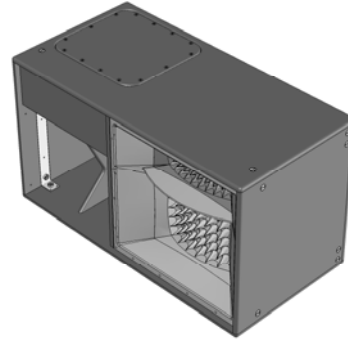
### **TA-500tDP Self-powered Touring Three-way Loudspeaker**

A self-powered version of the TA-500t with integrated

rigging system and integrated Class D amplifier module.

#### **TA-500H Horizontal Three-way Loudspeaker**

The TA-500H is a horizontally-orientated version of the TA-500 with the mid/high section rotated through 90° in order to maintain a 50° horizontal by 25° vertical dispersion pattern housed in a rectangular enclosure.



#### **TA-500HDP Self-powered Horizontal Three-way Loudspeaker**

A self-powered version of the TA-500H horizontal enclosure with integrated Class D amplifier module.

#### **TA-500HM Two-way High/Mid Loudspeaker**

A high/mid cabinet used for downfill and infill applications. Consists of a custom 10" MF driver on a Polyhorn™ device, and a custom HF driver on a Polyhorn™ device in a trapezoidal enclosure.



#### **TSW-218 Subwoofer**

The horn-loaded TSW-218 is designed to cover the sub and low frequency ranges from 25Hz to 160Hz, and can be used as part of a 5-way Aspect system in order to reinforce sub-bass frequencies. It utilises two custom designed neodymium 18" drivers loaded with TurboBass™ devices. The proprietary loading technique and horn flare design produces significant mutual coupling between adjacent enclosures, resulting in sensitivity gains of up to 110dB with eight units coupled.



### **B18 Subwoofer**

The B18 is a compact bandpass subwoofer designed to be used in a variety of installed sound system applications as well as portable sub-bass support for Aspect TA-500 enclosures. It consists of a high-excursion, 4" voice-coil, 18" LF driver in a bandpass birch plywood enclosure of modest dimensions. Speakon NL4 connectors are provided on the rear panel with special cable access bays that allow cabinets to be positioned against a wall when interconnected.

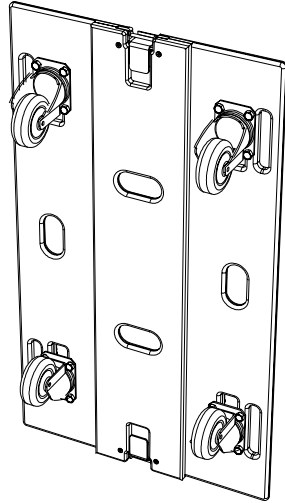


### **B18DP Self-powered Subwoofer**

A self-powered version of the B18 subwoofer with integrated Class D amplifier module.

### Transportation

An optional WB-500 wheelboard is available which clips on to the front of the cabinet, allowing single units to be conveniently transported. These are designed to be stackable, so that when not in use they can be neatly stored without taking up unnecessary floor space.





## **FLYING AND STACKING**

### **Overview**

The Aspect system flying hardware is specifically designed to take advantage of its precise horizontal directivity characteristics, as well as to allow a wide range of adjustment of the vertical angles between adjacent enclosures, and the overall vertical inclination of each column of enclosures. This means that arrays can easily be optimised to suit the coverage requirements of any situation.

Sound radiating from adjacent cabinets will successfully blend over a range of included angles, creating a coherent point-source image, and this results in the ability to tailor both the overall coverage and the SPL at a given distance.

The concept of arraying a point-source loudspeaker system is to create part of the surface of a sphere. A small part of a large sphere will form a high-directivity (long-throw) system with a high SPL at a distance, whereas a large part of a small sphere will be of lower directivity producing less SPL at a distance, but having a wider angle of coverage. This approach leads to the creation of a virtual point source of sound behind the array.

There are some simple rules to follow to help achieve this goal:

- Obtain a smooth even curve in the horizontal plane.
- Use a similar amount of tilt on each column.
- Ensure that the bottom corners of each column are in line with each other.

### **Safety Notes on Rigging**



The Turbosound Aspect rigging system has been designed and constructed to a high standard of safety, and tested to the most demanding of specifications.

In order to ensure the highest safety standards, the information following on the assembly and safe use of rigging accessories must be carefully understood and followed.

Only use Turbosound recommended rigging accessories, which are specifically designed for their intended purpose. Do not use Turbosound rigging with other types or brands of loudspeakers. This practice may compromise safety standards and Turbosound will not be responsible for damage or injury so caused.

Do not modify the rigging accessories, or use them in a way other than that described in this user manual. Rigging components supplied as part of a complete assembly are non-interchangeable and must not be exchanged with the component parts of any other assembly.

The component parts of a Turbosound rigging accessory must only be assembled using the fasteners and methods of assembly recommended in this manual. The use of fasteners and methods of assembly not specified or approved by Turbosound may result in an unsafe rigging assembly. Welding, or any other means of permanently fixing rigging components to each other or to cabinet fixing points is not allowed.

Rigging assemblies must only be assembled using the appropriate parts and fixings as specified in this manual using the specific mounting instructions. Rigging components or assemblies must only be fixed to Turbosound loudspeaker cabinets using the cabinet fixing points, assembly methods and fasteners specified in this manual and the specific mounting instructions.

Walls, floors or ceilings must be capable of safely and securely supporting the actual load. The rigging accessory used must be safely and securely fixed both to the loudspeaker and to the wall, floor or ceiling.

When mounting rigging components on walls, floors or ceilings ensure that all fixings and fasteners used are of an appropriate size and load rating. Wall and ceiling claddings and the construction and composition of walls and ceilings all need to be taken into account when determining whether a particular fixing arrangement can be safely employed for a particular load. Cavity plugs or other specialist fixings, if required, must be of an appropriate type, fitted and used in accordance with the maker's instructions.

Use only the rigging accessory fixing holes indicated in this manual and the specific mounting instructions to fix Turbosound rigging accessories to walls, floors or ceilings. Where specified, the recommended maximum torque settings for screw fasteners must be strictly complied with.

### Secondary Safeties

All loudspeakers flown in theatres, studios or other places of work and entertainment must, in addition to the principle load bearing means of suspension, be provided with an independent, properly rated and securely attached secondary safety.

Only steel wire ropes or steel chains of an approved construction and load rating may be used as secondary safeties. Plastic covered steel wire ropes are not permitted for use as secondary safeties.

### Safety Inspections



Carefully inspect rigging systems components and cabinets for defects or signs of damage before proceeding to assemble a flown array. If any parts are damaged or suspect, **DO NOT USE THEM.**

Regular, more rigorous test and inspection of rigging components must also be carried out. Safety legislation and test and inspection requirements will vary from country to country. In most cases, annual independent test and inspection by a suitably approved and qualified inspector will be required. Users must ensure compliance with all applicable safety requirements.

Turbosound recommends regular safety inspections and further recommends that a logbook be kept detailing the test and inspection history of each Turbosound rigging accessory.

Turbosound has adopted the following load safety factors:

- 12 x load safety factor: Chains, ropes, shackles, eyebolts, straps and hooks.
- 5 x load safety factor: Accessories generally employed in fixed, permanent installations.

Always wear protective headwear, footwear and eye protection in accordance with local regulations. Anyone involved in flying ANY sound system, especially in a touring capacity, should take note of the following advice:

The rigging of a flown sound system may be dangerous unless undertaken by qualified personnel with the required experience and certification to perform the necessary tasks. Fixing of hanging points in a roof should always be carried out by a professional rigger and in accordance with the local rules of the venue. The house rigger and/or building manager must always be consulted.

You should observe particularly the following points:

When initially ratcheting a column of speakers it is good to bear in mind the expected angle of inclination so as to avoid ending up with too much of the strap left on the ratchet. This is important because the ratchet can only take three complete turns before it releases itself.



**WARNING:** If a tilt strap is released suddenly, the column of enclosures may tend to swing violently forwards and care must be taken to avoid danger to persons in the vicinity. It is essential to check that nobody is standing immediately in front of the column, and to give a suitable warning, before the strap is released. Ideally, two persons should support the column from the side whilst the strap is released, or alternatively the bottom row may be returned to the ground before release. In any event it is essential that all personnel in the vicinity are aware that the system is about to move and that they must keep clear.

Aspect Flying System components have been individually tested in accordance with the following regulations:

- The Health and Safety at Work Act 1974
- The Supply of Machinery (Safety) Regulations 1992
- The Lifting Operations and Lifting Equipment Regulations 1998

Each component is covered by a Record of Load Test Certificate, which may be obtained on request from Turbosound, quoting the indentifying number(s) from the flying equipment. A copy of a sample certificate is reproduced overleaf.

Sample Certificate of Load Test

**TECHNIQUE**  
**Engineering Ltd**  
LIFTING EQUIPMENT SPECIALISTS & GENERAL ENGINEERS

**RECORD OF  
LOAD TEST**

RECEIVED  
11 FEB 2005

Certificate No. **INFORMATION ONLY**  
Date of Issue **INFORMATION ONLY**

This document complies with the essential requirements of the relevant sections of the following statutory regulations:  
The HEALTH AND SAFETY AT WORK ACT 1974  
The SUPPLY OF MACHINERY (SAFETY) REGULATIONS 1992  
The LIFTING OPERATIONS AND LIFTING EQUIPMENT REGULATIONS 1998

Name & Address of Customer / Owner of Equipment Turbosound Ltd Star Road Industrial Estate Partridge Green Horsham West Sussex RH13 8RY		Location of Equipment		
Customer Order Ref. -		QA Ref (if applicable) n/a		
Identifying Number(s)	Description of Equipment	Quantity	Safe Working Load (SWL)	Test Load Applied (Proof Load)
M131.1 M131.2 M131.3 M131.4	ASPECT FLYING BAR FB-890/3A	four	900kg	1800kg
<b>SAMPLE</b>				
<b>IMPORTANT: THIS EQUIPMENT MUST BE THOROUGHLY EXAMINED BY A COMPETENT PERSON (as defined by LOLER) AT LEAST ONCE EVERY 12 MONTHS FOLLOWING THE DATE ON WHICH IT IS FIRST TAKEN INTO SERVICE. A RECORD MUST BE KEPT OF WHEN THE EQUIPMENT IS FIRST USED AND OF ALL SUBSEQUENT THOROUGH EXAMINATIONS.</b>				

I hereby declare that the equipment described in this record has been load tested as detailed and thereafter examined and that as far as can be determined by such visual examination, found to be free from any defect likely to affect safety.

Signed



M F Divey  
Director (Engineering / Quality)  
Technique Engineering Ltd

## **FLYING HARDWARE**

### **Aspect TA-500 Flying Systems**

To take full advantage of the very precise dispersion properties of the Aspect system, two types of rigging system have been developed: a fully-integrated touring flying system which allows clusters to be rigged quickly and easily with an absolute minimum of additional external hardware; and an external flying system designed for use in fixed installations.

The flying systems are inherently safe, flexible and simple to use. The rigging design allows the creation of clusters and arrays that can be assembled quickly and with a minimum number of crew, and with full control of the vertical angles between enclosures and their vertical inclination.

### **Horizontal Coverage**

Because the Polyhorn's design dramatically reduces the acoustic energy outside of the specified 50° horizontal dispersion pattern, it is recommended that Aspect TA-500 enclosures always be arrayed in a smooth even curve, resulting in an array angle of 50° between boxes. Based on this assumption it is an easy job to assess how many columns, and therefore which particular combination of flybars, will be needed to achieve the required coverage.

### **Vertical Coverage**

Vertical coverage is dictated by the physical dimensions of the room and the location of the audience spaces. The number of boxes required in a vertical column is therefore determined by a number of factors including the trim height of the cluster, the vertical coverage you are trying to achieve, and the distance or projection required.

## **A. TA-500T TOURING FLYING SYSTEM**

Consists of fully-integrated rigging hardware used together with fixed angle flybars offering the ability to fly single columns, and two-wide and three-wide clusters up to a maximum total of nine enclosures.

The Aspect TA-500t touring flying hardware consists as follows:

- Chain bridle – for lifting the flybar
- Flybars – 2-wide and 3-wide variants for hanging up to 9 enclosures (3 wide by 3 deep)
- Flying chain assembly – for connector a column of enclosures to the flybar.
- Tilting strap – to provide the angle of tilt for the column
- Inter-cabinet link chains – for connecting the rows of enclosures together
- Integral flying hardware – fitted to the enclosure

### **Flybar Settings**

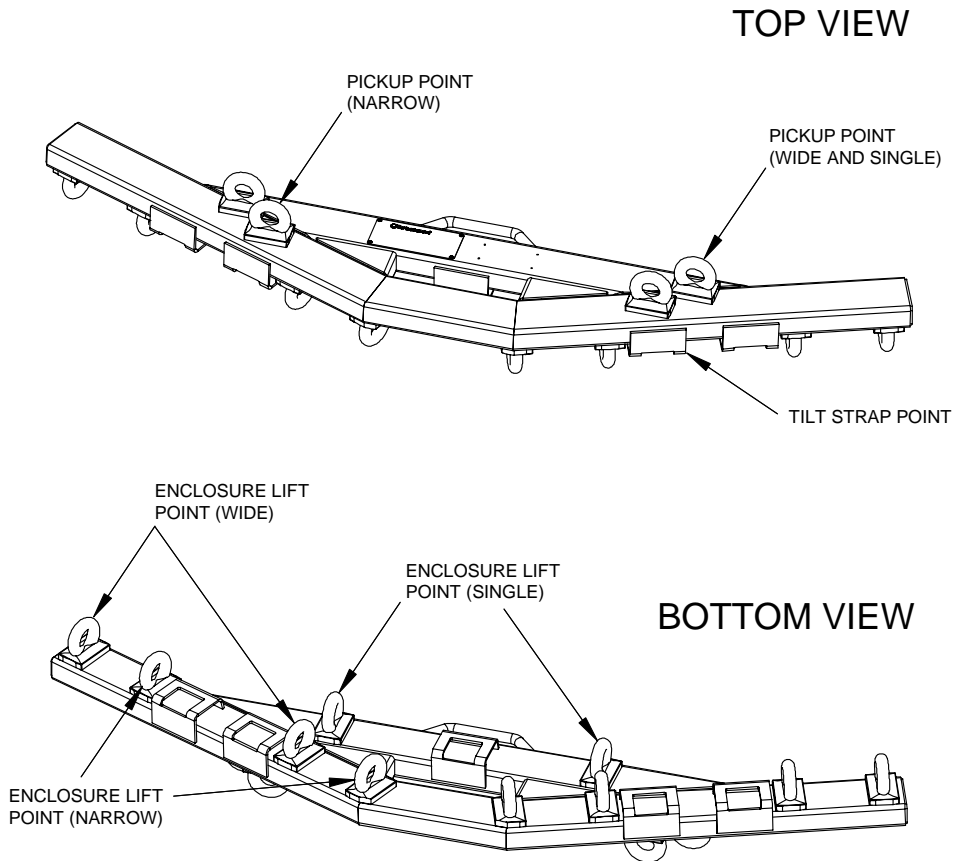
In order to accommodate the wide range of vertical coverage requirements dictated by a particular venue, the flybars offer two sets of lifting points, enclosure attachment points and lifting strap points. With reference to the table below the correct point can be selected for the required application.

The flybars also accommodate single column attachment points to enable users to suspend up to three rows of loudspeakers in a single column format. No additional parts or flybars are required to accommodate virtually all situations; it can all be achieved using only one type of flybar.

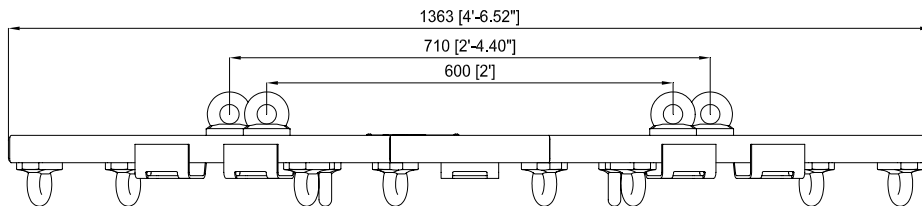
### **Touring two-wide flybar**

A fixed angle double bar fabricated from box steel section and designed to fly two vertical columns of cabinets up to three deep per column. It provides alternative cabinet suspension tabs and tilt strap points for narrow or wide configurations (when flying more than two boxes deep the wide configuration allows for the additional amount of kelp required), plus lifting points and safety points. A two-wide, three deep cluster can be flown from a single half-tonne motor using a CB-8003 chain bridle. Rugged lifting eyes are used preventing damage to lifting points and ensuring ease of connection.

The net weight of the bar is 21kg and the SWL is 380kg.



**Figure 1: FB-500T/2W Touring Two-wide Flybar**



**Figure 2: Flybar Lifting Points and Dimensions**

Two columns of enclosures can be flown from the FB-500T/2W flybar. Additionally a single column facility is provided allowing the flying of a single column of enclosures.



The following combinations are possible using the two-wide flybar.

**Table 1: Flying Matrix**

Number of Rows	Number of enclosures per row	Maximum total column angle	Flybar pickup point	Angle between rows
1	1	As required	Single	FC-500T Standard
2	1	21°	Single	FC-500T Standard
3	1	42°	Single	FC-500T Long
1	2	As required	Narrow	FC-500T Standard
2	2	7°, 14°	Narrow	FC-500T Standard
2	2	21°	Wide	FC-500T Standard
3	2	14°, 28°	Wide	FC-500T Long

In addition to the above stated angles, a further 5° of downward tilt angle is supported.

The process of flying boxes is achieved by suspending the columns of loudspeakers using chains attached to the top enclosure and the lifting points on the flybar. The flybars have a fixed angle thus ensuring the optimum horizontal dispersion is maintained. Kelp is applied to the columns to apply up to 5° of downward tilt as well as providing the means to achieve the pre-set angles dictated by the inter cabinet links.

There are two flying chain assemblies – a standard length version and a longer version. The standard length FC-500T Standard is for use with the narrow settings on the flybar and the longer FC-500T Long is for use with the wide settings – typically three rows of enclosures.

### **FC-500T Flying Chains**

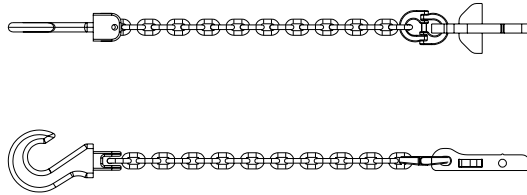
The flying chains are available in two lengths. The shorter FC-500T Standard chain is the standard part used for most applications, while the longer FC-500T Long version is used for three deep configurations. The assemblies consist of a swivelling hook, chain links and a cabinet attachment fitting. When flying systems always ensure that the flying chains are straight and that there is no evident twist in the chain.

Chains are universal (not handed) and therefore can be used for either side of the cabinet.

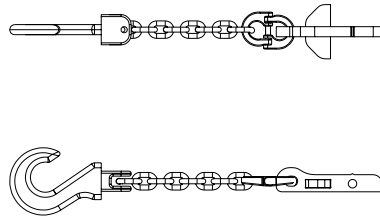
**user manual**  
**TA-500**

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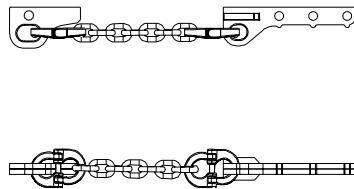
FC-500 flying chains are load tested to 140kg. The inter-cabinet chain assembly is rated at 60kg. Two inter-cabinet chain sets plus one top chain set provides the facility for lifting a maximum of three rows of enclosures.



**FC-500T Long Flying Chain**  
Net weight is 1kg (2.2lbs)

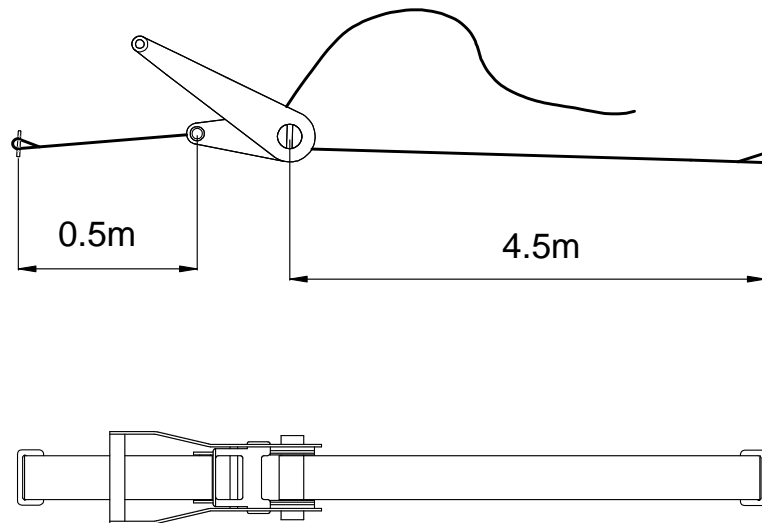


**FC-500T Standard Length Flying Chain**  
Net weight is 1kg (2.2lbs)



**Inter-cabinet Link**  
Net weight is 0.5kg (1.1lbs)

### TS-890 Tilting Straps



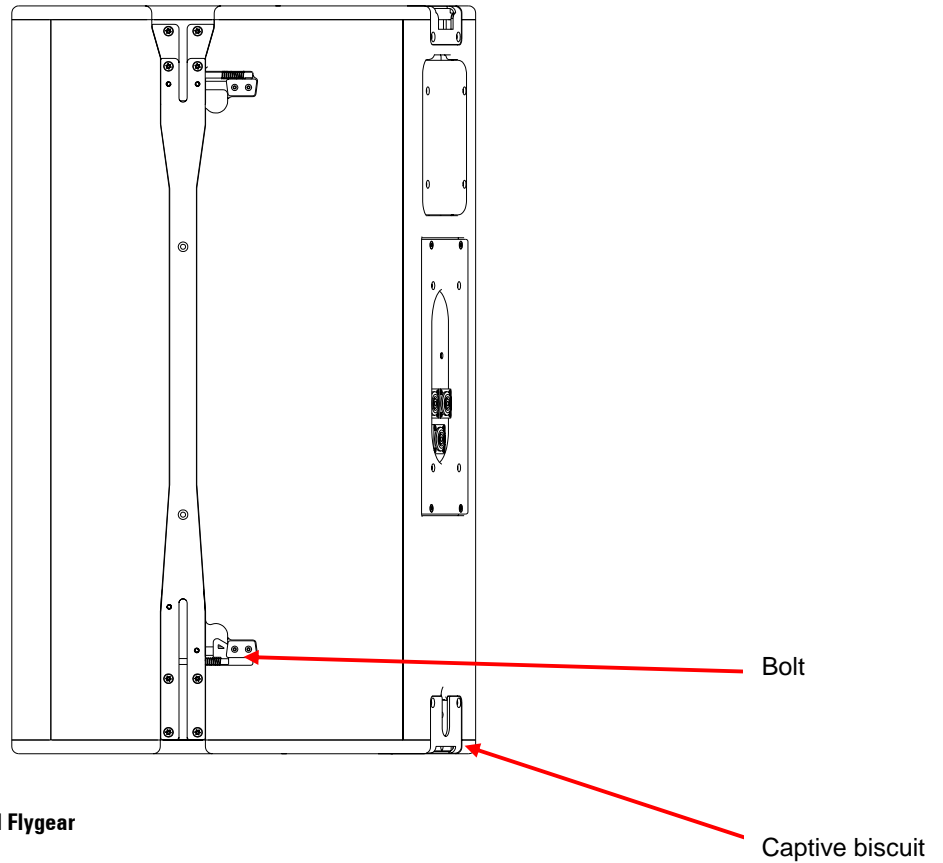
The tilting strap, TS-890, is in two parts. The longer part is attached to the tilt strap point on the flying bar using the buckle at its end. The other part of the strap with the ratchet is hooked into the tilt strap point on the underside of the bottom enclosure. The free end is then threaded through the ratchet and the strap tightened to achieve the desired tilt. The tilt strap is designed to ratchet in both directions so that the amount of tilt on a column may easily be increased or reduced incrementally. The ratchet is double acting serving to ensure the safety of the operator by limiting the swing of the cluster when letting off the load.

### Integral Flying Hardware

Aspect cabinets are flown and connected in vertical columns by means of the integral flygear that is rebated into the cabinet sides. In this way the load of the cluster is taken entirely through the steelwork and not through the box. It essentially consists of a moveable drop link that engages into a receptacle in the cabinet below with a choice of inter-cabinet angles.

All parts of the flygear are fitted flush with the woodwork of the cabinet, and can quickly and easily be removed for safety testing using a Torx TX20 bit.

The following diagram describes the various parts of the flygear.



**Figure 3: Cabinet Integral Flygear**

### **Bolt**

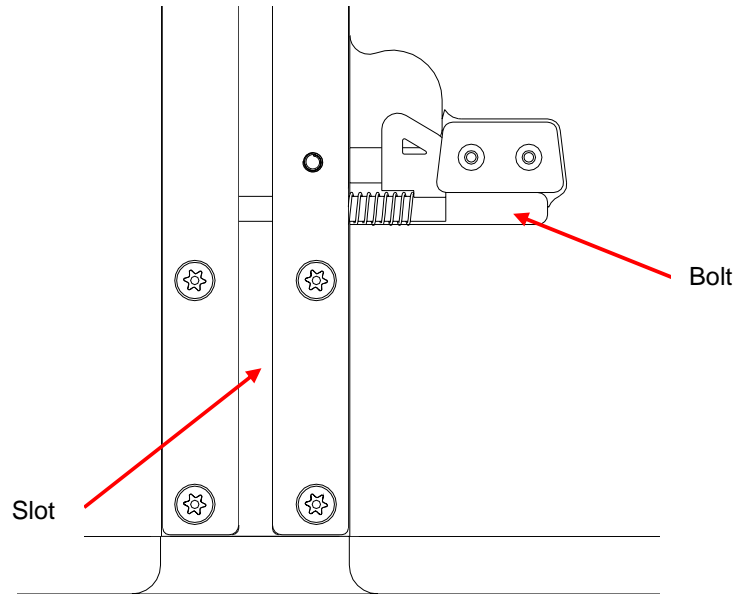
A retractable sliding bolt manufactured from high tensile steel which is used to connect the links to the cabinet for suspending the column and the rows below.

### **Captive Biscuit**

A captive biscuit is included in the cabinet, retained by a spring-loaded ball bearing. The component is designed to tie the backs of the cabinets together, whilst allowing up to 21° of vertical angle between rows.

### Connecting Flying Chains to the Cabinet

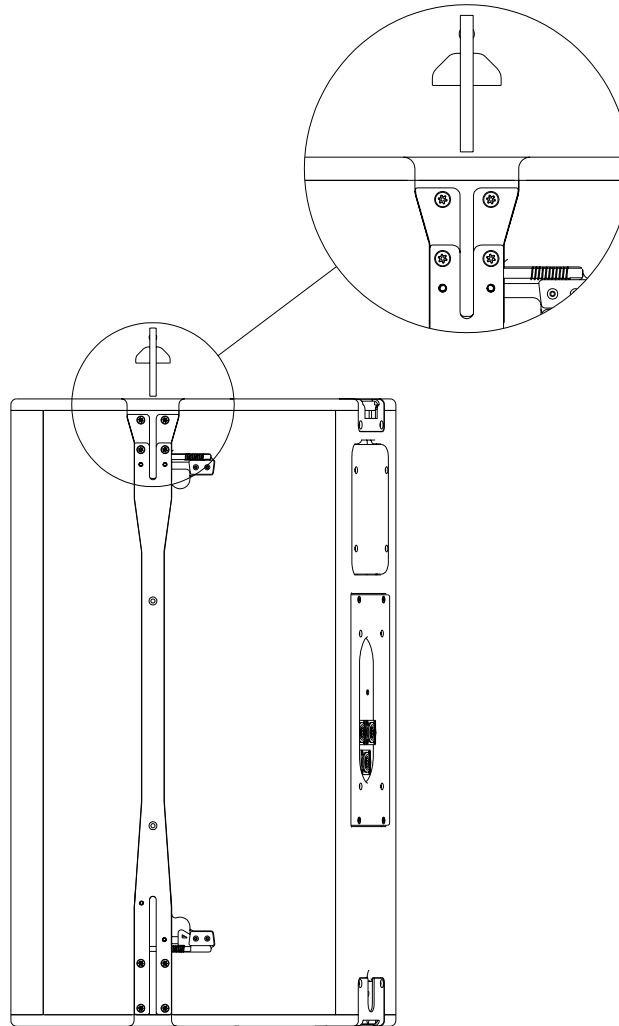
The bolt slides back along its runner enabling the placing of the profile into the slot. The bolt is spring loaded to ensure that when in its closed position (as shown below) it is free from vibration and cannot be damaged.



**Figure 4: Locking Mechanism**

**Sliding the top chain profile into the slot**

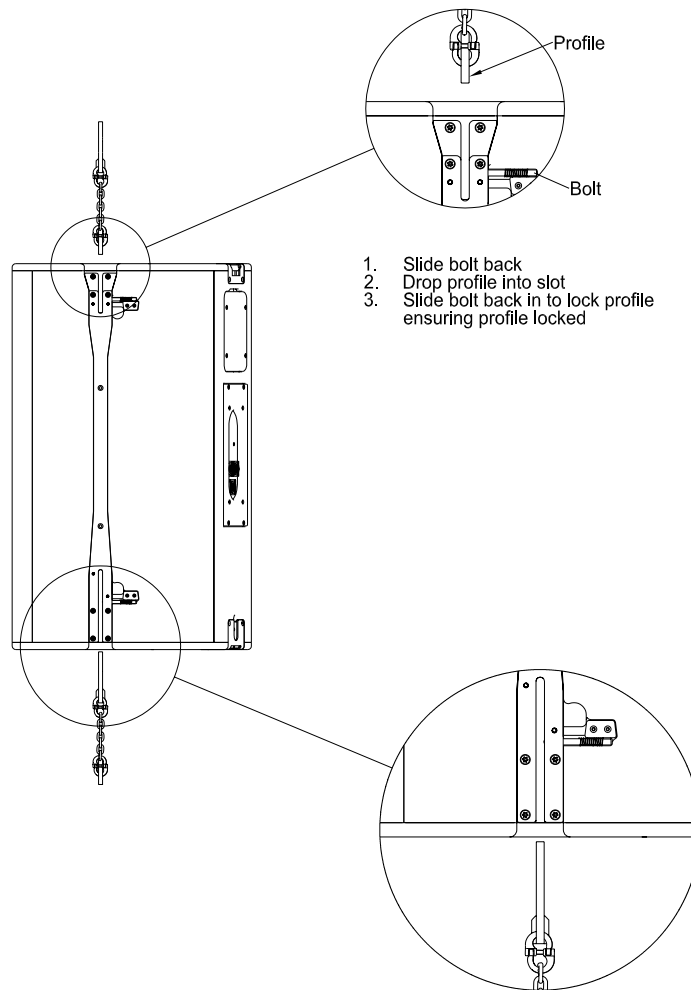
The profile is positioned into the slot so that the 'wings' bear on the top of the integral flygear assembly.



**Figure 5: Assembly of the Top Chains to the Cabinet**

### Connection of additional rows

If additional rows are required, (up to two additional rows can be accommodated) in the cluster, these are easily attached using the integral hardware and the inter-cabinet link chains. The enclosures are stacked on the ground in appropriate positions to allow easy lifting with the flybar. The inter-cabinet link chains are attached from the outside of the cabinets using a similar procedure to the top chain assembly.

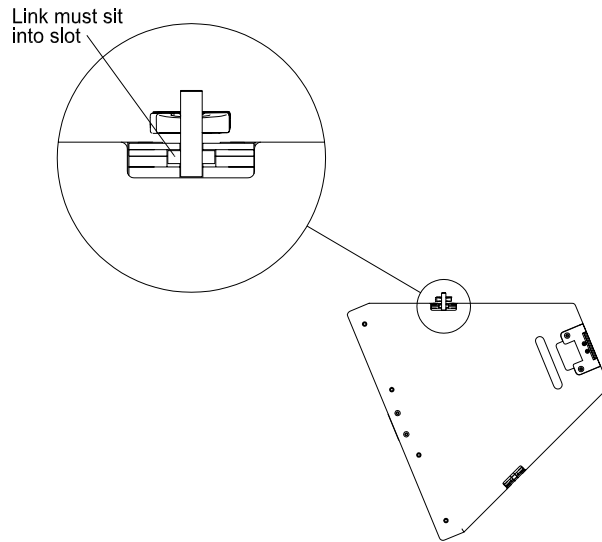


**Figure 6: Adding additional rows**

The lower link must fit into the flygear in a specific way to ensure the reinforcing part bears on the flygear appropriately:



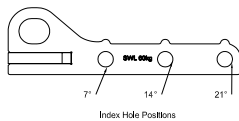
the link must be inserted correctly. Make sure that when using the 21° position the link is fitted parallel to the cabinet side.



**Figure 7: Lower link positioning looking from bottom of cabinet**

### Setting the angles between rows

The setting of the angles between the rows is easily achieved by selecting the desired hole in the index link relating the angle:

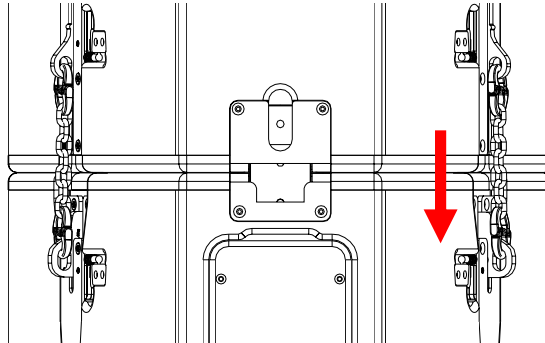


**Figure 8: Index link angle setting**

### Attaching the biscuit

Once the inter-cabinet chains have been connected both sides, the captive biscuit must be engaged. To do this, the biscuit is pushed out of its holder in the upper cabinet into the upper helping bracket of the lower cabinet:





**Figure 9: Biscuit slides into lower cabinet**

### **Attaching the Tilt Straps**

When all cabinets have been linked and the top chains attached, the tilt straps can now be attached.

First attach the longer strap to the flybar by sliding the flat buckle into the tilt strap attachment point. Slide the flat buckle on the shorter strap into the tilt strap point on the bottom of the cabinet, insert the free end of the strap through the centre of the ratchet spindle, and pull to apply some tension before ratcheting the column.

### **WARNING**

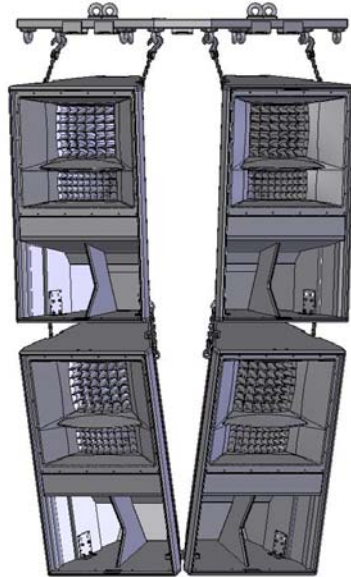
The tilt strap is designed to ratchet in both directions, an improvement over previous versions which did not allow incremental tilt reduction. However, at all times please note that if the tension on the strap is released suddenly, the column of enclosures may tend to swing violently forwards and care must be taken to avoid danger to persons in the vicinity. It is essential to check that nobody is standing immediately in front of the column, and to give a suitable warning, before the strap is released. Ideally, two persons should support the row from the side whilst the strap is released, or alternatively the bottom row may be returned to the ground before release. In any event it is essential that all personnel in the vicinity are aware that the system is about to move and that they must keep clear.



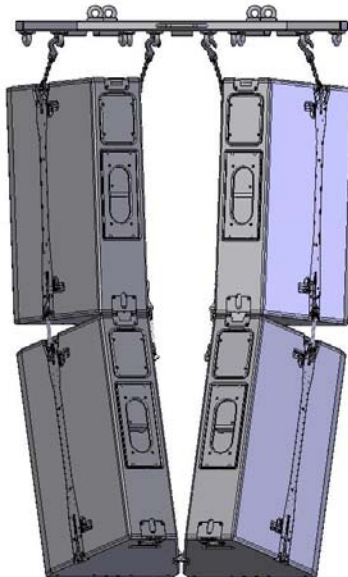
**SAFETY NOTE:** Turbosound flying systems have been designed and constructed to a high standard of safety and tested to the most demanding of specifications with a high safety factor. However, anyone involved in flying ANY sound system, especially in a touring capacity, should take note of the following advice: The rigging of a flown sound system may be dangerous unless undertaken by qualified personnel with the required experience to perform the necessary tasks. Fixing of hanging points in a roof should always be carried out by a professional rigger and in accordance with the local rules of the venue. The house rigger and/or building manager must always be consulted.

**Lifting the column**

When ALL the chains have been connected and the biscuit has been interlocked, the column is ready for lifting. Using the appropriate lifting point on the flybar, attach the bridle and lift ensuring during the lifting process that the column lifts evenly.



**Figure 10: Front view of the assembled cluster**



**Figure 11: Rear view of the assembled cluster**



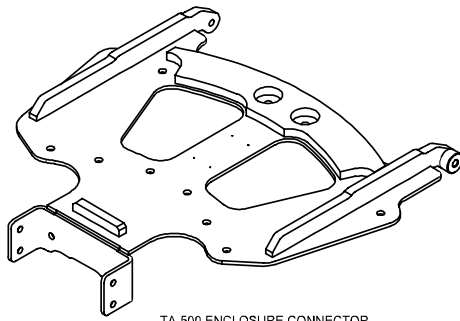
## B. TA-500 INSTALL FLYING SYSTEM

The flying system is designed to provide the following configurations of flown arrays:

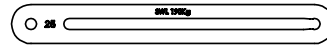
Number of Rows	Number of enclosures per row	Angle between rows
1	1	
1	2	
1	3	
2	1	0° – 25°
2	2	0° – 25°
2	3	0° – 25°
3	1	0° – 25°
3	2	0° – 25°
3	3	0° – 25°

The Aspect TA-500 install flying hardware consists as follows:

- Enclosure connector – attaches to the top of a row of cabinets
- Hinge brace – top brace that locks cabinets at the top of the row. Available in 2-wide or 3-wide variants
- Rear brace – bottom brace that locks cabinets together at the bottom of the row. Available in 2-wide and 3-wide variants
- Angle adjustment bars



TA-500 ENCLOSURE CONNECTOR  
2 X  
16.08kg EACH



TA 500 ANGLE SETTING BAR  
4 TYPES (5° - 25°) 2 off EACH  
0.38kg EACH



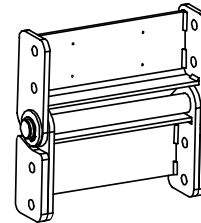
ZERO DEGREE ANGLE SETTING BAR  
2 X  
0.11kg EACH



TA-500 REAR TIE 2-WIDE  
2 X  
0.32kg EACH



TA-500 REAR TIE 2-WIDE  
2 X  
0.32kg EACH

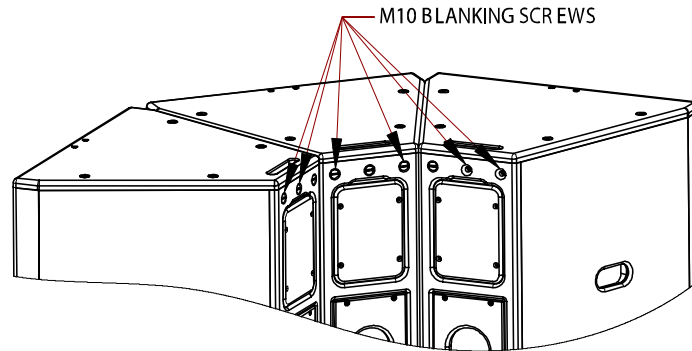


TA-500 HINGE SUB-ASSEMBLY  
1 X  
2.10kg EACH

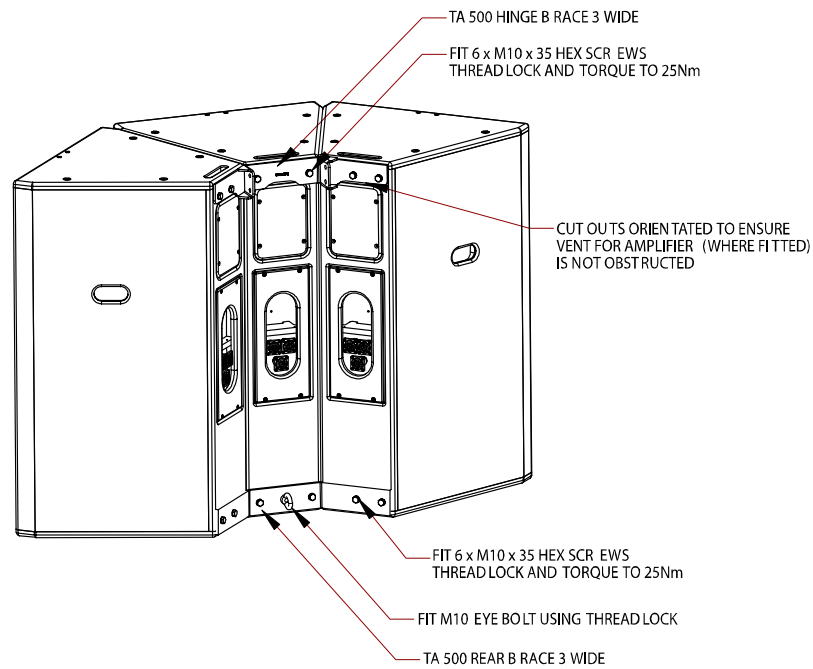
24 X		M10 x 40 HEX SCREW (18) M10 x 45 HEX SCREW (4) M10 x 55 HEX SCREW (4)
12 X		M10 NUT
36 X		M10 RECTANGULAR SPRING WASHER
26 X		M10 FORM A WASHER (36) M20 FORM A WASHER (2)

### Rigging Instructions

**STEP 1** - Set the boxes out on the floor with the sides touching. Remove the M10 blanking screws from the rear of the boxes at top and bottom as illustrated.



**STEP 2** - Fit a 3-wide hinge brace to the top of the array and a 3-wide rear brace to the bottom of the array using the twelve M10 x 40mm hex screws provided and torque to 25Nm. The use of thread-locking compound is recommended (see Appendix). Fit an M10 eyebolt to the centre of the rear brace.



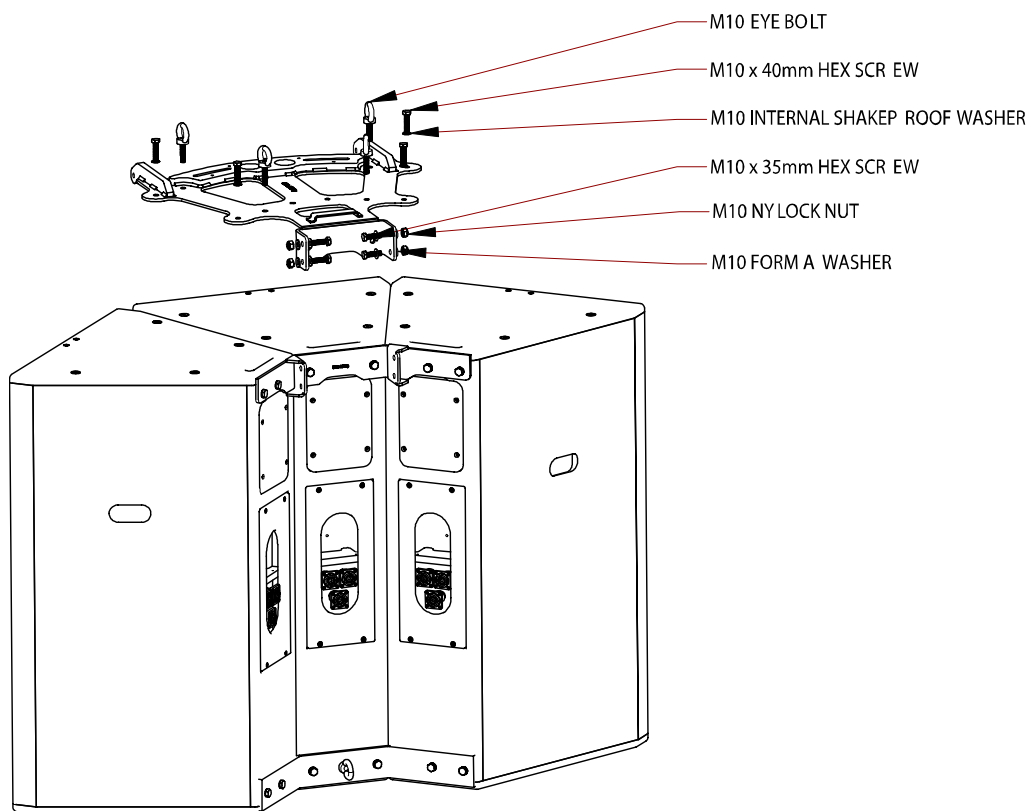
**STEP 3** – Fit the enclosure connector to the top of the array.

Locate the four M10 eyebolts from the fixings kit supplied and insert these through the enclosure connector into the rigging points on the centre cabinet. These will be used to pick up the array.

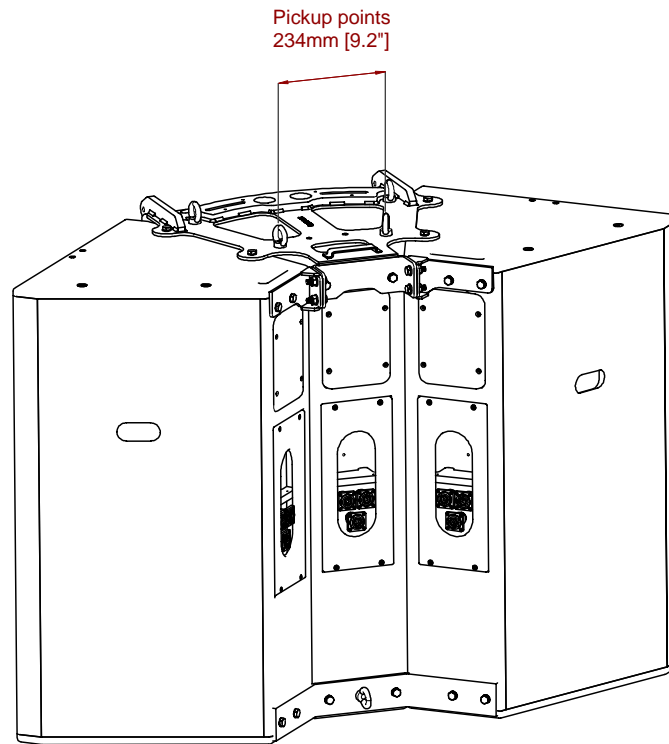
Locate the four M10 x 40mm hex screws from the fixings kit and insert these through the enclosure connector into the rigging points on the two outside cabinets, together with four M10 shakeproof washers.

Use the four M10 x 35mm hex screws from the fixings kit to lock the enclosure connector to the rear brace together with four flat washers and four M10 nylock nuts.

All fixings should be thread-locked and torqued to 25Nm.



**STEP 4** – The array is now ready to pick up.



Two independent pick-up points are recommended, spaced approximately 430mm (16.9") apart, using the front two eyebolts. The two rear eyebolts are provided as safety points.

Ensure all components are assembled using lock-tight.

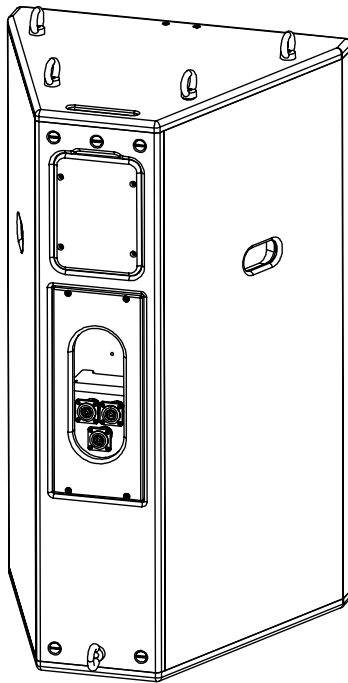
The total cluster weight including rigging hardware is approximately 210 kgs (462 lbs).



### **Flying a single TA-500 cabinet using M10 eyebolts**

The simplest method of flying a TA-500 cabinet is with a pair of M10 shoulder eyebolts on the top, using a third eyebolt on the rear of the cabinet to tilt the cabinet.

1. Remove the two countersunk M10 screws located towards the front of the cabinet.
2. Replace these with M10 shoulder eyebolts with a minimum thread length of 20mm (3/4")
3. Angle the cabinet as necessary using the third eyebolt position on the rear of the cabinet.



## **LMS SERIES LOUDSPEAKER MANAGEMENT SYSTEMS**

### **Introduction**

This section is provided with the aim of assisting sound engineers, installers and consultants to fully understand Turbosound Loudspeaker Management Systems, and to obtain the full benefit of their capabilities.

The Turbosound LMS-D26 and LMS-D24 are recommended for use with Aspect loudspeaker systems, offering varying features and facilities depending on the specific application.

### **Unpacking**

As part of Turbosound's system of quality control, the product is carefully checked before packing, to ensure flawless appearance. After unpacking the unit, please inspect for any physical damage. If any damage has occurred, please notify your dealer immediately, so that a written claim for damages can be initiated. You, the consignee, must instigate any claim. Please retain all packaging in case of future re-shipment.

There will be a small packet of spare fuses with the unit. Please keep them in a safe place.

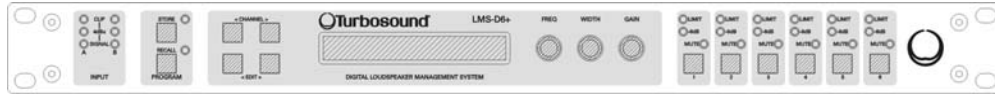
### **Mechanical Installation**

A vertical rack space of 1U (44mm / 1.75") is required for each unit. If used in a mobile or transportable system, the unit must be supported at the rear by additional bracing or shelving, to prevent vibration-induced metal fatigue of the racking 'ears'. Failure to do this will impair reliability and invalidate the Warranty. The rack casing will need a depth of 425mm (minimum) to clear the connectors.

Adequate ventilation must be provided by allowing sufficient room around the sides and rear of the unit to permit free circulation of air. Forced cooling is not required, a factor which aids component longevity. The front of the unit should not be exposed to long term direct sunlight as this can have a detrimental effect on the display lens.

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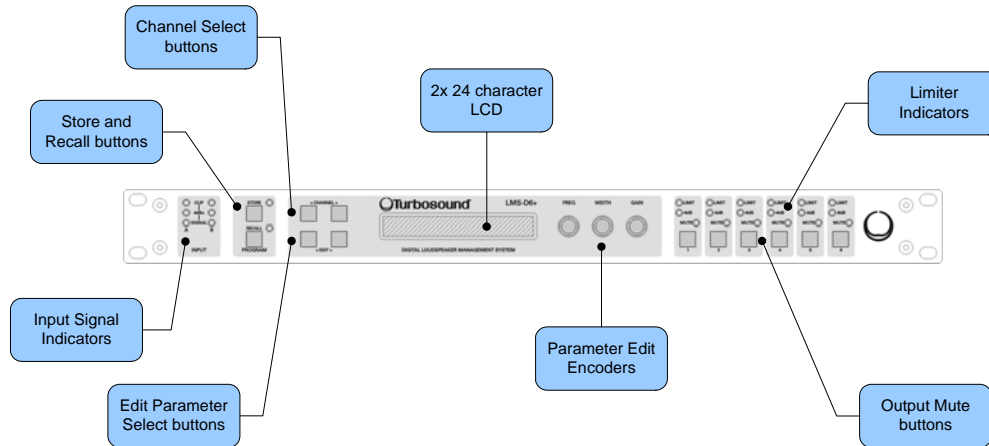
## LMS-D24 AND D26 LOUDSPEAKER MANAGEMENT SYSTEMS



### Features

- Minimal signal path design, providing exceptional audio quality with carefully optimised processing and high performance converters for a full >111dB dynamic range, 96kHz sampling rate and minimal filtering. Audio-grade capacitors are used in the analogue signal path.
- Sonically superb ADC / DAC combination; a carefully matched pairing of the best devices from Burr Brown and Wolfson.
- Newly released family of Analogue Devices SHARC DSP.
- Extended bandwidth; 96kHz sampling frequency provides for a nominally flat response to 40kHz.
- Front panel parameter rotary encoder provides a familiar and easy to use control format with all filter information displayed simultaneously on a backlit LCD display.

### Front Panel Functions



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

**Program Store and Recall** – these controls provide access to 45 presets. Pressing 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. The Recall function operates in a similar way, pressing the recall button allows the user to select which preset they require, pressing the button for a second time, then confirming, recalls the new DSP settings. The unit allows the user to set up user programs with full access to all parameters.

Note that presets cannot be stored or recalled when secure mode is activated.

**Channel Selection Buttons** – the currently selected channel is displayed on the top left hand corner of the LCD. Pressing the channel buttons scrolls through the available input and output channels and finally through the utility functions and back to the default screen. If operating a stereo-linked preset the channel name will indicate the channel pairing. For example 'A+B' means both input A and B parameters. The name of the output will be shown briefly at the top of the display when stepping onto an output.

**Edit Select Buttons** – the currently selected edit parameter is displayed on the bottom left corner of the LCD. Pressing the edit select buttons moves through the available parameters for the current input or output.

**Text display** – preset, channel, parameter and status information is shown on the 2x 24-character text display. In most screens the currently selected channel is displayed on the upper line and the edit parameter on the lower line. To simplify the display and enhance security, some parameters or parameter pages are omitted when not relevant.

**Parameter Knobs** – three velocity sensitive parameter knobs are used to adjust parameters shown on the display. Up to three parameters are displayed on the screen. The parameter name is shown above the parameter value in each of the three screen sections. The parameter knobs have a fixed association with the screen sections; the rightmost parameter knob adjusts the rightmost parameter and so on.

**Output signal and limiter indication** – two LED's are provided for each output channel. These show the signal level relative to the limiter threshold. The yellow LED will light when the signal is 6dB below the threshold and the red warning LED will light when the limiter threshold is reached.

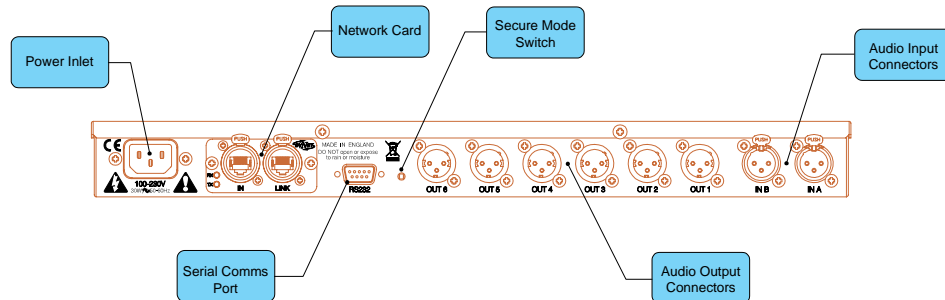
**Mute buttons and status LED's** – each output has a mute button and associated mute status LED. Pressing the button toggles the mute on and off.

Note that the mute buttons do not function when the Secure Mode is activated.

**Secure Button** (on the rear) – a momentary button is fitted behind 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.

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

### Rear Panel Functions



**Power Inlet** – provides connection to a suitable mains electricity supply using the cable supplied. The controller has a switch mode power supply that is capable of operating with a nominal mains voltage of 80 to 240v, 50/60Hz without re-configuration.

**Network card** – connects to a PC via a BvNet interface to enable network control of the loudspeaker system.

**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 by connecting pin 3 'cold' signal to the ground connection of the unbalanced destination input. Note that output pin-1's 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.

**Communications port connector** – the unit may be controlled entirely from another controller (typically a Personal Computer), running an application that is compliant with the ObCom standard. Connection will normally be made to the controller via this serial port connector. This port is also used for updating the firmware in the unit.

Note: The communications port is NOT disabled when the front panel is made secure using the secure button.

## **Operating the LMS-D24 and D26**

### **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.

### **Selecting a Factory Preset**

There is a library of thirty Factory Presets to suit a range of Turbosound enclosures.

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

To recall a Factory Preset for a particular cabinet or system, press Recall and use the left hand parameter knob A to scroll through the available factory preset locations (as indicated by a box symbol after the preset number). Once the appropriate preset has been selected press recall again, at which point you will be asked to confirm the action by pressing recall for a third time. This is to guard against accidental recall of Presets.

Factory Presets are locked so they cannot be over-written. The user can, however, store an edited version of a Factory Preset in any free preset location.

Details of all the Factory Presets can be found in Appendix A.

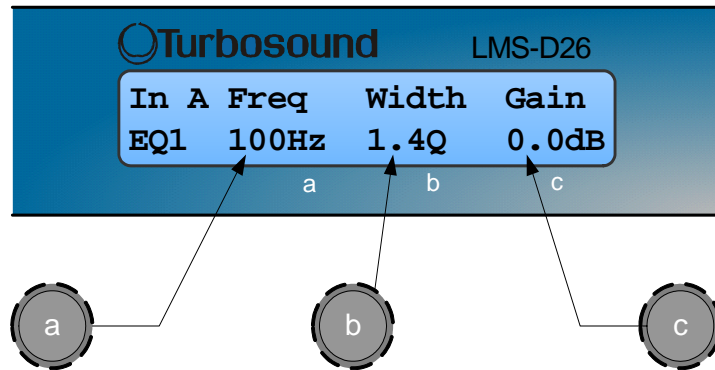
### **Creating a Crossover**

In addition to the Factory Presets the unit has two further 'Base Presets'; mono and stereo. 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.

### Navigation and Viewing Parameters

(Note: The LMS-D26 is shown in all the following screen shots; however the features and parameters apply equally to the LMS-D24)

Many of the processing elements in each input and output path have features that may be controlled by the user, such as gain, frequency or limiter threshold. We call these adjustable features parameters.

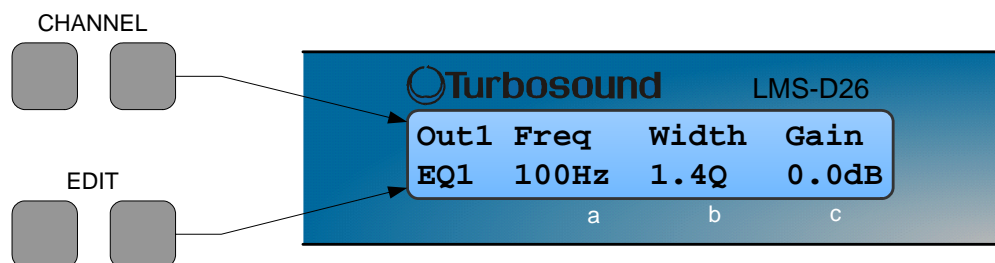


A parameter may be adjusted when it is displayed by turning one of the three-parameter knobs. Each of the three-parameter knobs is associated with a zone on the display. Adjusting the leftmost parameter knob will change the value of the parameter showing in the leftmost zone of the display and so on. Turn a knob clockwise to increase the value of a parameter, or anti-clockwise to decrease it. The knobs are velocity-sensitive so turning a knob rapidly will cause the action to 'accelerate', so the value changes more rapidly.



## Navigation

The DSP parameters are organised by channel. The currently selected channel is shown in the top left hand corner of the display. You can navigate between the channels by pressing the channel buttons. Pressing the channel buttons will scroll through the channels, utilities and back to the default screen. When using a Preset that is stereo linked, the channel selection will reflect this. For example '1&4' indicates outputs 1 and 4. When navigating onto an output channel, the usage of the output, as define in the factory preset, will be shown briefly at the top of the screen.



Pressing the edit navigation buttons gives access to the various pages of parameters available for each channel. The currently selected page is shown in the bottom left hand corner of the display, this is omitted on some pages where the function is obvious. The screen shows up to three (normally related) parameters for a given part of the processing functions on a given channel.

The edit buttons allow you to scroll, in either direction, through the different processing pages for a given Channel. When you go past the last page, you will be returned to the default page.

The channel buttons allow you to scroll, in either direction, through the input and output channels, whilst trying to maintain the currently viewed processing block. If the channel you scroll to does not have the currently viewed processing block, the next one will be shown instead.

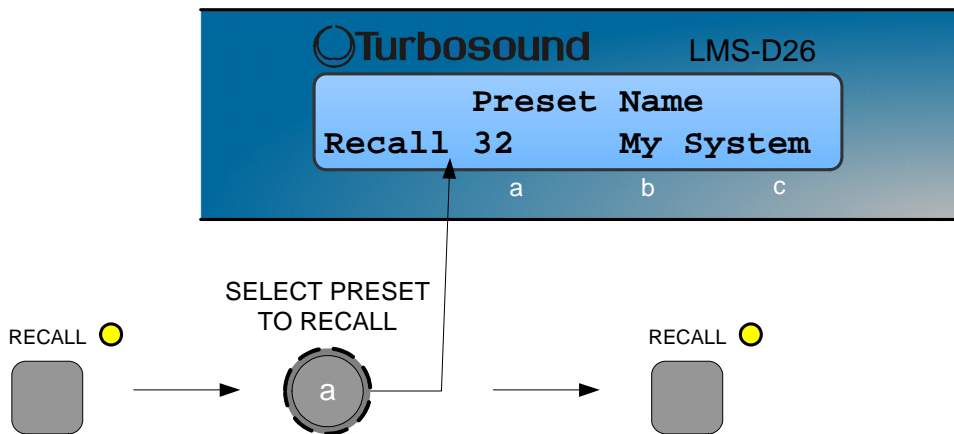
NB. When the unit powers-up, the settings will be the same as those when the unit was last switched off.

### Presets

The device contains a total of forty-five user and Factory Presets. The user cannot overwrite the basic mono, basic stereo or Factory Preset programs.

### Preset Recall

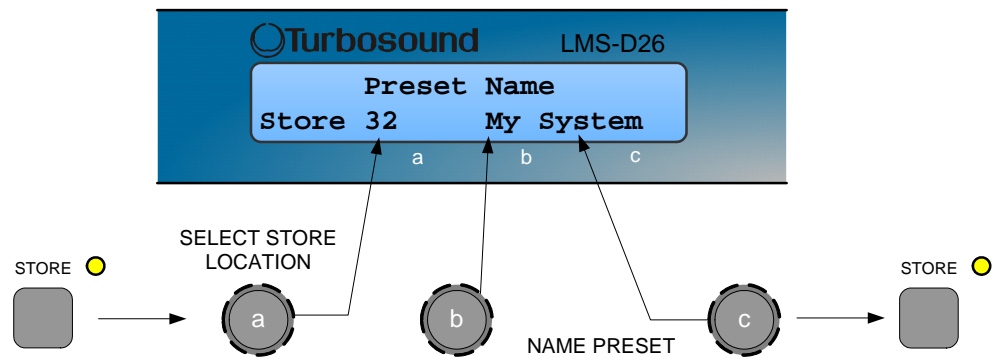
To select an existing Preset, press the Recall Button so the indicator above it illuminates. Turn parameter knob A until the required Preset number is shown on the display. Factory presets are indicated by a box symbol appearing after the preset number. Press the Recall Button again to activate the Preset. Pressing any other button will cancel the operation.



Users can develop their own Preset based on one of the basic or Factory Presets stored within the device. Once a basic or user Preset has been recalled, a user has complete freedom to adjust any or all of the parameters. Factory Presets can be used as the basis for user Presets but they have some parameters that are predefined as a function of the loudspeaker system. These parameters are 'hidden' from the user, as they should be constant regardless of application.

### Preset Store

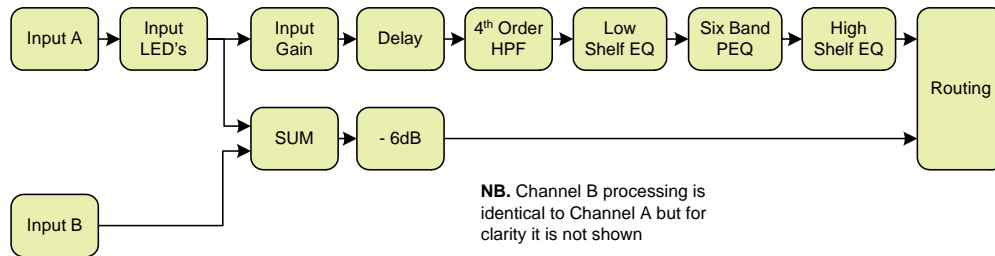
To store the current Preset in a user location, press the Preset Store Button so the indicator above it illuminates. Turn the first parameter knob until the required Preset location number is shown on the display. A Preset name of up to 12 characters in length can be entered using parameter knobs B and C. Pressing the Store Button again completes the process and stores the Preset. As with Preset Recall, pressing any other button cancels the operation.



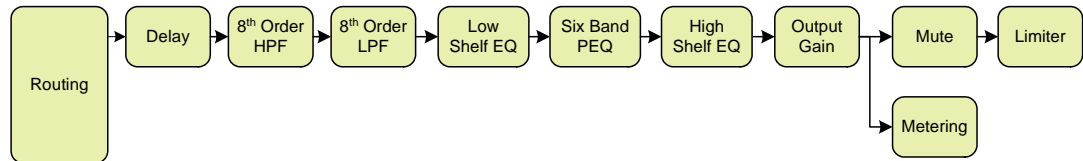
The user can overwrite non-protected Presets only; if an attempt is made to save a Preset in a location already occupied by a basic or Factory Preset a 'LOCKED PRESET' message is displayed.

## DSP Processing Layout

### Input DSP block diagram



### Output DSP block diagram



## Stereo / Mono Formats

There is only one 'standard' layout of the processing blocks, but flexible routing and control linking allows this layout to be adapted to a wide variety of applications.

There are two 'Formats', Mono or Stereo. With the Mono format, all outputs have unique parameter settings, and all outputs are identical in terms of processing functions and routing capability. This is the most flexible Format.

Stereo format pairs the inputs and outputs for stereo operation, the parameters of each member of the pair being identical. The routing of inputs to outputs is fixed. This format is intended for symmetrical stereo operation, eliminating the need to make identical parameter adjustments for each channel.

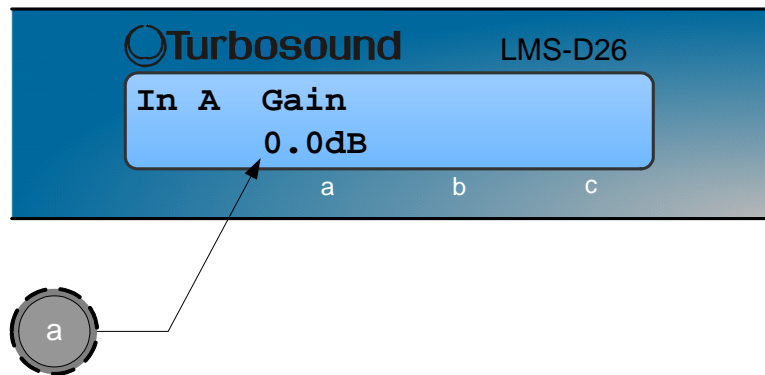
The channel pairing is:

- Left and Right Inputs
- Outputs 1 (routed from L input) and 3 (routed from R input) [1 and 4 for LMS-D26]
- Outputs 2 (routed from L input) and 4 (routed from R input) [2 and 5 for LMS-D26]
- Outputs 3 (routed from L input) and 6 (routed from R input) – LMS-D26 only]

**DSP processing**

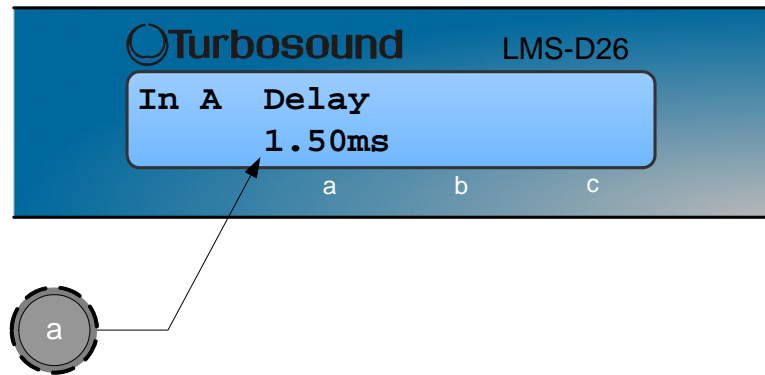
**Input Channels**

Gain



Knob A: Gain, adjustable in 0.2dB steps from -80 dB to +20dB

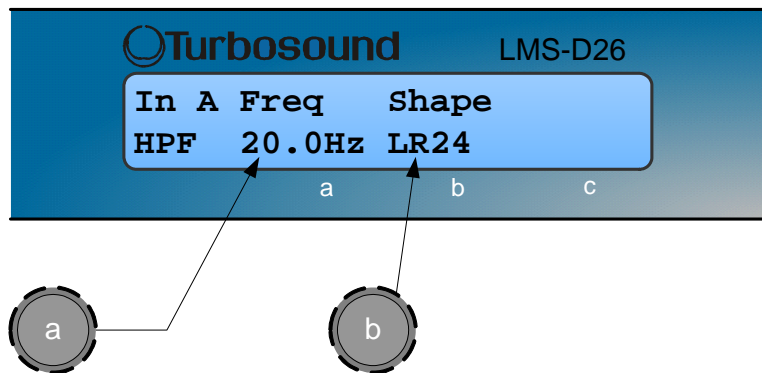
Delay



Knob A: Delay, adjustable in variable steps from 0 to 400ms

The delay parameter is adjustable in fine steps at low values; the adjustment becomes progressively coarser as the value increases. The velocity sensitive Parameter Knobs therefore provide accurate setting of driver offset delays (typically below 10ms) and rapid setting of longer system alignment delays.

High Pass Filter



Knob A: Frequency, out (off), 10.0Hz to 25.6kHz in variable steps

Knob B: high pass filter type

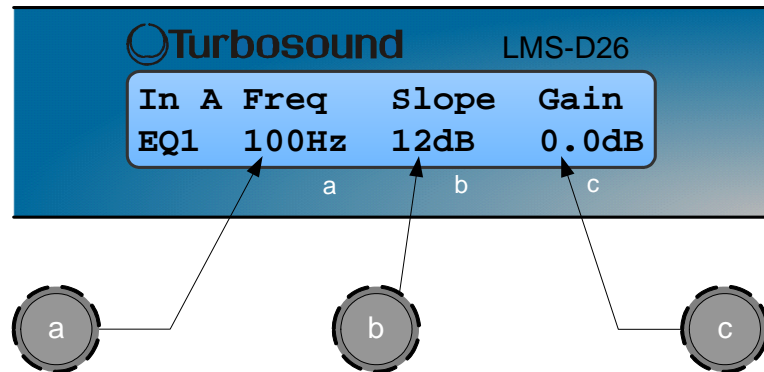
System high pass filtering is provided for the input signal. This is the preferred location for high pass filtering as it affects all outputs and can therefore improve inter-band phase relationships. Filter type is selectable from Butterworth, Bessel, Linkwitz-Riley and Hardman. Filter slopes of up to 4th order or 24dB / octave are provided. Not all filter types are available in all slopes. For example 18dB / octave Linkwitz-Riley filters do not exist.

The Hardman type filter is always described by its' order as the filter becomes progressively steeper rather than following a linear slope so a dB/octave description is not accurate.

### Parametric Equalisation

Eight sections of equalisation are provided, two shelving filters and six fully variable parametric sections.

#### High and Low shelving filters



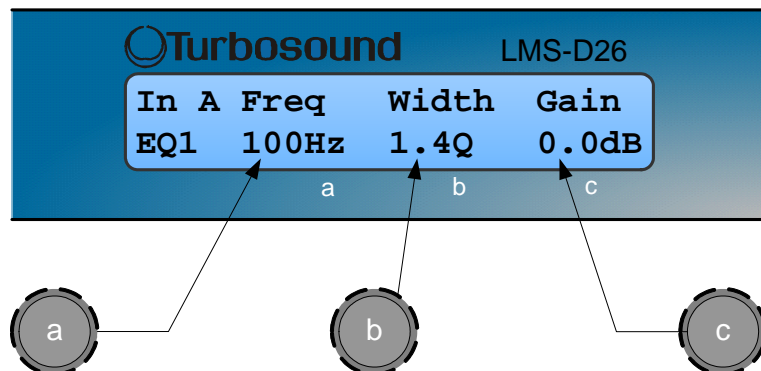
Knob A: Frequency, 10.0Hz to 25.6kHz in variable steps

Knob B: Slope, 6 to 12dB / octave in 1dB steps

Knob C: Gain, +/-15dB in 0.2dB steps

The frequency is specified as point where the filter deviates by 3dB from the gain value.

#### Parametric filters



Knob A, Centre Frequency, 10.0Hz to 25.6kHz in variable steps

Knob B, Width, display selectable, Q or BW (Bandwidth)

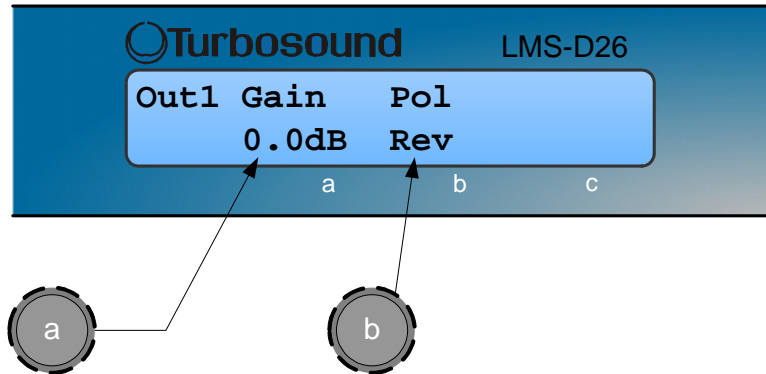
BW adjustable from 0.05 to 5 octaves in variable steps

Q adjustable from 14.2 to 0.2 in variable steps

Knob C, Gain, +/-15dB in 0.2dB steps

### Output Channels

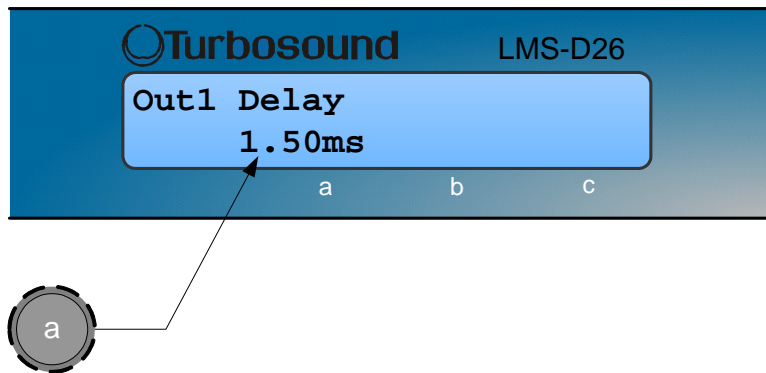
#### Gain and Polarity



Knob A: Gain, adjustable in 0.2dB steps from -80 dB to +20dB

Knob B: Polarity, selectable, normal or reversed with reference to other outputs

#### Delay

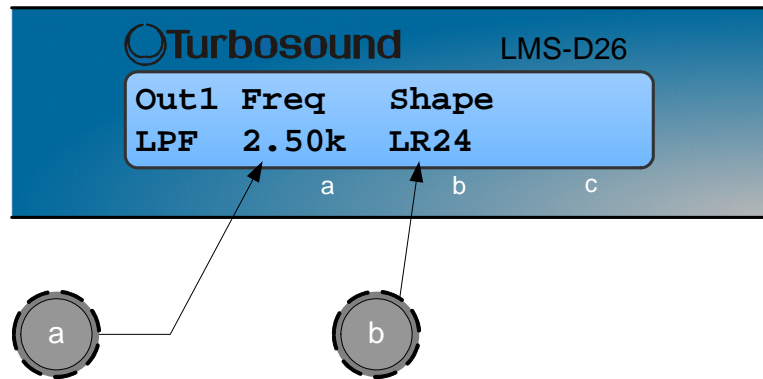


Knob A: Adjustable in variable steps from 0 to 80ms

As for input delay, velocity sensitive Parameter Knobs provide finer adjustment at low levels and rapid selection of higher values.



### High and Low Pass Filters



Knob A: Frequency, <<out, 10.0Hz to 25.6kHz, out>>

Knob B: high pass filter type

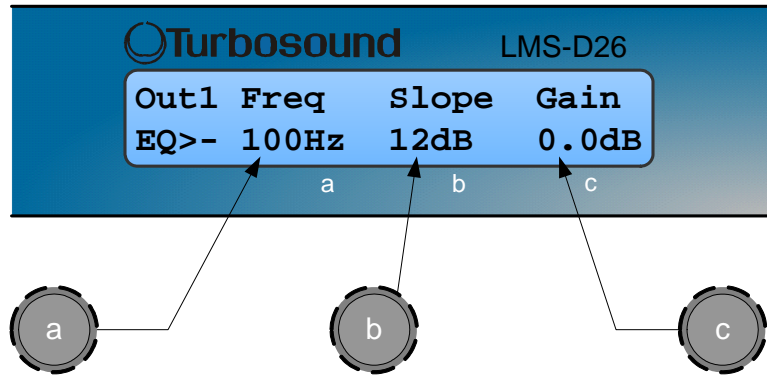
Filter type is selectable from Butterworth, Bessel, Linkwitz-Riley and Hardman. Filter slopes of up to 8th order or 48dB / octave are provided. Not all filter types are available in all slopes.

For example 18dB / octave Linkwitz-Riley filters do not exist.

The Hardman type filter is always described by its' order as the filter becomes progressively steeper rather than following a linear slope so a dB/octave description is not accurate.

### Parametric Equalisation

Eight sections of equalisation are provided in a similar format to the input channel equalisation; two shelving filters and six parametric.

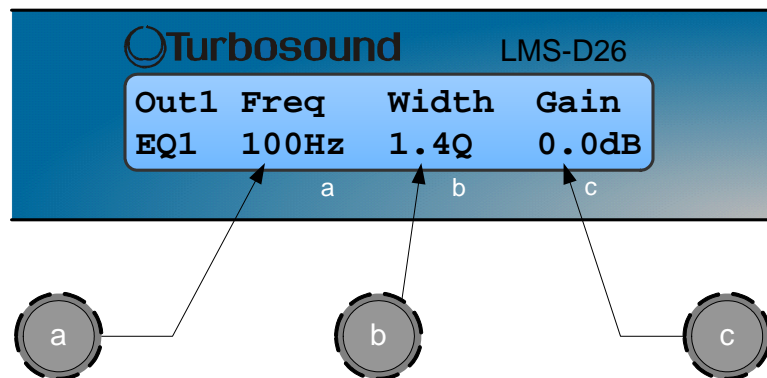


Knob A: Frequency, 10.0Hz to 25.6kHz in variable steps

Knob B: Slope, 6 to 12dB / octave in 1dB steps

Knob C: Gain, +/-15dB in 0.2dB steps

The frequency is specified as point where the filter deviates by 3dB from the gain value.



Knob A, Centre Frequency, 10.0Hz to 25.6kHz in variable steps

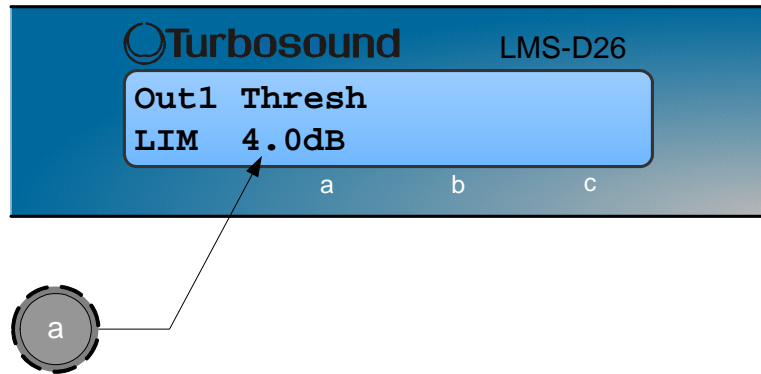
Knob B, Width, display selectable, Q or BW (Bandwidth)

BW adjustable from 0.05 to 5 octaves in variable steps

Q adjustable from 14.2 to 0.2 in variable steps

Knob C, Gain, +/-15dB in 0.2dB steps

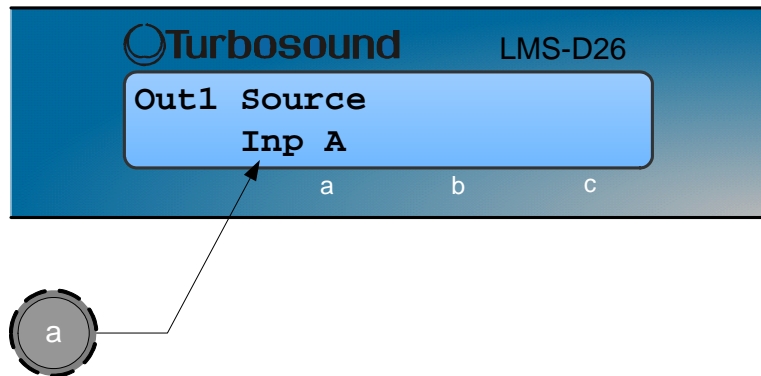
### Limiters



Knob A: Threshold, -40dBu to 20dBu in 0.2dB steps

A high performance, low distortion limiter is provided on each output. Threshold is user adjustable; all other parameters are carefully calculated dependant on configuration to provide clean and effective control of signal dynamics.

### Routing



Knob A: Output source, selectable; Input A, Input B or Sum A+B

Configures the routing from input to output. This function is only available in mono format Presets.

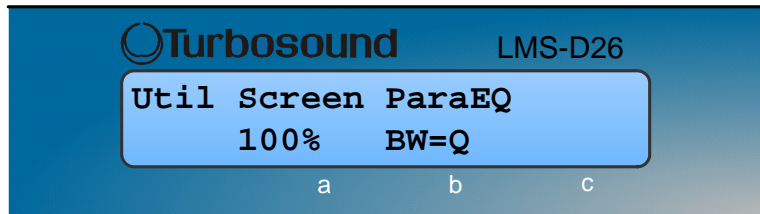
## Utilities

### Utility functions

Two utility functions are provided to adjust screen contrast and the display units used for parametric equalisation bandwidth.

The device automatically adjusts for the variations in display contrast as the temperature of the LCD changes. The screen contrast utility control sets the base contrast of the screen and also allows optimization for a given viewing angle.

Parametric equalisation width parameters can be displayed in either 'Q' or bandwidth, expressed in octaves.



## **T-25 AND T-45 HIGH EFFICIENCY AUDIO POWER AMPLIFIERS**

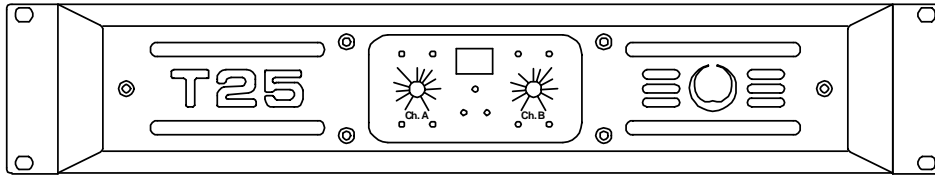
### **General Features & Facilities**

The T-25 and T-45 are highly efficient, lightweight, rugged high power amplifiers, with many original features developed to meet the requirements of modern professional sound reinforcement, for both touring and fixed installations. They have been designed with audio quality ranking equal first alongside utility and ruggedness.

The T-25 and T-45 utilise proprietary progressive switching rail output, which enables extremely high voltage swings and peak power without compromising sonic quality. Fan speed is automatically varied as required to keep the amplifiers within temperature limits. Signal limiters are included to protect speakers from clipped signals. The amplifiers include full DC and short circuit protection to ensure trouble-free service even in harsh environments.

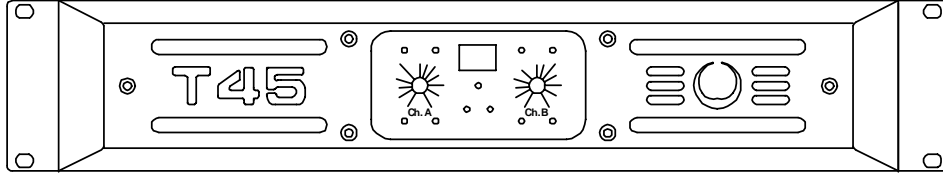
- Two independently controlled and powered channels.
- High continuous power, in excess of 1250 watts per channel into 4 ohms (T-25) and 2250 watts per channel into 4 ohms (T-45).
- -3dB indicators to ensure accurate level monitoring
- Power reduction control (PRC) allows maximum output level to be set below rated power output
- A 10k $\Omega$  actively balanced, fully floating input is fitted as standard.
- Front panel display of output device temperature.
- High damping factor, >400 below 1kHz.
- Low noise vari-speed fans for quiet operation.
- Front-panel accessible filter for improved dust collection.
- Consistent reliability and easy serviceability through solid, lightweight construction and modular packaging.

### Front Panel Functions T-25



- Mains power rocker switch – applies AC mains power to the amplifier.
- Mains power LED – illuminates when AC power is applied to the amplifier.
- Gain – rotary control which allows the gain of the channel to be adjusted.
- Signal – blue LED indicates signal presence, active from a minimum output level of 10 watts.
- -3dB – yellow LED is active when the signal is 3dB below the limiting level.
- Limit – amber LED indicates operation of the limiters.
- PRC – green LED indicates when the PRC for that channel has been selected.
- Bridge (BRG) – green LED illuminates when bridge mode is selected.
- Fault (A/P) – red LED indicates protection circuit activity.

### Front Panel Functions T-45



- Mains power rocker switch – applies AC mains power to the amplifier.
- Mains power LED – illuminates when AC power is applied to the amplifier.
- Gain – rotary control which allows the gain of the channel to be adjusted.
- Signal – blue LED indicates signal presence, active from a minimum output level of 10 watts.
- -3dB – yellow LED is active when the signal is 3dB below the limiting level.
- Limit – amber LED indicates operation of the limiters.
- PRC – green LED indicates when the PRC for that channel has been selected.
- Bridge (BRG) – green LED illuminates when bridge mode is selected.
- Fault (A/P) – red LED indicates protection circuit activity.

### **Mechanical Installation**

When supplied as part of the AMP-890.2 system rack, the amplifiers are pre-installed. If an amplifier is removed from the rack for any reason, it is important to re-install it correctly. The amplifiers must be supported at the front and rear, as originally supplied. Failure to support it adequately may eventually result in vibration-induced metal fatigue of the rack mounting ears and such damage will not be covered by the warranty.

Adequate ventilation is essential, both at the rear of the rack, the sides, and also at the front. This should be considered carefully when placing covers around the racks for protection from inclement weather at outdoor events, or when using blacks to mask them from view. If the venting is inadequate, the amplifier's temperature metering will display this.

**CAUTION:** Air emerging from the amplifier's high efficiency heat-exchangers can reach 60°C to 70°C. To prevent personal injury or fire, please ensure that people and combustible or flammable materials (e.g. plastic waterproofing, newspaper, clothing, costumes, solvents) are kept at least 2'/0.6m from the amplifier's exhaust outlets. If venting is inadequate, the hot air can adversely affect other equipment, and may soften some thermoplastic enclosures. If using plastic coated cables, take care to dress the leads away from the airflow. Professional-grade rubber cables are not affected.

### **Mains Power**

The T series amplifiers will operate from any international 50 - 60Hz AC mains supply between 110-120 V and 220-240 V. Separate models are supplied to match local mains supply requirements.

### **Powering Up**

When the amplifier is switched on by depressing the black POWER rocker switch, the protection circuit will initially activate whilst the circuits stabilise. Assuming no faults are detected the POWER LED (and the signal LED if signal is present) will light up after a few seconds.

### **Safety Earthing**

The Green/Yellow wire on the T-25 and T-45's mains cord must always be connected to the electrical installation's safety Earth (or Ground). It is essential for personal safety. The rack framework is connected to the same grounding circuit.



### **Voltage Setting**

Your models will be set up at the factory for correct operation on your local voltage supply. No further adjustment is necessary.

### **Voltage Range**

The minimum supply voltage over which the amplifier will operate is 180V for the 220-240V range, and 90V for the 110-120V range. Naturally, maximum power output will be reduced accordingly from the published ratings.

The maximum supply voltage which exceeds safe limits and causes the amplifiers to switch-off is in excess of 260 V for 220/240 V range, and 130 V for the 108/120 V range. This is however dependent on load impedance and program drive level as mentioned above.

Obviously, the mains voltage will reach these limits only in exceptional circumstances and the A/P (Audio Protect) LED will then flash.

### **Audio Connections & Controls**

The amplifiers' actively balanced, fully-floating input connections are fuss-free, regardless of the installation's complexity.

The incoming 3-pin XLR plug should be connected, with a high grade twin-core screened cable, as follows.

Pin 1	Screen - connect to shield
Pin 2	hot (signal +)
Pin 3	cold (signal -)

The shield connection to pin 1 at each amplifier input must be maintained under all circumstances, as TURBOSOUND will not be responsible for consequential damage arising to loudspeakers, etc., should this connection not be made.

The amplifiers are designed to operate with fully balanced equipment. Ground loops or loss

of performance may be experienced if connected to unbalanced sources. If it is unavoidable, however, the following wiring convention should be used.

Pin 1	Screen - connect to chassis of the unbalanced equipment, or left disconnected at the unbalanced end
Pin 2	signal hot
Pin 3	Signal cold

### **Polarity**

In accordance with international standards, T series amplifiers are supplied with Pin 2 hot (+), so a positive (+V) input gives a positive (+V) output from the positive (+) output terminals.

### **Input Impedance**

Each amplifier channel has an input impedance of 10k $\Omega$ , seen between pins 2 & 3 of the XLR.

When used with the LMS-D6 Loudspeaker Management System, distribution amplifiers are not required when a large number of T-25 or T-45 amplifier inputs are driven in parallel.

### **Gain and Sensitivity Settings**

Gain settings are changed internally by simple jumper links. Two rows of pins marked - GAIN A and GAIN B - are situated on the input PCB (PCB701). A jumper link sets the gain and the settings are as follows:

Link 1 & 2	Gives 32dB gain
Link 3 & 4	Gives 26dB gain
Link 2 & 3	Gives approx 37,5dB gain

NOTE: Factory setting is normally link 1 & 2 = 32dB gain.

Setting higher gain does not change the maximum available power but changes the level of signal input to achieve maximum power. In any case, provided that the input signal is less than 20dBu/7.7V, the built in limiter circuit will prevent distortion within the amplifier.

The gain should be set to match the signal from the source, e.g. mixer, controller, or equaliser.

### **Attenuation & Gain Setting**

The front panel gain controls allow precise level settings, and may be used to adjust the relative levels of sections of a large system, for example downfills or side seating cover in an arena.

The front panel gain controls are also useful when initially checking a system after it has been connected up.

Note that in BRIDGED mode only the Channel A control is active.

### **Output Connections**

A Speakon NL4 connector is provided on each channel.

### **Damping Factor**

The T series amplifier outputs provide a high damping factor, typically 400 times at low audio frequencies. This damping helps the amplifier to control the loudspeaker drive units, provided that the resistance of the intervening cables and connectors is very low. The sonic benefits of high damping factor are most pronounced at bass and low-midrange frequencies (i.e. 10 to 600Hz) providing a subjectively tighter sound as a result of the improved reproduction of transients.

Amplifier damping factor is degraded by high resistance in the loudspeaker circuits; i.e. thin conductors, long output cable runs and tarnished, corroded or loose connections.

Damping factor is maximised by installing cables containing conductors of large cross-sectional area, and by specifying connectors with heavy-duty contacts and waterproof covers. The cable sets supplied with Aspect systems are manufactured to a high specification with these considerations in mind.

### **Long Speaker Lines**

Whenever loudspeakers are connected to power amplifiers by long cables (above 20'/6m), there is invariably an increased risk of high frequency instability. It is aggravated by the combination of RF pickup in unshielded cables acting as aerials, and multiple complex reactances in the cable and loudspeakers.

High frequency instability can be avoided by adopting these common sense rules:

Ensure the input wires are shielded and that the shield is connected to the amplifier's input XLR pin 1.

Do not run output cables next to input signal lines. Keep apart, and preferably cross at right angles. If cables have to follow a similar route or path, keep them separated by at least 2 feet (0.6m).

### **The Cooling System**

The cooling fans respond to temperature sensors within the unit to maintain a safe operating temperature. In the event of excessive temperature, the protection circuit will operate, disabling the output. The red 'AUDIO-PROTECT' (A/P) LED will indicate this condition. (See fault indicator.)

There are 4 fans connected permanently with variable speed and a jumper link to enable them from cold.

Normal dynamic signals will not cause the amplifier to overheat unless the ventilation is inadequate. (See installation section and maintenance section.)

## APPENDIX A: TECHNICAL SPECIFICATIONS

	TA-500	TA-500t	TA-500H	TA-500HM
Dimensions mm (inches)	977 x 574 x 498 (38.5 x 22.6 x 19.6)	977 x 574 x 498 (38.5 x 22.6 x 19.6)	551 x 983 x 498 (22.6 x 55.1 x 30.3)	551 x 574 x 498 (21.7 x 22.6 x 19.6)
Net weight	52kg (114.4lbs)	57kg (125.4lbs)	52kg (114.4lbs)	37kg (81.4lbs)
Frequency range (±4dB)	60Hz – 20kHz	60Hz – 20kHz	60Hz – 20kHz	250Hz – 20kHz
Dispersion	50°H x 25°V	50°H x 25°V	50°H x 25°V	50°H x 25°V
Power handling (continuous)	LF: 400 watts MF: 200 watts HF: 50 watts	LF: 400 watts MF: 200 watts HF: 50 watts	LF: 400 watts MF: 200 watts HF: 50 watts	MF: 200 watts HF: 50 watts
Sensitivity (1w@1m)	LF: 106dB MF: 105dB HF: 112dB	LF: 106dB MF: 105dB HF: 112dB	LF: 106dB MF: 105dB HF: 112dB	MF: 105dB HF: 112dB
Max SPL (max/cont)	135dB/141dB	135dB/141dB	135dB/141dB	132dB/136dB
Crossover points	Passive: 250Hz Active: 250Hz, 4k/5k99Hz	Passive: 250Hz Active: 250Hz, 4k/5k99Hz	Passive: 250Hz Active: 250Hz, 4k/5k99Hz	4k/5k99Hz
Nominal impedance	LF: 8 ohms MF: 16 ohms HF: 16 ohms	LF: 8 ohms MF: 16 ohms HF: 16 ohms	LF: 8 ohms MF: 16 ohms HF: 16 ohms	MF: 16 ohms HF: 16 ohms
Construction	15mm & 18mm birch plywood	15mm & 18mm birch plywood	15mm birch plywood	15mm birch plywood
Connectors	2 x NL8MP 1 x NL4MP	2 x NL8MP 1 x NL4MP	2 x NL8MP 1 x NL4MP	3 x NL8MP

	TA-500DP	TA-500tDP	TA-500HDP
Dimensions mm (inches)	977 x 574 x 498 (38.5 x 22.6 x 19.6)	977 x 574 x 498 (38.5 x 22.6 x 19.6)	551 x 983 x 498 (22.6 x 55.1 x 30.3)
Net weight	54kg (123.2lbs)	59kg (130lbs)	54kg (118.8lbs)
Frequency range (±4dB)	60Hz – 20kHz	60Hz – 20kHz	60Hz – 20kHz
Dispersion	50°H x 25°V	50°H x 25°V	50°H x 25°V
Max SPL (max/cont)	135dB/141dB	135dB/141dB	135dB/141dB
Construction	15mm & 18mm birch plywood	15mm & 18mm birch plywood	15mm birch plywood
Connectors	1 x XLR female 1 x XLR male 2 x RJ45 network 1 x Powercon	1 x XLR female 1 x XLR male 2 x RJ45 network 1 x Powercon	1 x XLR female 1 x XLR male 2 x RJ45 network 1 x Powercon

	TSW-218	B18
Dimensions mm (inches)	574 x 1400 x 770 (22.6" x 55.1" x 30.3")	768 x 574 x 700 (30.2" x 22.6" x 27.6")
Net weight	110kg (242lbs)	65kg (143lbs)
Frequency range (±4dB)	35Hz – 150Hz	40Hz – 150Hz
Power handling (continuous)	1200 watts	600 watts
Sensitivity (1w@1m)	104dB	102dB
Max SPL (max/cont)	135dB/141dB	130dB/136dB
Nominal impedance	4 ohms	8 ohms
Construction	18mm birch ply	18mm birch ply
Connectors	2 x NL4MP	2 x NL4MP

## APPENDIX B: SPARE PARTS LIST

Stock Code	Model	Description
07A0255	FG-500T	Flygear assembly (2 sides inc bolts, springs, gaskets and fixings)
07E008	BG-890	Bolt guide plate
07E015	BS-890	Captive biscuit
07B075	SK-500	Screw kit for flygear (replace after service or inspection)
LS1021/2	LS-1021.2	10" High-mid driver
LS1527	LS-1527	15" Low-mid driver
04A9242	CD-113	Compression driver
05B1055	RC-1021	Recone kit
05B3140	RC-1527	Recone kit
05B9301	RD-113	Replacement diaphragm
07G0205	MG-500	TA-500 grille (with foam, badge and inserts)
07B055	ICL-500	Inter cabinet links
07B060	FC-500TS	Top chain assembly standard length
07B065	FC-500TL	Top chain assembly long
07B070	TS-890	Tilt strap

**APPENDIX C: WARRANTY**

All products in this manual are warranted by Turbosound Limited to the original end-user purchaser against defects in workmanship and materials used in its manufacture for a period of one year on electronics products and two years on loudspeaker products from date of shipment to the end user.

Faults arising from misuse, unauthorised modifications or accidents are not covered by this warranty. No other warranty is expressed or implied.

This warranty does not affect any statutory rights of the purchaser.

Should any fault develop with a component of your Turbosound system the faulty unit should be sent, in its original packaging, to the supplier or your local authorised Turbosound dealer with the shipping prepaid.

You should include a written statement listing the faults found, and the product serial number must be quoted on all correspondence relating to the claim.

**IMPORTANT:** We recommend you record your purchase information here for future reference.

Dealers Name: .....

Address: .....

Phone No: .....

Invoice/Receipt No./Date . .....

Serial numbers .....

.....

.....

.....

In keeping with our policy of continual improvement, Turbosound Limited reserves the right to alter specifications without prior notice.





**Turbosound Limited**  
**Star Road**  
**Partridge Green**  
**West Sussex RH13 8RY**  
**United Kingdom**