Operating and Service Manual

TANNOY®

MONITOR SERIES

Contents

AN INTRODUCTION TO THE NEW TANNOY MONITOR SERIES LOUDSPEAKERS

Of all loudspeaker manufacturers in the world Tannoy has the greatest number of loudspeakers in use for sound production in British and European studios. An enormous number of successful recordings has been produced on Tannoy Monitoring since the first introduction of the Tannoy Dual Concentric loudspeaker in the 1950s.

A decade has now passed since the introduction of the Super Red and upgraded Super Gold series of Tannoy Monitors. During this time they have earned an enviable reputation as the definitive standard for UK, European, Australasian and North American recorded sound production monitoring.

But it is easy to bury the requirements of monitor loudspeakers in a mass of superlative technical specifications and smooth sales features. The proof of successful engineering design is expressed in the opinions of the users and ultimately their success in producing programme material that is commercially and artistically welcomed by the customer.

It is no coincidence that Tannoy has been instrumental in this process since commercial recordings first became available. Tannoy engineering philosophies have always been genuine, no nonsense, realistic and without gimmick features. We never add a feature unless it has direct benefit to the user.

The Dual Concentric design philosophy is world known for its precise stereo imagery and for the ease of finding sounds within a sound stage. The presentation of the sound image makes long production sessions much less fatiguing than with other monitoring systems because the brain does not have to work as hard correcting for acoustic anomalies in the time and frequency domains.

During the last 10 years great strides have been made in the analytical understanding of loudspeakers. In parallel, the explosion of computing power available to physicists, electronics, acoustics and mechanical engineers has resulted in loudspeaker design techniques advancing at a faster rate than ever before.

Tannoy's massive experience and its highly innovative and skilled design engineering team, has placed the company in a most enviable position. This is reflected for the 1990s in what is a frankly exceptional — revolutionary rather than evolutionary — range of studio monitors.

UNPACKING AND VISUAL CHECKS

To get the speaker out of the carton without damage open the end flaps fully and bend them right back. Turn the package upside-down on the floor and lift the carton vertically up to leave the speaker resting on its packing tray. Remove the packing and the protective polythene bag.

Inspect the speaker for signs of transit damage. In the unlikely event of this having occurred inform the carrier and the supplier. Keep all the packaging if damage has occurred as this will show evidence of excessive handling forces. It is also a good idea to keep the carton if possible for future transportation.

Be very careful when lifting the larger models as they are very heavy.

Particles of packing material can be removed from the cabinet and grille surfaces with a soft brush or proprietary clothing lint remover.

QUICK SET UP PROCEDURE

Look at the connection panel on the rear panel. The input terminals are coloured red and black. They have been factory set with the Bi-wire selection device in the normal position.

Decide whether you want to set up using normal wiring or Bi-wiring. If you choose Bi-wiring you will need to arrange for two separate twin-core cables from each channel of the power amplifier to each speaker position. The benefits and philosophy behind the Bi-wiring principle are outlined in the technical section of this manual — see Section 5.

In either case please use cable of at least 2.5 square millimetre (2.5 mm^2) cross sectional area.

For normal operation just check that the Bi-wire selector is in the normal position with the Tannoy logo on the selector block nearest the red and black terminals. Connect the power amplifier to the terminals marked HF (high frequency) observing the standard polarity conventions, red to red and black to black. This will ensure positive acoustic polarity provided the associated electronics is suitably configured.

For Bi-wire operation slacken off the red and black terminals sufficiently to allow the Bi-wire selector block to be pulled upwards to show the words 'Bi-wire' and tighten one red terminal to hold it in place. Connect one of your twin core cables to the red and black terminals marked LF (low frequency) and the other twin core to the terminals marked HF. Please make sure that polarity is observed.

At the power amplifier, connect the two twin core cables together, positive to positive, negative to negative, and wire up to the power amp output terminals. Be careful to get the polarity correct or either the HF units or one complete speaker will be out of phase. If you have kept polarity red to red, black to black throughout the wiring then the system will have positive acoustic polarity provided the associated electronics is suitably configured.

The speakers are now ready for use. Please read the technical specifications regarding power handling before use on amplifiers with a power output greater than 250 watts per channel into 8 ohms (or 100 watts for System 2) — see Section 7.

If you feel that the high frequency level requires adjustment because of environmental or commercial circumstances then the HF link on the rear connecting panel may be set. This provides a fixed increase or decrease in the output of the HF unit by 1.5 dB over the range 2.5 kHz to 25 kHz. Slide the link mechanism between the blue terminals to give the response as shown on the connecting panel.

The power amplifier requirements are a function of the sound pressure level required, the size of the control room, the distance of the monitoring position from the loudspeakers, and, most important of all, the amount of headroom required when dealing with signals of wide dynamic range. A full discussion on this subject is beyond the scope of this manual but a few general guidelines can be given.

(i) For most applications a power amplifier of 150 watts continuous power output is adequate for each Monitor.

(ii) Where more headroom is required a power amplifier of 300 watts continuous power output per channel will normally be adequate, but precautions must be taken to make sure that the continuous power fed to the loudspeaker is not greater than the specified rating. This means in normal circumstances that provided there is no evidence of amplifier clipping and the signals have a wide dynamic range (i.e. not heavily limited or compressed) a 300 watt amplifier will be safe.

(iii) For small control rooms, the sensitivity of the Monitors is high enough to give adequate sound levels from 50 watt to 100 watt power amplifiers. However, remember that a smaller amplifier driven into clipping can do more damage to a loudspeaker than a large amplifier operating within its maximum output rating.

CAUTION: Clipping amplifiers are the evil of loudspeakers. Clipping produces an excess of H.F. energy which can destroy the high frequency compression driver over quite short periods (approximately 5 minutes). Clipping also usually produces some d.c. offset which will upset the position of the Low Frequency driver and drastically reduce its thermal power handling, resulting in early failure.

Above all, clipping amplifiers do not <u>sound</u> very good.

<u>Golden Rule</u> If the amplifier clips, either reduce the gain, or get a more powerful amplifier.

(iv) Overload Precautions: Provided the monitors are used in a sensible way, no special overload precautions are necessary. However, if total failsafe precautions are required the most reliable method of protection is a 4 amp fuse housed in an inline connector which must be replaced at the beginning of each session. (Fuses tend to "age" and become unreliable when operated over long periods close to their fusing point).

The use of incandescent bulbs with low cold resistance is not recommended since these devices can usually be heard compressing during wide dynamic range programme material.

(v) When using an external crossover and separate power amplifiers for L.F. and H.F. drivers the same comments above apply to the L.F. power amplifier. Although the H.F. power amplifier will normally be providing less power output than the L.F. power amplifier do not assume that the H.F. amplifier can be of a much lower power rating. The transient and dynamic characteristics of most music programmes shows a low average power requirement for high frequencies but a high peak power requirement. Unless this high peak power is catered for the amplifier will be driven into clipping with all the attendant problems. Therefore the H.F. power amplifier must have a peak power output at least equal to the continuous power output of the L.F. power amplifier. A good system design would use the same power

continued....5.

Connecting the Loudspeakers

There are two options available when connecting the speakers to the power amplifiers:

— use ONE normal twin cable with the Bi-wire selector on the rear panel set to NORMAL.

— use TWO twin cables with the Bi-wire selector on the rear panel set to BI-WIRE.

When using the normal connections with one twin-core cable, connect the cable to the terminals marked HF. This gives marginally better sound quality than when using the LF terminals.

Bi-wire operation gives significantly better sound quality for a modest outlay in extra speaker cables. Bi-wiring allows high frequency and low frequency electrical currents to be split between two cables and therefore complex reverse potential differences across the cables (due to resistive losses and reactive components) do not interact.

Remember that with dynamic ranges of 80 dB to 100 dB in the recording process the high frequency currents necessary for correct reproduction of a sound wavefront may be around 60 dB or more down from the low frequency currents. At these levels the potential difference across the LF cable may easily swamp the HF signal in the region at crossover unless Bi-wiring is used.

The Bi-wiring principal also continues the wiring philosophy within the crossover of all Tannoy speakers in that all earthing points should be star wired to the source terminal to prevent common earth paths.

The types of cable used to connect the speakers to the power amplifier will marginally affect the sound whether in normal or Bi-wire mode. There will be more differences between cables of less than 2.5 mm^2 area in the normal mode and so we recommend cables equal to or greater than 2.5mm^2 together with Bi-wire operation for best results.

It is worth experimenting with very pure oxygen-free or large crystal cables as these can resolve fine detail which would otherwise be missed. If these type of cable are used then the cross-sectional area specification referred to above need not apply rigidly.

Tannoy does not recommend the use of certain plaited or coaxial cables since their high capacitance can lead to instability and oscillation in some power amplifiers together with some loss of high frequency definition.

The Tannoy Monitor range will accommodate connection by 4 mm banana or spade connectors.

When connecting the speakers it is essential that consistent polarity is observed. The red terminal on the loudspeaker must be connected to the red or positive terminal on the power amplifier, and the black terminal on the loudspeaker connected to the black, negative or ground terminal of the power amplifier.

Power Amplifiers

The power amplifier should be reasonably well matched in power to the power rating of the speakers. Tannoy Monitors are very efficient and it can be tempting to economise on the size of power amplifier. However, for the correct resolution of fine detail and dynamics the power amplifier should have sufficient voltage swing which usually means a higher power output specification of say greater than 150 watts.

The power specification of the speakers has been measured on a continuous basis using well documented industry principles. The recommended use of a high power amplifier for sound quality reasons assumes that the speaker will not be subjected to the full clipped output of the amplifier over a sustained period of time. As with all monitor speakers most of the power from the amplifier is dissipated inside the speaker as heat. Tannoy monitors are designed to withstand peak overload conditions without damage but sustained overload or waveform clipping will reduce their serviceable life considerably.

There is the option, when using the speakers in the Bi-wire mode, to operate with two separate power amplifiers in what is known as a 'Bi-Amp' configuration. This gives additional benefits over Bi-wiring in that the LF and HF sections are completely separated from each other.

If this mode is chosen then it is absolutely essential that the power amplifiers are all of exactly the same specification. Although the HF section of the loudspeaker does not need such high power delivery as the LF section, it needs just as much instantaneous voltage swing to deliver the dynamic range. Additionally it is essential that the phase relationships across the audio band are preserved and therefore if bi-amp driving is chosen, identical power amplifiers are required.

The power output performance of the Tannoy Monitors is directly related to the power amplifier output. The conversion of electrical power from the amplifier into sound energy is proportional to the sensitivity specification of the Monitor. Please read the full technical specification for details.

For best results in dynamic range, an amplifier of not less than 100 watts per channel should be used on System 2, 8 and 10 and 200 watts per channel for System 12, 15 and 215.

Listening Position

Locate the monitor so that the listening position at the console is approximately 10-15 degrees from the axis of the Dual Concentric drive unit. This will give the optimum spread of HF information.

The distance between the two speakers should be between 2 to 4 metres, depending on control room size. Where possible avoid mounting the speakers close to walls, floors or ceilings. The distance between the monitoring position and each speaker should be slightly greater than the distance between the speakers.

Please note: if the speakers are placed too close to each other the full stereo image may not develop, on the other hand if you place them too far apart you will notice an audible hole in the middle of the stereo image.

Ensure that the console position does not obscure the direct sound radiation from the Dual Concentric drive unit when sitting down; the engineer and producer should have a clear, uninterrupted view of the monitor loudspeakers.

Duty Rating and On-Site Servicing

If the loudspeakers are used within their rated specifications then they will provide long, reliable service. In a commercial world, however, it is often impossible to guarantee that the monitoring system will not be abused in some way. Tannoy monitors are designed to withstand short term overload without damage but excessive overloads will reduce the expected life of the mechanical components and crossover capacitors somewhat. Therefore it is sensible to keep spare parts for on-site service where monitor down-time could be critical. With the correct spares in stock Tannoy monitors can be serviced in less time than a typical coffee break.

A list of recommended spare parts is shown in Section 8 of this manual as first and second level spares.

SYSTEM DESCRIPTION AND PHILOSOPHY

A loudspeaker design naturally splits into various parts: lower frequency, higher frequency, crossover network and cabinet. The design of these parts cannot take place in isolation as they are all interdependent. However for descriptive purposes we will break the total design into these parts and summarise at the end by describing the complete system.

High Frequency Drive Unit

Traditionally, Tannoy has used a single magnet driving both low frequency and high frequency magnetic air gaps. This gives a very compact drive unit with acoustic source alignment. In the new designs of 10-inch, 12-inch and 15-inch Dual Concentric units the HF unit and LF unit now have separate, dedicated magnet systems. This is because the HF waveguide design has become so sophisticated it cannot be made by processes suitable for magnetic flux carrying materials.

The HF waveguide can therefore no longer be an integral part of the LF magnet system. In splitting the magnet systems an extra degree of design freedom allows for very high precision casting and moulding processes together with accurate self centring diaphragm assemblies. Both production processing and in-field repairs can then guarantee consistent performance.

A new design of waveguide has been arrived at by making extensive use of CAD (computer aided design). We call it a waveguide because there is a direct analogy with electromagnetic radiation in that characteristic impedances must be carefully matched without introducing standing waves. The Tannoy HF waveguide matches the acoustic source impedance at the HF diaphragm into the listening environment.

The waveguide shapes the wavefront as it travels down from the diaphragm ensuring that path lengths are equal, that the wavefront is perpendicular to the fixed surfaces and that the wavefront is spherical. Only small errors of fractions of a millimetre can upset this condition and cause phase shifts in the waveguide. Accuracy of design and production are essential in achieving the correct conditions within the waveguide.

In this way, transverse modes are minimised and high frequency dispersion maximised. Wavefront shaping begins at the diaphragm surface and, because the compression ratio can be kept relatively low with this design, the distortions due to air non-linearities are minimised. A hyperbolic flare has been chosen for optimum low frequency performance at the crossover point.

The HF diaphragm is a new design. The waveguide requires total piston movement over the operating range since any breakup modes within the diaphragm will result in phase-shifted components at the start of the waveguide propagation. A rigid piston diaphragm operating to above 25 kHz is made from aluminium and magnesium alloy.

A special machine has been designed and built to form and extrude the diaphragm with a 2 mm skirt. This configuration gives the most rigid diaphragm and ensures reliable handling for production and field servicing.

Aluminium is notoriously difficult for adhesive working and we put the diaphragm through a special alkaline etching process followed immediately by the build process to ensure reliability.

The diaphragm assembly is suspended by a precision moulded, inert nitrile rubber surround. This has been designed and tooled using high-precision, numerically controlled machining techniques. Its very narrow roll eliminates resonances below 25 kHz and provides a very stable and consistent mounting. The roll form ensures high excursions can take place if necessary yet provides a fatigue-indestructible assembly.

The diaphragm is driven by a new design of voice coil assembly. High temperature polyimide-insulated, copper-clad aluminium, rectangular ribbon conductor is chemically bonded onto a glass-fibre former fitting onto the outside of the HF diaphragm skirt. This gives a high temperature (polyimide), very low mass (aluminium wire, glass fibre), high rigidity (rectangular wire, former to outside of diaphragm skirt), high reliability (nitrile suspension, copper clad aluminium) assembly.

Leadout materials are crucial for HF units and our new design incorporates beryllium copper flat strip to eliminate fatigue breakages and prevent fusing on unsupported areas under overload conditions.

The HF diaphragm assembly is factory mounted onto the waveguide by a newly designed high-precision production process. This ensures that the spacing between diaphragm and waveguide is consistent and the whole assembly self centres under all conditions when placed on the magnet assembly. Field replacement is therefore extremely simple and no difficult soldering or centring techniques are required.

The HF magnet assembly uses an anisotropic barium ferrite magnet for maximum energy product (BH_{MAX}), a newly developed magnetic air gap coolant for lowest viscosity and highest thermal rating, a copper flux stabilising ring around the pole piece to minimise voice coil inductance and control the highest frequency energy, and a cavity damper to control the rear cavity compliance beneath the diaphragm.

Physically, the whole HF assembly self centre mounts onto the back of the low frequency assembly using three screws carrying with it the self-centring HF diaphragm. Production and field service is therefore virtually foolproof and extremely consistent.

Polarised, push-on connectors provide connection to the input signal.

Low Frequency Drive Unit

The heart of the LF unit is the motor system comprising the magnet and voice coil. Computer optimisation of the low frequency magnet gives linear flux linking to the voice coil using low carbon steel pole pieces and an anisotropic barium ferrite magnet. A specially designed pure copper stabilising ring fits over the outer pole where it reduces eddy current losses, lowers midrange distortion and increases thermal cooling by a massive 50 per cent. In this way both power compression and reliability are considerably enhanced.

The choice of magnet operating point parameters, air gap flux strength, voice coil details (number of turns, resistance, winding length, diameter

etc), moving mass, dynamic compliance and drive unit radiating area presents a very complex mathematical problem where the solutions can take many different forms. The optimum solution depends on the intended use of the drive unit in particular cabinet systems and the expectations of the end user.

This is the skill or 'black-art' element of loudspeaker design. Reaching the correct answers is much easier if computers can be called on to assist with solving the equations. Tannoy has an in-house software facility producing purpose-written programs to solve these equations in both numerical and graphic terms.

The LF voice coil uses polyimide insulated, chemically bonded rectangular section copper wire wound onto a high temperature aluminium former for robustness and reliability in thermal conductivity. A specially designed heat barrier wound onto the end of the former protects the adhesive bond to the LF cone from excessive temperatures.

Robust, fatigue-free leadout braid connects to a polarised, vibration-proof, high-current terminal barrier connector.

The shape and materials from which the cone pistons are made reflect the optimisation of drive unit to cabinet size and end use. The 10-inch and 12-inch LF units use a precision-formed, post-etched polypropylene cone forming which gives best results for the Monitor-10 and Monitor-12 systems. The Monitor-15 has a traditional pulp cone with apex treatment and air-dry felting process. For cones of this size there is no better alternative when mass, rigidity, piston movement and natural upper roll-off characteristics are considered.

All LF drivers have their cones terminated by nitrile rubber, high-compliance surrounds. The characteristic cone termination impedance is matched by the surround material independently of the required suspension compliance. The unit system compliance is provided by the rear suspension where the best degree of mechanical control can be provided.

In all cases the shape of the LF cone has been calculated to match the HF hyperbolic waveguide ensuring the wavefront remains spherical and perpendicular to the cone surface throughout the propagation.

Brand new pressure die-cast chassis have been tooled for the new range drawing extensively on new thinking for LF drive units. It is important to eliminate trapped air cavities as these can provide unwanted compliances, upset the mechanical Q design requirements and cause unwanted acoustic colourations because of Helmholtz resonances and reflections from the chassis surfaces smearing the energy/time response.

The new castings have a very open construction with vented rear suspension features to eliminate low Q cavities, improve thermal cooling and prevent major reflections. Rigidity has been optimised in the axial plane to complement the cabinet philosophy (see later) while the front surface profile has been designed to prevent diffraction at the cabinet surface.

The three sizes of chassis each have purpose-designed trim rings to blend the HF wavefront into the cabinet. This feature has been shown in our research to be the biggest single factor in providing smooth HF radiation in Dual Concentrics (assuming, of course, that the HF unit is well designed in the first instance).

Crossover Network

There are two philosophies in designing loudspeaker crossover networks: the minimal and the conjugate.

The minimal approach requires that the drive units are inherently well behaved and that each section, LF and HF, require minimum equalisation to achieve a smooth flat amplitude response.

The conjugate approach requires that the drive units are accepted as they are but are well characterised. The crossover network is then calculated to provide inherent equalisation to ensure a smooth amplitude response.

The two approaches differ in design emphasis. The minimalist designer concentrates on the drive unit design in controlling the final performance, while the conjugate designer concentrates on complex electronic analysis of networks to achieve the same measured result.

Tannoy has always followed the minimalist philosophy as far as possible. This is because listening trials with loudspeakers always point to those with the least crossover design complexity as being more realistic, involving and convincing in their reproduction. However, this makes the drive unit designer's task more difficult as it is much harder to control performance through the mechanical parameters than through the electrical crossover components. It also puts much greater constraints on production repeatability of processes and test methods. However, overall the result in our belief is a better loudspeaker.

In crossover networks it is vital to use the very highest quality components for series connected elements. Air cored inductors and very high grade film capacitors are needed for best sound quality. Internal wiring has an effect and in the new Tannoy Monitor series high-purity, long-grain crystal, low-oxygen copper wiring is used.

The crossover networks in the new series use simple low order slopes (6 dB and 12 dB per octave) mainly to control the power distribution and balance. The components are of very high quality with hard wiring (no printed circuit boards) and mounted on the back of the terminal panel at the rear of the cabinet. All components are easily serviced in the field by removing the terminal panel from the outside of the cabinet. There is no need to remove drive units to gain access.

Terminal Panel

The terminal panel is a new design especially tooled for the new series. The option of conventional wiring or Bi-wiring is available by a unique high quality gold plated sliding mechanism with large diameter robust terminals. The benefits of Bi-wiring for monitoring are easily heard where the extra pair of cables can be accommodated.

The new terminal panel also includes a sliding link which provides adjustment of the high frequencies on a shelving basis from 2 kHz to 25 kHz with plus or minus 1.5 dB adjustment. The systems are

calibrated in production to be flat to within specification when set to the flat adjustment position.

All terminals and contacts are gold plated to eliminate contact potentials and oxidation.

The terminal panel carries the crossover mounting and can be removed from the outside of the cabinet.

Cabinet

The cabinet provides perhaps the greatest departure from convention yet seen in the professional marketplace. There are three major philosophies in the design:

With well designed drive units the majority of the aberrations in the loudspeaker system are due to the cabinet. Most of the irregularities heard and measured in the higher frequency areas are due to diffractions and reflections caused by the cabinet boundaries.

The amount of acoustic energy transfer that the drive units can launch into the listener's space is dependent on rigid mounting since action and reaction are equal and opposite. When the displacements of the HF diaphragm are calculated for sound levels in the region of 80 to 100 dB sound pressure level, the movements involved are extremely small, often fractions of a thousandth of an inch. However tiny these displacements are they carry information that is required for accuracy in the resulting sound stage.

It stands to reason therefore that the drive unit must be held in space very rigidly so that the HF diaphragm displacements are not themselves modified by the LF displacements which have inherently much more energy associated with them. The obvious method of doing this is to mount the drive unit rigidly into a rigidly made cabinet. But in doing this, a new set of problems appears.

Rigid systems are characterised by high stiffness. The natural resonance of the high cabinet stiffness — achieved by, say, cross bracing and bracing the driver to the rear of the cabinet — and drive unit mass, brings the natural resonance frequency into the audio band, typically around 100 to 200 Hz. This produces an objectionable colouration which can be mitigated in aural terms by some listeners by the increase in 'speed' and HF clarity provided by the rigid system. However, it is not an ideal solution.

In its new Monitors Tannoy has taken a radical approach pointed to by measured parameter research into cabinet systems coupled with listening tests. The Tannoy cabinets are stiff but with a high level of internal damping. A very complex internal bracing structure in each of the cabinets allows the drive unit to be held rigidly but also to be able to dump its resonant or reactive energy into the lossy couplings of the cabinet. The joints between the driver and the bracing structure have a special compound which is very stiff at high frequencies but will absorb energy in the critical colouration areas.

The cabinet panels are made from MDF but are laminated on each side to increase their stiffness. However, the layer of adhesive between MDF and laminate acts as a lossy energy absorbent medium.

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ON-SITE SERVICING

Cabinet Finish

The cabinet is finished in a high impact resistant, texture paint. To remove marks and scuffs use a medium soft brush. If necessary, a little warm water and detergent can be used but under no circumstances use a solvent or abrasive cleaner. The surface will change colour when wet but will return to normal when dry.

For touch-up of paint chips contact your local Tannoy Service Agent for materials and guidance.

The grille cloth may be brushed to remove dust and particles and may be washed in warm soapy water if necessary. Do not soak the grille frame or dry under artificial heat or the grille may twist out of shape.

Grille Removal

The grille is held by plastic split dowels located in the grille frame which fit into rubber lined holes in the front panel. To remove the grille pull any corner until the grille frame can be eased away evenly. Do not pull sharply from only one corner as there is a risk of the grille being twisted out of shape.

Dual Concentric Driver Removal

Lay the cabinet on its back taking care to protect the terminals and the rear surface. Remove the four hexagonal socket headed bolts and set aside. Ease the driver from the front of the cabinet taking care not to mark the front surface. Use a piece of stout cardboard to lever against if necessary. The driver will yield to constant tension as the special mass damping compound between the magnet and the internal cabinet bracing releases. Remove the driver, note the polarity of the internal connections and disconnect the internal wiring.

Take care not to damage the moving parts of the LF driver.

To refit the Dual Concentric driver, connect the cables from the crossover to the LF and HF terminals. Locate the piece of damping material which was pressed between the rear of the HF magnet and the cabinet crossbrace during manufacture. Roll it into a ball and press it onto the centre of the cabinet crossbrace.

Fit the driver into the mounting hole and maintain pressure on the front of the chassis until the driver seats into the compound. Please make sure that the internal connecting cables are not trapped between the HF unit and the cabinet crossbrace. Fasten the bolts finger tight and then progressively torque them down so that the driver seats evenly into the damping compound. Check the tightness of the mounting screws before fitting the grille.

Crossover Inspection and Removal

The crossover network is mounted on the rear of the terminal panel. To inspect it, remove the panel by releasing the hexagonal screws. Inspection can take place up to the limit of the length of the internal wiring. Take care to avoid undue stress on the cables and components. When replacing components make sure they have the same physical orientation as the original.

To remove the crossover completely the cables must be disconnected from the drive unit. Please proceed as above to remove the drive unit.

Drive Unit Servicing

The HF unit may be fitted with a new diaphragm assembly or replaced as a complete assembly for speed. In either case, with the driver face down, release the three bolts securing the HF assembly and lift the HF unit vertically upwards and away from magnetic attraction caused by the LF magnet. Replace the diaphragm — it is self centring — or the complete unit, taking care to align the parts correctly.

To refit the HF unit, hold it about 300 mm (12 inch) vertically above the LF magnet in both hands while resting on your elbows. Slide your elbows apart and lower the HF unit onto the back of the LF magnet. As the HF unit gets close to the magnet you will feel the magnetic fields repelling. Align the fixing holes and secure with the bolts, tightening down evenly. Do not tighten the bolts finally until you are sure the HF unit is seated correctly and the two magnet systems appear parallel.

The LF unit may be re-coned in the normal way. Ease the trim ring from the rubber surround and remember to refit it. The trim ring forms an integral part of the HF dispersion system. Use only the parts and adhesive supplied in the re-cone kit.

Sweep Signal Testing

Both LF and HF units may be checked for buzz and rattle individually. Set the rear connector panel to Bi-wire (see earlier for details). Using a very high quality oscillator (preferably a Beat Frequency Oscillator) and power amplifier set the output of the amplifier to give 3 volts rms at 1 kHz. Feed this signal in turn to the LF and HF terminal pairs. The speakers should be free from buzz and rattle.

To check for high level problems 10 volts rms is permissible to the LF unit above 70 Hz and 5 volts rms to the HF unit. Higher levels must be used with caution as the thermal rating of the drive units can be exceeded under test situations. Audible buzz and rattle problems can usually be heard with the 3 volt signals.

TECHNICAL SPECIFICATIONS

System 2 NFM

RECOMMENDED AMPLIFIER POWER	20 to 100 watts RMS
PEAK POWER HANDLING	150 watts
NOMINAL IMPEDANCE	8 ohms
SENSITIVITY (2.83 volts @ 1 m)	90 dB
DISTORTION	Less than 1% 55 Hz – 25 kHz
PHASE RESPONSE	Better than ±45 degrees
DISPERSION	Greater than 150 degrees up to 12 kHz horizontal
CROSSOVER FREQUENCY	3 kHz
CROSSOVER TYPE	1st order overdamped LF, 2nd order HF hard-wired, low-loss. Positive acoustic polarity
FREQUENCY RESPONSE (±3 dB)	55 Hz – 25 kHz
DRIVE UNIT TYPE	6.5 inch 1668GGG mid/bass unit
	1 inch 0259GL treble unit

CABINET SPECIFICATIONS

CABINET INTERNAL VOLUME	11 litres
CABINET MATERIAL	30.6 mm MDF front baffle, 18 mm high density particle board with energy absorbing bracing matrix
CABINET FINISH	High quality vinyl finish. Velti shadow grey soft-texture finish baffle
GRILLE	Steel mesh grilles to protect drive units
CABINET DIMENSIONS (HxWxD)	402 x 224 x 241 mm (15.8 x 8.8 x 9.4 inch)
CABINET WEIGHT	13.1 kg (28.8 lbs)
SHIPPING DIMENSIONS (HxWxD)	Approximately 540 x 440 x 260 mm (21.2 x 17.3 x 10.2 inch)
SHIPPING WEIGHT	Approximately 31 kg (68 lbs)

System 8 NFM

RECOMMENDED AMPLIFIER POWER	20 to 120 watts RMS
PEAK POWER HANDLING	200 watts
NOMINAL IMPEDANCE	8 ohms
SENSITIVITY (2.83 volts @ 1 m)	93 dB
DISTORTION	Less than 0.5% 48 Hz – 25 kHz
PHASE RESPONSE	System behaves substantially as a frequency-independent time delay.
DISPERSION	90 degrees conical
CROSSOVER FREQUENCY	2.3 kHz
CROSSOVER TYPE	1st order LF, cascaded 1st order HF with impedance compensation. Positive acoustic polarity
FREQUENCY RESPONSE (±3 dB)	48 Hz – 25 kHz
DRIVE UNIT TYPE	8 inch 2025GGG Dual Concentric

CABINET SPECIFICATIONS

CABINET INTERNAL VOLUME	18.3 litres
CABINET MATERIAL	MDF (30 mm — front and back; 20.6 mm — top, bottom and sides) with energy absorbing bracing matrix and BPF acoustic wadding
CABINET FINISH	Velti shadow grey soft-texture finish. High pressure twin laminate in shadow grey with metallic speckled finish on top, bottom and sides
GRILLE	Single piece, black acoustically transparent material on a wooden frame
CABINET DIMENSIONS (HxWxD)	460 x 300 x 230 mm (18.1 x 11.8 x 9.1 inch)
CABINET WEIGHT	12 kg (26.4 lbs)

SHIPPING DIMENSIONS (HxWxD)	Approximately 510 x 350 x 280 mm (20 x 13.8 x 11 inch)
SHIPPING WEIGHT	Approximately 16 kg (35.2 lbs)

System 10 DMT

RECOMMENDED AMPLIFIER POWER	30 to 150 watts RMS
PEAK POWER HANDLING	250 watts
NOMINAL IMPEDANCE	8 ohms
SENSITIVITY (2.83 volts @ 1 m)	91 dB
DISTORTION	Less than 0.5% 46 Hz - 25 kHz
PHASE RESPONSE	System behaves substantially as a frequency-independent time delay.
DISPERSION	90 degrees conical
CROSSOVER FREQUENCY	2.3 kHz
CROSSOVER TYPE	1st order LF, 1st order HF. Positive acoustic polarity.
CROSSOVER CONTROLS	Treble energy range 2 kHz - 20 kHz (settings) — +1.5 dB, Level, -1.5 dB
FREQUENCY RESPONSE (±3 dB)	46 Hz – 25 kHz
DRIVE UNIT TYPE	10-inch 2525GG Dual Concentric

CABINET SPECIFICATIONS

CABINET INTERNAL VOLUME	35 litre
CABINET MATERIAL	MDF (30 mm — front and back; 20.6 mm — top, bottom and sides) with energy absorbing bracing matrix and BPF acoustic wadding
CABINET FINISH	Velti shadow grey soft-texture finish. High pressure twin laminate in shadow grey with metallic speckled finish on top, bottom and sides
GRILLE	Single piece, black acoustically transparent material on a wooden frame
CABINET DIMENSIONS (HxWxD)	560 x 365 x 290 mm (22.0 x 14.3 x 11.4 inch)
CABINET WEIGHT	19 kg (41.9 lbs)
SHIPPING DIMENSIONS (HxWxD)	Approximately 660 x 465 x 390 mm (25.9 x 18.3 x 15.3 inch)
SHIPPING WEIGHT	Approximately 21 kg (46.3 lbs)

System 12 DMT

RECOMMENDED AMPLIFIER POWER	50 to 300 watts RMS
PEAK POWER HANDLING	450 watts
NOMINAL IMPEDANCE	8 ohms
SENSITIVITY (2.83 volts @ 1 m)	93 dB
DISTORTION	Less than 0.5% 44 Hz – 25 kHz
PHASE RESPONSE	System behaves substantially as a frequency-independent time delay.
DISPERSION	90 degrees conical
CROSSOVER FREQUENCY	1.5 kHz
CROSSOVER TYPE	2nd order overdamped LF, 1st order HF. Positive acoustic polarity.
CROSSOVER CONTROLS	Treble energy range 2 kHz – 20 kHz (settings) — +1.5 dB, Level, -1.5 dB
FREQUENCY RESPONSE (±3 dB)	44 Hz – 25 kHz
DRIVE UNIT TYPE	12 inch 3133GG Dual Concentric

CABINET SPECIFICATIONS

CABINET INTERNAL VOLUME	50 litres
CABINET MATERIAL	MDF (30 mm — front and back; 20.6 mm — top, bottom and sides) with energy absorbing bracing matrix and TF-1 acoustic wadding

System 15 DMT

CABINET FINISH	Velti shadow grey soft-texture finish. High pressure twin laminate in shadow grey with metallic speckled finish on top, bottom and sides
GRILLE	Single piece, black acoustically transparent material on a wooden frame
CABINET DIMENSIONS (HxWxD)	645 x 420 x 290 mm (25.4 x 16.5 x 11.4 inch)
CABINET WEIGHT	26 kg (57.3 lbs)
SHIPPING DIMENSIONS (HxWxD)	Approximately 745 x 520 x 390 mm (29.3 x 20.5 x 15.3 inch)
SHIPPING WEIGHT	Approximately 29.5 kg (65.0 lbs)
RECOMMENDED AMPLIFIER POWER	50 to 400 watts RMS
PEAK POWER HANDLING	600 watts
NOMINAL IMPEDANCE	8 ohms
SENSITIVITY (2.83 volts @ 1 m)	98 dB
DISTORTION	Less than 0.5% 38 Hz – 25 kHz
PHASE RESPONSE	System behaves substantially as a frequency-independent time delay.
DISPERSION	90 degrees conical
CROSSOVER FREQUENCY	1.5 kHz
CROSSOVER TYPE	2nd order overdamped LF, 1st order HF. Positive acoustic polarity
CROSSOVER CONTROLS	Treble energy range 2 kHz – 20 kHz (settings) — +1.5 dB, Level, -1.5 dB
FREQUENCY RESPONSE (±3 dB)	38 Hz – 25 kHz
DRIVE UNIT TYPE	15 inch 3833GG Dual Concentric

CABINET SPECIFICATIONS

CABINET INTERNAL VOLUME	100 litres
CABINET MATERIAL	MDF (36 mm — front and back; 20.6 mm — top, bottom and sides) with energy absorbing bracing matrix and TF-1 acoustic wadding
CABINET FINISH	Velti shadow grey soft-texture finish. High pressure twin laminate in shadow grey with metallic speckled finish on top, bottom and sides
GRILLE	Single piece, black acoustically transparent material on a wooden frame
CABINET DIMENSIONS (HxWxD)	840 x 550 x 440 mm (33.0 x 21.6 x 17.3 inch)
CABINET WEIGHT	45 kg (99.2 lbs)
SHIPPING DIMENSIONS (HxWxD)	Approximately 940 x 650 x 540 mm (37.0 x 25.5 x 21.2 inch)
SHIPPING WEIGHT	Approximately 50 kg (110.2 lbs)

System 215 DMT

RECOMMENDED AMPLIFIER POWER	150 to 500 watts RMS
PEAK POWER HANDLING	750 watts
NOMINAL IMPEDANCE	4 to 8 ohms
SENSITIVITY (2.83 volts @ 1 m)	101 dB
DISTORTION	Less than 0.5% 35 Hz – 25 kHz
PHASE RESPONSE	System behaves substantially as a frequency-independent time delay.
DISPERSION	90 degrees conical
CROSSOVER FREQUENCY	250 Hz and 1.5 kHz
CROSSOVER TYPE	2nd order overdamped LF, 1st order HF. Positive acoustic polarity
CROSSOVER CONTROLS	Treble energy range 2 kHz – 25 kHz (settings) — +1.5 dB, Level, -1.5 dB
	Low frequency window

FREQUENCY RESPONSE (±3 dB)	35 Hz - 25 kHz
DRIVE UNIT TYPE	15 inch 3835GG Dual Concentric
	15 inch 3834GG bass unit

CABINET SPECIFICATIONS

CABINET INTERNAL VOLUME	300 litres
CABINET MATERIAL	MDF (36 mm — front and back; 20.6 mm — top, bottom and sides) with energy absorbing bracing matrix and TF-1 acoustic wadding
CABINET FINISH	Velti shadow grey soft-texture finish. High pressure twin laminate in shadow grey with metallic speckled finish on top, bottom and sides
GRILLE	Single piece, black acoustically transparent material on a wooden frame
CABINET DIMENSIONS (HxWxD)	906 x 786 x 555 mm (35.7 x 30.9 x 21.8 inch)
CABINET WEIGHT	85 kg (187 lbs)
SHIPPING DIMENSIONS (HxWxD)	Approximately 1020 x 860 x 660 mm (40.2 x 33.9 x 26 inch)
SHIPPING WEIGHT	Approximately 96 kg (211.2 lbs)

LIST OF RECOMMENDED SERVICE PARTS

First level spares — marked in bold type in the following lists — are the quickest and easiest to fit, second level spares require some specialist knowledge or tools.

System 2 NFM

PART NUMBER	DESCRIPTION
2252 3182	Resistor wire-wound 6R8 9W
2606 0521	Capacitor 3.3 mF 100V 10%
4510 4716	Screw M4 x 16 mm Pozidrive epoxy-coated
4529 0002	Screw M4 x 25mm hex countersunk wood
4529 0003	Screw M3 x 25mm hex countersunk wood black
4940 0006	Terminal panel biwire nickel terminals
6405 0033	Grille mesh 6.5 inch
6405 0034	Grille mesh tweeter
6460 0035	Badge Tannoy logo gold 1 pin
6560 0010	Link rod - nickel-plated
6730 0192	Carton kit System 2 NFM
6811 0013	Choke 1.0 mH iron dust core
6811 0030	Choke tapped 50/35 Ferrite core
6835 0403	Luxbond 923 - 700 x 190 mm x 10 oz
6839 0131	Gasket, 6.5-inch drivers
7300 0221	System 2 crossover
7500 0159	Lead assembly (1087 Crossover)
7900 0189	**Driver kit - 0259GL**
7900 0210	**Driver kit - 1668GGG**
7900 0211	**Recone kit - 1668GGG**
9900 0151	Cabinet System 2

System 8 NFM

PART NUMBER	DESCRIPTION
2252 3024	Resistor 10R 17W 10% wire-wound
2606 0650	Capacitor 1.5 µF 160V axial polypropylene
2606 0658	Capacitor 0.22 µF polypropylene 100V
2753 3011	Capacitor 30 µF 150V non-polar
2753 3208	Capacitor electrolytic reversible low-loss 50V 10% non-polar
2753 3310	Capacitor 10 mF 150V
4510 4716	Screw M4 x 16 mm Pozidrive epoxy-coated
4529 0004	Screw M5 x 30 mm hex countersunk wood
4940 0005	Terminal panel biwire gold terminals
6177 0004	Dowel moulded black
6177 0013	Socket black nylon
6460 0028	Logo badge gold blocked
6460 0035	Badge Tannoy logo gold 1 pin
6560 0008	Link rod - gold-plated
6730 0191	Carton kit System 8 NFM
6811 0029	1.2 mH choke iron dust / Wilcon
6835 0400	Wadding bonded polyester 10 oz
7100 0099	Choke 1.0 mH bobbin air
7300 0281	System 8 Crossover
7600 0582	Grille assembly System 8 NFM
7900 0156	**HF section - 2025**
7900 0208	**Driver kit - 2025GGG**
7900 0209	**Recone kit - 2025GGG**
9900 0147	Cabinet System 8 NFM

System 10 DMT

PART NUMBER	DESCRIPTION
1411 0071	Damping compound 18 x 32 mm
2252 3166	Resistor 1.5R 9W 10% wire-wound
2252 3170	Resistor 2R2 9W wire-wound
2606 0522	Capacitor 4.7 mF 100V 10%
2606 0650	Capacitor 1.5 µF 160V axial polypropylene
2606 0658	Capacitor 0.22 µF 100V polypropylene
4504 5723	Screw M5 x 20 mm hex button black zinc
4510 4716	Screw M4 x 16 mm Pozidrive epoxy-coated
4529 0003	Screw M3 x 25 mm hex countersunk wood black
4783 0182	Terminal Crimp female 0.25-inch
4940 0007	Terminal panel complete monitors
6177 0004	Dowel moulded black
6177 0013	Socket black nylon
6460 0028	Logo badge gold blocked
6460 0035	Badge Tannoy logo gold 1 pin
6481 0173	Instruction book monitors
6730 0186	Carton kit System 10

6835 0300	Wadding acoustic
6835 0401	Wadding bonded fibre 400 x 230 mm
6839 0047	Gasket - 10 inch back
7100 0099	Choke 1.0 mH bobbin air
7100 0101	Choke 2 mH air core
7300 0270	Crossover Type 1111 System 10 DMT
7500 0173	Lead assembly Systems 10 and 12 DMT
7600 0570	Grille Assembly System 10 DMT
7900 0156	**HF section - 2025**
7900 0193	**Driver kit - 2525GGG**
7900 0194	**Recone kit - 2525GGG**
9900 0141	Cabinet System 10 DMT

System 12 DMT

PART NUMBER	DESCRIPTION
1411 0071	Damping compound 18 x 32 mm
2252 3014	Resistor 3R9 17W 10% wire-wound
2252 3016	Resistor 4R7 17W 10% wire-wound
2252 3024	Resistor 10R 17W 10% wire-wound
2252 3028	Resistor 15R0 17W wire-wound 10%
2606 0656	Capacitor 10mf 160V polypropylene
2606 0657	Capacitor 6.8 mF 160V polypropylene
2606 0674	Capacitor 2.2mf 160V polypropylene
4504 5723	Screw M5 x 20 hex button black zinc
4510 4716	Screw M4 x 16 Pozidrive epoxy-coated
4529 0003	Screw M3 x 25 hex countersunk wood black
4783 0182	Terminal Crimp female 0.25-inch
4940 0007	Terminal panel complete monitors
6177 0004	Dowel moulded black
6177 0013	Socket black nylon
6460 0028	Logo badge gold blocked
6460 0033	Badge Tannoy logo gold 1 pin
6481 0173	Instruction book monitors
6730 0187	Carton kit System 12
6835 0300	Wadding acoustic
6835 0401	Wadding bonded fibre 400 x 230 mm
6839 0050	Gasket seal 12 inch frames
7100 0101	Choke 2 mH air core
7300 0271	Crossover Type 1112 System 12 DMT
7500 0173	Lead assembly Systems 10 and 12 DMT
7600 0571	Grille assembly System 12 DMT
7900 0195	**Driver kit - 3133GG**
7900 0196	**Recone kit - 3133GG**
7900 0199	**HF diaphragm - 3133/3833**
9900 0142	Cabinet System 12 DMT

System 15 DMT

PART NUMBER	DESCRIPTION
1411 0071	Damping compound 18 x 32 mm
2252 3002	Resistor 1R2 17W 10% wire-wound
2252 3016	Resistor 4R7 17W 10% wire-wound
2252 3182	Resistor wire-wound 6R8 9W
2606 0656	Capacitor 10 mF 160V polypropylene
2606 0657	Capacitor 6.8 mF 160 V polypropylene
2606 0685	Capacitor 3.9 mF 160V polypropylene
4504 8726	Screw M8 x 20 mm button socket-head
4510 4716	Screw M4 x 16 Pozidrive epoxy-coated
4783 0182	Terminal Crimp feamle 0.25-inch
4940 0007	Terminal panel complete monitors
6177 0004	Dowel moulded black
6177 0013	Socket black nylon
6460 0033	Badge Tannoy logo gold 1 pin
6481 0173	Instruction book monitors
6730 0188	Carton kit System 15
6835 0300	Wadding acoustic
6835 0401	Wadding bonded fibre 400 x 230 mm
6839 0048	Gasket seal 15-inch frames
7100 0101	Choke 2 mH air core
7300 0272	Crossover Type 1113 System 15 DMT
7500 0174	Lead assembly System 15 DMT
7600 0572	Grille assembly System 15 DMT
7900 0197	**Driver kit - 3833GG**
7900 0198	**Recone kit - 3833GG**
7900 0199	**HF diaphragm - 3133/3833**
9900 0143	Cabinet System 15 DMT

System 215 DMT left-hand

PART NUMBER	DESCRIPTION
4199 0003	Screw M5 x 25mm Supadrive countersunk epoxy-coated
4504 8726	Screw M8 x 20 mm button socket head
4510 4716	Screw M4 x 16 mm Pozidrive epoxy-coated
6177 0004	Dowel moulded black
6177 0013	Socket black nylon
6730 0190	Carton kit System 215 DMT
6835 0300	Wadding acoustic
7300 0283	Crossover 1117 System 215 DMT
7600 0580	Grille assembly
7600 0581	Termination panel assembly
7900 0197	**Driver kit - 3833GG**
7900 0198	**Recone kit - 3833GG**
7900 0199	**HF diaphragm - 3133/3833**
7900 0206	**Driver kit - 3834GG**
7900 0207	**Recone kit - 3834GG**
9800 0830	Front cover System 215 DMT
9900 0149	Cabinet System 215 left hand

System 215 DMT right-hand

PART NUMBER	DESCRIPTION
4199 0003	Screw M5 x 25 mm Supadrive countersunk epoxy-coated
4504 8726	Screw M8 x 20 mm button socket head
4940 0007	Terminal panel complete monitors
6177 0004	Dowel moulded black
6177 0013	Socket black nylon
6730 0190	Carton kit System 215 DMT
6835 0300	Wadding acoustic
7300 0283	Crossover 1117 System 215 DMT
7600 0580	Grille assembly
7600 0581	Termination panel assembly
7900 0197	**Driver kit - 3833GG**
7900 0198	**Recone kit - 3833GG**
7900 0199	**HF diaphragm - 3133/3833**
7900 0206	**Driver kit - 3834GG**
7900 0207	**Recone kit - 3834GG**
9800 0830	Front cover System 215 DMT
9900 0150	Cabinet System 215 DMT right hand

WARRANTY

No maintenance of the Monitors is necessary.

All components are guaranteed for a period of five years from the date of manufacture, subject to the absence of, or evidence of, misuse, overload or accidental damage.

For further information please contact your dealer or the distributor in your country. If you cannot locate your distributor please contact:

Customer Services
Tannoy Ltd
Rosehall Industrial Estate
Coatbridge, Strathclyde
ML5 4TF, Scotland.

Telephone (0236) 20199
Telex 778621 TANMFG G.
Fax (0236) 28230.

DO NOT SHIP ANY PRODUCT TO TANNOY WITHOUT PREVIOUS AUTHORISATION.

This warranty in no way affects your statutory rights.

Our policy commits us to incorporating improvements to our products through continuous research and development. Please confirm current specifications for critical applications with your supplier.

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TANNOY®

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