



THE HISTORY OF THE DUAL CONCENTRIC

BACKGROUND

Tannoy is famous world-wide for its innovative, unique and very accurate sounding Dual Concentric. A Dual Concentric speaker unit is very different from the standard speaker industry drive unit. It has the tweeter or treble unit mounted at the centre of the bass unit so that the two units operate in total harmony with each other.

Many manufacturers such as JBL, Altec, Urei, KEF, Pioneer, Diatone, TEAC, have recognised the benefits of the co-axial or concentric arrangement of woofer and tweeter to cover the whole audio band from a single apparent point source. None of them has solved the problem from an ideal acoustic engineering point of view in the way that Tannoy has.

The construction and operation of the Tannoy Dual Concentric (upper case 'D' and 'C' !) is unique and provides benefits that other manufacturers cannot. The waveguide high frequency unit (so called because of the analogy in design to microwave engineering) has a smooth acoustic path through the centre of the low frequency unit without problems due to masking or diffraction. The low frequency unit operates without obstruction as the cone piston apex is well clear of the high frequency unit. Both units operate in harmony together providing a single point source covering the whole acoustic audio spectrum and in a way that recreates the original sound field better than any other system.

Tannoy Dual Concentrics are by their very nature complex to manufacture and therefore you will not find them in a low price system. In this world you get what you pay for and therefore for the best type of speaker system you should be prepared to spend more. The results are demonstrably worthwhile even in the unfamiliar surroundings of an in-store trial.

THE FORMATIVE YEARS

Tannoy was the trade name of a company formed by Mr Guy R Fountain in 1926. The name originates from a solid state rectifier invented by Guy Fountain made from an alloy or mixture of Tantalum and Lead. This Tantalum-Lead Alloy produced the name Tannoy. The name stuck fast to the company's products over the years and eventually became the company name, Tannoy Ltd.

From 1926 through the recession of the thirties and during the second world war Tannoy produced many different products all to do with speech and music communications. One innovative design was a universal speaker system designed for a travelling circus.



The speaker requirement was for high quality speech and music for announcement and entertainment purposes in the largest travelling circus of Bertram Mills. The speaker had to be efficient because all the amplification was by tube amplifiers (designed and built by Tannoy of course) and the power supplies were derived from not very efficient motor generators and rotary converters.

THE FIRST TANNOY DUAL CONCENTRICS

Drawing from his knowledge of high efficiency products made for the high quality public address market, the Chief Engineer, Mr Ronnie H Rackham combined a high frequency compression horn drive unit concentrically with a 15 inch direct radiating bass driver. His skill in designing wide band horn systems married the two drivers together so that the flare shape of the 15" bass unit continued the flare rate of the high frequency unit.

It was this important part of the design process that conceived a very low colouration horn device. Because the HF horn had a very large mouth diameter it had an inherently low cut-off frequency.

The cross-over point from bass to high frequency was selected at 1kHz, nearly a whole octave above the natural horn frequency lower cut off point, leading to previously unheard of low levels of colouration.

In 1947 the first Tannoy Dual Concentric was born. It was designated the '15" Monitor Black', had a power handling of 20 watts rms, a voice coil impedance of 15 ohms and a cross-over point of 1 kHz. Magnetic gap fluxes were provided by a cast iron alloy magnet and were very high for a speaker of the 1940s at 12,000 gauss for the low frequency voice coil and 18,000 gauss for the HF coil. (10,000 gauss = 1 Tesla). At 20 watts power handling in 1947 the unit was very well received and this, coupled with a sensitivity close to 92dB for 1 watt at 1 metre right up to the highest frequencies, was a milestone for the company in providing high quality speech and music capabilities in an efficient way.

Six years later the unit was improved to 25 watts power handling and the free air resonance lowered to 40Hz to enable the unit to be used in enclosures to improve the low frequency performance. The heavy, black crackle finish, overly engineered cast chassis was replaced by a gravity casting with much more open area to the rear to prevent rear reflections. The livery was changed to silver and in the Autumn of 1953 the '15" Monitor Silver' loudspeaker from Tannoy was launched in a compound horn cabinet called the 'Autograph'.

The previous 15" Monitor Black had an integral cross-over network and line matching transformer built into a square aluminium box mounted on the side of the chassis. All components were 'potted' in wax to prevent resonance and to protect the wax paper capacitors used at the time from moisture.



THE MONITOR SILVER

When the 15" Monitor Silver was announced, the cross-over network was separated from the chassis to prevent interactions with the ferrous magnet parts.

The 15" Monitor Silver was also used in the Corner GRF loudspeaker system launched in 1955. The 15" Monitor Silver was accompanied in 1957 by a smaller unit, the 12" Monitor Silver, which was the predecessor of the famous Tannoy Little Red Monitor launched in 1979.

The Monitor Silver range of 2 units continued in development with improvements to power handling, sensitivity and free air resonance through 2 more generations before significant changes took place.

THE MONITOR RED

In 1958 the Silver range became the famous original Monitor Red series with a 10" Dual Concentric being added in 1961. Power handling figures were improved to 50 watts for the 15" (25 watts for the 12") and sensitivity levels kept well up at 94dB for 1 watt at 1 metre to match well with tube amplifiers. The speaker units were designated:

15" Monitor Red LSU/HF/15-L

12" Monitor Red LSU/HF/12-L

10" Monitor Red LSU/HF/III-LZ

A couple of significant things appeared here. The designation 'L' at the end of the type number stood for Low impedance. The 15" and 12" units had 15 ohms voice coils that most people today would take as high impedance. The 'L' designates that the unit is of low impedance with respect to a 100 volt line system.

The 10" version was a different story. This unit departed from the 2" LF voice coil used in the 15" and 12", using a 2.5" coil. The solution to the voice coil and magnet gap design (or motor design as we call it today) was optimum only for a low impedance coil. The resistance of the '111LZ' coil was 2.8 ohms. The unit was supplied with an impedance matching transformer to get the impedance up to 15 ohms to match a tube amplifier. When the early transistor amplifiers were introduced the primary of the transformer was very bad news for the output stage as it presented a short circuit to any DC offset condition. It is interesting that with today's robust amplifier design the best thing would be to drive the voice coil directly and get a very good damping factor and apparent sensitivity.



THE MONITOR GOLD

In 1967 the 'REDS' were upgraded to 'GOLDS' with the arrival of the Monitor Gold series. Power handling was now 60 watts rms for the 15" Monitor Gold but with sensitivity levels dropped back to 92dB and, what is now considered the conventional impedance of 8 ohms. The sensitivity was reduced as the best compromise in bass extension and available amplifier power. Cone weights were increased to get a low free air resonance as the units were being used in cabinets of either vented or infinite baffle (acoustic suspension) design. The original compound and rear horn loaded designs such as the Autograph and Corner GRF were cumbersome for the increasingly sophisticated domestic market.

From 1947 to 1974 the front suspension design of the cone pistons in the Dual Concentrics had changed little. The relatively conventional looking corrugated paper surround at the circumference of the cone was a very sophisticated device. The importance in providing an excellent and well damped cone termination was understood even in the sixties by the Chief Design Engineer, Ronnie Rackham. His surround design was at the forefront of cone manufacturing technology in that the surround edge was significantly thinner and more flexible than the cone body.

This was achieved by screening the pulp mesh within the cone forming process so that less fibres were deposited in the crucial surround area. When the cones arrived at Tannoy a lengthy process involving glycerine and polyisobutylene with an acrylic barrier was devised in creating the correct cone termination properties with a high strength and compliance factor. In addition, an acoustic barrier was provided by a 'rug wool' strip mounted at the extreme perimeter of the surround.

During the change from Monitor Red to Monitor Gold the high frequency diaphragm rear throat cavity was changed from an aluminium pressing to a glass filled thermoset compression moulding. This is one of the many design change clues that can date an old Tannoy Dual Concentric very accurately. Although the chassis colour generally followed the model changes through the years, export countries often had different combinations of design status and finishing colour. Monitor Red units had a grey chassis and a red/pink rear magnet cover.

Monitor Gold units were grey chassis with gold covers.

These units were designated:

LSU/HF/15G

LSU/HF/12G & LSU/HF/12G/RS (rubber surround)

LSU/HF/III LZG (LSU/HF/III LZ2GU & GH)



In 1974 a radical approach to surround design was taken and the cone structures of the 15" and 12" completely redesigned for the HPD Series.

'Tannoplas' surrounds were fitted to 'Girdacoustic' reinforced cone structures in a wildly enthusiastic attempt to market the mystery of loudspeaker design to a world that was fairly ignorant of the Dual Concentric principle.

What the world did not grasp was that most recorded music available was being produced on the Tannoy Dual Concentric using either Monitor Reds or Monitor Golds. All the music at EMI including Abbey Road and most of the Decca Classical output was produced using Tannoys.

THE HPD

A major redesign of the Monitor Gold led to the 'Monitor High Performance Dual' HPD Series. Power handling was improved considerably by using high temperature adhesives in specially set up Tannoy coil winding and heat treatment sections. Sensitivity was maintained at 92dB for 1 watt at 1 metre while moving cone masses increased to give the correct 'Q' values for a range of 5 cabinet models.

Three different drive units were designed and manufactured for 5 different cabinet models:

15" Monitor Dual Concentric HPD385

12" Monitor Dual Concentric HPD315

10" Monitor Dual Concentric HPD295

The numbers after HPD refer to the nominal diameter of the unit in millimetres.

All units were 8 ohms and also supplied with cross-over and terminal panel as kits for the professional market or home constructor. The cross-over network is worthy of mention as there were some sophisticated circuits used for controlling both the level of energy from the HF unit and the degree of roll-off above 5kHz. An auto-transformer was used to match the relatively high impedance of the HF voice coil (10 ohms resistive, approximately 18 ohms above 1kHz).

Many HPD's were built into large cabinets for studio monitoring by a UK company called Lockwood. Such models as the Lockwood Major, Lockwood Universal played a very significant part in the development of the world's recorded music as these were bought almost entirely by the professional studios. For example, most of the successful records made by

Mickey Most at RAK Records were produced on Lockwood Monitors with Tannoy Dual Concentrics.



Trying to increase sales, especially to export countries, Tannoy produced a range of 5 cabinets using the HPD unit designated the 'A' variation. These were:

ARDEN	using	HPD385A 15" Dual Concentric
BERKELEY	using	HPD385A 15" Dual Concentric
CHEVIOT	using	HPD315A 12" Dual Concentric
DEVON	using	HPD315A 12" Dual Concentric
EATON	using	HPD295A 10" Dual Concentric

As well as being universally accepted around the world this range was exceptionally successful in Japan between 1975 and 1980 helping to establish Tannoy in the Far East as a manufacturer of very high quality loudspeakers.

ANISOTROPIC BARIUM FERRITE

From 1947 to 1978 Tannoy Dual Concentrics used a metal magnet made from an alloy of nickel, aluminium, cobalt and iron. Although of great strength this magnet material was not very efficient in power to weight ratio, and difficulty in the world supply of cobalt was generating a problem in maintaining smooth production at the Tannoy factories in West Norwood, London and Coatbridge in Scotland.

During the latter part of 1977 the decision was taken by Tannoy to design a new series of Dual Concentrics using Anisotropic Barium Ferrite magnets. This material is more efficient in power to weight ratio and had a much higher coercive force leading to fewer problems in demagnetisation under high power or low storage temperatures.

New magnet charging equipment was purchased to supply the much higher magnetising force needed by the new material. Magnets are supplied unmagnetised to Tannoy so that the magnet can be magnetised with all its metal pole pieces in place for higher gap field strength. The process of magnetisation is called 'charging' the magnet and takes place inside a heavy coil that generates an exceptionally strong magnetic field for a fraction of a second to align the magnetic domains within the material.



The first unit to emerge with the Anisotropic Barium Ferrite magnet system was a very high power, high sensitivity midrange unit used in the Buckingham and Windsor cabinet models. This unit subsequently went on to be used in the Buckingham Monitor and, with further modifications in high power music concert rigs throughout Europe.

From 1978 the pace of research and development at Tannoy increased many times over. A strong engineering team was assembled at the Scottish factory that was by 1980 the central focus of the company. A long term plan was developed that sought to improve every specification of the famous Dual Concentric units while developing specialist units for varying applications. This was to remove the inevitable compromise of using only 3 different units in a variety of applications.

The cornerstone of the hi-fi Dual Concentrics was the 10" unit with a revolutionary Polyolefin vacuum formed cone piston. Domestic hi-fi required smaller cabinets in the eighties and so a smaller unit was developed with very low colouration, high compliance and power handling and wide dispersion.

Together with an Auxilliary Bass Radiator design (ABR) a range of hi-fi Dual Concentric cabinets appeared:

T225 Mayfair using 2528 Dual Concentric with 2500 ABR

T185 Dorset using 2528 Dual Concentric with 2500 ABR

T165 Chester using 2528 Dual Concentric

T145 Ascot using 2528 Dual Concentric

This range was launched in 1978 as a replacement to the Arden - Eaton range and proved successful in increasing export penetration. However it was too much to ask of a 10" Dual Concentric even augmented by a 10" ABR to compete with the sheer sound reproduction capability of a 15" Dual Concentric in a big cabinet (the Arden or Berkeley). Those markets that had a particular affinity for the 15" Dual Concentric and its fine ancestry demanded its continuation.

The 2528 Dual was designed using an ABF magnet and a shorter wider dispersion HF horn system. It was the cornerstone of the Dual Concentric hi-fi range up to 1984 when the 2008S and 2008C were introduced. With variations of cone piston design depending on application the original 2528 Dual Concentric was used in the Stirling, and, the SGM10B monitor.



STUDIO MONITORS

In parallel with the hi-fi developments during the 1977 - 1979 period a separate team were working on Dual Concentrics for the Professional Studio Monitoring market. Although a survey at the time showed Tannoy to have the largest share by far of the studio market it had never advertised its Duals for this purpose. The Duals had been fitted to Lockwood cabinets or fitted into similar cabinets by end users.

The engineering team were confident that standards could be improved yet further using the Dual Concentric in a purpose designed and matched cabinet, and in 1979 at the AES Convention in Brussels, 3 models were unveiled specifically for the high power studio monitoring applications for which Tannoy had been famous. The famous Tannoy advertisement stated: "After 53 years of Research and Development, Tannoy is proud to present its Studio Monitor range."

Two new 15" Dual Concentrics were available. One was the 3838, a high compliance, lower free air resonance Dual for the TV and Broadcast marketplace where bass performance is crucial but ultimate levels of sensitivity are not required; and the other, the 3808, was a low cone piston mass, high sensitivity version for high sound pressure level monitoring and track laying.

A third system was also launched using the 2548 high power midrange Dual coupled with two 12" bass drivers (type 3126) in a 300 litre cabinet. To control HF dispersion the extra degree of freedom in having a midrange Dual Concentric in the Buckingham Monitor allowed a sophisticated wavefront shaping waveguide to be fitted - the first ever acoustic lens system fitted to a Dual Concentric.

In 1980 following hot on the heels of the 3 Professional Dual Concentrics were 2 smaller Professional versions for nearfield monitoring, the 3149 used in the SRM12X and Little Red Monitor, and, the 2558 used in the SRM10B. These additions completed a line of 6 Studio Monitors that cemented Tannoy Dual Concentric units onto the world map in their own right. Recorded music had been using the Tannoy Dual Concentric principle for years but had not realised it. With purpose designed cabinets and high power cross-over systems the full potential of the Dual Concentric could be realised.



The 1979/1980 Studio Monitor Range:

Buckingham Monitor	using	2548 Dual Concentric with 2 x 3126 Bass.
Classic Monitor	using	3828 Dual Concentric.
Super Red Monitor	using	3808 Dual Concentric.
SRM15X	using	3808 Dual Concentric.
SRM12X	using	3149 Dual Concentric.
Little Red Monitor	using	3149 Dual Concentric.
SRM10B	using	2558 Dual Concentric.

Following the success of the big Duals in the domestic markets in the Far East during the 1975 to 1980 period, Tannoy decided to maintain a high profile by developing loudspeaker systems with cabinets large enough to make full use of the Dual's capabilities, whilst being aware of the domestic space available for large speaker systems.

Between 1980 and 1982 3 smaller footprint domestic models were introduced using the same research and development pioneered for the professional line but with slightly less demanding power handling specifications. Three more very radical domestic systems were also developed as a trial in the marketplace for something very special in appearance and performance.

The small footprint range consisted of:

Arundel	using	3839	15" Dual Concentric
Balmoral	using	3128	12" Dual Concentric
Caernarvon	using	2558	10" Dual Concentric



THE WILDCATS

In 1984 the Research and Development team at Tannoy wanted to prove that the Dual was an excellent solution to very high quality live music performance venues. Clearly, with the sizes of magnet and levels of efficiency available it could not compete with the outdoor rock concert systems from Altec, Meyer and JBL but there was a niche in the cabaret and small club market where the sound quality needed to be considerably higher than that to which people were accustomed. Specially adapted Duals were designed that had more power handling and greater sensitivity than had ever been produced before by Tannoy. These were fitted to a range of very robustly made cabinets with reinforced handles and corners suitable for mobile cabaret or fixed contractor installation work. The line was christened the 'Wildcats' and was the start of a very successful venture into high quality voice and music raising for sophisticated venues such as clubs, theatres and churches.

The Dual Concentric is a unique speaker system ideally placed for communication and intelligibility in difficult acoustic surroundings. The dispersion character (directivity) is much more constant throughout the audio band than with most other systems. Therefore more direct sound reaches the listener than reflected sound and the intelligibility of the reproduced programme material is greatly enhanced. The directivity characteristic also prevents excitation of troublesome room resonances associated with the reverberation time of room acoustics.

Intelligibility and communication ability in halls and theatres is measured in 'Alcons' or 'percentage Alcons'. The measurement is a quantitative analysis of the hit rate of a listener in the hall interpreting different words that have similar vowel and consonant sounds.

A perfect acoustical environment would score 100%. The Dual Concentric system is notoriously good at providing the highest percentage alcon figures in any environment when compared to the competition.

The Tannoy Wildcat range consisted of the following speaker systems:

Lynx	using	3169G two 12" high sensitivity Dual Concentrics in a double cabinet.
Bobcat (B50)	using	3169R 12" high sensitivity Dual Concentric in a single small cabinet.
Puma (P100)	using	3809 15" high sensitivity, high power Dual Concentric.
Jaguar (J200)	using	3809 Puma driver in a larger cabinet for deeper bass
Panther (P200)	using	3859 15" Dual Concentric in a front sector horn cabinet.
Cougar	using	3859 15" Dual Concentric in a floor wedge monitor.



Lion (L300) using 15" bass unit in a coupled cavity bass bin.

Cheetah (C150) using 15" bass unit in a small coupled cavity bass bin.

Leopard (L200) using 15" bass unit in a direct radiating bass bin.

The original Wildcat series was split into two ranges in 1987 to create a dedicated road proof MI cabinet series and a specialist contractor's line for permanent installation. In 1985 Tannoy started test marketing the high-output Dual Concentrics of the Wildcats into the more domestic end of the market. The Impulse Series was created using similar Duals to the Wildcats in more acceptably finished cabinets for home use. The series was not considered a major success but out of the work in engineering, a new high power studio monitor was developed - the FSM.

The FSM was designed to sit at the top of the studio monitor line that was being improved and developed by Engineering for launch in Autumn 1985.

Many improvements had been worked on in the period from 1980 to 1985 and the time had come to incorporate all enhancements into the new range. The range change is signalled by the move from Super Red Monitor to Super Gold Monitor. Edge wound coils, higher power and thermal handling, improved levels of sound quality and a 'faster, tighter' sound quality contributed to the success of this line.

SIGNIFICANT IMPROVEMENTS

From 1985 Tannoy abandoned printed circuit boards and wafer switches in the cross-over designs. A significant amount of research had shown conclusively that the layout and mechanical design of a high power speaker cross-over was vital. Listening tests were carried out with great precision to isolate some of the aural effects encountered.

The Tannoy R&D department concluded that:

Printed Circuit Boards are detrimental to sound quality.

Star earthing is of paramount importance.

Components must be held down securely to prevent microphonics.

Wiping contacts and switches downgrade sound quality significantly.

Gold plating of electrical contacts is beneficial to sound quality.

Connecting cables can have audible effects.

TANNOY

In 1985 the introduction of the Super Gold Monitor series and a top end monitor called the FSM commenced, replacing the Super Red series. Simultaneously a gradual change over in other products to 'Hard Wiring', eliminating printed circuit mounted components and, 'High Current Switches' using gold plated screw terminals, for which many world-wide patents were granted, was undertaken.

SEPARATE MAGNETS

In 1986 a smaller model was slotted in at the lower end of the Prestige Range called the Greenwich using a newly developed 8" Dual Concentric, and a similar Dual Concentric drive unit used for the DTM-8 (8" Dual Concentric Desk Top Monitor).

The introduction of the new 8" Dual, designated 2008C for the cast chassis version and 2008S for the rigid steel version, was another milestone for Tannoy. The 2008 used a split magnet system - separate magnets for LF and Concentric HF portions of the driver.

This gave greater manufacturing versatility and commonality with other components making the 2008 more economical to manufacture. Previously all Tannoy Dual Concentrics used the single magnet philosophy pioneered by Ronnie Rackham in the late forties.

With the advent of very high precision, high pressure zinc die-casting processes during the eighties an extra degree of flexibility was beginning to appear; first in manufacture and then in design of the Tannoy Dual Concentric.

ALCOMAX 3

As explained earlier the large cast metal magnets were abandoned in 1978 in favour of Anisotropic Barium Ferrite. However there was a considerable lobby from traditionalists that the cast metal magnet Dual Concentrics had a certain sound quality that was impossible to reproduce in ANY other type of speaker design. A research project was initiated in 1988 to attempt to quantify this feedback. The result was a recognition that the cast metal magnets were acting as a shorted turn around the coil thereby minimising flux modulation. For the aficionados and traditionalists a version of the Dual Concentric was designed and engineered with a new Alcomax 3 metal magnet made from an alloy of cobalt, aluminium, selenium and ferrous iron. This unit was put into a very prestigious model of the Westminster, the Westminster Royal, and into a traditional period cabinet named the Canterbury. All the knowledge learned so far in the Tannoy Engineering department went into these models resulting in spectacular performance and acceptance into the market.



RHR LIMITED EDITION

Tannoy decided to honour its principal mentor and now retired Chief Engineer in 1986 by asking him to design a period cabinet with a traditional rear folded horn. This project was completed by Ronnie and launched as the RHR Limited Edition. Only 111 pairs were made and were actively sought around the world. In response to overwhelming demand a further small quantity were produced with subtle appearance design characteristics and named the RHR Special Limited Edition. They change hands now for a premium. Although Ronnie had passed retirement age he was keen to maintain a place in the Tannoy Design Team. He regarded it as a special honour to be able to play a leading role in the cabinet design of the Canterbury 15 and Canterbury 12.

Ronnie passed away peacefully in December 1990 after an illness in which he showed the same practical fortitude and great strength of character that he had brought to the whole Tannoy team over more than 40 years service with the Company.

In 1989 the pace of Dual Concentric innovation increased considerably. The two magnet system approach pioneered in the 2008 was carried a stage further with the introduction of waveguide principles.

SERIES 90

A new 8" Dual Concentric was conceived, the 2025, used in 3 domestic hi-fi cabinets:

DC1000	using	2025 Dual Concentric in 25 litre cabinet.
DC2000	using	2025 Dual Concentric with 2026 bass in 35 litre cabinet.
DC3000	using	2025 Dual Concentric with 2026 bass in 50 litre cabinet.

DIFFERENTIAL MATERIAL TECHNOLOGY

A separate research project had showed amazing results in Differential Material Technology, the science of combining different materials to achieve the required acoustic properties at strategic places in a speaker design.

DMT coupled with the new 2025 design put Tannoy firmly on the world-wide map for the Dual Concentric system performing in small footprint domestic cabinet systems. At last the population could listen to recorded material and be assured that they would hear everything that the artist intended.



WAVEGUIDE THEORY

The waveguide theory and research started in 1989 for the 2025 was developed in an increasingly sophisticated way using Computer Aided Design and draughting techniques coupled with mathematical modelling of waveguide principles. Much progress was made during 1989 and 1990 resulting in a very special and totally different approach to the HF section of the Dual Concentric.

The 2025 Dual Concentric provided the clues to Tannoy's direction but when the new 12" and 15" Dual Concentrics appeared in the Monitor Series System 12 and System 15, people realised that Dual Concentric design would never be a traditional approach again.

A new range of professional monitoring systems was introduced in 1990 based on waveguide principles;

System 215	using	3833GG 15" waveguide Dual Concentric with separate 3834 15" bass (Soffit mount monitor).
System 15	using	3833GG 15" waveguide Dual Concentric (mid field monitor).
System 12	using	3133GG 12" waveguide Dual Concentric (mid field monitor).
System 10	using	2525GGG 10" waveguide Dual Concentric (near field monitor).
System 8	using	2025GGG 8" waveguide Dual Concentric (desktop near field monitor).
System 2	using	0259G tweeter and 1668GG bass/mid 2 way discrete system (desktop near field monitor).

All the System series cabinets had a revolutionary design appearance and had all the latest thinking in DMT cabinet design.

CONTRACTOR SERIES

Also in 1990 a new range of Wildcat replacements were introduced using more robust versions of the Duals developed for the System series. These cabinets were designed specifically for the sound and video contracting market providing very high sound quality with unequalled robustness.

TANNOY

An innovative cabinet was designed with a trapezoidal shape incorporating an aluminium extrusion housing integral flying points to suspend the cabinets safely above an audience. The whole suspension system was rigorously safety tested and has a national certification of safety. The Contractor Series was given the code system in engineering of CPA and this has stuck with the development right out into the marketplace.

The range consists of:

- | | | |
|----------|-------|---|
| CPA 15 | using | 3836 15" high output waveguide Dual Concentric in a trapezoidal cabinet. |
| CPA 15FM | using | 3860 15" high output Waveguide Dual Concentric in a compact cabinet. |
| CPA 15.2 | using | 3861 two very high power 15" bass units in a rectangular bass bin. |
| CPA 12 | using | 3134 12" high output waveguide Dual Concentric in a very compact trapezoidal cabinet. |
| CPA 5 | using | 1501 5" ICT Point source drive unit in an exceptionally compact easily mounted moulded cabinet. |

Of the range the CPA 5, the last one to be introduced in May 1991 at the NSCA Show is worth further investigation.

The HF unit of this tiny driver operates on entirely different principles to all the other Tannoy drive units. The HF driving diaphragm has no coil, but a 'skirt' projects from the bottom of the diaphragm. The skirt is immersed in the same magnetic field as the LF unit coil and energy is induced into it from the LF coil. The cross-over point can be set by the LF coil parameters and the diaphragm diameter. The HF diaphragm is effectively driven by eddy currents in the skirt which acts as a shorted turn similar to transformer theory. The unit is therefore exceptionally robust with no possibility of HF burnout, a common problem with systems of this size and use.

WESTMINSTER ROYAL

The potential in the design of the Westminster Royal for a superb performance loudspeaker was well demonstrated with the incorporation of the Alcomax 3 cast alloy magnet system. The longer HF horn resulting from the increased magnetic length of the magnet gave an even better match to the acoustical front loading of this very complex and special cabinet.

To take full advantage of the Dual Concentric drive unit the cabinet was specified as birch plywood throughout and to compensate for thicker internal partitions the whole cabinet and low frequency horn mouth area was increased accordingly.



In addition to the increased height of the cabinet distinguishing the Westminster Royal from the Westminster HW the solid walnut top and bottom mouldings were sharpened in profile and subtle inlays of burr walnut were added to the front baffle.

Increasing awareness of the effects of the purity of the copper interconnecting wires during associated research projects pointed the way for all the internal wiring in the Westminster Royal to be specified as Van Den Hul cable. Careful listening tests determined the gauges of cable in various areas, even the connecting wire integral with the drive unit HF section was re-specified.

The result was another landmark in loudspeaker design and performance and is recognised throughout the world as one of the finest loudspeaker systems ever to have been produced.

THE SIXES

The SIXES were introduced at the Consumer Electronics Show in Chicago in June 1991. This range of 7 models comprised 3 discrete 2 way speakers and 4 Dual Concentric models. Of particular note was the introduction of a 6.5" Dual, the smallest that Tannoy had ever designed.

The range was to replace Series 90, but with the incredible pace of development on Dual Concentrics most of the range used either the 8" or the 6.5" Duals, the two top models having both driven bass units and Mass Tuned Passive Cones to produce very low frequencies. Much research had gone into this method of getting a much lower fundamental tuning of the cabinet and new techniques and materials were becoming available.

Of particular note in the Sixes Dual Concentrics was the use of injection moulded cones. Most manufacturers were content with vacuum forming cones because of the economy of the tooling. Tannoy realised that the optimum profiles required to make the next quantum leap for the Dual could not be obtained by the vacuum forming process. Very expensive injection moulding tooling was developed and both the 8" and 6.5" cones used this new technique.

Yet another first for Tannoy was seen in the surrounds of the SIXES bass units and Duals. A very special and secret technique for making the roll surround an integral part of the cone profile resulted in both excellent acoustic matching of energy in the cone and surround and gave a much smoother transition for the HF wavefront as it propagated down the profile.

The HF unit at the heart of the Dual Concentric drive unit is broadly similar in diaphragm and coil design to a direct radiating unit. However the energy from the diaphragm is matched to the air load by creating a spherically expanding wavefront. This ensures that the directivity is even more constant and symmetrical and the whole system produces an incredible stereo image.



The perfectly spherical wavefront is generated by the waveguide at the throat of the LF unit so that the energy then propagates down the carefully arranged flare of the injection moulded LF cone, which itself is optimised to ensure a smooth and extended response well integrated with the bass/midrange energy from the LF unit.

The SIXES Dual Concentrics consist of:

609 using 2033 8" Dual Concentric

611 using 2033 8" Dual Concentric, 2035 8" bass

613 using 1662 6.5" Dual Concentric, 1663 6.5" bass, 1664 6.5" MTPC

615 using 2033 8" Dual Concentric, 2034 8" bass, 2037 8" MTPC