

# Wilson benesch

Wilson Benesch loudspeakers have always been distinctively different. Unique in every detail each design is visually stunning. Incorporating the most advanced materials known to man.

They reject convention and through innovation define the future.

The Wilson Benesch sound has captured the imagination of music connoisseurs throughout the world.

## trinity



The Future is Carbon

This landmark design sets the agenda in the pursuit of high definition, wide bandwidth sound reproduction. Trinity can be used on its own, or in combination with the Torus system, to achieve the ultimate in terms of high quality, wide bandwidth, high definition sound. It pays homage to the capability of Vinyl source material, as well as the greater bandwidth capability of SACD and DVD Audio formats.

### History Behind The Design.

The greatest emphasis has always been placed upon the need for integration of dynamics within the transducers used in Wilson Benesch loudspeakers. To overlook this most critical concern, is to ignore the incredible capabilities of the human ear. Without integration, there is no illusion of one system, and the magic of recreating the event is lost before the stylus touches the vinyl. Only by convincing the ear that everything is in harmony, can a successful attempt at recreating the original be made.

After the completion of the Tactic and Isobaric Tactic designs, Wilson Benesch committed to a long term development project, to create new solutions for high quality sound generation, in to ultra and infra sonic sound. The work was inspired in part by analogue playback systems, that had always been capable of delivering broadband sound, into infrasonic and ultrasonic regions. (see audio fidelity statement on 50 year old vinyl pressing of Louis Armstrong's Jelly Roll.)

In 2003 work began on the first element, the patent applied for Torus system. Three years later the remarkable success of the Torus endorsed the importance of this work. Four years later, we are delighted to announce the realisation of a completely new generation of loudspeaker design.



#### TECHNICAL DATA (RIAA)

##### Total Frequency Range Stereophonic Recording

This High Fidelity Stereophonic Recording was produced featuring the Frey Stereophonic Curtain of Sound\* technique.

When heard on a balanced playback system, the elements or musicians on the recording will be reproduced in the exact locations, directionally, as at the original performance. This original, positive technique to produce a pure, true stereophonic effect so that the instruments or elements of the recording are perfectly relocated as to direction of sound is an Audio Fidelity development and is true stereophonic reproduction.

This recording was made on an Ampex 350 with special electronic circuitry, using Telefunken MS 2, and M 251 microphones. The masters were cut with an automatic Scully Record Lathe mounting a Westrex 45-45 cutter with special feedback electronic circuitry driven by custom 200 watt amplifiers.

Precision mastering was done so as to achieve maximum stylus velocity consistent with minimum distortion, resulting in the ultimate in channel separation and realizing the greatest possible signal-to-noise ratio.

While the total frequency range of 16 cps to 25,000 cps on this record may not be within the range of ordinary human hearing, nevertheless inspection of the grooves with a microscope will show the etchings of the upper dynamic frequencies. It is the opinion of the manufacturer that if these frequencies were omitted from this record a certain warmth of tone that is felt and sensed rather than heard would be lost. For this reason and to achieve the ultimate in our "Studies in HIGH FIDELITY STEREOGRAPHIC sound" we have gone to these extreme electronic lengths.

Although any 33 1/3 RPM stereophonic record playback equipment may be used in playing this recording, it is recommended that playback equipment of extreme wide range and fidelity be used so that the recording may be enjoyed to its utmost.

Low Frequency Limit .....	16 CPS
High Frequency Limit .....	25,000 CPS
Crossover .....	500 CPS
Rolloff .....	13.75 DB at 10 KC

### Trinity.

The latest loudspeaker to come from Wilson Benesch, provides another glimpse of the future for loudspeaker design, that is in advance of all of its contemporaries. The key objectives were to achieve the most natural sound with the lowest possible noise floor. Close attention has been paid to phase and uncontrolled resonance and bandwidth, with point source characteristics being the guiding principle. The comprehensive list of new technologies that can be found in Trinity are touched on below.

1. Cabinet. P.A.C.T. (Poly Alloy Carbon Technology) cabinet architecture.
2. The Trinity of Drivers. (The first, second and third element.)
3. Crossover
4. Primary Baffle
5. Sub Baffle
6. Bracing
7. Port Arrangement
8. Stand
9. Terminals
10. Spikes
11. Grill
12. Internal wire

## **1. Cabinet**

If a loudspeaker resonates it is no longer a transducer but an uninvited musical instrument. A key objective of all High definition loudspeaker designs, must be to engineer out any potential uninvited musicians. In pursuit of this goal, Wilson Benesch has drawn upon the most advanced materials technology available, in order to take full advantage of the performance envelope of the advanced drive units deployed in the design.

### **P.A.C.T. (Poly Alloy Carbon Technology) cabinet architecture.**

A wide variety of alloys have been selected to perform specific engineering tasks within the Trinity architecture. Combined with A.C.T. technology, the result is the most advanced structure ever seen in a loudspeaker.

The carbon fibre used in Trinity is woven exclusively for Wilson Benesch. Its design is based upon a 12 K High Modulus multi axial woven Carbon fibre fabric. One layer alone, deployed in the Torus cone eloquently demonstrates the awesome properties of this material. It copes with mass loads in excess of 100,000 its own mass. Of course in the loudspeaker monocoque it is just one part of the Advanced composite structure. This structure provides massive improvements over any simple carbon layer, by taking advantage of the well known I beam properties of structural design. The resulting 18 mm thick A.C.T. structure, is a formidable barrier to resonant energy: think of Formula One cars colliding with concrete walls. In terms of stiffness, damping, low mass and therefore fitness for purpose, this advanced material, is one part of the new structure that replaces the industry standard set by the previous Wilson Benesch designs. According to all physical criteria required of loudspeaker cabinets, it can be stated with some confidence, that without exception no other material can match the physical properties of A.C.T. technology.

## **2. The Trinity of Drive units. First element. The W.B.One Drive Unit.**

History behind the design.

A solid principle at the core of all Wilson Benesch design, has been the fundamental respect for the need for integration between drive units. In pursuit of this design objective, the Tactic multi role dynamic drive unit was created, with the aid of over £120,000 of matched funding from government. The outcome provided a unique conceptual approach, that has stood the test of time, and now sets Wilson Benesch apart from every loudspeaker design in the world.

The timbral match and dynamic similarity between all Wilson Benesch products is unmatched. The ability to generate low frequency sound that is matched dynamically with the mid range drive unit, is quite impossible with conventional technology. The clamshell Tactic Isobaric solution overcomes all the principle flaws of the large diaphragm design, commonly accepted by other designs. The rejection of large diaphragm drive unit, is a unique development path that sets

Wilson Benesch apart from its contemporaries. Some of the principle flaws of the large woofer would include: the fact that they cannot integrate, they are incapable of matching the mid range unit dynamically, they provide a massive window for resonant energy to escape and of course the sound emanating from the different cone material is quite different to the mid range driver. It was this philosophical departure from convention and rejection of the norm that led to the patent applied for, highly innovative Torus design. Wilson Benesch has never and will never make a loudspeaker with drive units greater in size than the Tactic.

### **The W.B. One.**

The latest drive unit the “W.B. One” incorporates a number of small but very important details that have been painstakingly researched and developed within the companies C.N.C. manufacturing cell, which is equipped with full three dimensional modelling.

The W.B. One drive unit takes advantage of the latest Nd.Fe.B magnetic material that delivers more magnetic flux, providing for a more powerful motor system but significantly one that does not obstruct the anti-phase energy projected from the back of the cone.

To exploit the increase in flux, modifications to the adjacent conducting metalwork has been required. The new motor assembly was modified to handle the increase in flux without any major increase in size. All the profiles retain the same curved forms so as to cause the least turbulence in air moving behind the diaphragm. The front and back plates have been modified, to enhance air venting, providing for more effective cooling and venting of air from the rear of the dust cap.

The length of the magnetic aperture has also been increased in order to increase the length of coil submerged in flux. This increase enables greater control and a more responsive reaction to the all important transient.

The net result sees a 3dB improvement in sound pressure levels and significant improvements in signal to noise ratios. Dynamics are almost electrostatic in character, but with real slam that is only possible with the most dynamic compression and rarification of air. The most obvious characteristic is the noticeable freedom of delivery, that isolates and defines the instruments, in a sound field that extends well beyond the confines of the enclosure. This characteristic can be found in other drive units, however, the materials used in the cone also create resonant characteristics that are uncontrolled. It is argued that the resonances are beyond measurement or perception. Whilst we would agree that the auditory mechanism is incapable of perceiving sound above 20 Khz, we would disagree that this is beyond human perception. The “Sphere” proves that this is the case.

(Note on the material used in Wilson Benesch drive units:~

Like the Tactic, the W.B. One exploits Isotactic polypropylene developed by Wilson Benesch during the Bishop project, in conjunction with Professor Ian Ward, one of the world’s leading chemists. This remarkable material sets the standard, in terms of the ideal balance required in cone structures that of stiffness, mass, self damping and speed of sound transmission.)

### **The Second Element. The Wilson Benesch Tweeter.**

To its credit Wilson Benesch has remained with what is fundamentally the same tweeter for over a decade. Whilst our contemporaries have promoted new designs with “superior performance”, in our assessment these designs have all paid a high price to achieve the extra bandwidth that has been sought after. This price comes as uncontrolled resonant energy that is ultrasonic. Where we differ is that we would argue that this energy is perceptible, and that the hard and fatiguing character of sound that comes with these technologies is not acceptable, and in our view quite

un-natural. The Sphere fully endorses this view, and can be seen to provide the ideal solution of a tweeter that takes over when the Wilson Benesch tweeter reaches its limits at approximately 20,000 Hertz, notably well within its limits. Within these limits, sound is produced that is controlled and without off the scale resonances that are ultrasonic. In sharp contrast to hard dome solutions, the Wilson Benesch soft dome is highly controlled, well damped and free of uncontrolled structural resonances. It is common knowledge that all materials possess a resonant signature. Woven, relatively soft multi material structures exhibit several orders of magnitude less violent resonant signatures than hard single material designs. These Single material structures be they made from carbon, beryllium or whatever metal all resonate in a very uncontrolled way. The argument that this resonance is above 20,000 Hertz beyond the threshold of hearing and so unimportant is completely erroneous. The Sphere lucidly demonstrates that this energy is perceptible and does have a significant effect when produced accurately. When ignored and uncontrolled the resulting sound is typical of so many designs of today often fatiguing and typically characterised by sounding hard and synthetic.

In contrast the Wilson Benesch tweeter works exceedingly well within its limitations from 5,000 to 20,000 hertz. In contrast to hard domes the signature is often characterised as being sweet, natural or accurate. So although today there might be many devices that provide a few thousand hertz extension beyond the Wilson Benesch tweeter we would argue that the price of securing this result is too high. The distortions and loss of damping are simply unacceptable.

### **The Third element. - The Sphere.**

In collaboration with Murata of Japan Wilson Benesch is proud to announce the realisation of The Sphere, This Ultrasonic Generator.

is the third element in the journey towards high definition sound reproduction. It provides the consumer with a real alternative to the one tweeter does all approach. As with the Sub woofer, Wilson Benesch chose the alternative path. It takes longer but the result can be justifiably described as innovative and effective in pursuit of its goals.

The Sphere has been designed to function with the greatest accuracy. It only begins to function at the point where many would claim that humans cannot perceive sound any longer, at 20,000 Hertz. It continues in a controlled way up to 100,000 hertz well beyond that of all other tweeters. This band of sound is clearly perceptible. Like the Torus, it integrates perfectly with the Tactic drive unit. Like the Torus it opens up a new dimension in sound reproduction.

A White paper on this important development is attached to this paper.

### **3. Crossover**

The best crossover, is no crossover. With no crossover you have no phase anomalies between voltage and current that are frequency dependent. Every crossover component acts like a spring between the amplifier and the drive unit, reducing its damping factor and so control dramatically. Simplicity is the goal as always. Within the stand of Trinity is a hand built crossover that is completely removed from the cabinet.

### **4. Primary Baffle**

The Baffle is the structural foundation for all the energy from the drive units. Wilson Benesch introduced the Alloy baffle in the A.C.T. One, over a decade ago. This high quality solution enables a rigid structure to be created that places the drive units as close as possible to one another. The "Point Source" is the ideal and to approach this solution, the drive units must be assembled as close to one another as possible. High tensile bolts, clamp this sub system to the steel "Sub Baffle". The baffle has become a sub system in itself. It provides a mounting structure

for all three drivers that affords massive, highly damped, compressive clamping forces to reduce as much as possible spurious uncontrolled resonant artefacts in the drive units themselves. It's a little bit like clamping them in a vice. This method of retaining the drive units affords other benefits one of which is to remove clutter from the outer face of the baffle leaving a smooth high precision machined surface.

### **5. Sub Baffle**

Displaced behind the Primary baffle and locked into the profile of the aluminium alloy side extrusions is the steel "Sub Baffle." In itself this engineering solution exhibits a resonant frequency that is well above 7,000 hertz, so well outside the ears most sensitive sound band. However when married to adjacent dissimilar materials via lossy adhesives this energy is instantaneously converted to heat rather than sound. Simple, but extremely effective.

### **6. Bracing**

Bracing is the internal architecture of the loudspeaker. The quality of bracing is not simply a function of numbers however. The material chosen to provide the bracing is extremely important. This is why precision cut steel members are used in the Trinity. The braces act as a sound super conductor as well as a bracing structure. (Sound travels through steel at almost 15 times faster than through air at 5050 metres per second compared with 344 metres per second in air.) The objective of the brace is not simply to control resonance, it is also seen as an energy conductor, removing energy from the baffle and taking it away to lossy structures that convert this energy to heat.

The other important benefit of steel is that the structure can be far smaller in size and so consume far less precious air volume. The

Laser cut steel sub baffle and bracing is quite simply, the best solution available. The net result is a high precision super stiff structure that rapidly conducts resonant energy to the A.C.T. monocoque.

### **7. Port Arrangement.**

In order to provide the main driver with the highest air volume possible and avoid any internal obstructions to air movement, the port have been externalised with two alloy turned tube structures firing down towards the ground through the carefully cut stand design. This arrangement affords the cabinet all of its precious air volume, and directs bass energy from the ports down to the ground, producing the most accurate method of enhancing low frequency output from the driver.

### **8. Stand**

The stand is fabricated from precision ground steel alloys and extruded aluminium alloys. All the elements are bonded together and compressively clamped during fabrication. The net result is a low profile highly rigid design. This structure is then terminated into the multi alloy loudspeaker cabinet structure, with 8mm high tensile bolts via Stainless steel stands. The direct connection from the steel internal bracing elements to the stand itself, provides the best possible sink for resonant energy, enabling it to be conducted to ground with the minimum effect upon the perceived sound.

### **9. Terminals.**

The termination of electrical signals is always accomplished by secure bolt fasteners in any engineering application. For this simple reason Wilson Benesch manufactures its own copper alloy bolts before Rhodium plating them. A Wilson Benesch spanner provides the user with the confidence that once tightened, the seal will be air tight and totally reliable. Bananas can be used also.

## **10. Spikes.**

The termination point of any speaker is the spike. Wilson Benesch spikes are the most formidable. Each rear spike can be easily adjusted to provide a rake angle on the attitude of the speaker. The 14mm threads are quite considerable and pay homage to the task that they must perform.

## **11. Grill**

The acoustically transparent curved grill attaches to the baffle with the aid of magnetism. In environments where there is a risk of damage from the inquisitive the grill affords some protection without sacrificing any performance. It can be removed to completely reveal the beautiful machined alloy baffle beneath, which can be seen the cutting edge technologies of the drive units.

## **12 Internal Wire**

Wire technology has seen dramatic recognition over the last decade. The fundamentals remain the same however. Trinity takes advantage of the best materials available according to the task that it must achieve.