



See nothing, hear everything For decades, the pioneering innovations developed at Bowers & Wilkins Steyning Research Establishment have influenced the way speakers are designed and built all over the world. Technological advances that can be found everywhere sound quality matters, including top recording studios such as London's Abbey Road. For CI 800 Bowers & Wilkins introduces some remarkable technologies never seen before in in-wall and in-ceiling speakers. Providing pristine, audiophile sound, from speakers that disappear into your environment.

True sound Bowers & Wilkins is the name behind some of the world's most respected loudspeakers. These include the iconic Nautilus™, the reference 800 Series Diamond, and CT800, delivering the ultimate home theatre experience.



Interview Senior Development Engineer John Dibb discusses the challenges faced developing CI 800.

What challenges were presented incorporating technology from 800 Series Diamond into a custom installation range?

The main challenge stems from the need to fit systems into around 100mm (3.9in) depth walls and around 200mm (7.8in) in-ceiling cavities. Whilst high-frequency and midrange drive units do not present a depth problem, specialised shallow bass drivers are necessary for in-wall applications, and considerable development is needed to ensure that they match the performance of their deeper box-speaker counterparts.

It is also essential to supply a rear enclosure, fitted within the wall or ceiling, to define the working volume of the system. For the in-wall case, this has to have a relatively thin wall construction, in order not to eat up valuable cavity space, and a great deal of time has been spent optimising materials and internal bracing to get the stiffest possible structure.

The finish and dimensional accuracy needed on baffles used on in-wall/ceiling systems precludes the use of more traditional materials such as wood or MDF. It took some time to find the ideal material, one that would give us the precision, strength and acoustic properties required. Ultimately, the material which best suited our needs was a highly glass-filled thermoset resin.

What are the advantages of in-wall and in-ceiling design?

There are two real advantages in mounting a speaker flush with a wall or ceiling. Firstly, there are no discontinuities, such as the corners on conventional cabinets, so the diffraction effects caused by these edges are no longer present, and there is none of the typical back reflection from walls behind the speaker. Secondly, a speaker mounted on a large surface operates more efficiently in the low frequencies, giving a different characteristic to a box speaker in free air. This effect can be exploited in a correctly designed bass driver, to give greater headroom with lower distortion.

And how do you meet the challenge of any drawbacks?

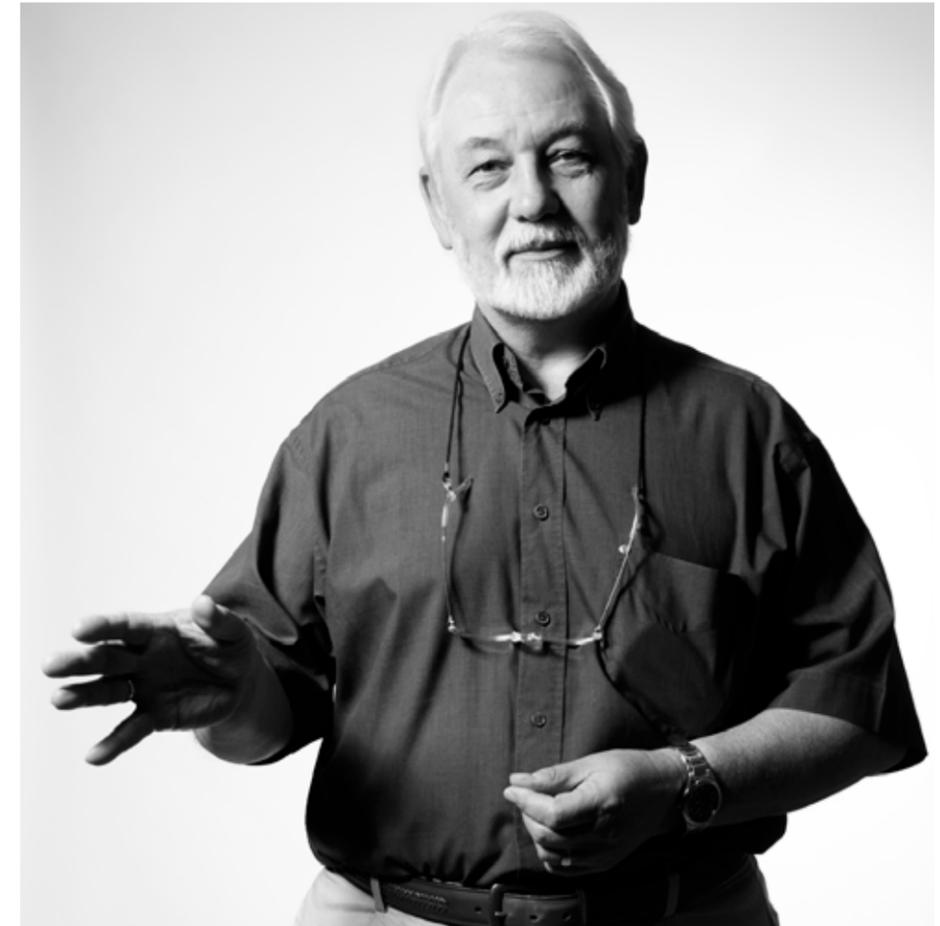
There are two drawbacks with in-wall systems. Firstly, the wall structure in which they will be used is uncertain. It might be masonry, which is excellent, or it might be a lightweight timber/plasterboard construction, which itself will vibrate to colour and distort the sound. To alleviate this problem, we try to reduce to a minimum any vibration reaching the wall, by isolating drivers from the baffle.

Secondly, there is a practical limit to the volume available in a rear enclosure, which can restrict the low frequency extension of the system. This we counter with specially developed back boxes.

The major disadvantage with ceiling placement, is that the listener is, more often than not, a long way off the axis. With free-standing and in-wall speakers, the position of listeners relative to the speaker is relatively well defined, typically varying only a few degrees off the forward axis. In stark contrast, someone listening to a ceiling speaker might typically be 60 degrees off axis, where the response of drivers is markedly altered. To counteract this our ceiling systems have the drivers recessed into the ceiling, angled at 30 – 45 degrees.

What different challenges do you face designing an in-ceiling as opposed to an in-wall loudspeaker?

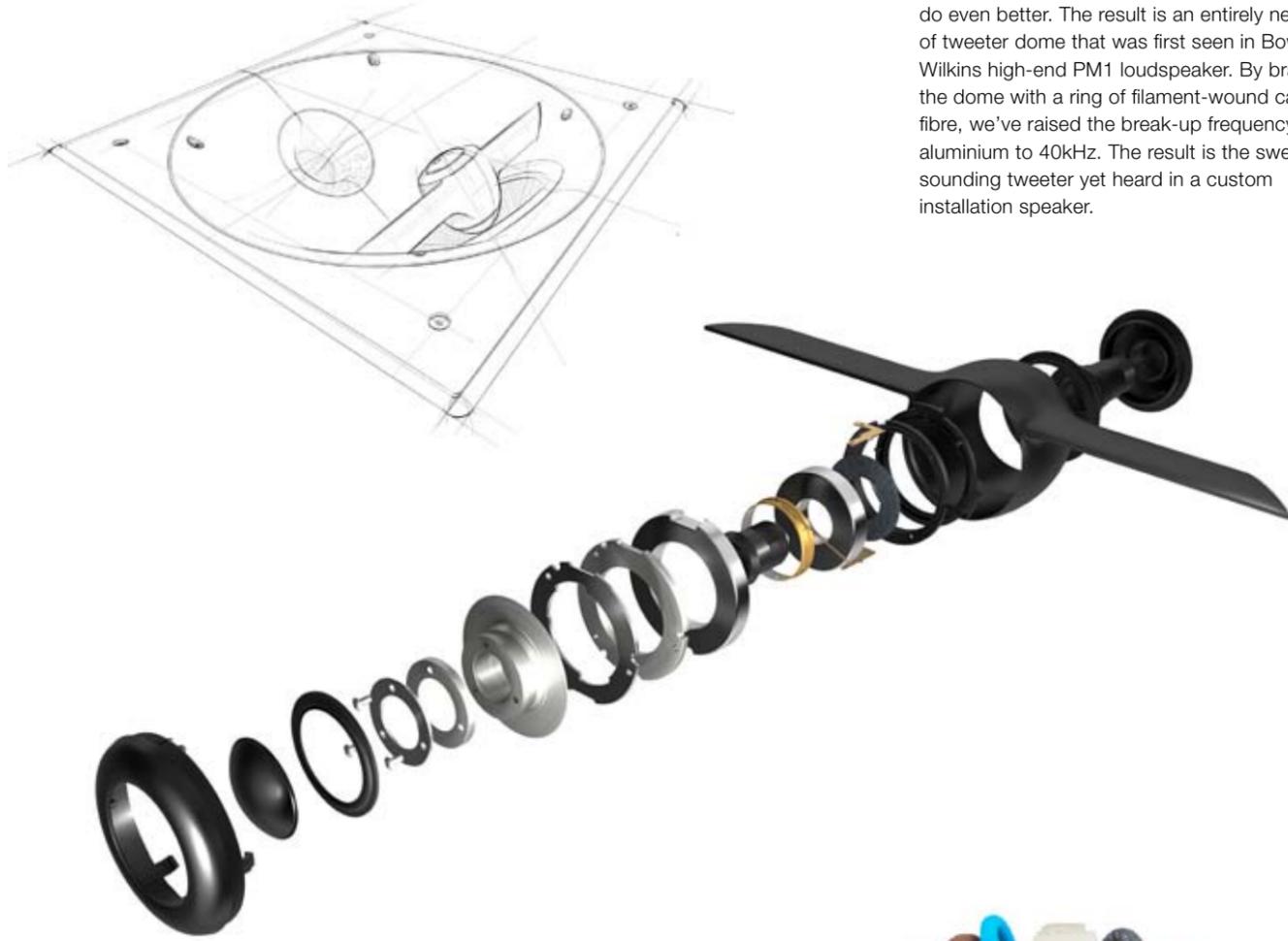
With CI you need to ensure that the dispersion of sound is as wide as possible, and experience has shown that a coaxial driver arrangement does this best. Previous systems have also used mechanical rotation of the high-frequency unit and variable driver equalisation to optimise responses at different angles. Any change in the position of a driver will, however, introduce small changes in performance, so for a purist design such as the CCM8.5, any variation in driver positions were ruled out. The drivers were optimised for wide and even dispersion, to give the minimum variation within a defined listening window. Some flexibility is available however, in that the entire baffle can be rotated with no effect on performance, allowing the centre of the window to be aimed at the listening position.



Dr John Dibb,
Senior Development Engineer
at Bowers & Wilkins.

Carbon Braced Tweeter

With a break-up frequency of 30kHz, our aluminium dome tweeters already push sound quality well above the upper limits of the audible range. But inspired by what we've learned about diamond, we wanted to see if we could do even better. The result is an entirely new type of tweeter dome that was first seen in Bowers & Wilkins high-end PM1 loudspeaker. By bracing the dome with a ring of filament-wound carbon fibre, we've raised the break-up frequency of aluminium to 40kHz. The result is the sweetest sounding tweeter yet heard in a custom installation speaker.



Clear midrange

CI 800's midrange drivers are made from Kevlar®, dyed blue rather than Bowers & Wilkins traditional yellow for a more discreet finish. Kevlar has long been the material of choice for Bowers & Wilkins midrange drive units, because of its unique break up properties. In CI 800 Kevlar benefits from the addition of Bowers & Wilkins FST™ drive unit design, and also the Anti-Resonance Plug from the high-end PM1 loudspeaker. The result is pristine midrange performance, with natural sound reproduction, just the way the artist intended you to hear it.



Crossover

A crossover's construction speaks volumes about the quality of a speaker. What to look for is simplicity. The rule is, the better the design of the drive units, the simpler the design of the crossover can afford to be. And the quality of the CI 800 drive units is such that we've been able to make the speaker's first-order crossover one of the simplest – and best – we've ever produced, using the same exceptional, hand-picked components found in the flagship 800 Series Diamond.



Better bass

Custom installation speakers offer both advantages and challenges for low frequency output. The nature of securing the baffle into what is often a rock-solid wall provides a stable platform for the drive units to operate. However, because the drive units have to fit into such a thin cavity, specially designed low-excursion drive units have to be designed.

CI 800's dedicated bass units use carbon-reinforced Rohacell® cones, as found on the 800 Series Diamond, while Bowers & Wilkins Flowport™ technology dramatically reduces unwanted 'chuffing' effects at the low end. The result is solid, powerful bass, no matter where you listen in the room.



Installation

One of the biggest challenges facing Bowers & Wilkins engineers in translating the high performance of the 800 Series Diamond to the CI 800 range was ensuring the in-wall back box performed as well as any of our traditional free-standing speaker cabinets. A great deal of time has been spent optimising materials to get the stiffest possible structure, and listening to the results. The back boxes are also fully Matrix™ braced, for extra rigidity and improved performance.

Installers have also been listened to, so the back boxes feature bi-wireable cables that are guided to the terminal panel through tubes. The back boxes also connect to the baffle electronically, with a multi-pin connector.



Braced for action

Matrix has long been a core Bowers & Wilkins technology. With CI 800 it has been utilised to add rigidity to custom installation products for the first time.



CI 800 Series speakers

CCM8.5

CCM8.5 is a two-way in-ceiling loudspeaker, which offers high-quality acoustics in an incredibly discreet package. It features a Carbon Braced Tweeter and a single 7inch bass/mid Kevlar driver, with anti-resonance plug. All the drive units are located in a continuously rotatable central baffle, which allows for the custom installation version of 'toeing in' the loudspeaker.

Description	2-way in ceiling loudspeaker
Drive Units	1x 25mm (1in) Aluminium Carbon Braced Tweeter with Nautilus Tube Aluminium Tweeter 'wing' allows time alignment 1x 180mm (7in) woven blue Kevlar cone bass/midrange driver with anti-resonance plug Continuously rotatable mini-baffle allows "toe-in" Flowport
Frequency range (-6dB)	35Hz - 40kHz
Power handling	120W
Sensitivity	88dB
Impedance	8Ω (minimum 3.3Ω)
Frame outer	351mm x 351mm (13.8in x 13.8in)
Cut-out	331mm x 331mm (13in x 13in)
Cut-out allowance	8mm (0.31in)
Protrusion	8mm (0.31in)
Back box	701mm x 343mm x 177mm (27.6in x 13.5in x 6.9in)



CWM8.5

CWM8.5 is a two-way, in-wall loudspeaker. It offers high-performance acoustics, from a relatively compact loudspeaker. It features a Carbon Braced Tweeter and a single 7inch bass/mid Kevlar driver, with anti-resonance plug. It also features a single Flowport for smooth bass performance.

Description	2-way in-wall loudspeaker
Drive Units	1x 25mm (1in) Aluminium Carbon Braced Tweeter with Nautilus Tube 1x 180mm (7in) woven blue Kevlar cone bass/midrange driver with anti-resonance plug Flowport
Frequency range (-6dB)	35Hz - 40kHz
Power handling	120W
Sensitivity	89dB
Impedance	8Ω (minimum 5Ω)
Frame outer	411mm x 247mm (16.2in x 9.72in)
Cut-out	395mm x 231mm (15.5in x 9.09in)
Cut-out allowance	8mm (0.31in)
Protrusion	8mm (0.31in)
Back box	1088mm x 350mm x 90mm (42.8in x 13.6in x 3.54in)



CWM8.3

CWM8.3 is a three-way, in-wall loudspeaker, conceived to offer the very best performance for a customer requiring great sound, without seeing the source. It features a Carbon Braced Tweeter, a 5in Kevlar FST drive unit and two 7in carbon fibre reinforced Rohacell low frequency drivers. The central baffle is rotatable, so CWM8.3 can be used in either vertical or horizontal alignment.

Description	3-way in-wall loudspeaker
Drive Units	1x 25mm (1in) Aluminium Carbon Braced Tweeter with Nautilus Tube 1x 130mm (5in) woven blue Kevlar cone FST midrange drive 2 x 180mm (7in) Carbon Fibre Rohacell Bass drivers Flowport
Frequency range (-6dB)	30Hz - 40kHz
Power handling	200W
Sensitivity	89dB
Impedance	8Ω (minimum 5Ω)
Frame outer	880mm x 254mm (34.6in x 10in)
Mini Baffle	240mm x 240mm (9.4in x 9.4in)
Cut-out	862mm x 236mm (34in x 9.3in)
Cut-out allowance	8mm (0.31in)
Protrusion	8mm (0.31in)
Back box	1660mm x 350mm x 90mm (65.4in x 13.7in x 3.5in)



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