



# GoldenEar ForceField 4

## SUBWOOFER

No, GoldenEar is not part of the James Bond franchise: it's a new company, but one that's been started by two very old—and very experienced!—hands in hi-fi... Sandy Gross (who co-founded both Polk Audio and Definitive Technology) and Don Givogue (a co-founder of Def Tech). As for why they named the company as they did, even a cursory glance at GoldenEar's website will reveal that the two aren't shy about blowing their own trumpets: *'We call our newest loudspeaker company GoldenEar Technology because, in our industry, a "golden ear" is someone who hears exceptionally well. Because we do, the industry and audiophile press have consistently praised us over the years for our "golden ears" and all the many loudspeaker accomplishments that our unique talents have helped us to achieve.'*

### THE EQUIPMENT

There are three subwoofers in GoldenEar's range, and all are very small. There's the

small ForceField 4 reviewed here, the even-smaller ForceField 3 and the ForceField 5, which is the most recently-released (and largest) of the three models. As you can see, the ForceField 4 is most unusually shaped, being thinner at the top than it is at the bottom. All three models are similarly shaped, and it's reported that this shape was created to satisfy designer Don Givogue's desire that a subwoofer should have non-parallel sides, which he says *'helps minimize standing waves and distortion.'* The non-parallel sides notwithstanding, the top and bottom surfaces of the ForceField 4 are still parallel, as are its front and rear surfaces.

At the front of the ForceField 4 is a bass driver that GoldenEar says was custom-designed specifically for it and rates with a diameter of 254mm. My tape measure told me that this was the overall diameter of the driver, including the chassis. The actual cone itself which, according to GoldenEar, is made from *'computer-optimised, ultra-stiff, fibre'* is

only 165mm in diameter. It's coupled to the chassis via a very, very large foam roll suspension (around 35mm across). This combination of cone and surround puts the Thiele/Small diameter at 205mm, which in turn puts Sd of the cone at 110cm<sup>2</sup>.

The driver is connected to a Class-D amplifier that GoldenEar rates with an output of 1,200 watts. Reportedly designed in-house at GoldenEar, the amplifier circuitry includes digital signal processing ICs to optimise the frequency response of the subwoofer, as well as protection circuitry to prevent you from accidentally overdriving the cone.

Look underneath the ForceField 4 and you'll discover a highly unusually-shaped passive radiator—a shape that GoldenEar says is *'quadratic'* but I think is actually an irregular octagon (two of the opposite sides are equal in length and are longer than the other six sides). Givogue says he selected this shape to allow the passive radiator *'to use the maximum surface area on the bottom of the*

cabinet' and that the use of a passive radiator was to 'avoid noisy ports.' You can see from the photograph accompanying this review that the passive radiator certainly occupies almost all the surface area available at the bottom of the ForceField 4. I must admit, however, to being confused about Givogue's desire that the passive radiator occupy 'all the available area', since the optimum size of a passive radiator is usually determined by a specific formula that involves inserting the volume of the cabinet and the Thiele/Small parameters of the ForceField 4's front-firing bass driver and has nothing at all to do with the actual area available for the passive radiator (which is also sometimes known as a 'drone cone'). I can only assume that when Givogue applied the formula in the case of the ForceField 4, the result required the passive radiator to have an area that was so large that all the area was required. (I determined the Sd of the passive radiator to be approximately 620cm<sup>2</sup>.) The diaphragm of the passive radiator is completely flat (*à la* KEF's famous B139, which didn't look dissimilar!) but the centre has a visible fixing that suggested to me that GoldenEar is mass-loading the diaphragm from the rear in order to tune it.

The rear panel of the ForceField 4 is notable for what is NOT fitted to it, rather than what is. It has only a single gold-plated LFE input, rather than a line input. 'Aren't these the same?' I hear many readers protest. 'No they're not,' is the short answer, although the long answer is that on many subwoofers, they ARE one and the same. A true LFE input expects that it will be fed from a true LFE output from an AV amplifier, AV receiver or AV processor. As such, a true subwoofer LFE input will not have a filter in its circuit—whatever you feed into the LFE input will go directly to the subwoofer driver. The idea is that the AV amp, receiver or processor pre-filters the signal *before* sending it to the subwoofer. It is this type of LFE input that's fitted to the ForceField 4, so that if you connect via this input, the rotary 'low-pass' control on the subwoofer won't do anything at all, not one thing. (And actually, the ForceField 4's LFE input DOES have a fixed, 200Hz low-pass filter in circuit, which GoldenEar says is 'in order to facilitate the proper interface with LFE out').

This implementation is completely different from most other subwoofers which have a combined Line/RCA input which is

connected to the subwoofer's internal amplifier via variable low-pass filter (but sometimes gives you the option of switching that low-pass filter 'in' or 'out', depending on whether you're feeding the subwoofer a pre-filtered signal or not.)

This means that in order to make use of the ForceField 4's rotary low-pass crossover control (marked 40–150Hz with a single intermediary calibration point at 95Hz), you MUST use the speaker level banana post input terminals, which are positioned on standard 19mm centres, so you can use dual Pomona connectors if you like. I was not particularly enamoured of how GoldenEar has decided to arrange the terminal pairs, which places the left and right inputs vertically above the left and right outputs, rather than side by side, as I would have expected. (And in the case that I agreed with the orientation of GoldenEar's layout, I would have still have said that it's 'back-to-front', because when you're looking at the subwoofer, the speaker wires from the subwoofer to your left-channel speakers will come from the right-hand side of the terminal block, and those to the right-channel speakers from the left-hand side of the terminal block, so they will have to cross over each other to get to where they're going.)

Other fairly common features missing from the ForceField 4 are a 'Phase' control (but read more about this later in this review!) and a subsidiary power switch. The lack of a subsidiary switch means you cannot 'force' the ForceField 4 to be permanently 'on'. Instead whenever the subwoofer is powered, the subwoofer will turn itself on and off automatically via signal-sensing circuitry built in, so it will switch on when it detects an audio signal at the LFE input or the speaker level inputs and then switch off automatically after a set time period. In fact, although I can force my own subwoofer 'on' if I want, I actually use the 'signal-sensing' option, so I'm a bit of a hypocrite with this criticism. I guess I'd just like GoldenEar to offer me a choice, rather than forcing me into using a particular mode of operation!

One other thing missing from the ForceField 4 are line-level outputs, but given that there are no line-level inputs, providing outputs was never really an option.

The ForceField 4 is supported by four large, soft rubber feet that serve two purposes. The obvious one is

to ensure the output from the down-firing passive radiator can 'escape' into the listening room. The second reason is, as GoldenEar jovially puts it, 'to keep the sub from dancing around on the floor.' Although the feet are certainly large, they are not large enough to raise the subwoofer high enough to provide a slot if you have very deep pile carpet in your listening room. However, if you have either a solid floor of some type, or normal carpeting in your room, they will certainly do the job. If you site the ForceField 4 on a solid floor,

## GOLDENEAR FORCEFIELD 4 SUBWOOFER

**Brand:** GoldenEar  
**Model:** ForceField 4  
**Category:** Powered Subwoofer  
**RRP:** \$1,195  
**Warranty:** One/Five Years  
**Distributor:** Kedcorp Pty Ltd  
**Address:** Unit 8, 509–529 Parramatta Rd  
 Leichhardt  
 NSW 2040  
 ☎ (02) 9561 0799  
 ✉ info@kedcorp.com.au  
 🌐 www.kedcorp.com.au



- Very small
- Unique styling
- No reflex port
- No variable LP filter on line level input
- Speaker terminal layout
- Can't force 'On'

## LAB REPORT

Readers interested in a full technical appraisal of the performance of the GoldenEar ForceField 4 Subwoofer should continue on and read the LABORATORY REPORT published on page 40. Readers should note that the results mentioned in the report, tabulated in performance charts and/or displayed using graphs and/or photographs should be construed as applying only to the specific sample tested.



Lab Report on page 40

the edge of the subwoofer will sit 35mm above the floor level. This, in turn, will put the top of the subwoofer just 324mm above floor level. The 'footprint' is just 1,333cm<sup>2</sup> (the ForceField 4 being 292mm wide and 457mm deep at the base).

The ForceField 4 is finished in a fairly plain black vinyl finish. This, apparently, is the only one available: you cannot order any other vinyl finishes and there are no optional high-gloss paint finishes available either.

### IN USE AND PERFORMANCE

The last subwoofer I used at home (Sunfire's Atmos) was so small I ended up having to put it out of the way to stop people accidentally tripping over it. GoldenEar's ForceField 4 isn't quite as small (but its smaller brother, the ForceField 3 is closer in size to the Atmos) but it is still small enough that I'd want it out of traffic areas, and it's certainly small enough to fit under many of the ordinary furniture items you'd usually find in a living—or listening—room. When I was moving the subwoofer around the room, one of the feet came loose, and it was at this point that I realised that the feet are not glued to the bottom of the subwoofer, but screw into place using a standard thread. (This isn't mentioned in the Owners' Manual). This is actually an excellent feature, because if you have deep pile carpet, and therefore need to raise the subwoofer higher from the floor to achieve a 35mm 'slot' around the base, you can fit your own (higher) feet—most likely spikes if you have deep pile carpet, since these won't 'flatten' the carpet and will also prevent the speaker from 'dancing around on the floor.'

The fact that a subwoofer delivers very low audio frequencies means that it's crucial that it be correctly positioned in your room—something that will usually take half-an-hour or so, depending on the room. It's a simple procedure that requires no test instruments at all. You can find details here: [www.tinyurl.com/subwoofer-placement](http://www.tinyurl.com/subwoofer-placement)

If you use the speaker terminal method to connect your amplifier or AV receiver to the ForceField 4, you have two different options. You can run your left and right speaker cables to the subwoofer itself, then run speaker cables from the speaker outputs on the ForceField 4 to your speakers. If you choose this configuration, there's an internal high-pass filter (a 150Hz turnover with a 6dB per octave slope) inside the ForceField 4 that removes the low-frequencies from the audio signals that are going to your main speakers. The other option is to run one set of wires to your speakers, and another set (in parallel) to the ForceField 4, so your speakers will get a full-range signal and you can use the ForceField

4 to reinforce (and extend) the low frequencies. Either way, you'll be able to use the ForceField 4's rotary low-pass control to roll off the higher frequencies produced by the subwoofer, but no matter where you set the rotary control, the high-pass filter remains fixed at 150Hz.

If your receiver has an LFE output, this gives a third option, since you could use either of the two connection methods outlined in the previous paragraph, or simply forget about using the speaker level connections, and instead just use a single cable to link the LFE output on the receiver to the LFE input on the ForceField 4.

Unlike some subwoofers, whose high-level inputs cannot be connected to the speaker outputs of amplifiers with balanced outputs, or to amplifiers with Class-D output stages, the high-level speaker inputs of the ForceField 4 are fully-balanced around ground and full differential inputs that have an impedance of about 470Ω to ground from each speaker terminal. This means you can safely connect any type of amplifier to the ForceField 4. It also means that you can reverse phase if you like, simply by running the posi-

tive speaker cables to the negative terminals and the negatives to the positives, which means that despite not being fitted with a 'Phase' switch, you actually do have the same control over phase as a subwoofer fitted with a two-position phase switch (0°/180°).

The variety of connections it's possible to make with the GoldenEar meant I had to make some decisions when reviewing the subwoofer as to how best to connect it to reflect how audiophiles might use it in their systems. In the end, I decided that when I used the ForceField 4 in a home theatre setup, I would connect it via its LFE input and when I used it as the subwoofer in a stereo system, I would use the speaker-level inputs to connect it to my amplifier.

Used for home theatre, the ForceField 4 delivered punchy sound that was almost visceral in its impact, and deeply enough to reproduce the usual gamut of low-frequency sound effects (the explosions, the sound of collapsing masonry, the footsteps of Tyrannosaurus Rex, the deep rumbles presaging impending doom, and so on) with satisfactory realism, though I felt there wasn't *quite* the feeling of the gut-churning low bass

■ **Used for home theatre, the ForceField 4 delivered punchy sound that was almost visceral in its impact...**



that I experience when listening to larger subwoofers... you know, the type of bass you seem to feel, rather than hear... but the levels and bass extension I was getting were amazingly good when I took the size of the subwoofer into account.

When used in stereo-only music systems, the ForceField 4 also acquitted itself well, delivering its best and most musical performance when partnered with small bookshelf speakers, and with the speakers connected to the ForceField 4 so that they were relieved of having to perform their usual low-bass duties. In this set-up I not only found the bass to be very smooth and extended, but also found that the upper bass and midrange sound of the bookshelf speakers I was using improved perceptibly, with their performance obviously benefiting greatly from not having to reproduce low bass. However, I did find that careful positioning was required to ensure a stable sound field, so that the output from the subwoofer segued properly with that from the main left and right speakers. I also found, as you'd expect, that the ForceField 4's performance was at its best in small- to medium-sized rooms and at moderate, rather than loud, listening levels. In these situations, you will be rewarded by lovely, tight—and very tuneful!—bass that will enhance your appreciation of whatever music you're listening to.

I trialed the ForceField 4 paired with

larger, floor-standing speakers, and felt that despite good results, the previous set-ups with smaller speakers worked better. I found I achieved best overall bass when the main left and right speakers were powered directly from the amplifier, with the amplifier's speaker terminals also being connected to the ForceField 4. With this set-up, I found that positioning the subwoofer was less critical than it was when using small main speakers, but you will likely have to set the volume of the GoldenEar fairly low to order to ensure the upper bass isn't overly forward (since in this set-up both the subwoofer and the floor-standers will be delivering bass at the same frequencies).

### CONCLUSION

The GoldenEar ForceField 4 is a powerful, punchy subwoofer. I think you'll get the best—and most cost-effective—performance from it when you match it with smaller speakers (be they bookshelf or satellite types). You can team the ForceField 4 with small speakers of any make or model, of course, but



the obvious 'best fit' would be the models specifically recommended by GoldenEar, which means a pair of SuperSat 50s if you're looking for a two-channel system. If you're after a full 5.1-channel surround system, you'd also need to add a SuperSat 50C centre and either a pair of the SuperSat 3s or another pair of SuperSat 50s! for the surround channels. Whichever type of system you choose, you will discover that GoldenEar's new ForceField 4 is a great little subwoofer!  **greg borrowman**

LAB REPORT ON PAGE 40

## Equipment Reviews on Zinio

Australian Hi-Fi Magazine's most recent equipment reviews are now available digitally, from Zinio, so you can buy an individual electronic copy of the magazine containing the review you want, for just \$4.49. Each copy of the magazine you download will contain at least three additional reviews, plus a variety of feature articles and music reviews. The following recent equipment reviews are currently available via Zinio.

- Aaron XX 20th Anniversary Integrated Amp
- Atlantic Technology 334SB Subwoofer
- Atlantic Technology 444SB Subwoofer
- Atohm GT 1.0 Loudspeakers
- B&W 802 Diamond Loudspeakers
- Bel Canto C5i Integrated DAC/Amplifier
- Berkeley Audio Design Alpha DAC
- JBL Studio 130 Loudspeakers (Also Free Download from [www.avhub.com.au](http://www.avhub.com.au))
- JBL Sub 150P Subwoofer (Also Free Download from [www.avhub.com.au](http://www.avhub.com.au))
- Marantz PM-KI-Pearl-Lite Int Amplifier (Also Free Download from [www.avhub.com.au](http://www.avhub.com.au))
- Marantz SA KI Pearl Lite SACD Player
- Moon Evolution 700i Integrated Amplifier
- Oppo BDP-95 Blu-ray Universal Disc Player (Also Free Download from [www.avhub.com.au](http://www.avhub.com.au))
- Orpheus Apollo VI Loudspeakers
- PS Audio Perfect Wave Transport & DAC
- Move 2500 Portable DAB+ Radio
- Technical Brain TBC-Zero/TBP-Zero Pre/Power Amplifiers
- VAF Signature i90 Loudspeakers
- Velodyne Digital Drive DD-15+ Subwoofer
- Whatmough Signature P33i Loudspeakers



To download any of these reviews, type [www.tinyurl.com/Equip-Reviews-1](http://www.tinyurl.com/Equip-Reviews-1) into your browser, then click on the link to the review you want. (Zinio's electronic platform supports Android, Windows 7, WebOS, iOS, and Air.)

CONTINUED FROM PAGE 30

**TEST RESULTS**

After examining the graphs of the GoldenEar ForceField 4's performance, I was reminded of that old but very true adage that 'the proof of the pudding is in the eating.' Taken literally, this means that when you're cooking a pudding, it really doesn't matter what ingredients you use, or in what proportion you use them, or how long you cook it in the oven, or even the temperature of that oven. In the end, all that really matters is how the pudding tastes once it has cooled down! Taken less literally, the adage means that when you're undertaking any task, it's the end result that matters. (*Editor's Note: I am not at all sure that that this is really the meaning of this proverb. The authorities I consulted explained that this proverb means that something has to be experienced in order to prove how good it is. Steve and I have agreed to disagree, but as editor, I get to have my say!*)

**■ The frequency response measured was 27–160Hz ±3dB. This is an excellent response for a small subwoofer!**

In the case of the GoldenEar ForceField 4, I would not have guessed—at least not from examining the individual contributions of the down-firing passive radiator and the front-firing woofer—that the two responses would combine in the listening room to give the overall frequency responses that are shown in Figures 1 and 2. Yet this is exactly what happened! In pondering this, I discovered that to make the nearfield measurement of the downfiring passive radiator, *Newport Test Labs* couldn't put the microphone underneath the subwoofer, so instead positioned the subwoofer free-field and measured at the radiator directly. I would have preferred it if the lab had instead placed the subwoofer on the floor, and then measured the output of the 'slot' formed between the floor and the bottom of the subwoofer. Unfortunately, when I asked if this could be done, the subwoofer had already been returned to the distributor, so it wasn't possible. (*Oops, mea culpa... Editor*)

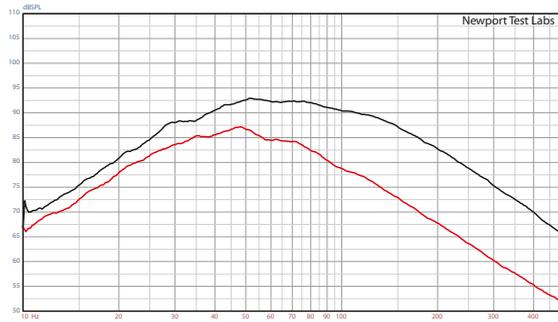


Figure 1: Pink noise frequency responses (smoothed to one-third octave) at 2.0 metres with crossover control at 40Hz (red trace) and 150Hz (black trace). [GoldenEar ForceField 4 Subwoofer.]

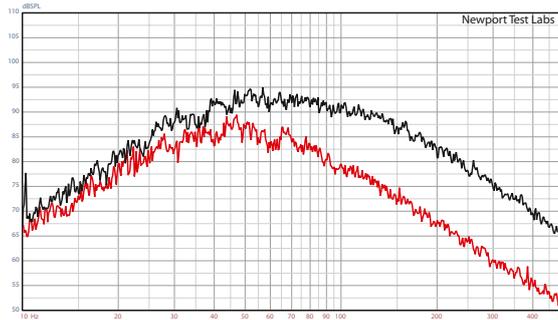


Figure 2: Pink noise frequency responses (unsmoothed) at 2.0 metres with crossover control at 40Hz (red trace) and 150Hz (black trace). [GoldenEar ForceField 4 Subwoofer.]



Figure 3: Nearfield sine frequency response of bass driver (black trace) and down-firing passive radiator (red trace) when using LFE input. (Note that data for has not been re-scaled to compensate for differences in radiating areas.) [GoldenEar ForceField 4 Subwoofer]



Figure 4: Nearfield sine frequency response of bass driver (black trace) and down-firing passive radiator (red trace) when using high-level inputs with crossover set to 40Hz. (Note that data for has not been re-scaled to compensate for differences in radiating areas.) [GoldenEar ForceField 4]



Figure 5: Nearfield sine frequency response of bass driver (black trace) and down-firing passive radiator (red trace) when using high-level inputs with crossover set to 150Hz. (Note that data for has not been re-scaled to compensate for differences in radiating areas.) [GoldenEar ForceField 4]

However, it really doesn't matter about the nearfield measurements, because, as I said in the introduction, 'the proof of the pudding is in the eating' and the in-room frequency response of the ForceField 4 is very good. As you can see in Figure 1, the black trace shows the response of the ForceField 4 when the crossover control is set to 140Hz, and the frequency response measured by *Newport Test Labs* for this setting was 27–160Hz ±3dB. This is an excellent response for a small subwoofer, but somewhat shy of GoldenEar's claim for '14Hz–250 Hz', so I should note that GoldenEar's specification sheet does not show dB limits. So yes, if you wish to dispense with such limits, the ForceField 4 does indeed provide output at 14Hz (albeit 20dB down from reference!) and at 250Hz (where it's 14dB down from reference).

The red trace in Figure 1 shows the ForceField 4's frequency response when its crossover control is set to 40Hz. With this setting of the control, *Newport Test Labs* measured the in-room response of the ForceField 4 as 25Hz to 85Hz ±3dB.

The frequency response of the ForceField 4 when the crossover is set to 140Hz means the subwoofer will integrate particularly well with small bookshelf speakers, the response of which usually starts rolling off at around 150Hz (manufacturers' claims notwithstanding!). This means that with the ForceField 4 control set to 140Hz, the ForceField 4 will extend the response of those speakers very smoothly all the way down to 27Hz, and the fact that the high-frequency response of the ForceField 4 rolls-off above 130Hz will mean you'll get a very nice acoustic 'crossover' from the subwoofer to the main speakers.

Looking at the response measured by *Newport Test Labs* when the ForceField 4's crossover is set to 40Hz, it's obvious that steeper high-frequency roll-off really kicks in at 70Hz, so you'd get the best 'acoustic crossover' between the subwoofer and the main speakers if the response of those main speakers started rolling off at around 90Hz or so. This would certainly be the case with larger two-way speakers and smallish floorstanders.

As I have now said twice, the proof of the pudding is in the eating, and in the case of GoldenEar's ForceField 4 design, it turned out to be a very tasty pudding indeed! 