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Thiel's CS2.4 Loudspeaker

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Thiel
CS2.4
LOUDSPEAKER

Wes Phillips

DESCRIPTION Three-way, floor-standing loudspeaker. Drive-units (all anodized aluminum): 1" (25mm) dome tweeter coincident with 3.5" (114mm) cone midrange; 8" (204mm) cone woofer; 8.5" by 11" (230mm) passive radiator. Crossover frequencies: 800Hz, 2.5kHz. Crossover slopes: acoustic first-order, 6dB/octave. Frequency response: 36Hz–25kHz, ±2dB. Phase response: minimum phase, ±5°. Impedance: 4 ohms nominal, 3 ohms minimum. Sensitivity: 87dB/2.83V/m. Recommended power: 100–400W.
DIMENSIONS 41.5" (1055mm) H by 11" (280mm) W by 14" (380mm) D. Weight: 70 lbs (154kg).
FINISHES Walnut, black ash, natural cherry, white oak, amberwood, morado; other finishes available at additional charge.
SERIAL NUMBERS OF UNITS REVIEWED 1991, 1992.
PRICE $4200–$4400/pair, depending on finish. Approximate number of dealers: 109. Warranty: 10 years.
MANUFACTURER Thiel Audio Products, 1026 Nandino Boulevard, Lexington, KY 40511. Tel: (859) 254-9427. Fax: (859) 254-0075. Web: www.thielaudio.com.

Jim Thiel sounded almost bored. "Almost everything about the CS2.4 is pretty standard stuff—short-coil, long-gap, low-distortion drivers, aluminum diaphragms, polystyrene capacitors, spatial coherence, time coherence, reduced diffraction baffles, reduced cabinet vibration, etc., etc. Of course, *I* think the execution of the 2.4 is more successful than our previous models, but in terms of what's really different, that mechanical crossover is what's special."

That mechanical crossover is the compound driver Thiel devised for the CS2.3: a 1" tweeter mounted coaxially inside a 3.5" midrange cone, both driven by a single voice-coil. Both drivers have anodized aluminum diaphragms, separated from one another by a compliant polypropylene surround. Because the two share a single magnetic system, there's no electrical crossover between them. At low frequencies, the voice-coil drives both diaphragms just as it would with any midrange driver, but at frequencies above 2.5kHz, that polypropylene "coupling suspension" has enough compliance to allow the midrange cone to decouple, and the voice-coil drives the tweeter diaphragm, to which it is directly connected.

"For not much more than the cost of a high-quality two-way (which is what the electrical crossover system is), you get the performance of a three-way. You get a lot more performance for the money."

That, to those of us who aren't genius speaker designers, is pretty special indeed. Thiel balks at such praise, however. "If you only knew how much time I spend mulling over and working on some of these ideas, well, the few solutions I've developed are…" He laughed ruefully. "It was one of those simple ideas that's easy to model on the computer—you can get the ratio of masses and the areas and the damping and compliance and the coupling suspension, and it works great *in theory*—but getting it to actually work in practice was quite a development project."

One that apparently paid huge sonic dividends in the CS2.3, to judge from Brian Damkroger's enthusiastic review in the January 1999 *Stereophile* (www.stereophile.com/floorloudspeakers/220), in which he compared its quickness of response to that of a Porsche 911. So when Thiel Audio Products' Kathy Gornik mentioned that the CS2.4 had never been examined by *Stereophile*, I quickly volunteered for the task. I don't have a driveway, let alone a Porsche, but I certainly have parking space in my listening room.

Magic is what we do. Music is the way we do it.

As Jim Thiel suggests, the CS2.4 is an evolutionary product, albeit one designed intelligently. It shares many of the characteristics of all Thiel loudspeakers, including Thiel's preferred acoustic first-order crossover, drivers designed and built in-house, and rigidly braced cabinets with sloping, radiused, 3"-thick baffles. Also like all Thiel designs, the CS2.4 is time-aligned and phase-coherent. "Etc, etc.," as Jim Thiel says.

The tweeter and midrange drivers have neodymium magnets and boast a newly redesigned magnet venting system, which Thiel says reduces resonance. The 8" inverted-dome aluminum woofer is driven by a 2.5-lb magnet and is allied with a 7.5" by 11" oval passive radiator—a change from the CS2.3's round, 9" radiator.

As usual with Thiel speakers, the woodcraft, veneer matching, and overall fit'n'finish are exceptional. I've never been disappointed with this aspect of Thiel's total package, so I was surprised and impressed by several apparently small touches, including the adjustable, threaded brass cone feet, the brass binding posts (easily tightened with bare fingers or, if you're really into torque, a hex driver), and the magnetically attached

ERIC SWANSON

speaker grilles. I say *apparently* small touches because these little luxuries cemented my impression that the CS2.4 is an awful lot of speaker for $4400/pair.

If your cup is full may it be again

Thiel supplies unusually detailed setup instructions in its manual, and you really need to follow them if you want to hear the CS2.4 sing in tune. Although the speaker benefits immensely from being situated well away from the front and sidewalls (my review pair wound up 3' from my sidewalls and slightly more than 4' into the room), the most important parameters will be your seating distance from the CS2.4s and the height of your ears. The speakers need at least 8' between your sweet spot and them or they won't be phase- and time-coherent. I sat about 13' away. Listeners who sit lower in their seats than I do might find they need to get closer to the speakers—carefully observing Thiel's minimum suggestions, of course.

I've reviewed Thiels before, and usually this is the point where I have to say something like *Be careful to mate them to an amp that's capable of really driving them.* That's because Jim Thiel believes in

MEASUREMENTS

I estimated the Thiel CS2.4's voltage sensitivity to be slightly higher than both average and specification, at 88dB(B)/2.83V/m. However, despite Wes Phillips' conjecture that this speaker is not too hard to drive, its impedance plot (fig.1) indicates that the CS2.4 demands a *lot* of current from amplifiers. Not only does its impedance drop to 2.73 ohms at 600Hz, but it stays significantly below 4 ohms from 100Hz to 50kHz, and there is a difficult combination of 4.5 ohms magnitude and –45° electrical phase angle at 80Hz. Thiel CS2.4 owners should make sure they have a good 4 ohm–rated amplifier to drive this speaker.

The traces in fig.1 are free from the small discontinuities that would indicate the presence of enclosure resonances. Even so, I found a resonant mode present at 281Hz on the side panel, as well as some other, low-level modes higher in frequency (fig.2). As WP didn't comment on any midrange congestion, it's entirely possible that this behavior looks worse than it sounds.

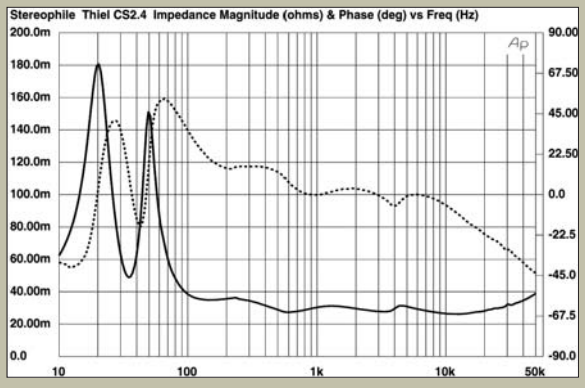

Fig.1 Thiel CS2.4, electrical impedance (solid) and phase (dashed). (2 ohms/vertical div.)

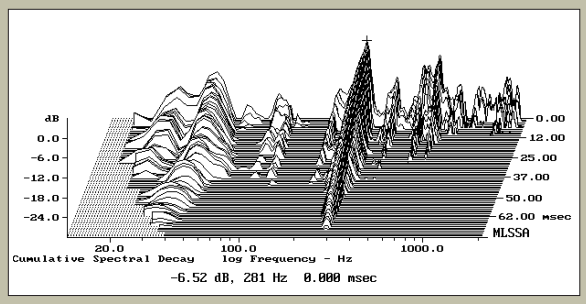

Fig.2 Thiel CS2.4, cumulative spectral-decay plot calculated from the output of an accelerometer fastened to the center of the cabinet's side panel 12" from base (MLS driving voltage to speaker, 7.55V; measurement bandwidth, 2kHz).

The saddle at 35Hz in the impedance-magnitude trace implies that this is the tuning frequency of the CS2.4's passive radiator (which behaves in the same manner as the slug of air in a reflex design's port). As expected, the woofer's nearfield response features a notch at this frequency (fig.3, blue trace), which is when the back pressure from the port or radiator resonance holds the woofer cone still. The passive radiator's output peaks at the same frequency (fig.3, red trace). Though its 12dB/octave high-frequency rollout is marred by some slight peaks, these may well be sufficiently low in level to have no subjective consequences. The Thiel's overall low-frequency response is plotted in black in fig.3; some of the apparent low-frequency boost will be due to the nearfield measurement technique, but there is still a little too much bass in absolute terms—as Wes pointed out, the speaker's balance is rich. But note the excellent LF extension apparent in this graph, with useful output available down to 30Hz.

Higher in frequency, the CS2.4 is basically flat on-axis throughout the midrange and low treble. However, there is a discontinuity at 3kHz, which is just about where the small midrange unit crosses over to the coaxial tweeter, followed by a somewhat shelved-up (2–3dB) high treble. The speaker's output continues to rise above the audioband, reaching +10dB at the 30kHz limit of this graph. (This measurement was made with a calibrated DPA 4006 microphone; I double-checked the speaker's ultrasonic behavior with an EarthWorks QTC-40 mike, which has flat response up to 40kHz.) WP did

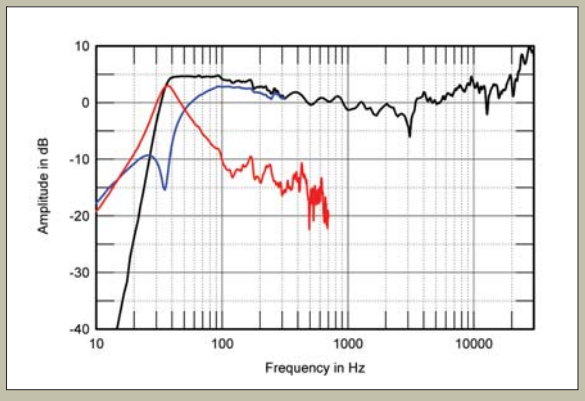

Fig.3 Thiel CS2.4, anechoic response on tweeter axis at 50", averaged across 30° horizontal window and corrected for microphone response, with the nearfield responses of woofer (blue) and port (red), plotted below 300Hz and 700Hz, respectively, and the complex sum of the nearfield woofer and port responses, taking into account acoustic phase and distance from the nominal farfield point, plotted below 300Hz (black).

speakers having low impedances, that requires a stiff kick in the chops. Thiel's answer to the question why is simple: "Watts is cheap."

If the CS2.4 was hard to drive, it did not reveal itself to me. I tried a 35Wpc tube amp, several 100Wpc solid-state amps, and several more powerful hybrid and solid-state amps. I even connected it to my newly acquired Fisher 500-B (thank you, Peter Breuninger, for your series of *Stereophile* reviews of vintage audio gear), which, while not my first choice for the job, did not acquit itself too badly. In other words, the CS2.4 seemed a fairly easy Thiel to drive. I'm tempted to attribute this to the mechanical crossover between the tweeter and midrange, but I suppose John Atkinson's measurements will confirm or refute this conjecture.

The only other setup consideration is that you need to play the CS2.4s hard and long to get it to break in. Just one day after I installed them in my system, a fellow audiophile dropped by to show off his new monoblocks. "They don't sound so reticent in the low end at my house," he said of his new toys. I assured him that the speak-

measurements, *continued*

find the CS2.4's presentation "crisp," though he felt the Thiel had less HF extension, less HF "air," than the Peak Consult Empress, which he reviewed in October, despite the Empress's having less measured on-axis energy in the treble. Perhaps this was due to the tube amplifiers he was using some of the time. In my own auditioning of the CS2.4 (in mono) with solid-state amplification, I was aware of its shelved-up top octaves, though they didn't sound unnatural. I suspect that, subjectively, the treble is balanced by the CS2.4's powerful bass.

Turning to the Thiel's dispersion, the horizontal radiation pattern on the tweeter axis (fig.4) reveals that the on-axis glitch in the crossover region fills in to the speaker's sides, while the tweeter's off-axis output drops rapidly above 20kHz. However, a lack of energy develops at around 1kHz, which might make the speaker sound both a little reticent and bright in overly reverberant rooms.

In the vertical plane (fig.5), the presence-region notch in the tweeter-axis response does fill in for ear heights a few inches below that axis (already a low 32.5" from the floor). Sit with your ears above the tweeter, however, and the same lack of energy in the 1kHz region as seen in the horizontal dispersion plot makes an appearance. The use of widely spaced drive-units and first-order crossover filters makes this behavior inevitable, however.

The tradeoff is that the speaker's behavior is optimized in the time domain. The CS2.4's step response (fig.6) has almost a perfect right-triangle shape with just a small amount of leading-edge overshoot apparent, this correlating with the shelved-up top octaves seen in the frequency response. The cumulative spectral-decay plot (fig.7) is very clean in the midrange and low treble, but is marred by what appear to be ridges of delayed energy in the mid- and high treble. I believe that this doesn't reveal resonances so much as interference effects from the coaxial midrange/treble driver.

Overall, the Thiel CS2.4 offers pretty good measured performance, its few idiosyncrasies resulting from the designer's use of a first-order crossover between the woofer and midrange unit. *—John Atkinson*

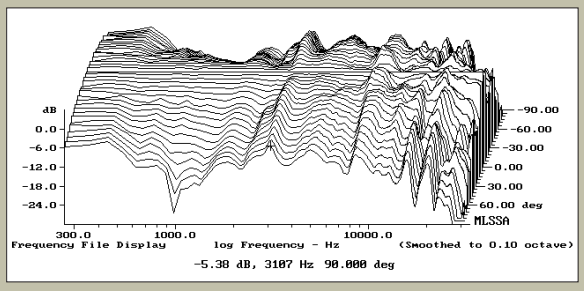

Fig.4 Thiel CS2.4, lateral response family at 50", normalized to response on tweeter axis, from back to front: differences in response 90–5° off axis, reference response, differences in response 5–90° off axis.

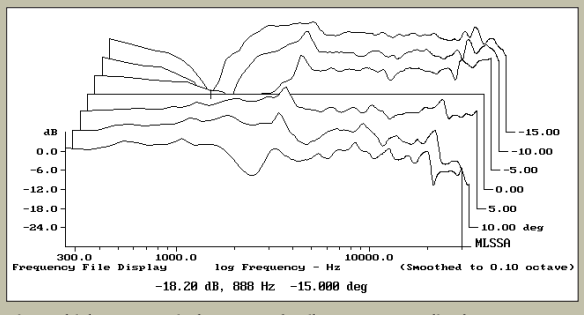

Fig.5 Thiel CS2.4, vertical response family at 50", normalized to response on tweeter axis, from back to front: differences in response 15–5° above axis, reference response, differences in response 5–15° below axis.

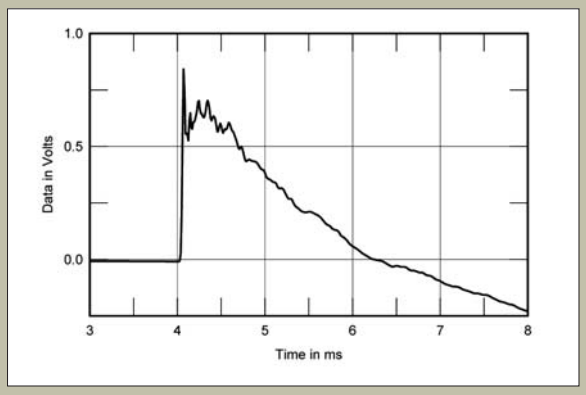

Fig.6 Thiel CS2.4, step response on tweeter axis at 50" (5ms time window, 30kHz bandwidth).

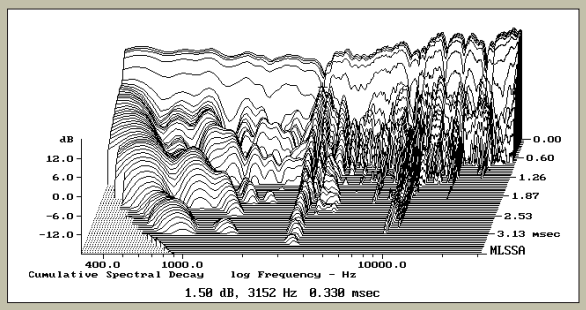

Fig.7 Thiel CS2.4, cumulative spectral-decay plot at 50" (0.15ms risetime).

ers were just starting to loosen up.

I then proceeded to play the final movement of Leonard Slatkin and the St. Louis Symphony's recording of Mahler's Symphony 2, "Resurrection" (SACD, Telarc SACD-60081) for two days running, which made a huge difference. Then my neighborhood audiopal Jeff Wong dropped by while I was playing the DSD remastering of Brian Eno's *Before and After Science* (CD, Virgin 77292). "Wow," he said, "that bass is all over the place and the sound is completely speakercentric. I remembered this as sounding more open than that."

Me too. And after another day of playing the Thiels hard, it was. They just kept improving, becoming more balanced, less harsh, less tight and, umm, rhythmically unsupple—just flat-out more enjoyably musical the more I played music through them.

"I have no idea why that's true," said Jim Thiel, "but that's been my experience as well. It has caused some problems here at the factory, because I will play a prototype a lot in the design stage and get to know its sound well. Then, when I get the first production sample, I say, 'Hey, this doesn't sound the same—what's up with that?' Usually, they do sound stiff at first and all the sound is inside the speakers. Then they open up."

Would you hear my voice come through the music?

Boy, do they ever—open up, that is. After nearly 200 hours of vigorous break-in, I pulled out the Persuasions' *Might As Well…The Persuasions Sing Grateful Dead* (CD, Arista GDCD 14070) and played "Ripple." *Ripple* is right—as goosebumps rippled up my arms and climbed the nape of my neck, my mouth gaped open, and I lost myself in the wash of sound. First was Jerry Lawson's raspy tenor riding along on top of Jimmy "Way Down" Hayes' walking bass, later joined by Raymond X. Hayes' falsetto and Eric Thompson's mandolin. It was magic—pure and simple.

Speakercentric? Oh no, the voices—and string overtones—hovered in the room, free of the speakers and any sense of constraint. And Hayes' bass was deep, warm, and just as amazingly physical as it is when you stand next to the man on stage. Trust me, I've been there, and as memorable as that experience was, listening to it re-created by the CS2.4s was scarcely less so.

It was time to return to those discs that had failed to impress during the CS2.4s' prolonged burn-in. *Before and After Science*'s "No One Receiving" skittered along, driven by the muscular drumming of Phil Collins and the twin basses of Paul Rudolph and Percy Jones. The Thiels threw a wide soundstage that now reached from sidewall to sidewall, and filled it with synthesized percussion, guitar fills, and a variety of real and synthesized string sounds. The bottom end was taut, reasonably deep, and propulsive, while the electric guitar sounds cut through the haze like knives (or should that be axes?)—a day-and-night difference from earlier in the audition, and about as coherent as I've ever heard the song sound.

The Mahler 2 was an even more impressive change, probably because there's so much more information contained in its wide-bandwidth (50kHz) Soundstream master tapes. The sound was immense. If the space between my room's walls was completely filled by the Eno's soundstage, those walls could not begin to contain the Mahler—so they simply disappeared.

The dynamic range of the Mahler's final movement (*Im Tempo des Scherzos. Wild Herausfahrend*) highlighted the exceptional ability of the CS2.4s to portray extremely quiet sounds in vast spaces, as well as their equally impressive capacity for filling those spaces. The movement begins with an explosion of instruments that recapitulates the outburst of the third-movement *scherzo*. That fades to silence and we hear the horns call from far offstage. This too is followed by silence, and then the unaccompanied chorus begins to sing Klopstock's verses so quietly that a whisper would sound like a shout in comparison. Even though I know this piece—and this recording of it—so well, when I heard it through the Thiels my first thought was that I was hearing the opening lines in my memory rather than through my ears: "Aufersteh'n, ja aufersteh'n wirst du, / mein Staub, nach kurzer Ruh!" (Thou shalt rise again, yes again, / my dust, after a short rest!). The sound grows stronger, then the orchestra joins the chorus with a buoyant E-major theme from the first movement that links it to the *Langsam* "Resurrection" melody and lyric—sung first by the basses, then the rest of the chorus, the solo singers, and, at last, swelled by the vast tintinnabulation of the whole orchestra.

Where words fail, music begins, or so Heine claimed. That final movement of the "Resurrection" is beyond words. It's a tonal testament to the power of hope and it has never failed to move me, even through a 2" radio speaker—but hearing it through the Thiel CS2.4s was almost emotionally crippling. These speakers should come with a warning label: *Do not attempt to operate heavy machinery while under the influence of this product.*

If my words did glow with the gold of sunshine

The CS2.4s were preceded in my listening room by the Peak Consult Empress loudspeakers (reviewed in the October 2005 *Stereophile*). There are many similarities between the two, both cosmetically and in terms of sonic virtue, though the Empress costs $25,000/pair and the CS2.4 only $4400/pair. But, to paraphrase Ronald Reagan, I don't think most listeners will hold the Thiel's value against it.

In fact, the two speakers shared a lot of felicities. "Ripple" sounded rich, free of box coloration, and full of tingly detail through both speakers. The

ASSOCIATED EQUIPMENT

DIGITAL SOURCE Ayre C-5xe universal disc player.
PREAMPLIFIERS Ayre K-5xe, Conrad-Johnson ACT2, Viola Labs Cadenza.
POWER AMPLIFIERS Ayre V-5xe, Coda S5, Fisher 500-B, Cayin SA 50T, Moscode 401HR, Viola Labs Symphony.
LOUDSPEAKERS Peak Consult Empress.
CABLES Interconnect: Cardas Audio Golden Reference, Shunyata Research Aries & Antares, Viola Labs Silver Balanced. Speaker: Cardas Audio Golden Reference, Shunyata Research Lyra. AC: Cardas Audio Golden Reference, Shunyata Research Anaconda & Orion.
ACCESSORIES Shunyata Research Hydra AC Power Distribution System; Solid-Tech Rack of Silence equipment stand, Feet of Silence & Discs of Silence equipment supports; Ayre Myrtle Wood Blocks. *—Wes Phillips*

Thiel lacked a shade of top-end air on Jerry Lawson's vocals, which might surprise the "metal tweeters always sound peaky" crowd, but there you have it.

Yet I'm not sure the Empress's greater HF extension was more accurate. Some listeners will prefer it, and the extra sparkle was seductive, but I've heard Lawson close up—heck, I've shared fried chicken with the man—and I'm not completely convinced that that extra energy is really in his voice. Each speaker sounded convincing on its own—I was aware of HF differences only when I compared them directly. If you do the same, you may well prefer a little more air, in which case you'll want the Empress—or you'll find the Thiels less "hi-fi," in which case you'll choose *them*.

However, the Empress did give Jimmy Hayes more robust body. Not a lot more, but maybe 20 lbs more authority. *That* was convincing.

Listening to Eno's "No One Receiving," I was less equivocal: more bottom end with the Empress but less rock-'n'roll thrash. The Thiel's crisper articulation, especially of incisive guitar tones, was my clear preference. And don't assume I'm talking about a big difference in bass, either—the Thiel went plenty low. It's rated to 33Hz, and I believe it.

And Mahler's "Resurrection"? I was extremely impressed with the Slatkin/SLSO recording when I reviewed the Empress, but I have to give the thumbs up again to the CS2.4. Mostly, I suppose it was my sense that, as good as it was, the Empress was a bit reticent. It did everything extremely well, and quite bowled me over. But the Thiel committed itself to full-blown emotional music with such exuberance that my intellect was completely bypassed.

Intellect bypassed by emotion is a pretty good definition of music. If it's also the best description of a given

THIEL SMARTSUB SS1

"Subwoofers are boring," whined John Atkinson when we were dickering about column inches for this sidebar. "I know they're important, but I just don't get excited reading about them."

I knew what he meant. The typical subwoofer has a beefed-up driver(s) and a run-of-the-mill amp-crossover module all too frequently purchased off the shelf at www.subwoofermodulesrus.com. Oh, you do get flavor variations: forward-firing *vs* downfiring, class-D *vs* linear amp, and the ever-popular trio of ported *vs* sealed *vs* isobaric enclosure. Yawn.

But the SmartSubs are the products of Jim Thiel, a man with his own ideas about everything. "I think subwoofers usually just sound horrible, so I wasn't interested in making a product I wouldn't like."

So what prompted him to design not only a subwoofer, but an entire line of them, not to mention several passive crossovers and an active crossover-integrator?

"Ignorance! Had I known how big a project it would be and how long it would take, I would have never felt confident about devoting all that time and resources to it."

The problem, as Thiel saw it, wasn't the subwoofer itself—even if he designed a subwoofer that satisfied him with its frequency response, high output, and low distortion, it was still liable to sound "horrible"—but with the one-size-fits-all approach to integrating the outputs of the subwoofer and the main speakers with the acoustics of the room they have to perform in.

"Take a speaker like, let's say, a CS1.6," said Thiel—"a two-way speaker with a pretty good crossover. Even a relatively unsophisticated observer would probably hesitate to remove that crossover and use it in a completely different loudspeaker with different drivers, a different-sized enclosure, and so on—and that's the kind of situation that subwoofers are in with processor-based management or the generic crossovers built into the backs of most of them. And, as you know, crossovers are something I have strong opinions about.

"Instead of trying to figure out the filter characteristics you want, I thought we should start with the signal that represents the output you want from the combination of the sub plus the main speaker. To oversimplify, that would be the input signal, and you subtract from it the part that the main speakers will reproduce—you electronically construct an analog of your main speakers that has the same [low-frequency] output characteristics, the same rolloff characteristics, and you take that signal and subtract it from the main input signal. What you are left with, by definition, is whatever the subwoofer will need to put out to blend with the main speakers to produce the desired result. That's the insight that got me excited about the subwoofer project."

Toward this end, Thiel developed a different set of subwoofers. They are typical of all Thiel designs in featuring Thiel-designed and -built high-excursion aluminum drivers that use the firm's short-coil, long-gap motor system. The models differ mainly in the sizes and numbers of drivers: the SmartSub SS1 has a single 10" driver, the SS2 has two, the SS3 has two 12" drivers, and the SS4 two 15" drivers. The SS1 ($2900), which I auditioned, also differs from the rest in that it has a 500W linear class-A/B amplifier with a tracking switching power supply, instead of the 1000W module that comes with the others.

What none of the SmartSubs comes with is a crossover. You need to add one of Thiel's passive models, all of which are configured for use with Thiel main loudspeakers and are available in two- and five-channel versions; or Thiel's active S1 Integrator-crossover; or you could use your surround-sound processor's LFE output and break Jim Thiel's heart.

The amplifier modules on the SmartSubs look like those on other subwoofers, but the controls aren't there to set rolloff, phase angle, or crossover point—they instead allow you to set environmental parameters, such as distance from the side and rear walls, in addition to LFE extension. Input is limited to an RCA connection for LFE signal reception or balanced XLR to one of the Thiel crossovers.

The PX02 external crossover ($350) is also quite different from the run of the mill. To begin with, it's not a crossover but an integrator. You get one configured to your Thiel main speakers—and PX02s are offered only for Thiel main speakers. "It took over a month of engineering time to do the seven models I designed—I don't have the time to do hundreds of models," Thiel explains.

To connect a PX02 to your system, you run a second pair of speaker wires from your amplifier ("and they don't need

loudspeaker, then that's a loudspeaker I can definitely live with.

However, lest you think I've lost my enthusiasm for the Peak Consult Empress, I have not. It has a polish and a richer tonality that many listeners will prefer to the Thiel's "just the facts" frankness. You might admire both speakers, as I did, but you'll *love* only one or the other.

If I knew the way I would take you home

The Thiel CS2.4 is not a perfect loudspeaker—that's a critter I've never encountered at any price—but it's hard to fault within its price range. It's a whole lot of speaker for the money. It's built to a flawless standard. It's drop-dead gorgeous. It *commits* itself to music as an acolyte commits himself to a religion, which is to say without restraint. I'm tempted to similarly throw off restraint in singing its praises.

There are some reasons you might choose to resist the CS2.4, however. It requires a big room; if you can't sit 8' away from this speaker—and give it lots of breathing room, too—it won't integrate properly and you won't hear a balanced, coherent sound. Despite my amazement that my Fisher 500B actually *worked* with the Thiel, I'm reluctant to recommend the CS2.4 with amplifiers that don't have at least 50Wpc or pretty solid damping. The Fisher worked, but you know what they say about dancing dogs.

In the end, it always comes down to taste. You may prefer a bit more sparkle on top, not that the Thiel lacks that—or you may prefer deeper bass, and I'm pretty happy with what the CS2.4 has in that department. In that case, you'll want a different loudspeaker. You should still listen to the CS2.4, though. Very few speakers get so much right between those extremes—and once you've heard what the Thiel does there, nothing less may satisfy.

to be high-quality cables, either," Thiel added). The PX02 subtracts its analog of the main speakers and passes on the remaining information to the SmartSub. The main speakers play full-range, the subwoofer augments their output.

The S1 Integrator-crossover is far more flexible and can be used with any speaker. It can be inserted between the preamp and amplifier or receive input at the speaker level, and it can work in one of two modes: Crossover or Augment. Which you use will depend on your main speakers, Thiel suggests: large, full-range loudspeakers work best with Augment; smaller speakers may do better with Crossover. Fortunately, the S1 can store six different settings, so you can store both and use the S1's remote control to compare and contrast from your listening seat.

The S1 is almost infinitely flexible. You enter information concerning your system, including the sensitivity of your main loudspeakers, enclosure type, low-frequency limit, and damping. Add a few more parameters, such as the gain of your amplifier, your preferred low-frequency extension, and your preferred crossover point (if you're using it in crossover mode). Some of this information is fairly straightforward (you'll know if your speakers have a sealed or reflex enclosure), some you may need to look up (Thiel posts a fairly comprehensive base of speaker data at www.thielaudio.com/subsetup.cfm), and some you may need to experiment with.

I initially set the crossover as low as possible, thinking I should let the Thiel CS2.4s do as much of their stuff as possible. I didn't hear as much bass enhancement as I'd thought I should get, so I kept setting it higher. Finally, when I reached 80Hz, I seemed to click in to the magic spot. Thiel later suggested that 10Hz above a speaker's –3dB down point seems to be a good rule of thumb; my 80Hz is quite a bit higher than that.

The question is, how much difference will a single 10" driver make with a full-range speaker such as the CS2.4, which already has pretty good bass extension? Plenty! And not all of it where I expected, either.

First, if you're using Thiel speakers as your mains, the PX02 is one heck of a deal. For $350 plus a cheap set of speaker cables and a plain-vanilla XLR cable from my home studio's mess o' wires, I got more bass, which I reckoned was the whole point of the thing. That bass was tauter, went about half an octave deeper, and was perfectly in sync with the rest of the music—in fact, I kept walking over to the SS1 and putting my hand on its lid to determine that it was still on. No sound came from the sub itself, or so it seemed—everything just sounded bigger and better. "The Mooche," from the Jerome Harris Quintet's *Rendezvous* (CD, Stereophile STPH013-2), glided along on some of the deepest bass burbles I've ever heard from this disc.

But when I used the S1 Integrator-crossover in crossover mode, I was stunned at the transformation. Art Baron's trombone mutters were brighter and richer than I'd heard them even 10 minutes before, with the PX02. And Marty Ehrlich's soprano sax had brassy sawteeth I was sure weren't there before. Sure, there was more bass, but everything sounded so much better.

Well, duh. If a subwoofer is correctly mated to a main speaker, it's the sonic equivalent of losing 50 lbs—everything gets easier because there's less strain all around. Freed of the heavy lifting, the CS2.4s were able to shine, not just in the low frequencies, but in the middle and on top, too. It was a remarkable enhancement in a loudspeaker I was already pretty besotted with.

But it came at quite a hefty price. The SS1 cost $2900, the S1 $4400. Add interconnects, and the Thiel subwoofer system costs nearly twice as much as the main speakers I started out with. Who would do such a thing?

No one, I suspect—at least, no one would buy the CS2.4s and the SS1-S1 combo at the same time. After all, you can buy a pair of CS6s for less than that. But I could see someone who already owned a pair of CS2.4s and loved 'em adding an SS1 and a PX02. Heck, maybe even an S1, if such a person thought he might want to add a second SS1 at some point.

I suspect, however, that the real customer for Thiel's S1 and SmartSubs is someone who owns a different company's loudspeakers and loves 'em inordinately, except for a slight sense of bass inadequacy. Intelligently integrating real bass into the sound of a beloved loudspeaker is something that might enter that much-mythologized territory of "more important than money."

Actually, in the face of that kind of musical bliss, money doesn't really seem like all that much to ask. *—Wes Phillips*