

## Floor-Standing 4-Way Speaker with Powered Subwoofer

### Infinity “Intermezzo” 4.1t

Infinity Systems, Inc., a Harman International Company, 250 Crossways Park Drive, Woodbury, NY 11797. Voice: (800) 553-3332. Fax: (516) 682-3523. Web: www.infinitysystems.com. Intermezzo 4.1t floor-standing 4-way loudspeaker system with built-in powered subwoofer. \$7000.00 the pair. Tested samples on loan from manufacturer.

***Editor’s Note:** I hasten to point out, before the self-righteous element in the audio community does, that Don Keele is currently employed by Harman/Becker Automotive Systems, which is owned by the same parent company as Infinity Systems, namely Harman International. Harman/Becker and Infinity are totally independent of each other, without any overlap; in fact, they are located 700 miles apart—but they are connected via Sidney Harman’s pocket. He, or more precisely his company, owns a significant percentage of the audio industry, so that any one of the limited number of truly qualified audio engineers (like Don Keele) has more than a small chance of falling within his purview. It can’t be helped. As I pointed out in one of the earliest issues of The Audio Critic, in the late ’70s, the alternative is to use reviewers totally unconnected to the audio industry, such as audiophile dentists. Other magazines do. Unfortunately, said dentists don’t know the difference between MLS and ETE, and that matters to me more than our reviewers’ affiliations. I can assure you, in an event, that no one at the corporate offices of Harman International even knew about this review, let alone influenced it.*

### Introduction

*Intermezzo:* a short musical movement separating the major sections of a lengthy composition or work; or *intermediate:* one that is in a middle position or state. Both terms aptly



describe the subject of this issue's loudspeaker review, the Infinity "Intermezzo" 4.1t, by appropriately tying together function and music. The 4.1t is simultaneously an intermediate speaker in Infinity's home theater lines, positioned between the higher-priced Prelude MTS and the lower-priced Interlude, Entra, and Modulus lines; and at the same time, of course, does an excellent job playing music.

The Intermezzo 4.1t is a tall and relatively narrow floor-standing loudspeaker with built-in powered subwoofer, packaged in a total system that combines first-class industrial design and handsome good looks. The 4.1t system couples a three-way direct-radiator system operating above 80 Hz to a powerful subwoofer using a side-fired very-high-excursion 12" metal-cone woofer operating in a closed-box enclosure, powered by a built-in 850-watt power amplifier.

The upper three-way portion of the design is passive and combines a 6½" cone midbass driver with a 3½" midrange and a 1" dome tweeter, all of which are mounted on the front of the enclosure and crossed over at a rapid 24 dB/octave rate. The bottom half of

the system is devoted to a rather sizable closed-box enclosure housing the 12" woofer, amplifier, system controls, and connections. All driver diaphragms utilize Infinity's sandwiched composite metal/ceramic diaphragm material, which is said to be light weight, quite rigid and inert, and allows all the drivers to operate essentially as pure pistons over their respective operating bandwidths.

I last reviewed a set of an Infinity systems similar to the 4.1t for *Audio* magazine back in 1996. These were the Infinity Compositions P-FR systems, which are similar to the current Prelude MTS line. It performed excellently in all regards except for a low-frequency response that did not quite keep up with its upper bass and higher-frequency performance. My measurements of the bass output of the Intermezzo 4.1t, described later, reveal that it quite significantly outperformed the bass response of the P-FR systems. Infinity has been doing their homework! The bass improvements started with the higher-priced Prelude MTS line, whose subwoofer is quite similar to the 4.1t's. The Intermezzo line includes a separate powered subwoofer, the 1.2s, which is equally powerful.

The Intermezzo 4.1t includes a rich complement of controls and inputs on the rear panel of the subwoofer enclosure (see rear panel graphic). The system is equally at home in a complex home theater setup or a simpler two-channel stereo situation. Inputs and controls have been provided for many different operating configurations, from standalone stereo operation driven by an external power amplifier with the system's sub deriving its signal from the speakers terminals, to a complicated home theater setup driven by a Dolby Digital or DTS processor with separate power amplifiers or a multichannel amplifier.

The 4.1t's subwoofer power amplifier utilizes a high-efficiency switch-

## Manufacturer's Specifications

Type: 4-way, floor-standing, with powered closed-box subwoofer

Drivers: 12" cast-frame woofer with 3" voice coil, 6½" cone mid-bass, 3½" cone midrange, 1" dome tweeter, the last three with Ceramic Metal Matrix Diaphragms

Crossover Frequencies: 80 Hz, 500 Hz, 2.8 kHz, 24 dB/octave

Rated Frequency Response: 30 Hz to 20 kHz, ±1.5 dB; 23 Hz to 22 kHz, ±3 dB

Rated Sensitivity: 87 dB at 1 meter, 2.83 V rms applied

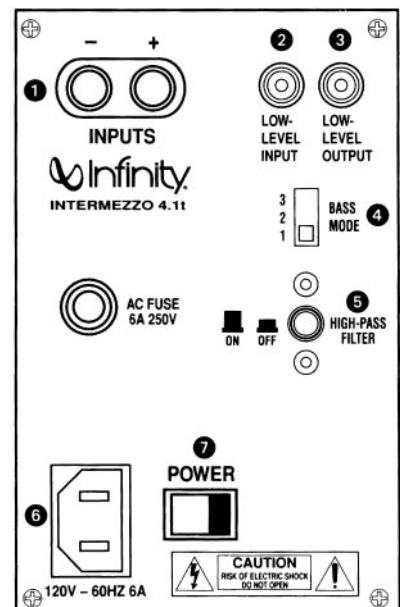
Rated Impedance: 6 ohms, nominal

Recommended Amplifier Power: 25 to 500 watts

Internal Amplifier Power: 850 watts continuous with less than 0.1% THD @ 50 Hz

Dimensions: 51½" (height) x 12½" (width) x 27" (depth) = 1308 mm x 318 mm x 686 mm

Weight: 93 lbs. (42.3 kg) each

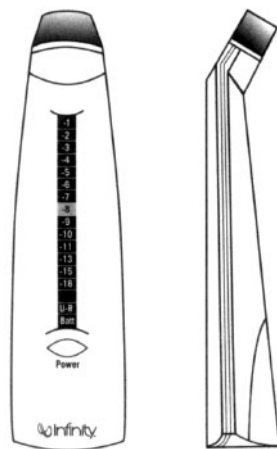


Infinity "Intermezzo" 4.1t rear panel

mode tracking power supply powering a class-AB amplifier. The power supply's output voltage tracks the audio signal in such a way as to minimize output device power dissipation. Quoting the 4.1t's owners manual: "The result is an extremely efficient audio amplifier that does not compromise audio performance." The tracking power supply is not unique with Infinity, however; it first started out primarily in the professional audio field (Crown International and Carver were among the first to offer the feature on their amplifiers) and then trickled down to the home market.

The 4.1t includes a single parametric subwoofer equalizer in its bass electronics, intended for smoothing the subwoofer's response in its listening environment. As is well known, the listening room heavily influences what is heard from a loudspeaker in the bass range below 100 Hz. The equalizer, if set properly, can effectively optimize the Intermezzo's subwoofer response to complement most listening environments. The parametric equalizer can provide a variable-width cut or dip of arbitrary frequency and depth, which, if matched to a room peak, can considerably smooth out the system's in-room response. As pointed out by Infinity, this also improves the system's transient response because the low-frequency speaker-to-room response is essentially minimum phase. (Techno-geek comment: If a system is minimum phase and its frequency response magnitude is equalized flat with a minimum-phase equalizer, its phase response will follow and also be equalized flat, and hence its transient response or time behavior will be optimized.)

This theory is all well and good, but how does the user know how to set his equalizer for optimum results? On the one hand he/she could hire an expensive acoustical engineer to come in with his one-third-octave real-time spectrum analyzer, noise generator, and

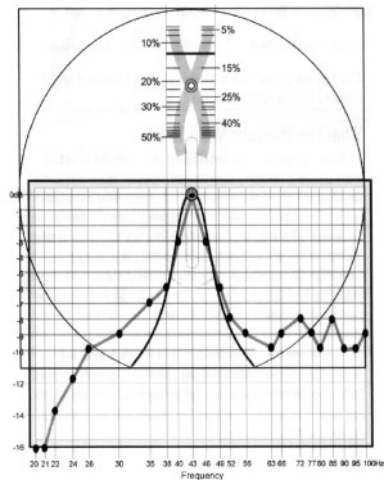


R.A.B.O.S. Sound Level Meter

calibrated microphone, and properly set the equalizer after doing some measurements. Or, on the other hand—tuh da!—the user could employ Infinity's slim LED sound level meter (see Sound Level Meter graphic) and the accompanying test CD with detailed instructions, which are supplied with the 4.1t to accomplish the same task. Gee, Infinity thinks of everything! Infinity calls their adjustment system R.A.B.O.S. or Room Adaptive Bass Optimization System (love that acronym!). It comes with documentation and bass response graphs that the user fills in, along with a circular hinged clear-plastic protractor-like gizmo, called a "Width Selector" by Infinity, that allows the user to rapidly determine the Q or resonance width of the dominant peak in the system's response (see Width Selector graphic). Matching a speaker/room response peak by adjusting the parametric filter's notch depth and frequency is relatively easy; however, this is not the case with the Q adjustment. More on this subject later, in the use and listening section.

### Measurements

The Intermezzo 4.1t's frequency response was measured using two different test techniques: (1) nearfield measurements to assess the low-fre-



Width Selector Graphic

quency response of the subwoofer, and (2) windowed in-room tests to measure mid-to-high-frequency response. The test microphone was aimed halfway between the midrange and tweeter at a distance of one meter with 2.83 V rms applied. One-tenth octave smoothing was used in all the following curves.

The on-axis response of the 4.1t, with grille on and off, is shown in Fig. 1, along with the response of the subwoofer. Without grille, the response of the upper frequency portion of the curve (excluding the sub) is very flat and fits a tight 3-dB window from 95 Hz to 20 kHz. The woofer exhibits a bandpass response centered on about 50 Hz and is 6 dB down at about 25 and 90 Hz. In the figure, the woofer's response has been level adjusted to roughly match the level of the upper frequency response. Averaged between 250 Hz and 4 kHz, the 4.1t's 2.83 V rms/1 m sensitivity came out to 86.2 dB, essentially equaling Infinity's 87 dB rating. The grille caused moderate response aberrations above 4 kHz, with a reduction in level between 3 and 11 kHz, a slight peak at 12.5 kHz, followed by a dip at 17 kHz. The grille can be easily removed for serious listening if required. The right and left systems were matched fairly closely, fitting a  $\pm 1.5$  dB window above 150 Hz.

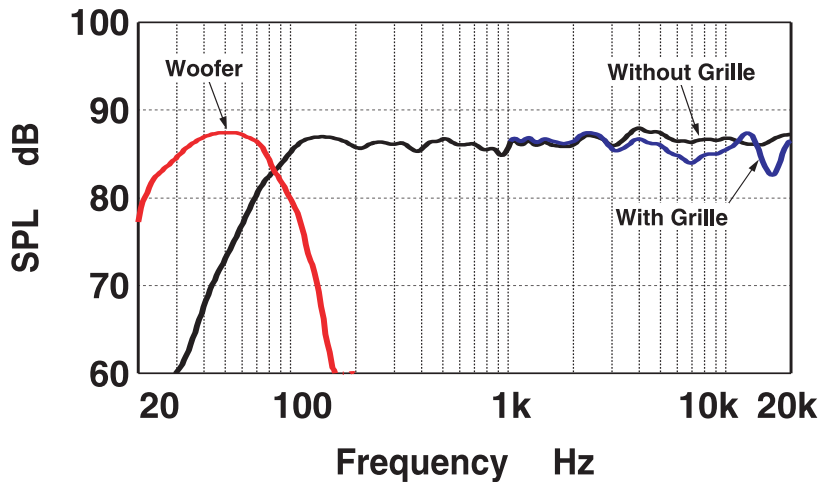


Fig. 1: One-meter, on-axis frequency response with 2.83 V rms applied.

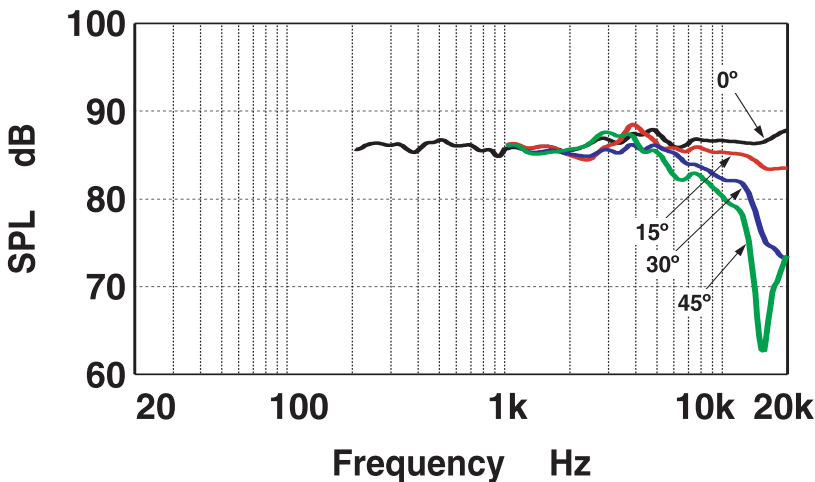


Fig. 2: Horizontal off-axis frequency responses.

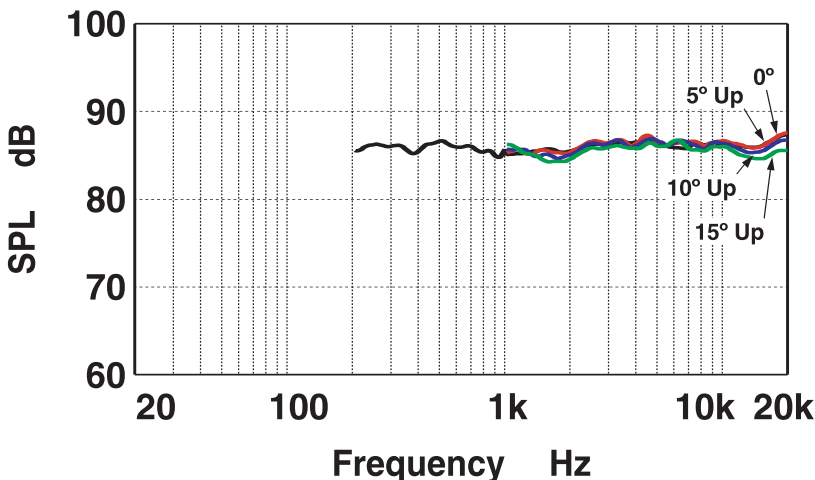


Fig. 3: Vertical off-axis frequency responses above axis.

The Intermezzo 4.1t's horizontal and vertical off-axis frequency responses are shown in Figs. 2 through 4, respectively. The horizontal off-axis curves with 15° increments in Fig. 2 are well-behaved but exhibit rolloff above 12 kHz at angles of 30° and beyond. The system's vertical off-axis curves out to ±15° in Figs. 3 (up) and 4 (down) are exceptionally well-behaved and exhibit hardly any response aberrations through the upper crossover region between 2 and 3 kHz.

Figs. 5 and 6 show the input impedance magnitude and phase of the upper frequency portion of the 4.1t (less subwoofer), with and without the system's highpass filter engaged. Fig. 5 indicates an impedance minimum of 3.2 ohms at 120 Hz with the highpass engaged, and a maximum of about 18 ohms is exhibited at 2.8 kHz with the highpass off. With the highpass filter engaged, the system's impedance rises to above 20 ohms at 20 Hz. The minimum rises to 4.4 ohms with the highpass off. The system's impedance phase in Fig. 6 appropriately follows the magnitude response as any well-behaved minimum-phase impedance should. With the highpass filter on, the low-frequency phase drops to nearly -90°, as it should for a capacitive system. The 4.1t should be an easy load for any competent power amplifier or receiver.

The continuous sine wave total harmonic distortion (THD) of the Intermezzo 4.1t versus axial sound pressure level (SPL) in dB is shown in Fig. 7. The THD for each frequency in the range of 20 to 80 Hz at each third octave is plotted separately in the figure. The level was raised until the distortion became excessive or the system could not play louder because of the limits of its built-in amplifier. The distortion was measured in the nearfield of the woofer and then extrapolated to the levels generated at 1 m in a free space. My experiences with many sub-

woofers using 12" to 15" diameter drivers indicate a ratio of about 28 dB between the nearfield sound pressure and that measured in the farfield (usually 2 m ground-plane measurements, which correspond to 1 m free-field measurements); i.e., the nearfield pressure is 28 dB louder than the farfield pressure.

Fig. 7 plots the THD values computed from the amplitude of the 2nd to 5th harmonics as a function of the fundamental's SPL. The figure indicates a robust bass output rising above 110 dB at distortion levels less than 10% between 40 and 80 Hz. At lower frequencies, the distortion rises to higher levels at correspondingly lower fundamental SPL levels, although, even at 25 Hz, levels above 100 dB can be generated at distortion levels below 20%. All in all, the 4.1t's subwoofer can reach some fairly impressive levels in the bass range. Remember, however, that at low frequencies in a typical listening room, subwoofers can play significantly louder due to room gain than they can in a free-space environment without room boundaries.

Fig. 8 plots the 4.1t subwoofer's maximum peak SPL as a function of frequency for a transient short-term signal, which was a shaped 6.5-cycle tone burst. The graph represents the loudest the sub can play for short periods of time in a narrow restricted frequency band in a free-space environment. In-room levels will be significantly higher. These levels are significantly higher than the continuous sine wave levels shown previously in Fig. 7 and represent the peak levels that can be reached short term, using typical program material. These data indicate that below 40 Hz the 4.1t significantly outperformed its predecessor, the Compositions P-FR system, as I noted in the introduction. The bass output of the 4.1t places it solidly in the upper third of all the systems I have tested, including several stand-alone subs.

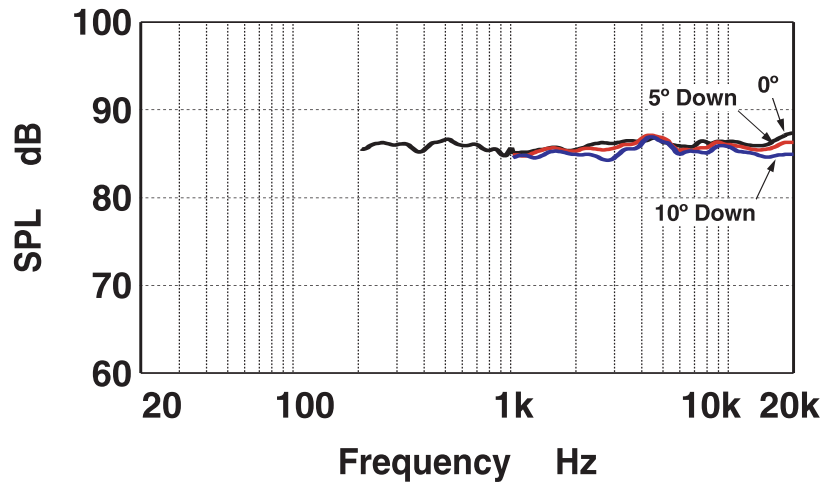


Fig. 4: Vertical off-axis frequency responses below axis.

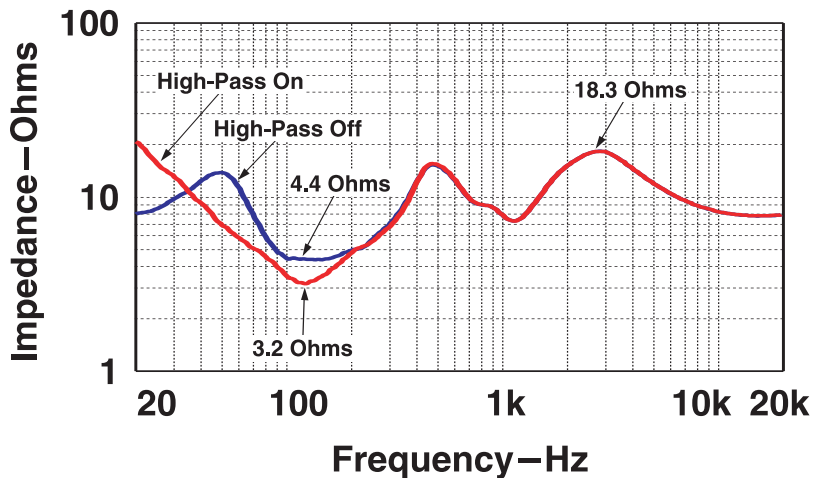


Fig. 5: Impedance magnitude.

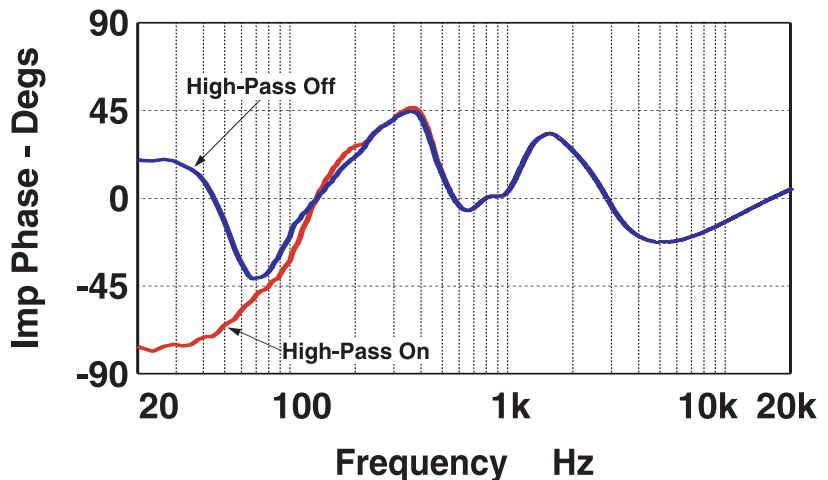


Fig. 6: Impedance phase.

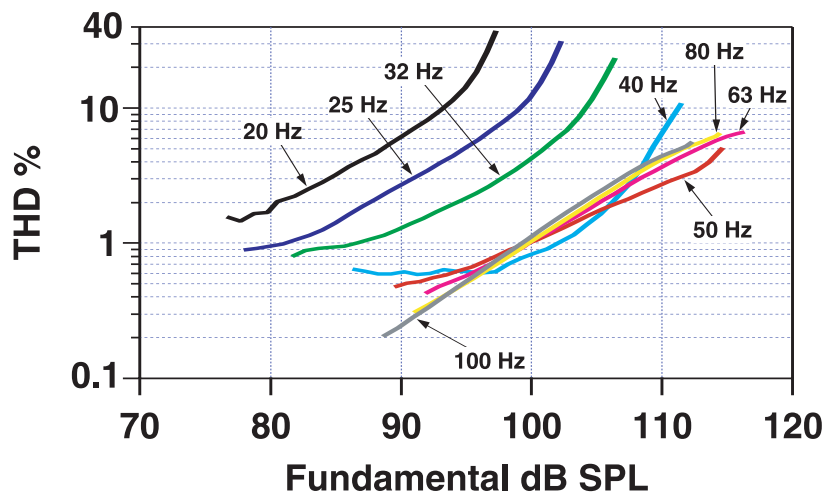


Fig. 7: Woofer harmonic distortion (THD) vs. fundamental level, 20 Hz to 80 Hz.

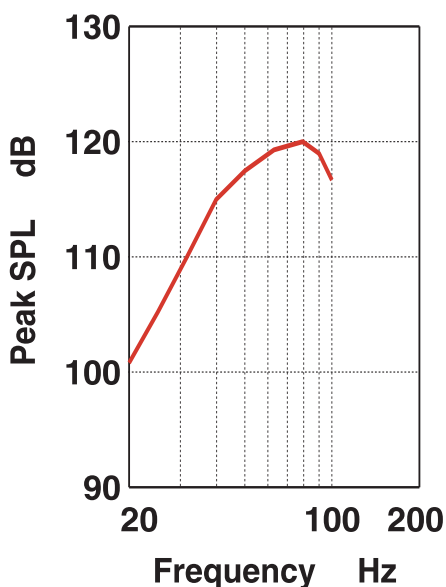


Fig. 8: Woofer maximum peak SPL vs. frequency.

### Use and Listening Tests

Although each Infinity Intermezzo 4.1t is quite heavy at 93 lbs., they were relatively easy to unpack and move around. Without spikes attached, they could be walked around on my listening room's carpet without much difficulty for positioning. Once set up, the 4.1t's presented a strikingly handsome appearance with a thoroughly modern look. With their curved and sculptured metallic design

and Infinity's attention to detail, they definitely did not present the usual mundane picture of wooden rectangular boxes. With grilles removed, the picture was no less likable. The side-mounted woofers had a heavy-duty, no-nonsense look that urged me to "let's turn these babies on and see what they'll do." The low end of the 4.1t's did not let me down. It was like having a pair of good subwoofers, one on both sides of my room!

I evaluated the Intermezzos as two-channel stereo speakers and not as home theater systems. Their performance was outstanding in almost every area. They would perform very well in either situation. They strongly competed with, and sometimes exceeded, the performance of my reference speakers, the B&W 801 Matrix Series III's. I listened to them standing by themselves as well as alongside the reference speakers in a rapid-switching A/B comparison setup. The 4.1t's did not require any line-level attenuation to match the sensitivity of the reference systems. Their volume level was essentially the same as of the B&W's when reproducing the same broadband program material.

I first went through Infinity's R.A.B.O.S. procedure of setting the

bass level and equalization (EQ), using their sound level meter (SLM) and CD. My intentions were first to use their supplied SLM and CD along with their suggested procedure long enough to gain familiarity with them to report in this review, and then switch over to my one-third-octave real-time spectrum analyzer (an AudioControl Industrial SA-3050A) to finish the EQ and level-setting process.

But—I was fooled! Infinity's method worked so well I continued using it to measure the room response and set the built-in parametric equalizer. I only used the real-time analyzer to set the overall bass-to-upper-range balance. Part of the problem with using the real-time analyzer and pink noise (played off the Infinity CD or the built-in noise generator) was the variability of the band readings due to the inherent randomness of the noise. The R.A.B.O.S. system, in contrast, uses sine wave warble tones, which inherently exhibit much less level variation. The warble tones, interestingly, worked better with the real-time analyzer but of course energized only one band at a time. The warble tones sounded like something from a '50s sci-fi movie, *The War of the Worlds* or *Forbidden Planet!* The sci-fi ambience was reinforced by the SLM, which looked like a cross between a Star Trek communicator and a Flash Gordon blaster. Setting the width or Q of the parametric equalizer was made much simpler with Infinity's graphical scheme, using the adjustable plastic gizmo.

The measured bass response of the 4.1t's in my basement listening room exhibited a broad peak of about 8 dB at 26 Hz as referenced to the response between 60 and 100 Hz. When the peak was equalized with the Intermezzo's built-in parametric equalizer, the bass response was much flatter and better behaved. The equalizer's controls, which vary

frequency, level, and width, are on the front of each system, accessible with a supplied screwdriver through small holes.

Now to the interesting part: how did they sound? In a word, excellent! Interestingly, their sound was extremely close to my reference system's on almost everything I listened to. I often had a hard time telling which system was playing when set up side by side. Sometimes I couldn't believe my A/B switch and had to walk up close to the systems to determine which was playing! Bass was very extended and flat; midrange was smooth and liquid; while the highs were quite neutral and very revealing of whatever I played. High-frequency response was smooth and extended, but the highs were slightly emphasized as compared to the B&W's, although they did not lend an air of brusqueness to vocal sibilance, unlike many systems. Soundstaging and imaging were excellent, with a very stable center image on mono vocal material. The systems really shined when played loud on complex orchestral material with percussion. Even so, I did notice a bit of upper-bass/lower-mid congestion when I played loud pipe organ material, as compared to the reference systems.

The one standout sonic feature of the Intermezzos was their excellent bass response. They could shake the walls and everything attached when played at high levels with material having sub-40-Hz content. Yeah...I know you are supposed to track down and eliminate all the spurious vibrations and rattles in your listening room, but I use them to check for the presence of honest-to-goodness high-level bass energy in the room. Few systems I listen to are capable of rattling the walls; the B&W's and the Intermezzos can easily do this.

I found myself getting out all my favorite CDs with high-level low-bass

content to audition over the 4.1t's. This included Telarc's Beethoven "Wellington's Victory" (Telarc CD-80079) with the digitally recorded canons, the bass drum on "Ein Straussfest" (Telarc CD-80098), the kick drum on Spies "By Way of the World" (particularly tracks 6 and 7, Telarc CD-83305), the low pedals on the organ version of the Mussorgsky "Pictures at an Exhibition" (Dorian DOR-90117), and the jet planes and miscellaneous sound effects on "The Digital Domain: A Demonstration" (Electra 9-60303-2). The excursion of the woofers of the 4.1t was truly scary, a full 1.2" peak-to-peak capability.

The system really came into its own on loud rock music with heavy kick drum and bass guitar. I promptly turned the 4.1t's front-mounted bass-level control up to maximum to provide concert-level bass on this material. The 4.1t took all I could give it while reproducing a very stimulating bass whomp that I could feel in the pit of my stomach. There's got to be something humorous about an early-sixtyish loudspeaker reviewer sitting around listening to the likes of ZZ-Top, AC-DC, and Kiss at near concert levels to evaluate speakers. It's fun though! Who said you couldn't have fun with your hi-fi?

On the pink-noise stand-up/sit-down test, the 4.1t's were nearly perfect, exhibiting hardly any midrange tonal changes when I stood up—the full equal of the B&W 801's in this regard. I did uncover a bit of a problem with the Infinity's upper bass and lower midrange when I listened to my 6.5-cycle shaped tone bursts (the same bursts I used to measure maximum peak SPL for Fig. 8) in an A/B comparison with the B&W's. At 40 Hz and below the Infinity Intermezzos were the equal of the B&W systems. Between 50 to 80 Hz, the 4.1t's could play significantly louder and cleaner than the

B&W's. However, from 100 Hz to 200 Hz, the B&W's output easily bested the Infinity's because of the limitations of the rather smallish 6½" cone bass/midrange used by the 4.1t. The 4.1t's 6½" bass/midrange has generous excursion capability but with its smaller area could not keep up with the air-moving capability of the B&W's much larger 12" bass driver.

The 4.1t's did a particularly good job on well-recorded female vocals, projecting a nearly perfect, very realistic center image with no trace of harshness or irregularities. Although the systems shined on large-scale complex program material played loud, they were equally at home on intimate material such as string quartets and other classical chamber music.

'Nuff said. I was very impressed with the Infinity Intermezzo 4.1t's. They performed excellently on everything I listened to, and I was particularly impressed with their bass capability. Their imaging and soundstaging was flawless, and they could play loudly and cleanly on complex program material that profits from loud playback. I much liked their adaptability to match their listening environment, using the built-in parametric equalizer and the easy-to-use setup procedure with the supplied sound level-meter and CD. Their thoroughly modern good looks and top performance make them naturals for any home theater or stereo listening setup.

To get more detailed information on the Intermezzo 4.1t's and other Infinity systems, I suggest checking out their Web site (listed above) and also requesting copies of their quite interesting and informative white papers on their method of equalizing room effects (R.A.B.O.S.) and the story behind their ceramic metal matrix diaphragms (C.M.M.D.).

—Don Keele