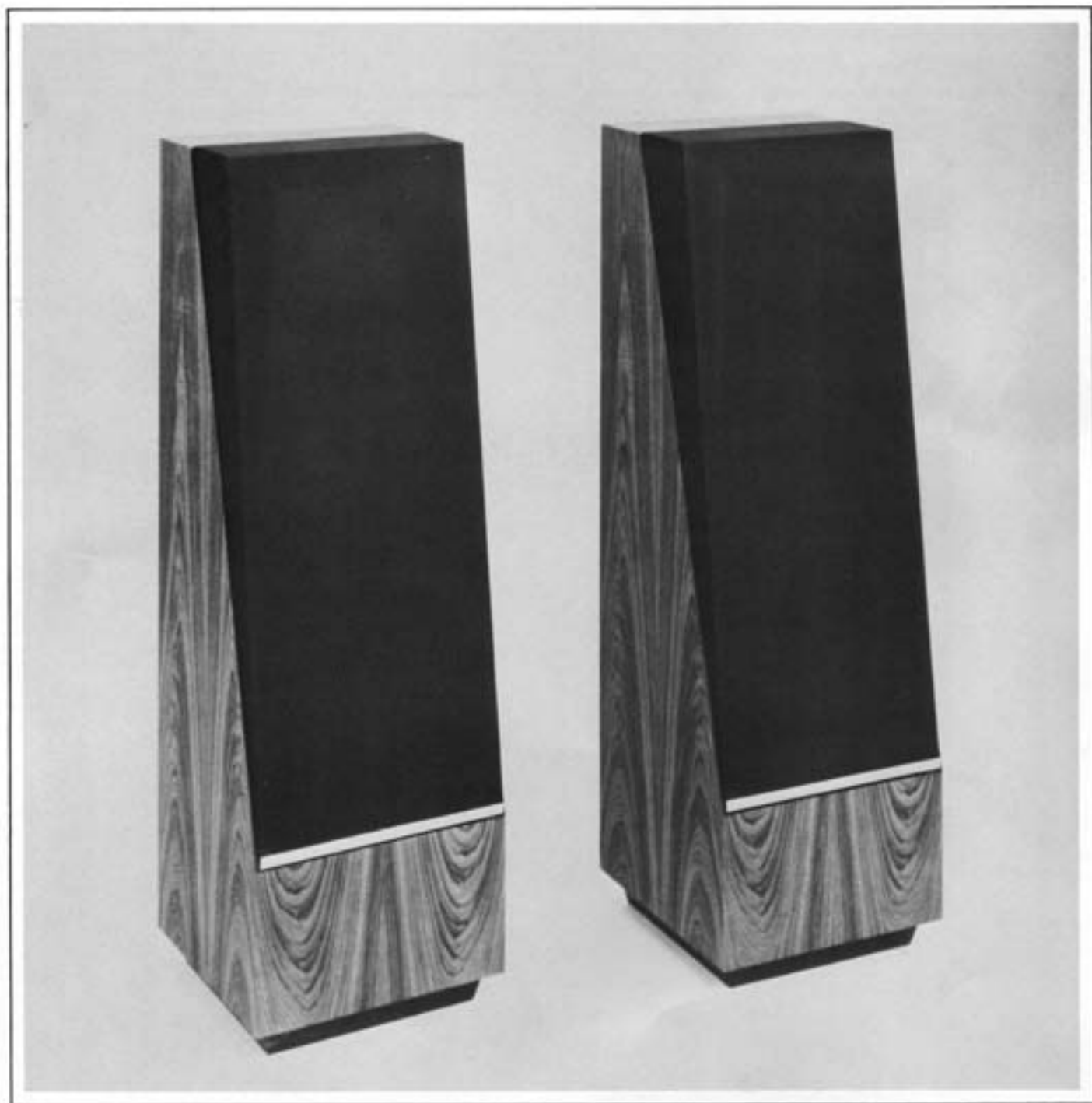


THIEL

Coherent Source Loudspeaker
model CS3



*We believe that the CS3 is
musically more accurate in more
ways than any other loudspeaker.*

At THIEL Audio, we design and build state-of-the-art, high performance loudspeakers — speakers that reproduce extraordinarily realistic music.

The THIEL model CS3 is very unusual because it not only performs extremely well in all conventional respects, it also preserves all time and phase information contained in the musical signal. By accurately reproducing all this information, the CS3 allows you to experience your favorite music exactly as it was intended. We believe that the CS3 is musically more accurate in more ways than any other loudspeaker. We invite you to listen to it with music you love. Your ears will tell you why we are proud of our work.



Together, the time and phase coherence of THIEL speakers make a significant advance toward the goal of perfect music reproduction.

REPRODUCING MUSIC

The Musical Signal

Musical sounds consist of simultaneous vibrations at many different frequencies whose relationships of amplitude, time, and phase are specific and constantly changing. These relationships create the uniqueness and individuality of every musical sound and are the reasons why the same note sounds different on two different instruments -- a guitar and a piano, for example.

In order to preserve the true sonic character of music, all of the relationships of amplitude, time, and phase must be accurately reproduced.

Limitations Of Conventional Speakers

Even the best conventional speakers attempt to reproduce only the amplitude relationships of music. These designs ignore the time and phase information which conveys most of the spatial characteristics of music. Therefore music reproduced by these designs does not seem to occupy real space and always sounds artificial. As a result, your brain must work harder to correlate the sound of such speakers with your inner reference of live music. This extra mental effort prevents you from enjoying recorded music as much as you would a live performance.

Advancing The Art

In 1976, we began developing speakers that could preserve all the information in a musical signal. Our efforts produced in 1978 the THIEL model 03 -- the first full-range, minimum phase loudspeaker to accurately preserve time and phase information over a wide listening area.

This unique design helped make audiophiles aware of the importance of time and phase coherence in musical reproduction. The CS3 is the third generation refinement of this classic coherent speaker design.

There are some speakers that deal reasonably well with time coherence but that do not use phase coherent crossover systems. By physically staggering the position of the drivers, these speakers compensate for some time inaccuracies, but their crossover systems fail to preserve the phase relationships of music -- relationships that are more important to accurate sound reproduction than driver position by itself.

Together, the time and phase coherence of THIEL speakers make a significant advance toward the goal of perfect music reproduction.

What Is Time Coherence?

Time coherence means that the sound from each driver reaches the listener at precisely the same time. This is accomplished by physically positioning the higher frequency drivers farther from the listener than the lower frequency drivers by the precise distance required to compensate for voice coil position and time delays in the crossover.

In our speakers, the drivers are positioned along a sloping baffle, rather than by steps that would create diffraction colorations. All our drivers are mounted vertically so that their relative distance to the listener does not change with the horizontal position of the listener, ensuring that you can hear coherent reproduction over a broad area.

Time coherence gives a sense of focus and enhances resolution of detail.

What Is Phase Coherence?

Phase coherence, simply stated, means that all of the drivers push and pull in the same direction, in step with the input signal at all frequencies.

Our speakers achieve phase coherence by having the crossover network complement the characteristics of the drivers in their enclosures, so that together they provide gradual, first-order (6dB/octave) roll off slopes for each driver. This is the only crossover type that provides uniform frequency response, uniform phase response, and uniform power response.

Phase coherence provides a natural, spacious, three-dimensional sound image and extremely "alive" reproduction of transient musical sounds.



The step signal response of a conventional crossover system illustrates both time smear and phase distortions of a transient signal.



This is the step signal response of a "time-corrected" crossover system. Although time smear is reduced, phase distortions remain unchanged.



This step signal response of the THIEL Coherent Source crossover system shows completely coherent response to the transient signal.

Good specifications alone do not guarantee a musically accurate speaker.

Listening And Measuring

Good specifications alone do not guarantee a musically accurate speaker because conventional measurements give only a partial description of performance. There are some types of sonic faults which are apparent to the ear but difficult to interpret from measurements. Therefore, listening also plays a major role in our design process. We literally spent thousands of hours listening to identify subtle imperfections. By correlating these perceived imperfections with measurements, the causes were eventually isolated and corrected, and the results checked again by listening.

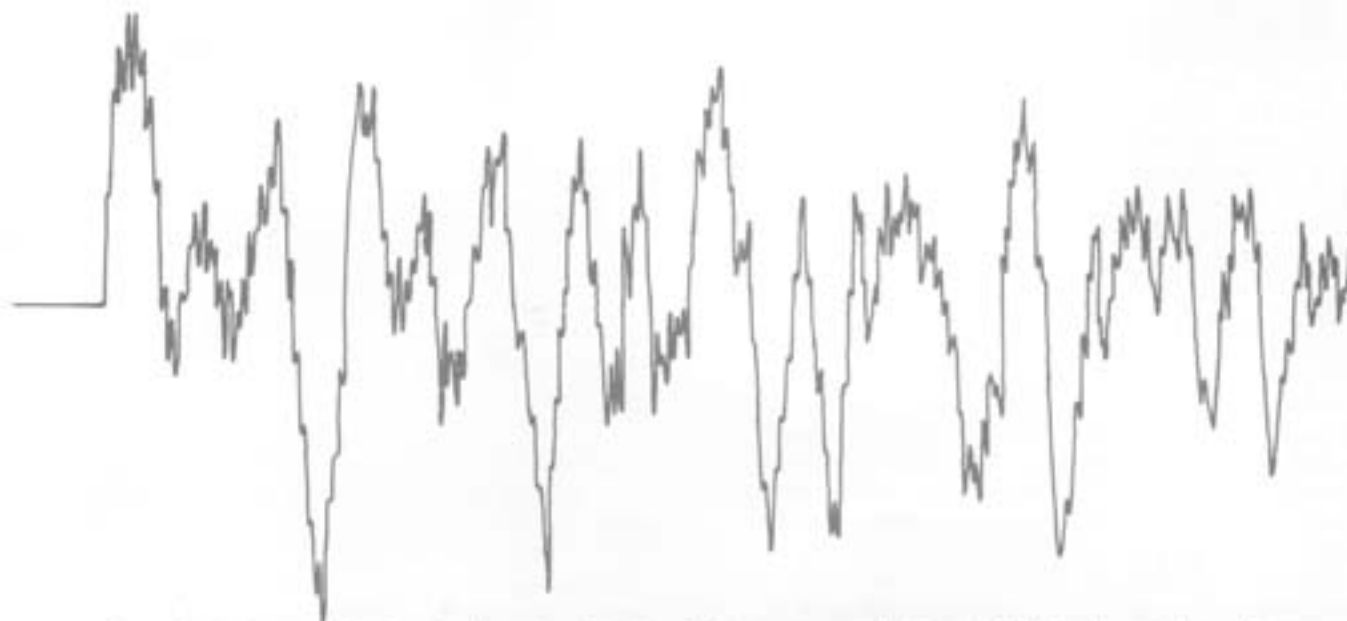
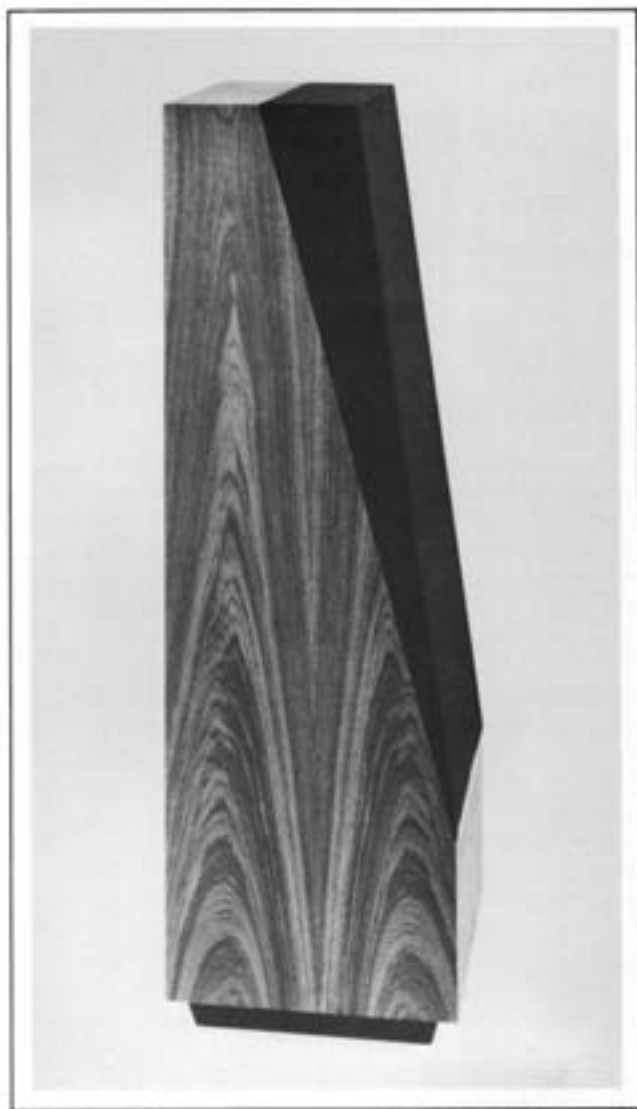
This painstaking process provides more than good specifications; it ensures a high level of musical fidelity.

Quality

We have a strong commitment to providing products whose design, materials, and construction are of the very highest quality. Our products are engineered with thoroughness and attention to detail to ensure the highest level of performance.

Only very high quality materials are used. For example, all driver baskets are die cast magnesium, all crossover capacitors are polypropylene and polystyrene (or by-passed with these types), and the cabinet walls are twice as thick as usual. Every speaker is thoroughly tested to ensure it meets the standard of the design prototype.

This care in executing all design details, while costly, results in important benefits for you: high quality musical reproduction and a high degree of ruggedness, consistency, and reliability.



Even 50 milliseconds of a single piano note illustrates the immense complexity and subtlety of musical sounds.

*Our goal is to build loudspeakers
that do not compromise any
musical characteristic.*

PERFORMANCE

Music has several independent characteristics which must all be reproduced for a complete and faithful musical experience:

- **Tonal Balance** — determines the exact timbre of each musical sound.
- **Imaging** — is the effect of sounds existing in real, three-dimensional space.
- **Clarity** — refers to the subtle detail and distinctiveness of musical sounds.
- **Dynamic Range** — is the contrast between loud and soft musical sounds.
- **Frequency Range** — extends from the deepest "felt" vibration of a bass drum to the shimmering delicacy of a triangle.

Some speakers reproduce a few of these characteristics well, but usually at the expense of others. For example, planar designs provide a high degree of clarity but are inherently limited in deep bass response, dynamic range, and imaging. Our goal is to build loudspeakers that do not compromise *any* musical characteristic.

We take pride in the high performance of the THIEL model CS3 in all aspects of music reproduction.

Tonal Balance

Correct tonal balance means that the musical spectrum is reproduced without over or under emphasis of any part. Correct tonal balance allows the music to be heard without the speaker imposing its own tonal coloration.

The extremely accurate tonal balance of the model CS3 ensures faithful reproduction of the exact timbre of each specific musical sound. Voices sound natural, not nasal or constricted, and a tenor saxophone is not mistaken for an alto nor a viola for a violin.

Imaging

The ability of a speaker system to recreate the positions of instruments in three-dimensional space is called imaging. Two criteria must be met for a speaker to provide natural imaging. First, a speaker should not generate its own false spatial clues through diffraction or other delayed sources of energy from the enclosure. In designing the CS3, we paid a great deal of attention to removing all sources of delayed energy. This eliminates boxy colorations and contributes to open and spacious reproduction.

Secondly, all spatial information in the musical signal must be reproduced through the speakers. The CS3 preserves spatiality because it accurately reproduces all the phase and time information in the musical signal. As a result, the placement of voices and instruments can be easily identified.

The CS3 reproduces all front-to-back information provided by the source, correctly placing instruments in the positions they were originally recorded. The sound image is wide, extending even beyond the speakers, and it remains stable in space and does not shift with changes in listener position.

The CS3 imparts a unique and exciting sense of tangibility that cannot be provided by conventional speakers.

Clarity

Clarity refers to the ability of a speaker to preserve subtle musical details. These details contribute to convincing musical reproduction and are necessary for a sense of reality and authenticity. They allow instruments to remain separate from one another and individual voices in a chorus to be heard distinctly.

We have ensured the preservation of delicate musical information in designing the CS3 by greatly reducing diaphragm resonances in drivers, resonances in cabinet walls, diffraction effects, crossover component distortion, and other factors. Every detail of design and construction helps to preserve musical nuances that enhance musical enjoyment.

In addition, the phase and time coherence of the CS3 provides greater clarity because all the harmonics of each musical sound reach your ear at the same time and with their phase relationships intact. This clarity is most noticeable in transient musical sounds such as guitar plucks and percussive sounds where the transient detail remains clearly focused in time.

Dynamic Range

Dynamic range is the difference between the softest and the loudest sounds that can be reproduced without significant distortion. Wide dynamic range ensures the preservation of contrasts that are crucial to musical enjoyment. The CS3 can realistically reproduce highly demanding instantaneous levels because of its high efficiency and capacity to handle power, and it can reproduce soft sounds musically because of its high resolution of detail and low distortion.

The CS3's wide dynamic range provides clean and delicate reproduction of complex music, even at high volume.

Deep Bass Response

The THIEL CS3 achieves deep bass response, uniform to 22Hz, by incorporating an electronic bass equalizer as an integral part of the system. Because of this innovative technique, bass response can be extended about one octave deeper, while maintaining high efficiency and a moderately small enclosure.

The unusually deep and powerful bass response of the CS3 provides a musical foundation that greatly contributes to the realism and emotional impact of music.

We have a strong commitment to providing products whose design, materials, and construction are of the very highest quality.

COMPONENTS

The High Frequency Driver

The 28mm soft-dome tweeter incorporates every possible refinement of design to achieve an uncompromisingly high level of performance. It provides clear, open reproduction with unusually good dynamic range. Its response is extremely smooth, without dips or peaks that would cause coloration, and extends to beyond 35KHz. The extended response eliminates phase shift in the upper end of the audible spectrum for an open and delicate sound.

The large magnet and the lightweight diaphragm contribute to the CS3's high efficiency and very fast rise time of only 12 microseconds. The center pole piece and the magnet cavity are vented to provide a very low and well-damped fundamental resonance. The voice coil is wound with hexagonal wire, giving it higher mechanical rigidity. The magnetic gap is filled with ferrofluid to provide more efficient cooling of the voice coil. The multistrand lead wires eliminate the possibility of breakage. These factors contribute to the CS3's high power handling capacity and reliability.

The Mid Frequency Driver

The 11 cm midrange unit of the CS3 has a very wide bandwidth of more than seven octaves, suiting it particularly well for use in this system with gradual crossover slopes. The diaphragm is coated with a viscous compound which contributes to its very smooth frequency response by damping undesirable resonances in the cone. The suspension is a rubber half roll which, together with the vented pole piece and long voice coil, ensures low distortion in the lower range. High efficiency is maintained by the use of a very large magnet. Its very rigid die-cast magnesium basket provides greater clarity of reproduction.

The Low Frequency Driver

The CS3's 25cm woofer provides powerful deep bass response. The large bass output capability is achieved by the use of a very long voice coil in conjunction with a very large magnet. This design allows a constant amount of coil to be in the magnetic gap during large excursions, so there is low distortion even while reproducing deep bass tones at high volume.

The woofer provides clear reproduction because of its rigid, die-cast magnesium basket, which greatly reduces vibrations that would obscure musical detail. The rubber roll surround and treated diaphragm contribute to its smooth frequency response.



The high frequency driver



The mid frequency driver



The low frequency driver

The Crossover Network

The crossover network is the heart of the CS3 system and its most complex and critical component. Its primary function is to direct the different frequencies of the incoming signal to the appropriate driver. In addition, the crossover network of the CS3 complements the characteristics of each driver to preserve all phase information, which is extremely important for the correct spatial representation of music. It also corrects small imbalances in the response of the drivers and is responsible in large part for the high degree of accuracy of the system.

Still another function of the CS3's crossover is the equalization of the impedance of the system. By correcting impedance deviations, the driving amplifier can "see" a resistive rather than a reactive load. This load is easier for the amplifier to drive and ensures its highest performance.

Polypropylene and polystyrene capacitors and air core inductors are used to ensure extremely low levels of distortion.

Electronic Bass Equalizer

The CS3 speaker system incorporates an active electronic bass equalizer to achieve very deep bass response. In conventional systems, deep bass response can be obtained only by resorting to inefficient systems and large enclosures. Equalization allows us to circumvent these limitations and makes possible a system which provides exceptionally deep bass response while maintaining moderately high efficiency in a relatively small enclosure.

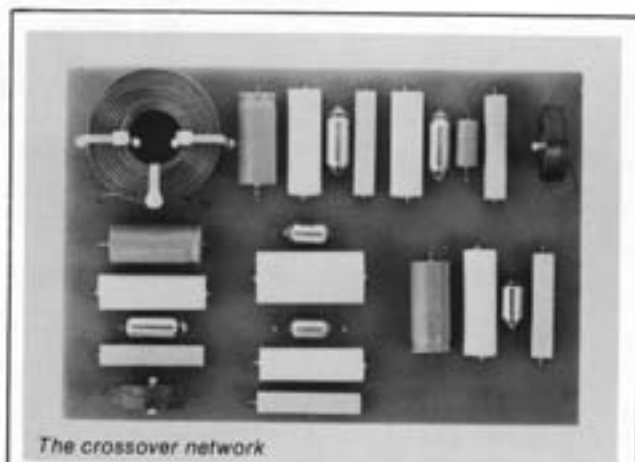
The bass equalizer causes the amplifier to provide an increased amount of power to the speaker at very low frequencies in order to exactly compensate for the falling response of the woofer at those frequencies. The boost is applied to frequencies below 70Hz and reaches a maximum of 12dB at 25Hz. The unit is inserted into the signal chain either through the tape monitor loop of the preamplifier or receiver or between the preamplifier and the power amplifier.

The equalizer employs sophisticated discrete FET circuitry which achieves extremely low levels of all types of distortion. All components are of the highest quality. Only polypropylene and polystyrene capacitors and metal film resistors are used.

The Cabinet

The cabinet of the CS3 is a very important component of the system and is responsible for several aspects of the speaker's high performance. The sloping baffle correctly positions the drivers for accurate time response and is also designed to eliminate diffraction of the tweeter's energy. Diffraction is caused by cabinet edges, and results in delayed sources of energy that obscure detail and create colorations. To eliminate this effect, the baffle sides are precisely curved so that the energy of the drivers does not interact with the edges of the cabinet.

The cabinet walls are 28mm thick in order to provide a rigid mount for the drivers and to reduce vibrations that would obscure subtle musical detail. Our cabinets are made with carefully selected, genuine Teak veneers in matched pairs with a high quality natural lacquer finish for beauty and durability.



The crossover network



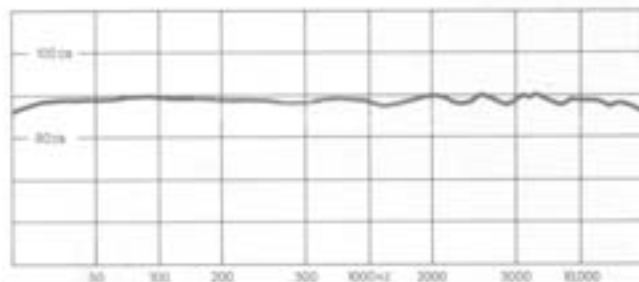
The electronic bass equalizer



The sloping baffle of the model CS3 positions the drivers for proper time coherence.

PERFORMANCE DATA

Frequency Response



Frequency response gives an accurate indication of the tonal accuracy and balance of the loudspeaker system, provided that distortion and resonances are at a minimum. We believe frequency response is, in fact, more important than is usually appreciated and therefore we take great care to achieve a very high degree of accuracy in this respect.

This graph represents the amplitude of the CS3's output through the audible frequency range. It shows how closely the speaker's response approaches the ideal of being uniform at all frequencies. The frequency range is 22Hz to 22KHz between the -3dB points. The general shape of the curve is flat, with no large area deviating from a straight line, indicating extremely neutral tonal balance. Also, the response line itself is exceptionally smooth with deviations of less than 1 1/2 dB from 24Hz to 18KHz.

This measurement was taken under anechoic conditions and therefore represents the response of the speaker itself, independent of interactions with a room. This type of response is the most relevant to musical performance since the initial primary sounds from the speaker and the secondary reflected sounds of the room environment are heard independently. In order for the initial sound to be correctly balanced, it is necessary for the anechoic response of the speaker to be uniform.

Step Response



A step signal, like a musical sound, is made up of many frequencies that have precise amplitude and phase relationships. For a step signal to be accurately reproduced, phase response, time response, and amplitude response must all be accurate. Because this wave form is so valuable, it is commonly used to evaluate the performance of electronic components and cartridges. It is not typically used for speaker evaluation because most speakers are not able to reproduce it recognizably. Because the model CS3 has accurate phase, time, and amplitude response, it will reproduce a step signal extremely well, indicating a totally coherent and tonally accurate response.

There are two major characteristics to note about the above step response. First, the vertical line is very straight and changes direction cleanly, without any pre-shoot, indicating time and phase coherence. Secondly, the horizontal line is very smooth, evidence of very little ringing and a flat frequency response.

Bandwidth (-3dB)	22Hz-22KHz
Amplitude Response	24Hz-18Hz±1 1/2dB
Phase Response	Minimum±10°
Sensitivity	89dB @ 1 watt-meter
Impedance	4 ohms
Recommended Power	40-250 watts
Size	13 x 13 x 41 inches
Weight	75 pounds

The THIEL model CS3 system has an automatic 90 day warranty to the original owner. An optional extended 10 year warranty is available free of charge when the product is purchased from an authorized THIEL dealer.

Cabinet finishes other than Teak are available on a special order basis.

Associated Equipment

Because the CS3 is an extremely accurate and revealing speaker, it will benefit from association with the very best equipment. For the same reasons the CS3 reproduces all musical information, it will also reproduce any distortion generated by other components in the audio chain.

This does not mean you must only buy very expensive associated equipment; however, your other equipment should be carefully selected on the basis of its sonic performance and should be properly set up.

Your THIEL dealer has been chosen for his ability to assemble a musically satisfying system and to offer expert advice. We urge you to take advantage of his knowledge and experience.

You Can Hear The Difference

Some potential buyers of sophisticated audio equipment lack confidence in their own ability to appreciate high quality musical reproduction; they assume only an "educated" ear can evaluate the equipment they are listening to.

We think this is a fallacy. Everyone is familiar with the sound of live music, and since this is the basic reference for judging music reproduction, everyone qualifies as an expert critic in hearing how well a system succeeds in sounding natural.

We encourage you to use your ability to recognize life-like sounds in choosing your audio equipment.

Coherent Source is a trade mark of THIEL Audio Products Company.

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