THÖRESS

2CD12 . Two-Way Horn Loudspeaker

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96dB/W/m

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P R O D U C T D E S C R I P T I O N

Our horn based 2CD12 Loudspeaker (2CD12-LSP) combines high efficiency (96dB/W/m) with balanced frequency response and excellent sound dispersion within a still modestly sized floor standing cabinet (416 x 346 x 1170 mm). The loudspeaker exhibits the effortless and live sound which only horn based constructions can attain, and yet manages the seamless coherency of the best single cone point-source transducers. Therefor offering a stunningly realistic presentation that will easily measure up to the expectations of even the most experienced and critical music enthusiast, especially when driven by our all-tube single-ended triode or EHT integrated or mono amplifier.

The 2CD12-LSP features several outstanding design principles which set it far apart from competitive loudspeakers components.

CONSTANT DIRECTIONALITY HORN

The loudspeaker relies on a unique two-way design featuring TWO treble horns. A main horn mounted on the front and a complementary super-tweeter horn (with exceptionally wide dispersion) mounted on the top of the cabinet connected in parallel with the main horn. The main horn covers the upper three octaves of the audio band (2kHz-16kHz) and is driven by a high-grade 2-inch compression transducer featuring an ultra-light titanium diaphragm driven by a very powerful neodymium magnet structure, ensuring extremely fast transient response.

Both the main horn and the complementary horn employ a very particular geometry (introduced to the audio world in the early 1970s by the ELECTRO VOICE MANTARAY horn family) in order to attain CONSTANT DIRECTIONALITY (CD). CD-horns are unique in providing a very wide dispersion (nearly) independent of frequency over their entire operational range. By contrast, the more widely used horns with exponential or tractrix geometry are DIRECTIONAL. Their dispersion narrows considerably as the frequency of the radiated sound waves rises. Notably, a property which is also known from full-range drivers and foil transducers! In fact, this is the very reason why loudspeakers which rely on such transducer principles are often perceived as colored or even odd sounding even when they show a flat on-axis response and are auditioned and judged under favorable acoustical conditions. A wide and frequency consistent dispersion characteristic is not only desirable in order to avoid a narrow sweet spot, as it is often believed. It ensures that the timbre of the early reflections (coming from the six room boundaries) follow the timbre of the direct/on-axis loudspeaker output. An irregular dispersion characteristic leads to serious sound coloration which cannot be overcome, nor by smart crossover design, nor via DSP manipulations.

Above 10kHz where the dispersion of the main horn begins to narrow the top horn starts to spread airy highs into the listening room and such compensates for the gently rising directionality of the main horn towards the end of its operational range. Hereby the coherency of the main horn remains completely intact since there is no crossover point between the two horns! Amazingly, thanks to these unique design principles our 2CD12-LSP provides near-perfect sonic properties even when turned 90 degrees sideways to the listening position!

WOOFER

Carefully mated to the two horns on the low end is a 12-inch bass transducer with light paper cone and an exceptionally powerful magnet, one of the best transducers of this kind available today, in our estimation. Due to a unique TRANSMISSION LINE driver loading, the 2CD12-LSP exhibits powerful, extremely fast and airy bass response. This specific design choice allowed us to avoid the more or less pronounced boxy sound characteristic known from loudspeakers of the sealed or vented type (which constitute the vast majority of loudspeakers available on the market today). The cabinet in principle acts as an open baffle shaped as a (short) undamped transmission (time delay) line, whereas the driver is placed about in the middle of the time delay tube. There is no air cushion behind the cone that impairs the linearity of the cone suspension! The rear sound is allowed to propagate into the room and to naturally contribute to the wanted acoustical output of the loudspeaker! The length of the time delay tube simply has been chosen in such a way that this (6-dB, response doubling) superposition of soundwaves happens right in the region where the infinite baffle roll-off of the bass transducer occurs. The free-air resonance frequency and the respective (naturally high) damping behavior of the transducer remain completely unaltered! Acoustical filtering which could impair the transient response of the inbuilt transducer, as in case of conventionally designed sealed or vented loudspeakers, is avoided!

DRIVER LOADING AND TRANSIENT RESPONSE

There are mainly two reasons why sealed/vented loudspeakers tend to sound boxy.

At first, a low frequency driver loaded by a sealed or vented cabinet obviously radiates the same amount of acoustical energy in the cavity of the cabinet as it radiates in the listening room. While the front output of the woofer propagates into the a (SPACIOUS) room the rear output remains trapped in the (SMALL) inner life of the cabinet until it is absorbed (transferred into heat via acoustical friction) after consecutive reflections at the cabinet walls. This obviously causes excessive cavity noise and ringing which oozes out through the driver cone (and the cabinet walls) and such blurr the wanted loudspeaker output, even when the inner life of the cabinet is heavily dampened with absorbing material. Curiously, an effect which has been widely if not completely ignored by conventional loudspeaker design wisdom, probably because it is rather tricky to analyze via acoustical measurement (yet, it is easily revealed by the human sense of hearing).

The second reason why conventional driver loading leads to a boxy sound characteristic is much less subtle and related to TRANSIENT/IMPULSE RESPONSE. Transient response is an essential matter in loudspeaker design as it inevitably involves acoustic and electric filtering! And this does not come as a big wonder since the nature of music is nothing else than a (highly organized) universe of acoustical transient events, after all (If music was a static phenomenon audio science would be a most trivial discipline).

When a cone transducer is loaded by a small, sealed cabinet (small compared to the so called equivalent air volume of the transducer) the air cushion behind the cone forms a spring which has a strong influence on the performance of the inbuilt transducer. From the perspective of technical acoustics, the air-filled cabinet imposes an acoustical second-order high pass filter on the transducer (12dB roll-off of the response below resonance) as a vibrating system. The resonance frequency of the loaded transducer rises while the resonance damping described by the so-called total quality factor Q of the respective filter system decreases (compared to the respective free air conditions). The total quality factor of the high pass filter is unambiguously determined by the magnitude of the air chamber behind the cone in superposition with the free-air transducer parameters (neglecting eventually applied porous filling of the air chamber). Low Q values (large cabinets, high resonance damping, Q around 0.5, Bessel Characteristic) ensure an impeccable transient/impulse response of the system yet the bass response rolls off rather early and is meager. Higher Q values (medium sized cabinets, Q around 0.7) lead to a more pronounced and extended bass response, yet at the expenses of a compromised transient response (Butterworth Characteristic of the filter). Furthermore, Q values approaching or surpassing 1.0 go along with miserable transient response and ripple response at pass band frequencies (Tschebyschev like filters). So the designer of a (passive) sealed box loudspeaker is spoilt for choice. Either he goes for favorable transient response (low Q) and creates a bass slim sounding loudspeaker. Or he chooses a higher Q in view of an extended bass response and accepts compromised impulse response as a penalty. In the latter case the air cushion also tends to behave like a non-linear spring and such forces the driver motor into additional distortion, but this is another story.

Conditions are even worse with vented cabinet loading (bass reflex design). Here the air chamber behind the transducer cone is coupled to a Helmholtz resonator given by a passive cone radiator or an additional (small) air cushion in a port. The rear output of the transducer triggers the Helmholtz resonator to sound radiation which is used to enhance the wanted acoustical output of the loudspeaker. In this case the cabinet imposes a FOURTH-order acoustical high pass filter onto the transducer (24-dB steep roll off below resonance!) which results in further degradation of the transient response of the sound radiating system compared to the sealed box situation. The Q value of the respective high pass filter again determines the frequency and transient response of the swinging system. The design principles for the vented box scenario are considerably more complicated than the sealed box criteria and are exhaustingly covered by the widely applied (but rarely deeply understood) Thiele-Small Theory. There are good and bad vented box implementations, certainly. But they all suffer from a more or less crippled transient response. A hard fact which is admitted even by conventional loudspeaker design wisdom.

CABINET AND CROSSOVER NETWORK

The 2CD12 cabinet is made of poplar plywood. A rather light but stiff sandwich material with high internal damping, making it an ideal choice for cabinet construction. Dark brown oak veneer gives the speakers a neutral appearance, which is believed to match well with all kinds of interior styles. A speaker grill is not supplied with our 2CD12 Loudspeaker. However, as the black transducers optically blend into the dark veneer, a technical look is avoided in favor of an elegant wooden furniture like appearance.

The 2CD12 crossover filter network is based on low-order filters which have been specifically designed and optimised for maximally linear phase response (maximally flat group delay). This is to say that the various frequency components of the signal experience the SAME delay times as the signal runs through the filter from pass band to stop band. Thus, the signal remains consistent and intact in the TIME DOMAIN, overshot and ringing is avoided and near ideal transient response is the result! The crossover network is executed with point-to-point wiring techniques and potted in a non-magnetic die-cast case via sealing compound.

FEATURE OVERVIEW

- Highly efficient floor standing loudspeaker (96dB/W/m).
- Two-way design featuring 2 treble horns connected in parallel.
- Main horn driven by a high grade 2-inch compression transducer. Indirectly radiating complementary super-tweeter horn (mounted on top of the cabinet).
- Very uniform wide-band frequency response and excellent dispersion characteristics due to CONSTANT DIRECTIONALITY geometry of both horns.
- High grade 12-inch paper cone woofer.
- Powerful, extremely fast and airy bass response thanks to our unique OPEN CABINET woofer loading.
- Crossover network executed with point-to-point wiring techniques. Crossover module potted in a non-magnetic diecast case with sealing compound.
- Modestly sized cabinet (416 x 346 x 1170 mm) made of very light poplar plywood, neutral dark smoked oak veneer, weight 38Kg (each loudspeaker).

THÖRESS...

A Tribute to Professional Audio Components
from the Golden Age of the Electronic Tube !