

DECWARE™

High Fidelity Engineering Co.

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High Definition Towers under evaluation in the Decware reference room

**DECWARE / High Definition Tower speakers
model **HDT206EM****

OWNERS MANUAL

**This manual as well as additional information and support can
be found at:
www.decware.com**

*Congratulations on your purchase of our reference grade
full-range single-driver loudspeakers!*

CAUTION

The Decware modified Fostex drivers installed in your new speakers feature a phase guide that replaces the dust cap similar to Lowther and other expensive full range drivers. This means **the voice coil gap is exposed** to the eliminates since it no longer has a dust cap over it to protect it from dirt and contaminants. While this may be common practice amongst high end speaker enthusiast, it does require extra care in using them. A garage or area with high dirt is out of the question. The biggest fear is that metal shavings would get in the gap. Because of the tremendous magnetic flux in this gap there would be no hope of getting the shavings back out so the driver would be ruined. Our warranty does not cover contaminated voice coil gaps. We understand accidents do happen, and repair service is always available in or out of warranty.

DRIVER REMOVAL

If the driver is ever to be removed for any reason, extreme care should be taken to ensure no metal shavings from the mounting screws or other contaminants enter the voice coil gap. The best way to prevent all chances of contamination is to cut a paper circle the diameter of the speaker and tape it to the black rubber trim piece on the metal frame. This would effectively seal the cone from all exterior debris. After you re-install the driver you can remove the paper and tape.

PACKING

Your HDT speakers are shipped with the Decware modified Fostex driver installed. There is also a top plate and grill (both removable) in each shipping carton.

DAMAGE

Please inspect your speakers for damage when you unpack them. Speakers are always insured when shipped from our factory. If you have shipping damage you must keep all packing materials in tact and contact us right away. UPS and most shippers in order to honor an insurance claim will have to come back to your address and either pick-up or inspect the package and its contents to determine if the damage was their fault.

SETUP

Once you have your new speakers unpacked and inspected for damage it's time to set them up and start listening. Your speakers are shipped ready to play.

GRILLS

The removable grills may be left on during playback or taken off. Room acoustics can largely effect a persons preference as to what sounds better, grills on or off. The speakers on either side of the cabinet are passive radiators. They are fairly high mass and pretty tough so no grills are required for the sides. The main speaker is delicate so protection with the grills is advised.

TOP PLATE

Your speaker comes with a once inch top plate fitted with 4 rubber feet that locate on 4 holes in the top of the cabinet. This plate re-directs the sound that comes out of the long shaft (T-LINE) that comes up the rear of the cabinet in such a way that it is dispersed radially into the listening space. If you remove it while the speakers are playing you will find quite a bit of sound coming from this large shaft.

BOTTOM PLATE or SPIKES

Your speaker can be fitted with your choice of bottom plate, or spikes. The bottom plate is cut 1 inch larger than the outside dimensions of the speaker and painted black. It screws onto the bottom of the cabinet. This adds a decorative touch to the speaker and allows the user to easily slide the speaker around on the carpet. If you have a typical listening/family room area to set these speakers up (and of course want the best performance possible) consider this before buying spikes. In rooms like this speakers are often tucked out of the way and fairly close to walls. Spiking the speakers will make it impossible or at least very difficult to move the speaker. While in theory the spikes would improve the sound of the speaker - the reality is - only when the speaker is in the ideal location. In a room like this the ideal location is pulled out into the room right in everyone's way. Being able to slide them around makes it possible to listen them properly and put them back out of the way when you're done. In other words, being able to pull them out into the listening space with no spikes will sound far better then placing them against the wall with spikes.

AMPLIFICATION

Your new speakers have an efficiency of 96 dB with 1 watt at a distance of 1 meter. They have a nominal impedance of 8 ohms. These speakers are ideal for SET (single ended triode) amps because they present the amplifier an easy load and are high in efficiency. Your favorite 2A3 or 300B and similar amplifiers are ideal. A good 2 watt amplifier works nicely for normal listening levels.

What's nice about these speakers is that they will also play the higher power side of the fence without distortion or strain. Push pull amplifiers rated up to 30 watts RMS also work with these speakers and will achieve HUGE playback levels.

THE BEST AMPLIFICATION FOR FIDELITY

These speakers are honest. They let you hear exactly what the limitations of all preceding gear is. Bad recordings will sound bad. Good recordings will sound REAL. The fidelity of any system is restricted by the weakest link in the component chain. This is usually the source, followed by amplification. High quality Tube gear is recommended. Ideally ours.

HOOKING YOUR SPEAKERS UP

There are standard binding posts located fairly high up on the cabinet back. This was done to keep the wire connecting the binding posts and the speaker as short as possible. These will accept bare wire up to 8 gauge, or spade connectors and are marked RED (+) and BLACK (-). These connectors will also accept banana jacks. We recommend decent quality speaker cables. Lamp cord or similar budget wire will hamper the clarity and smoothness of the speaker.

ABSOLUTE PHASE

Just because your equipment is market with (+) and (-) doesn't guarantee your bottom line absolute phase will be correct. Absolute phase is a subtle thing that effect image placement in the sound stage, and sometimes even frequency balance to a small degree. Any piece of audio gear from your source to your amplifiers can and does change absolute phase, usually several times. Lots of audio gear flips absolute phase without flipping it back again. This can be a source, phono stage, preamp, crossover, power amp etc. It is a good idea every so often to reverse the (+) and (-) wires on both speakers to flip the absolute phase and then listen carefully to see which way sounds better. This should be done every time a component in your system changes.

PLACEMENT and BASS RESPONSE

These speakers have wonderfully accurate bass response. However, in smaller untreated listening rooms bass frequencies can accumulate and create a bass peak followed by the inability to hear very low bass. If you are in a small space and have to place your speakers in close proximity to walls or corners you may find the bass is too strong. In the back of the speaker cabinet at the bottom is a rectangle port that can be plugged to reduce bass output.

PLACEMENT AND IMAGING

Provided you have a healthy and happy stereo set, you'll probably notice right away that these speakers image unusually well. They can disappear at distances of only 4 feet from your kneecaps. They are so good in this department that when compared to other single driver full range speaker designs you may feel like it really doesn't matter where you put them. If this happens, please realize that just because the sound you're hearing is better than what you had doesn't mean it's right. Take the time to experiment with placement during the first few weeks. In the smaller room shown on the cover of this manual the speakers are ideally placed. The sound stage goes well beyond



HDT206EM OWNERS MANUAL

PLACEMENT AND IMAGING CONT.

the width of the room as does the depth. This is considered a near-field arrangement with respect to the listening chair and is ideal for those infatuated with the finer points of music playback. In the reference room pictured on the manual being fed with a top notch source the speakers have a perfect frequency balance with believable weight and dynamics while maintaining a glass smooth top end at all times. They were voiced and referenced against our Acoustats and sound almost exactly the same. This is very rare for a speaker to be this good. Point is, these are ideal conditions which you may not have. We can help you hear the full potential of these speakers by consulting you on the room and the rest of your gear at any time - just call us.

The HDT features a super high order cabinet design developed in 1989 by Steve Deckert.



Shown in natural Maple with Grill.

FEATURES

The cabinet design offers superior performance over standard reflex enclosures in both linearity and imaging. It has many of the advantages of a horn loudspeaker with none of the drawbacks. Interestingly enough it works best with drivers designed for horn loading.

Equipped with our modified Fostex FE206E full range drivers, these

High Definition Towers have the following features:

- High efficiency of **96dB** with 1 watt at 1 meter.
- Excellent power handling up to 30 watts RMS.
- Single Point source.
- Decware modified FE206E Fostex full range 8 inch driver.
- New Decware Phase Guide Technology.
- No crossovers of any kind.
- Wired straight through to the back.
- Less than 12 inches of hookup wire.
- Cliff 24K 8 gauge 5-way binding posts.
- No parallel surfaces inside cabinet.
- Dual side firing passive radiators.
- Vertical transmission line.
- Top mounted dispersion plate.
- Internal coupling chambers.
- Three internal and one external reflex ports.
- An internal averaging chamber.
- No internal rear wave reflection problems.
- Wave front propagation from 5 sides of the cabinet.
- Anti-resonant cabinet construction - very dead.
- Available in genuine hardwoods.

CABINET

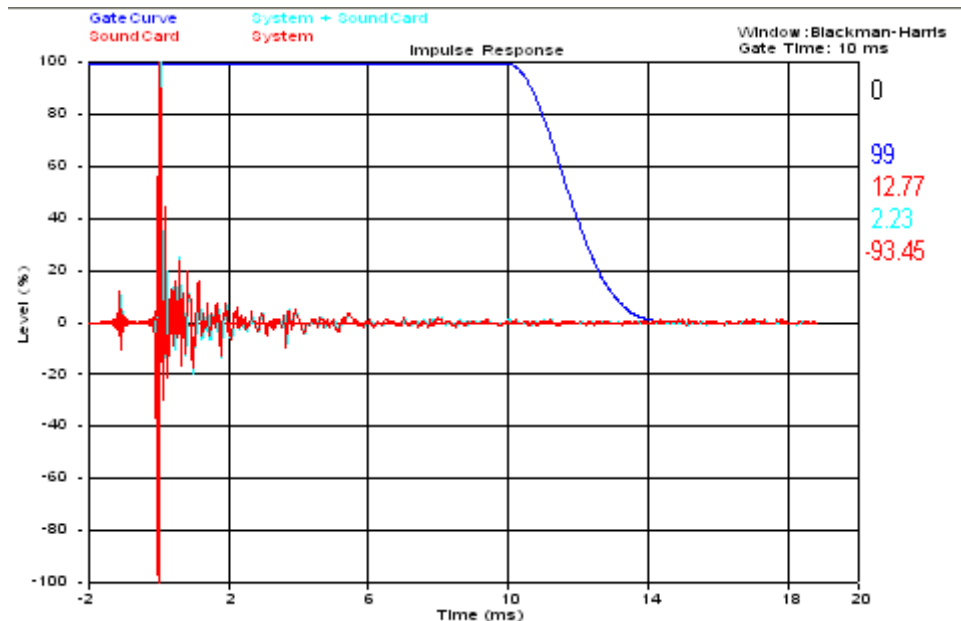
These features are in primarily due to an esoteric multi-chamber cabinet where each chamber has it own resonance followed by a group resonance from the other chambers. Careful tuning creates an enclosure with tuning across several octaves. Normal cabinets are tuned at a single frequency and damp the woofer across one octave with the maximum control at the tuning frequency. This cabinet adds this control at multiple points so similar to a horn, the tuning of the cabinet changes in relation to the music played through it.

SOUND

They sound fast, flat, controlled, very open, and holographic. The do not sound dry, bloated, pinched, tipped up in the treble, beamy, nor do they have any of the typical high efficiency shout made famous by other high efficiency single driver loudspeakers. The bass is very controlled and nicely extended just below 40 Hz.

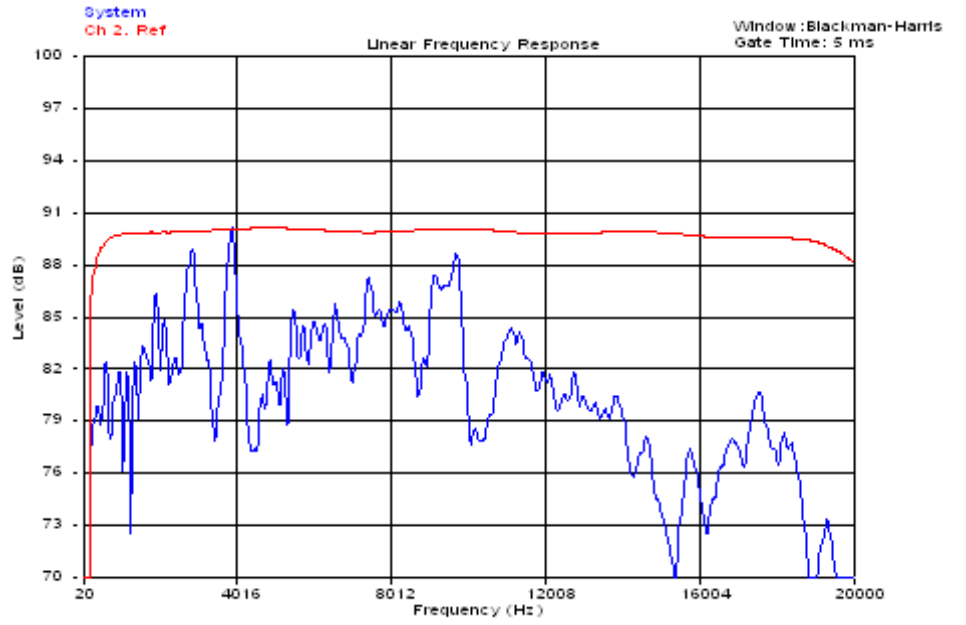
IMPULSE RESPONSE

The speaker and cabinet relationship can be quantified by the resulting impulse response. This is a measure of the speakers tremendous speed.



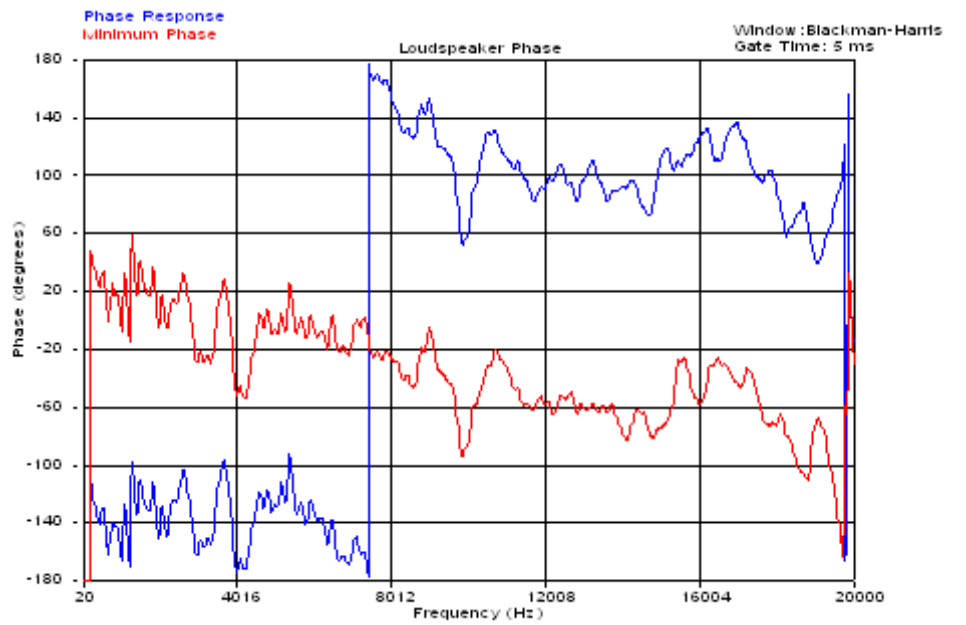
LINEAR FREQUENCY RESPONSE

This is a typical in-room response at 30 degrees off axis.



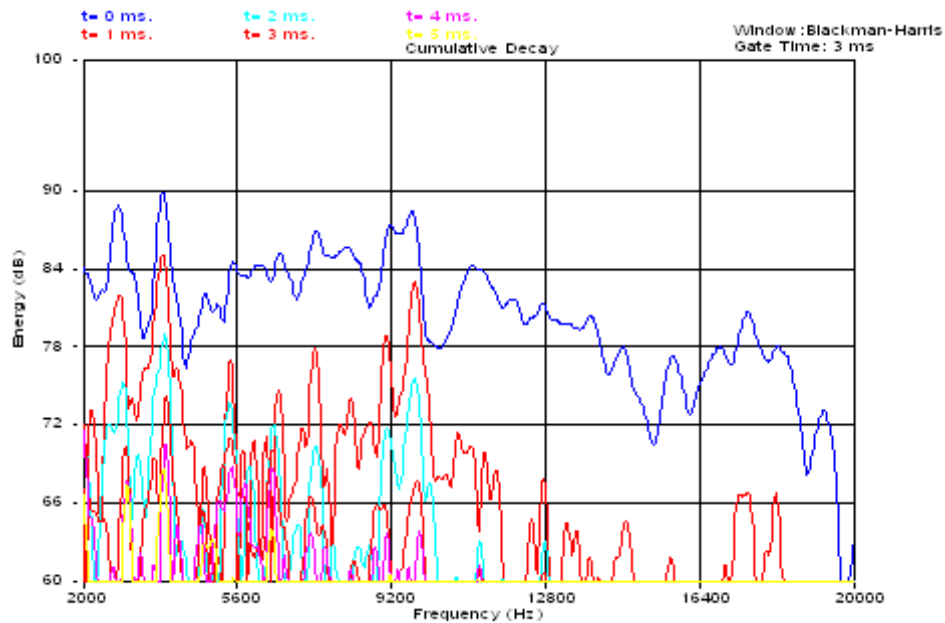
LOUDSPEAKER PHASE RESPONSE

This is the phase response of the speaker across it's frequency band - unusually good.



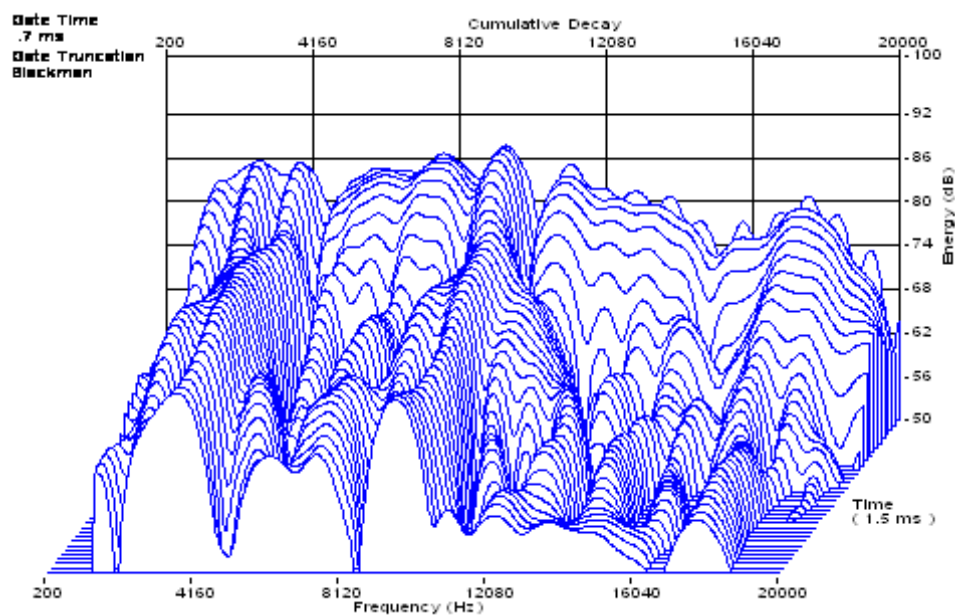
CUMULATIVE DECAY RESPONSE

This represents the typical decay or in-room response over 3 milliseconds.



WATERFALL PLOT

This is the same plot as above but in 3D and over 7 milliseconds.



DESIGN NOTES by Steve Deckert**HOW IT WAS DEVELOPED**

This cabinet design was actually my first serious endeavor into hi-end audio. It came to pass during the 1980's when I was inspired and heavily inflicted with the hi-fi fever after taking my first job in a hi-fi retail shop. At the store I was surrounded with decent loudspeakers and amplifiers. I was in what could be called after-hours heaven. After playing with everything for some time, I got a pipe dream idea for a loudspeaker and being "in the biz" it was the perfect opportunity to try it. After all, how many times in your life do you have a whole store full of speakers to compare your ideas against?

I built a prototype of the design, but only single cabinet similar to the one pictured with Bendi at the left. (No point building a pair until you know for sure it's worth the effort.)

I compared my single cabinet, then an 8 inch two-way design, on almost a daily basis with the better speakers we had at the store. Tweak, compare, tweak, compare, and more tweak and compare. This went on for about a year until I had a speaker that I and everyone who worked at the store thought was better than everything else we had. Once I reached that point, I built a fresh PAIR of the speakers. You can imagine the anticipation of hearing a pair for the first time after listening to only one all that time!

During this process **I learned that you can easily judge the transparency of a loudspeaker by listening to only one.** Basically if a single loudspeaker could disappear by itself then you knew a pair of them would be great!

With a finished and tweaked out pair that everyone agreed was the best sound we had at the store I set off for the Consumer Electronics Show in Chicago to see and listen to the best of the best. I was surprised to find how few the number of speakers were that came close or were in even in the same league as my own. Mostly what I saw and heard was overpriced half-baked ideas that sounded like crap. I remember thinking "*this is what hi-end audio is like?*"

The CES experience, being my first, was a profound bit of enlightenment. The prices



and poor sound left me print stunned. It also gave me the confidence to eventually go into business with a dream of getting people who were serious about good sound back on track. As task, I might add, that is not unlike trying to overthrow a religion.

Drastically effected by the CES experience I spent several more years perfecting this design with hopes it could be a flagship for a new speaker company someday. (Remember this is 20 years ago).

I finally reached a point where I simply couldn't find any ways to improve the design. I listened to them for a couple years without change, or the desire to tweak on them.

I decided to put my energies into some new ideas and see if I could eventually come up with something else that might top these. To let myself explore fresh ideas, I needed to put these "on ice" and get them out of site for a few years. It actually took another 10 years before I had a speaker that I thought might be as good (or better) and as planned, it was a completely fresh approach. I am referring to my Radial Loudspeakers, specifically the RL-2's.

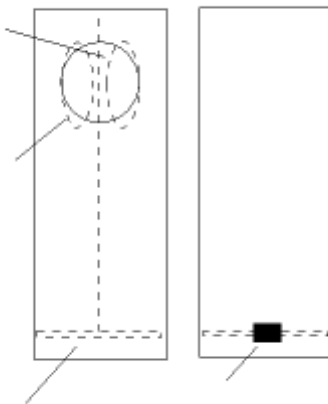
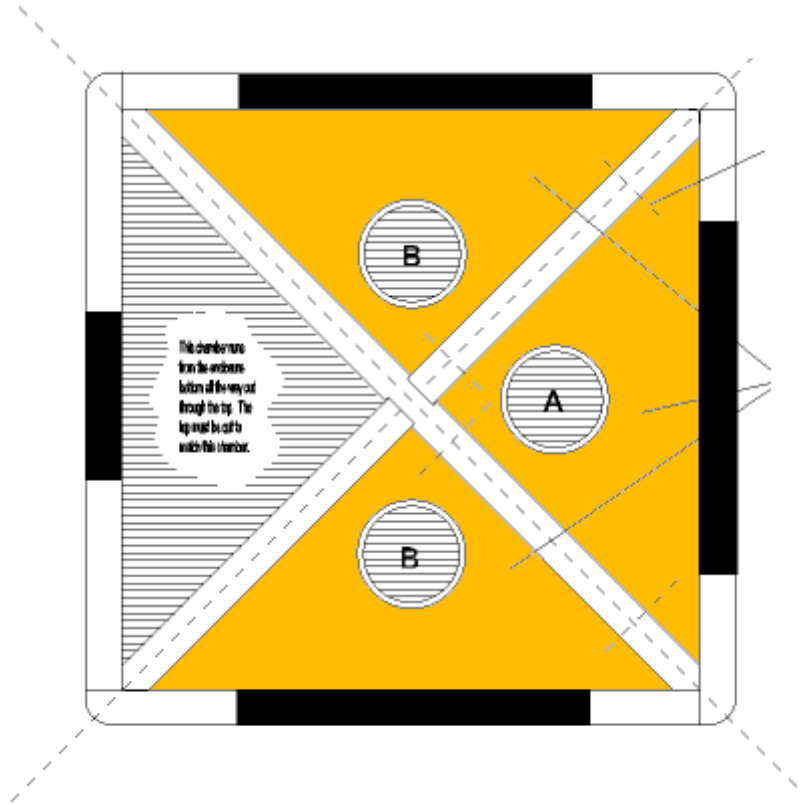
This bring us to last year when I drug my original works out of storage, dusted them off and had an all night speaker wars between the original HDT speakers and my more recent Radials. It was almost a draw. Each speaker had strong points but both were defiantly in the same league. This demonstrated to me that my original work of 20 years ago was as good as I thought back then. Even with the experience I've acquired since that time my best work, the RL-2's did not blow them away. Of course for this test, I used the original driver compliment.

As you can see from the picture the original design was a two way. It had a reference efficiency of about 89dB at 1 watt. Shortly after starting DECWARE the Zen Triode amplifiers were born and suddenly we needed high efficiency speakers. The 89 dB wasn't going to cut it except for low level listening. The Radials which were an attempt at a higher efficiency speaker ended up being only 91dB so they too fell a little short for a 2 watt amplifier. To make a long story short we cam across a newer Fostex driver called the FE206E early this year. It is an 8 inch full range driver with an efficiency of 96dB. We started working with it in various cabinet designs hoping to develop a more suitable match for our lower power amplifiers.

Of all the available cabinet designs for this type of driver, horn loaded and ported box types, I haven't come across one yet that I was completely crazy about. Much of this cabinet research was done using Lowther drivers because at the time, this Fostex driver was not around yet. I liked many of the things that the ported box designs did, but found all of them somewhat un-refined. I realized that I may already have an almost perfect cabinet for these style of drivers already done one day and decided to try them in the HDT cabinets and the rest is history. It took minimal re-tuning of the cabinet to perfectly compliment my favorite of these drivers (FE206E) and results had us shaking our heads in amazement.

So that is the short version of how this speaker came to exist and why I've never mentioned it on the web site all these years. The rest of these design notes will focus on how the cabinet design actually works and why we feel it is far and away the best enclosure design of it's kind.

HOW IT WORKS



The image above shows a cross sectional view of the cabinet looking down from the top. The orange represents the three chambers that the speaker sees. Chamber A is the primary chamber where the speaker is mounted. Pictured to the left is a front and rear view of the cabinet. The two ovals behind the speaker opening are located directly behind the cone to allow the back wave off the cone to enter the secondary chambers (B) where it is absorbed by the passive radiators. The ovals cut directly behind the speaker opening couple the three chambers together at the top while the ports in the bottom of each chamber couple to an averaging chamber in the base. This allows us to tune the primary and secondary chambers some distance apart to improve the dampening.

The averaging chamber in the base turns into a straight transmission line that runs the length of the cabinet where it exits at the top. There is a duct on the lower rear of the cabinet that tunes the averaging chamber and sets up the tuning for the transmission line. Having multiple chambers each specifically tuned and coupled together resonates across a much wider bandwidth than any known reflex box design I've ever

seen. The wide band frequencies that come up the transmission line are filtered and dispersed 90 degrees into a radial pattern into the room. This combined with the passive radiators and rear duct creates a more radial sound pattern than conventional designs. It has sound coming off 5 sides of the box in the lower registers of the midrange and bass regions.

A noticeable effect this cabinet has on frequency balance can be heard in the actual tone of the instruments and vocals played on it. It's not a clinical sounding speaker because of the depth of tone it can reproduce, however when combined with our modified Fostex driver it certainly does have clinical precision making it an excellent reference speaker.

The modifications to the FE206E include damping the frame, applying a special ink to the banana fiber cone, removing the dust cap, and installing a very unique phase plug that is made of steel and bonded to the pole piece of the magnet. This changes the shape of the magnetic flux in the voice coil gap which alters the Thiel & Small parameters and obviously the sound of the driver. Before the modifications the driver while good, had some problems with beaming and sounded somewhat dry.

These speakers have real bass. You will probably never feel like a sub is needed to balance their sound. These speakers as a result of the phase plug design have real highs. Flat out to 18KHz you never wonder if a tweeter would help things when you listen to these because it's simply all there. (*Unmodified I often contemplated adding a tweeter crossed over at 10K.*) These speakers have a midrange that I can only compare to Electrostats. Amazing transparency and effortlessness. Female vocals are top notch.

PRINCIPLE OF THE DECWARE PHASE GUIDE

NOV 2003
by Steve Deckert

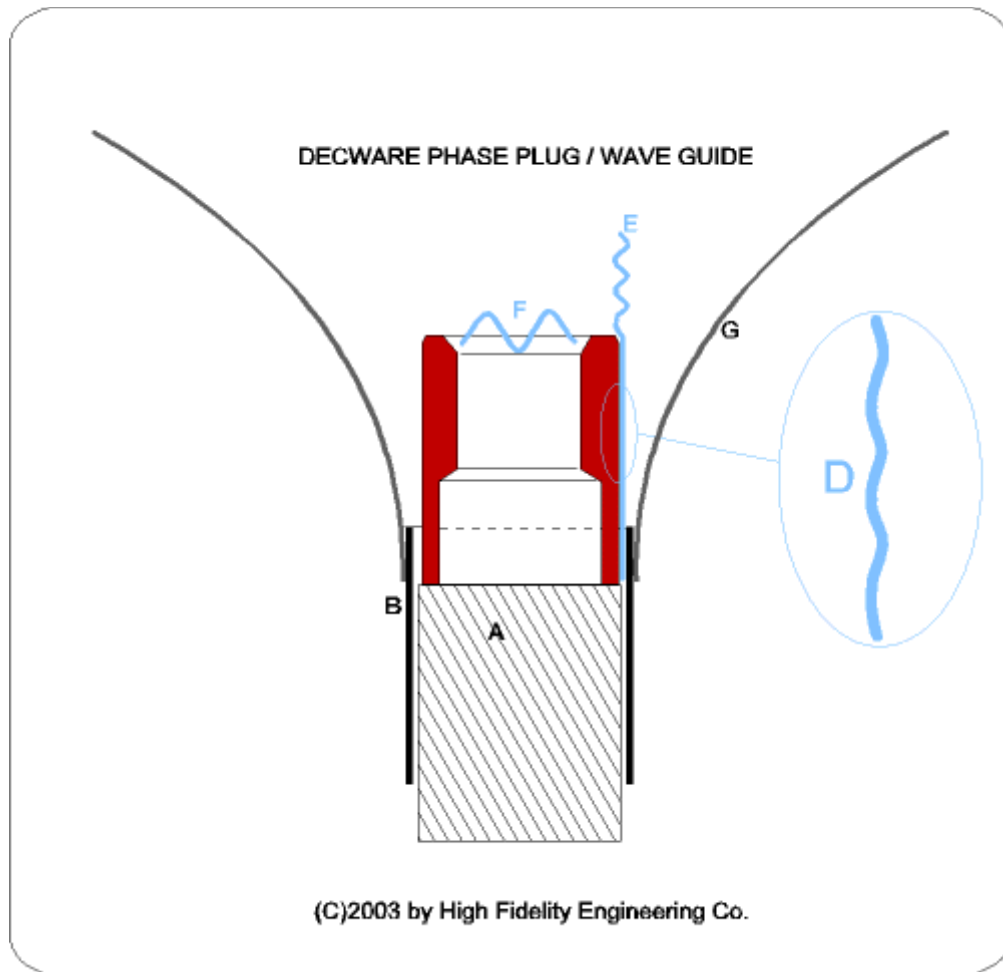
Our new High Definition Tower speakers are using a modified Fostex full range driver, model FE206E. A respectable sounding driver in it's stock form, a giant killer with the proper modifications. It comes stock with a whizzer cone and vented dustcap. On more expensive speakers that reproduce mid and high frequencies it's common to find what is typically called a "phase plug" located in place of the dust cap. The bullet shape of the plug is designed to reduce the inherent phase cancellations that occur between the dust cap and speaker cone. By reducing the phasing issues at these higher frequencies it is possible to improve and flatten frequency response. From a more subjective perspective it helps add depth and clarity to the sound stage with less beaming.

Many Lowther and Fostex type full range drivers also use phase plugs of some sort to accomplish these goals. Some have whizzer cones to extend high frequency response above 8K, some do not. Either type will be effected the same by the addition of a phase plug. The the only modification would be to the shape of the plug itself to better complement the steeper angle of the (whizzer) cone.

You will notice many variations on the shapes and application of phase plugs, especially if you look at Lowther speakers. This paper will describe yet another variation but one who's principles will apply to most extended range drivers, with or without whizzer cones and without concern for the exponential or flat shape of the cone. The shape of this phase correcting device does not change from one cone type to another. This is the first major difference that separates it from common practice.

The second most obvious distinction is that the device is steel not plastic. It couples directly to the magnetic pole piece, modifying the poles magnetic field. This in turn makes subtle modifications to the Thiel and Small parameters that were present before the device was added.

Another very apparent distinction is that this device is hollow. This is one of the fundamental advantages it has over more common designs. The hollow reservoir resonates to create high and low pressure nodes at the tip.



In the illustration above, you can see a cross sectional view of the main components involved with the application of this device. They are as follows:

- A) Stock steel pole piece that it attaches to.
- B) The voice coil bobbin that it sets inside.
- C) Shown in red - the phase guide itself.
- G) The speaker cone.

The phase guide displaces the dead air space above the pole piece. This area above the pole and between the inside walls of the bobbin create the same effect as an empty silo in a barn yard. If you walk inside the empty silo and play music, the reflections make it hard to understand what you're listening to. There are two ways to correct the reflections inside an empty silo. Extensive modification to it's shape and absorbing wall treatments or fill the silo. By filling it you reduce the air and the distance between surfaces to a point where there is little or no sound.

The high frequency energy (resonance) created by the voice coil that is not absorbed by the cone travels along the surface tension of air laying on the phase guide. The high pressure of air molecules that form on the surface of the phase guide create a skin effect or surface tension that acts as bending wave transducer. Put a different way, the energy from the voice coil bobbin uses the surface tension found on the phase guide as a bending wave transducer. This is illustrated in D) of the above picture. This wave guide offers organization and stability to the air molecules that are bending across it's surface.

When the energy reaches the end of the phase guide it launches off the rim into the air and out into the room. Since the phase guide and it's rim are fixed and solid, they do not move. In part E) of the picture above you can see this makes for a solid platform for the energy to launch from. (Aids in the linear projection of sound) The alternative is removing the phase guide and allowing the energy to launch off the chaotic end of the voice coil bobbin, a point that moves. This is the weak spot with most moving coil speakers that do not have the voice coil bobbin trimmed perfectly flush with the cone. Anything that sticks past this point resonates with ugliness. The dust cap is often used to block this nasty sound from being heard.

The most interesting part of the Decware phase guide is how the hollow cavity modifies the actual shape of the plug as it relates to the dispersion or organization of sound waves.

Specifically the shape or tip of a phase plug determines how well it corrects the phase errors between the cone and the plug. With this phase guide, the hollow cavity resonates just as any Hemholtz resonator would, with the frequency and Q determined by the length, diameter(s) and port. (See part F) At frequencies that are below resonance, the air pressure at the tip is zero making the shape of the tip true to it's physical dimension - flat. At higher frequencies, the piston of air in the cavity will resonate creating an alternating high and low pressure at the tip. When the pressure is high, the tip takes on the shape of a bullet with respect to low pressure around it. This in turn sets up a wave guide for the sound that surrounds it. This means that the shape of the tip is constantly being modified in real time by the sound itself. That translates into different phase angle correction at different frequencies!

Hearing is believing. When you compare a fixed plastic non-hollow phase plug to this it is easy to realize that the fixed bullet shape will only modify phase angles one way. The angles will be ideal for some frequencies and less than ideal for others. To demonstrate this, you can take some gum and cover the opening of the Decware phase guide and listen. It won't matter if you make gum hemispherical or bullet shaped or even flat. If you plug the hole you will hear a significant reduction in high frequency extension and clarity when the opening is blocked. You can even do this with you finger. Unblocked, the sound is wonderfully more open with noticeably better detail in the top end. You can amaze yourself for hours by going back and forth.

I worked on tweaking the Fostex driver for about 3 days. The majority of attention was on finding the right phase plug to replace the dust cap. The time was spent trying every shape and style phase plug I could make or find, including the very light bulb I used to see by. This is when I came up with the Decware phase guide.

This is the primary modification that we make to the Fostex FE206E driver. I have also done this with other drivers both with and without whizzer cones and get consistent results with all of them. In listening to test drivers with conventional phase plugs, this phase guide



HDT206EM OWNERS MANUAL

was very audibly superior. In practice it is also superior because you don't have to try to computer model the ideal shape for any given cone geometry. The only variable with this design is length which must be determined for each application.

As for it's altering the magnetic properties of the pole which is obviously going to change the shape of the magnetic flux in the gap and alter driver specs, so far no negative effects on the sound could be detected. If the alteration of these specs actually makes the driver sound better then it stands to reason there will be a driver somewhere that will react in a negative way. My observations so far indicate the change is minimal.