

The Ohm Walsh F and A Loudspeaker

The purpose of this essay is to provide potential buyers and users much needed clarification and information regarding the magical and little understood Ohm Walsh model "A" and "F" Coherent Wave Transmission Line Driver/Audio Speaker from the 70's and 80's. I hope to correct many misconceptions and incorrect information which has arisen throughout the years.

Let me begin by saying, unfortunately, not only have these speakers had a tremendous amount of misinformation disseminated throughout the years, but there are also many dangers presented by perhaps well meaning individuals whom attempt to recone these old units and sell them on E-bay and various audio markets, such as Audiogon, as "working" or "refurbished". This is the furthest from the truth, for no one, not even Ohm Acoustics rebuilds these any longer. So far as I know, and it is my humble opinion, but, I am currently the only person in the world that can build these units from scratch or refurbish the old units, including cabinetry and some 30 upgrades to materials and performance specifications.

I am here to tell you in no uncertain terms that these speakers represent some of the most sophisticated and difficult to build audio transducers ever made and mass marketed while still representing some of the finest musical reproduction capabilities of any speaker ever devised **ranking easily amongst the finest speakers in the world for decades.**

The capabilities of these drivers, when properly executed, have been known to rival and compete with many "cost is no object" systems such as full range ribbons, Apogee, Quad ESL's and Infinity's super IRS standard systems, costing \$25,000 to \$30,000 in the 70's.

At the time of their final production in 1984, the Ohm "F" model commanded as much as \$4,500 retail and the "A" model commanding \$6,500. The drivers truly represent the word "exotic" and the cabinetry bordering on works of art.

As many others have stated the driver of the "F" model consists of a steeply inverted cone standing some $12 \frac{3}{4}$ " in height with a slant of 75.5 degrees. The cone is constructed of two metal foil sections and one paper section. The top third is made from titanium foil having a thickness of .0025", the mid section is made from polished and tempered aluminum foil, (**Not stainless steel**), having a thickness of .003" and finally the last section is made from felted paper having a thickness of .025". The finished cone weighs an incredible 124 grams. I would like to mention that aluminum foil off the shelf from "Reynolds" will not do the trick here.

While the above materials represent the bulk of the cone, the magic of their function lies in fact in the treatment and correct assembly of each section. To be brief, the top titanium section has a special treatment applied to its internal surface that acts as a sound absorber, a stiffening agent and cone nodal breakup control. It resembles grey modeling clay, but it isn't, and lasts a good deal longer. However, be aware this material is critical for proper operation and it does dry out and crack after 15 to 20 years, so it should be replaced. Reconers never do this, let alone know the proper materials to use. Next, the Aluminum section is also treated internally and externally in several special ways. Externally, the cone has ribbing lines running vertically for the entire length of the aluminum section that have been scribed into the aluminum at precise intervals, depth and angle. This ribbing helps to make the cone stiffer, but also is used to "tune the cone". Internally, the foil is covered with a specially selected grade of "open cell" damping foam of precise thickness. The foam runs the entire length of the aluminum section and covers about 1/3 of the titanium. One of the most important things overlooked or not attempted by refurbishes is the replacement of this special foam. One reason is because it is very difficult to remove the old and then equally difficult to replace the new. In addition, this foam is not readily available off the shelf.

If the foam surround is decayed from aging, as all units now are, then the internal foam is decayed as well and **MUST** be replaced regardless of whether it looks OK or not. Typically this foam crumbles or rots turning into “gooey” fragments and falls off in gobs if touched. It is used for damping, control of cone ringing and control of the speed of the wave front traversing the cone.

The final cone section of the “F” model, the paper is perhaps my favorite when it comes to being misunderstood and overlooked. The bottom third felted paper section serves many functions, but is most responsible for producing the lower bass frequencies of the driver. A close examination reveals lots of slits cut into the paper and what looks like silicone seal applied to the internal side of the cone. My favorite story is perhaps one I read of an individual that sent his speakers to be repaired only to find upon their return that the silicone had been applied to the slits that he had so carefully had peeled off, thinking that someone before him had placed it there as some sort of repair. He was incensed and demanded a full refund because he felt the speaker had been incorrectly repaired. Here again, this sealant **MUST** be there and must be applied correctly. A closer look will reveal 4 rows of slits placed horizontally in exacting positions across the cone surface. These slits control cone break-up, provide a properly terminated high loss transmission line and prevent reflected sound from the cone annulus from returning back up the cone and interfering with the oncoming wave. Further, the paper is treated with a properly positioned internal “ring” of paper that is also a stiffener and produces a density change in the material. Finally, the paper portion is terminated with another paper “ring” that is cut and glued to the main paper body, again producing a state change and acoustic signature.

Now that we have a basic understanding of the driver's conical section, let's examine the remaining and very critical suspension and compliance portion of the Walsh Driver. The suspension of this transducer consists of some very familiar parts, namely a foam surround and a spider roll as is commonly seen in many piston driven speaker assemblies. As many of you may know, the stiffness of the spider and the thickness of the surround as well as the type of materials used combine to form a system that controls the driver's acoustic parameters. These parameters are based upon some of the Thiele and Small calculations and are critical for the system to produce the desired frequency response, desired bass roll off, total system impedance, high end response and box functions. The suspension is designed to work with a sealed enclosure.

Changing any of these components represents significant changes to the overall system performance and can make or break the speaker's ability to reproduce realistic sound. Trust me when I say, that **not just any old “off the shelf” foam surround or any spider of the same size and color** will work in the proper function of these drivers. **It will NOT!** Any reconer or refurbisher that tries to use stock parts will obtain marginal performance at best.

I would also mention that reusing the old spider is not advisable since most have been stretched considerably due to the weight of the cone pulling it down for many years. The surround not only suspends the cone and correctly centers it, but is also provides for critical damping of the acoustic wave as it reaches the end of the cone and thus prevents most of the acoustic energy from being reflected back up the cone. The spider serves to center the voice coil and provides mechanical resistance to the driver's motion. This **mechanical resistance** couples with the voice coils **DC resistance** to produce the speaker's **total impedance** or load to the driving amplifier.

Will it play you ask? Yes, the speaker may play, and it may even sound acceptable to some, but it will be far from optimal and therefore far from being one of the finest speakers in the world. More than likely, the speakers will sound dull, lackluster, even muffled in the high end. The clarity will suffer on voice reproduction and choral groupings. The bass will be dull, slow and lack articulation. The difference is a hand made sports car compared to a small compact model.

Once again, to my knowledge, I am the only person in the world that has these items made to order and to my specifications so as to be compatible with the originals and or the **enhanced new units that I build.**

Finally, we come to the very **heart and soul of this phenomenal driver**, namely the **voice coil**. The voice coil is not only responsible for providing the electrical impulses that are transformed via. The interaction between the electrical input signal and the high energy Alnico magnet, but it also represents the power handling ability of the driver and its ability to produce the highest frequencies as well as the lowest simultaneously.

Unlike any other driver, this single voice coil must be capable of functioning over the entire audio range of 20 Hz to 20 KHz. and beyond. This transducer is made from a very thin anodized aluminum ribbon wire with a rectangular cross section that is wound on the tall edge and adhered to the inside of an anodized aluminum former. The coil consists of a single layer and must withstand extreme temperatures approaching 300 degrees C during operation. It must also be extremely lightweight, since **the mass of the VC represents the critical mass of the moving system** that must be accelerated or decelerated in order to pluck the cone and produce the highest frequency sound waves. The original goal was to have a VC that weighed less than 4 grams. Because of this, the Walsh driver is the only speaker in the world that can successfully pass a square wave retaining more than 95% of its original shape. I would like to point out that there are **also variants** of this coil that are used in different "F" cones and also the Big brother Ohm Walsh "A". Having said this, please understand that there are **NO substitutions** for these coils and the use of any other type of coil, wire, winding, form etc. from presently available stocks will not work. As with the other parts, I make these coils to order and have them expertly wound to my specifications and application.

While I have endeavored to present the Walsh "F" in considerable detail, one may infer from this information that the Walsh "A" functions in much the same fashion and in theory this is true. However, the "A" is an entirely different version of the Walsh principal in action, having a cone with a nominal 18 inch size. This driver is only slightly taller than the "F", but has a dual flare cone and is made entirely of metal foils. The top section of the cone employs a 3 inch voice coil similar to its smaller brother, but of a nominal 8 ohm impedance. The top portion of the cone is made from thin titanium foil and employs a steep angle of 75.5 degrees. While this section is somewhat longer than the "F" cone, where the titanium meets the aluminum section the cone flares abruptly to a cone angle of 62.5 degrees. There it continues to the entire extent of the cone body and ultimate diameter of approximately 14.5 inches.

Like the smaller "F", the cone is terminated by a special doped cloth pleated surround, designed to do exactly what its foam counterpart does in the "F" model. The actual size of the driver is a misnomer and is more truly measured at 16 inches to the outside of the surround and 18 inches to the driver frame. The cone is completed with treatments to its inside with putties, foams, diamond shaped hash markings for stiffness and for tuning.

The "A" represents an unbelievable work of art, form and function. Sonically, it has no equal with the ability to go subsonic and produce thunderous bass while simultaneously producing the full subtle air of voice and delicate articulated highs. Not bad for a cone that weighs more than 346 grams.

In conclusion I would like to reiterate that the Wash "F" and "A" Transmission Line drivers are extremely difficult to build, highly complex in their execution and make considerable demands on construction techniques and materials even today. In fact, just to show how much thought went into the design of these speakers consider this...every glue in every joint was chosen for its sonic properties as well as its merits as an adhesive.

I would like to share you with a little back round on myself. My name is Dale Harder and I reside in Parma Ohio. I am an Aerospace, Laser, Electro-Optics and Audio Engineer, and have been in these fields for more than 30 years. My long love affair with the Ohm Walsh Speakers started in 1972 and to my knowledge I am currently the only person in the world that can still build true "Walsh Style" drivers from scratch or refurbish the old Ohm Walsh units including cabinetry. I have devoted much of my life to improving upon this series of speakers purely for my own

enjoyment. I would also like to state that **I am in no way connected with Ohm Acoustics** nor they with me at the present time. The information that I have given is from my own learning and experience. While I have endeavored to be accurate, I assume no responsibility for any of its use or content. Further, **I do not manufacture these speakers under the name of Ohm Walsh "A" or "F"** as that would be a trademark infringement. I simply emulate the Walsh principals. **I do however manufacture new drivers and complete speakers called the Walsh Style TLS-I or TLS-II** respectively and I refurbish older units with some 30+ improvements using the Walsh "A" or "F" as a base guide. Lastly, **I Do Not sell parts** for do-it-yourselfers, sorry, so please don't ask.

Thanks and Good listening,

Dale Harder. dale@HHR-ExoticSpeakers.com