

Hello All, I thought I would post this information as it should answer some questions I have read here. I have been designing speakers & tube amps for 25 years as my full time job. I had a pair of these when I was 16 and was impressed with them. I have now purchased a pair of both models of the Mach 1s. After listening I have found that they do sound different. After testing both, the difference is easy to explain. It is not that the 4024a is a better speaker, but the crossover in the 4024a does a better job and produces a flatter response. I have been modeling a new crossover for the Mach 1 4029 that will put them in a league = to almost any speaker on the market. I will use all the stock drivers and cabinets, only the crossovers will change. If you look at the graphs I have included you will see that the Mach 1 crossover is not a true three-way design but a two way. The mid horn is used as a mid and tweeter. The tweeter does the same job to help try and smooth the response. The tweeter is still getting Bass energy down to 200Hz at - 35db, NOT GOOD. The mid can be cleaned up as well with another order and a bandpass filter. However, it is awesome how good they made these speakers many years ago, without the use of modeling software. Some of the speakers we manufacture today are 32,000.00 a pair. I want to see with the right crossover how close I can make the Mach 1s to our reference system. If you look at the graphs you can see the transfer function of all the drivers on both models as well as the SPL curve and impedance. The new unit is said to be 4 ohm, not so. The driver is marked 6 ohm, but in the sweeps you can see both woofers have the same low end impedance. Because of this stated impedance difference they made a different crossover for each model. But, with the right crossover in each model, one is as good as the other. Ferro-Fluid can be added to the 4024a very easy.

The Machs have a foam gasket that holds the midrange diaphragm in place. It rots like the woofer foam. If the foam has rotted the mid diaphragm will jump around and produce a lot of distortion. I had to replace it on my pair to clean up the mid distortion. You can use a 1/16" to 1/8" foam tape with sticky on one side. Cut it to the same width as the mid seal that is there now. Just something to check if the caps don't fix your problem. My model is the 4029.

that is it! it is the only thing that keeps the diaphragm pressed to the magnet top plate. if it is rotted the diaphragm can jump around and buzz like a kazoo, creating almost all distortion.

They are all 8ohm 4024, 4024a and all 6ohm 4029. There were never any 4ohm bass drivers in the Mach 1s.

The magnet is sealed. It is not a chamber for acoustical energy. It is there to support the back of the midrange horn so it will not break if the unit is dropped, etc. The cup screws to the cover board and the back of the horn goes in it with the foam. It is for support of the horn only. The first models had a piece of wood glued to the woofer top plate and the flange of the horn bolted to it. There was no plastic cup at all.

If you look at the last post I did before this one, you will see the impedance plot. Look at the woofer impedance and note it is at 8ohms or higher through most of it's response area, 20hz - 1.2khz. If the Parts Express woofer is truly 4 ohm it would need the crossover adjusted. I have not measured the PE driver yet. You would be far better IMO, to refoam your current drivers unless they have other problems as well.

It can handle it, because we are not taking the mid lower, we are pushing the woofer higher!! That's why the first upgrade I listed with the 14uf capacitor, shown a few posts earlier, is in the woofer circuit!!! A woofer taking higher frequencies is like taking candy from a baby.... Also, the 3rd order crossover, which is the real fix, which I also posted several post back, makes the system handle even more power by taking a full octave off the bottom end that the mid horn has to reproduce! That means less distortion and more

POWER!! 🎧

Where did everyone go? 🤔 Here is a transfer function chart showing that not only can the speaker withstand the changes but it is easier on the system with the new parts. In the chart the lighter colors are

the test with the new parts installed in the Mach 1 #: 4029 and the darker ones are the measurements from the stock unit! As you can see the low frequency energy that was going to the mid horn and tweeter have been reduced. Yes, the woofer is now getting more energy around 1.2k but that is very easy on a woofer. All the current is in the low frequencies around 200hz and lower. I am looking for some feedback of people who are trying these **mods** or at least interested in them, otherwise I guess I'll quite posting this

information and just go enjoy the Machs I changed! 🤪

That is correct for many woofers that peak in response and has worked in many redesigns by changing the hard dome for a softer one. However it is different in the case of the Mach 1. In the attached graph you can see that the woofer peaks at around **2.3khz**. This graph is the woofer's SPL with no crossover, mounted in the stock cabinet. However, it's amplitude does not go above the average SPL output of the woofer, therefore it does not cause an issue.

With the Mach 1 woofer, the Dust Cap is a hard plastic and for a good reason. It provides needed cone reinforcement, to remove it would cause the woofer to fail under large amplitude drive signals. The cabinet is under extreme vacuum/pressure. This can be tested just by trying to push in on the woofer and note the high resistance to movement. The cabinet is very small for this size woofer as it is sealed off just under the mid range horn.

I can tell you that I have measurements from when I was 21 years old. That's a long time ago. I have tested around a dozen over the years of the 4029s. All the results have been very, very close to the units I now have. I will be glad to test your driver units with the crossovers I have designed for anyone who wants to know for sure. If you really wonder, you can send a woofer, just the mid motor and the tweeter. I can place them in one of the cabinets I have already done and we will see the results. It should be easy to pack just one woofer with the mid and tweeter. I don't mean the complete midrange horn, just the mid motor, about 4" x 4"!

I posted a while back about the foam seal on the mid horn. Here are images showing the rotted foam. It was all scraped off and new foam cut from 1/16" thick foam sheet,(one side sticky) in strips. I cleaned the unit good with rubbing alcohol and Q Tips. You will see this in the pictures.

UPGRADE: you can add three felt pads cut from 1/8" felt, each cut about 1/8" smaller than the first. Clean the pole piece first and glue the largest one down first and then the next two. Just make sure it does not over hang the voice coil gap. Look at the pictures. This stops reflections off of the pole piece from bouncing back to the diaphragm causing distortion. Much cleaner sound. NOTE: It does not change the SPL of the horn, it just stops secondary reflections from clouding detail. 🤪







Here are the last few images on the mid range work. The felt under the dome does the same job of the insulation behind the woofer in the bass cabinet. Only use three pieces of felt. Make sure it does not touch the inside of the mid dome. See the first picture below, the side view.





First off, I got some private questions about the mid range **mods**, with concerns that it would reduce the volume and keep the mid driver from producing the lower frequencies. The reverse is true. It extends the lower frequency and greatly smoothes the curve. Look at the attached chart and you will see the lower end of the mid is now better and the rest of the response is way smoother! This is because the reflections can not cause cancelation or nodes under the dome because they have been absorbed! The lowest end is improved the most for two reasons:

1..The felt acts to increase the size of the area under the dome; see:

http://en.wikipedia.org/wiki/Loudspeaker_enclosure

scroll down to where it says sealed enclosures.

2..The lowest frequencies creates the strongest reflections that can cancel the energy radiated by the dome.

This is a Do It Yourself form and if you try it and don't like it you can Un Do It Yourself!! If you don't try you will never know! 🤪

Both sweeps are with no crossover, amp connected to mid range horn only and at 1 watt 1 meter.

..The Mach 1 was introduced in 1976 Model 4024, lifetime warranty

..In 1977 the Mach 1 Model was changed to 4024a as they now were just 5 year warranty not lifetime. The model was changed to identify that they were 5 year warranty not lifetime. None of the Machs ever had rubber surround, it was a foam with a vinyl coating on them.

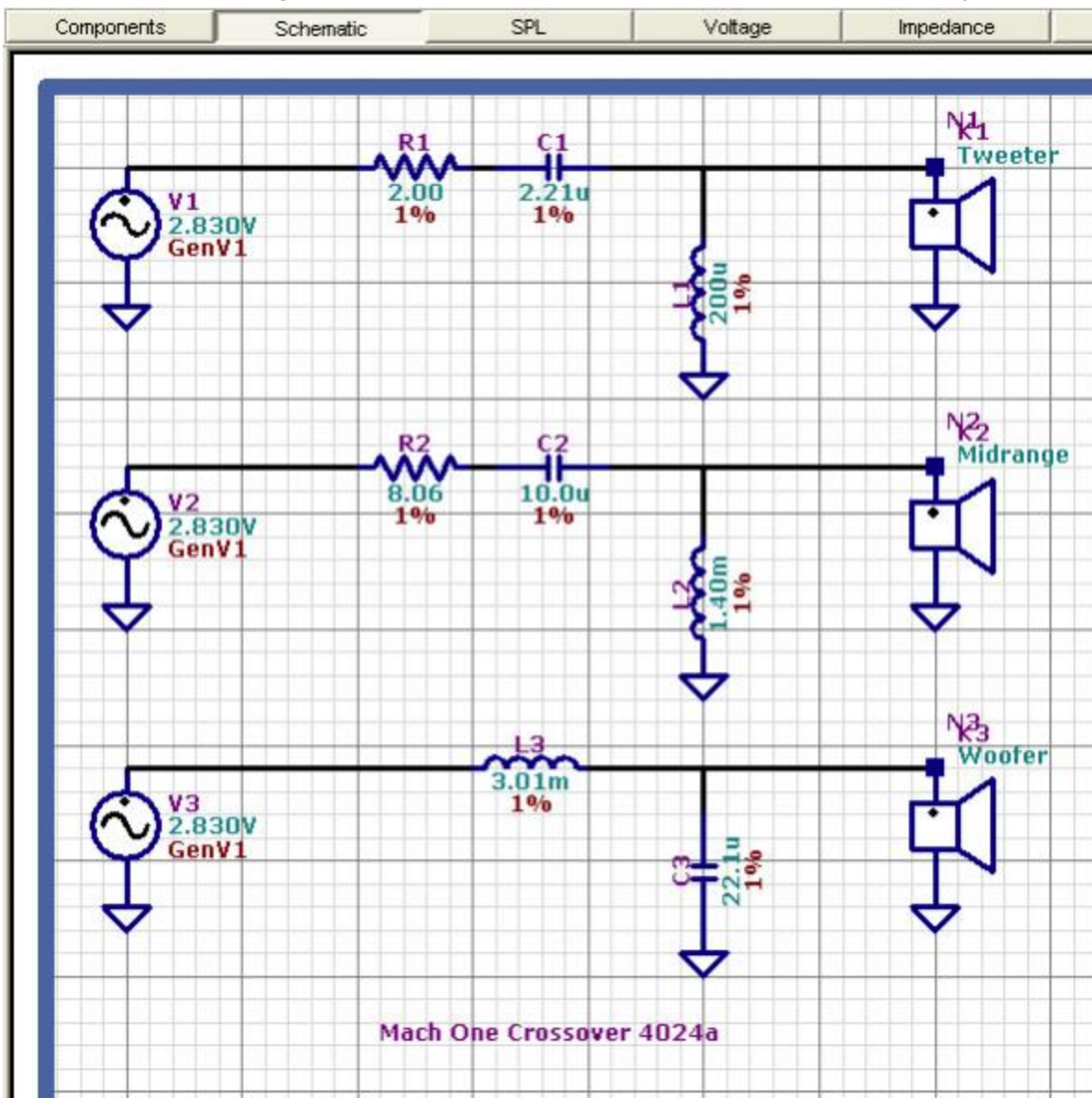
..In 1981 all the specs were the same. See Image 4. I have from a good source that the Mach One never changed from 1976 up to 1981. Same production.

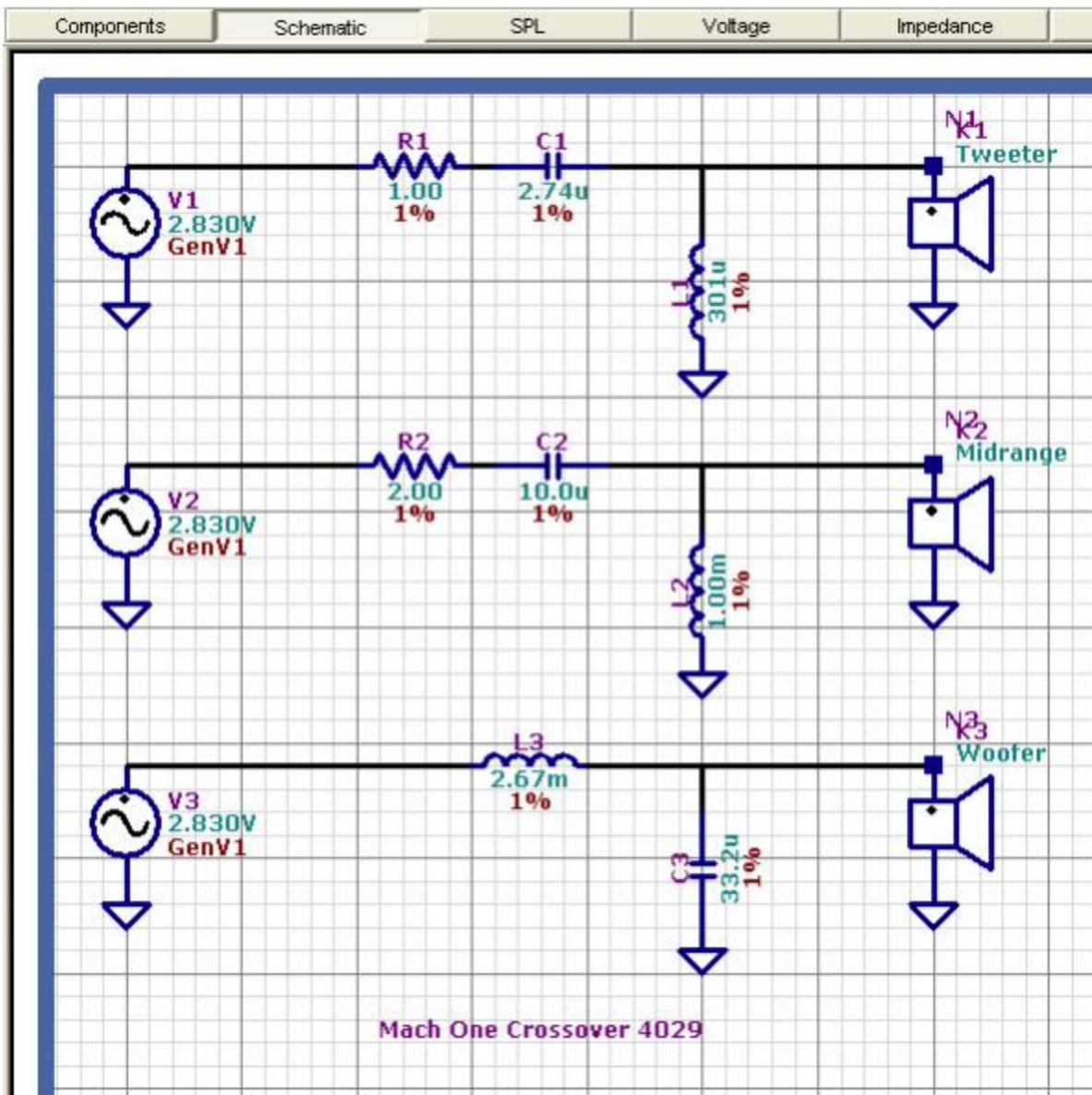
..1982 the new Mach One Liquid Cooled was introduced as 4029. See Image 5, NOTE that it says 8 Ohms not 4. The woofer in the 4029 states it is 6 ohms. This is not true as I have tested many and all are 8 ohms. Even the Ad, image 5 states 8 ohms as well. The only thing that changed on the 4029s were:

- 1..New holder for back end of mid-range driver
- 2..The new woofer with uncoated foam surround
- 3..Less screws in the L-Pad plate and the plate it's self
- 4..Trim ring on woofer
- 5..New grill cloth (with four fasteners instead of six)
- 6..Speaker wire connector (spring terminals)
- 7..Speaker's crossover.

I am researching the changes to the woofer at this time. I think the 4029 used a larger gauge wire for more power handling which explains some of the changes needed to the crossover. Will update with more info as soon as I can confirm what the changes were 🤔

Here are the circuit diagrams for the stock crossovers for the 4024a and 4029, just for reference. 😊





Here is another upgrade that makes the bass of the Mach 1 much better and deeper and drops the FS of

the system by 10Hz! 🍌

All other upgrades I have posted are easy to reverse, this one is not. It can be done but it is not quick or easy to reverse. I can only tell you it makes the bass much better and much deeper. As you can see I did mine but I know my own work and know the results of my modeling.

If you do decide to do this mod, you will need to seal the mid horn completely. RS glued the horn to stop rattling but not a perfect air seal. I had to go over the seams to stop the air leaks. Also, notice the rubber gasket seal around the back cover opening I added. This area should also be filled with insulation before putting the cover back on. The holes are cut with a 3 1/2" hole saw in a drill from the woofer opening. It requires you to remove the woofer and all insulation to do this. Drilling three holes at 3 1/2" diameter is all that is needed. It enlarges the cabinet volume by around 3/4 foot.



The mod listed about 4 posts up, about using the mid-range area for active woofer space, goes a long way in curing the one note bass. The FS is dropped by 10Hz. It also removes a large part of the boom that was due to the system having to hi a Q, due to the very small enclosure and the driver having a hi QTS to start with. There are more **mods** that I will post as we move forward that will remove almost 100% of all the issues you spoke of! 🤪

dnewma04 said: "That woofer will be a bear to work with, it's not just a high Q, it's a high enough Q to make a worthy dipole woofer."

Most people would be shocked to know the optimum cabinet size for the Mach 1 woofer is over 45 cubic feet! But there are many ways to make it better, which is why we are all here. Mass loading, bucking magnet (lowering QTS) which lowers overall systems Q, etc. The units I have sound very, very good but have many **mods** not talked about here yet!

No, not at all. If you go look at the graphs of the 4024 & 4029, yes the 4024 is smoother but it has a wider null in the mid area that is about 4db. I think they knew that and in the release of the new 4029 they tried to correct that. The RC in the circuit helped to create the hole around 1Khz in the 4029. Also, I think the older woofer measures about 1.25 ohms higher, so they were also trying to bring up the SPL of the horn to match the newer woofer.

The real difference, if all others things are equal, is that it makes about a 3db difference in the output of the mid circuit. But it is in series with the capacitor so it creates an RC circuit that is about **2.5db** more at 1.5k and moves up toward 4db more output in the 3 or 4 khz range. 😊

From what I remember, the woofer is basically the same as the Mach 1. Different cone, dome, etc. but the magnet and voice coil are the same. Can't confirm this now it's just what I remember. Cabinet size is almost the same, Mach II being a little larger in volume, so in stock format should perform a little better in the low

end. The Mach II is also ported which will help some. The high frequency driver in the Mach II is more linear as is the midrange driver. Bottom line IN STOCK FORMAT should perform very good. I would love to have a unit to test and see. If I can get my hands on one I will let you know for sure how they compare!! 🤖

1..I think the Mach 1 is the single best looking speaker from it's time. Beefy, bold, solid. No other speaker has this look!

2..It has more potential for larger rooms because of the horns.

3..IMO, with a few **mods** nothing from the time period will even come close.

4..While in stock form the Mach II might be a slight bit more linear, it does not have the dynamic capability of the Mach 1.

5..Cone type midranges are everywhere for a fairly small price. You will not find a 17" horn like the Mach 1 has today, even willing to pay many, many times the amount of the cone mid.

6..While I know just from doing this for 25 years+ that the Mach II is easier to design, due to standard type drivers, if both were fully optimized to their maximum performance level, I'll take the Mach 1s please!! 🤖

It is necessary to glue the trim ring. If you don't it will buzz and vibrate on the frame.

By late tonight a complete overview of the **tier** 1 upgrade will be posted. This will include circuit changes to the woofer, tweeter and a recap of all upgrade information previously posted.

Please NOTE: This is just **tier** 1, as there will be three in total. **Tier** 1 brings the Mach 1 4029 to a very respectable performance level. **Tier** 2 and 3 will deal with taking the Mach 1 as far as it can go! 🤖

It would be nice to have an idea of the people interested in this upgrade with feedback as they make their changes. If you plan to participate in this upgrade, please let me know. 🤖

The **tier** 1 upgrade paper is ready for all who have an interest. It is in PDF file format and can be

downloaded at the link below. Please contact me with questions. 🤖

<http://66.116.167.39/mach1/tier1.pdf> - This is the Tier 1 PDF file

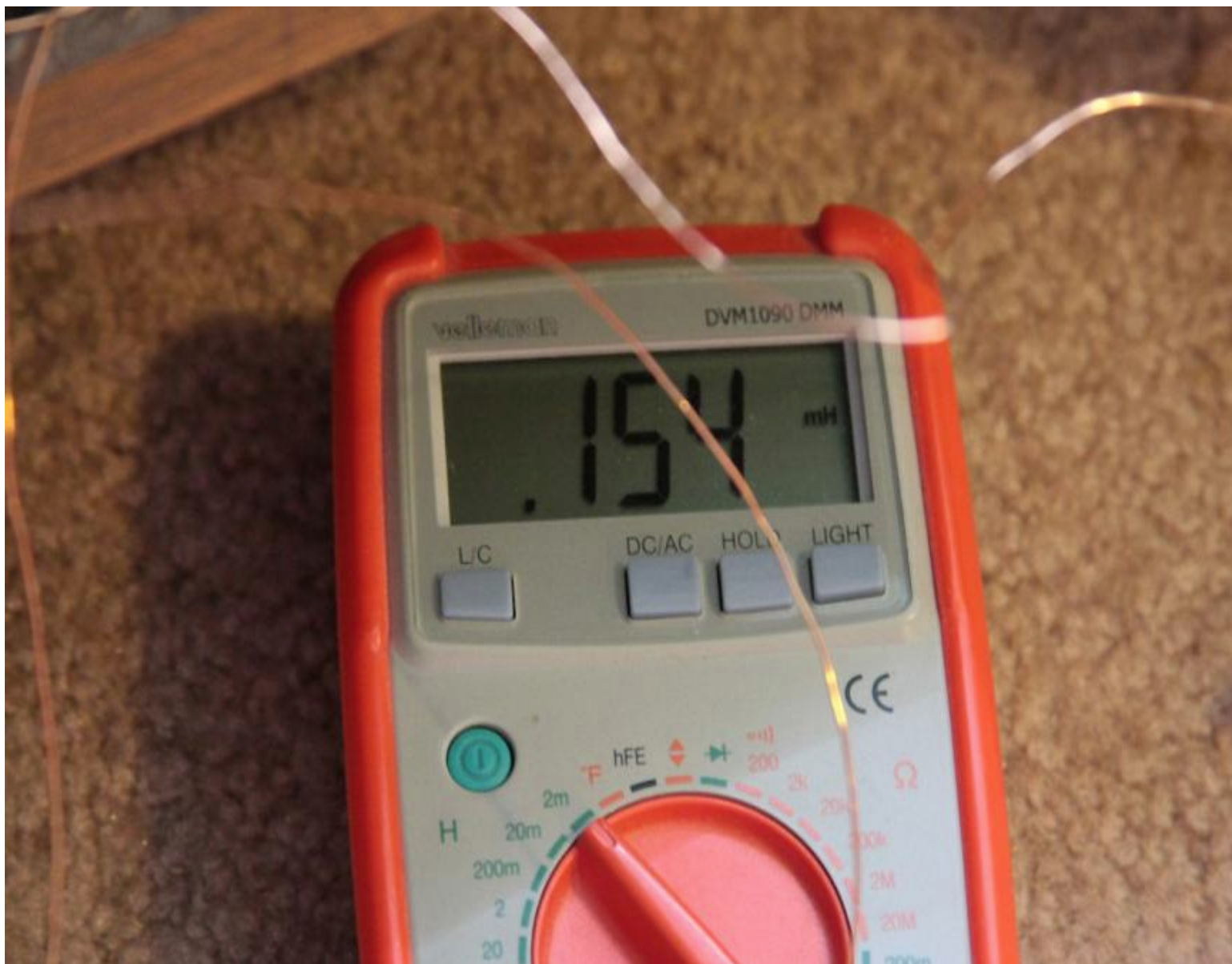
It needs to be pretty close. My multi meter has a L position for showing inductance. If you have one that has this ability you could just use it. I think it's a cored inductor for the .3, if so it would most likely not be half, the value would drop pretty quick. If you need me to, I can pull one of the woofers out and see how many turns it takes to get to the .15mh. It should be close enough, but we will not be sure of your starting value. I would guess it would be within 10% this way. 🤖

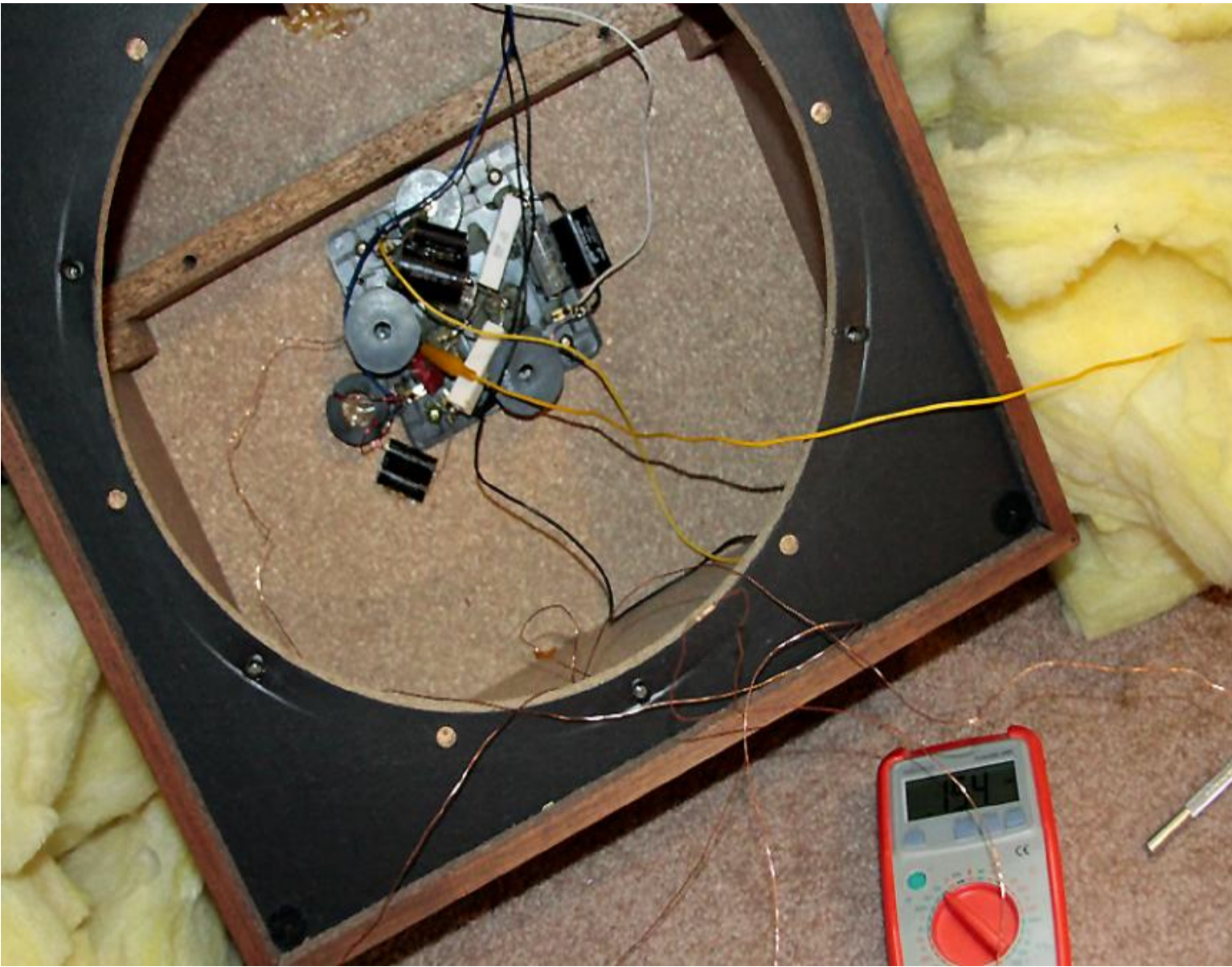
The .3mh coil can be unwound to make the .15mh. It's fun.... They had glue all over mine and it was tricky to get it started unwinding. After I did, it was no problem. To wind it down to the .15mh coil, do the following:

Unwind it 52 turns. This will give you about 11' 7" of wire. It doesn't have to be 11' 7" but you should end up with a piece between 11 & 12 feet long. As you can see on the meter mine ended up at .154mh at 52 turns taken off. Be sure to scrape the enamel off the wire when you cut it so you will get a good solder joint! Also, make sure the wire left on the coil is tight. Put a few pieces of electrical tape, etc. on it to hold the winding tight.

I also included a picture from the woofer side of the holes cut into the mid area. You can also see a 1 x 1 inch brace I added. 🤓









Holes into mid area
to enlarge cabinet volume

The fluid is Ferro Fluid, and is an oil base with iron particles in it. It should be very dark! I would not clean it out or change it. The Ferro Fluid is designed for each use. We all know what oil does to plastic and vinyl, it make it hard and crack. They designed it to work with the materials in this driver, the wire, glue and former materials of the midrange dome. If you change it, the new fluid could attack the materials and cause a failure. The foam pad under the midrange cup IMO, is to hard. I would not use silicone, it is to dense. You need a very rubbery type of open cell foam and it should not be attached to the mid dome, it should only touch it and the foam should compress very easy! If a more dense material is used it will not only damp the driver but will reduce bandwidth and SPL. A 1/16" thick weather strip foam tape from Lowes, made for doors & windows, is what I used. It is also designed to hold up well to weather and to moisture! 🍀

For the most part they should work in the Mach 1s. The specs are pretty close, but it would be a try and see as the upper frequency range is 800hz higher than the Mach driver, on paper. I'll bet it's real close! 💡

15" Polypropylene (400-1301A) Specifications Cone Woofer

Nominal Impedance:.....8 ohms RMS
Frequency Response:..... .25 Hz-2000 Hz

Free Air Resonance (Fs):..... 25 Hz
 Infinite Baffle Resonance Frequency:.....24 Hz
 Piston Area (SD):.....0.0855 m
 Rated Power Input - Nominal:.....1 00 W
 RMS Thermal Power Limit (P_{MAX}):.....200 W
 Flux Density (BL):.....10.29
 DC Voice Coil Resistance (R_E, ohms):.....5.5 ohm
 Voice Coil Inductance (L_{VC} at 1 kHz):.....0.77 mH
 Equivalent Air Volume (V_{AS}):.....20.8 CU. ft. (587.5 liters)
 SPL:.....91 +/- 2 db/1W/1m
 Moving Mass (M_{ms}):.....91g
 Electrical Q Factor (Q_{ES}):..... 0.71
 Mechanical Q Factor (Q_{MS}):..... 3.22
 Total Q Factor:.....0:58
 Equivalent Acoustic Volume (V_{AS}):.....523.9
 Mechanical Suspension Compliance (C_{MS}, UM/N):.....487.41 UM/N
 Mechanical Mass of Cone Assembly and Free Air Load:.....90.95 C
 Mechanical Mass of Cone Assembly Only:.....76.17 9
 Peak-to-Peak (Maximum) Linear Excursion:.....3.8 mm
 Cutout Depth):..... 35.3 Inches/17 cm
 Power Handling:..... 100 watts RMS
 Magnet Weight:.....29.9 oz.
 Speaker Weight:.....118.4 oz.

First off, I think you guys are great! 🤖 I have in my past designs been through more than 1600 iterations before finding the one that I really liked the impedance, phase and SPL and the Sound. Months and months of listening. The measurements are the first thing and they have to be attained, then the listening. You can have what looks like the same SPL and because of phase or something in the drivers, it just don't have the magic, so you go back and start over. Just for grins, see the attachment. It's an 8th order on the level 3 I am working on! 🤖

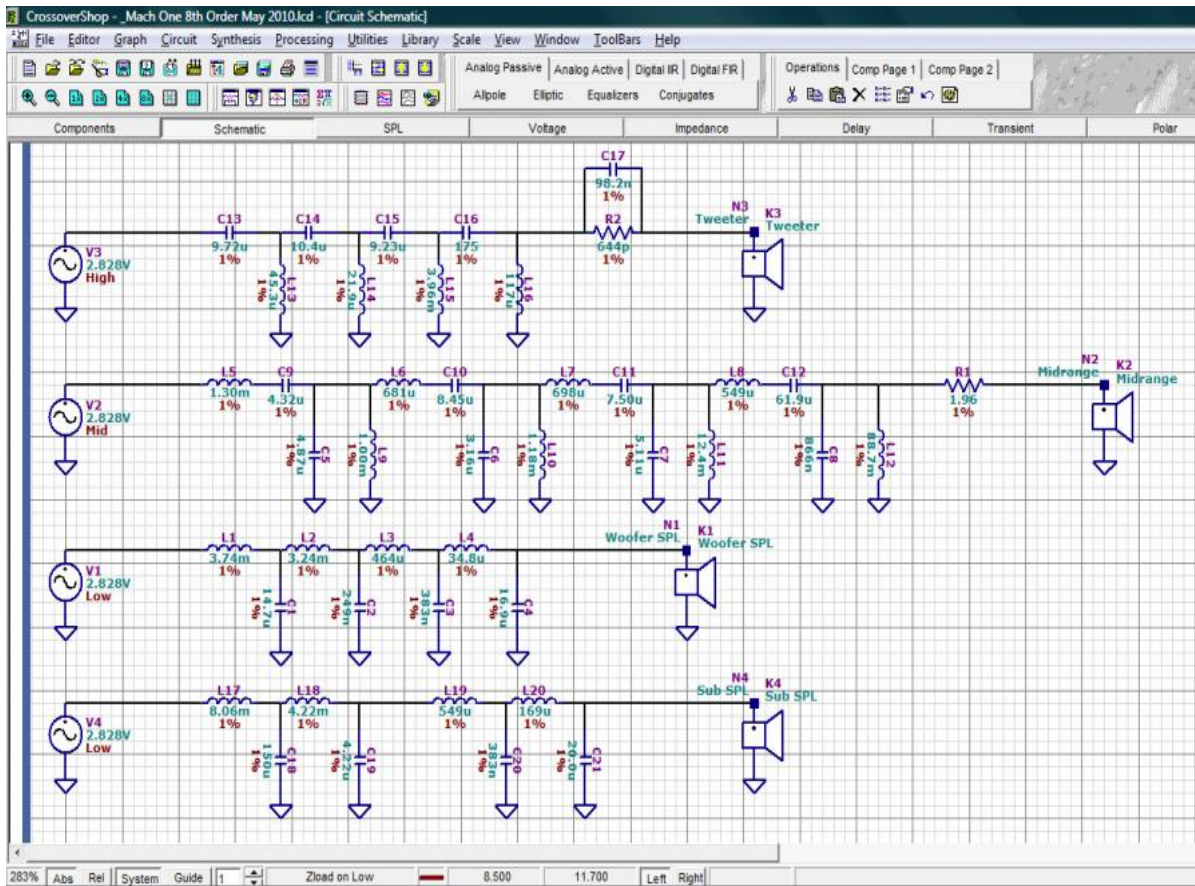
Originally Posted by **Buttercup** ➤

I opened my Mach I 4024a today and while trying to remove the tweeter I cracked the plastic mounting plate.

The front of the speaker has a vinyl sheet on top of the particle board and the plastic adheres to it... I was as careful as I could be, but it was stuck pretty tight and the plastic has become a bit brittle.

I've removed all the nuts from the rear of the mid and it too is stuck to the vinyl... does anyone have a tip on removing these without cracking the plastic?

The best way is to remove all screws on the L-Pad/Tweeter plate, then turn the volume up on that speaker with some bass heavy music. Turn up the volume slowly until the plate pops loose. The pressure from the woofer is evenly distributed across the plate and is less likely to crack it. It should not take much volume to pop it off. As for the midhorn, Leave the nuts off and leave the driver on the midrange horn for weight. Just let the unit set with the weight of driver on the horn for a while and it should slowly turn loose. Again playing music with strong bass may help. 🤖



Just an update. **Tier 2** is coming along!! I have to confirm a few measurements before I release it. If it turns out like I think it will, this will be the last upgrade!! Remember I said, if it turns out as the modeling shows now it will be past awesome!! I am also suppose to be getting a set of 4024a drivers. Once they come in I will do the test for **Tier 2** on them as well and design a crossover for them too. We will finally know all the differences between the 4024a and the 4029s!! I will keep you posted as I move forward! 🙌

The 4" hole saw is fine. The three 3.5" holes was for a multi-chamber resonance, that will not be used in the newest **Tier 2** design. The 4" will be just fine. 😊

The Mach 1 driver has around 143 square inches of cone area. The 4" holes each have just over 12. I would go for three and if you can without cutting into the wires I would add a fourth. The 3 x 3.5" was for a muti-chamber effect, which changed the response curve a little. We are not after that anymore. Bottom line is two is not enough.

Bracing is fine even with the 3 x 3.5" holes. I only used one brace of 1" x **2**" front to back. I just cut the brace where it had to be tapped into position and glued it in place. The **mods** are for the 4029 only at this point. Someone said they would send me the 4024a drivers. If that happens I will do a crossover for that model as well! The sides are only 9" deep and do not really need a brace.

The foam tape you mentioned as if you were talking about using it with the woofer. The only foam I spoke of is 1/16" thick and 1/8" wide to replace the seal/damper in the Midrange driver. And yes, in the size I listed the foam for weather stripping is good.

SORRY, MY MISTAKE: I had to edit and put this in here. I think this is what you were talking about. I did say to cover the midrange driver cover with foam to seal for air leaks as well. 1/16" to 1/8" thick will work good for the midrange cover.

Yes, the 3 x 4" holes is better. I plan to release **Tier 2** upgrade soon! I am still waiting on the 4024a drivers so I can see what is needed for it.

OK. Is the O ring flat or is it round? It looks like a spacer to keep the dome from buzzing or touching. If it is flat, how thick is it? If it is around 1/16" thick and the foam you put on is 1/8" thick, I would put the O-ring/washer back in the unit. This will make up for the extra foam thickness. Also, the horn will not be as loud/sharp as it use to be, that's what the foam damper is for. If you had a new horn is would be more like the one you just did. Also, what new caps did you put in? What brand/values?

That would be the best thing to do, replace the foam with the 1/16" foam. As for the spacer I would put it back in the unit based on what I have seen. Can you try to get better pictures and also a picture of the dome assembly it's self. I think the sticky stuff on the ring and in that area is the melted / rotten foam that was in the mid.

I have tested this one and it fits and the ohm load is the same, the material is the same as is the look. It requires just a few **mods** but will work fine. The foam ring has to be removed and your leads soldered and taped in place. 😊

<http://www.parts-express.com/pe/show...number=290-531>

Please see the picture. No foam should overhang the Mid cup where the dome sets. There should be a small recess where you cleaned the old foam off. Try to make sure your foam is no wider than this recess and that it does not overhang any edge of that recess area. On your units the clear washer (O-ring) needs to be left in place. The newer models have a molded in ring, so keep those in your units. Also, the foam is to thick. It would be good to redo them with the 1/16" foam tape! 😊



Cyanoacrylate or more commonly known as Super Glue. This is part of the Tier2 upgrade and the perfect way to reinforce the cone. You drip it on from the back of the cone. You put it on a drop at a time and it wicks out into the material. You need to cover the back of the cone all the way from the voice coil all the way out past the first ring. It's easy to tell where you have covered because the cone turns a darker color as you apply the drops. Even if you use a full 1oz bottle, 75 percent gases out and you have only added a 1/4 oz. A 1oz bottle is enough to do 3 or 4 drivers. When it gases out in a large area like this, it is deadly, it will burn your eyes and lungs. 🤮

W A R N I N G: Do this out doors only and up wind. It helps to use a no fumes formula. There will be full instructions and pictures once I complete and post the Tier2 upgrade. This really cleans up the sound and makes the cone super rigid!

Hello all. I have been slammed with things that have taken my time from this. Don't worry it's coming it will just take me more time to complete. When this is finished, there will be a lot of people blown away. The **mods** I have done now requires you to set the receiver flat!! No EQ, no tone control, no loudness. And you will get solid, clean transient bass all the down to a very solid 30hz. It's spooky how good the low end is. As for the other **mods**, if you like the horn screaming and in your face you may want to reconsider the **Tier 2mods**. It gives depth and smoothness that you would not believe you are listening to horns. It is so different, it works wonders even on the finest jazz recording, blues out of this world and new levels on rock. Many will say that it's not even the same speaker and sound wise it is not. It is still the same look, drivers and all the things we loved about the Machs! Just a new crossover and few other changes and this thing comes alive. I know the Machs had all the problems and characters that every one here has listed. That is why I have spent so much time fixing them! The results so far; I am more than Happy with!! Hope

to finish and post more soon! 🍌

Now that the driver will produce over 9db more output at 30hz, its rated efficiency in the low bass is now 3 fold more that what it was! Meaning it only takes about 1/6 the power to drive to the same volume level as before. The driver has a xmax of 3mm. This is 3mm + and 3mm - for a total of 6mm or 1/4". Because the driver does not have any focus ring or pole plate shorting ring, etc., it has a large stray flux field. I have found that the driver, due to this stray flux will yield a total of 9mm, or just over 1/3" of linear travel before modulation occurs. After the **mods** on the bass driver in **Tier 2**, the driver is hitting peaks of just over 5mm at 100 watts but producing 3 times as much output!! Now when including the SPL in the lowest octave, to produce a maximum SPL at 30hz, the power handling has actually increased. Running them at 100 watts with the increased efficiency is way to loud and feels like it will tare the house down. So, they are still linear in output at 100 watts RMS. If that is a trade off, it is well worth it because of the performance difference. All and all I think they will do just find!! 😊

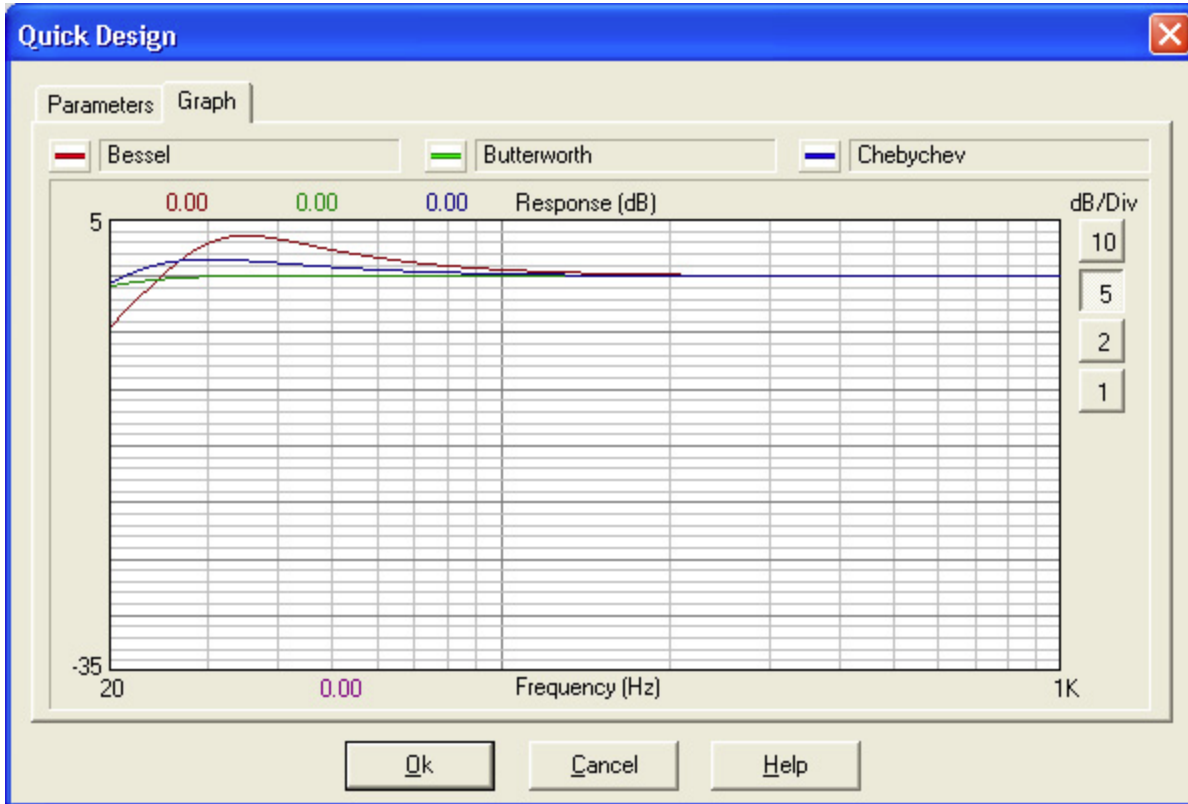
I will back up this information in testing charts when I release the **Tier 2** paper! 🍌

Hello, The 12 x 4" slot would be better than 3 x 4" holes!! I just thought the holes would be easier. The 12 x 4" would yield more area and would be better!

Le: 2.97 mH
Impedance: 8 ohms
Re: 7.1 ohms
Fs: 11 Hz
SPL: 93 dB 2.83V/1m
Vas: 21.28 cu. ft.
Qms: 5.01
Qes: 0.63

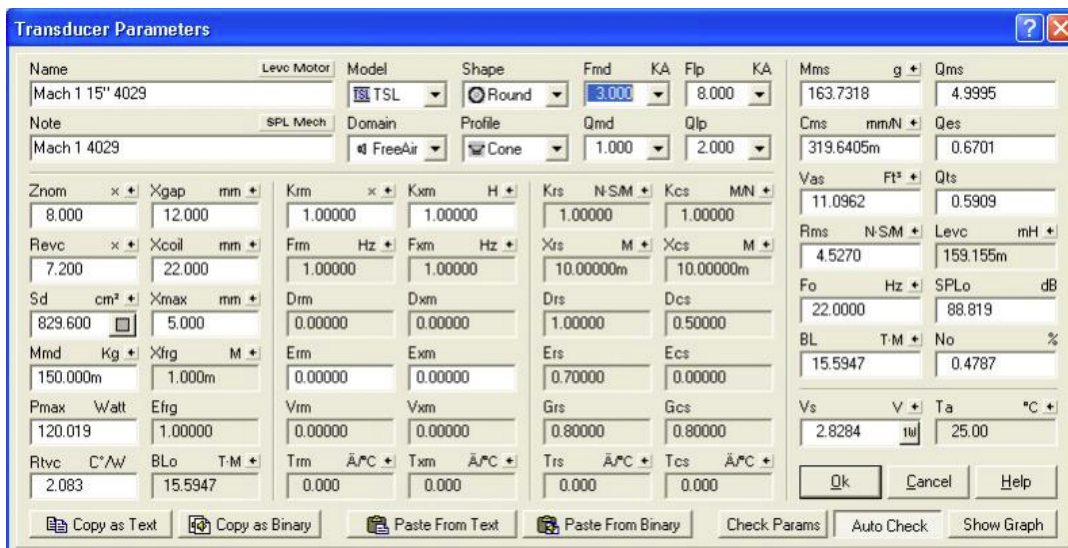
Qts: 0.553
Xmax: 3.2125 mm
BL: 13.12 TM

Here is a model of the Mach One Driver with the **Mods**. It is the Red Line, Bessel Alignment. Before you respond about the gain in the lower output, you must note that in the measurements of the real system there is a 4.5db gain in the 80hz thru 200hz range due to diffraction effects of the baffle's dimensions.



Here are the Original Parameters for the 4029 Driver. I also have included proof of my testing. I stated that the driver produced clean sound up to 9mm of cone travel. The specs that have been listed by others on the Xmax is wrong. The real measurements are just as I had observed in my listening test, confirming my hearing of the 9mm of cone travel before modulation. The real measured total Xmax for the 4029 is 10mm!! It is now confirmed. 😊

Please see the images attached!! Way better woofer than what I first thought. I was challenged to the point that the only thing left was to cut one apart and have a look-see!! This driver is awesome!!! 🍌



I did cut it up. That's fine because now we all know for sure what the Xmax is. No big deal I will just rebuild it... 🤖

Also, I have attached more pics to confirm this new information. The 4029 is a dual layer voice coil and not a four layer. This explains the increased Xmax on the 4029. Same amount of wire, two layers, equals a longer winding length on the former. The unit I have pulled apart, is not edge wound but is round wire of 28ga. The voice coil former is aluminum and is coated in an copper dielectric. The magnet is bolted to the frame! Way better than the rivets most other manufactures use. A very nice and well made driver!! 😊 No, they don't.

Efficiency is defined as

$$No = (4 * \pi * Fs^3 * Vas / (c^3 * Qes)) \text{ with } Vas \text{ in } m^3$$

$$4 * \pi / c^3 = 9.523 \times 10^{-7}$$

so for an 11Hz Fs, Vas of 600l (.6m³) and .63 Qes that would be

$$(9.523 \times 10^{-7} * 11^3 * .6 / .63) = .001207 \text{ (or } .1207\%)$$

$$\text{To get to dB SPL at 1W it's } 112 + 10 \log(No) = 112 + 10 \log(.001207) = 82.8 \text{ dB}$$

The 93dB SPL doesn't work out with 11Hz Fs and 600l Vas.

First off as you have shown me I can show you. It's not floor bounce it is Half Space Gain. Now we need to agree we both have knowledge of speaker design and quit throwing stones at each others grammar and the words we choose. I know what floor bounce is but it is not the technical name or use and the VAS of the series driver/cabinet of which I listed is not technically correct. The point is I believe we both know what each other is talking about. It is a floor speaker, if it is designed anechoically it will not be linear as you set it on the floor, any floor, it will now have a 6db boost in all frequencies produced by the woofer until the power response start to close in on the woofer. This includes setting it down outside in a field. I have a mid driver that is a NAMM Audio 5" from a 24,000 DBL model speaker. You can run the T/S on it or use the factory specs and it shows it is 89db SPL. Now you run a raw SPL gated sweep and at 1w/1m. The average SPL is around 90db and in the 1khz range and a half octave on either side of 1khz, the output is over 105db. By standard T/S math you would say no way but that is what the driver produces in SPL output.

These are the things that T/S can't show or predict. You and I both know why. This driver has very bad resonances at 1kHz and is adding in phase to the electronic energy applied to the speaker. The losses I spoke about as you know are frequency dependent and very high Q. The full specs of the **mods** on the driver are attached. Without me responding to the rest, please stop and check the math. I think you will see with the half space gain that they are 93dB.

The cone area between the two is only 3%. One is listed as cm^2 and the other is listed as m^2 . The one with the lower FS and increase in VAS is 3% larger because I included more of the surround in the cone area because it is now contributing more to the SPL as the cone is moving further.

If you look at the first graph, the parameters K_{rm} , K_{xm} , E_{rm} , E_{xm} , which is part of the TSL data, is set to 1 or 0 (unmeasured). On the second chart they are measured and do not have just a static entry. This is the reason for some of the differences. They define what the speaker is doing in the upper range of the Response. The voice coil in **Tier 2** is not changed. Also, note these are two different speakers from different Mach 1s, 4029 and may be years apart and different production runs. Also, the 1st unit had stock foam on it and the second had been replaced.

1..There are parameters in a driver that are sensitive to change and others that are not. Example: Two identical drivers, voice coil wire gauge is the same, number of turns, winding length, etc. Cone shape, weight, material. All things the same as far as hands on examination is concerned but two completely different sets of parameters. This has happened in our production testing a few times through the years. It all came down to the permeability of metals in the top plate and the pole piece of the magnet steel. Point is no driver change is required to get different results, just one error in the production of a single piece that would otherwise, upon physical inspection would appear to be the same. 🤔

2..The cabinet being Acoustic Suspension and of a very high Q in this case, provides the largest portion of the compliance load for this driver. Even with changes up to a 30% mark, has almost no effect on the output. 🗣️

The glue is not needed for function. It may have been used to set the VC centering in a Rub & Buzz production test.

You can do the same as you reassemble the mid driver. You can hook it up to your amp, just the mid driver, no crossover, just straight wired to your amp. Use a 1kHz test tone from a CD, etc. Set the volume/voltage to the driver at 2.83 volts AC. Move the dome of the mid driver side to side on the magnet until the tone is pure with no buzzing sound. Once you have found this position, set the face of the horn over the dome and replace the screws. If its tone is not pure after tightening the screws, start the procedure over. You may have to do this a few times to get it right. Newer models have alignment pins so the VC was self centering. Also check that the new foam you put on does not overhang the gap that is molded into the housing. Also, make sure yours has the spacer in place, it provides the clearance between the compression chamber and the dome.

STA-84 GOOD RECEIVER

On the Mach One woofer cone area both are correct (james007 & dneuman). The woofer acts as if it were two different sizes! The surround material is an acoustical absorbing medium. At higher frequencies the surround absorbs most all energy that hits it, making the cone area just the size of the paper cone. At lower frequencies however, the surround is stiff and thick and becomes part of the piston of the cone as it is now moving air! You can see this as it plays and is reproducing lower frequencies. The cone area is the paper cone plus about half of the surround width! In modeling on a woofer we are usually more concerned with the bass output and would use the larger area for that. When you do your testing sets there are parameters that are known as an absolute. The DCR, FS, nominal impedance, acoustical output, mass, etc. Then if the modeling does not match the real world sweeps you can adjust the cone area until it does. Now we know the cone area and all the math behind it is correct when these two (model & real) sweeps confirm

one another. Just thought you would like to know this. 😊

Just a note to let everyone know what's going on. I am very happy with the bass and the mid horn of the new design(**Tier 2**). The depth and dimension is awesome. These Machs now hit super low bass and very, very clean!! The mids are round and lush with no edge at all. Very open and transparent. 😊 It is not the same speaker!!

I am not happy with the tweeter, which in this case is handling from 5khz and up. I have now tested 8 of these tweeters and they all have a 12db hole at 10khz. I am looking at what can be done to fix this issue because it's the only piece keeping me from publishing the **Tier 2** paper. I want to keep all the drivers original and I don't want it close, I want it dead on the money. I can't tell you how much better and how awesome they sound now, even with the tweeter issue! Just wanted to let you all know I am still working on it! I think I will drill the phase plug on one of the units and see if it helps the 10khz range. I think the throat size of the tweeter horn is causing this dip due to cancelation. 🤔

No they are not! **Tier 2** has it's own set of upgrades and blows the changes of **Tier 1** away. However the **Tier 1** is needed to complete **Tier 2**. The holes have to be in the mid chamber to use the **Tier 2** upgrades. I will post the details in **Tier 2** but the woofers are stiffened and mass loaded in **tier 2**!! What a difference! 😊

It is just for the 4029 at this time. However, you can do the mod to open the midrange area up to the woofer. This is for 4024, 4024a and 4029. It helps the bass and helps the boom. The midrange area should be opened up on all models of the Mach Ones!

I have some 4024a drivers coming and will be able to see what is needed for the 4024, 4024a after I test them.

That could be an option. I think the 12db hole is from the shape and size of the horn throat. If it is then the drivers, whether from a 4024a or 4029 will make no difference. This is what I have to confirm. I love the sound now from the woofer and the Mid Horn, it is 100% better in the **Tier 2** mod. The tweeter as I said before is the only problem left to solve. 🤔

I wanted to update the people that are waiting to hear about the Tweeter horn. New modeling I have done looks really good and if it works as modeled, we can keep the tweeter and it will perform great!! I found a problem that was throwing me off and just found out why today. Never assume anything and I should know better. Glad I didn't waste more than a day on it. The tweeter if you look is wired in phase at the horn. It is also wired in phase as the crossover, so I assumed the full path was in phase, wrong. At the L-Pad connections they had inverted the phase and this is the reason I thought I was not getting good data and the horn would never test as modeled. Now knowing about the phase, I can remodel and I think the horn will work as it should. I'll update you as I get further along with testing but as of now, things are looking way better!! 🤖

I am sure the Tweeter horn in the Mach One will now work! I still have some more testing, but so far so good. They now sound better than I have ever heard them before. Now I am just trying to see if anything can be made any better before I call it done!! They are 10 times better right now than a stock Mach One. I just want to know there is nothing left that could make them even a little better yet.

Also, if anyone has blow tweeters this diaphragm will fit and work great. You have to remove the foam ring and solder the leads but it works great! It is also made out of the same material and looks the same as well.

<http://www.parts-express.com/pe/show...number=290-531> 🤖

On first inspection this is my findings. I was surprised! I have not done any measurements yet, this is just dissecting and visual inspection. The cones are from the same die but the 4029 cone is stronger. It seems that it has been pressed with greater pressure and is more dense! The surround on the 4024a is not rubber but is a heavy foam that is coated with a thin coating on both front and back to seal the foam and therefore stops mold from getting in the pores and causing foam rot. The compliance is the same as both has the same moving mass and the same FS! The 4024a does have a copper voice coil, while the 4029 has an aluminum copper clad voice coil. The 4024a does not have a four layer voice coil as stated in RS ads, it has a flat edge wound wire single layer voice coil! The 4029 has a much longer winding length and therefore a longer more linear travel! 🤖

The magnet structure seems to be the same but I will measure them to confirm the BL properties. Over all the only major changes is the voice coil former material and the voice coil wire/winding length. Once I repair the 4024a and put it back together I will do acoustical measurements and post the results. One other note, both woofers are really 8 ohm nominal impedance with the 4024a more towards a 9 ohm speaker. Now I would like to test a 4024 and see if it has the four layer VC. This may explain the reason for the change in model number between the 4024 and the 4024a!! More to come! 🤖

If you know how your L-pad was wired, you follow the wire that is on the red colored terminal of the tweeter. It should be going to pin two of the L-pad if it is wired in phase. The 4029 model sends this wire to pin 3, which is ground. Therefore the tweeters on the 4029 are running in reverse phase in stock format. I think you will find the same on the 4024a model as well.

From the factory the tweeters were wired out of phase. This was not a mistake but was done to try and reduce the time difference between the mid and tweeter. I would not change it with the stock crossover. With my new one, **tier 2**, looks like you will invert both mid and high from the factory position. It will be confirmed when I complete the design, of which I am close!

Good News! I have completed the **Tier 2** design and have been listening for more than 100 hours to the results. I can't say enough about how awesome these speakers are now. The dynamics and transient response is better than most that I have heard! I am sure there are many that may question this, but I say mod a pair any listen! I have had a few other engineers to listen in a blind test against many 8-10K speakers. Each one and every time selected the Mach Ones as the best sounding speaker, they had no idea what they were listening to! 🤖

It will take some time for me to document the **mods** as they require some thought and detail as to how they need to be done. I wanted to give you an update and let you know what's going on. Hope to get this written and posted in the next week. 🤖

Note: If you plan on doing this upgrade the Midrange needs the mod for the foam damper and the felt on the pole piece. You also must open up the midrange enclosure area to the woofer cabinet. This information can be found in this thread of you can download the **Tier 1** PDF file, which will show how to do these **mods**. You can download the **Tier 1** PDF at the link below:

In my units I am using air-core inductors, 15ga on the woofers and I am using Dayton Audio polypropylene caps in the crossovers for all, lows, mids & high! The resistors are non-inductive ceramic 20 watts.

That is one of the questions we are going to answer as I have some 4024a drivers on the way. However, I can tell you that only the 4029 has the Ferro-Fluid. This only makes a big difference at high power levels but it can be added to the 4024a!

As I started testing the Mach tweeters and midrange horn drivers, I found a number of things to report. I

will post pictures and graphs later but wanted to let you know what I have found.

On the tweeters the 4024a model has a paper voice coil, the 4029 has an aluminum voice coil. The 4024a dome is mounted to a card board form and the 4029 is on a plastic form. I had stated before that you could add Ferro-Fluid to the 4024a and now that I know it has a paper/card board voice coil I no longer suggest adding any Ferro-Fluid. I believe it will attack the form and make it fail. The 4029 also measures around 1.2 ohms less which should give it a little more output which is much needed. Both units have alignment tabs to center the voice coil. I will test the SPL later and post the output of each unit. Both are very good build quality.

On the midrange units the 4024a also has a paper/card board voice coil and again the 4029 mid has an aluminum VC. The impedance of the 4024a and the 4029 match and the output of each should be the same. The 4029 has a self aligning dome assembly while the 4024a does not. This only matters as the unit is put together. Everything else is the same between the two.

One thing I saw on both tweeter & mid of the 4024a drivers is a very resonant impedance sweep due to the lack of Ferro-Fluid. It is certain that the 4029 drivers will handle much more power.

As I continue, I will update you and will start posting pictures and charts so you can see this for yourself! Woofers will be Next! 😊

The 4029 model has spring loaded push terminals, much nicer! I see them on ebay from time to time. I would try and pick up a pair of these and they screw right in!! 😊

This is a recap of what I found different so far between the 4024a and the 4029. Test graphs will be coming!

On the tweeters the 4024a model has a paper voice coil, the 4029 has an aluminum voice coil. The 4024a dome is mounted to a card board form and the 4029 is on a plastic form. I had stated before that you could add Ferro-Fluid to the 4024a and now that I know it has a paper/card board voice coil I no longer suggest adding any Ferro-Fluid. I believe it will attack the form and make it fail. The 4029 also measures around 1.2 ohms less which should give it a little more output which is much needed. Both units have alignment tabs to center the voice coil. I will test the SPL later and post the output of each unit. Both are very good build quality.

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The magnet flux of each mid and tweeter models measure the same! Both midrange domes are of the same material, the mid housing, the complete assembly, all the same. The only thing I find different is the alignment tabs on the front plate and the VC material! I haven't done it yet but I will. I believe that both mid horn units will sound very much the same and measure the same as well. Those test are coming...

Both tweeters use the exact same dome material as well. The 4029 being darker in color is only from being stained by the Ferro-Fluid in them, they are both coated textile domes. The method of VC alignment in each model is different, but again the real difference is in the VC of the two. I do expect to see a difference in the measurements between the tweeters. Those test are coming too...

Hello All. You can start working on your woofers to get them ready for **Tier 2!** I have attached some pictures that may help. This is where we coat the woofer cones with cyanoacrylate glue(super glue). This does a few things for us.

- 1..It will increase the frequency response of the woofer.
- 2..It adds a lot of strength that is much needed.
- 3..It also weather proofs your speaker.
- 4..It adds mass.
- 5..It gives the faded cone back it's original color.

As I stated before, with this glue, please read all the warnings about the safety of this glue. It will burn your eyes, your lungs, etc. I recommend a non fuming formula and to do this out doors and up wind! You will make as small a hole in the glue tip as possible. You will paint or draw this on the cone like you are coloring a white piece of paper with a pencil or felt tip pen. You need to use a **2** or 3 inch size clean dry paint brush to clean all the dust from the woofer cone first. One cleaned, Start with the glue at the edge of the dust cap and work you way up the cone. The dust caps on some of these older woofers comes loose, so make sure you go around the edge of the dust cap two times. If you get this glue on the dust cap, wipe if off with a paper towel right away. Work your way up to the surround. If you get it on the surround, wipe it off with a paper towel right away. The non-fuming glue will take an hour to fully dry. The standard will dry in 4 or 5 minutes, but it is deadly, the fumes are really bad. You can practice this on any piece of cardboard first to get a feel before doing your speakers! See the pictures and post if you have questions. Please don't PM me on this, post them in the thread because others may have the same questions and it will help them as well. More to come...!



The high frequencies are extended, the sound is cleaned up and the large cone is less prone to the drumhead effect. The bass is tighter and cleaner with more punch. It will extended the top end to 3khz. I have done 4 woofers and all are consistent and extend to 3khz!

It will help the 600 boost but opening the midrange area and coating the woofer will get rid of it all! 🤪

- 1..It will increase the frequency response of the woofer.
- 2..It adds a lot of strength that is much needed, makes the cone much more rigid, this also lowers distortion.
- 3..It also weather proofs your speaker.
- 4..It adds mass, needed for **Tier 2** Upgrade.
- 5..It gives the faded cone back it's original color.

As I started this new design, I tried many amps on the Mach Ones! After all this testing, no amp that I tested came as close as the Realistic STA-2080 as being the optimal/best amp for the Machs. It is a very high current design, which is what they like. A very full bodied midrange that is smooth. Other units did sound good but didn't drive the units the way I wanted. So, after all this testing, I voiced the new **Tier 2** upgrade around the Machs be driven by the STA-2080 and all listening test were done with this amp! A list of amps I used and tested are shown below. The ones that start with an (*) are the ones I felt performed the best with the Machs!

- * Realistic STA-84
- Realistic STA-800
- * Realistic STA-90
- * Realistic STA-95
- * Realistic STA-225
- Realistic STA-235b
- Realistic SA-2001
- * Realistic STA-2000
- * Realistic STA-2080 (The Best)
- * Realistic STA-2100

Marantz 2252B

Pioneer SX-580

*Pioneer SX-980

You can use it on any paper pulp driver! As the paper pulp cone ages, the bond in the fibers starts to turn loose and the cone softens up. This is due to moisture content changing, the same thing that causes the foam to rot. This is the reason that a lot of older 4024 or 4024a drivers buckle under high power usage. Coating the cone will not change the driver, except it will make it perform like it did when it was new when the fibers were tight. It will also lower distortion and make the driver more linear. The less the cone flexes the more linear the audio output will be! 😊

If done right you will not need more than **2** oz. This glue is very thin and covers and wicks into the fibers! Here is a link, however this is not the no-fume formula. You will need to check a local hobby shop for that.

<http://www.parts-express.com/pe/show...number=340-602>

This is the same glue I use!

<http://www.hobbytown.com/Shop/styren...less-thin-1-oz>

The Ice Shield is a roofing material to replace tar paper. Many have used it to line the panels in cars for audio where it will make a difference. Any time you add anything to a panel you change the resonance of that panel. It can be a brick, a chunk of brass or Ice Shield. It will not remove lower energy but it will help remove the higher energy/buzzes if you have them. It won't hurt to line the cabinet walls and even the mid range horn body. However, this material will take up internal volume from the cabinet so, be very clean with the install and don't try to put too many layers. The cabinet was too small to start with which is why we used the midrange area to make it larger.

I know it might not seem like much but if you covered the side walls and the back of the cabinet behind the woofer, without doing the top and bottom you have already reduced your cabinet volume by over 200 square inches! That's not a ton but it does add up quick.

As quoted I don't know everything and learn new things every day! I never thought it was a bad idea, I think it is a great idea! I just didn't want anyone to get carried away and put four layers and then say the **Tier 2 mods** didn't give them the bass response I said it would. I do think it will help as the cabinet does have some issues with vibration. I really think it will help on the midrange horn and the side panels! 😊 We are all here just trying to get a better music experience!

No trial and error, just tons of measurements and from every angle, then hours of crunching data. You can draft a quick x-over in a few hours but that is not what I am after. My goal is to make the units AGAP. I have done 100s of iterations already with several dozens to go...

On another note: It looks like the 4024a will use the same crossover as the 4029. Mids, Tweeters and Woofers acoustical SPL output is all but the same. There are just a few spots where there is 1db difference in the bandwidth area that will be used. I will post the SPL response graphs tomorrow, or should I say later today, sense it's 1:21am already!!! 😊

Here are the testing results I said I would post. Also, note that all the drivers between the 4024a and 4029 are so close they can be called the same. You can find this much difference between the same model just a different unit. Bottom line is, many have said they think the stock 4024a sounds better but you could put a crossover from a 4024a model in the 4029 model and it should be so close you couldn't tell the difference!

The real difference that happened to the sound between the 4024a and 4029 was the crossover! 😊
The info above is the non-fuming type. I recommend it highly. The first thing you have to do is get all the dirt/dust off the driver with a clean dry paint brush. Make sure it is clean, clean, clean.. Ok. Now, with the smallest opening you can make and letting the glue run out on it's own, you must draw it on, like coloring a white piece of paper black with a pencil. You will see it soak into the cone right away. Any that does not soak in must be wiped off with a paper towel right away or it will turn shinny. It is almost like putting on a drop at a time and letting it soak in, then doing it all over again. Note, if it does not soak in right away, you must wipe it off with a paper towel. Also, you do not want to stop in the process, or it will make it harder to get a smooth look. If the glue you just put on is allowed to dry first the next glue you put on, where it meets the previous glue will not soak in where it over laps and the new applied glue will end up shinny if not wiped off. Hope this helps and please ask questions or try it on a piece of cardboard first to get the feel of it.

A 1oz bottle should do a pair of Mach 1 speakers. You may need just a little more to finish the second unit and it does take time to do. Also, if you are using the standard formula, you should be outside and where the wind will blow the fumes away from you.

I'm having difficulty finding the 14uf and 8.2uf caps... can I combine caps in parallel to get the correct value?

Yes you can parallel them to get the right value. I think PE has the 8.2uf in the Solan caps. 😊

The lower midrange from the woofer cone, if the surface is shiny, will have a thinner sound, cold and glassy. If the paper stays dull and textured it will produce a more damped tone in the lower mids. If it is shiny from a rubberized coating that will be fine, but the polymer in the CA is glass hard and so will the sound be. Like the

difference in a metal dome and a soft dome tweeter! 😊

The Solan Caps are very fast, but, I have tested and noticed that all Solans have a strong edge in their sound around 3khz. This has something to do with materials and their construction. This is something that is not needed on the Mach 1s. On a speaker like the Mach 1s, I think you will get better results with the Dayton! Some may not hear the difference, but I do. Bottom line is, you can use the electrolytic caps to save money if you need to and they will work fine. In this speaker, it is more about the value(correct component value), than the brand of the product.

A speaker with a great design and cheaper parts can out perform a speaker with the best of parts and a poor design! 🙄

If your multi-meter has an option to test inductance you could just wind off wire until it reads .15mh. If your are referring to it reading .15 ohms, that will not work.

I posted a while back, as a guess maybe around page 16, how many turns to take off to wind the .3 down to .15mh.

52 turns off should be fine. If you have a MM that has a mh scale and can test inductance, I would use it to confirm it, that would be best!

If you have 1/8" foam or the like, you can cut it 1/8" wide and lay it on a flat surface on it's side and cut it in half with a razor! I did this on the last ones I refoamed. The strips are just over 3" long, should be easy enough.

I would expect to see an ohm load just about one ohm higher, around 7.5-7.6. It would not hurt to double check and look at the crossover again and just see that all looks ok.

Replace the 22uf with 14uf (Woofers)
Replace the 3mh coil with **2.7**mh or wind down (Woofers)
Replace the 10uf with 8.2uf (Midrange)
Replace the 1.4mh coil with 1mh coil or wind down (Midrange)
Replace the .2 mh with .15mh (Tweeter)
Replace the **2.2**uf with 4uf (Tweeter)

Follow all the other instructions in the **Tier 1**

Set both Midrange and Tweeter dials to 0db (4024a) or -3db (4029) for the new 0 db setting. This is because of the resistor values used in each model, the 4024a using more resistance does not need to be turned down but the 4029 does. If you want your dials at 0db on the 4029 model, you can replace the **2** ohm mid resistor with 8 ohm and replace the tweeter's 1 ohm with a **2** ohm resistor.

Tier 1 was for 4029 models only as I did not have nor had I tested any 4024a of which I still had the data. As I tested the 4024a drivers a week or so ago, I found that they are pretty much the same as the 4029!! Both in impedance and more important, in acoustical SPL output! Now, some have decided to do a **Tier 1** on their 4024a models. **Tier 1** didn't say to change the 3mh to **2.7**mh because again it was for the 4029 which already had a **2.7**mh. So the changes I just posted a few back are needed for anyone that is going to use the **Tier 1** on a 4024a model. NOTE: About the 3mh Coil. If you leave your 3mh just as it is and the lower mids sound thin, then I would wind it down. If you are happy with the lower mids and they sound full, leave it alone! The change will be small, but to some they will hear the difference! Hope this helps. 😊

In the **Tier 1** all drivers are to be hooked in Phase. + to + and - to -. I have found from the factory the model 4029 had the Woofer and Mid wired in phase. However, the tweeter was hooked out of phase from the L-pad to the tweeter driver. With the **Tier 1**, the tweeter needs to be hooked in phase/reverse the clips at the tweeter horn. I believe you will find that the 4024a models are also wired this way. Make sure to check them.

The wire is enameled, this coating keeps it from shorting, however, a couple of nicks and you do have a short. I would make sure they don't cross, or at least, make sure they don't touch.

On the 4024a i have found the wiring from the crossover to the L pad are identical for tweeter and mid range, the only thing i dont know is on the tweeter which side is positive, there are no markings but one terminal is a reddish brown the other is off white. I think the reddish brown would be positive ,if so they are wired in phase if not i am out of phase please let me shed some light if you can

The red is positive! But, I bet you have a blue wire on the red terminal and I also bet it goes to pin 3 of the l-pad, which is ground!! If the blue wire is on the 3rd pin, you need the blue wire on the white terminal and not the red one!! 😊

If the blue wire is on the red terminal of the tweeter you are in good shape! If no one has ever change it, that means the 4024a are in phase from the factory on the tweeter. 🙌

*I am starting all the **mods** in this thread to a pair of 4024A's. Thanks to all who have contributed. I posted back on page 4 or 5 I believe and have waited until videolady completed all her work. I am an engineer but know nothing about audio systems and am eager to learn some since my golf game is getting worse instead of better.*

1)The black plastic base on the mid horn driver diaphragm and coil was glued to the magnet deck with a brown glue or sealer. Do I need to reglue it? If so what kind of glue?

2) How do I attach the 1/8 inch felt circles to the magnet deck and attach the three together when I **tier**

them up?

Thanks for any help. I am sure I will have more questions as I go thru all the **mods**.

You can use silicone glue for the mid. You need to feed the unit a 1k test tone at 1 watt/2.83volts, when you put the dome back on with the glue. Move it left, right, up and down to center it and make sure it is not buzzing on the pole piece. Hold it at that position until the glue sets.

If you get the felt pads that are self stick, that is all that is needed. They will stick to the magnet pole and to each other. 😊





Just some info for those who want to know. None of the Mach 1s were ever 4 ohm. None of them were ever even 6 ohms. The 4029 woofers are marked 6 ohm but that is the DCR of the driver. You can look at any ad all the way up to where they stopped selling the Mach 1s. You can do this at: www.radioshackcatalogs.com. You will see that all Ads for the 4029 model says 8 ohms, all Ads for the 4024 and the 4024a also says 8 ohms. I have tested all these drivers and they are all 8 ohms.!

I am not interested in these ports for a few reasons. However, anyone can add these at will and post their results. The reason I would not use them are as follows:

- 1..They do not add any extension to the response and pull more current from your amp.
- 2..They unload the driver at lower frequencies, (below F_c).
- 3..They cut the low end response another 6db. AR systems roll off at 12db an octave and the AV systems roll off at 18db.
- 4..Group delay and transient response is slightly worse with them.
- 5..They change over a period of time, depending on the amount of dust in the room.

That sounds all right, they all should be in phase in **Tier 1**.

Left pin on L-Pads, Pin 1, input - goes to x-over

Mid pin on L-Pads, Pin 2, positive out goes to related driver

Right pin on L-Pads, Pin 3, Ground goes to related driver ground and ground on the x-over

I received a mid driver to replace my toasted unit... many thanks to Copa1934 for his generosity, so I'm ready to complete this project... but as always I have a couple questions!

My originals are 4024A models, the driver Copa sent is from a fluid cooled model... this being the first fluid cooled driver I've ever had apart I have a couple questions before reassembly: The groove in the magnet that the VC slips into is full of the black oily fluid... should I clean it out? The fluid doesn't seem to be contained by anything...normal? Since my other speaker is non-fluid cooled can I just wipe this fluid off and go with it dry?

On another thought, I measured the new caps and they are a bit off: the 14Uf measures 14.88 (I combined 3 caps) the 8.2Uf measures 8.53 (2 caps) and the 4Uf measures 4.25 (single)... Will this make a noticeable difference in the sound? I also measured the old caps and they each measured over a bit as well, could be my meter I suppose.

Yes, use a paper towel and just soak the fluid from the magnet gap. Once it's out, wipe again with a dry one to clean up what's left. It would be better for the drivers to match. Your caps values are ok. Caps will measure different at different frequencies and yours are close enough.

I haven't left yet. I have had a lot of health issues(heart problems) and it has had me down. I never intended to leave anyone hanging. Sometimes the body says slow down and you have no option but to do so. I have completed the **Tier 3** work and I just have to document it so I can put it on line. I will not state a time as I have no control over health issues but I will say I will post it just as soon as I can get it all written up. Sorry I haven't been on here to answers any questions in a while. By God's grace I'll make through and hope to have the **Tier 3** posted soon. 😊

The resistors suggested are correct. The mach one, when set completely flat has a dark sound as the lower mids are produced through the woofer. The woofer produces about 1.2k down and the resolution in this range will be warm and thick but the amplitude with these resistors is flat. The newest x-over design in **tier 3** helps these issues. I am documenting version 3 now and hope to have it completed soon. However, I think it is much better than the stock unit if you are listening for long periods of time. I use some of the best known records to judge the final results. Compared to a stock unit it will sound thick and warm, but if you compare it to another standard type speaker (not horn loaded), I think you will find the tonal balance much closer with the suggested resistors. Hope this helps.. 😊

The difference you heard could of been placement. Even with them being side by side there can still be a huge difference. Next time you check two speaker, swap the speakers position after your first listen and then test again. One foot or more can make a world of difference. The measurements were gated to remove room reflections and the room is over 65 feet wide and 45 tall with the speaker suspended 20 feet in the air. I also did sweeps with the unit on the floor in the middle of the room to correlate the measurements.

Tier 3 is the last one, there is no **Tier 4** in the works. I have listened to them now for many months. After the **Tier 3 mods**, I believe they are as good as they will get without changing drivers and I don't plan to do that. 😊

<http://www.retroradionetwork.com/thoms/tier1.pdf>

I finished the **mods** this weekend - all **Tier 1** changes + woofer cone treatment, added one brace and put a little fill in mid horn cab. also weathstripped the mid horn and Lpad panel. I'd estimate approx. 8 hrs, but I didn't really add it up.

Thanks to VL for all the work and all others who contributed.

My experience and impressions for those interested (Mach Ones, 4029):

Set both Midrange and Tweeter dials to 0db (4024a) or -3db (4029) for the new 0 db setting. This is because of the resistor values used in each model, the 4024a using more resistance does not need to be turned down but the 4029 does. If you want your dials at 0db on the 4029 model, you can replace the **2** ohm mid resistor with 8 ohm and replace the tweeter's 1 ohm with a **2** ohm resistor.

>>>>

I made the following unwraps to the three coils in the 4024a.

woofer 3.0mh down to **2.7** 10 turns off equals **2.695**mh

mid 1.4mh down to 1.0 20 turns off equals .997 mh

tweet .20mh to .15mh 32 turns off equals .148mh

Hope this helps the 4024a owners.

>>>>>>>>>>>>>>

Nice summarization. One thing to add, which I'm still working on, is enlarging the cabinet. I've come up with a way to increase the volume without irreversibly modifying the original cabinet, in other words if you don't like the change you can go back and no one would be the wiser. Due to the in-climate weather I've put off this mod for a bit. I hope to complete the tier-1 **mods** soon. Got a couple other projects that are less demanding to complete.

It may help to add this tip from VL to your condensed **tier 1-tier 2** upgrade..

Hello All. You can start working on your woofers to get them ready for **Tier 2!** I have attached some pictures that may help. This is where we coat the woofer cones with cyanoacrylate glue(super glue). This does a few things for us.

- 1..It will increase the frequency response of the woofer.
- 2**..It adds a lot of strength that is much needed.
- 3..It also weather proofs your speaker.
- 4..It adds mass.
- 5..It gives the faded cone back it's original color.

As I stated before, with this glue, please read all the warnings about the safety of this glue. It will burn your eyes, your lungs, etc. I recommend a non fuming formula and to do this out doors and up wind! You will make as small a hole in the glue tip as possible. You will paint or draw this on the cone like you are coloring a white piece of paper with a pencil or felt tip pen. You need to use a **2** or 3 inch size clean dry paint brush to clean all the dust from the woofer cone first. One cleaned, Start with the glue at the edge of the dust cap and work you way up the cone. The dust caps on some of these older woofers comes loose, so make sure you go around the edge of the dust cap two times. If you get this glue on the dust cap, wipe if off with a paper towel right away. Work your way up to the surround. If you get it on the surround, wipe it off with a paper towel right away. The non-fuming glue will take an hour to fully dry. The standard will dry in 4 or 5 minutes, but it is deadly, the fumes are really bad. You can practice this on any piece of cardboard first to get a feel before doing your speakers! See the pictures and post if you have questions. Please don't PM me on this, post them in the thread because others may have the same questions and it will help them as well. More to come...!

Try to answer sendust and fritz in one fell swoop. Regarding size the Tier-1 document hints to this early on, just reread it today. Through PM's VL told me to shoot for roughly 4cuft with my custom design, but more on that much much later as I'm still working out details of which mid and tweeter to use, i.e. really a Mach crossbreed of sorts.

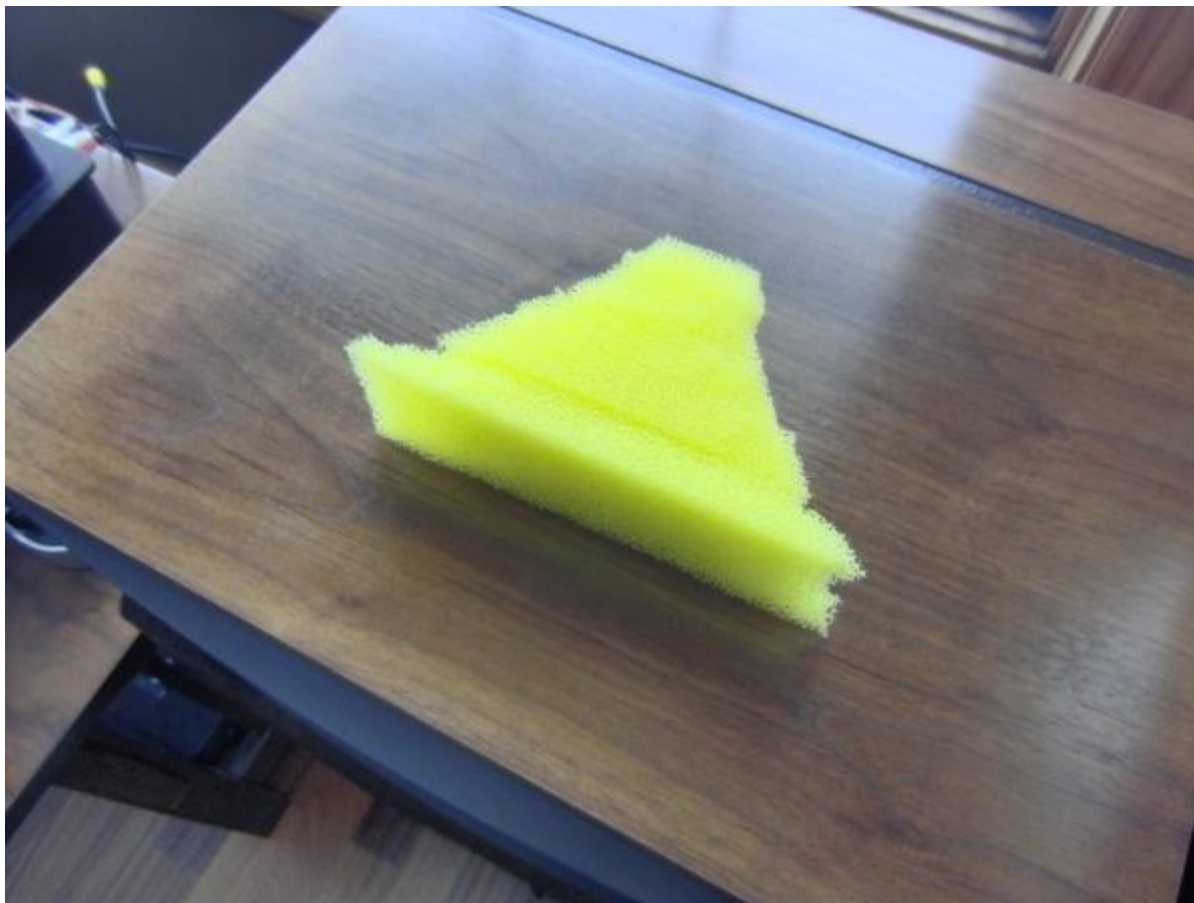
All my Mach's have the screws in the back and none have the mid braces mentioned. I have 4024a and 4029. If enough date codes are posted there may be a way to figure this one out, though I've never heard brought up the possibility of an additional factory/place for them to be constructed. Remember, we're talking over 6000 locations stocking at least one floor pair and possibly a backup, and stocking as many as 6 pairs for sales. Do the math, that's a huge number of one model of speaker.

As for the mid, check out the Tier-1 document. It's very possible the mid needs rebuilding, though caps can restrict the frequency response leaving the mid sounding weak since it's not producing the band width it's suppose to since it's being constricted on both top and bottom ranges. Don't discount pots. Scratchy IS an issue. The fact that you hear changes means only that some signal is getting through, but contamination works like resistance, hence reduced output. Just cleaned one of the pots in my AR3a, with same issue, contamination was amazing, as well as some corrosion.

"The bullet has to be there in the midrange driver. It is a phase plug, without it the horn would be very beamy and the spl would go down. The 4 small slots cause the air pressure to increase from the dome to get through the slots and is the very thing that makes the spl of the horn go up. This is why they are called compression horn drivers. If this section is altered it would only get worse. All compression horns have this type of setup."

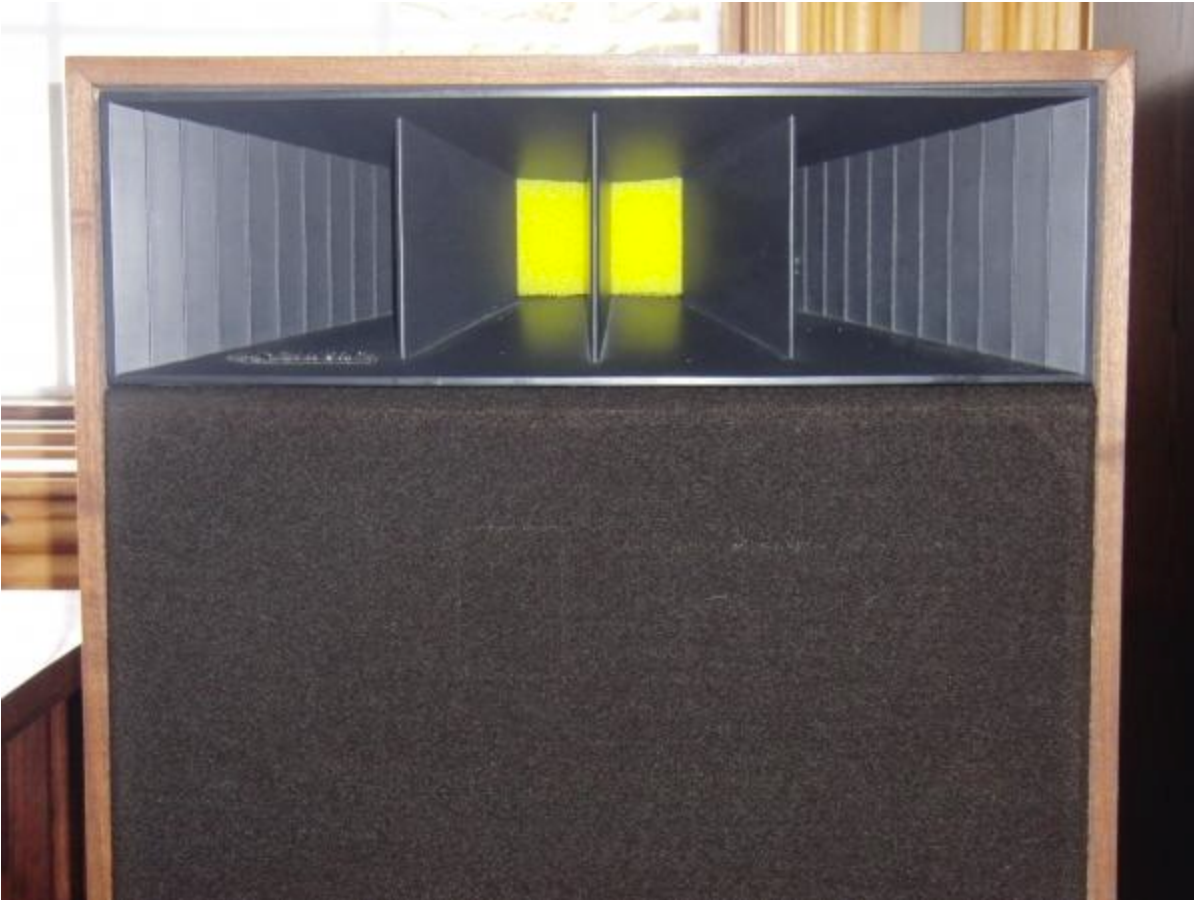
Sure, I can post up a how-to. I haven't started on the second one yet. I've got both in parallel with my Paradigm's atm and am reluctant to take them out now! When I do I'll take a few pics along the way. Should be in the next week or so, my wife wants them to match. 😊

For those interested in taming the horns harshness further, I stumbled on [this thread about reticulated foam](#). So I thought "it's a cheap thing to test out", and I went and picked up humidifier filter made of reticulated foam. (30 pores/inch) I's about 13/16" thick so I cut 5 layers of increasing size that fit in the horn's throat:



Unfortunately they only had yellow, but this was just a test anyway. Looks like so in the horn:

Surprisingly it does work. Tames down the harshness quite noticeably without loss of detail. The yellow ones are staying in there until I find some black foam. Btw, you have to use reticulated foam and I read elsewhere it should be about 30 pores/inch.



The caps aren't a problem. \$11.61 per speaker. In the **tier 1** pdf VL calls for a 22ga .15Mh coil. I doubt one can be found. That coil should have a dcr of .33ohms. A 20ga .25Mh coil also has a .33ohm dcr and will handle twice the wattage so it will give off much less heat. I remember somewhere in this thread VL talks about reworking all three coils. I will have to look for that and see what I can come up with. In the mean time maybe VL can get the message about the coils and offer some info.

Erse, P.E. and many of the others have simple carts to use. The trick is in the search. Couple tips.

1. Most you can enter 6uF to find 6 microfarad. But with some searches you may need to type 6.0uF (not case sensitive, just proper practice) OR 6mF (some use "m" rather than "u", which technically isn't correct but phonetically correct, sort of). In some cases you may need leading zero's, i.e. 0.47uF rather than .47uF. Not all sites reference the same. The other issue is finding "like" values. I found P.E. to have more selection or more granularity, if you will, making it easier to find less common values.

2. Stick with at least 50v caps, some will say 100v but if you don't listen at "stupid loud" levels it won't matter much.

3. If you're experimenting and not worried about replacing caps again (15-30 years down the road) then simply go with Electrolytic. Most people argue today's are better quality than yesterday's variety so all is

good. If you don't wish to visit this again or you plan to pass the speakers down you might want to consider Polyester (PE) or Polypropylene (PP). I'm no expert, but my understanding is that PP can produce different results for the same value meaning fine adjustments to the crossover may be necessary. Audible difference? Some would argue not, but just thought I'd mention it.

So, in a nutshell the "value" may be your best bet, BUT, here are some part numbers for reference. These only work on the PE website. 2.2uF 100v = "027-324". 4.7uF 100v = "027-332". One other point, these are Non-Polarized. Speakers use AC not DC, plus and minus (or red and black) are simply there for "phase" reasons and not really polarity. Polarized will have plus and minus symbols on them so you can tell the different. Usually they have both leads on one end where non-polarized have leads on opposite ends, sometimes referred to axial (like an axle, but not like axle rose).

A note on the leading and trailing zero's. Some sites use both, which means you can find 6uF and 6.0uF used on the same site. Why? I haven't a freaking clue. Bad Developer karma is all I can figure. Real DBA's wouldn't allow that to happen.

VL had posted these coil wind downs for the 4024As

woofer - 3.0mh down to 2.7 -10 turns off equals 2.695mh

midrange - 1.4mh down to 1.0 - 20 turns off equals .997mh

tweeter - .20mh to .15mh - 32 turns off equals .148mh

Here is a list of the caps and part numbers from Parts Express. I just unsolder one of the legs of the resistors and test them. If they are in spec (and they almost always are) I use them.

12uf 027-430 \$4.31 The 12 and 2 will be piggybacked for 14uf

2uf 027-414 1.48

8.2uf 027-426 3.37

4uf 027-421 2.01

I will be ordering caps in the next couple of days. Lots of speakers to repair and recap. When it rains it pours. I know some are waiting for pics but customers come first. Should be about a week so get your soldering irons and glue guns ready.

1..Did you check your tweeter and midrange to make sure the stock #s match what I listed on page one?

2..Did you check your tweeter and see that on an ohm meter it shows around 7 ohms? Did you check the mids in series and see that they show around 7 ohms?

3..Did you check the polarity at the driver terminals to make sure they are correct. Your crossover looks great and is wired correct!!

4..Are you running these tone flat. Loudness turned off and bass and treble in the mid position?

5..Have you moved them out of the corner and raised them off the floor 6 to 8 inches.

I had noted that you advised that unwinding 52 rounds gave you a reading of .154 , Is this close enough or is it better for me to use a multi-meter and confirm .15

Yes, use a paper towel and just soak the fluid from the magnet gap. Once it's out, wipe again with a dry one to clean up what's left. It would be better for the drivers to match. Your caps values are ok. Caps will measure different at different frequencies and yours are close enough.

The red is positive! But, I bet you have a blue wire on the red terminal and I also bet it goes to pin 3 of the l-pad, which is ground!! If the blue wire is on the 3rd pin, you need the blue wire on the white terminal and not the red one!!

Replace the 22uf with 14uf (Woofers)

Replace the 3mh coil with 2.7mh or wind down (Woofers)

Replace the 10uf with 8.2uf (Midrange)

Replace the 1.4mh coil with 1mh coil or wind down (Midrange)

Replace the .2 mh with .15mh (Tweeter)

Replace the 2.2uf with 4uf (Tweeter)

woofer 3.0mh down to 2.7 10 turns off equals 2.695mh

mid 1.4mh down to 1.0 20 turns off equals .997 mh

tweet .20mh to .15mh 32 turns off equals .148mh

This is what I have for the 4024a

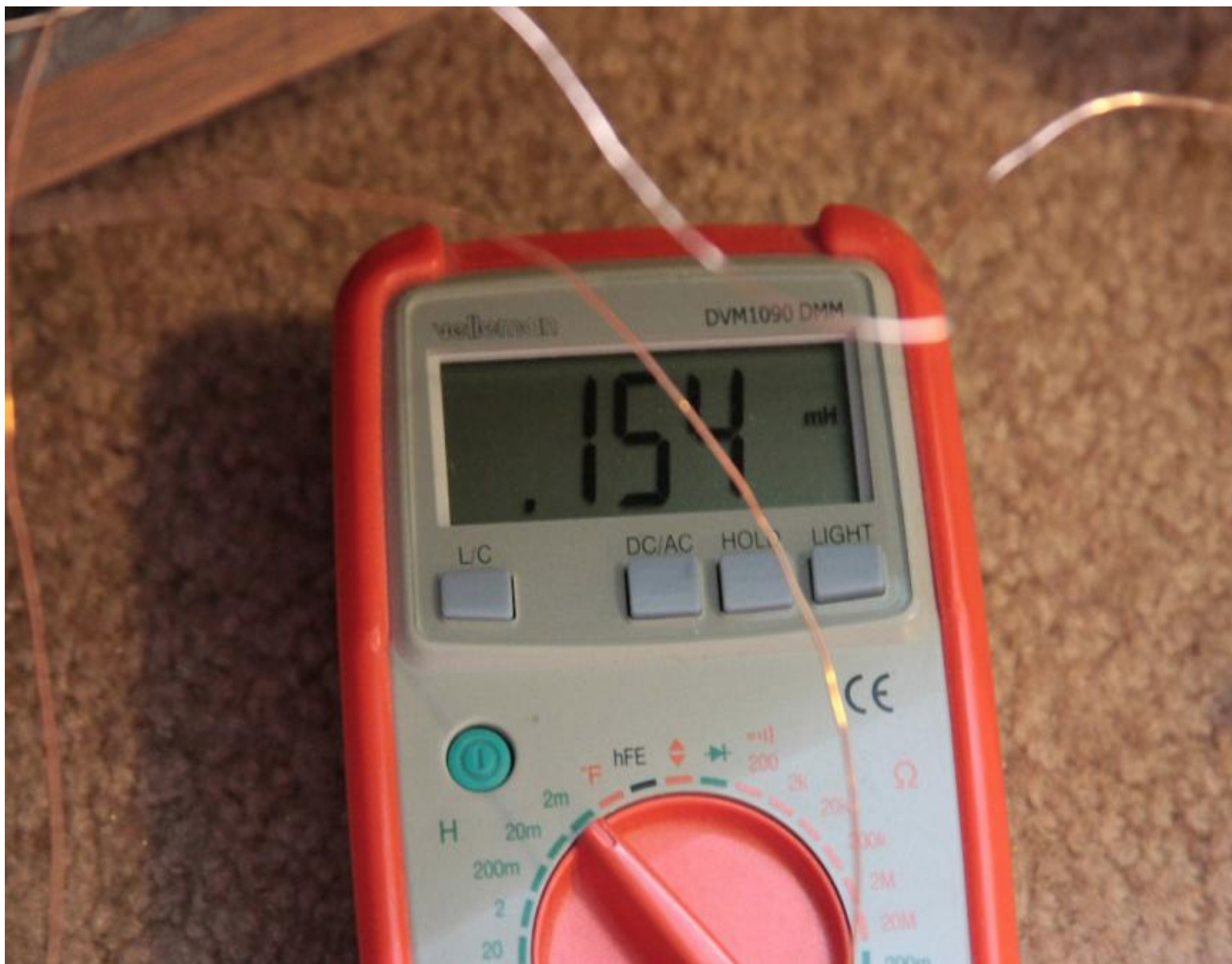
The 4029 only gets one coil changed, the .3 gets wound down to .15

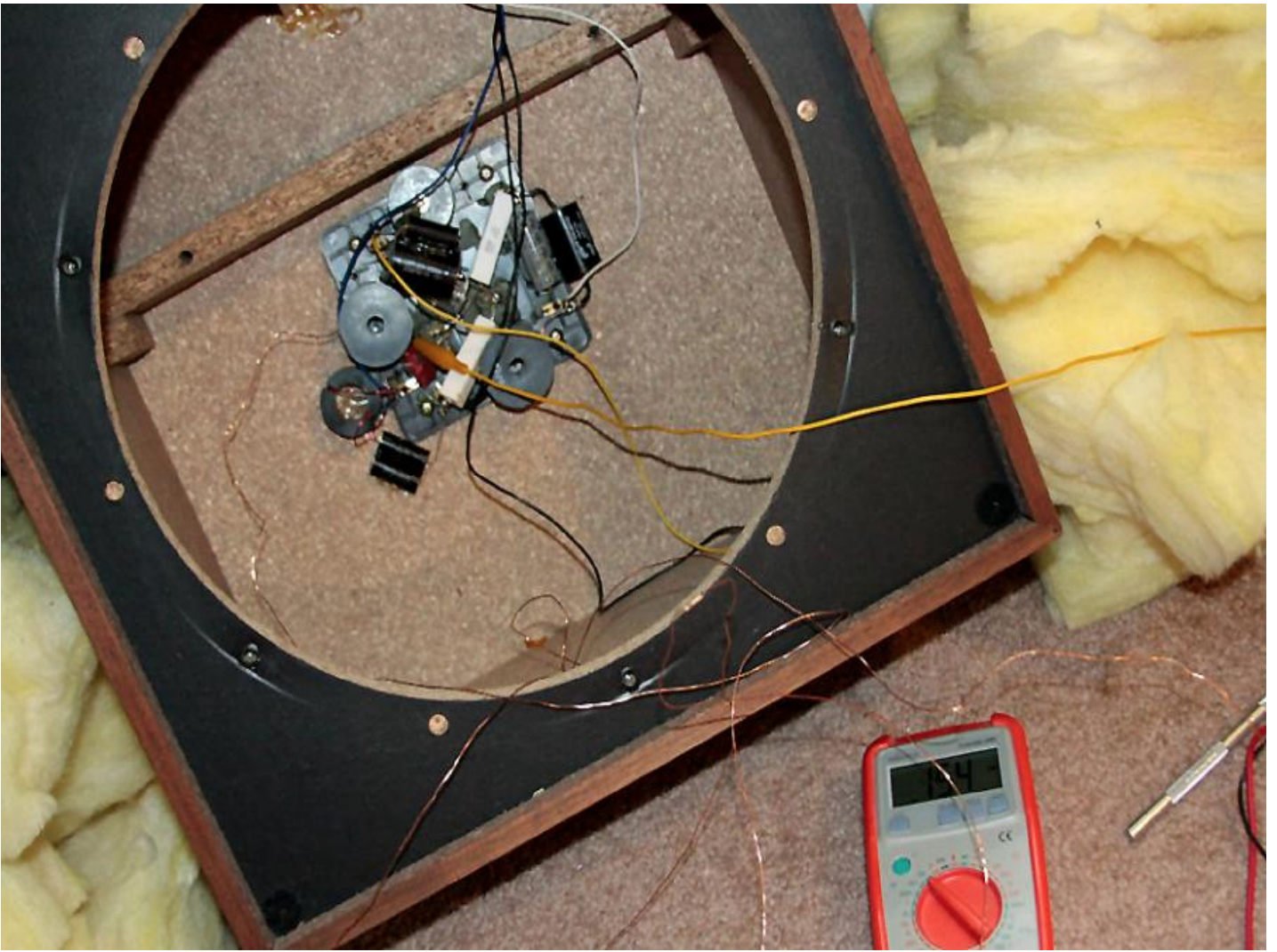
Unwinding the .3mh Coil

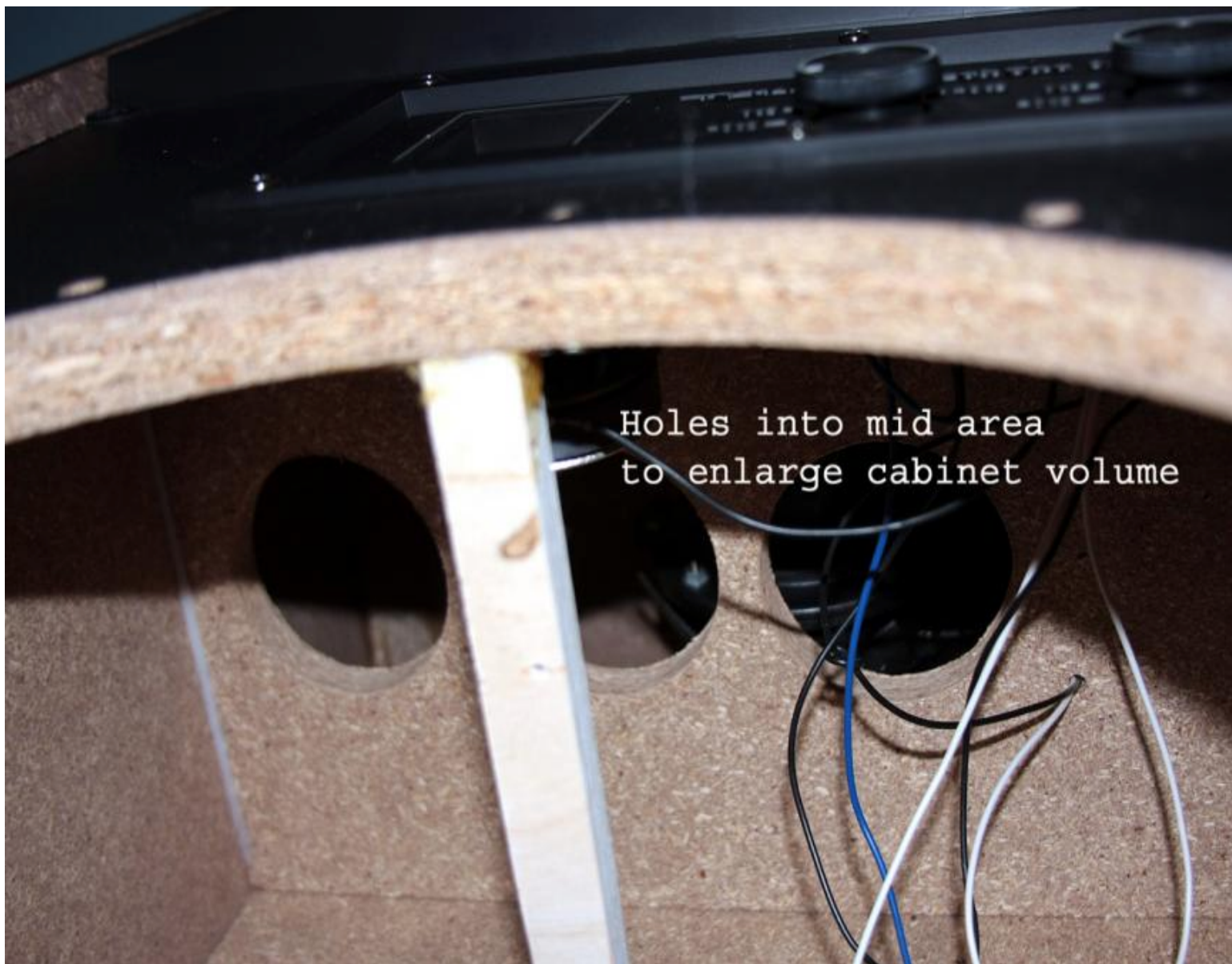
The .3mh coil can be unwound to make the .15mh. It's fun.... They had glue all over mine and it was tricky to get it started unwinding. After I did, it was no problem. To wind it down to the .15mh coil, do the following:

Unwind it 52 turns. This will give you about 11' 7" of wire. It doesn't have to be 11' 7" but you should end up with a piece between 11 & 12 feet long. As you can see on the meter mine ended up at .154mh at 52 turns taken off. Be sure to scrape the enamel off the wire when you cut it so you will get a good solder joint! Also, make sure the wire left on the coil is tight. Put a few pieces of electrical tape, etc. on it to hold the winding tight.

I also included a picture from the woofer side of the holes cut into the mid area. You can also see a 1 x 1 inch brace I added. 🍀







Holes into mid area
to enlarge cabinet volume

