

Gen III Model II dash speaker (squawker) upgrade

by XS650

I previously upgraded my four door speakers to Pioneer TS-A1673R speakers with Dynamat Extreme in the doors. That made a very significant improvement in sound quality over the stock speakers. That was covered here:

<http://priuschat.com/forums/gen-iii-2010-prius-audio-electronics/93817-gen-3-non-jbl-speaker-upgrade.html#post1324450> .

At his time I am still using the stock non-JBL receiver. I will eventually install a Rosen NAV.

In this paper I upgrade the dash speakers to Pioneer TS-A878 speakers. I selected these speakers because they looked like good performance for the money and two other PCers had used them and liked them. I believe that any other 3.5 inch co-axial speaker with similar performance characteristics would also make a major improvement over the stock dash squawker.

I would like to give a big thank-you to Spiderman for his paper on installing the same speakers. His paper saved me quite a bit of time. I believe the extra work I did made some improvement over Spiderman's method, but his installation gives a big improvement over stock with less effort. Spiderman's paper is here:

<http://priuschat.com/forums/gen-iii-2010-prius-audio-electronics/91508-squawker-upgrade-help.html>

The stock dashboard squawkers are basically junk. In addition to being poor quality very lightly built (The Pioneer speakers weigh just under 6 times as much as the stock speakers) speakers, they are only very high frequency range (the stock bass blocker is 5,850 Hz) and leave all the bass through upper mid range sounds to the door speakers (Definitions: <http://www.decibelcar.com/menutheory/141.html>). Leaving the mid to upper-mid range sound down at the door speaker height results in much of the sound being absorbed by the upholstery, carpet and occupants legs with a resulting poor sense of direction for the sound (poor stereo effect). Using dash speakers that produce mid through very high frequencies results in a stronger stereo effect as well as a cleaner, less muffled sound.

Some people have commented on the bass blocker capacitor that is in the TS-A878 speakers. It is important to note that capacitor only blocks bass from the tweeter section of the TS-A878 and not from the mid range section of the TS-A878. An external bass blocker should still be used. As far as the circuitry external to the TS-A878 is concerned, the TS-A878 does not have a bass blocker.

The original Prius dash speaker circuit, OTOH, has a 6.8 μ F capacitor attached to the dash speaker plug. It does function as a bass blocker for the dash speaker. I used that capacitor's connection points to wire in my additional bass blocking capacitance. That worked out nice because I retained the stock Prius plug so I wouldn't have to mess with the car's speaker wiring harness.

I ended up with an external 22 micro-Farad capacitor in parallel with the stock Prius 6.8 μF for a total of 28.9 μF in series with a 3.9 ohm resistor which is discussed in the table. The capacitor drops the dash speaker audio level a nominal 3db at 1480 Hz and 9 db at 690 Hz. The resistor is only there to balance the overall sound level between the dash and door speakers.

Only the right speaker used the 6.8 μF in parallel with the 22 μF capacitor. By the time I got done with trial and error mods on the left speaker, the 6.8 μF capacitor leads were too short to use so I didn't use the 6.8 μF . It didn't make a big difference, both sides sound about the same.

Note that the bass blocker frequencies are calculated assuming that the 4 ohm speakers are actually 4 ohms. That's enough for a starting point when the system is going to be tuned by ear.

Also note that if you run the dash speaker and door speaker in parallel (stock wiring) without a bass blocker, the head unit sees a nominal 2 ohm load which is more than the stock load and an extra load on the output stage of the head unit. I haven't heard of anyone toasting a Prius head unit from not running a bass blocker on the dash speaker, just be aware that you aren't helping the head unit's output stage life.

Left Dash Speaker	Right Dash Speaker	Comments
<p>Pioneer TS-A878 sitting loose in enlarged dash cutout. 100 μF (MFD) bass blocker. Apx 3db down at 400 Hz. 6DB/octave roll off.</p>	<p>Stock. Stock 6.8 μF bass blocker is 3 db down at apx 5850 Hz, 6 dB/octave roll off. Only allows very high frequency sound to dash speaker</p>	<p>Left vastly better than stock, even without sealing around speaker front edges. I could have done the right side, buttoned this up and been happy with the results. This is basically what Spiderman did plus 100 μF bass blockers. An excellent return on \$ and time.</p>
<p>As above plus too small speaker enclosure fabricated in place from butyl backed aluminum tape and Dynamat Extreme and sealed around speaker. <u>Don't enclose speaker in a too small enclosure.</u></p>	<p>As above</p>	<p>Left sounded maybe a bit duller but still vastly better than stock. But, see next comment.</p>
<p>As above</p>	<p>TS-A878 sitting loose in enlarged dash cutout. 100μF bass blocker in parallel with stock 6.8 μF = 106.8 μF</p>	<p>This was a surprise that showed the value of a side by side comparison. My too tight enclosure sounded a lot duller than the speaker sitting loose in the dash.</p>
<p>As above except the cut the tight left speaker enclosure out, resealed around speaker at mounting surface.</p>	<p>As above</p>	<p>Improved left side, they are about equal now</p>
<p>As above</p>	<p>Experimented with bass blocker caps to move cross over frequency. Also extra resistance to reduce volume of dash speaker. Ended up with 22μF+original 6.8μF=28.9 μF in series with 3.9 ohm resistor. Stuffed some carpet padding in dash to close biggest openings behind speaker without crowding the speaker. Sealed around speaker at mounting surface with Dynamat Extreme.</p>	<p>This improved the right side. 28.9 μF bass blocker put more of the lower mid-range frequencies into the door speakers which handled them better. By calculation, the dash speaker is about 3db down at 1380 Hz and 9db down at 690 HZ (6 db/octave) because of the bass blocker. The resister dropped the dash speaker about 3 db more. The balance between the dash and door speaker is better and the bass from the door speaker is more noticeable.</p>

Left Dash Speaker	Right Dash Speaker	Comments
<p>Made same as right speaker, except didn't use a 6.8 μF capacitor in parallel with the 22μF capacitor. The 6.8 was omitted because I had butchered it's leads too much to use it, not for performance reasons. Total capacitance was 22μF. Did use a 4.9 ohm resistor in series with the capacitor. This resulted in a calculated crossover frequency 3db down at 1810 Hz</p>	<p>As above</p>	<p>I really like the results. It's amazing how good a stock basic sound system can sound with decent speakers and a good installation.</p>
<p>Added grill cloth</p>	<p>Added grill cloth</p>	<p>Moved cloth over and off speaker several times listening for differences before permanently attaching to speaker cover. Maybe a slight reduction in sound quality, can't be sure.</p>



Start at the top, peel back the soft trim piece, then start pulling the column cover off. Except for the strap that need a twist in the next picture, it comes off easily with no tools.

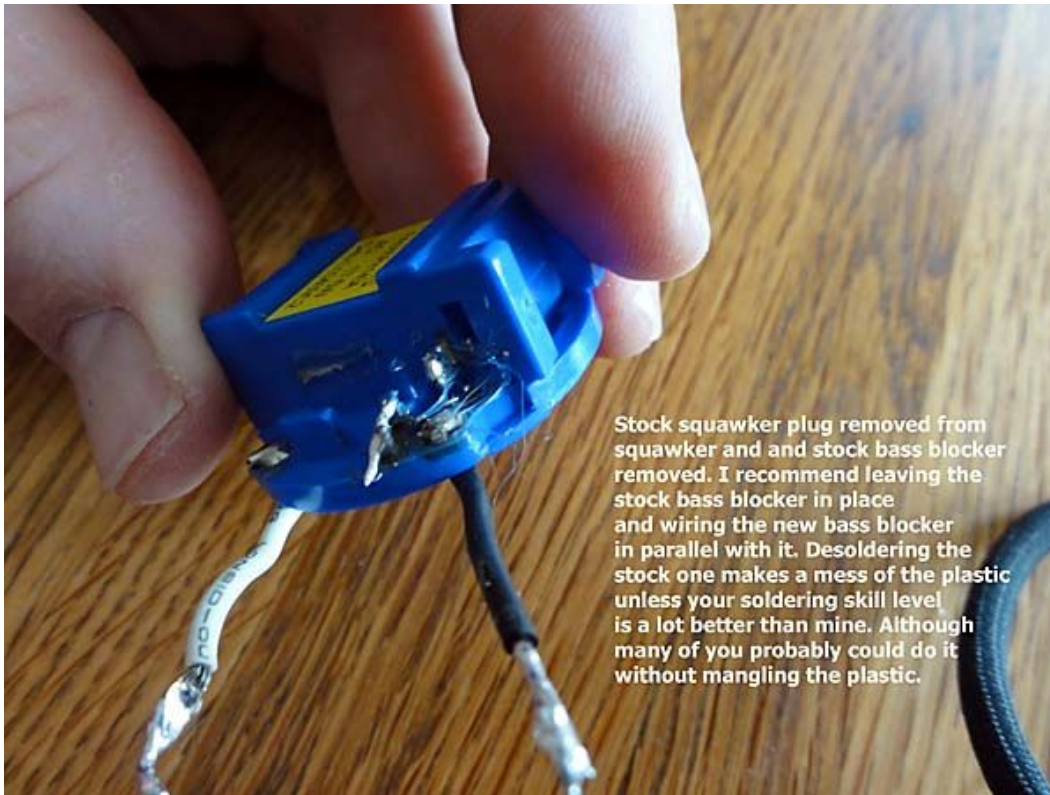


That short retainer strap needs to be rotated 90 degrees to release it. It appears to be there to control how the air bag cover starts to fly off. It contributes nothing to holding the trim piece on.



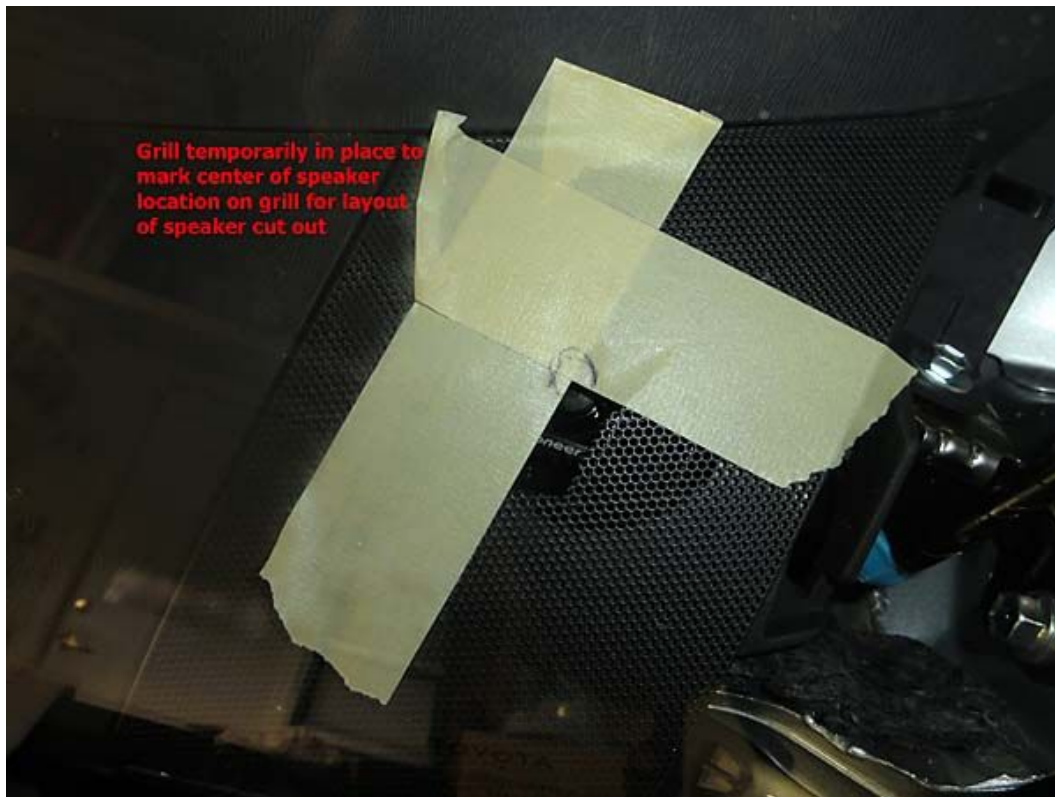
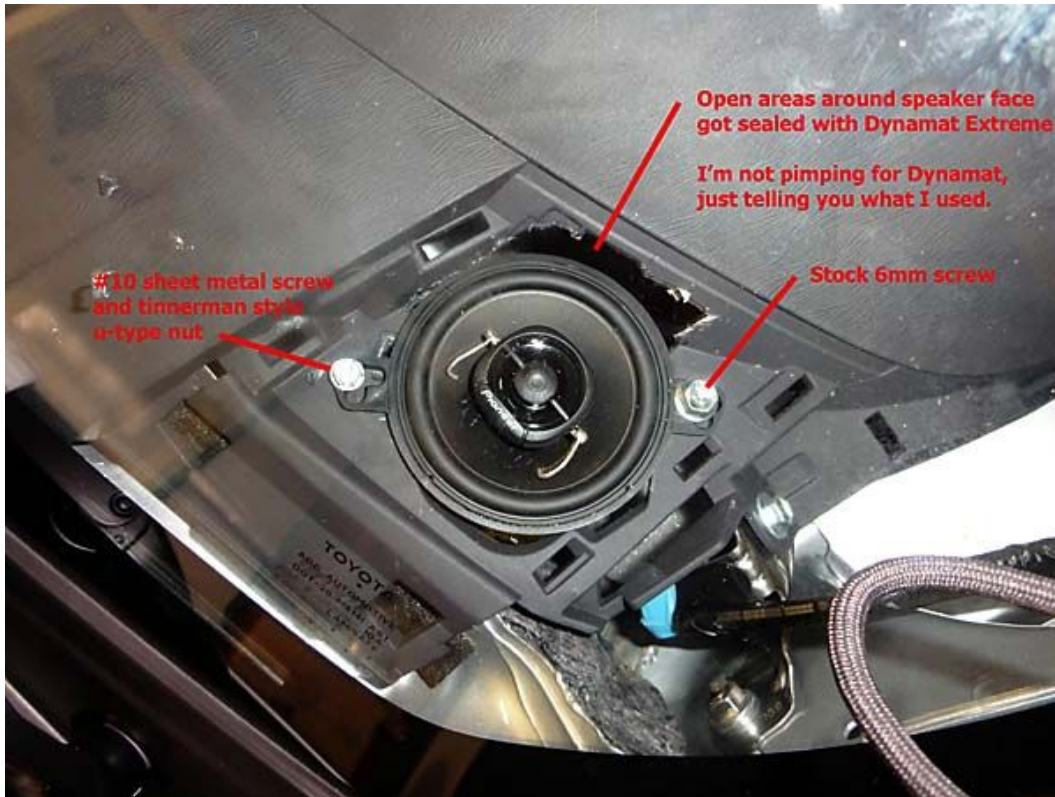


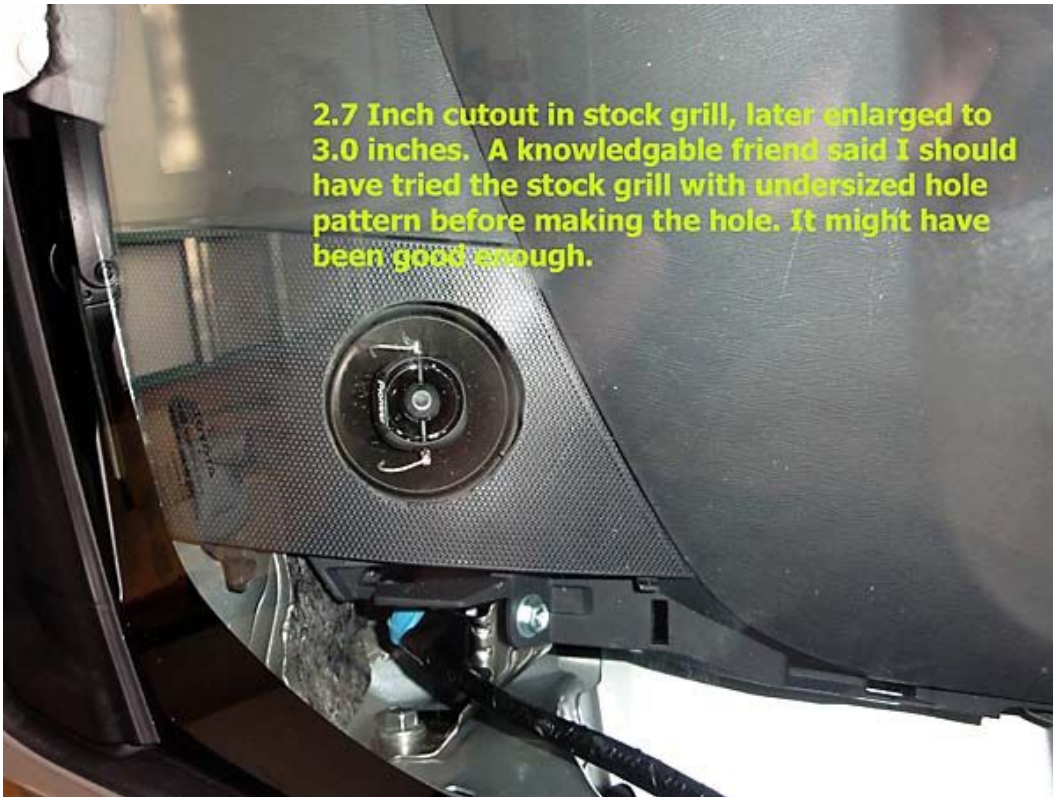
Stock plug pried part way off of stock squawker. I reused these so did not need to alter the stock speaker wiring in the car. Add a few inches of wire so you have some flexibility when you are connecting things in the dash.

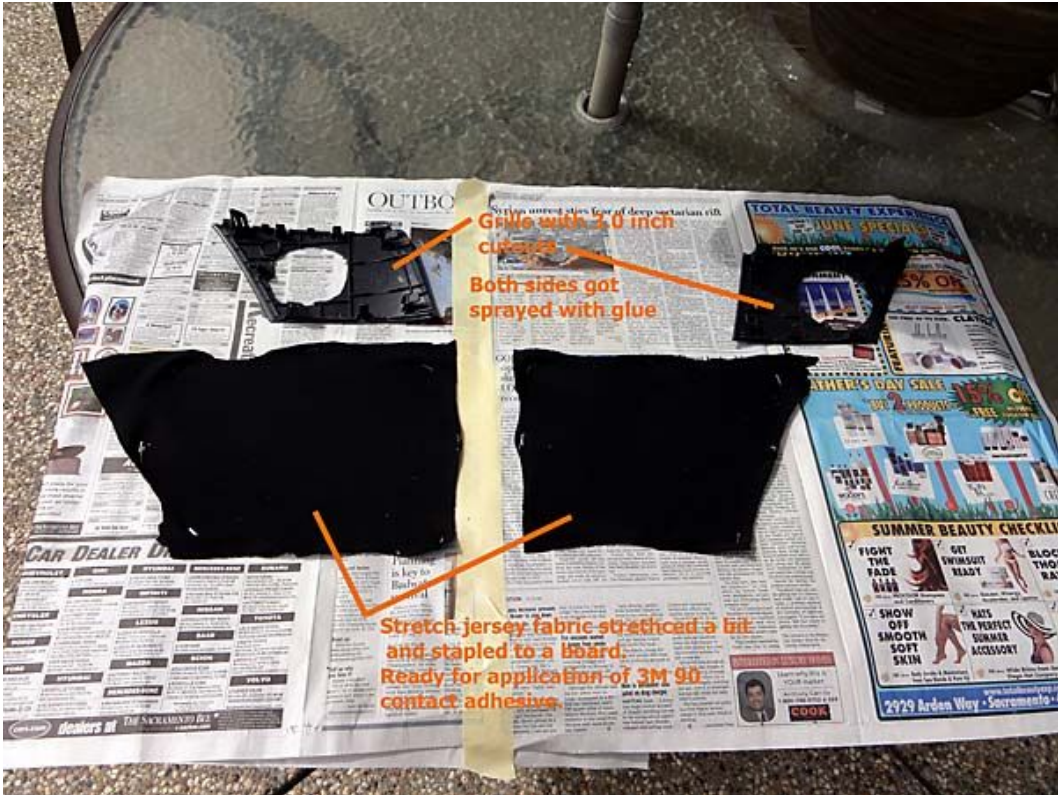


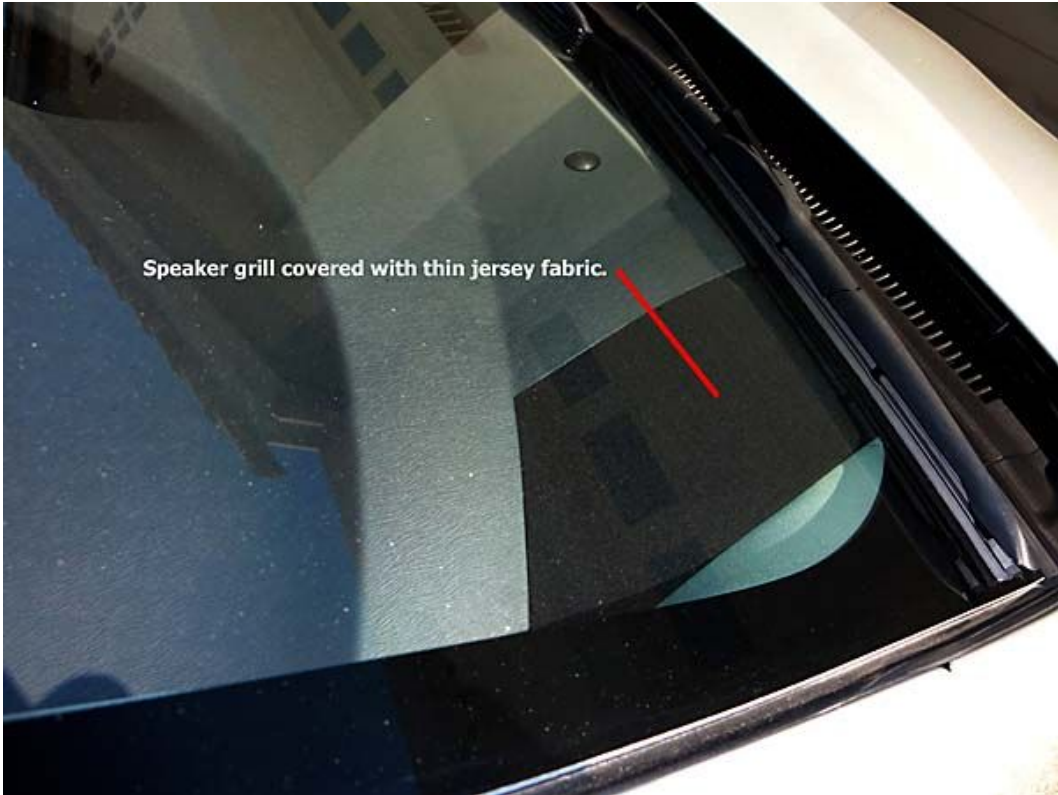
Stock squawker plug removed from squawker and stock bass blocker removed. I recommend leaving the stock bass blocker in place and wiring the new bass blocker in parallel with it. Desoldering the stock one makes a mess of the plastic unless your soldering skill level is a lot better than mine. Although many of you probably could do it without mangling the plastic.











Speaker grill covered with thin jersey fabric.