

# 2008 Toyota Prius Premium JBL with Navigation and camera

Installing a new Head Unit, Amplifier,  
Subwoofer and door speakers

# You will need these tools

- a table saw,
- a mitre saw,
- a jig saw (or routing table or roto zip will work too)
- wood "C" clamps help a lot, I used them, but could be done without them
- Solder iron/sponge/solder
- electric drill preferably with a stop (doesn't keep spinning),
- 1/8 inch drill bit,
- 2 pieces of scrap MDF at least 12x12 at width of 1.25 inches, I used scrap shelving from a hardware store \$.50 4 ft x 12"
- For this project you will need machine screws about 1.75 inches long with a lock nut and washer. width of 1/8 to 1/16. Or just see what you have on hand
- 2 2x24 1/2 inch MDF sheets (or 1 4x4) - dark brown MDF,
- 1 tube liquid nails & small caulk gun (liquid nails may as well be called liquid wood due to the fact it dries hard.
- I used a brad nailer with 1.25 inch brads, can use just glue or finishing nails or very skinny drywall screws with pilot holes
- 1 door panel tool (\$8)
- 1 wire stripper
- crimp tool or something comparable for your ground and amp terminals.
- blue wire connectors (or solder and electrical tape)
- 1 flathead and phillips screwdriver
- 1 roll of duct tape with the peel and stick tear off type you would use on a dryer duct (\$6) small roll is fine,
- drywall screws at least 3/4 inch not more than 1.5" (my amp and sub came with their own so you may be OK)
- I used 4 different color of electrical tape for identification, you can use any tape you find or colored markers or whatever is easiest for you
- You will need about 50 feet of at highest 18GA speaker wire the amp kit I used came with 20 feet, but I used some I had laying around (11GA)
- I used a drywall square and speed square, but anything you have that is going to make it square...

- I was looking at the new cars and trying to find out what is better and it's coming back to the technology in them, not really better mpg. So I thought why not improve what I have so I began this challenge: I have a 2008 Prius with Navigation, Back up Camera, AUX input, steering wheel controls, Bluetooth phone with MIC and JBL amp with a 9 speaker (so called premium system) and I want to upgrade to something worth talking about that also includes at least today's tech and room for tomorrows. I was going to buy the nav update disk and found my new HU is the same price. I have a Prius for MPG only and I am not looking to lose that in my upgrade. I also have a spare tire for a reason and I have limited trunk space even in the corners so I have none to spare. I also do not want to advertise I have an aftermarket system for safety reasons so this is an awesome challenge.

This is either going to be easy for you or you are going to see why you pay so much at an install shop, but the info I have here will be useful for the install shop also. This is also not a "HOW TO" it's a "HOW I DID IT". I tried to use tools most homes would have for a handy man and to achieve my same outcome in its easiest fashion. I have a heavy electronics background from 1990 till 2006 when I retired from car audio and went to home audio non audiophile, but very high tech. I've installed about 30 high power systems and about 20 radios. I've only done 3 component upgrades that included removal of a door panel. I haven't done any audio work in cars for about 10 years, so if I am doing it wrong I apologize, but for those just getting started I'd rather you try this than guess.

- When I researched my upgrade I found many forums about schematics and what other people did and got a lot of ideas, but no one has done this I have seen so far. I don't have a lot of wood working skill and this box could be cut at my local home depot at 25 cents a cut if I really needed it done, but the cuts need to be perfect for this to work out. The first install I did was to answer my question, what if I put better speakers in the door? So I pulled out the stock speakers and felt foolish due to they looked like I was doing a direct replacement using alpine that had the same size magnet (unknown to me till I had it out). So do not replace door speakers till after you do the amp replacement first. could save you \$100 and 2 hours. Also the door speakers go to the factory amp in 7 inputs and the load value is important to understand if you do not replace the door speakers as I did.

To do this I removed the screw in the hand pull and there is a plastic cover behind the handle that pops off with a flat head and removed that screw. Use the trim tool to get in the door panel and pry out lightly till you feel the pop. I went around the bottom then just pulled the panel off slowly and steadily. I unclipped the door light and then unclipped the arm rest control and pulled it through the hole in the door and let it hang. Then use drill to drill with 1/8 bit to drill out rivets and pop out the factory speaker. I cut the clip back 1 inch from the speaker and then stripped the factory wire back about 1/4 inch. I then took the tweeter mount down (it pops off - beware that top clip likes to come off I did a repair on mine with the duct tape.) the factory tweeter is held in with weak clips and pops out. I unclipped it and replaced it with the component tweeter and made sure the lettering was straight on the front then used duct tape to mount it. I ran the wire from the tweeter down the door frame and used the duct tape to seal holes and tape wire to door. I ran the connectors to the speaker terminals then clipped the aftermarket clips then wire nutted the speakers. Look to wire schematics to see correct pos and neg it is more than important to not get this backwards. When you remove the rear door panel be careful the top tweeter has minimal slack and you can rip it apart and I wanted to keep this and it has a crossover in it so you will not want to damage it. I caught it just in time. When you take rears off simply unclip the tweeter from the door panel. I will try to give a link to a video on how to remove the door panel

### Premium Door Speaker removal using a 1/8" drill bit





Speaker Profile comparison





Remove stock tweeter then align new tweeter in place

Using duct tape attach it to the factory mount



# Draw your template





Using template on back of speaker carton trace the speaker cutout



Cut out spacers and verify fit then drill 1/8" holes for your bolts to go into to hold the space to the door. Don't drill a pilot hole too close to the outside





Insert bolts to hold spacer to the door

My rear alpiners didn't come with wiring, so I soldered the speaker wires to the terminals. The smaller one is the negative on the Alpine speakers



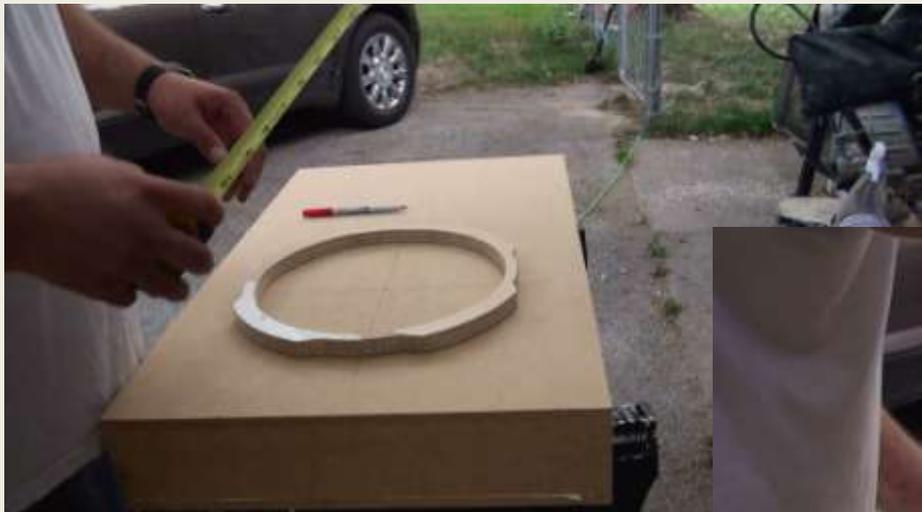
- Next was, I have seen 8 inch and 10 inch and everyone seems to take up the trunk space. Forget that. I want to do a 12" and I want my spare tire. So I looked to Pioneer for the answer, 12 inch ibflat sub. mounting depth of 3.375 inches. My prototype box I used 3/4" MDF due to my old habits and came up the sub is kissing the bottom of the floor door. (3/4 doesn't flex) I have now also found 1/2 doesn't as long as you're not throwing 1000 watts here. This would be OK as long and I put foam around the top of the speaker, but if I put weight on the top and I'm turned up it might cause a flutter, so I am not going to deal with that aka (Prius box for sale). So after learning my lesson there I moved to a high density MDF 1/2 inch and found the perfect dimensions. It also has a built in amp rack with enough ventilation to run wires. This also is a prototype box, but I will use it till I get a better idea. I found my amp rack is a little tight to get the wires in properly and I think if I rebuilt this I may skip it due to less access to amp tuning. But it looks nice. I now have a hidden 12" with a 1/2" clearance from the top of the floor door and I put a small spacer to make sure cargo doesn't change that.



Do a dry run make sure all pieces are straight and no gaps



Glue and brad nail your pieces together. Use A LOT of liquid nails, you are actually gluing this box. The nails are just for drying and backup.



Use template that came with subwoofer, I made one out of wood for fun



Use amp to trace out amp rack. Go about 1" further out on the sides with the wires so both smaller sides of the amp.



Make sure top plate fits correctly then glue it on and nail it. Then drill a hole for the subs wire pull wire then generously caulk the hole on both sides (or use terminal cup if you have one and glue it also)



- Now comes wiring. I will post a chart that tells you what gauge to use, but it told me to use 10, I used 8. There is a shipping issue with my new head unit so this leaves me in a bind, but led me to side notes that would be helpful for those who aren't going all out. I know the specs of the new head unit so I know I need 5 channels of rca and a remote wire and I will be using the stock back up camera. So I ran my labeled speaker wire for 4 channels 10 ft each, to the factory amp location and I ran 6 channel RCA (or could have used component video cable) up through the main battery ventilation and across back seat and down middle to the factory amp. I then routed it to the central radio area under the carpet from there.
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- The amp I chose is a 5 channel 1200 watt amp, 2 ohm stable, but I am not interested in running hot or losing MPG, So I am trying to stay as close to 4 ohm as possible for this install. RMS values are 40 watts x4 and 300 watt x1 at 4 ohm. The factory amp is like 18 watts RMS and 40 Peak per channel and it's 4 channels split from what I have read. The speaker wire from the factory is more than adequate for the doors so I used 11 gauge main speaker lines to the factory amp location to splice to the speaker inputs (I would prefer to use 18, but I only had the high power kind. 18 is what the factory system is using and I think 20 is the alpine size). I don't see the point of a remote bass in a Prius unless you just wanted the bass gone like listening to a book on tape. I will be using the on amp crossover for this upgrade and there is a crossover in the HU that will help with the bass adjustment. Adjusting gain is introducing noise to your system and is meant to boost the input signal due maybe the front sounds louder than back or can't hear sub over the doors, basically for staging. Not for annoying the neighborhood. I will be adding a 1/2 din crossover in the future if I am not happy with the staging and the amp has an on off switch to use it's crossover.



Pull 4 runs of 10-11ft speaker wire. Use a marking that is different to identify later, I used tape, below is a 4 channel RCA and a 2 channel RCA and making connections tight





Remove rear seat cushion and unbolt front seat and push to the side. No need to unhook seats wires. then run wires up center to amp under seat and then continue it up to the dash





Run wires under seat (I had to remove the fold down seats bolt to make room. Then run wires to spare tire area

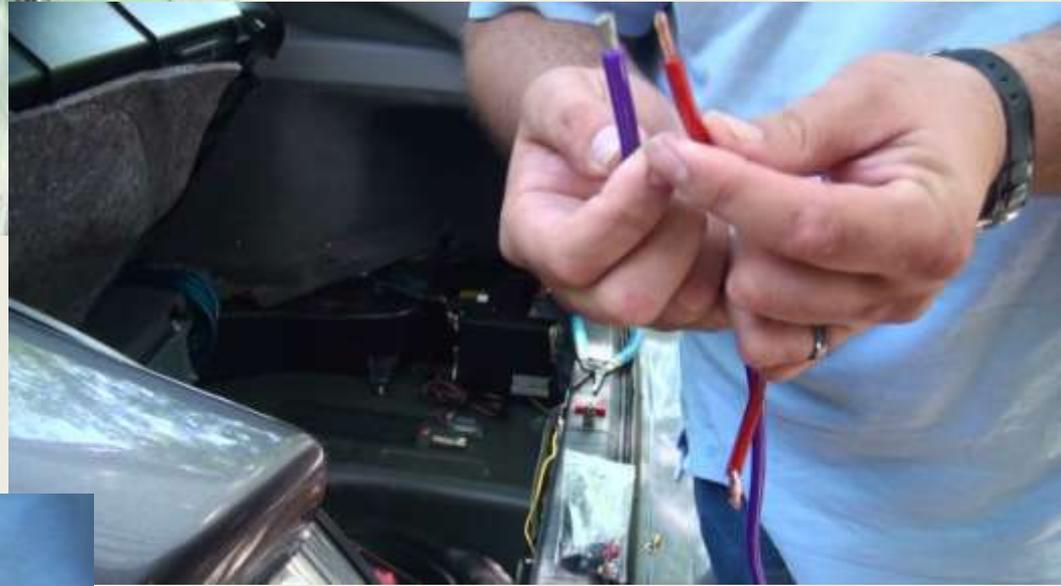


Cut a 3x3 inch hole –I used a roto zip - and pull wires through. Then pull box out and prepare for power wire install



Remove the floor cover over the battery and remove red plastic protector then loosen the  $\frac{1}{2}$  inch nut on top of the terminal.

Make sure you get real 8 GA wire, the red is 12 GA and sold as 8 GA look for (OD)=BAD.



Crimp the terminal O ring to the power wire then run about a 7-10 inch wire to the fuse terminal and connect it.



Remove the fuse at this time and don't put it back in till you are ready to run a test.

The rear cargo connector back here makes a perfect ground location. Remove bolt then prepare ground wire to be attached to this location.



Crimp one side at a time then tighten





Place box in cargo box then route wires into the amp rack.

Use a notebook to write down each front/rear left/right according to your wire marks



You may pilot hole and attach amp at this time and prepare it to take out later to adjust the built in crossover.

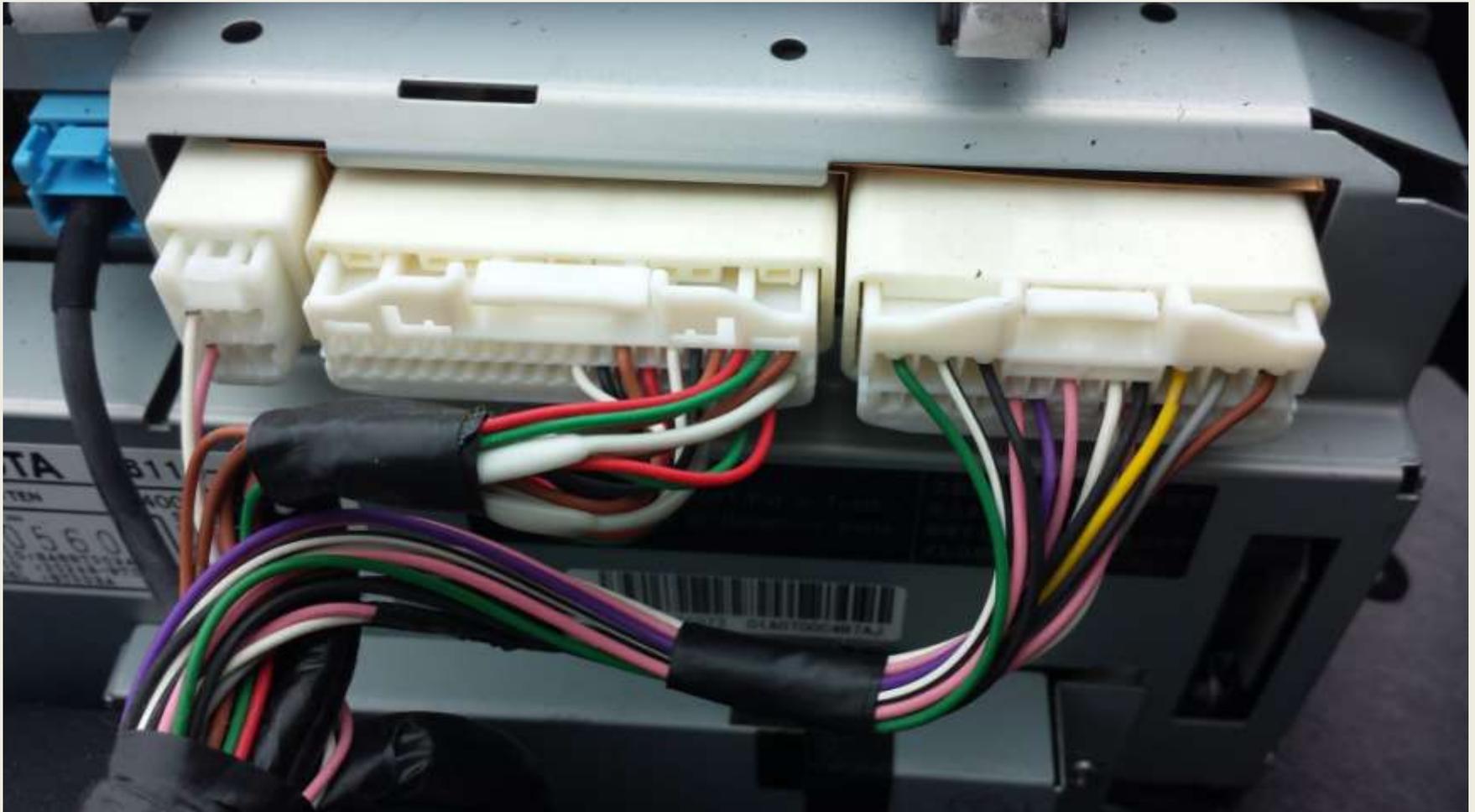


While I am waiting for my new HU to be delivered I hooked up a high to low converter and soldered it to the rear speaker out wires. This is a backup option, skip this if you are doing the full install.



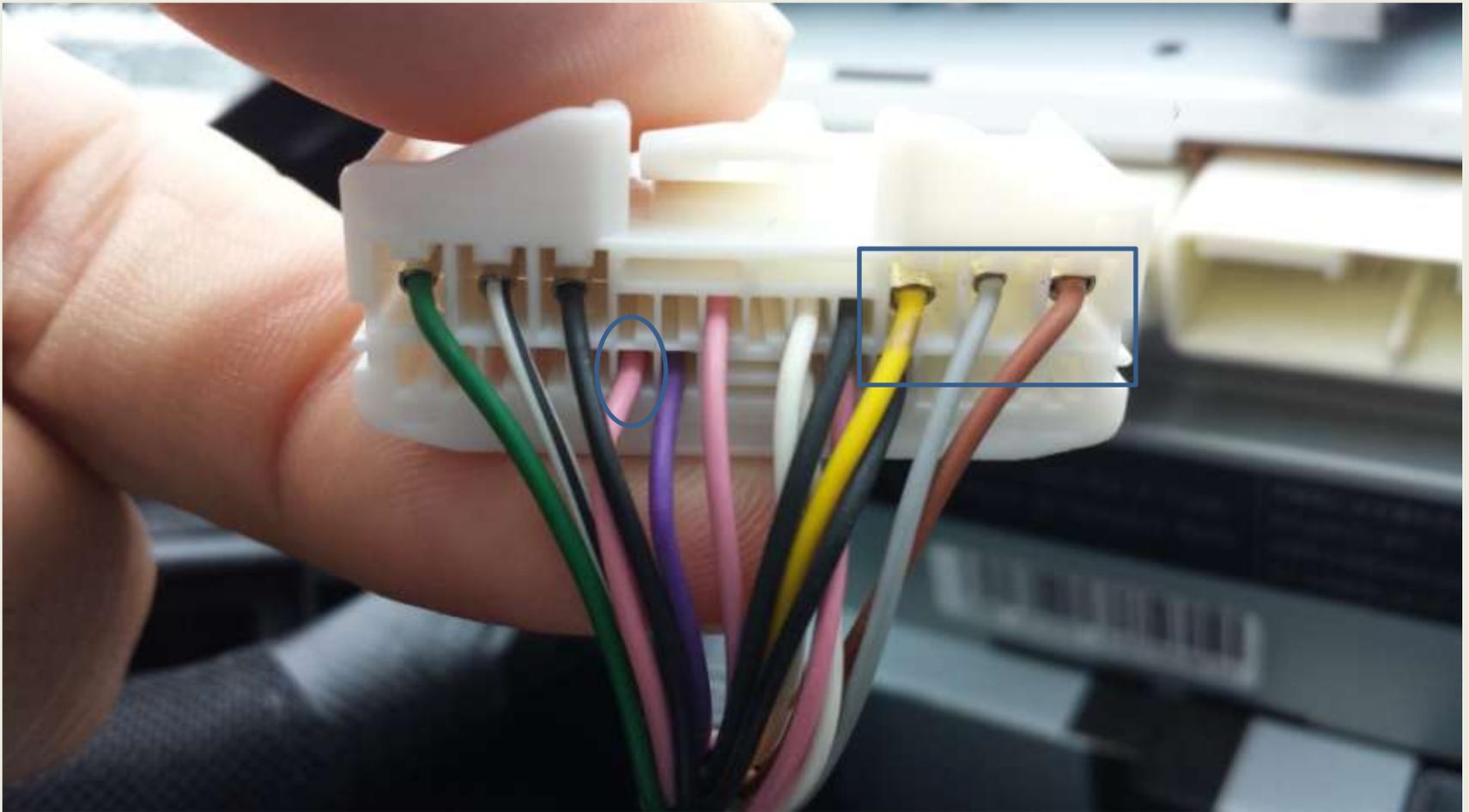
- I am now trying to hack into the back up camera to attach to the HU's back up camera input also and I want to have a solid access point for the acc, power and ground for the HU. I will also be hooking up the HU speaker level output to the center speaker if I need a better sound stage. I am researching the wire harnesses and I think I have cracked a few codes for other questions I saw on other posts, aka: How do I hook up an amp to the factory input vs the crossover & amplified output signal? I found that the red/green black/white low pass output from the factory radio have a fixed output. That means the volume control doesn't change at this point. I was going to try it at the amp, but I think the blue wire going to the amp is comparable to a gain of some sort and is unrelated to the audio input. I then hooked a high to low converter up to my rear speakers under the passenger seat and ran the lines up to the HU location. I have a filter with a remote bass installed in it.
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- Now that I have the amplifier hooked up and a signal I was able to do a first test. I've created a monster. My HU is on back order so I will have to use it like this for a while. The first thing I noticed was my box is rattling against the metal tire tools under it. So I will be using a towel or foam of some sort under the box. I also think I will have to strap the box down to keep it from rattling (like a cell phone on a table on vibrate). Since I cannot test the front and rear speakers with the aftermarket amp I am stuck with an unmounted amp. I can feel it missing some low notes, so I assume it's the factory crossover. At this point I would say if you are not looking for crisp clear theater sound in your Prius with a staged sound setup you don't really need this setup. It's like using a flame thrower to light a fire. It gets the job done, but there are other easier ways to do it. With the factory crossover getting in the way of the signal, the best thing you could do is it the preamp low end splice and install a bass remote as a volume control and install a shutoff switch for when you don't need the low end. After I am finished I am going to also post the design to do this with 2 8" and 1 10" I think for those who are not doing a full overhaul. It doesn't take your breath away like the systems I used to make, but it is beyond a stock system for sure.

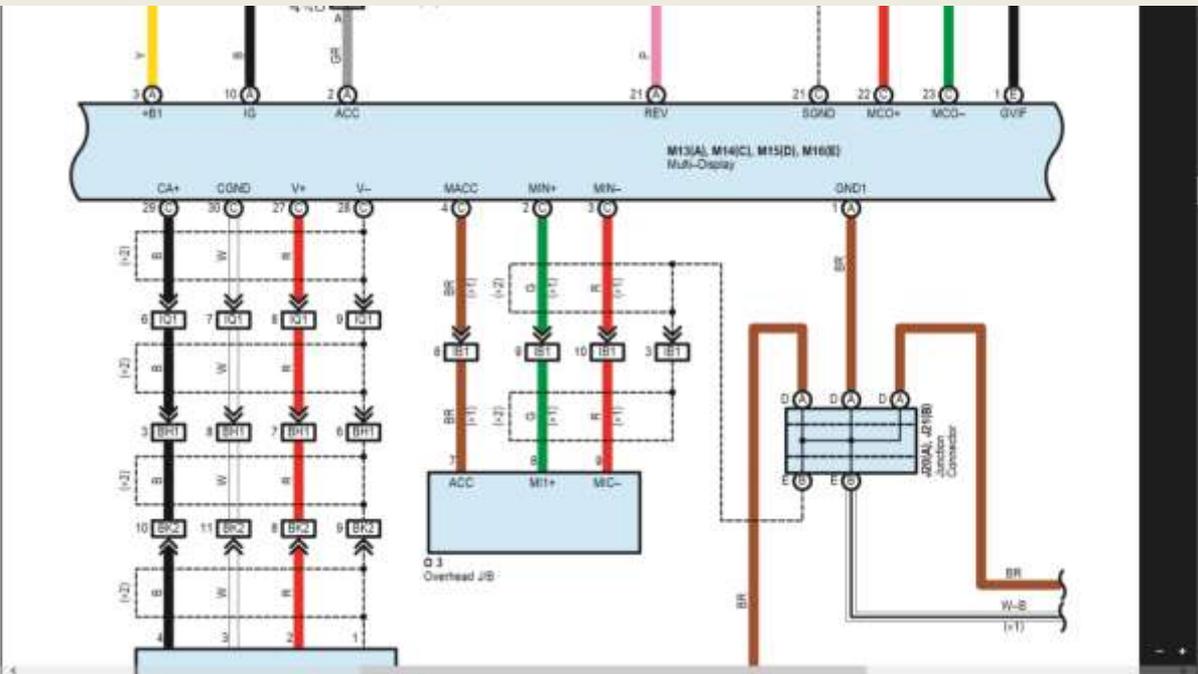
# HU Pre wire for aftermarket



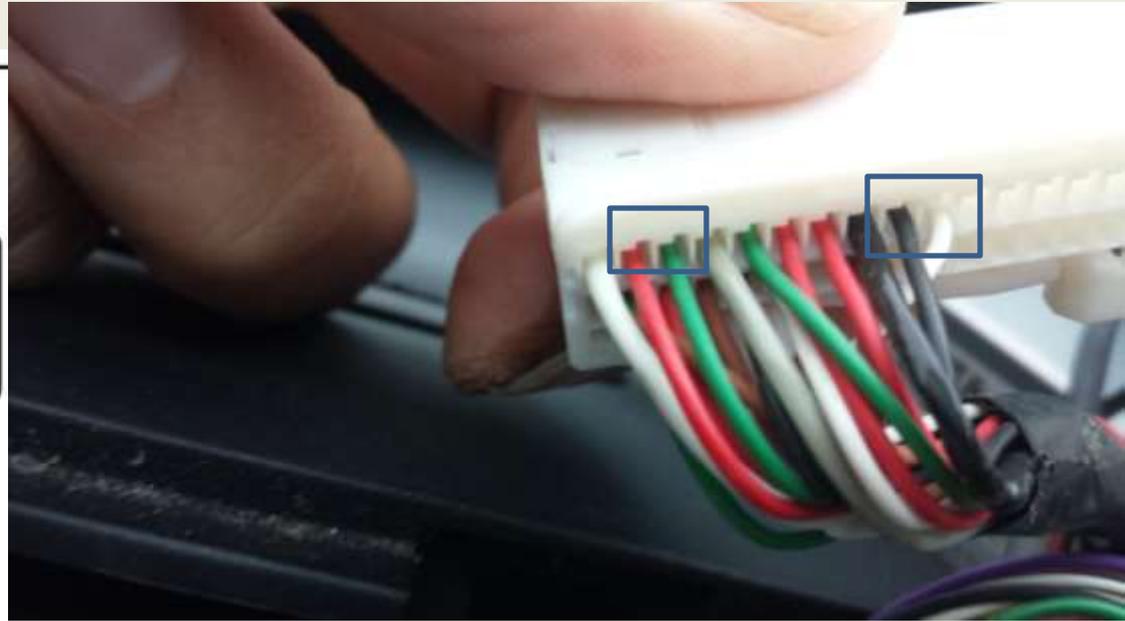
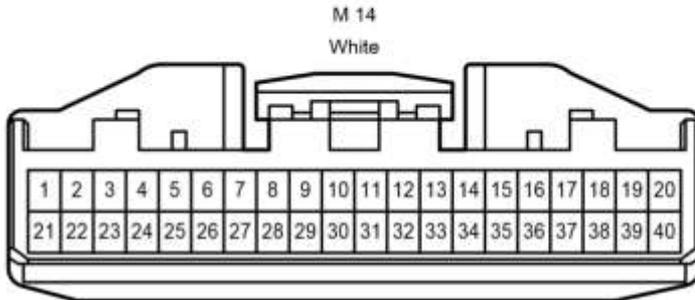
This is what the back of the navigation display looks like. The far right brown is Ground, Gray is ACC and Yellow is 12 volt constant. The pink wire next to the violet wire is the back up wire (bottom row not top)

Pink wire next to purple is backup, Brown – Ground, Gray ACC and Yellow constant 12V I ran 16 inch marked wires from each of these to prepare for my aftermarket radio.



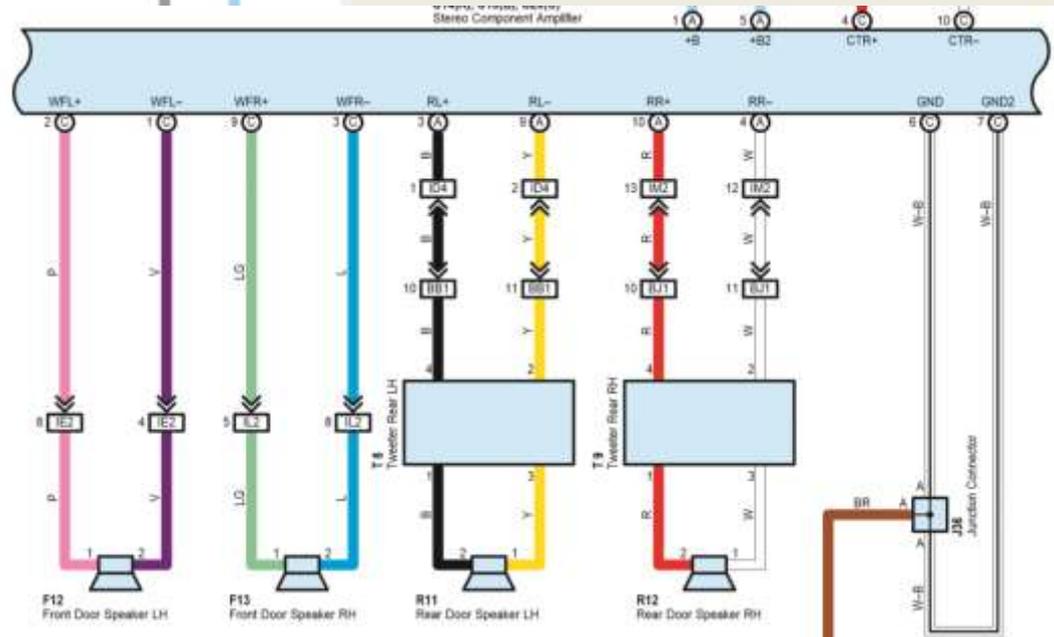
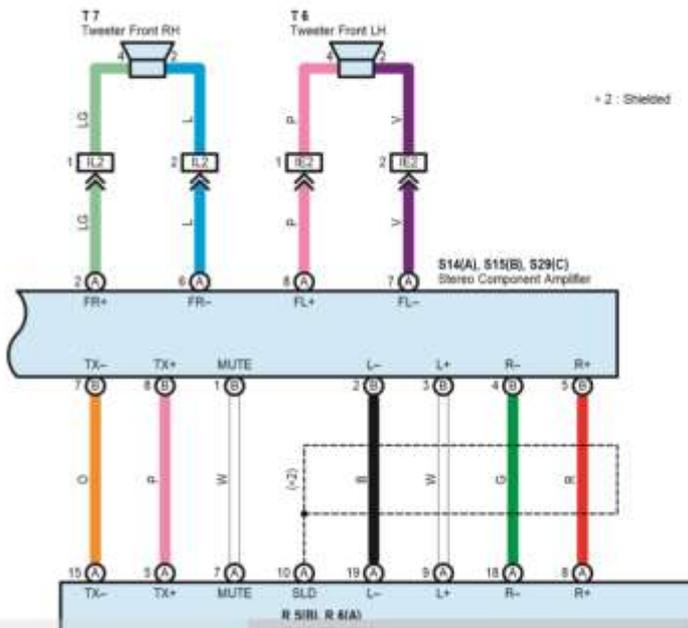


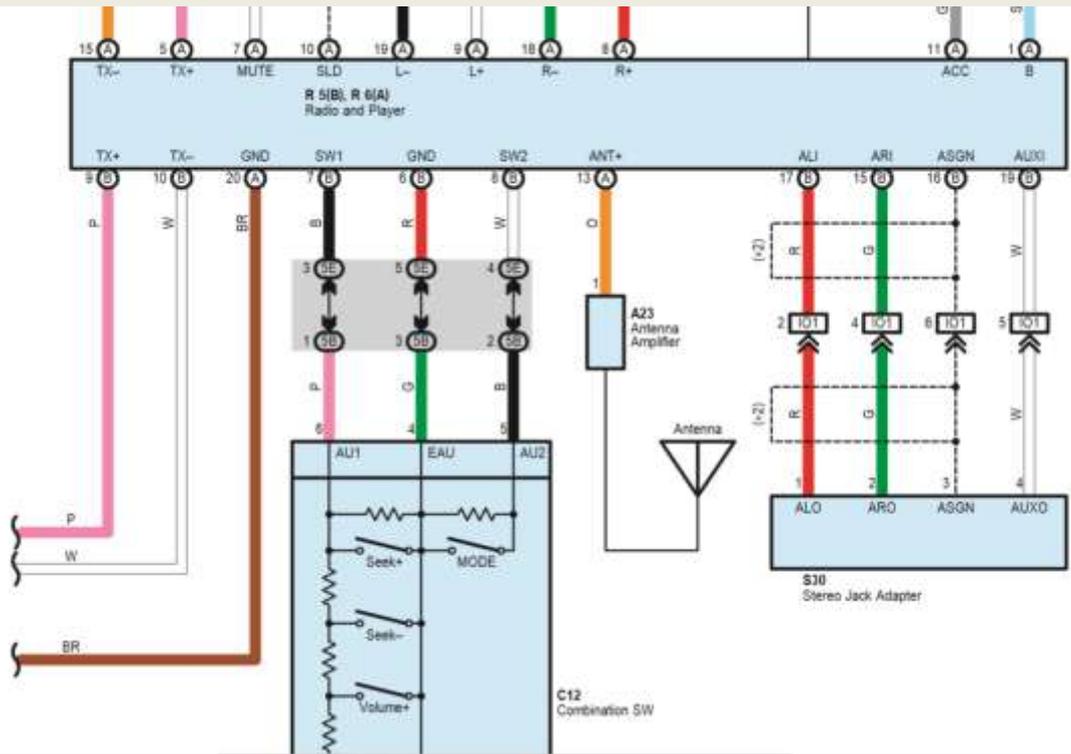
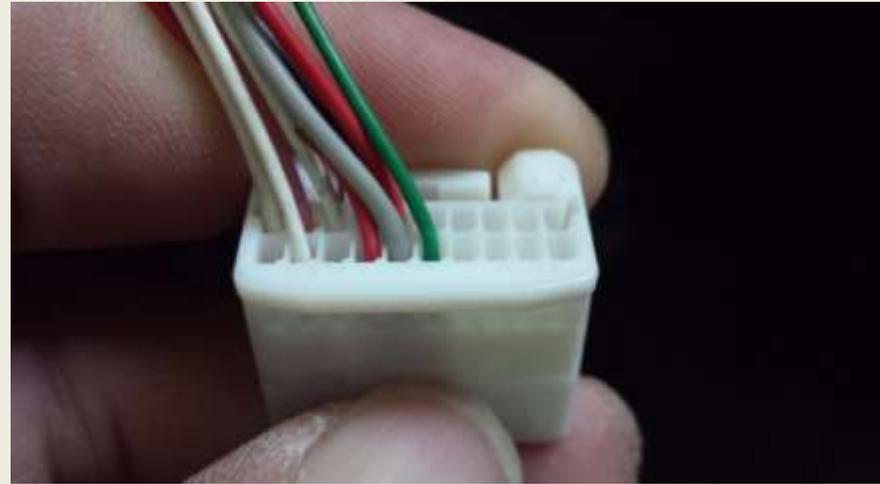
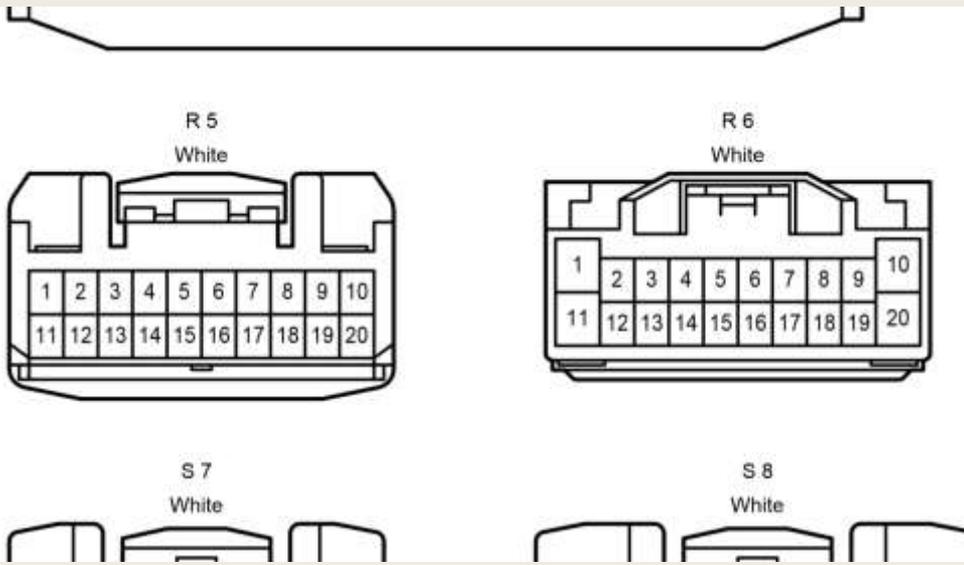
The top row far right white is the negative TV and the black is the POS shielded hookup. On the far left the Red is the Positive and Green Neg for the overhead driver side microphone



# Speaker Wiring Diagram on Amp

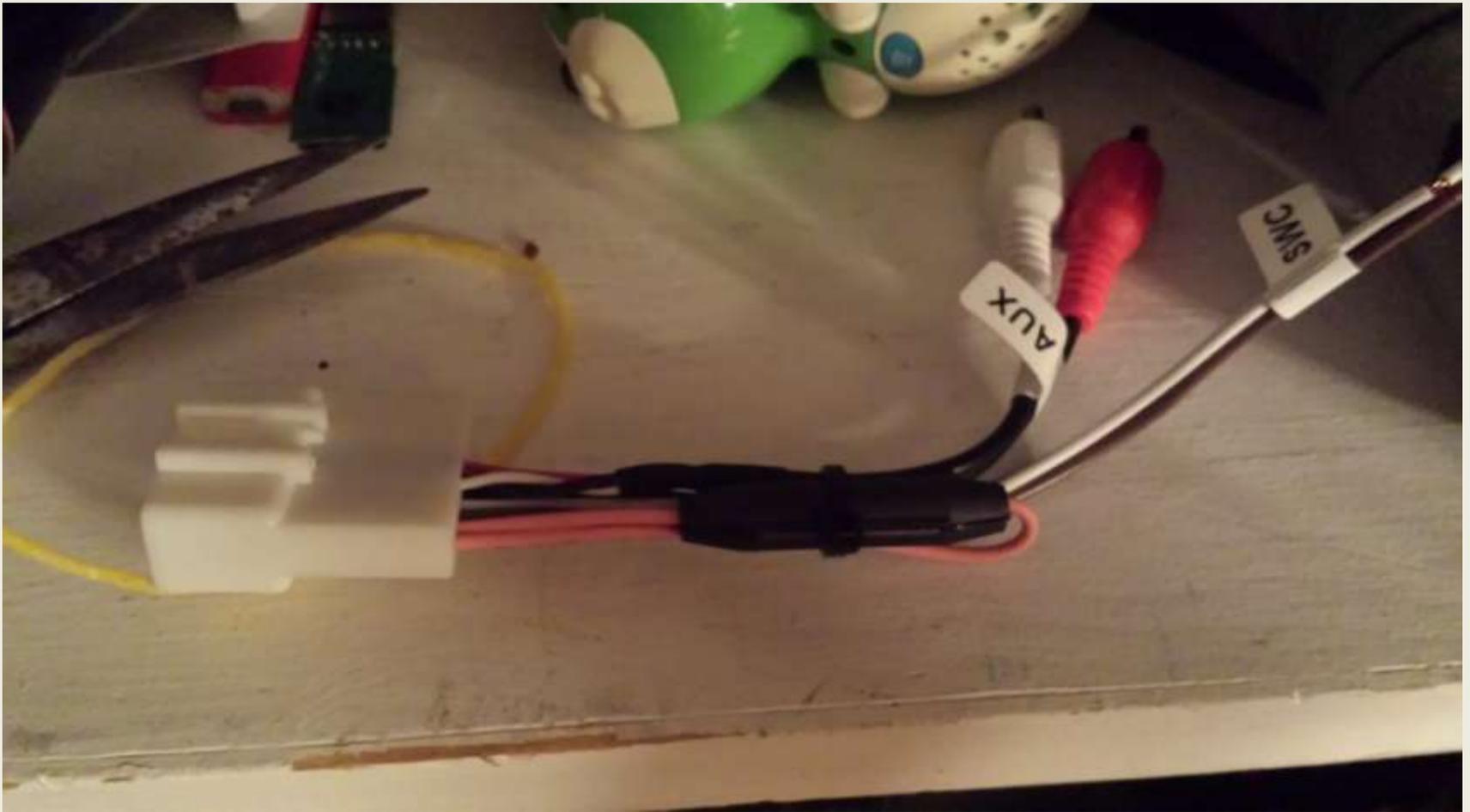
Do not hook an RCA cable up to the black/white, Red/Green outputs to try to get a preamp without an aftermarket head unit, there is no volume control with those wires. You have to hook a high low converter to the Black/Yellow and Red/White rear speaker hookups. These are the ones on the Blue clip next to each other.





You should get a harness with your dash kit for this plug. The wires showing there are the AUX input the white is not on my aftermarket harness. The other side is the steering wheel control wires

This is the harness that came with my dash kit from amazon.



- Now the HU I picked has a video out and a rear AUX input including for video. The dash kit I got has the SWC and air conditioning resistor with it and the wires seemed to match up except for the Aux 0 which is the white wire. It also has 2 male RCA connectors for the middle console 3.5mm input. I will hook that up in tandem with the rear video input (if you won't be doing rear video don't worry about doing this), but they are just for future expansion. I sent to the rear seat 2 video out rcas and 3 rca (red white yellow) in connectors and put them under the passenger seat for now.
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- The HU I have has an MHL connection that will allow me to hook my phone and apps right up to the radio so I installed a dashboard phone holder that can hold a large ipad down to a small iphone. I will be running an mhl wire with hdmi to this mount. The radio has bluetooth also for streaming and I can use the AUX, and micro sd card or usb front input. Basically everything I need. Later I will explain how to go bigger with this install, but I got the base model with a 2 volt out on the preamp. The HU comes with it's own microphone I will be running to the ceiling also.
- While I am waiting for my HU I began my pre-wire. I hooked up a mono headphone plug to the red/green wires on the back of the navigation monitor and plugged it into an external speaker. Works great. So I will most likely be plugging this into my new HU mic in instead of running theirs. I may still run theirs before I put the dash back, but it would be a backup in case the built in microphone isn't clear enough. I also hooked up a video RCA wire to the video input and I ran a splice to the pink back up camera wire. I used a volt meter to verify this activates when I go in reverse only. I also spliced the navigation display for it's power, ground, and ACC. I will most likely be using the ACC at the factory amp location for the amp, but for now I wanted an option to shut the amp off to power if I made a mistake. I wish I had a 22 gauge wire stripper today due to it would have been easier to do a quick splice for a solder joint.
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- Since the Prius doesn't have a voltage meter, and I don't want to have it running all the time so I bought a small volt meter display. I will most likely install it behind the din cover that folds down and you will hook the wires up to the ground and ACC. I am trying to keep this system as stealth as possible so when You look at my car you will think it's a normal stock system.

- I will be adding my head unit and it's installation here when I get it. Also how I setup the amp and staging. I thought I would post what I have so far.

# Some sites I found good info on During my shopping and building:

- <http://www.crutchfield.com/S-6xEvCUuibcF/learn/how-to-match-subwoofers-and-amplifiers.html> How to match an amp and speakers
- [http://www.crutchfield.com/S-MEgZ9MVtpiF/learn/learningcenter/car/cable\\_gauge\\_chart.html](http://www.crutchfield.com/S-MEgZ9MVtpiF/learn/learningcenter/car/cable_gauge_chart.html) - power wire size chart
- <http://youtu.be/VIYpuB9r44M> How to remove the Dash and get radio out
- <https://www.youtube.com/watch?v=92QN5HWuAo0> another dash removal
- [http://www.axxera.dualav.com/downloads/manuals/swi\\_operation.pdf](http://www.axxera.dualav.com/downloads/manuals/swi_operation.pdf) - swc wiring
- <http://www.cnet.com/news/car-techs-guide-to-using-your-android-phone-in-the-car/>
- <http://tom-morrow-land.com/tests/priusaudio/> detailed ohm and jbl info
- <http://www.diymobileaudio.com/forum/build-logs-project-install-gallery/71700-2007-prius-mild-upgrade.html> I thought this guy made a box out of the cargo box and that is what sparked my overall interest in this install.

# Parts I used

- <http://www.axxera.dualav.com/mobilevideo/av614bh.php> Head Unit
- [http://www.amazon.com/gp/product/B00G1YNHEK/ref=oh\\_aui\\_detailpage\\_o00\\_s01?ie=UTF8&psc=1](http://www.amazon.com/gp/product/B00G1YNHEK/ref=oh_aui_detailpage_o00_s01?ie=UTF8&psc=1) voltage display
- [http://www.amazon.com/gp/product/B0000WS0NC/ref=oh\\_aui\\_detailpage\\_o02\\_s00?ie=UTF8&psc=1](http://www.amazon.com/gp/product/B0000WS0NC/ref=oh_aui_detailpage_o02_s00?ie=UTF8&psc=1) rear speakers
- [http://www.amazon.com/gp/product/B007MTNBSK/ref=ox\\_ya\\_os\\_product\\_refresh\\_T1](http://www.amazon.com/gp/product/B007MTNBSK/ref=ox_ya_os_product_refresh_T1) front speakers
- [http://www.amazon.com/gp/product/B00DUCB65I/ref=ox\\_ya\\_os\\_product\\_refresh\\_T1](http://www.amazon.com/gp/product/B00DUCB65I/ref=ox_ya_os_product_refresh_T1) MHL connector
- [http://www.amazon.com/gp/product/B00K9854T0/ref=oh\\_aui\\_detailpage\\_o04\\_s00?ie=UTF8&psc=1](http://www.amazon.com/gp/product/B00K9854T0/ref=oh_aui_detailpage_o04_s00?ie=UTF8&psc=1) subwoofer
- [http://www.amazon.com/Mediabridge-Component-Video-Cables-Audio/dp/B003ZZ8EQ4/ref=sr\\_1\\_1?s=audio-video-accessories&ie=UTF8&qid=1408067050&sr=1-1&keywords=component+video](http://www.amazon.com/Mediabridge-Component-Video-Cables-Audio/dp/B003ZZ8EQ4/ref=sr_1_1?s=audio-video-accessories&ie=UTF8&qid=1408067050&sr=1-1&keywords=component+video) - 5 channel wire could work
- [http://www.amazon.com/gp/product/B002G53BCG/ref=oh\\_aui\\_detailpage\\_o03\\_s00?ie=UTF8&psc=1](http://www.amazon.com/gp/product/B002G53BCG/ref=oh_aui_detailpage_o03_s00?ie=UTF8&psc=1) dash kit with wire harness for SWC
- [http://www.amazon.com/gp/product/B00C6PDG94/ref=ox\\_ya\\_os\\_product\\_refresh\\_T1](http://www.amazon.com/gp/product/B00C6PDG94/ref=ox_ya_os_product_refresh_T1) dash mount for universal cell phone
- [http://www.amazon.com/Kenwood-KAC-7005PS-Performance-Channel-Amplifier/dp/B00786XNS0/ref=sr\\_1\\_1?ie=UTF8&qid=1408281013&sr=8-1&keywords=kenwood+5+channel](http://www.amazon.com/Kenwood-KAC-7005PS-Performance-Channel-Amplifier/dp/B00786XNS0/ref=sr_1_1?ie=UTF8&qid=1408281013&sr=8-1&keywords=kenwood+5+channel) amp
- <http://www.homedepot.com/p/Unbranded-1-2-in-x-2-ft-x-4-ft-Medium-Density-Fiberboard-1508108/202089097> MDF wood for speaker box x2 pieces
- <http://www.homedepot.com/p/Liquid-Nails-10-oz-Heavy-Duty-Construction-Adhesive-LN-901/202203994> glue
- <http://www.amazon.com/Lightning-Audio-LA-8I-Amplifier-Power/dp/B00DCZJ6FK> Wiring Kit I used, but any real 8GA kit will work. I also have a 60 amp fuse I used, but the 50 should be fine.

- A component video is shielded for video quality and should hold up in your car fine. It also is a 75 ohm wire as are the audio cables. And the HU has a mono sub woofer output anyway. You can plug the single RCA into the sub input on the amp, but if you want you can put a Y on it.
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- I had a box of audio cables from my past so I had a huge supply of test wire. Here is the best part list I can pull together:
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- HU: AV614BH You can get this on crutchfield for \$269 and it will come with the dash kit. Just make sure the dash kit comes with the steering wheel control wire harness.
- Amp: Kenwood 7005PS 1200 watt 5 channel amp
- Sub:Pioneer TS-sw3002s4 4ohm sub. get the 2 ohm if you are trying to get crazy and prepare to lose MPG.
- Alpine 6 1/2 SXE 1750s Front & SXE 1725S Rear
- 4 channel RCA 20 ft
- 2 channel RCA 20 ft
- voltmeter display (amazon \$3-\$7)
- 16 feet 24 down to 18 GA single signal wire for remote wire. can use speaker wire and break it into two then solder the ends in the middle...
- 16 feet 8 Gauge wire, 2 ring connectors for battery terminal and ground
- 60 amp fuse and holder
- 60 feet speaker wire, prefer 18 gauge. I only had 12... not fun to run that in tight spaces.
- 1 male to 2 female RCA Y adapter for behind radio sending signal to sub input (could be done at the front HU or Amp if you prefer)
- 1 mono 3.5mm cord. Can use a stereo one as long as you figure out which one would be the "mono" ring. (of course I just cut ends off cables)
- -May be able to use the wire from some of your broken head phones, but I wouldn't give it more than a foot of slack - or use the mic that comes with HU.
- I used the scosche dash kit for 2004 plus toyota, it had the harness with it for steering wheel and the A/C loop resistor.
- I got the Amazon basics SM622-AMZ for my phone, should fit most phones with most cases. I like it so far.
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- This whole install cost me \$750 plus or minus \$20 for taxes and misc supplies like tape and solder and it's estimate on the wire costs due to I already owned a lot of them.
- If you are going to buy a wire kit like I did, buy it at the store, or research it at the store and make sure it doesn't say 8 GA (OD), that means outer diameter.. so you are really getting a 12 GA. You are 3 feet from the battery, you really only need a 12, but I like to run cool. It took 2 hours to build the box properly, 1 1/2 hours to remove the seat and carpet and run wires. 25 minutes to take the dash apart. 30 minutes to solder the splices on the mic, back up camera and power wires. 2-3 hours to do the door speakers from making a spacer to installing. 30 minutes to wire the amp. Due to I was writing this and going over the schematics and building this it took me 4 full days to complete. I would personally charge someone \$300 to do this install and build this box. There is a lot of little wires and sharp edges. A pro shop could do this for \$400 on up due to insured and they have better tools and wiring.

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- Side notes:

- What about the factory amp? Well, it's not hurting anything where it is and if I want to sell the car I simply use the speaker wire to splice the wires back to the amp. I only need the 4 speaker outputs and I cut them back from the amp clip about 2-3 inches to allow fo future repair then taped the ends of them from the amp.
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- Why didn't I install the amp under the seat? The amp is twice the size of the one there, also I have kids who drop food and whatnot on my floor. Also The sub wire should short due to that's what I want the current going to not the door speakers. Also the amp kicks out some heat, lets keep that in the back. (but as this point you could remove the amp if you really wanted to. The wires hooked to it are primary to the stock system once the A/C loop is installed behind HU.
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- What about the spare tire? Don't cut your wires short. And the hole you put in the cargo bucket should match up to where the wires come from the HU. I then put about 3 feet of slack at the top of the speaker box that if I picked up the black tray it wouldgive me about 3 feet of room to work then just pull the wire back when you're done. I may wrap the wires in a towel or something (towel is nice when changing tire anyway right?) so they don't resonate on the plastic tub. I didn't change anything under the plastic tub. just make sure everything is screwed tight so it doesn't rattle. I may even wrap the jack tools in a towel and put them under with the tire if I wanted to not have to lift the speaker box, or if I secure the box.
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- How did I get the wires to the trunk? The black air vent to the main battery is soft and It allowed me to get my hand in there. I also used a wire coat hanger. I also used a roto zip to cut the 4 inch hole.