

2004 Prius JBL Audio system response, specs, and photos

Written 7/05, revised 10/07, by [Tom Morrow](#)

This document presents what I found out about the 2004 Toyota Prius JBL sound system while deciding how to improve upon it. Frequency response of the signal delivered to the drivers was measured for the various channels. Pictures and other accompanying information are included. Various information I gathered from the internet and elsewhere is also consolidated here. Note that Toyota has two different audio systems available on the 2004 Prius, the Basic system with 6 channels and the JBL Premium system with 9 channels. This document only concerns the JBL premium system, although there may also be information here of use to people with the Basic system.

Electrical specifications

The nine speakers are: (This information copied from [VFAQ](#))

1. Front driver's tweeter (top front corner of front door) - 2.0 cm (0.8") 6ohm
2. Front driver's woofer (bottom front corner of front door) - 16 cm (6.3") 2ohm
3. Front passenger tweeter (top front corner of front door) - 2.0 cm (0.8") 6ohm
4. Front passenger woofer (bottom front corner of front door) - 16 cm (6.3") 2ohm
5. Rear driver's tweeter (top front corner of rear door) - 2.0 cm (0.8") 6ohm
6. Rear driver's woofer (bottom front corner of rear door) - 16 cm (6.3") 3ohm
7. Rear passenger tweeter (bottom front corner of rear door) - 2.0 cm (0.8") 6ohm
8. Rear passenger woofer (bottom front corner of rear door) - 16 cm (6.3") 3ohm
9. Center dash (above screen) midrange (center channel, *not* subwoofer) - 6.5 cm (2.6") 2ohm

The head unit includes 6 disc CD changer, radio, and cassette player. The JBL amplifier is separate from the radio; it lives under the passenger seat. It is rated at 45 watts per channel to each of 4 channels by Toyota. That rating is curious since the amp has seven speaker level outputs not four:

- Left and Right Front Woofers (low pass signal)
- Left and Right Front Tweeter (high pass signal)
- Center speaker (band passed signal)
- Left and Right Rear ("full" range signal)

The fact that Toyota says the amplifier has four channels might mean that the Front Woofer/Tweeter/Center channels are split out via passive crossover located inside the amplifier housing. Or it could just have been an error on Toyota's part; perhaps there are more than 4 channels of amplification.

The front woofers and tweeters as well as the center speaker are each connected directly to the amplifier with nothing between. The rear woofer and tweeter are connected in parallel to a single amplifier connection at the tweeter. The rear tweeters have a capacitor in series (mounted right on the tweeter in the door), which acts as a high pass filter to keep some of the lows from reaching it. The rear woofer is daisy-chained in parallel off of the tweeter/capacitor connector. All drivers have quick-disconnects on the drivers themselves which allow them to be disconnected and/or reconnected easily.

The amplifier is very much customized for the Prius. It controls the volume of the outputs, as well as the fade/balance. It has a computer network connection to the radio, where digital volume, fade, and balance data is sent to the amplifier. The radio sends two channels (Right and Left) of balanced analog audio to the amplifier, at a fixed level (not changed by the user's volume control). The amplifier performs the crossover function for the front channels, sending lows to the woofer and highs to the tweeter. In addition, there is equalization in the amplifier that reinforces some frequency ranges and lowers others, and the equalization changes depending on volume setting.

The fact that the amplifier takes a fixed level input and controls the volume itself means that the amplifier cannot simply be replaced by an aftermarket amplifier, because aftermarket amplifiers need a variable level input that varies with the volume setting the user has chosen

The JBL amp produces all the beep tones that happen when you press the buttons next to the LCD or on the LCD itself. It sends the beeps to all speakers simultaneously, including to the center speaker, and the beep amplitude seems to be constant, not related to the volume control setting.. Disconnecting the JBL amp outputs will mean you will no longer hear those beeps. The following beeps are not from the JBL amp and happen even with the JBL Amp completely disconnected: Seatbelt, Lock/Unlock with keyfob, Reverse.

The JBL amp mutes the audio when voice command is used. The analog signal coming into the JBL amp from the head unit is muted during bluetooth phone conversations. So if you disconnect the JBL amp you will have to turn the music off manually when using speech recognition, but you won't have to do so for bluetooth telephone calls if you are using the factory head unit.

There are signal wires feeding into the JBL amp that are labelled MUTE and N-MU on Toyota's schematic. I did not measure any voltages on these wires even when the audio signal was muted for voice command or bluetooth phone. But it is possible I might not have had a good connection in my test, so test yourself if these signals are of interest to you. It is possible that these wires may use grounding to indicate muting.

The LCD displays take into consideration whether the amplifier is connected to the head unit. When the JBL amp is disconnected the volume control on the LCD does not display a level number, and the Sound controls such as Bass, Mid, Treble and Fader/Balance are greyed out so that the user knows they cannot adjust them.

I measured the levels of the [balanced](#) signal from the head unit to the amplifier using track 21 of the Stereophile Test CD 3. This signal is a 1khz sine wave tone at -20db relative to digital clipping. I measured 200mVac with my digital multimeter between Left Positive and Left Negative. I measured 100mV between Left Positive and Ground (or Shield), which confirms that this is a balanced signal. In order to get the max output level, it is necessary to multiply the 200mV value by 10 according to [Stereophile](#), so the max signal level is 2 Volts balanced. This sort of balanced signal should generally not be directly connected to an aftermarket amp or other device; a special line output converter should be used such the Soundgate [LOCPREA](#) or [LOCB.2](#) balanced line output converters if you want to tap into that signal. However most people will not use that signal because it's not controlled by the volume control.

Physical measurements

All of these measurements were made with a ruler by myself so should not be considered official specs.

All woofers are mounted low and towards the front of the their doors. There is a black plastic ring riveted to the door sheet metal, extending approx 0.5" past the sheet metal. The metal flange of the speaker is screwed into that plastic ring with four screws, and a sticky rubber gasket sits between.

Front Left Woofer (right assumed to be the same)

- Mounting depth, flange to end of magnet: 2.25"
- Magnet diameter: 4" at widest, 3.5" at back end.
- Flange diameter: 6.5"
- Inner diameter of black mounting ring riveted to door: 5.75"
- Distance from front of mounting ring to the door glass, which is the first thing a deep speaker with a wide magnet would hit: 3". I am not saying a speaker with 3" mounting depth will work, because it would be too close to the glass. I would use a speaker with less than 3" mounting depth because when the door is slammed closed the window probably moves a bit. You would probably be fine with 2.5" mounting depth or less.
- I was able to test install [Focal I65KP](#) woofers with mounting depth 2.8". They required me to cut off two small protruding tabs on the black riveted mounting ring with a handsaw and drill four new holes for the screws.
- Magnet diameter that might barely fit under the glass to extend past 3" safely: 1.75". If your speaker magnet angles in a cone shape, with smaller diameter the further you are away from the mounting flange, then you might be able to put a speaker with depth greater than 3" in the front if the diameter is less than 1.75" where it's 3" deep from the flange. That is a maximum dimension, and for safe tolerances I would only use something smaller. Your car may not measure the same as mine.
- The plastic interior door panel has a ring that presses into the foam on the factory speaker mounting flange to form a seal. The asymmetrical depth of this ring is .5 " at the shortest side, and 1.5 " on the longest side. Since the grille is as close as .5 " from the woofer, adding mounting spacers to get more mounting depth is not advisable.

Rear Left Woofer (right assumed to be the same)

- Mounting depth, flange to end of magnet: 2.25"
- Magnet diameter: 3.375" at widest, 3" at back end.
- Flange diameter: 6.375"
- Inner diameter of black mounting ring riveted to door: 5.625"
- Distance from front of mounting ring to the side impact protection bar, which is the first thing a deep speaker with a wide magnet would hit: 4.5". This is plenty of room to mount almost any kind of woofer in the rear.
- The plastic interior door panel has a ring that presses into the foam on the speaker mounting flange to form a seal. The asymmetrical depth of this ring is .375" at the shortest side, and .625" on the longest side. Since the grille is as close as .375" from the woofer, adding mounting spacers to get more mounting depth is not advisable.

Front Left Tweeter (right assumed to be same, rear assumed to be the same except for addition of capacitor)

- Front flange diameter: 1.5"
- I installed the 2" [Focal TN52](#) aftermarket tweeters in the front factory location by cutting away most of the plastic structure in the

sailpanel with a utility knife, enlarging the hole with the knife, and then using Mortite weathersealing putty to hold the tweeter in place and damp vibrations.

- Front Flange depth: .25"
- Front grille extends .125" forward of front flange
- Total depth of tweeter assembly including connector: 1.125"
- All tweeters are mounted high in the doors themselves, and the wiring is therefore accessible inside the doors.
- There seems to be plenty of room to mount crossovers inside all the doors, through the woofer opening holes, although that location might be somewhat weather-exposed.

JBL Amplifier

- Amplifier measures 9"x6"x1.625", and is attached with a bracket that places it approximately 2" off the floor.
- The mounting hardware for the amplifier forms the end caps on the amp, so changing the mounting location of the amp would probably require destructive bending or cutting. The Amplifier is held onto the car with three 13mm head bolts into the floor of the car. Removing those bolts permanently would result in holes in the floor to the outside.

Under the Passenger Seat

The following information is provided to be helpful to someone who might want to install an aftermarket amplifier or other device under the passenger seat. This could be a good mounting location for a very small factory amp because it leaves the rear hatch area free to hold batteries to convert the Prius to an EV later on, and the necessary connections are available under the seat. Ventilation is also probably better with underseat mounting than in the lower hatch cargo compartment. The floor is not flat under the seat, so measurements of the height reported here are very approximate and should not be relied upon for any important purposes.

- There is 15.5" between the chair rails, and there is approx 5" of space between the floor and the underside of the seat. Various components of the chair that grip the rails have a distance of 12.5" to 13" between them, and those components are approximately 3 to 3.5" above the floor.
- Between the floor carpet and the amplifier is a black plastic vent from the air conditioner that gives strong airflow when the "foot" setting on the climate screen is activated. This vent is 7/8" tall off the floor and extends approximately 4" towards the rear of the car, and exhausts towards the rear of the car. There is 7.5" between the end of the vent and the edge of the rear carpet mat. There is a picture in the pictures section.
- There is a structural crossbar running side to side across the car that forms a big hump in the floor, below the front of the seat. The ventilation duct goes over that hump. From that hump to the edge of the rear carpet mat is approximately 12.25". From the ventilation duct to rear carpet mat is 11.5"
- The maximum amplifier size that might fit if the JBL amp were removed or remounted and the vent destructively removed is approximately: 15" x 12" x 3.25", including connections.
- If the amp were mounted over the vent, max dimensions might be 15" x 11" x 2.5", including connections.
- By heavily modifying and fabricating brackets, it might be possible to remount the JBL amp on top of an aftermarket amp because it would fit between the chair rail-clamping hardware on either side.
- Keeping the JBL amp in the factory mounting location, the max dimensions of an amp that might fit underneath it if you removed the black plastic amp cover: 13" x 7" x 1.75" including connections. That would block the vent if you used the max 7" dimension.
- The seat is held down with four 14mm bolts.
- Reminder: because of the curvature of the floor, I cannot be sure what would fit, and you should measure for yourself before buying an amp to fit under the seat.

Rear cargo box

The covered cargo box under the hatch area has the following maximum interior dimensions: 33" x 21.5" x 5.5". Note that because the corners are not square the actual usable space is slight less. This seems like a good place for amplifiers, although heat would be a consideration.

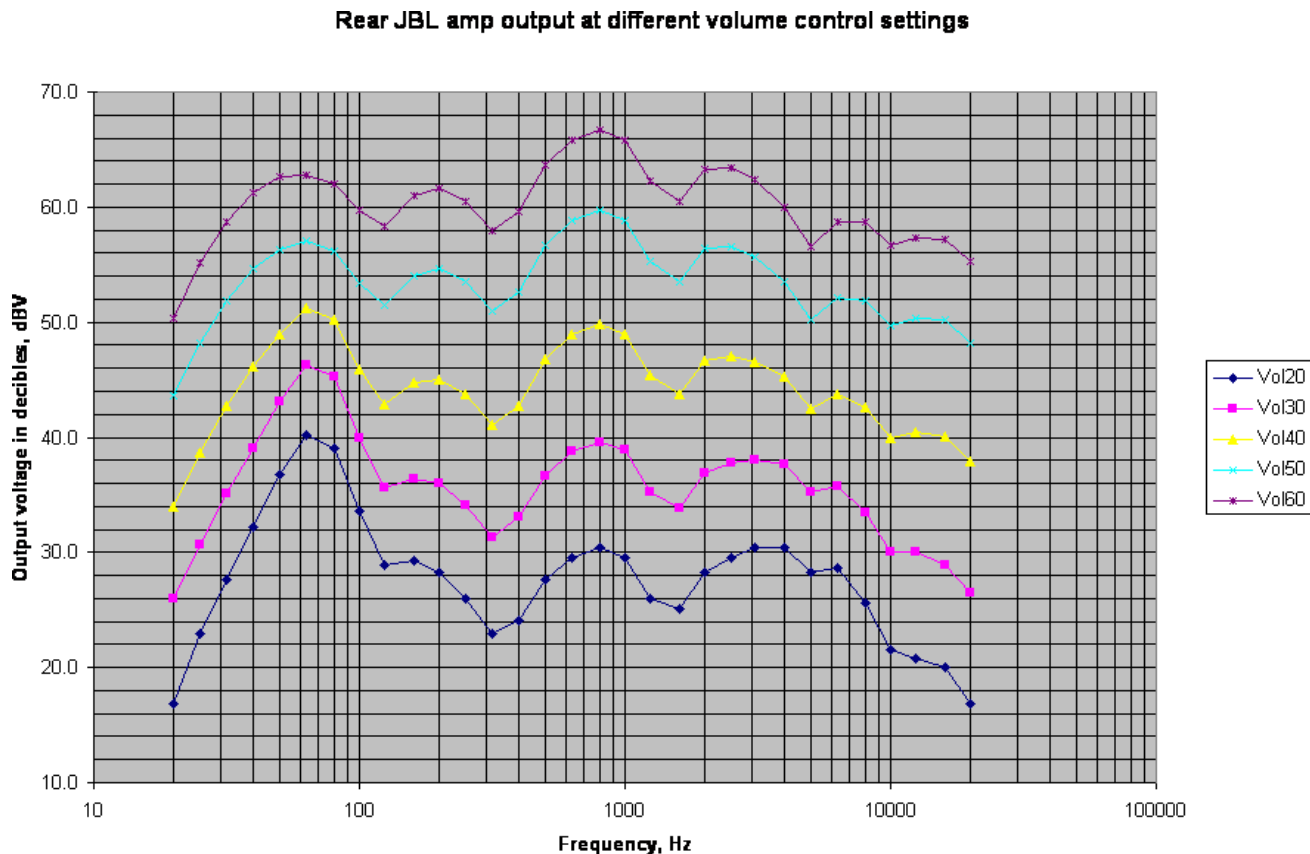
Amplifier frequency response measurements

In order to determine the frequency response for the amplifier channels, I used two different test CDs: Stereophile Test CD 3 has full range of warble test signals in 1/3 octave increments from 20Hz to 20kHz, tracks 17-19. I used that for most of the graphs. Autosound 2000 CD-101 is a test CD that has individual tracks with sine wave frequencies from 10 to 99 Hz for the graph of below-100Hz response. Both discs were played through the dash head unit CD player.

For each channel tested, I disconnected the driver(s) and replaced with a 3.3 Ohm resistor. Using a Fluke 10 digital multimeter, I measured the AC voltage across the resistor in millivolts. Volume was fixed and tone controls were centered (except for the charts that display tone control results). Results were entered into an Excel spreadsheet and graphed with Excel. If you want access to the raw data you can [download the spreadsheet](#).

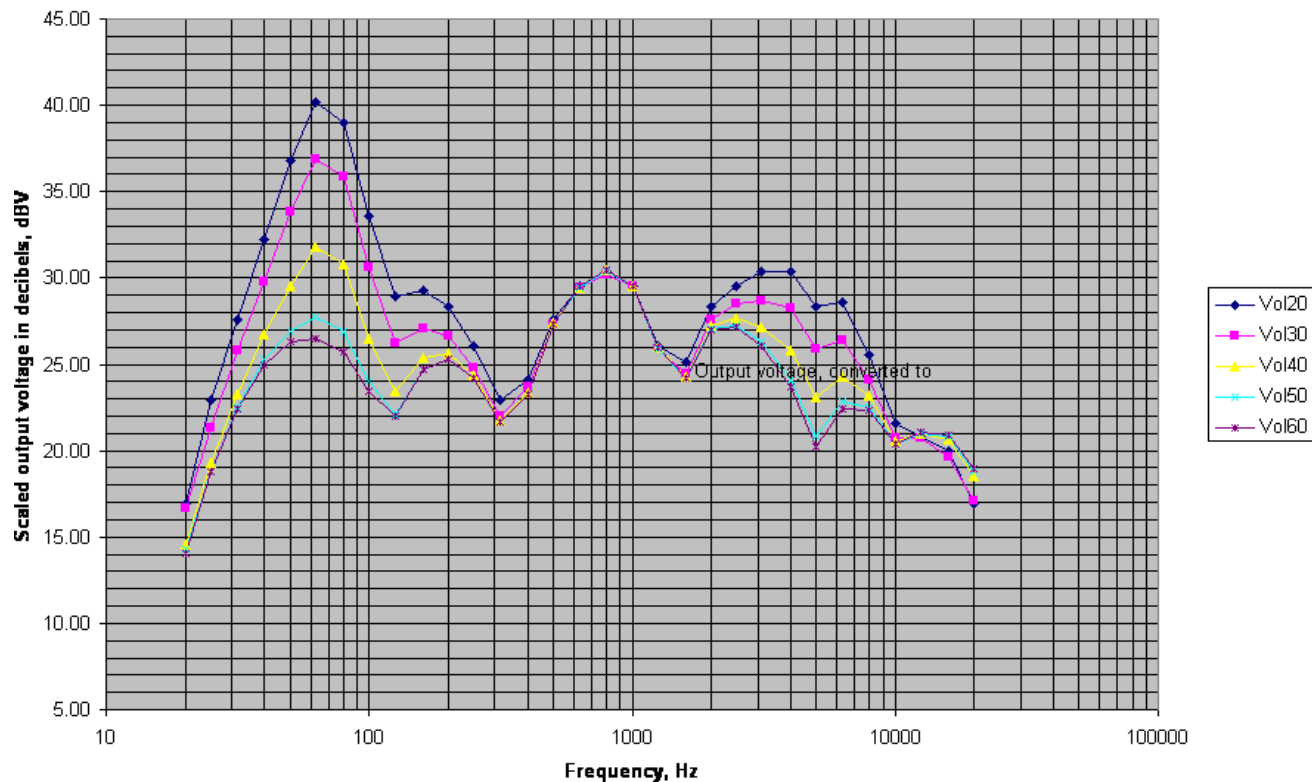
As a control, to make sure the test is valid, I did similar tests on my Home stereo: I used a portable Panasonic CD player feeding into a Harmon Kardon home amplifier, connected to the same 3.3 Ohm resistor. The home stereo gave basically flat frequency response, except for some high frequency rolloff, as seen in Graphs 4 and 5. Since the Fluke 10 multimeter I used is only rated to have a bandwidth of 5Khz, the high frequency rolloff above 5kHz shown in the graphs is likely due to the meter not the actual signals.

Graph 1



Graph 2

Rear JBL amp output at different volume levels, scaled to match at 1Khz

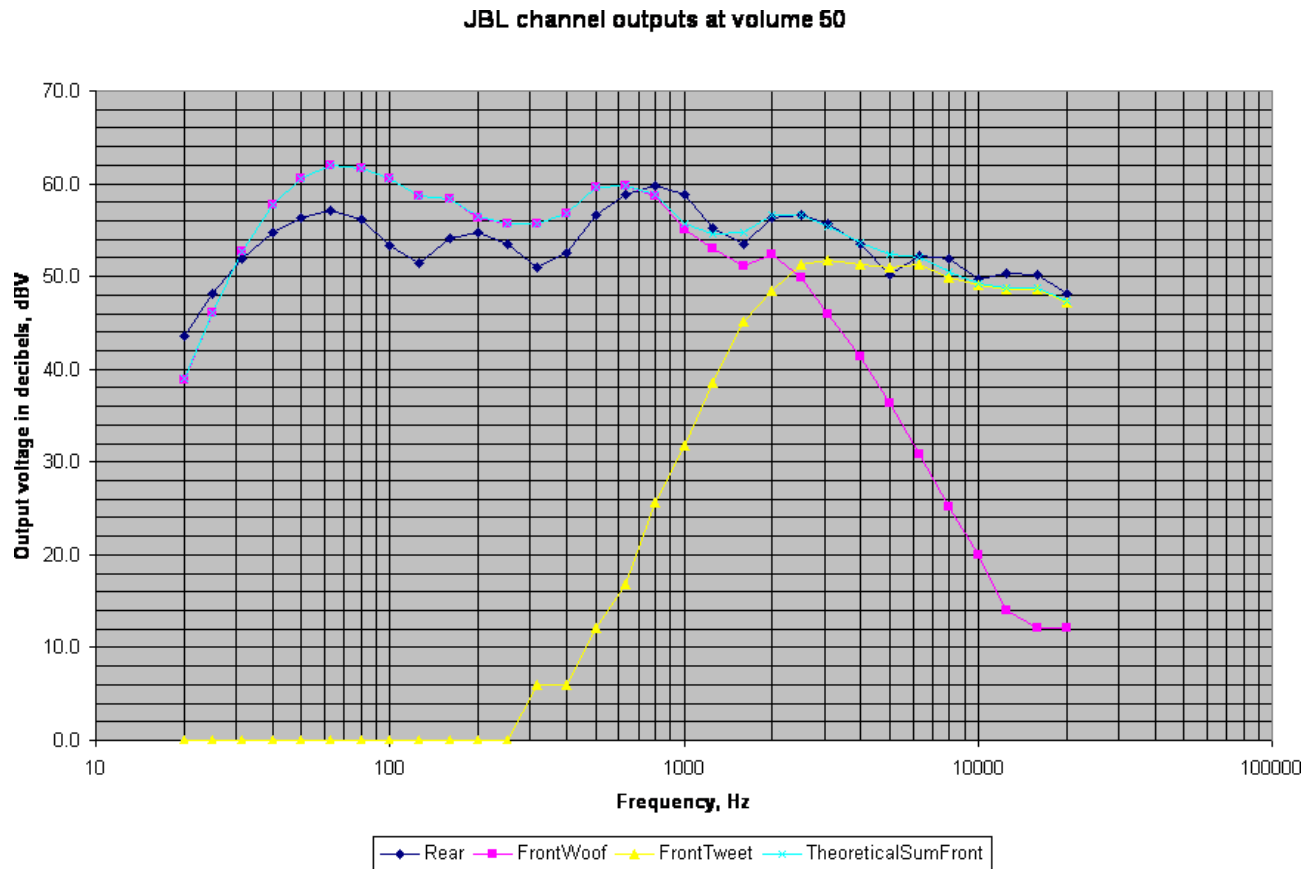


Graphs 1 and 2 show the rear channel output at different settings of the volume control. They are both created from the same set of measurement data; Graph 2 incorporates scaling to factor out the level changes. These graphs clearly show that at low volumes the JBL amp is adding bass boost at 70Hz, and treble boost around 5kHz. The effect is that the frequency response is much closer to flat at high volumes than at low volumes. The volume control has a range of 0 to 62 plus "MAX". I typically listen to the factory system at volumes between 30-40.

It seems like one approach for getting flatter frequency response would be to somehow make normal listening level be 50 or so. This could be done by feeding the JBL outputs into an aftermarket amplifier and turning the gain down lower. Or it might be doable by adding heavy duty resistors to the factory system to soak up power, but that solution could increase distortion, heat, and possibly change crossover behavior.

In order to get an idea of whether the upper volume ranges introduce excessive distortion, I listened to track 99 of the Autosound 2000 CD-101 test CD. That has a signal that slowly rises into digital clipping and then stays just below the clipping level. Playing that track I didn't hear any additional clipping even with volume turned up to 62, so on first glance it seems that the upper volume level JBL amp outputs might be clean enough for use fed into an aftermarket amp.

Graph 3

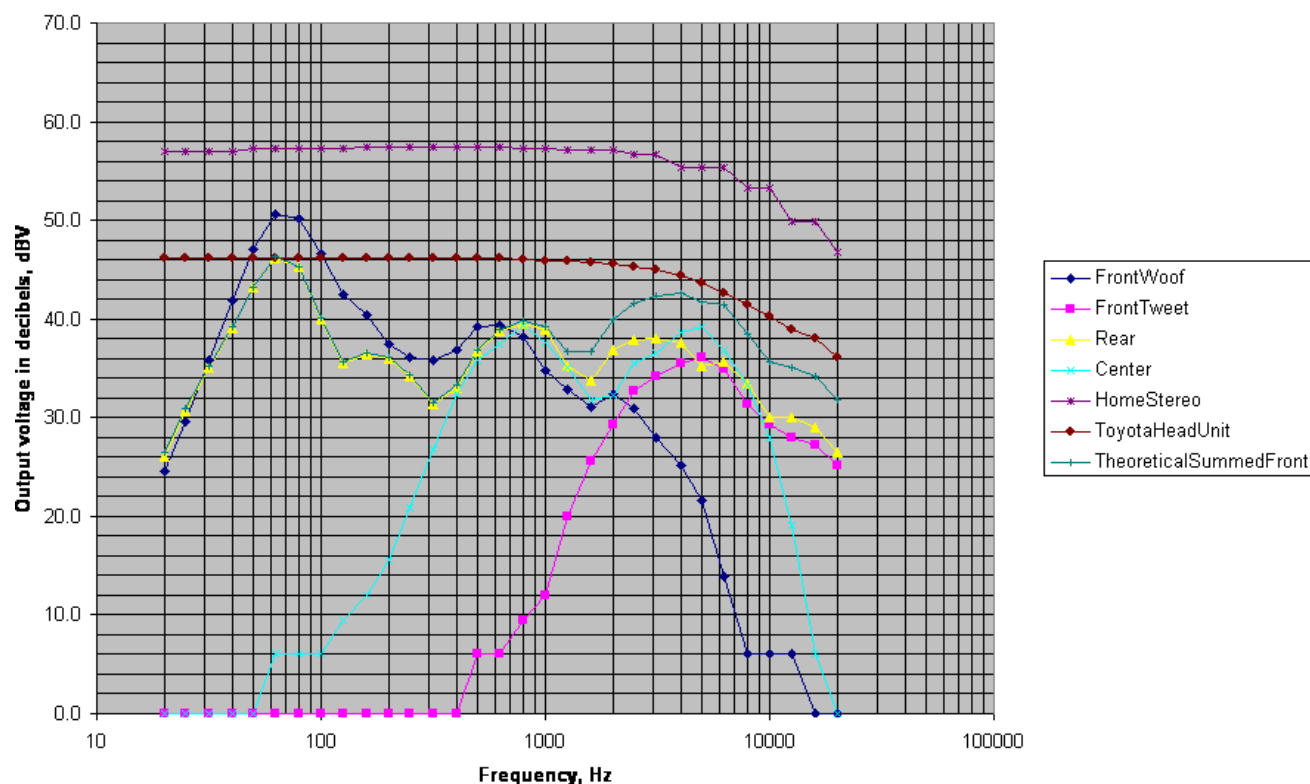


Based on graph 2, Volume level 50 seems like a good level to get a clean signal, even though it's way too loud for actual listening in the factory system. It's almost as flat as the Volume 60 signal, and has some headroom to make sure we're not pushing up against clipping. Graph 3 shows the frequency response of the JBL amp outputs at Volume 50. The result "TheoreticalSumFront" is the result of mathematically summing the front woofer and tweeter voltages. This summing function could be done with a box like the [Audiocontrol LC6](#), and then we would have almost-full range signals for the front and rear channels to feed into an aftermarket amp, and we would retain the factory fader control functionality. Note that the Audiocontrol LC6 website doesn't explain the summing functionality very well, but from reading the sales note I believe it's done by joining two outputs with a RCA "Y" cable. I did some research into summing and found various summing circuits on the web that just use simple resistors, like [this one from Rane](#) and [another one](#). The interesting thing though is that most passive line output converters already have the requisite 10 kOhm resistors incorporated into their designs, meaning that they can be used for summing with just a Y cable. David Navone confirmed to me that his [NE-774V](#) can be used for summing signals with just a Y cable on the outputs, which provides a cheaper alternative than the Audiocontrol LC6.

Note that the "TheoreticalSumFront" signal could probably be made flatter by adding some gain to the tweeter signal before the summing. The treble rolloff in the rear channel is actually desirable to me... I prefer the rear channels to just add fill and bass; having too much treble in the back tends to ruin imaging.

Graph 4

JBL amp output at Volume 30

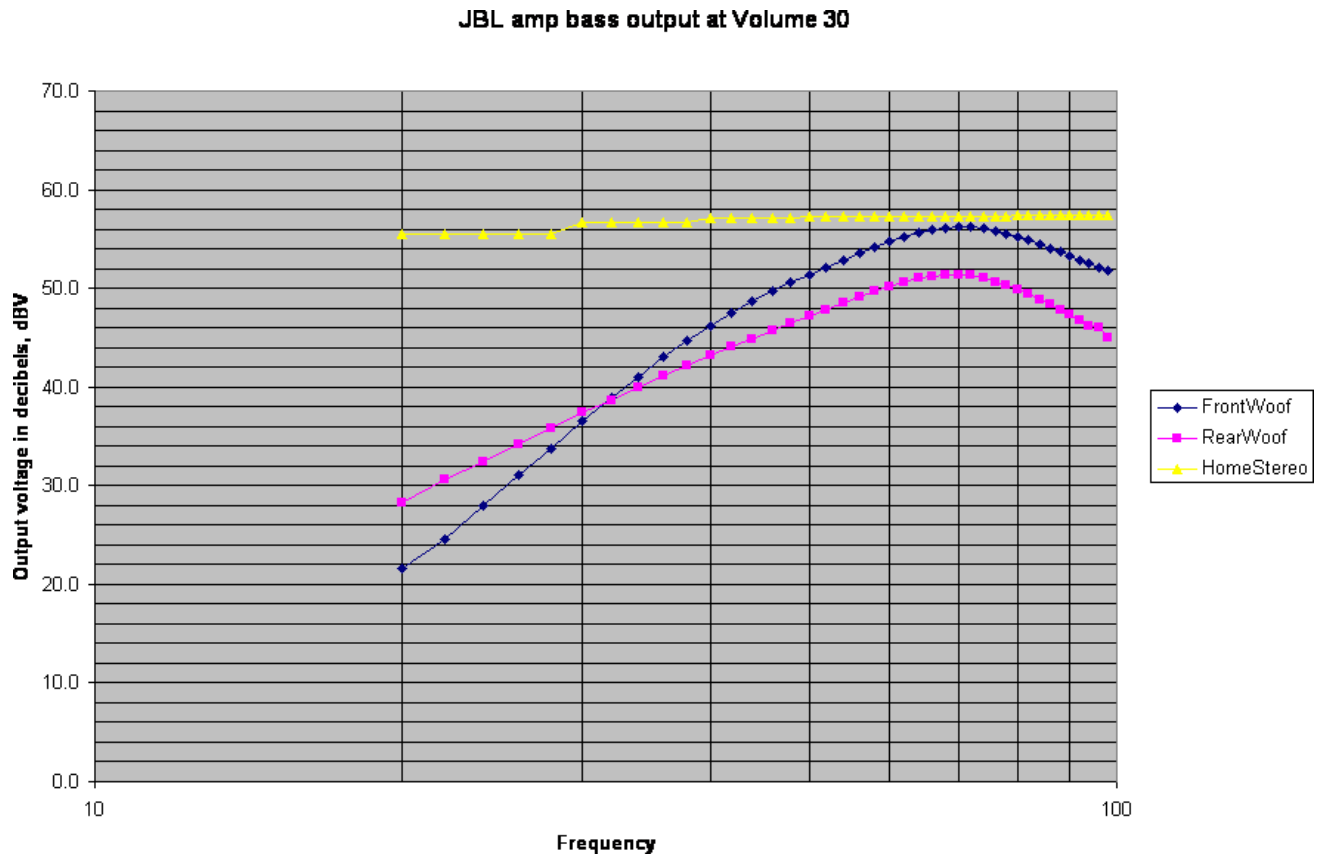


At volume level 30 (a normal to low listening level with the factory system), as shown in graph 4, the 70Hz hump in bass output becomes evident, as well as the steep rolloff below 70Hz. This is undesirable to me, and so I would want some way to get a flatter frequency response. Note that for comparison I have shown the Toyota Head Unit signal that feeds into the amplifier. That has a nice flat response (except for some gradual high frequency rolloff). Tapping into that signal would clearly give the flattest signal of all. This graph also shows that the center channel speaker is band limited, dropping off below about 500Hz and above about 7kHz.

In home theater systems simply disconnecting the center speaker will result in significantly lower levels for dialog and other "centered" sounds. I wanted to make sure this effect would not occur with the JBL system. To test this, I used the "Stereo Review/Chesky Gold Stereo and Surround Sound Set-up Disc" Track 11. This is a "stepped stereo pan test", where a sound moves between right and left. I listened to see if it would be significantly quieter when the sound was in the center with the center channel disconnected. It was not; the sound retained roughly equal volume all the way right to left whether the center was connected or not. This indicates to me that the center signal is driven off a simple sum of front right and left (with bandpass of course).

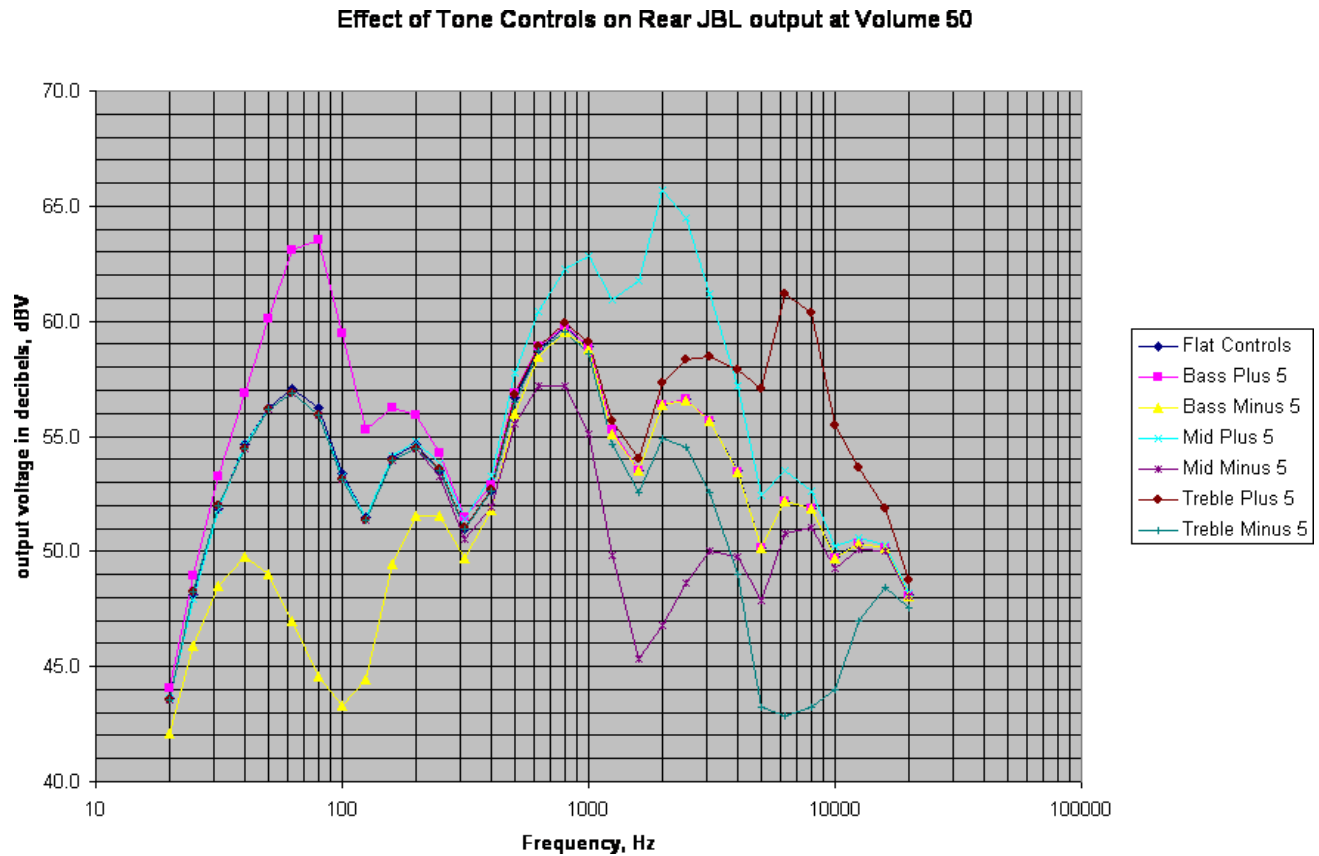
Note that the high frequency rolloff shown for the ToyotaHeadUnit data (as well as everything else) is likely the frequency response of my Fluke 10 meter, so it may even be flat up into the higher frequencies.

Graph 5



Graph 5 simply shows higher resolution data for the poor bass response at Volume 30. It shows that the peak is at 70Hz. At least the response is smooth and therefore amenable to parametric equalization.

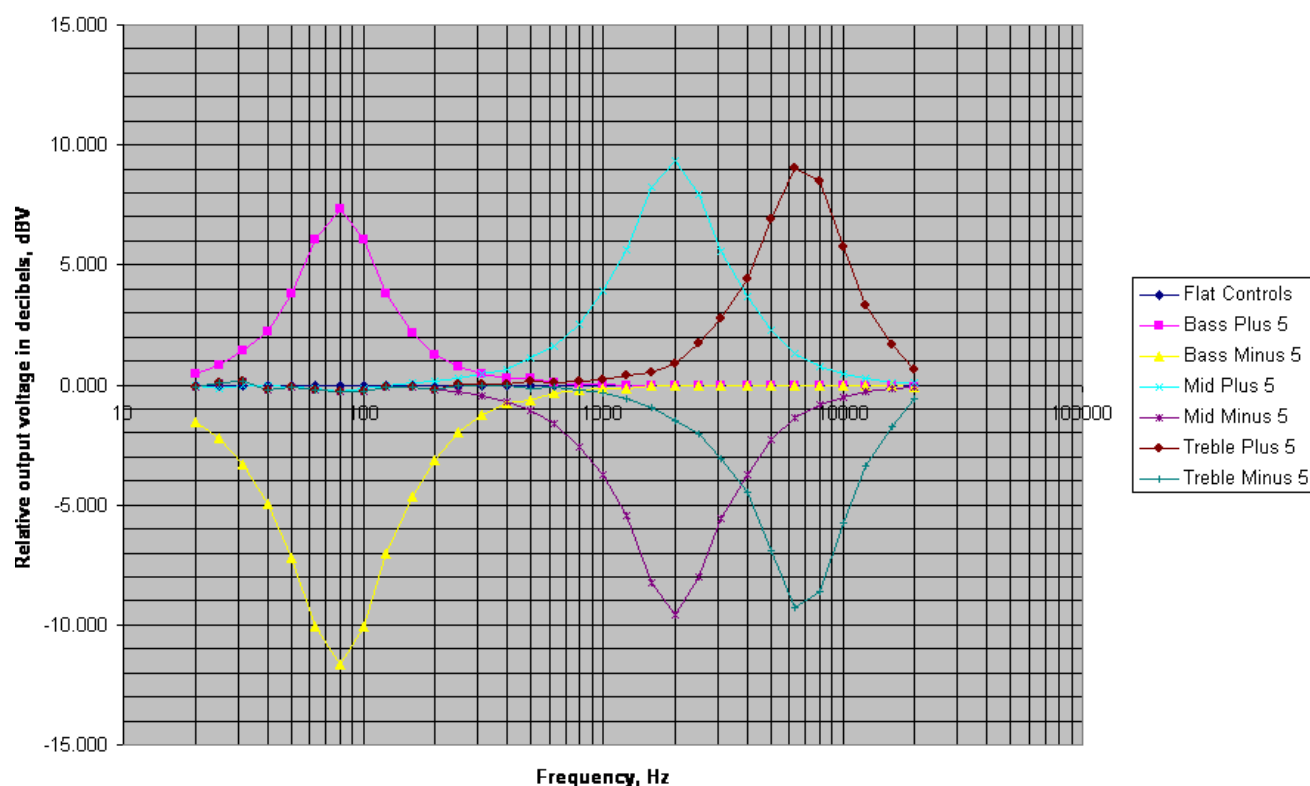
Graph 6



One thought was "I wonder if I could use the factory tone controls to smooth out the frequency response". This graph seems to indicate that the tone controls have generally the wrong center frequencies to make much improvement.

Graph 7

Relative effect of Tone Controls at Volume 50 for Rear JBL output



Graph 7 was made from the same data as graph 6, by scaling it so that zero is the no-tone-control signal. From this graph we can see that the tone control center frequencies are approximately: Bass 80Hz, Mid 2kHz, Treble 7KHz.

Summary of measurement results

The main observations are:

- The amplifier rolls off bass frequencies below 70Hz, steeply at normal volumes like 30, and gradually at high listening volumes like 50.
- The amplifier applies equalization across the whole frequency range so there is no completely flat region.
- The rear signal is the closest to a full range signal
- Factory tone controls will not help to get flat frequency response.
- Parametric equalization could be effective in flattening the bass region.
- Summing the front woofer and tweeter signals produces a signal almost as good as the rear signal but with slightly less bass.
- The band limited center channel can be disconnected without significantly affecting overall response.

Possible ways to improve sound

It is clear that there is a need to add more low frequency response.

My suggestion for most people wanting to improve the sound quality with minimal effort is to install a high quality front component set (woofers, tweeters, and crossovers), and drive them off of the rear output of the JBL amp (which has better bass). The rewiring might be accomplished under the seat on the outputs from the JBL amplifier. Many people don't need the rear speakers at all so they can be disconnected, but if you insist on having rear speakers for occasional rear passengers then you can probably remount the front woofers and tweeters in the rear, rewiring so that they are driven off the JBL front woofer and tweeter outputs.

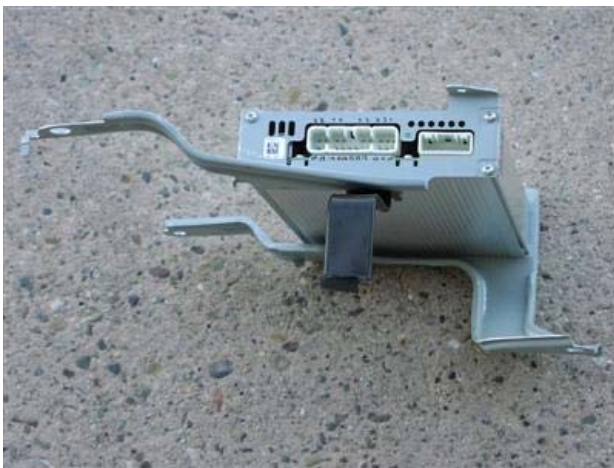
Adding a subwoofer is the most common approach to getting more bass, mostly because audio installers don't need to understand the details of the Toyota audio system in detail to implement it. Connecting it to the rear outputs would give it the best signal to work with. But note that you would still be sending it a signal that is not flat. This might not be a significant problem since in the real world resonances and other environmental factors often change the bass response by much more than that, and you can always crank up the level of the subwoofer. Many subwoofers have "Bass Boost" circuitry that boosts around 50Hz or so, and that might be useful for evening out the response. It might also be useful to set the subwoofer crossover frequency lower than 70Hz, perhaps 50 Hz, in order to counteract the effect of the sloping input to the sub.

Another approach might be to employ a parametric equalizer to smooth out the 80HZ boost. The Rockford Fosgate Power series amplifiers have the "Para Punch" bass boost on the rear channels, which has a variable center frequency of 35-70Hz and 0 to 18db boost. This type of control could help flatten the bass response without a subwoofer.

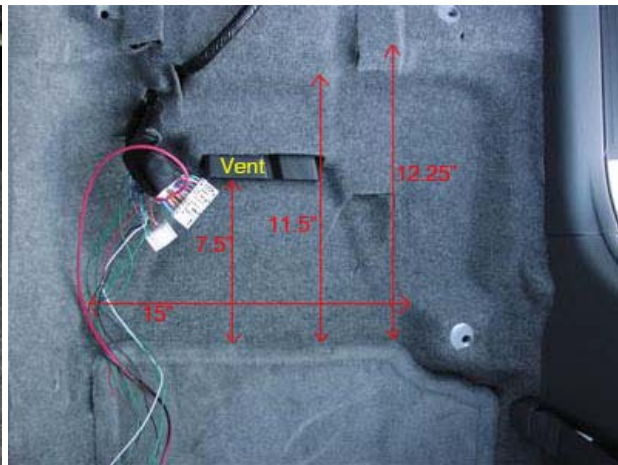
The [JL Audio CleanSweep](#) is designed expressly to clean up the frequency response of systems like this by equalizing the JBL amp outputs back to flat.

I'm not a big fan of subwoofers in cars myself. They mess up the impulse response by delaying bass events however long it takes the sound to come from the rear of the car to your ears. I prefer to have my bass as crisp as possible, even at the expense of missing the lowest octave of bass. A great 6.5" speaker in a door panel that is well damped with Dynamat type products and sealed up can sound much better than one of the compact 5.25" or 6.5" subwoofers whose design goal was to make it small enough, light enough, and cheap enough that everyone would buy it. The door itself becomes a subwoofer, with greater interior volume than you would ever find in a small sub enclosure, and the leaks in the door essentially turn it into a ported design.

Pictures of the factory system

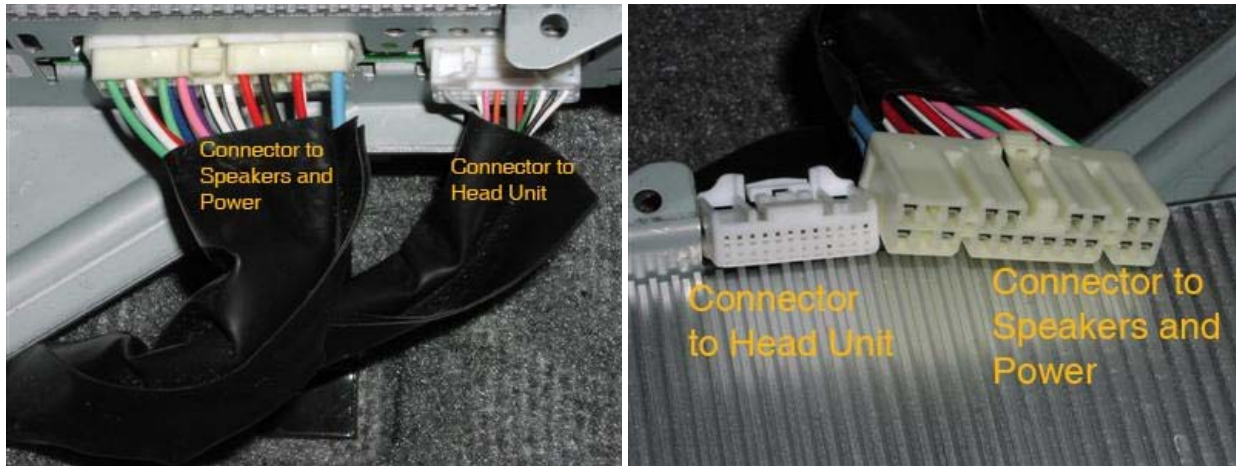


The JBL amp has mounting brackets integrated into the casing.

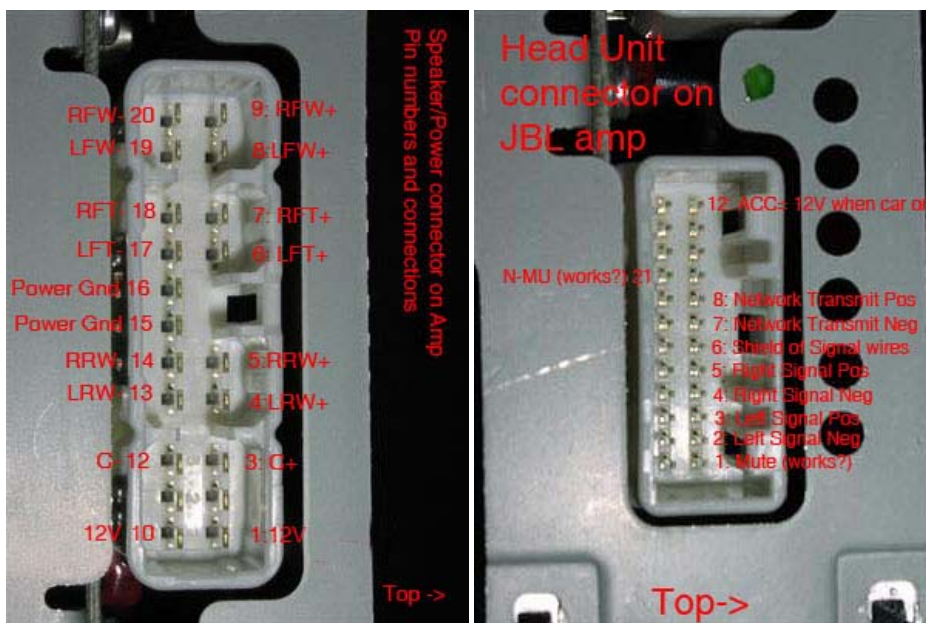


Left: The JBL Amp, as seen with the black plastic cover removed and the passenger seat removed. Right: JBL amp removed, exposing

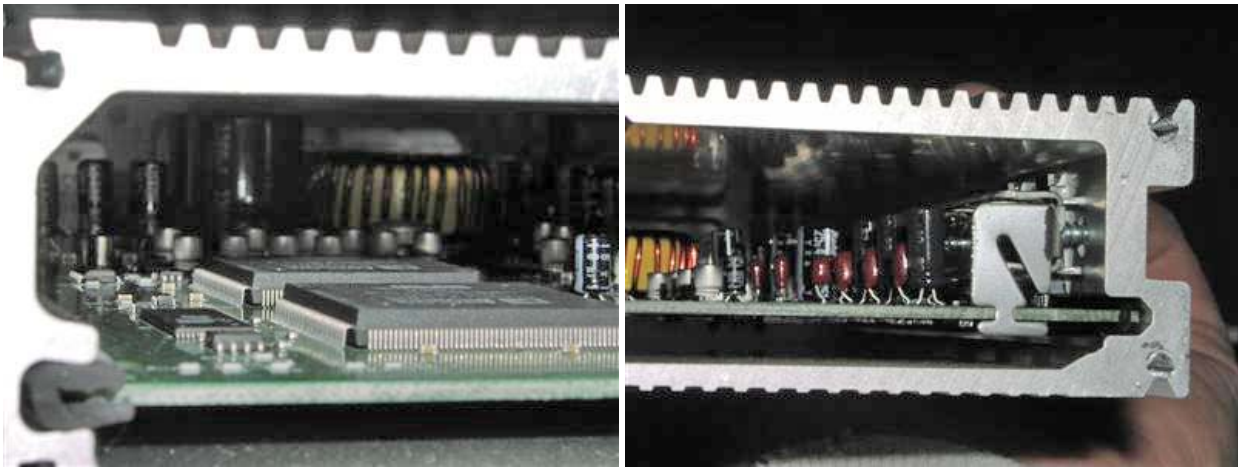
air vent.



Left: connectors to amp plugged in. Right: connectors unplugged.



Left: the Speaker/Power connector on the amp. Right: the Head Unit connector on the amp.



Some shots of the interior of the amplifier... not a lot of circuitry in there. Right picture: you can barely see the power transistors (or whatever they are) heatsinked and screwed to the case to conduct heat away.



Left: holding the sail panel so you can see the silver clip and white snap on the bottom that attach it to the door. Right: holding the tweeter under the back of the sail panel where the tweeter fits in.



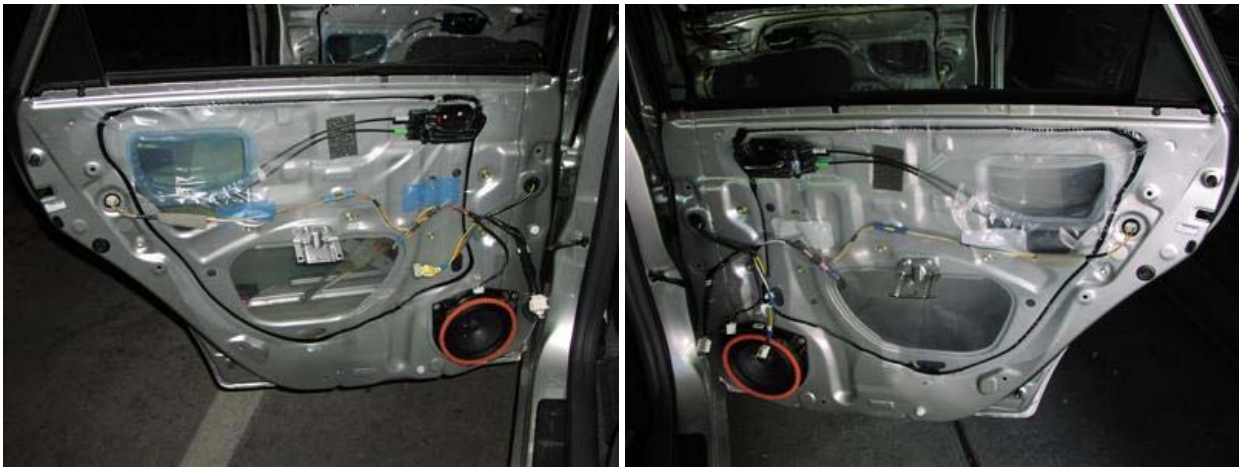
Left and Right front doors



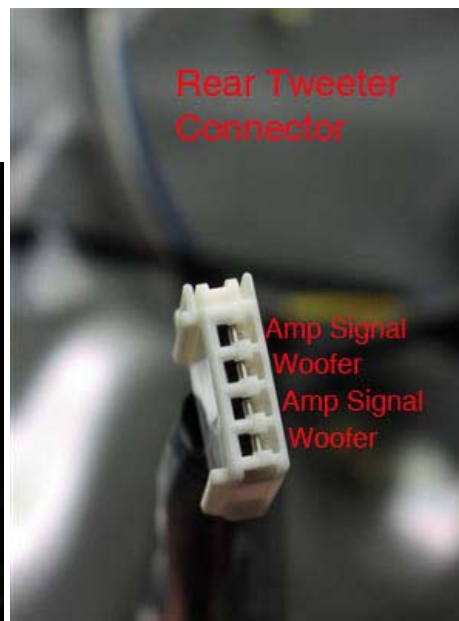
Location of the woofer in the front door



Front door woofer off. Window rolled all the way down. Notice glass 3" away from mounting lip would prevent very large magnet speakers from being used.



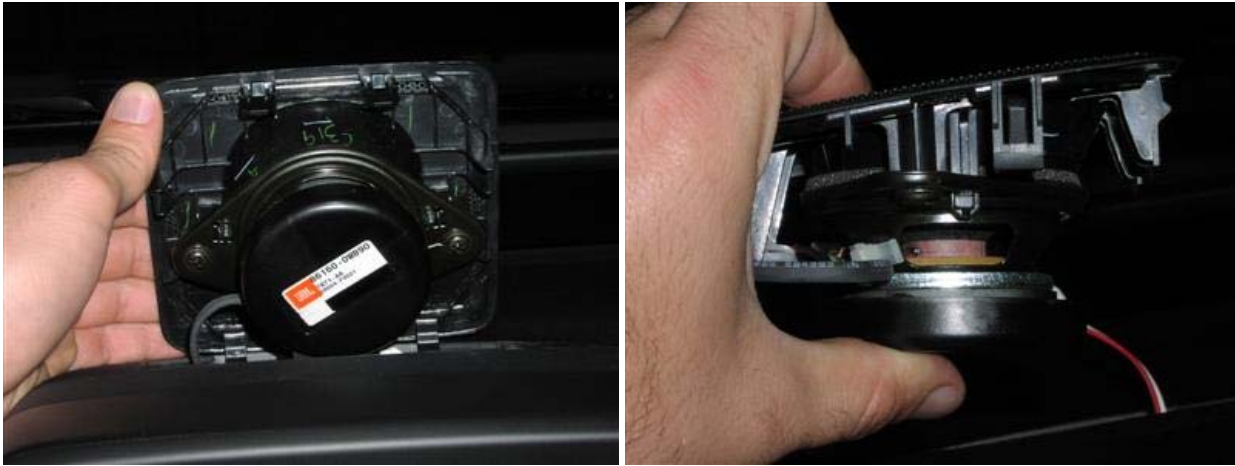
Left and Right rear doors



Left: the back of the tweeter assembly. Notice the black capacitor on the rear tweeter. Right: Right Rear tweeter connector



Rear speaker. Window rolled all the way down is nowhere near the speaker well. The side impact bar is a good 4"+ behind, so big speakers would fit back here.



The center speaker.

Disassembly information

If you want to replace the speakers, I suggest you first read [Sparky's guide](#). That has lots of pictures and will help you understand how to disassemble the rear doors much better than my discussion below.

Here's the cliff notes on removing the interior door panels:

- Note that all power windows get disabled when any power window switch is disconnected, so if you want them down while you work roll them down first.
- On the front doors, remove the tweeter sail panel by pulling the whole thing away from the door. Disconnect and set aside.
- Unscrew the screw in the grip well that you use to close the door.
- To reach the other screw you need to remove a black plastic panel behind the lever you use to open the door. You might get it out with your fingers with some effort, or insert a screwdriver wrapped in fabric in the back lower corner (while pulling the lever away from the door) to pop it off. It pops straight out toward the other side of the car. Then unscrew the screw underneath.
- Remove the front plastic part of the armrest that contains the window switches and such, by pulling upward with your fingernails underneath the end closest to the front of the car. It just snaps out and swings up. Disconnect the wires.
- Pull the bottom and sides of the whole door panel out by hand; it is held on with those little white press-fit clips. Be very careful with the top parts where the two different colored plastic pieces meet (eggplant colored on top and gray on the bottom in my Prius). The physical bonding between the two plastic pieces is weak, and I caused a small crack while removing one door panel because I pulled from the bottom rather than by the top clip. To remove the topmost clips make sure you are pulling on the top plastic panel, not the bottom one.
- Then lift the door panel straight upwards, and disconnect anything still connected to it.
- If some of the white clips stay on the door, remove them with needle nose pliers and put them back on the plastic panel.

The speakers are then visible and can be unscrewed by removing the four philips head screws. They will still be held in place by the very sticky rubber gasketing between the speaker flange and the black plastic mounting ring. Use a screwdriver to pry the speaker out; it takes more force than you might expect. Do it slowly so that there is time for the rubber gasket to unadhere gradually, and try to keep the gasket sticking to the speaker basket so it will be easier to reinstall.

The tweeters just press fit into place and are easy to pop out.

The center speaker can be removed easily without disassembling anything else. The speaker is mounted to the grill assembly. The edge towards the back of the car swings up. I found I could work my fingernails and then fingers under the corner nearest the passenger seat, and just pull up to pop it out. Don't try to pull it from the edge towards the front of the car because that's the "hinge" side. Some others have suggested a butter knife wrapped in fabric, but if you can get it with your fingers only that's preferable. Be careful because that area will show marks easily.

My system

After immersing myself in the world of car audio while researching this document, I decided it would be fun to enter my vehicle in some car audio competitions. As I was putting my system together I decided to make the effort to comply with the rules of the car audio competitions. I was so inspired by the local qualifying competitions that I decided to try for the world finals. I qualified and I drove from California to Atlanta and back for the 2006 IASCA world finals car audio competition. I was a bit disappointed that I came in last place ([8th out of 8 in Rookie](#)), but most of the other competitors, even in the Rookie division, had much more experience with other competitions than I did. Most of my competitors completely gutted their vehicles and replaced panels with new fiberglass to optimize sound quality, spending tens of thousands of dollars on dedicated vehicles and top of the line exotic electronics to wow the judges. So I was proud of my \$2500 system with used scratched head unit being in the same league. My goal was to have fun competing for a year and then end up with a practical great sounding daily driver.

Competition setup

This install is completely stealth, so that no car functionality is lost to the system. The hatch area remains fully usable, and the system is invisible when closed up. The electronics are mounted above the fully usable spare tire. The subwoofers are in the rear doors. The factory head unit remains usable for the in dash CD changer and cassette, and an aftermarket head unit is mounted below it. The processor controller is in the glove compartment. Front speakers are mounted in the factory locations.

- Alpine 7949 Head Unit located under factory head unit
- Alpine H700 Processor with controller in glove compartment
- Rockford T8004 50Wx4 Amp in trunk
- Memphis MCA2004 50Wx4 Amp in trunk
- Focal 165K2 speakers with TN52 tweeters in front door factory locations
- JL Audio 81B4 subwoofers in rear doors
- Archos Jukebox 20 mp3 player in center armrest console

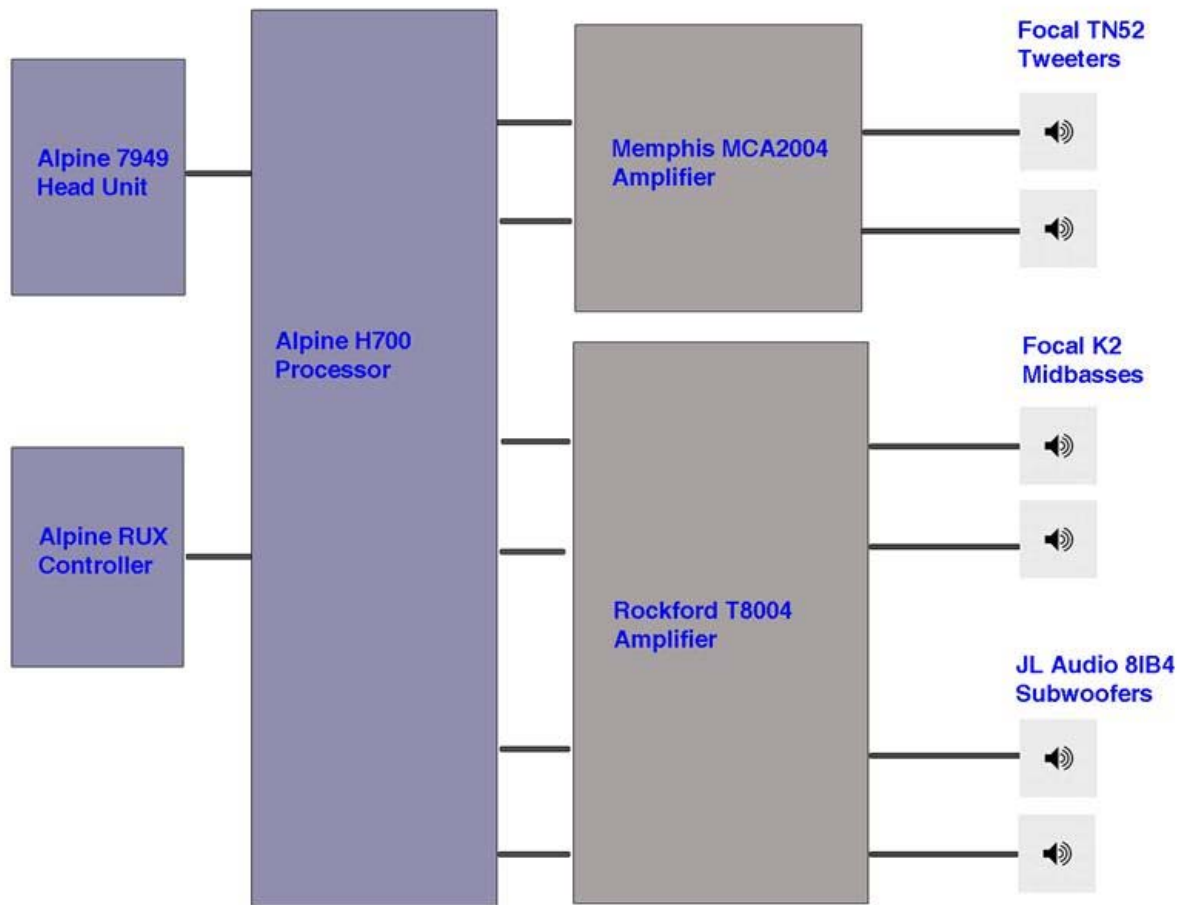
The centerpiece of the system is the Alpine H700 processor which provides equalization, crossover, time alignment, switching, digital and analog inputs, and a volume control, allowing me to get a pure digital signal path completely independent of the factory system for my mp3 player. The H700 has a separate controller mounted up front that allows me to tweak everything easily.

Changes to be made after the competition for daily driving:

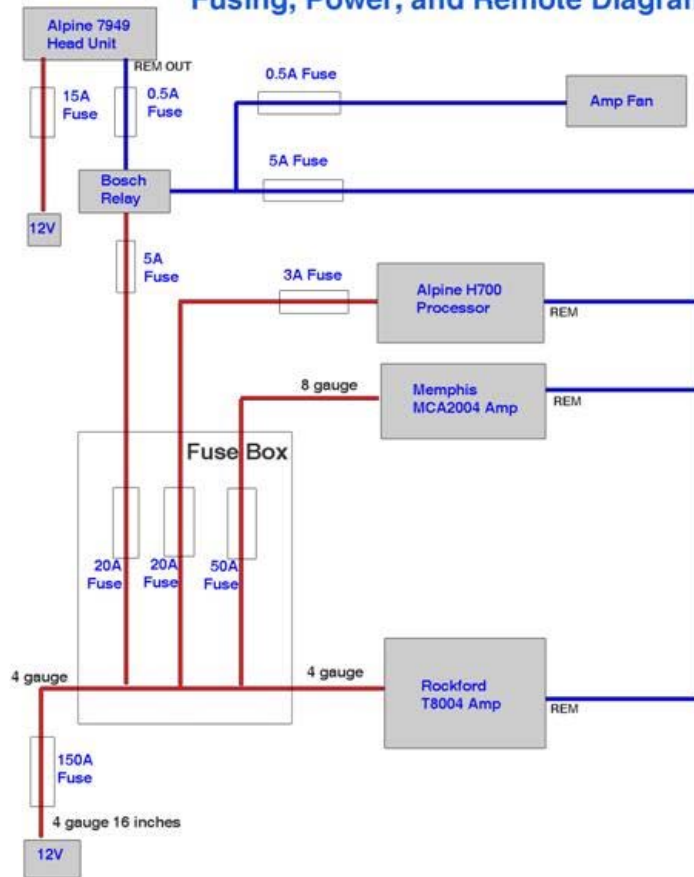
To meet the competition rules I had to use an external Alpine head unit, but after the competition I will remove that and mount the Alpine H700 processor controller under the factory head unit, so I can use it to switch between the factory head unit sound (connected via the rear speaker outputs to the H700 RCA inputs with a voltage dividing resistor network) and the digital SPDIF output of my Archos Jukebox 20 mp3 player (which receives charging power from a DC/DC installed under the amps). I'll use the H700 equalizer to correct the bass rolloff of the factory JBL amp.

Note that these diagrams and pictures below are of the competition setup which ignores the factory system entirely, so most people would not find this the best setup.

Signal flow diagram



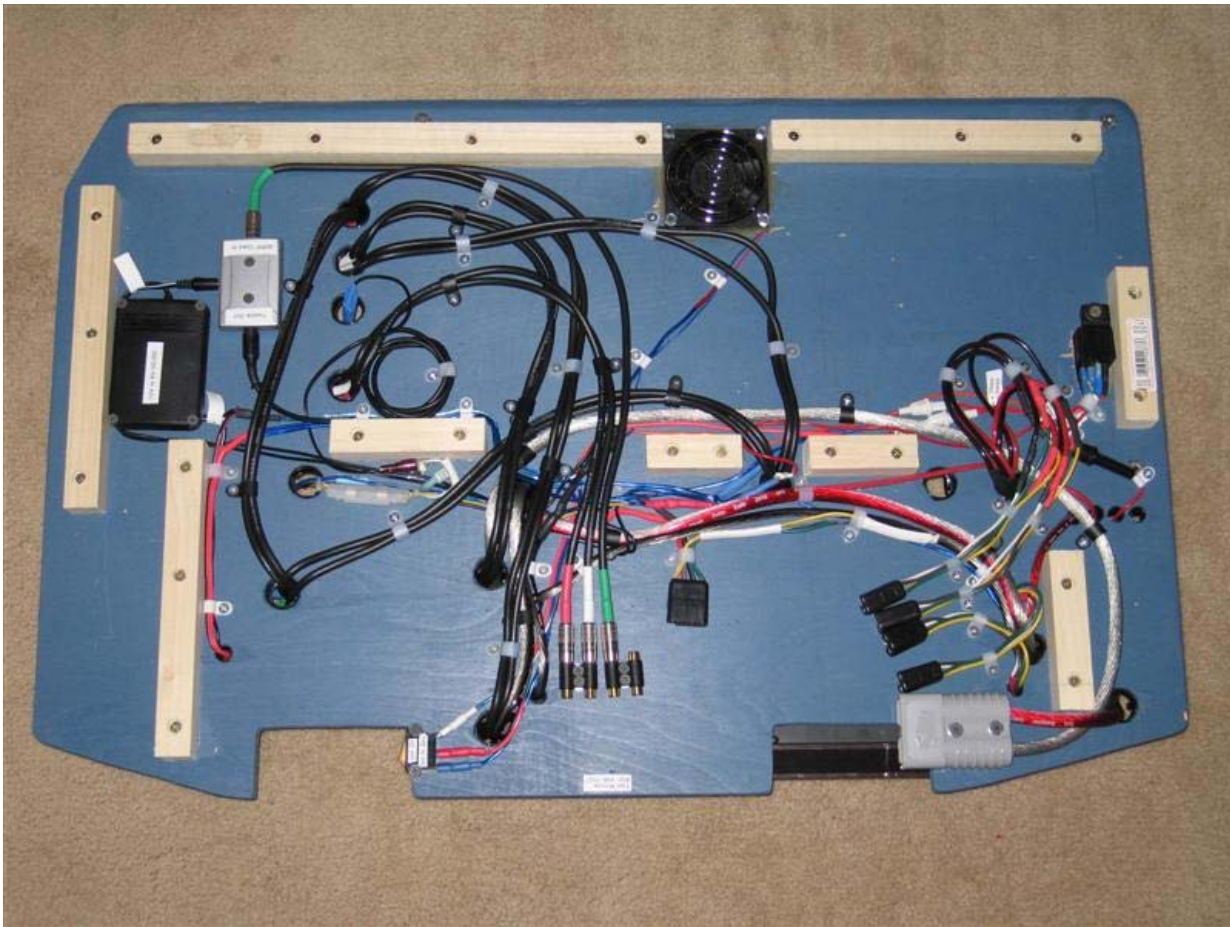
Fusing, Power, and Remote Diagram



Most of the system is mounted in the cargo box under the hatch area, all under the hatch carpet floor. You see the amplifiers, fuses, and H700 processor, as well as the Maxxbass processor in the lower right corner which was removed because it degraded the sound a little.



The underside of the amp rack shows the connections, and the cooling fan. Everything has quick disconnects so it can be removed for service.



The Focal TN52 tweeters were installed in the factory positions with some cutting and held in place with mortite weather seal.



The front speakers were mounted in the factory rings, and lots of dynamat type material deadens the door.



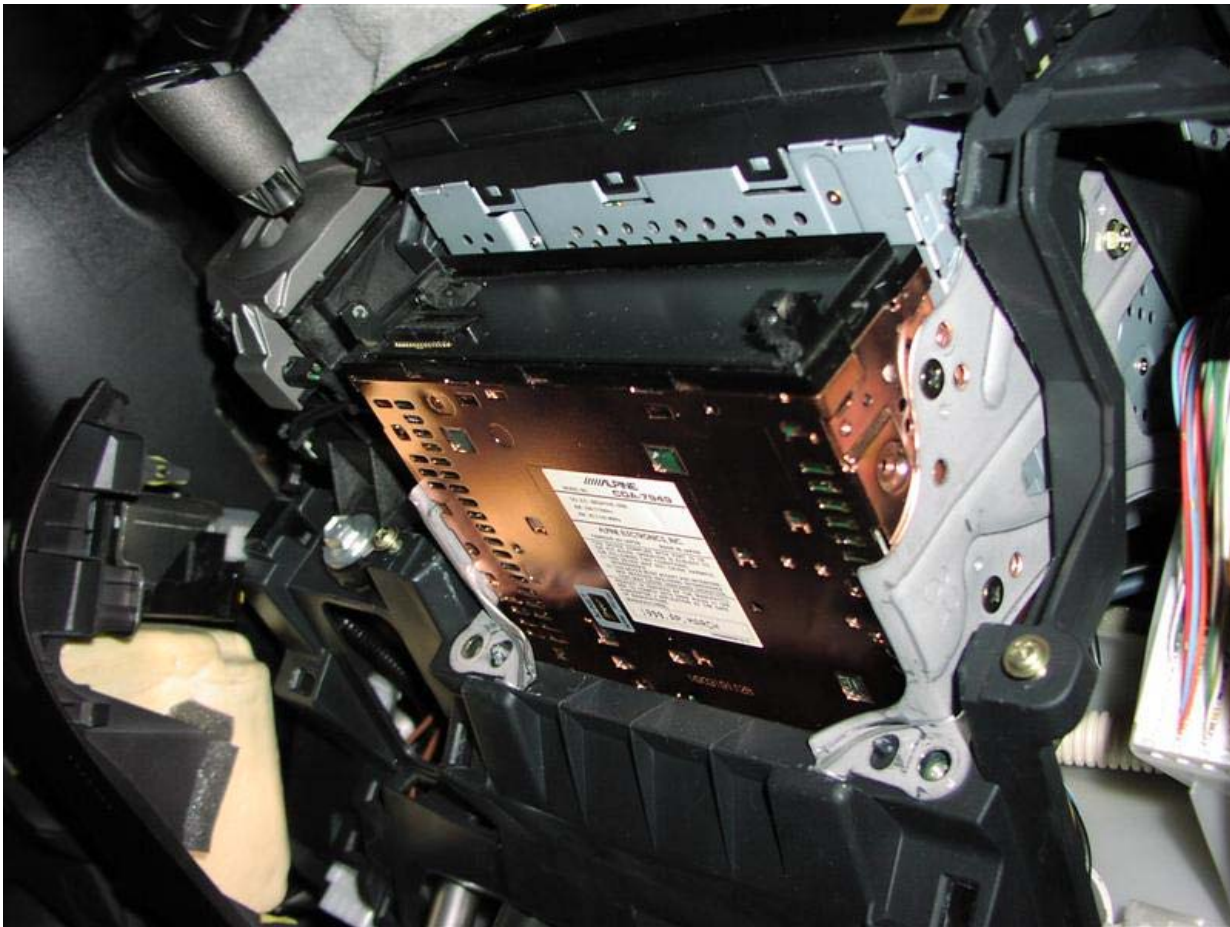
The rear 8" JL audio subwoofers required custom plywood mounting rings epoxied onto the rear doors, and I also had to use a heat gun on the interior plastic panels to expand the speaker grille shape and give them room to boom.



The system in the cargo box lifts out to access the spare tire, but is secured for theft and accident prevention with a bolt through the center into a custom bracket on the spare tire bolt.



The competition head unit was installed below the factory head unit, but after competition that will be replaced by the H700 controller which was in the glove compartment.



Links

[Sparky's guide](#) to replacing the rear speakers in the Basic (non-JBL) system.

[Schematic](#) of the Audio system

[VFAQ](#) has some basic facts on the audio system.

Please [contact me](#) with errors, omissions, and compliments.

2005 Toyota Prius – Rear Door Speaker Replacement Guide

by ~sparky~, 6.12.05



First, thanks to everyone who has posted such comprehensive and valuable information on the *priuschat.com* website – I found this website to be an incredibly valuable resource as I prepared for and took delivery of my new 2005 Prius Package 4/AC in Driftwood a few weeks ago, and as I considered purchases and modifications to make this great car better fit my needs. I hope others find this helpful.. it's my way of trying to 'give back' and provide a valuable resource for others considering the same project.

This document is intended to provide a step-by-step guide to replacing the rear speakers in a 2005 Toyota Prius. It is very simple and straightforward. It describes replacement on a 'base' non-JBL system, but should be very relevant (although maybe a slight bit different) for the 'premium' JBL system, and for replacing front speakers (which I also did).

The difference in sound quality is remarkable. I replaced the rear speakers with *Infinity Kappa Series 62.7i, 6 ½" two-way loudspeakers* and the front door speakers with *Infinity Kappa Series 60.7cs 6 ½" two-way component speakers* (see links to manufacturer website below). Both sets included adapters that facilitate simple mounting in the Prius' larger door speaker enclosures (most speakers would require purchase of a separate adapter). Both sets also feature crossovers that provide much better sound separation, and allowed me to tweak the treble settings to +3db, which better suits my taste for lots of high treble. I purchased the speakers on ebay for \$85 (for the rear 62.7 pair) and \$160 (for the front 60.7 pair), plus shipping.

It took me about an hour on the first rear door, and 30 minutes on the other rear door (experience counts!) Front doors took about twice as long - the crossovers were a little more complex to wire, and the doors had more 'stuff' to disconnect and re-connect.



Infinity 62.7i
(Rear Doors)

<http://www.infinitysystems.com/car/audio/product.aspx?ProdId='KAPPA62.7I'&Ser=KAP&Cat=MEL>



Infinity 60.7cs
(Front Doors)

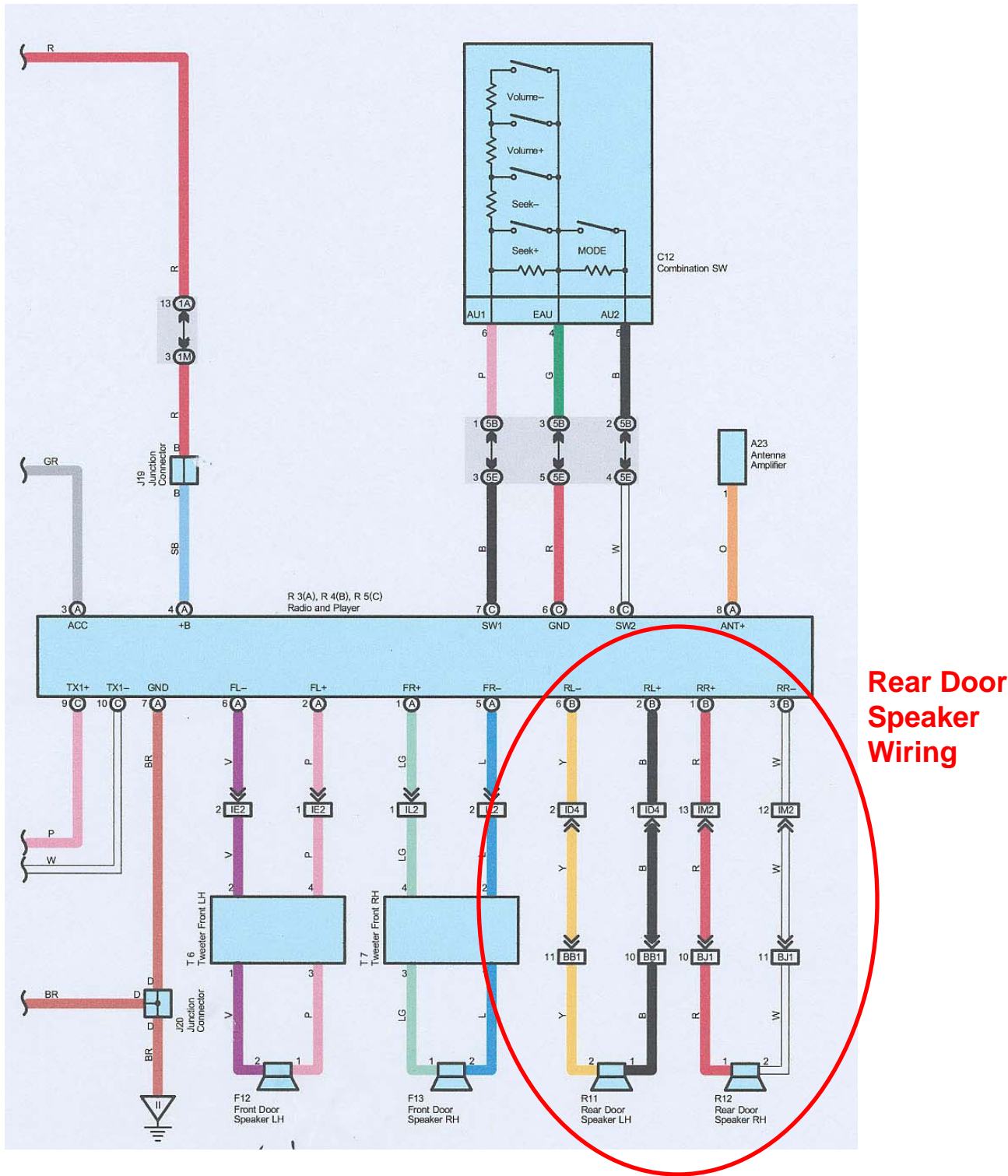
<http://www.infinitysystems.com/caraudio/product.aspx?ProdId='KAPPA60.7CS'&Ser=KAP&Cat=COS>

(Not pictured above, but these include crossovers)



2005 Toyota Prius – Rear Door Speaker Replacement Guide

2005 Toyota Prius *non-JBL* Stereo Wiring Diagram



2005 Toyota Prius – Rear Door Speaker Replacement Guide

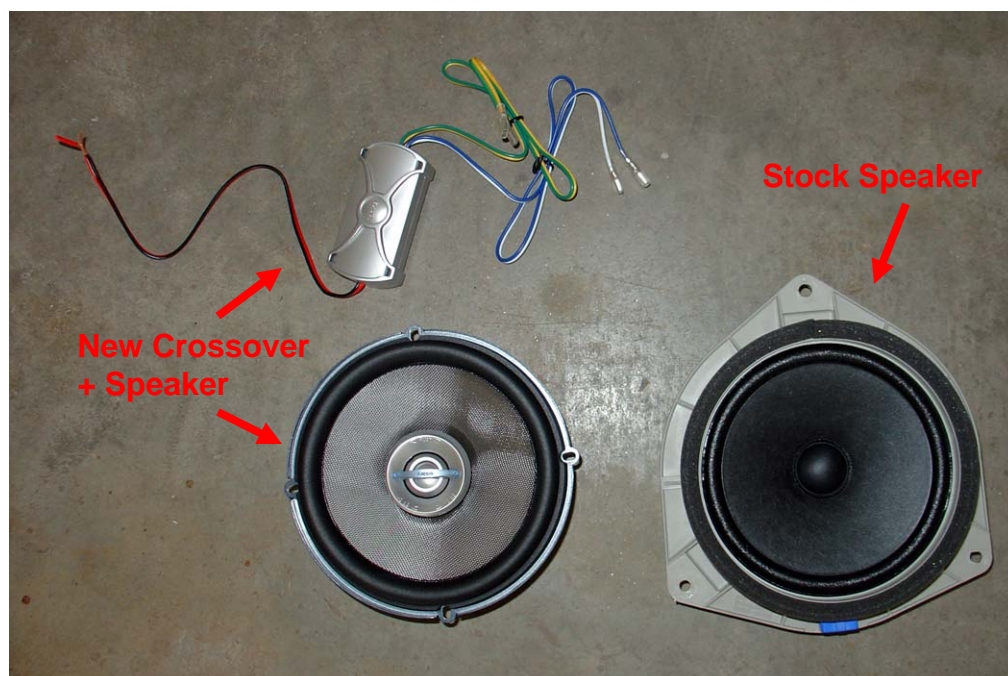
p3

by ~sparky~, 6.12.05

Infinity Kappa Series 62.7i - 6 1/2" Loudspeakers



<http://www.infinitysystems.com/caraudio/product.aspx?ProdId='KAPPA62.7I'&Ser=KAP&Cat=MEL>



2005 Toyota Prius – Rear Door Speaker Replacement Guide

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by ~sparky~, 6.12.05

Step 1: Remove door hardware - two screws, plastic piece + armrest panel



Remove screw #1 in arm rest panel.



Remove small plastic cover panel and screw #2 in door pull.



Remove arm rest panel – up gently on forward edge – it snaps out very easily,



Disconnect automatic window switch.

2005 Toyota Prius – Rear Door Speaker Replacement Guide

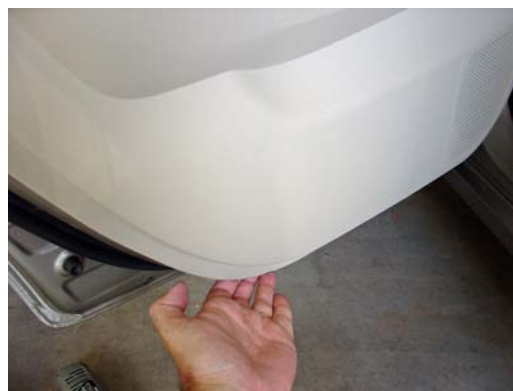
by ~sparky~, 6.12.05

p5

Step 2: Remove door panel



Unsnap door panel – pull gently around the edges to unsnap the fittings.



Continue unsnapping panel around the bottom and up the sides; when fully unsnapped, lift panel up – be careful to not scratch windows (especially if you have tint).



Photo of door with panel removed. I had a few *stubborn* white clips stay in the door – remove them from the door by pushing from the inside out – and re-attach them to the door panel.



Photo of stock speaker to be removed.



2005 Toyota Prius – Rear Door Speaker Replacement Guide

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by ~sparky~, 6.12.05

Step 3: Remove stock speaker and install new mounting bracket



Unclip the connection at the top of the speaker.



Using a 1/8" bit, drill out the rivets – this requires a little elbow grease – don't be gentle. Retrieve any loose parts that fall into the door (so they don't rattle around later as you drive around).



Remove the speaker – amazing how small the magnet is on the back is, and how light the entire speakers is – *no wonder it sounded like that !*



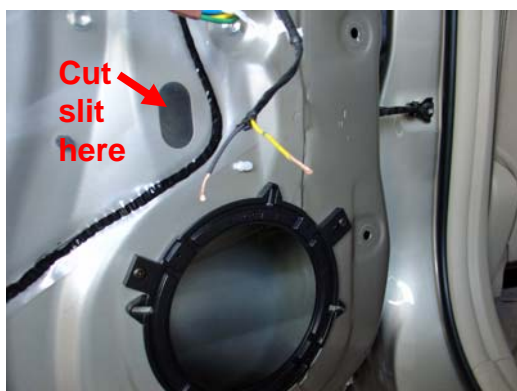
Attach the new plastic speaker mounting bracket provided (pictured above) – use two of the existing holes you just drilled the rivets out of, and drill one new one. Attach with three new screws and clips in the back (as provided).

2005 Toyota Prius – Rear Door Speaker Replacement Guide

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by ~sparky~, 6.12.05

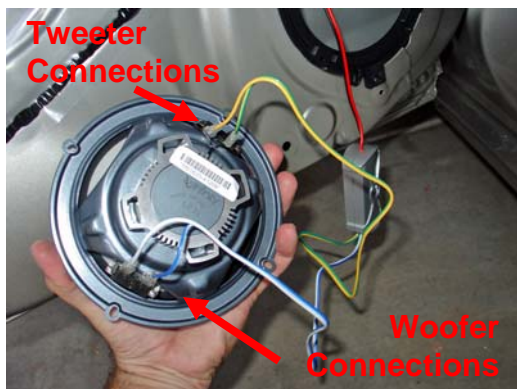
Step 4: Wire and install new speaker



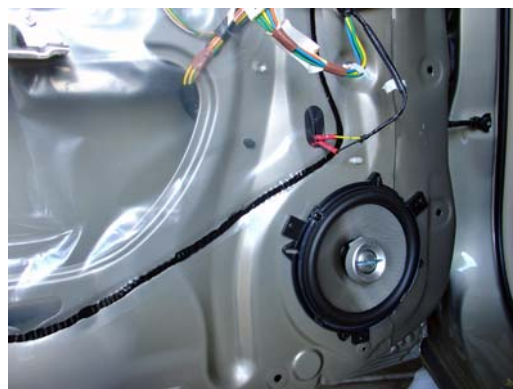
Cut the stock connection from the end of the speaker wire you just unclipped and strip the wires; cut a small slit in the plastic seal to run the connections so you can connect to the back of the speaker (make sure to seal this up later !)



Connect wires (make sure to confirm +/- polarity) – my connections as shown were to a crossover. The car's black is + and yellow is -, connected to my crossover's red + and black – *(always interesting not connecting black to black...)*



Connect crossover wiring to the new speaker – this one has two connections for the tweeter (yellow and green) and two for the woofer (white and blue). Make sure to confirm +/- polarity.



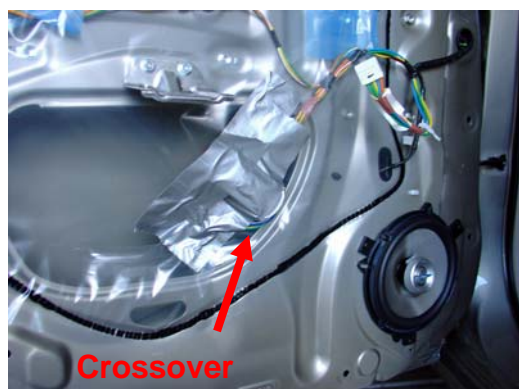
Attach the speaker to the mounting bracket using the four screws as provided. Be careful – this is the closest you will come to the delicate neoprene of the speaker cone with a sharp object !

2005 Toyota Prius – Rear Door Speaker Replacement Guide

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by ~sparky~, 6.12.05

Step 5: Seal up door panel and finish



Cut a small slit to bring the crossover back thru to the front of the plastic. Tape the crossover to the plastic using duct tape. Use the same duct tape to re-seal the door.



Attach the door panel to the door – press gently at the points where the white clips fit back into the door. They should snap easily into place.



Finished product !

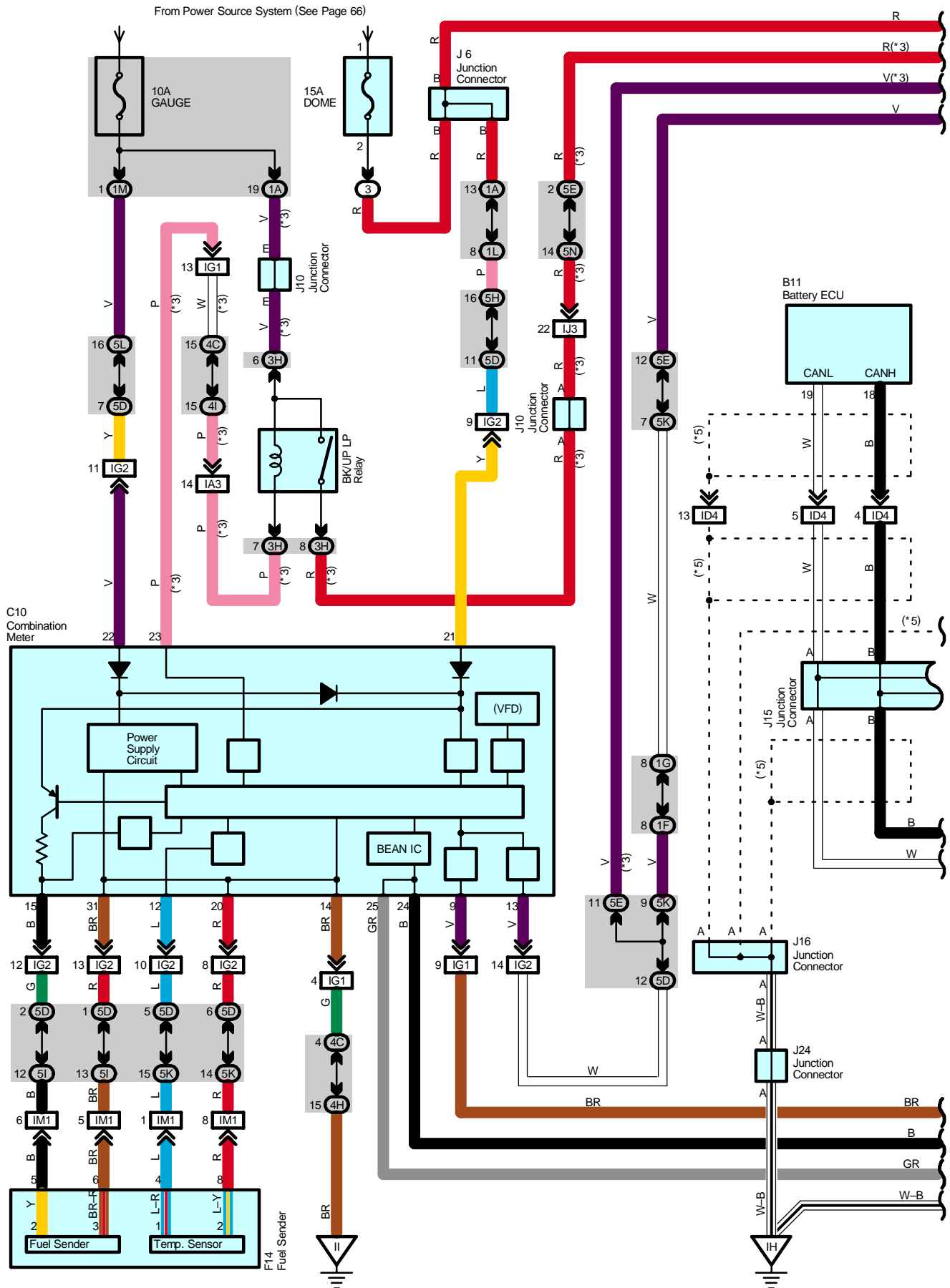
These speakers sound fantastic. I was very surprised by both the simplicity of the job and the difference in sound quality.

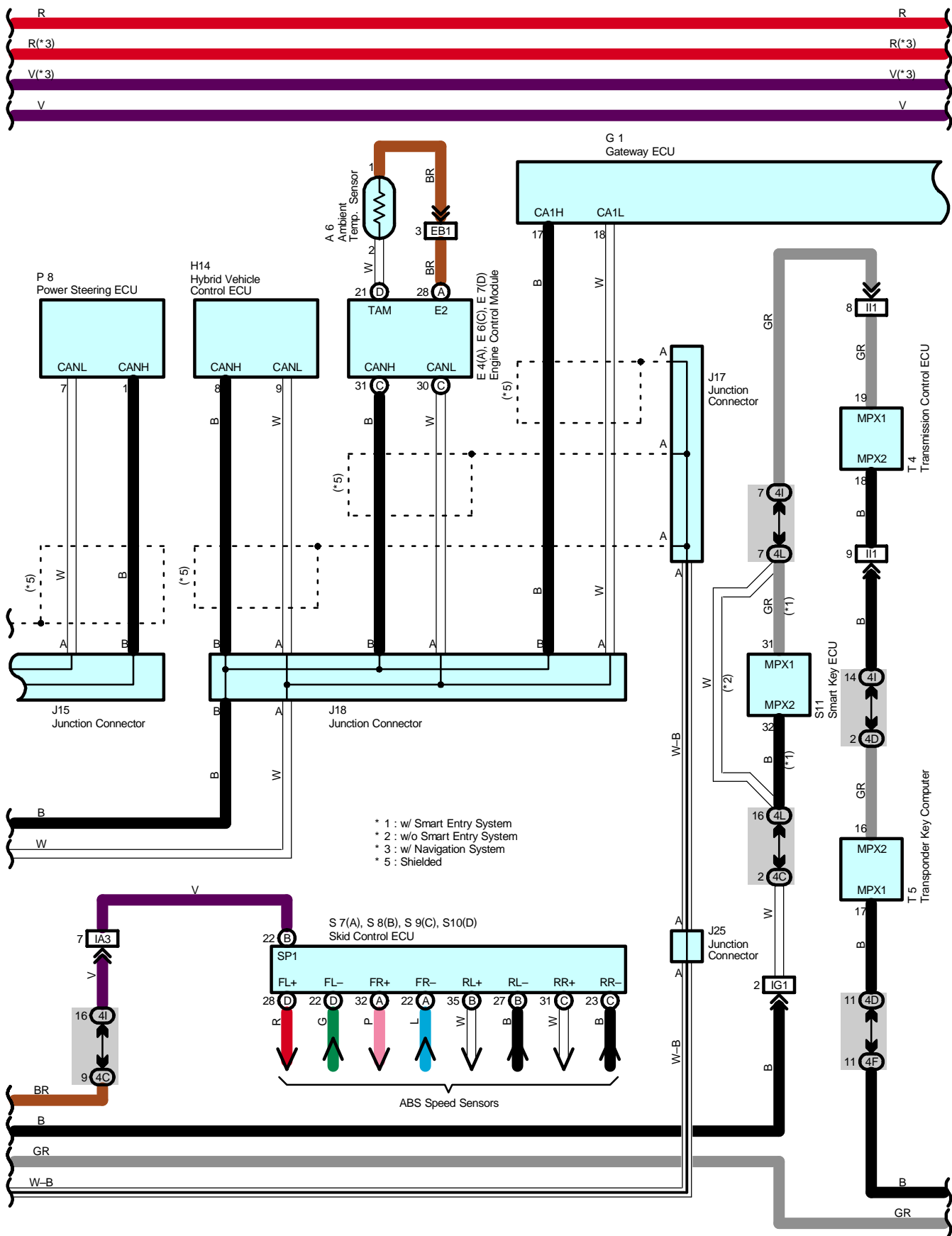
What's next? I plan to install a Kenwood KSC-SW1 mini-subwoofer (definite) and an Alpine MRP-F240 4-channel amplifier (likely) in the 'hidden' cargo compartment. The amp can push the speakers at 50W RMS x4 at 2 ohms and has a separate pre-out for the sub - perfect for my situation.

If anyone has questions, PM me on the <http://www.priuschat.com> website – my username is ~sparky~. Good luck !

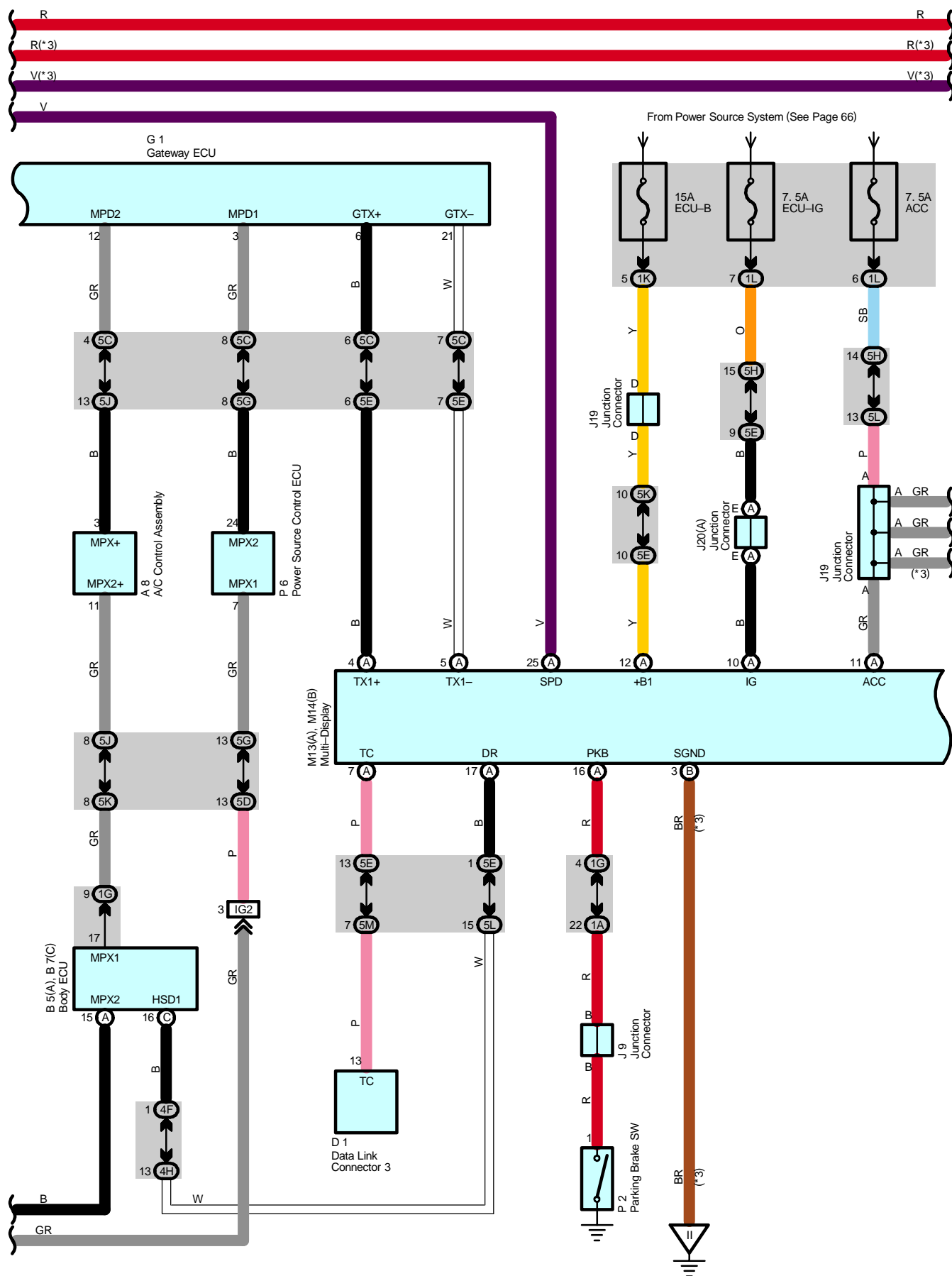


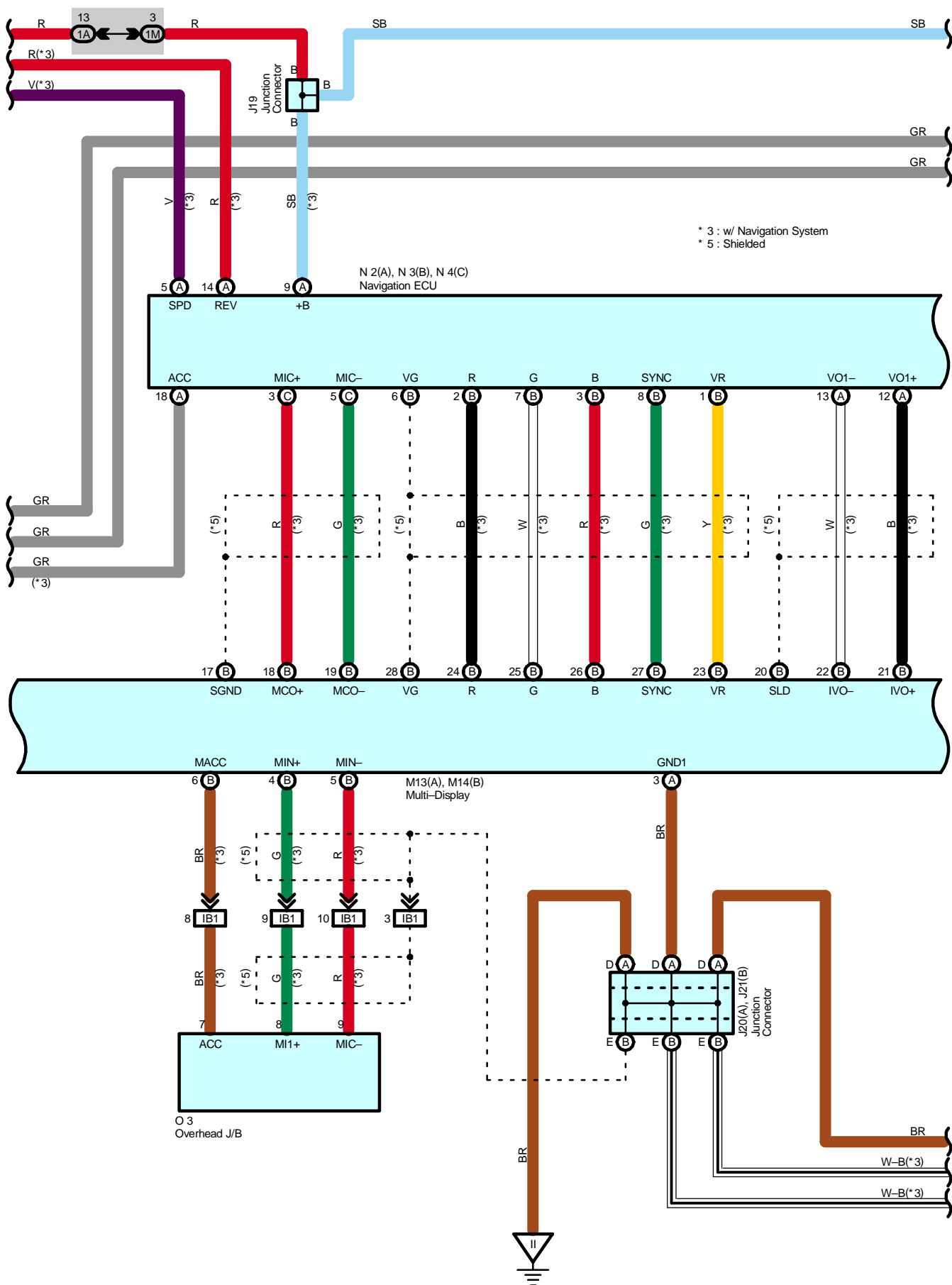
Multi-Display and Audio System with Separate Amplifier



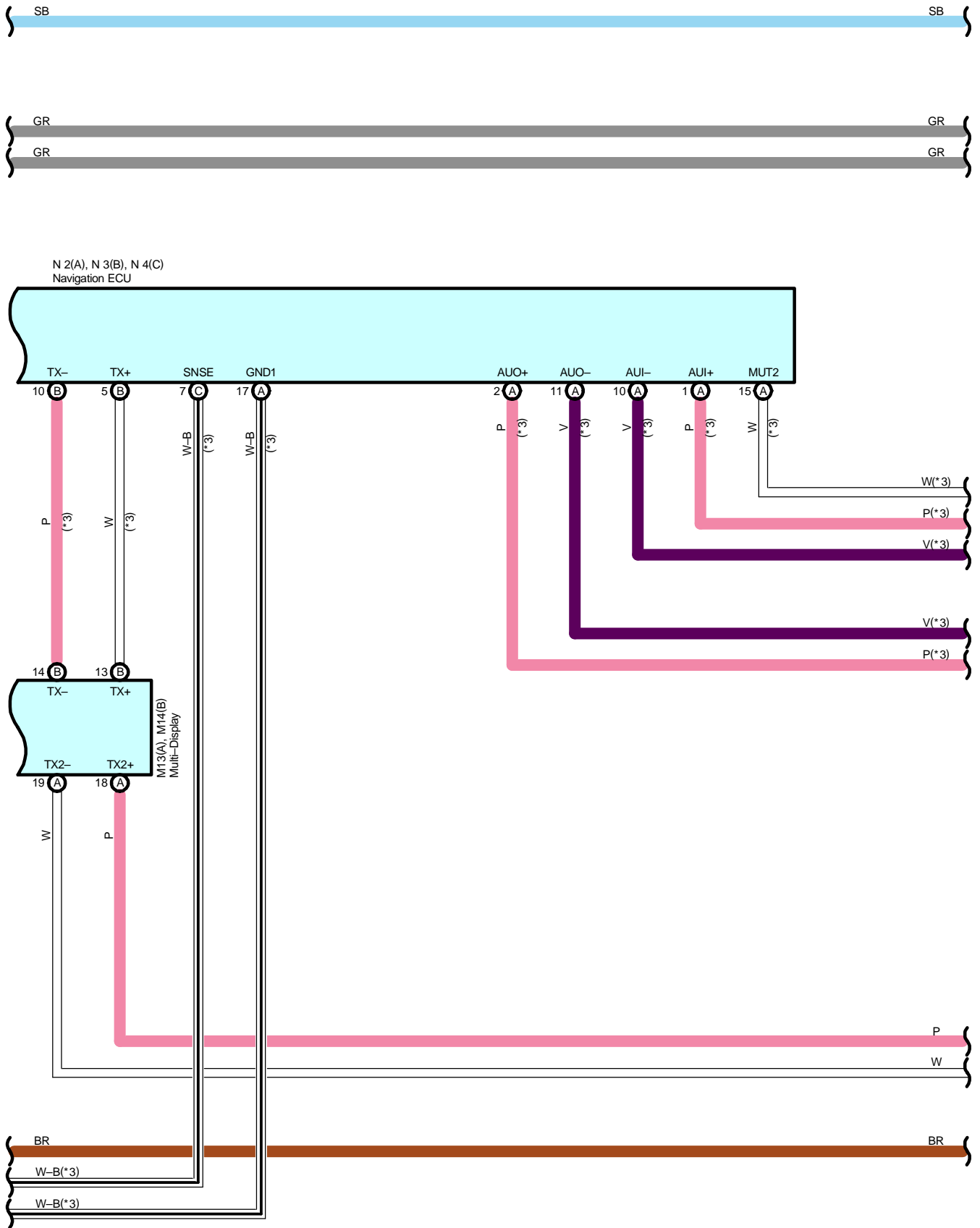


Multi-Display and Audio System with Separate Amplifier

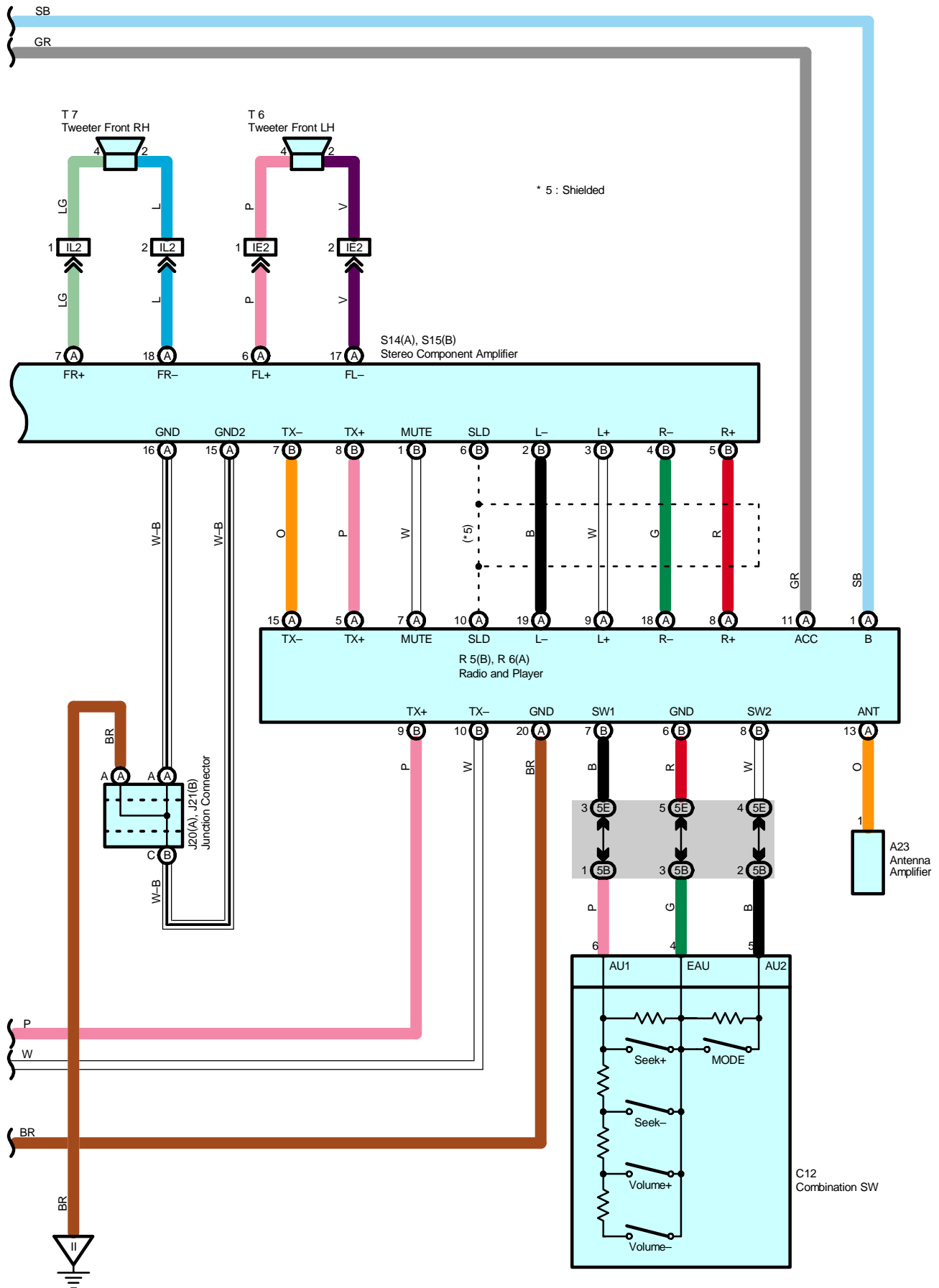




Multi-Display and Audio System with Separate Amplifier



Multi-Display and Audio System with Separate Amplifier



Service Hints

R6 (A) Radio and Player

(A)11–Ground : Approx. 12 volts with the power SW at ACC ON or IG ON position

(A) 1–Ground : Always approx. 12 volts

(A)20–Ground : Always continuity

S14 (A), S15 (B) Stereo Component Amplifier

(B)12–Ground : Approx. 12 volts with the power SW at ACC ON or IG ON position

(A) 1, (A) 10–Ground : Always approx. 12 volts

(A)15, (A) 16–Ground: Always continuity

N2 (A), N4 (C) Navigation ECU

(A)18–Ground : Approx. 12 volts with the power SW at ACC ON or IG ON position

(A) 9–Ground : Always approx. 12 volts

(A) 17, (C) 7–Ground : Always continuity

M13 (A), M14 (B) Multi–Display

(A)12–Ground : Always approx. 12 volts

(A)10–Ground : Approx. 12 volts with the power SW at IG ON position

(A)11–Ground : Approx. 12 volts with the power SW at ACC ON or IG ON position

(A) 3, (B) 3–Ground : Always continuity

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page
A6	44	J9	48	P8	49
A8	46	J10	48	R5	B 49
A23	46	J15	48	R6	A 49
B5	A 46	J16	48	R11	52
B7	C 46	J17	48	R12	52
B11	50	J18	48	S7	A 49
C8	47	J19	48	S8	B 49
C10	47	J20	A 48	S9	C 49
C12	47	J21	B 48	S10	D 49
D1	47	J24	48	S11	49
E4	A 47	J25	48	S14	A 49
E6	C 47	M13	A 48	S15	B 49
E7	D 47	M14	B 48	T4	49
F12	51	N2	A 48	T5	49
F13	51	N3	B 48	T6	53
F14	51	N4	C 48	T7	53
G1	47	O3	52	T8	53
H14	47	P2	49	T9	53
J6	48	P6	49		

○ : Relay Blocks

Code	See Page	Relay Blocks (Relay Block Location)
3	22	Engine Room R/B (Engine Compartment Left)

Multi-Display and Audio System with Separate Amplifier



: Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
1A	28	Engine Room Main Wire and Driver Side J/B (Lower Finish Panel)
1F	28	Instrument Panel Wire and Driver Side J/B (Lower Finish Panel)
1G		
1K		
1L		
1M		
3H	22	Engine Room Main Wire and Engine Room J/B (Engine Compartment Left)
4C	36	Instrument Panel Wire and Center Connector No.1 (Behind the Combination Meter)
4D		
4F		
4H		
4I		
4L		
5B	40	Instrument Panel Wire and Center Connector No.2 (Instrument Panel Brace RH)
5C		
5D		
5E		
5G		
5H		
5I		
5J		
5K		
5L		
5M		
5N		



: Connector Joining Wire Harness and Wire Harness

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
EB1	54	Engine Wire and Engine Room Main Wire (Inside of the Engine Room R/B)
IA1	56	Engine Room Main Wire and Instrument Panel Wire (Upper Parts of Front Body Pillar LH)
IA3		
IB1	56	Roof Wire and Instrument Panel Wire (Upper Parts of Front Body Pillar LH)
ID4	56	Instrument Panel Wire and Floor Wire (Left Kick Panel)
IE2	56	Front Door LH Wire and Instrument Panel Wire (Left Kick Panel)
IG1	58	Instrument Panel Wire and Instrument Panel No.2 Wire (Behind the Combination Meter)
IG2		
II1	58	Engine Wire and Instrument Panel Wire (Behind the Glove Box)
IJ3	58	Engine Room Main Wire and Instrument Panel Wire (Behind the Glove Box)
IL2	58	Front Door RH Wire and Instrument Panel Wire (Right Kick Panel)
IM1	58	Instrument Panel Wire and Floor No.2 Wire (Right Kick Panel)
IM2		
BB1	60	Rear Door No.2 Wire and Floor Wire (Left Center Pillar)
BJ1	62	Rear Door No.1 Wire and Floor No.2 Wire (Right Center Pillar)



: Ground Points

Code	See Page	Ground Points Location
IH	56	Cowl Side Panel LH
II	56	Instrument Panel Brace LH

Toyota Prius FAQ - Stereo

[Why does the owner's manual say my stereo has DSP \(Digital Signal Processing\) and ASL \(Auto Sound Levelizer\)?](#)

[Does the CD player play MP3 CDs?](#)

[What are the 6 speakers in the base stereo?](#)

[What are the 9 speakers in the JBL stereo?](#)

Why does the owner's manual say my stereo has DSP (Digital Signal Processing) and ASL (Automatic Sound Levelizer)?

DSP/ASL are not included in the base stereo or the premium stereo for 2004-5. DSP is not included in the 2006, but ASL is. The Owner's Manual is incorrect.

[Return to top](#)

Does the CD player play MP3 CDs?

No, only CD Audio for 2004-5. It does support CD-Text, though, so you will get titles on supported discs (including ones you burn yourself if titles are added via Nero or other CD-Text capable burning software). 2006 supports MP3 CDs, but not playlists, and plays the songs in alphanumeric order, so you should probably rename the songs in the directories with 01-, 02-, etc at the beginning of the song names to get them in the original album order.

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What are the 6 speakers in the base stereo?

They are:

1. Front driver's tweeter (top front corner of front door) - 3.8 cm (1.5") 4ohm
2. Front driver's full range (bottom front corner of front door) - 16 cm (6.3") 4ohm
3. Front passenger tweeter (top front corner of front door) - 3.8 cm (1.5") 4ohm
4. Front passenger full range (bottom front corner of front door) - 16 cm (6.3") 4ohm
5. Rear driver's fullrange (bottom front corner of rear door) - 16 cm (6.3") 4ohm
6. Rear passenger fullrange (bottom front corner of rear door) - 16 cm (6.3") 4ohm

See [pic](#)

[Return to top](#)

What are the 9 speakers in the JBL stereo?

They are:

1. Front driver's tweeter (top front corner of front door) - 2.0 cm (0.8") 6ohm
2. Front driver's full range (bottom front corner of front door) - 16 cm (6.3") 2ohm
3. Front passenger tweeter (top front corner of front door) - 2.0 cm (0.8") 6ohm
4. Front passenger full range (bottom front corner of front door) - 16 cm (6.3") 2ohm
5. Rear driver's tweeter (top front corner of rear door) - 2.0 cm (0.8") 6ohm
6. Rear driver's full range (bottom front corner of rear door) - 16 cm (6.3") 3ohm
7. Rear passenger tweeter (bottom front corner of rear door) - 2.0 cm (0.8") 6ohm
8. Rear passenger full range (bottom front corner of rear door) - 16 cm (6.3") 3ohm
9. Center dash (above screen) midrange (center channel, ***not*** subwoofer) - 6.5 cm (2.6") 2ohm

See [pic](#)

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VFAQ Prius, [VFAQ.NET](#)

[talonts](#)