



Car Acoustics

By: Mallory Frantz, Stephanie Byers, and Jeremy Wiley

+ Acoustics



- Acoustics is the quality that determines the ability of an enclosure to reflect sound waves effectively and produce clear hearing.

+ Factors Involved In Car Acoustics

- **Road Noise**- other cars, wind, ext.
- **Vibrations**- rattling of the cars body
- **Electrical interference**
- **Size/Shape of Cabin**- dead space and echoes
- **Materials**- interior and exterior

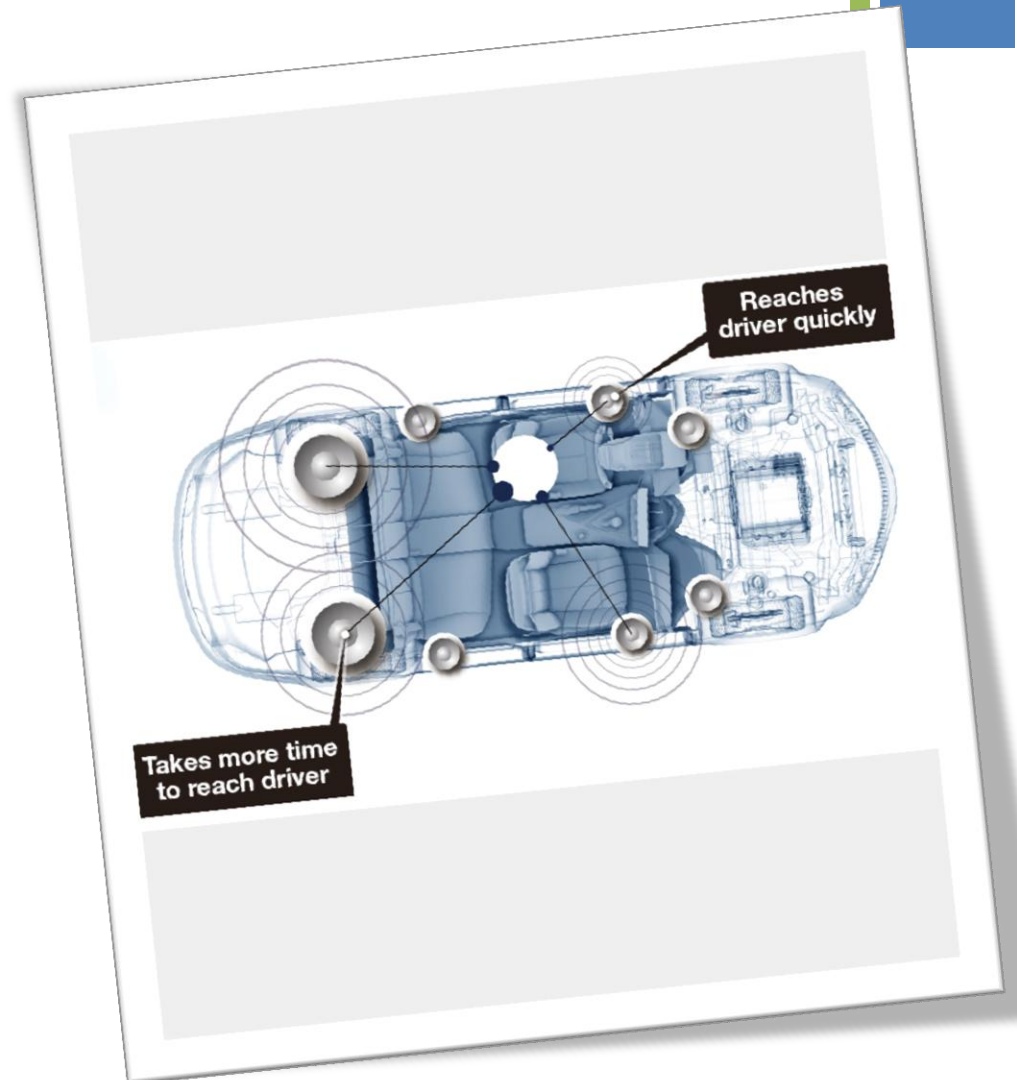
+ Factors To Improve Your Car's Acoustics

- Elimination of environmental noise- the road is noisy with wind, tires, and other cars on the road. To eliminate the background noise:
 - Buy new tires
 - Tune the engine
 - Replace the muffler
 - Tighten loose bolts and hinges for less rattle
 - Specifically position the speaker



+ Speaker Positioning

- Equidistant and unobstructed from the listener
- Achieving time alignment—you want sound to arrive simultaneously to the ear.
- Mount the speakers in the upper portion of the doors or bottom of the doors with correct angle
- Rear speakers should be aimed at the listener, not the glass
- Use a UTP (unshielded twisted pair cable) to separate the electrical wires and speaker wires.



+ Worst Cars for Acoustics:



Soft Top Cars:

- Softer materials absorb the sound and the bass will not be able to effectively reflect. (Like Chapter 15)
- The seat material plays into the absorption of sound as well.

Convertibles:

- The convertible is similar to an outdoor auditorium, as the top will allow the noise to escape without reverberation.

Cab Trucks:

- The cab truck has limited space so the subwoofers lay directly behind you.

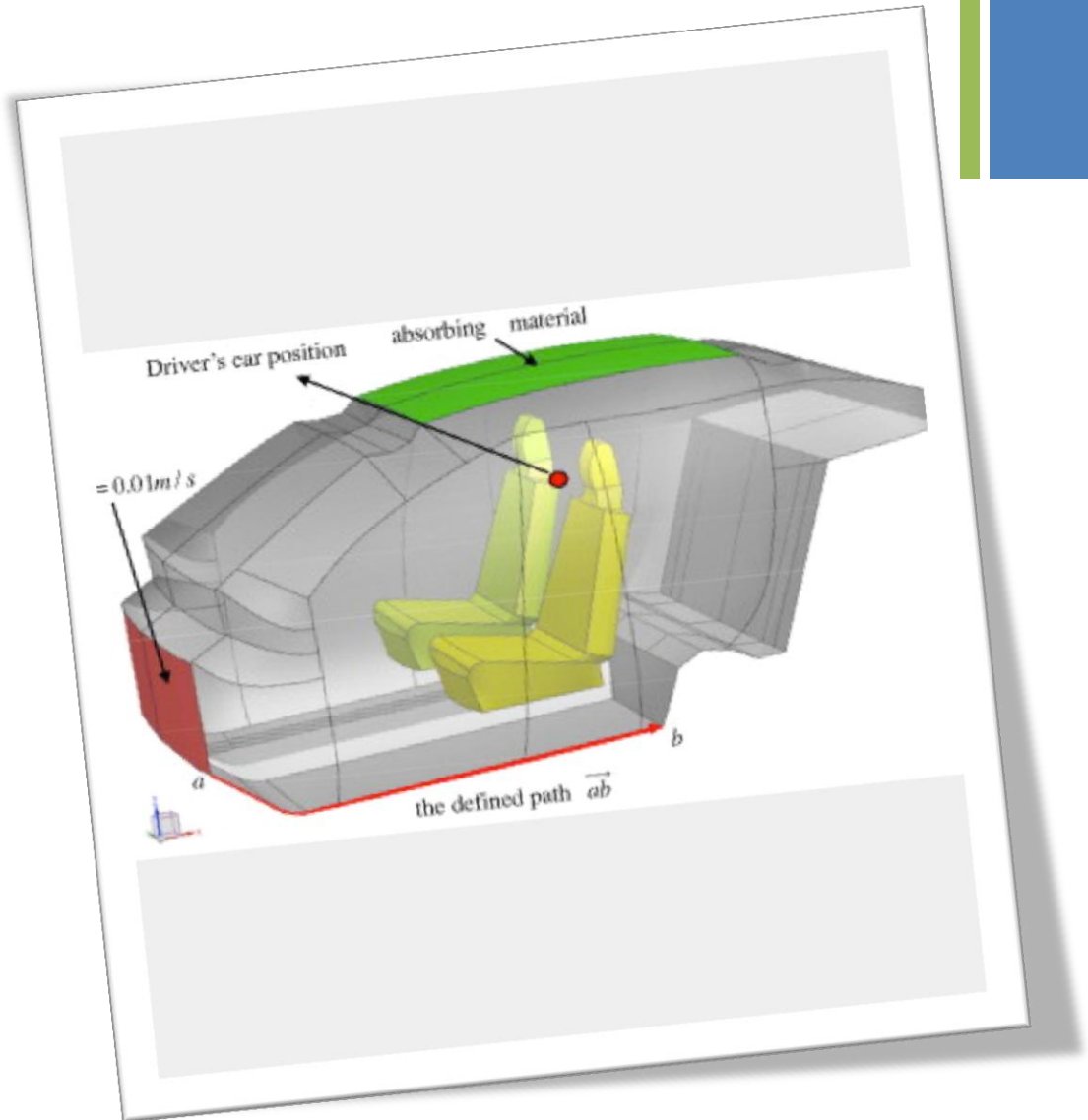
Car Configurations:

- Cars with the stereo located in the back makes it difficult to hear.
- Cars with the gas tank directly behind the rear seat poses problems for it makes it difficult to run wires through those types of cars.
- Old cars with large trunks and solid backseats pose difficulties since it is hard to get the sound to travel through the thick seats.

-

+ Best Type of Car for Acoustics:

- Hatchback type and SUV's:





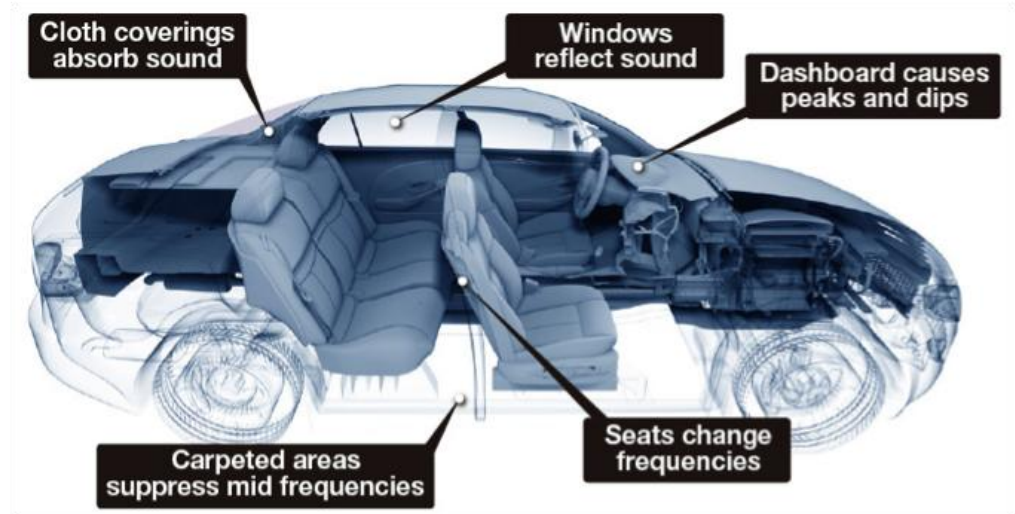
Products Used to Better Your Car's Acoustics:



- **“Slim” Subs**- these subs are $\frac{1}{2}$ the mounting depth, which makes it easy to apply to cars with limited space.
- **“Acoustic Interlayer”**- this layer goes behind some of the newer windshields. Noise is transmitted through the vehicle's glass in four main ways:
 - Air-pressure differences can be heard against the glass at highway speeds.
 - Air hitting the edges of the vehicle's body
 - Outside traffic and environmental noise
 - Vibration of the car
- Thickening the glass provides some noise reduction and adds weight to the vehicle for less rattle. The interlayer dampens unwanted sound and is particularly efficient in the 1,500 Hz to 5,000 Hz range. It can reduce the sound by 2-3dBs overall.
- <http://youtu.be/-XpO3xWCwt8>

+ Products Continued...

- **Imprint Sound Processors:** This new sound technology mends acoustic problems in the car's cabin. It measures your car's acoustics, processes the sound, and then delivers the optimal sound based on your car's measurements
- <http://youtu.be/gqdx81-cU9s>



+ Products Continued...

- **“Hush up”**- this product is applied to floors, doors, or whole interiors to dampen vibrations, squeaks rattles and road noise.
 - <http://youtu.be/I5E9mjI3y1E>
- **“Hardtop Acoustic Sound Deadener”**- reduces the noise inside your hardtop with a custom designed install.



+ Our Experiment...

- Driving at 70 mph with windows up and air conditioner the sound was 99.7db
- Driving with the windows half down at 70mph it was 115db
- Driving with the windows fully down at 70mph 135.2 db.
- Driving at 30mph it was essentially the same.





■ The End