SELECT PRODUCTS

PROCON™

PROfessional **CON**trol Sound Damping by ***Select Products***

What is "Sound Damping"?

Sound damping is a generic term used in car audio to describe various kinds of noise and/or vibration control. These control methods break down into basically four distinct areas:

1. Blocking the noise by way of a barrier.
2. Absorbing the noise by way of an acoustical material.
3. Damping the noise by way of "mass loading".
4. Isolating a noise source by way of mechanical or material de-couplers.

Traditionally, sound damping in the car audio industry is comprised of a combination of one or more of the first three techniques/materials, with some using a material de-coupler to enhance the performance of another material. Although it can be highly effective, mechanical isolation is rarely used in car audio.

Properly installed sound damping/noise control materials can have a dramatic effect on many different aspects of your automotive environment. These include:

⇒ Greatly reduced in-cabin road noise
⇒ Vastly decreased long-distance driver fatigue
⇒ Greater dynamic range of your audio system
⇒ Improved bass definition and response
⇒ Clearer vocals and tighter audio response characteristics

In order to maximize these performance goals from your sound damping efforts, it is best to know how these *blocking, absorbing and damping* materials function and how best to combine them to fully realize their potential.

MATERIAL PROPERTIES:

- Barrier materials can be simply thought of as walls, which obstruct or block the passage of sound. Barrier materials can be metals (aluminum, lead, steel), rubber or loaded vinyl. The ability of a material or item to block sound is based on the materials transmission loss* (TL). (*Transmission Loss (TL) - The reduction in magnitude of sound between two locations) The density of any one material is the greatest contributor to determining its transmission loss. The more dense the material, the greater the transmission loss (in dB). Some typical materials are listed in Fig. 1.

	FREQUENCY						
	125	250	500	1000	2000	4000	8000
MATERIAL	Transmission Loss (in dB)						
LEAD							
1/32" or 2lb./sq.ft.	22	24	29	33	40	43	49
Barrier #3 (uses 1/64" or 1lb./sq.ft. lead barrier)	19	20	24	28	33	40	43
LOADED VINYL							
Mass Load w/Aluminum (uses 1/2lb./sq.ft. loaded vinyl)	12	13	16	20	26	32	37
Barrier #2 (uses 1lb./sq.ft. loaded vinyl)	15	17	21	28	34	38	43
ALUMINUM							
Mass Load w/Aluminum (uses 1/2lb./sq.ft. alum sheet)							
1 lb./sq.ft. Aluminum sheet							

Fig. 1

The most common forms of blocking/barrier materials used in car audio are ½lb - 1lb loaded vinyl and thin (1/32" to 1/64") lead layers imbedded within other materials. These materials work well because of their ability to block sound from penetrating thru them. They also have a very low resonant point thereby allowing minimal transference of low frequency acoustical energy. Loaded vinyl has the benefits of being a very lightweight acoustic barrier material, is relatively inexpensive and is easy to cut and form. Lead layering is a highly effective acoustic barrier. It has an extremely low resonant frequency, is relatively inexpensive, highly pliable and is easy to cut and form.

- Acoustical absorbers are materials that convert acoustical wave energy into heat energy. This occurs because the acoustic "wave" has to work its way thru the material, losing its energy by way of friction, which is converted into low level heat. Acoustic absorbers are usually rated by their noise reduction coefficient (NRC) value. NRC is a rating given to a material which relates to its ability to absorb noise. It is calculated from the averaged sound absorption rating for frequencies between 250Hz and 2000Hz. Due to the varying lengths of sound waves, the thicker the material, the higher the NRC.

MATERIAL	**FREQUENCY**					
	125	250	500	1000	2000	4000
POLYURETHANE FOAM (Open Cell)	Sound Absorption Coefficient					
Mass Load w/Pro Foam and **Barrier #3** - 1/4" thick	0.10	0.12	0.20	0.28	0.50	0.80
Hood Liner - 1/2" thick	0.15	0.22	0.44	0.84	0.84	0.84
1" thick	0.20	0.42	0.90	0.92	0.80	0.84
2" thick	0.28	0.62	0.94	0.92	0.80	0.78

Fig. 2

Acoustically absorptive materials used in car production include velour and carpeting. Other acoustic absorbers are materials such as acoustic foam and fiberglass batting. Acoustic foam is highly desirable because it is specifically engineered to absorb sound waves within the range of human hearing. It is highly effective at absorbing unwanted reflected mid-range frequencies. It can be effectively used in tweeter locations to prevent extreme harshness caused by hard surface reflections.

NOTE: It is very important to realize that transmission loss barriers such as loaded vinyl/lead liners and sound absorbers such as acoustic foams/fiberglass batting are **NOT** interchangeable. Transmission loss barriers have very little sound absorption qualities and sound absorption materials have practically no transmission loss qualities. In order to maximize your efforts at "damping" your vehicle, a combination of these two techniques/materials **is necessary**.

- Mass loading is used to reduce both the *structural resonance* and the *impact noise* of a material/surface.

  Structural resonance (noise) is the adding and/or prolonging of sound energy by the reflection or vibration of objects. Damping reduces this structural resonance by increasing the "mass" of the object, thereby lowering its naturally occurring resonant frequency.

  Impact noise is the "ringing or reverberation" that occurs when an object is struck in some fashion. Damping does not absorb impact noise; rather it reduces the "ringing" that occurs after being struck in both time and magnitude.

A high quality mass loading material is engineered to absorb the vibration motion of a damped object and convert this into thermal energy. This will provide both structural resonance and impact noise deterrence into one product.

The best damping materials for the car audio environment are those that are NOT water soluble, are highly pliable for ease of installation, are water/chemical/temperature/solvent resistive and which use a wide-temperature pressure sensitive adhesive (PSA) backing. In order for a damping material to work best, it must maintain a solid bond to the material being damped.

- De-couplers are materials and/or mechanical devices that isolate one object from another such as the body mounts/motor mounts or the shock absorbers in a car. These devices separate objects from each other using some type of reactive/absorptive material/part.

PROCON PROfessional **CON**trol **Sound Damping Products:**

Select Products has developed a series of highly effective damping materials aptly named **PROCON**™ for **PRO**fessional **CON**trol. These products have been specifically engineered to provide you with everything from the basic mass loading materials to the most sophisticated multi-layer, multi-material products available for the car audio environment. Each has been specifically chosen for its advanced ability to *block, absorb and/or damp* your vehicle at the highest possible levels. All have been engineered for:

- Maximum performance
- High flexibility/pliability
- Ultra-high adhesion factor
- Cost effectiveness

PROCON "Mass Load" Series

- **Mass Load**
  This is a .035" thick, high-grade extensional damping material. It is chemical and water resistant, is highly pliable and uses a high-grade pressure sensitive adhesive (PSA) backing. It has a 30% stretch ratio and easily conforms to most surfaces.

- **Mass Load - S** ***NEW!!***
  This startling new product is the latest technology. It is a .035" thick, high-grade Ethylene Copolymer damping material and uses the same high-grade pressure sensitive adhesive (PSA) backing as the regular "Mass Load". What makes this product so incredible is that this material is able to be S T R E T C H E D (hence the S) in all directions and up to 100% **without heat,** making it the most easily applied/most pliable damping sheet material in the industry!

Mass Load (and Mass Load-S) can be used on virtually every internal wall surface of a car. Both are highly effective damping materials that provide a great starting point for complete noise control. Doors, trunk and hatch areas, floors, roofs, firewalls and even internal trim panels will benefit from the application of these products. There is virtually NO surface on your vehicle that these products won't help. The most common installation areas are the door surfaces, internal panels and the floor area.

PROCON “Mass Load Pro” Series

- **Mass Load w/Pro Foam**

  This is the same .035” thick, high grade extensional damping pad and pressure sensitive adhesive (PSA) backing used in the “Mass Load” product but adds a ¼” embossed ester foam acoustic absorber that is bonded to the top surface of the damping pad. This foam acoustic absorber is specially formulated to absorb the critical mid and upper-mid frequencies that can cause “smearing or blurring” of the sonic image. These two materials make for a very highly effective damping/absorbing combination. It has an overall thickness of .35”, making it very easy to install.

- **Mass Load Pro w/Aluminum**

  This is a 1/2lb/sqft loaded vinyl barrier layer with a 5mil aluminum foil facing. One of the most common ways to apply an effective barrier to an automobile is to use a layer of aluminum or lead to the vehicles internal surfaces. This combination of the loaded vinyl and the aluminum barrier layer effectively doubles the TL of either material, making for a very high performance acoustical barrier. It uses a high-grade pressure sensitive adhesive (PSA) backing for adhesion and has a overall thickness of .055” nominal.

PROCON “Hood Liner”

PROCON Hood Liner is specially engineered to provide maximum sound absorption with a minimal of space intrusion. The ½ acoustical foam used in this product is designed to maximize the absorption of the frequencies generally associated with engine noise, while the metalized polyester film facing helps protect the acoustical foam and control thermal heat transfer by reflecting the thermal energy back before it saturates the protected surface. It uses a supported rubber based PSA backing for maximum adhesion strength under the extreme chemical and temperature conditions of an engine compartment.

PROCON “ Pro Barrier” Series

Barrier #2

This high performance acoustic barrier product combines a very dense 1lb/sqft loaded vinyl barrier with a ¼” open cell foam de-coupler/absorber bonded to it. This foam is designed to be both an acoustical absorber and a material de-coupler to increase the overall transmission loss (TL) performance by separating or ”de-coupling” the loaded vinyl barrier material from the transmitting surface. This allows for the maximum barrier performance in a very small package.

This product is especially suited for floor and trunk areas that are notorious for low frequency noise transfer.

Barrier #3 w/Lead

This is a multi-material product that combines both barrier and acoustic absorption materials into one ultra-high performance product. In order to maximize the TL characteristic of a lead barrier layer, it is best to use a de-coupling material between this barrier and the car surface. One of the best de-coupling materials for this application is 1/8” closed cell foam. This material is electrically/chemically and acoustically inert, highly

pliable and extremely wear resistant. That is why the base of this product uses this de-coupler. It is specially formed to support and maximize the performance of the 1lb/sqft lead barrier material. Above this lead barrier layer rests a ¼" ester type embossed acoustical foam, engineered to absorb the widest range of frequencies possible.

This is the highest quality noise barrier, sound absorption product available in car audio today.

APPLICATIONS:

Doors, Interior Panels:

LEVEL 1 - The basic material to use here is Mass Load (or Mass Load-S). This application will give you a well damped, vibration free area for mounting speakers. It is critical to damp both the internal and external portions of the door in order to minimize both structural and impact noise. If you choose to damp only one of these panels, we recommend you damp the door skin and when possible, the internal panel.

LEVEL 2 - For increased damping performance with the added advantage of a ***noise barrier***, we recommend you use Mass Load Pro w/Aluminum. This product combines a ½ lb./sq.ft. loaded vinyl barrier layer base with a 5mil thick aluminum facing. This combination of loaded vinyl mass loading material and an aluminum barrier creates an amazingly high transmission loss (TL) product along with amazing damping results.

- or -

For increased damping performance with the added advantage of an ***acoustic absorber***, we recommend you use Mass Load w/Pro Foam. This product combines the damping properties of Mass Load with the addition of a ¼" ester type acoustic foam. This foam layer is an exceptionally high performance sound absorber, reducing the backwave resonance peaks that commonly occur because of the door metal outer skin reflecting the sound wave back onto the doors inner panel. The resulting damping/absorption combination can significantly increase the performance of all door-mounted speakers.

LEVEL 3 - The maximum combination of noise barrier and acoustic absorber performance can be achieved by using Barrier #3. The installation of this product will give your car the ultimate in noise reduction and acoustical sound control.

Flooring:

LEVEL 1 - Use Mass Load or Mass Load-S for basic sound damping. Concentrate your efforts on the main floor area and any transmission hump that may exist. 50% to 60% coverage will give you maximum damping. The entire floor area has a high transmission factor so be aware of this as a high noise potential area. Remember that damping is NOT the same as using a noise barrier material. For this you will need to go Level 2.

LEVEL 2 - Mass Load Pro w/Aluminum will provide you with an excellent noise barrier with the addition of the damping performance. Be aware that the aluminum is NOT as wear-resistant as other materials so use of the factory floor padding here is advised.

LEVEL 3 - Here is where really great sound barrier performance begins to shine. Use Barrier #2 material here. The foam de-coupler/absorber and the 1lb/sqft loaded vinyl combination will provide you an incredibly quiet and highly wear-resistant flooring that will provide you a good foundation for the rest of your damping project.

LEVEL 4 - For the ultimate in sound barrier, non-reflecting installations use Barrier #3. The combination of the closed cell foam de-coupled lead barrier layer and the ¼" ester type acoustic foam will give you the maximum sound damping available in car audio. This combination is extremely wear-resistant, and is engineered for the maximum noise barrier performance.

Trunk and hatch:

LEVEL 1 - Use Mass Load or Mass Load-S for basic sound damping. The coverage area should include the floors, the sidewalls, the rear deck (if applicable) and the trunk lid itself. The entire floor area should be covered, as the trunk area tends to transfer A LOT of noise to the interior of the car. Remember that damping is NOT the same as using a noise barrier material. For this you will need Mass Load Pro w/Aluminum. This product will provide you with an excellent noise barrier and great damping performance. Be aware that the aluminum is NOT as wear-resistant as other materials so use of a padding here is advised.

LEVEL 2 - Use of Barrier #2 material here will give you an amazing improvement. The foam de-coupler/absorber and the 1lb/sqft loaded vinyl combination will provide you an incredibly quiet and highly wear-resistant flooring that will provide you a quiet, well insulated area. The trunk lid will be best handled by the use of Mass Load w/Pro Foam.

LEVEL 3 - Again, the ultimate in sound barrier, non-reflecting installations will be using Barrier #3. The floor will be served best by the closed cell foam de-coupled lead barrier layer and the ¼" ester type acoustic foam. Using Barrier #3 on the trunk lid will maximize this noise barrier/acoustic absorption and give you the maximum noise control for this otherwise very noisy area in your car. Because of the wear-resistance of this product, you will get a lifetime of use.

Hood:

PROCONÔ Hood Liner is specially formulated to reduce the transfer of acoustic energy from under the hood. The ½acoustical foam is engineered to absorb the broadest range of frequencies possible. The metalized polyester film facing both protects the foam from underhood chemical damage AND helps reflect unwanted heat from the hood surface, helping to protect the painted surface.