



Vintage Triumph Register Maintenance Handbook

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Mounting Concealed Hi-Fidelity Loudspeakers in a Vintage Car Without Compromising the Vehicle's Integrity - One Approach, in the Triumph TR4

Brian Jones
brianjone5@mac.com

This article is for those of us who may wish to listen to Bizet, Coltrane, Ella, or The Rolling Stones while driving our Little British Cars through deserted roads, with an affordable, appropriate solution to installing loudspeakers that provides a sound quality that we can enjoy and appreciate, without compromising the integrity of our cars.



High Fidelity speakers, comprising 6.5" woofers and 0.5" tweeters, producing excellent sound, are mounted in direct earshot of the driver and passenger in this TR4. Can you spot them? If interested, then read on.

Scope

This document discusses one approach to mounting speakers in a small car. The car illustrated here is a 1963 Triumph TR4. No opinion is made on the choice of head unit (the source of the audio) or it's mounting. This document provides information on the solution this writer designed and used to successfully mount loudspeakers in this car. However this approach should be adaptable to other, similar vehicles.

The Challenge

The quality of sound generated in a vehicle is very often limited by the availability of speakers of appropriate size and the quality of their mounting. Small speakers, inadequately mounted, deliver poor fidelity of sound reproduction. The TR4, and similar cars of its era, provide minimal opportunities to mount speakers in a way that delivers acceptable fidelity. For those of us that care about these vehicles, damaging these cars in order to mount speakers is unforgivable, though some owners do just that. Other solutions must be sought.

I designed my speaker mounting with the following order of priorities in mind:

- To maintain the integrity of the vehicle
- To conceal the speaker installation
- To produce acceptable fidelity
- To permit easy removal from the vehicle

The Compromise of Inadequately Mounted Speakers

I struggled with small speakers mounted in various places around my car. I have tried small speakers mounted under the front foot-wells; I have tried plastic-boxed speakers on the cabin floor behind the seats, and boxed speakers on the rear shelf. Not one of these solutions was adequate to my ear. The audio signal from my inexpensive though adequate radio/cassette head unit was compromised to the point of inaudibility at all but the lowest speeds.

Speaker Mounting Solution

The obvious place for speakers is on the rear 'diff' shelf, or, for less unsightly positioning but with added audibility difficulties, on the cabin floor behind the driver and passenger seats. I have explored both options. Neither has proven successful with the speakers and 'speaker box' structures that are readily available in wood or plastic.

My TR4 came to me without the optional 'Occasional Seat Cushion' that mounts on the rear 'diff' shelf for 'occasional' passengers. I had been looking for a cushion appropriate to my car for some time. Frustrated, I had resolved to buy a re-upholstery 'skin' and to make my own seat. I did not need the seat cushion for passengers. No one that I know over the age of ten years could fit the rear seat in anything approaching comfort; no one of that age could make a reasoned decision about traveling in such a position without a seat belt. I merely wanted the seat cushion to complete the car to my own satisfaction

At the same time, I wanted an effective way to mount speakers, so that when I chose to listen to music or news or other programming, I could do so, with satisfaction, at a full range of speeds.

Pondering this, while I bought and tried several examples of modular 'boxed' speakers, and finding each remarkably inadequate, I came to design my speaker box as an upholstered rear seat cushion.

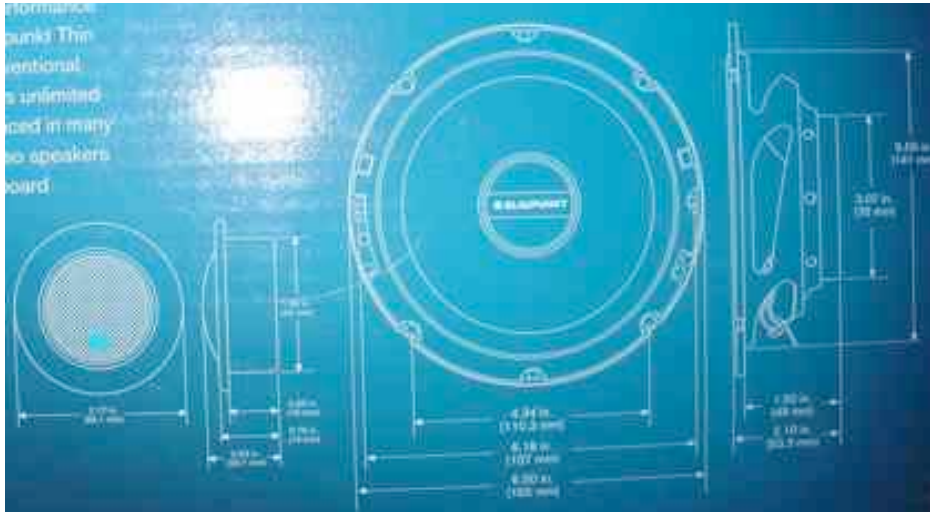
The design

Once I had established where, why and how I was to mount my loudspeakers, meeting the criteria stated above, I set about design and construction. First I acquired low profile high-fidelity speakers that would minimize the constructed height of the 'seat'. I opted for the following speakers from Blaupunkt, for \$70. I, with these, some carpentry and a venture into the world of upholstery, could then create a seat cushion look-alike that delivered the audio I sought, while maintaining the integrity of the car.

The Speakers: Blaupunkt THc660 comprises woofers are one-third thinner than conventional speakers, with a mounting depth of less than 2". The set includes woofers, crossover modules and 0.5" dome tweeters. Power handling is 180W max and 60W RMS, with a response of 60 to 23,000 Hz, with 4 Ohm system impedance. Purchase price: \$69.95. Try searching on Google or ebay for speaker + thin.



The large image that follows shows the dimensions of this set of speakers. You could certainly spend more, for Higher-fidelity speakers, but for the \$70 these speakers cost, they gave me the biggest bang for my buck, literally!



Speaker dimensions: This illustration, from the Blaupunkt packaging, shows the mounting dimensions for their THc660 speakers. They are remarkably shallow in their mounting requirements, at less than 2 inches. This minimises the 'seat' height

Constructing the Speaker Box

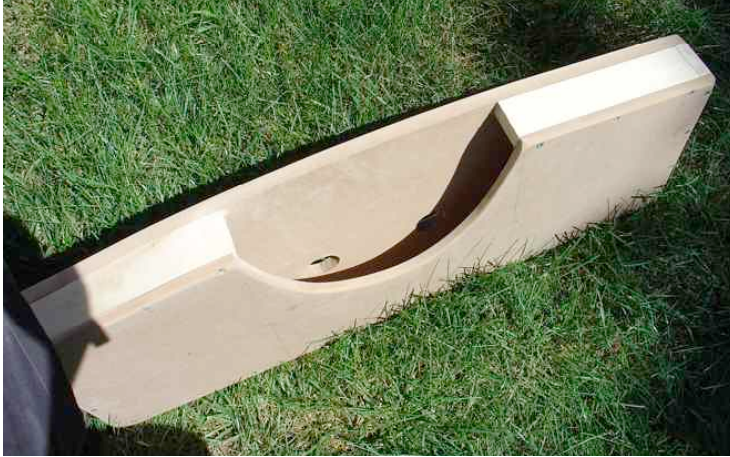
With the rear shelf seat cushion established as the location for my speakers, I set about creating the footprint for my speaker box.

The cardboard pattern provides an accurate cutout of the differential hump and the diff shelf to form a firm base for the speaker box. This is the same footprint as the 'Occasional Rear Seat' that was available as an option from Triumph.



With the footprint achieved as an accurate pattern, construction began. I used MDF (medium density fiber board) for the base and waffle board. I used Poplar for the vertical sides to the construction, as illustrated below.

To assemble the structure, I used high-quality, galvanized, countersunk, square-drive screws. I rounded all the edges of this structure to aid the addition of upholstery later on. The structure was made to be a snug fit between the rear wheel arches in this bare form. I calculated that when the upholstery was added, I would have an appropriately secure 'interference fit'.



The speaker box showing the cutout in the base for the differential hump, as defined by the cardboard pattern.

The baffle board is cut from $\frac{3}{4}$ " MDF. The sides are ripped from 4" x 1" poplar board. The base is $\frac{1}{2}$ " MDF and has the cutout for the differential hump. The baffle board is the same size as the base, but without the differential cutout. The structure is fixed together with galvanized screws with an 'outdoor' application, such as for deck construction.

While I do not anticipate anyone using the structure as a seat, I wanted to protect the speakers from luggage or parcels that I might carry on the 'seat'. The tweeters seemed adequately protected in their mountings, but I felt the woofers needed something across their opening to protect them from damage.

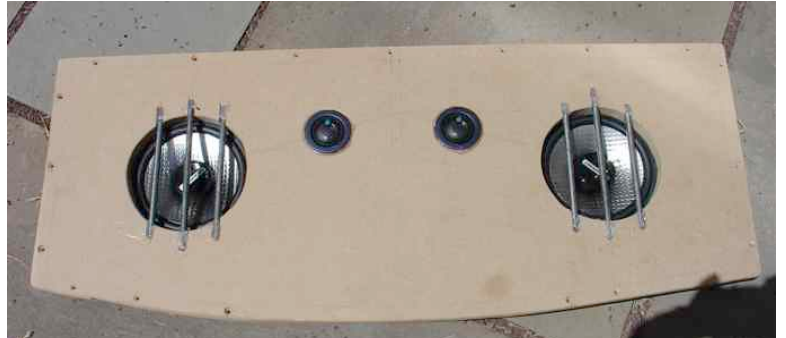
Bars of $\frac{1}{4}$ inch diameter steel rod were cut to length and then hot-glued into recesses cut into the baffle-board face. These bars will protect the speakers from physical damage



This illustration shows the solid construction of the speaker box. The baffle board averages more than a foot deep and almost three feet wide, offering a vastly superior mounting for speakers compared to any other options I could accommodate.

I mounted the woofer speakers from beneath, and the tweeter speakers from above. If wished, the cushion height (speaker box height) could be reduced by mounting the speakers from above, in routed seats in the top surface of the baffle board. This could have reduced the cushion height by 3/8". Further reduction could be achieved by using 1/4" plywood for the base instead of 1/2" MDF.

The Blaupunkt speakers mounted into the Baffle Board, seen from the top.



Here is the top lid (baffle board) seen from below, awaiting the installation of the crossover modules, which are about the size of a garage door remote.



Woofers and tweeters, shown here, installed in the baffle board of the speaker box.

With the speakers and crossovers installed in the baffle board, the next step was to assemble the baffle board into the speaker box to complete the cabinet for testing.

At this stage, connectivity for the speakers, fit to the vehicle and the general audio impression are reviewed. Temporary connections for the speakers can be seen in this image.



Making the speaker box look like a seat cushion

This was a bit of an adventure. I bought black speaker cloth and quilt padding from a fabrics store called Jo Ann Fabrics (in case that chain is near you). Quilt padding is white synthetic material that looks like cheap filter material for air conditioners. Every Wal-Mart has it. I wanted to sew together the speaker cloth with the quilting material to produce the quilted effect of auto upholstery, and in particular, my TR4. I wanted the look of a seat, but the performance of a speaker cover.

I then rescued my wife's sewing machine from storage – a machine I had never known her to use. Finding it complete with the instruction manual was very valuable. I learned how to load the two threads and try out my first attempts at upholstery on sample cuts of my two materials. I started with straight stitches, but soon learned that zigzag stitches gave the closest approximation to the welts in the upholstery I was comparing to.

I found that a clear chalk line meant I could deliver a clean, straight stitch line, and so armed, I set about my task.

I cut the speaker cloth and quilting material about 4" oversize in each direction – that is 4" beyond the upper face of the baffle board. I pinned the two cloths together and began marking the lines where I would sew the welts. The TR4 squab has welts about 1 7/8". I set my 'welts at 1 1/2" expecting considerable stretch in the cloth. I would have been better served with welts at 1 3/4".

With the cloth pinned and lined up parallel to my table edge, I used my construction square and tailor's chalk to mark my sewing lines, using the table edge to align the square to my task.



This image shows a close up of the speaker cloth I have sewn into welts to meld with the cars interior upholstery. The bright sunlight in this image accentuates the contrast between the speaker cloth and the original vinyl fittings in the car. In 'real life' the contrast is much less noticeable.

With the speaker cloth cover stretched and stapled into place, I then had to recreate the white vinyl piping (or chord in the upholstery industry's terminology) that would tie-in with the car's interior. To achieve this, I wrapped and hot-glued a 2" wide strip of white vinyl material along a length of nylon chord. Vinyl sheet and nylon chord is available from any upholstery supplier. I then stapled the piping up against the edge of the speaker cover. A strip of black vinyl was then back-stapled and folded over to reveal the white piping in a way that recreated the look of sewn upholstery. The black vinyl strip was wide enough to fold under the speaker box to be secured there with staples.

I installed speaker terminals from Radio Shack on the front-right corner of the speaker box. The snug fit of the bare wooden speaker box, bulked out slightly with the upholstery, now fitted between the wheel arches with a perfect 'interference fit'.

The sound this speaker system produces in the car, driven by the very average stereo that came with the vehicle, is very satisfying and clearly audible at even highway speeds. I have just acquired an original Triumph radio. A future project will be to get that radio refurbished and have modern electronics to complete my setup.



A final shot of the overall look of the car's interior complete with the speaker 'seat' mounted on the rear shelf.

This was a fun project that is easily completed in one or two weekends. The woodworking skills and tools are minimal, and well, the sewing was an adventure that was easier, and produced better results, than I had hoped.

I believe I met my criteria:

- To maintain the integrity of the vehicle.
- To conceal the speaker installation.
- To produce acceptable fidelity.
- To permit easy removal from the vehicle.

Good luck creating the audio solution that works for your cherished car.

Brian Jones, July 2007
BrianJone5@mac.com