

Building the Perfect Street/Track VW IRS Suspension System

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Notes and Assumptions:

- This is theoretical based off of information gathered from different sources on the Internet and literature. Please feel free to add to or correct any information that might be less than clear or accurate. The sources for information are given proper credit wherever possible.
- You Super Beetle folks have to draw your own conclusions, as I do not know jack about the MacPherson strut setup in the cars.
- Any omissions of available products from EMPI and KYB are on purpose, as I am not overwhelmed with their stuff.

This article is aimed at creating a suspension system that is aimed for street and track events (mostly PCA and SCCA auto-cross) based off an IRS pan with a light Beetle top body. The Beetle body will be in a stock configuration using metal fenders and such, essentially little to no "lightening" with Lexan windows, fiberglass, or stripped out interior.

I am going under the philosophy that the early 911 will be a close match to the Beetle in terms of weight bias and handling characteristics. Of course given that the front suspension is different we have to allow for some creativity in this area and infer things that are similar.

According to Bruce Anderson in his book Porsche 911 Performance Handbook here is the optimal early 911 setup for street and occasional track:

- Front Torsion Bar: 21mm (stock 18.8mm)
- Front Sway Bar: 22mm
- Rear Torsion Bar: 26-27mm (stock 24.1mm)
- Rear Sway Bar: 22mm

From here I will take each item in a sectional fashion as to try and avoid running issues together and hopefully make for a quickly referencable document that is easy to follow.

Front Suspension Torsion Bars:

First off drop the Link and King Pin setup (pre-66 models), no discussion about that here. We will assume a ball-joint front end as it seems to be the most common and logical way to go. The following information is derived from the VW Beetle Performance Handbook by Keith Seume.

The early VWs front ends came with four (4) torsion leaves per tube. Later King and Link pin models had four (4) large leaves and four (4) small leaves per tube. The ball-joint models had four (4) large leaves and six (6) small leaves for dampening.

Apparently a solid torsion leaf gives a harsh ride and the more separate leaves per torsion tube the more dampening effect you have. Being as the Beetle front end is very light as it is I would just go ahead and stick with the later ball-joint ten (10) leaf setup. No real areas of improvement the way I see it in this area. Granted if an Avis/Puma adjuster beam is added in I am not certain how this might affect the torsion beam action.

Front Suspension Sway Bar:

I am not even sure what sway bar is given in a stock Beetle configuration, but I can surely say that with any improvement in the rear suspension it will be too soft for use and need upgraded. Currently I am not aware of any other option than getting an aftermarket sway bar from such vendors as SAW - www.swayaway.com. The only product they have listed is a 3/4" unit for the standard Beetle front end. 3/4" = 19.04mm, this of course falls short of our goal of 22mm as earlier stated. Remember that we do not want the rear sway bar to be bigger than the front due to the sudden oversteer that can be caused by this type of setup.

Front Shocks:

This is easy in my book, Bilstein ball joint shock PN is B46-0620. Granted Koni has early VW shocks as well that I will need to research more, PN 80-1787. Again Bilstein will be a tough product to beat, as they seem to be the longevity with retained performance champ a true 100,000 mile shock. www.shox.com has the best prices I have found and a very helpful staff.

Rear Torsion Bars:

This is clearly the toughest area of selection and setup/installation you will face in this whole suspension system. I am not even going to get into the proper adjustment of the torsion bars here, it is complicated and I would advise going to a professional race shop to get this worked out and

shipping fee.

Rear Sway Bars:

The big choice here is between SAW (www.swayaway.com) and Porsche 924/944 parts. First lets cover the SAW products available... Which is one, the IRS 3/4" (19.04mm) sway bar kit. This again falls short of our 22mm goal, but is an easy match for the front 3/4" SAW kit. This might be the only shot of having front and rear sway bars of an equal size.

On a side note, I used to own a '69 Beetle and bought a 3/4" rear sway bar kit for it but never installed it due to the poor mounting hardware around the torsion tube or a u buy.

944	1983-1985	Optional 14mm
944	1986+	Optional 18mm
944		M030 20mm
944S		None standard, optional 18mm
944S M030/M637		25.5mm
944S2	1989	18mm
944S2	1990+	16mm
951 (944 Turbo)		18mm
944 Turbo S		16mm or 18mm (Not sure which)
968 All		16mm, optional 20mm

There is no telling what is available from the Porsche aftermarket in this area as well. I bet if you need a custom sway bar one can be had through some good Porsche race shops... It will cost though. Since we have a 3/4" SAW unit up front at 19.04mm (3/4") then it is best to stick with the 18mm sway bar the way I see it. If you have fears of sudden oversteer or nasty road conditions then stick with a 14mm or 16mm unit.

Rear Shocks:

This is easy in my book, Bilstein IRS PN is B46-0034. Granted Koni has early VW shocks as well that I will need to research more, PN 80-2149. Again Bilstein will be a tough product to beat, as they seem to be the longevity with retained performance champ a true 100,000 miles shock. www.shox.com best prices I have found and a very helpful staff.

Bushings:

Some people swear by the urethane units and some by the stock German rubber units. There are advantages and disadvantages to each type. You be the judge on what works for you. Personally I will try the urethane units just because I like the long-term value due to the lifespan and tighter control of the suspension.

It seems that Rocky Mountain Motorworks has a good selection of the blue urethane bushings that are supposedly self lubricating. Opposed to the red ones which as far as I know do not have this feature.

Control Arms:

Of course the control arms are part of the suspension system and many people like to swap in the aluminum 944 control arms or other 944 components on the rear. This is very dependant on what you plan to do with the car and what rear track width you plan to run. I will leave this up to you all to decide on what works here in your situation. Personally I will stay with the stock VW IRS components in this area since I want a slim track to retain the stock fenders.

Conclusion:

As we have seen here it is close to impossible within reason to achieve the early 911 setup as Bruce Anderson laid out, but we are really close to a stock 911 setup with these easy add on swaps. All in all pretty good and keeps the budget within reason as well. In summary here is what we/I are ending up with:

Front torsion bars:	Late model vw stock 10 leaf
Front sway bar:	SAW 19.04mm (3/4") dia
Front shocks:	Bilstein
Rear torsion bars:	Porsche 25.5mm
Rear sway bar:	Porsche 18mm with weltmeister clamp on mounts
Rear shocks:	Bilstein

Hopefully this is a bit educational for you all as it has been for me compiling and researching all this information. Some areas I wished for more available products and in some areas we have almost too many options. There is a lot to think about when designing your system that relates to how you want to use your car, just err on the side of caution as an extreme setup will be a real downer in a daily driver or Michigan pothole

dodger.

If you have any questions, comments, additions, or deletions please feel free to drop me an e-mail.

Good Luck,
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