

Rear Suspension Install

2002 E39 BMW 525i



**Control Arms
Ball Joints
Integral Link
Wheel Bearings**

Well, after doing a complete front suspension install I decided to go ahead and do the rear as well. I figured this would be a good idea since I will be upgrading to 18" wheels in the next couple of weeks and would like to have the suspension as tight as possible before the extra meat goes on. With everything being tight up front, I could actually feel the rear shifting while partaking in some spirited driving.

Pictures: [Rear Suspension Install Pictures](#)

My car has close to 85K on the clock and figured since I am keeping it, the suspension should be totally redone front and rear. I replaced the shocks about a year and a half ago and have been running Koni Sports and OEM sport springs for a majority of the time. I recently upgraded the springs with H&R's which was a wise move as far as the handling and comfort department are concerned. Also, I am running Eibach sway bars front and rear which makes the car flat as hell in the turns. So, it was time to go ahead and upgrade the control arms, integral link, ball joints, and wheel bearings. I already replaced the ball joints about 8 months ago (can't remember exactly) and they were in good condition when removed. I replaced them anyway since I am more of a preventative maint. freak when it comes to suspensions.

In order to do this job the right way, you will be spending close to \$1,000 for all the correct parts and those would be Lemfoerder and FAG (Wheel Bearings). Here is the parts list:

2	LEMFOERDER 33326770749_S	LEMFOERDER Integral Link Rear Suspension (Trailing Arm Support) Left/Right (2 Needed Per Car)	\$42.69
1	LEMFOERDER 33326767831_S	LEMFOERDER Control Arm Left Rear Upper Subframe to Wheel Carrier	\$106.78
1	LEMFOERDER 33326767832_S	LEMFOERDER Control Arm Right Rear Upper Subframe to Wheel Carrier	\$107.48
2	LEMFOERDER 3332677424_S	LEMFOERDER Guide Link for Rear Wheel Carrier Left or Right	\$161.54
2	FAG 33411095652_S	FAG Wheel Bearing Rear (45X80X37) (2 Needed Per Car)	\$69.54
2	LEMFOERDER Ball Joint	LEMFOERDER Ball Joint (2 Needed Per Car)	\$48.13

I replaced the hardware associated with all of the parts and were bought from the dealer. This job can easily be done with some hand tools and a couple of specialized tools to make the job much easier. So, for those of you who think you need an air compressor and fancy stuff, need not worry. You will need a torque wrench that can torque up to 221 pounds, a three jaw puller (I used a hydraulic 3 jaw puller), and a bearing puller. All of these tools can be purchased from [Harbor Freight](#) if you do not already have them. Trust me, this is all you will need other the regular sockets, drivers, extensions, 3lb. hammer, etc. you may already have.

I am not going to write a step-by-step of what I did since I just don't have time, but I did take many pictures during the procedure. The pics ([Rear Suspension Install Pics](#)) should give you a good idea of what is involved with this process outside of all of the French words used to get the driver's side wheel bearing off.

Remove Roundel caps from both rear wheels using a flat micro screwdriver without marring up your wheels. You should now see the axle nut on the axle shaft staked down. You need to use the same micro screwdriver and slowly tap it in the staked portion. This will work a little more room in there so you can insert a larger flat blade screwdriver later in the process. Once you have tapped enough room to fit a decent sized flat blade, you can start pounding away with your 3 lb. hammer in a controlled manner. Once you have enough clearance to turn the axle nut, grab a breaker bar and 36mm socket and loosen the nut to wear it just breaks free. Then, leave it alone. Do this for both sides and then loosen the lug bolts for both wheels. You are now ready to jack up the rear of the car from the differential. Once you have it high enough, put the car firmly on jack stands using the jack pads. Double-check and make sure the car is firmly planted before you go any further.

Now you can remove the passenger side wheel and set it off to the side. Remove the headlight leveling sensor using a 10mm and 7mm wrench and move it upwards out of the way. Disconnect the sway bar link from the carrier using two 16mm wrenches and lay it down and out of the way. Remove AABS pulse sensor using a 5mm hex bit and move it out of the after unclipping it from the plastic piece attached to the wishbone. You can then unclip the two latches that secure the plastic piece on the wishbone and move it out of the way. Now you may remove the brake caliper using a 7mm hex socket/wrench and hang it off of the sway bar using a bungee cord or wire (pop off retaining clip on front). Remove the caliper carrier from the hub carrier using a 16mm socket/wrench and set all of these parts off to the side. Use a 5mm hex socket/wrench and remove the brake rotor retaining screw and brake rotor, setting those off to the side as well. If the rotor is hard to get off, then you might want to make sure your E-brake is not engaged. Grab your 36mm socket and proceed to remove the axle nut from the hub.

The passenger side bearing/hub assembly was taken off using a 3-jaw puller and did not come off separately from the bearing as some of the write-ups I have read. While using the puller, the half shaft was actually moving inwards instead of the hub sliding off of the half shaft. Once the half shaft would not go in any further, it gave me enough room to fit the head of my E14 internal star socket to remove the 4 bolts that hold the wheel bearing on the knuckle. Otherwise there is not enough clearance to get a good grasp on the bolt without fear of stripping it on the hub carrier. Once the wheel bearing was disconnected from the knuckle, it came off with the hub as an assembly. Then, the hub was pulled off of the bearing using a 2-jaw puller. I had to use a socket (1-1/4" 1/2") which was about the same size as the diameter of the splined hub shaft in order to press it off of the bearing. As you can see in the pics, I attached the hub/bearing assembly in a spare rear brake rotor and then on the wheel to keep everything stable for removal. The passenger side was pretty easy to separate and once this is done, the inner race of the wheel bearing will remain on the hub in almost every case. So, this is when the bearing removal tool (\$40) from Harbor Freight (picture of red case) comes in if you want to do it in an effortless, civil manner. The alternative is to beat it off, heat it up, use a punch, etc. if you want to do it the barbaric way and risk damaging the hub in the process. The bearing puller tool will remove it easily and within a few minutes after it is setup. I highly recommend this method and is worth the cost of the tool. After the inner race is removed from the hub, you are ready to install the new bearing on the knuckle. You will need to use four new E14 star bolts for new installation and the old ones are

not to be reused – again, **do not re-use them**. Once the passenger side bearing was removed, I could rock the bearing back and forth 1-2mm. Bottom line...it was shot to hell and back.

Make sure you clean the mating surface between the knuckle and the new bearing before you install it with the four new star bolts (PB Blaster – let all parts soak and clean, scrub with toothbrush, wipe clean, and then lubricate). The half shaft is able to move around freely within the knuckle allowing you to easily fit the E14 Internal Star Socket from behind with ample clearance and install the new wheel bearing. Once the wheel bearing bolts are torqued down (22 ft lb), you are now ready to install the splined hub onto the splined half shaft dangling inside of the newly installed wheel bearing. Put grease on the outside and inside of the hub in order to make installation much easier (I used Valvoline Synpower Synthetic lubricant). You must slowly line the hub with the half shaft in order to mate the splines correctly and do it tight enough to where it will hang on by itself. This will insure that it is lined up and ready to be installed all the way. At this point I used a 4x4 piece of wood about a foot in length and placed it against the outside face of the hub. Grab the 3lb. hammer and proceed to smack the 4x4 while it is firmly butted up against the hub in order to eliminate any damage to the hub. Slowly, but surely, the hub will start moving inside of the wheel bearing. It won't hurt to put a little grease/lubricant on the exposed part of the hub every few hits to insure there is plenty of lubrication to help the process. Once you see enough threads on the spindle, you are now ready to spin on the new axle nut you purchased and push the hub on the remainder of the way. Use a 36mm socket to tighten the nut as much as you can by hand/ratchet and leave it alone.

The Upper Rear Control Arm (Wishbone) is easily replaced using two 18mm wrenches for the end connected to the carrier. The ball joint end connected to the knuckle requires the use of a 21mm socket/wrench and 10mm wrench to hold the ball joint in place while turning. Installation is the reverse of removal.

The upper front control arm (traction strut) actually controls the "toe" adjustment for the rear wheels and uses an eccentric bolt connected to the carrier. For this procedure it really helps to remove the plastic piece underneath the car attached to the sub-frame bushing closest to the rear wheel you are working on. Also remove the 10mm nut holding the wheel well liner as well as the three 8mm nuts holding the panel toward the rear of the liner (two of them actually hold the mud flap looking panel next to the jack pad and the other is screwed into the plastic piece removed from the bottom of the sub-frame mount). All of this helps you gain access to the eccentric washer and nut that holds it in. Now you are ready to make a mark on the head of the eccentric bolt and on the carrier itself in order to get the bolt close enough when the new arm is installed (Again, you should be using new hardware on everything). Once you have made the mark, you can proceed to remove the carrier end of the control arm using two 16mm wrenches. The ball joint side of the guide link can be removed using a 16mm wrench and a 7mm wrench to hold the ball joint in place while turning the nut. Once you have the old eccentric bolt out of the carrier side of the arm, make a mark on the new eccentric bolt in the same location and begin re-installation. Installation is the reverse of removal.

The Integral Link only requires the use of a 24mm socket/wrench and 18mm wrench and will come out pretty easy. You should remove the bolt holding in the shock in order to relieve tension before this process is done. To be on the safe side, I always place a jack underneath the assembly to avoid any surprises. After I pop the shock out, I then lower it and adjust accordingly. Once the integral link has been removed you can now replace the ball joint. I do not have pictures of the ball joint removal/installation in this set of pics since I did this procedure a few months ago. However, I do have a link to more pics that shows what to do ([Click here for pictures for Rear Ball Joint Install](#)). Also, there are quite a few write-ups done for this procedure on the forum.

Now you are ready to torque all of the nuts and bolts:

Component	Torque Specs	
	Ft.-Lbs.	Nm
Integral Link to wheel bearing carrier (18mm)	77	104
Swing Arm to Wheel Bearing Carrier (24mm)	189	256
ABS Pulse Sensor (5mm)	6	8
Shock Absorber to Lower control arm (21mm)	94	127
Stabilizer Link to Swing Arm (16mm)	48	65
Stabilizer Link to Sway Bar (16mm)	32	42
Traction Strut (Upper Front Control Arm) to sub-frame (16mm)	44	60
Traction Strut (Upper Control Arm) to wheel carrier (16mm)	48	65
Wishbone (Upper Rear Control Arm) to wheel carrier (21mm)	105	142
Wishbone (Upper Rear Control Arm) to sub-frame (18mm)	81	110
Brake Rotor to Hub (5mm)	12	16
Rear Brake Pad Carrier to Wheel bearing Carrier (16mm)	48	65
Brake Caliper to Brake Pad Carrier (7mm Hex)	26	35
Rear axle shaft nut to hub (36mm)	221	300
Wheel Bearing to Wheel Carrier (E14 Internal Star Socket	22	30
Wheel to Hub	90	120

Once you have replaced all of the parts for the suspension, go ahead and put all of the panels, brakes, sensors, etc. back together. I ended up jacking up the rear carrier up to the point where the car started lifting to mimic the preloaded weight. I

then torqued everything except the axle nut in this position – you can loosen everything later and then re-torque when the car is in the normal preloaded position. If you have access to a lift, then this process can be done with the car in the normal/preloaded driving position (recommended). You can torque the lug bolts back to 90ft. lbs. and then lower the car. Now you will need to get your 36mm socket out again and set your torque wrench to 221 ft. lbs. and torque the axle nut down. Once you have done this on both sides, you can then raise one side of the rear and remove the wheel. Now you are ready to stake the axle nuts in order to lock them into place. You can just use a punch/dull flathead screwdriver and a 3lb. hammer to accomplish this. Lower the car and repeat this process on the other side.

The passenger side wheel bearing removal was about what I expected it to be. However, this was not the case for the Driver's side. I bent my forged Craftsman 2 jaw puller trying to get the hub off. Then I bought a three jaw puller and one of the braces broke off of that tool. By this time I was getting pissed . So, I get a ride to the local AutoZone and rented one of their slide hammers as this seems to be the method some have had success in removing the hub from the assembly. Well, after about 60-80 slides with all of my force, the damn hub did not even budge one bit. Back to harbor Freight I went. This time I saw a sweet 5 ton hydraulic 3 jaw puller for \$60 and thought this would do the trick. Sitting next to it was a 12 ton 3 jaw hydraulic puller on clearance for \$80 that looked more enticing and might come in handy for other jobs down the road. So, I bought the 12 ton unit and got back to the scene of the crime. I have to say that the 12 ton unit is one nice piece of machinery and would highly recommend it if you have the cash. The nice thing about it is that the you do not have to torque the puller while it is attached to the assembly – the hydraulics do the work for you allowing everything to remain stationary. After I got the 12 ton 3 jaw hydraulic puller on the hub and started to turn the shaft it sounded like a sonic boom and scared the ever living shit out of me. Believe me, there is no way any of my other tools would have gotten that thing off. Once the assembly was off and went through the same process as above, the driver's side bearing was in much better shape than the passenger's side.

After upgrading my front and rear sway bars with Eibachs, the rear brackets have deformed to the point where the bar makes them clank under stress. They were deformed to the point where the bars probably were not doing half of their job. So, I ordered some TC Design brackets (red) to take care of this problem. They are a very tight fit and are very well made – they better be for \$127 shipped! I will also replace the fronts with a set of OEM I picked up from the dealer because I know they have taken a beating.

My thoughts...

The second I pulled out of my driveway I could tell the difference in the rear end. It was smooth and very controlled. As I got on the interstate it was more evident how tight the rear was as I picked up speed. There was no shifting in the rear in lane change maneuvers and was razor sharp. I was real giddy as a result. I cannot really describe the feeling in words, but this is something that should be done on every E39 with over 60K miles, and maybe less in some cases. My expectations were far exceeded after the install and the very reason I ended up writing this install. It is not hard if you have the right tools and is a crime if you pay someone to do it due to the

high labor costs involved. Similar to the vanos repair, I think many people are intimidated by the rear wheel bearings and suspension and often neglect it in that it is not as important as the front. Well, the E39 I6 has a 50-50 balance and it will only achieve this good balance if the rear half of the suspension is up to speed.

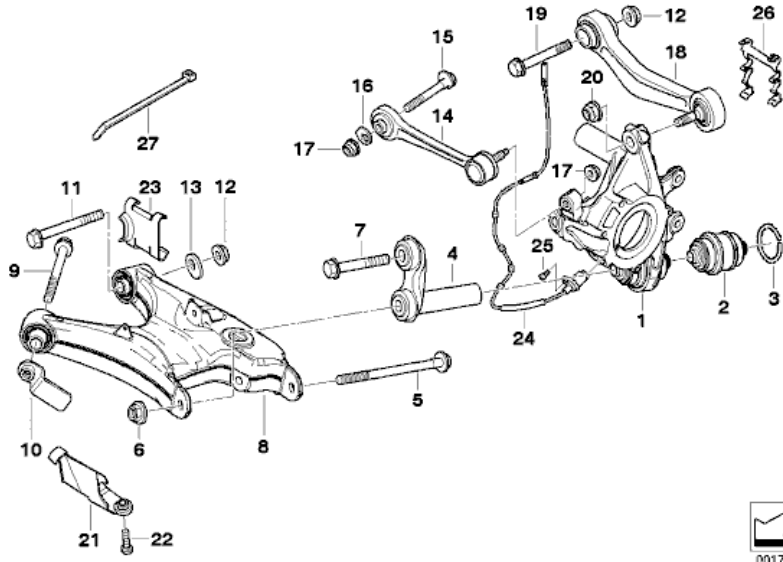
I also believe the rear suspension is neglected as a result of our sensory perception. We concentrate on the front because our senses from the hands on the steering wheel override any sensory data we may receive from our but in the seat. My front end is so tight that I could feel the rear end sway when driving under certain conditions. This is what prompted me to go ahead and tackle the rear, as well as an upgrade to 18's in the next couple of weeks. It is literally like driving a new E39 again - and yes, I have driven a brand new E39 I6 & V8. This procedure should be on everyone's to-do list if not done already.

I bought all of my parts from [AboveallMotorwerks](#) as they have excellent service and the lowest prices I have found (excluding hardware from the dealer). Many of you have your select vendors you like to order from - just make sure to get Lemfoerder and FAG for all of your parts regardless of where you purchase them.

Next up...subframe bushings!

E39 525i REAR AXLE SUPPORT/WHEEL SUSPENSION

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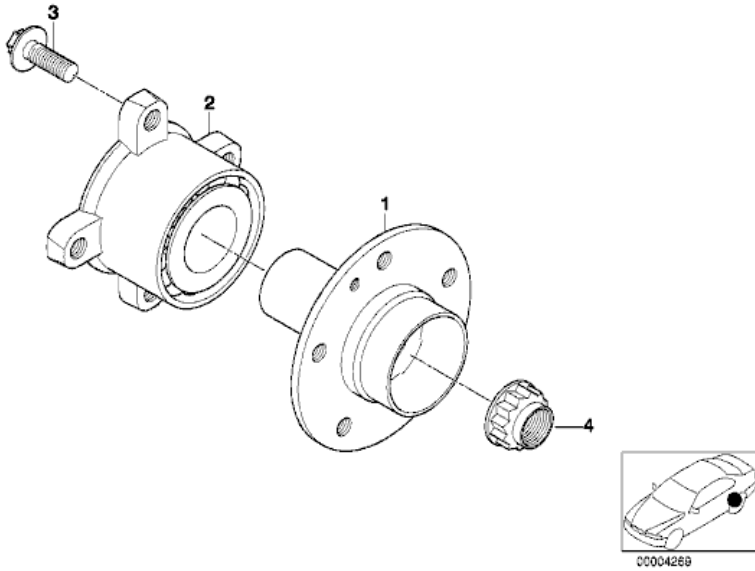


No.	Description	Supplement	Qty	From	Up To	Part Number	Price	Notes
01	Wheel carrier, rear left		1	12/2001		33326757315	\$474.30	
01	Wheel carrier, rear right		1	12/2001		33326757316	\$474.30	
02	Ball joint		2			33326767748	\$51.89	
--	only in conjunction with SNAP RING		2			33321091687	\$1.41	
03	SNAP RING		2			33321091687	\$1.41	
04	INTEGRAL LINK		2			33326770749	\$56.36	
05	Hex bolt	M16X1,5X263	2			33321092870	\$10.71	
06	Self-locking collar nut	M16X1,5-10 ZNS3	2			33326760383		
07	Hex bolt with washer	M12X1,5X67 ZNS	2		03/2007	33321091583	\$1.98	
07	Hex bolt with washer	M12X1,5X67 ZNS3	2			33326763463		
08	LEFT SWING PART		1		03/2003	33321093713		ENDED
08	LEFT SWING PART		1			33326755471	\$300.20	
08	RIGHT SWING PART		1		03/2003	33321093714		ENDED
08	RIGHT SWING PART		1			33326755472	\$300.20	
09	Hex bolt with washer	M10X100	2			33321090875	\$1.98	
10	LOCKING NUT		2			33321091707	\$2.46	
11	ECCENTRIC BOLT	M12X1,5X98	2			33321095102	\$8.26	
12	Self-locking collar nut	M12X1,5-10 ZNS3	4			33326760668	\$0.56	
13	ECCENTRIC FLAT WASHER		2			33321092310	\$1.80	
14	Guiding suspension link w rubber mount		2	12/2001		33326777424		
15	ECCENTRIC BOLT	M10X66 ZNS	2		03/2007	33321093456		ENDED
15	ECCENTRIC BOLT	M10X66 ZNS3	2			33306760591		
16	ECCENTRIC FLAT WASHER		2		03/2007	33321093455		ENDED
16	ECCENTRIC FLAT WASHER		2			33306760592		
17	Hex nut with flange	M10-10 ZNS3	4			33306760587	\$0.56	
18	Wishbone, left		1			33326767831	\$219.85	
18	Right wishbone		1			33326767832	\$219.85	
19	Collar screw	M12X1,5X90	2			33321091058	\$1.32	
20	Combination nut	M14X1,5 ZNS	2			33321092384		ENDED
20	Combination nut	M14X1,5-10ZNS3	2			33326760380	\$2.34	
23	STONE-CHIP GUARD LEFT REAR		1	08/1996		33321094081	\$6.14	
--	only applies to LEFT SWING PART		?	08/1996		33321093713		ENDED
23	STONE-CHIP GUARD RIGHT REAR		1	08/1996		33321094082	\$6.14	
--	only applies to RIGHT SWING PART		?	08/1996		33321093714		ENDED
24	Pulse generator, ABS		2			34526756376		
25	Fillister-head screw	M6X16-ZNS	2			07119901438	\$0.50	
26	LEFT BRACKET F PULSE GENERATOR ABS		1			33181182957	\$2.34	
26	RIGHT BRACKET F PULSE GENERATOR ABS		1			33181182958	\$2.34	
27	Cable strap	L=292MM/B=4,8MM 4				61131377134	\$0.78	

Notes

E39 525i SIDE SHAFT/WHEEL BEARINGS

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No.	Description	Supplement	Qty	From	Up To	Part Number	Price	Notes
01	Drive flange hub		2			33411093371	\$71.98	
02	Angular-contact ball bearing unit 45X80X37 only in conjunction with		2			33411095652	\$78.96	
--	Collar screw	M10X1X31-10.9	8			33321093661	\$0.66	
03	Collar screw	M10X1X31-10.9	8			33321093661	\$0.66	
04	Collar nut	M27X1.5	2			33411133785	\$8.70	

Notes

- Items pictured but not listed are not installed on your vehicle.
- Items pictured without a number are listed on another diagram.

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