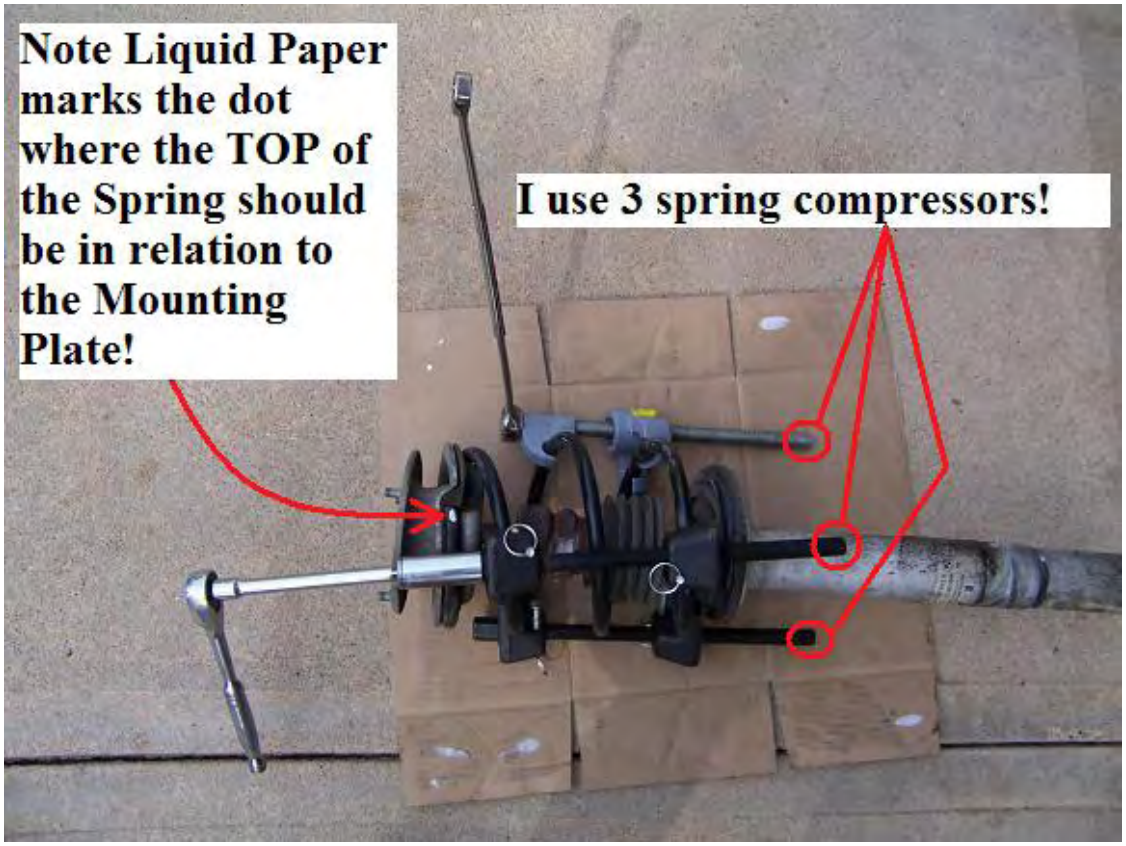
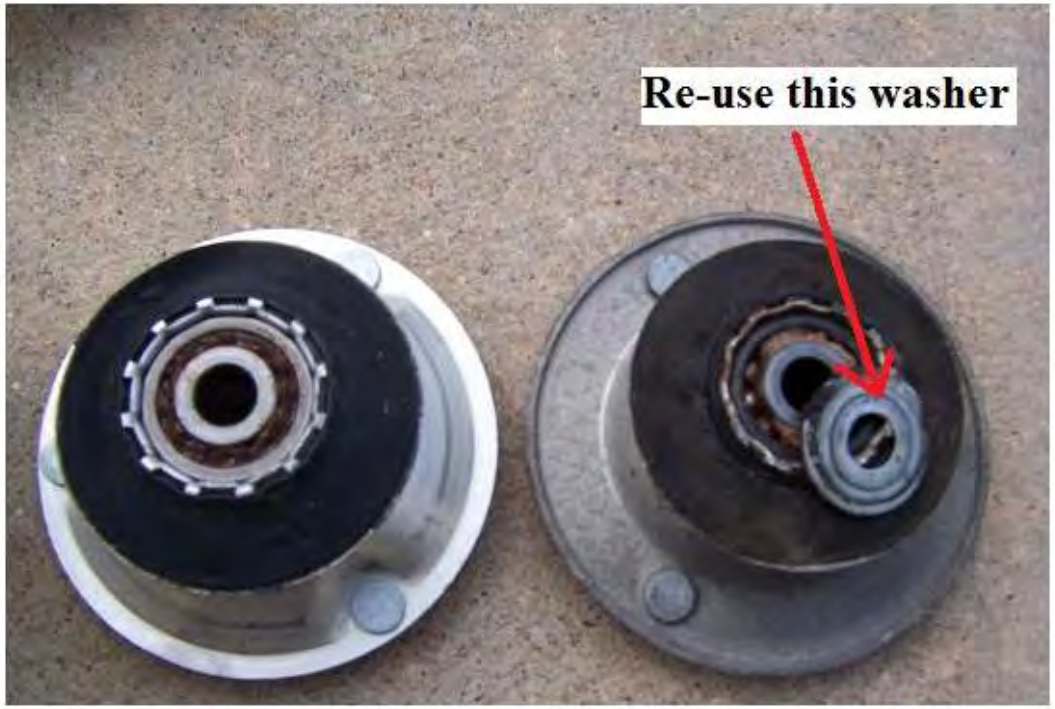
13. I use three (3) Spring Compressors instead of the usual 2 compressors, it is much easier (and SAFER) to compress the Spring this way. Remove the Strut and NOTE the layout. Do NOT lose any washers. Note that at the bottom of the Strut Guide, there is a protective washer, I re-use it. Of course, you can also get a new protective washer.

14. Now install the new Bilstein Strut, Rubber Pads (the UPPER Rubber Pad is different than the Lower Rubber Pad), New Strut Guide, Washers in the appropriate order. Align the Lower Rubber Pad with the Notch on the Strut Perch:

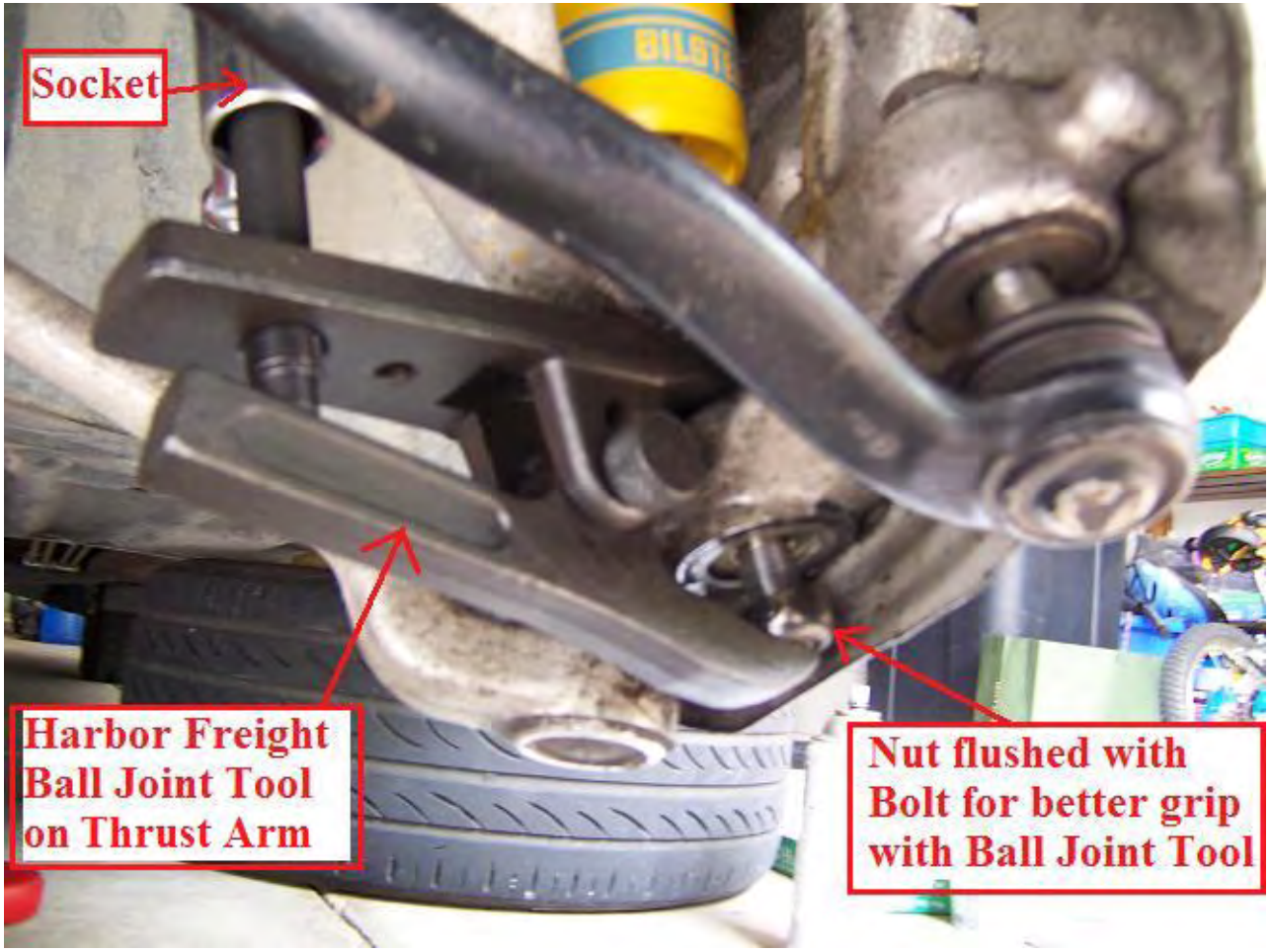


Bilstein Strut has Internal Stopper so no need for this
Nut
Guide
Large Washer
Spring Pocket
Upper and Low Rubber Pads
Small Washer

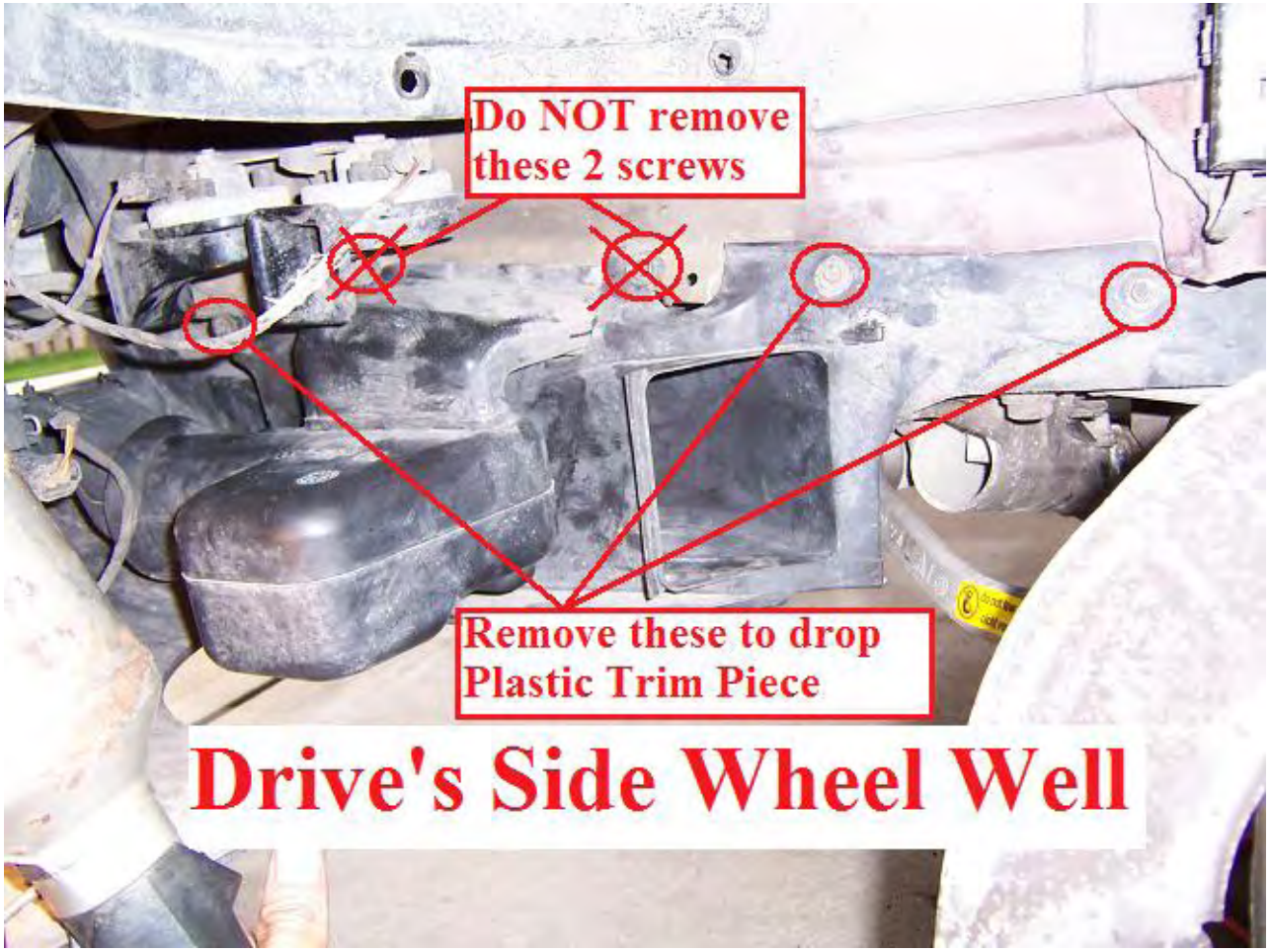

Re-use this washer

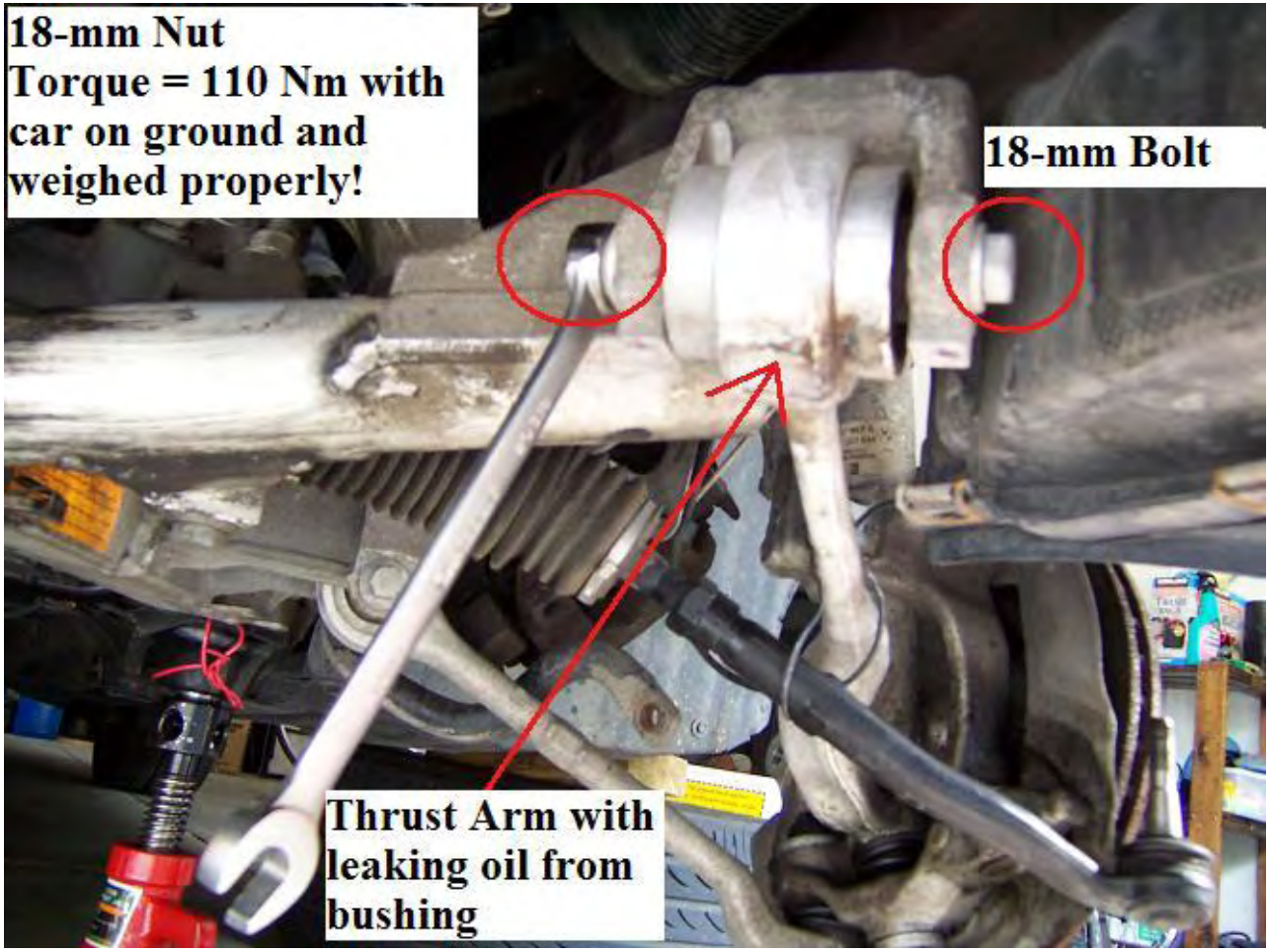
15. Hand-tighten the 22-mm TOP Nut for now, final torquing of this Nut will be done later in the car. Slowly release the 3 Spring Compressors making sure that the Spring lines up exactly as factory setup: TOP of Spring touches the Guide notch and BOTTOM of Spring lines up with the 4:30 o'clock mark on the Perch.

16. NOW Stop! If you want to replace the Thrust Arm, do NOT install the Strut now! I made this mistake….....Arghhh….....a nd later have to undo the Strut-Steering Knuckle attachment because the Thrust Arm BJ cannot be removed with the Strut in place!
NOTE: BJ Removal Too bits on both the nut (I leave it flushed with the bolt's end) and the bolt:



17. Replace the *Thrust Arm* with new Thrust Arm, hand-tighten the 22-mm Nut but do not torque it yet (Do all of these Nuts later). Before you can do this, you have to remove the Thrust Arm's protective boot (10-mm bolts) and the Plastic Fender Lower Housing and the Plastic trim (8-mm socket) which itself has three (3) 8-mm screws:

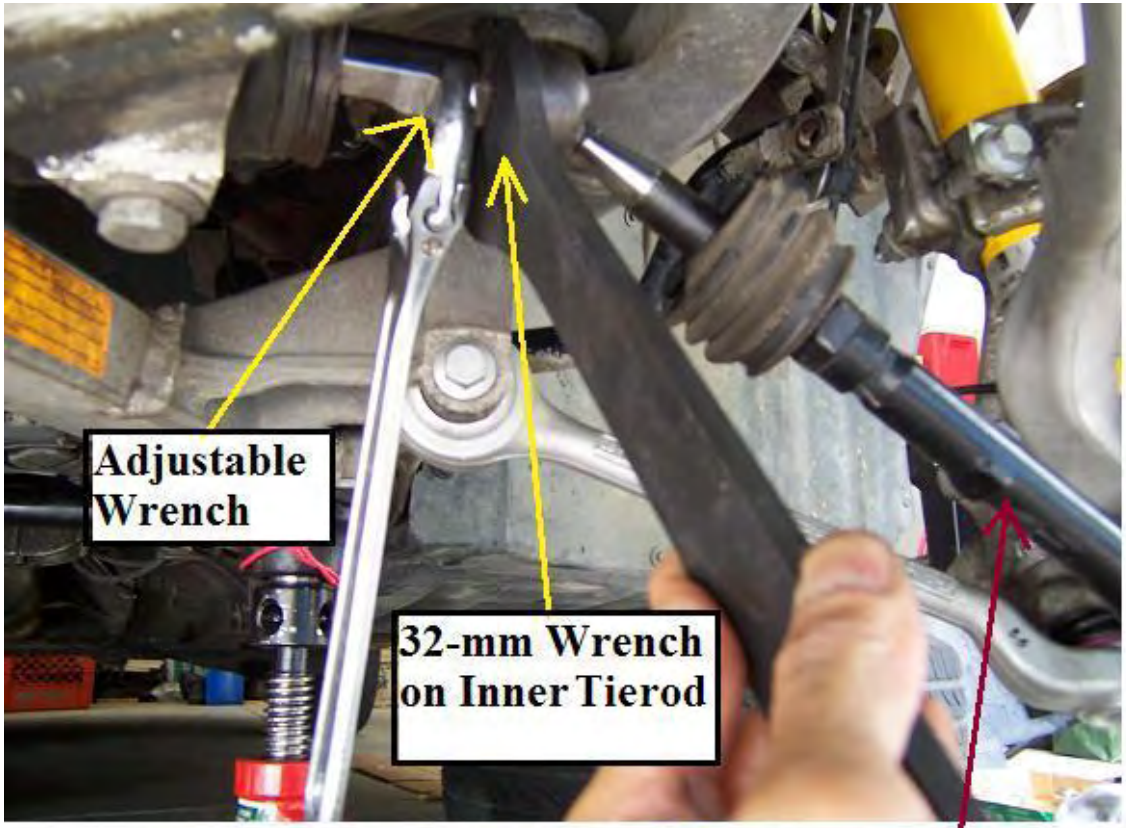

Do NOT remove
these 2 screws
Remove these to drop
Plastic Trim Piece
Drive's Side Wheel Well

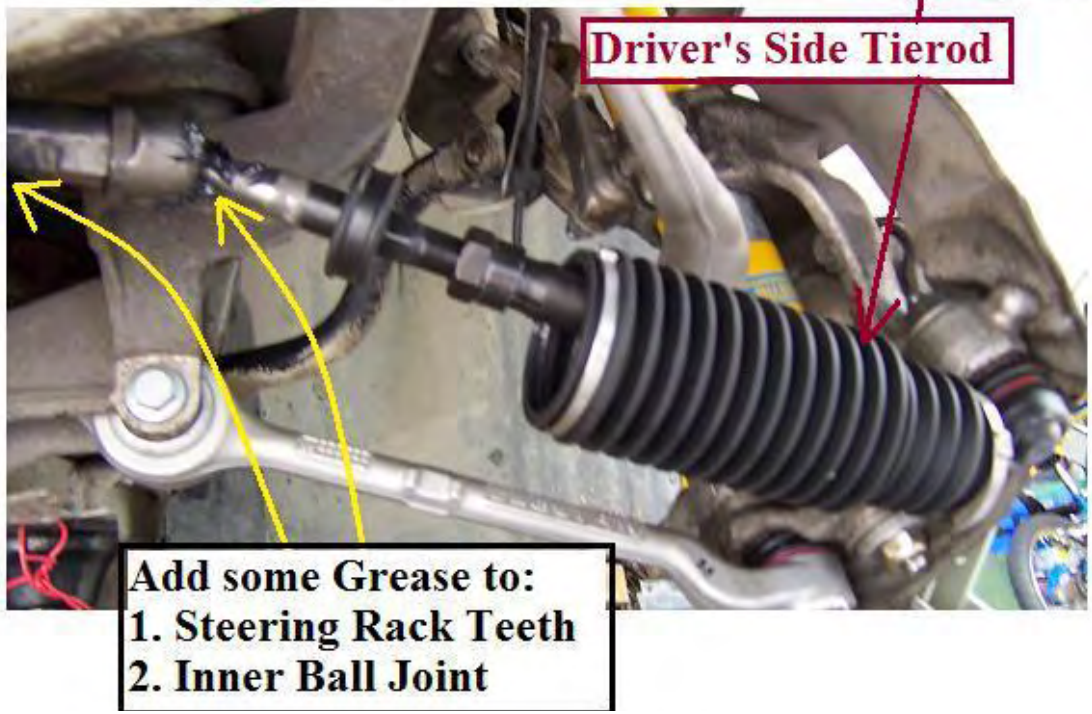


18. Replace the *Control Arm* with new Control Arm, hand-tighten the 22-mm Nut but do not torque it yet (Do all of these Nuts later).

19. Re-install Strut, taking care not to damage paint work!
- Place a jack below Steering Knuckle and slowly raise it up.
- Twist the new Strut a bit to allow it to sit properly.
- Make sure the Strut bottoms down properly on the Steering Knuckle!
- Also check the **R vs L marking** lines up correctly as shown.
- Jack up the steering knuckle a bit more, verify that everything is correctly lined up.
- Now torque the Pinch Bolt to **81 Nm**.

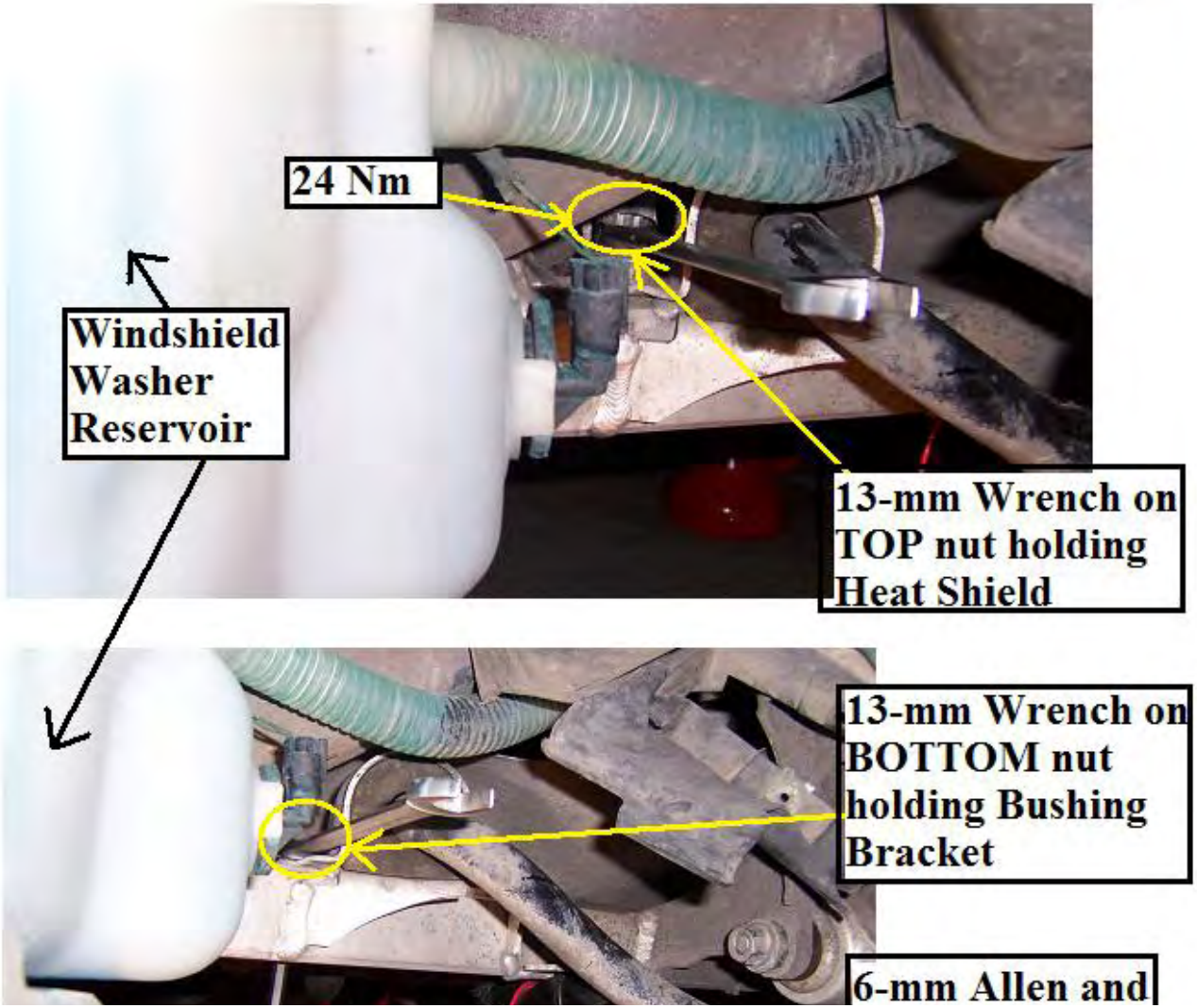
20. To replace the Tierods:
* Stock BJ Nut is 18-mm
* Steering Rack Driver's Side: 32-mm wrench and counter-hold with adjustable wrench.
* Passenger's side, no place to counterhold (simply a round Steering Rack Shaft: no place to apply the adjustable wrench), so apply 32-mm wrench and tighten it. I tighten it a bit **below** the published torque values **(71 Nm)** to avoid damage to steering rack. Actually when you remove the 32-mm nut, it was not tightened much from factory, it comes out easily:


Adjustable Wrench
32-mm Wrench on Inner Tierod


Driver's Side Tierod
Add some Grease to:
1. Steering Rack Teeth
2. Inner Ball Joint

* Do NOT forget to:
- Apply a bit of extra grease to the output shaft rack and INNER ball joints.
- Protective Rubber boot.
- The Oetiker clamps: dry fit on the rubber boot first so you know what notch needed to tighten it. Use a Ceramic Tile Cutter (Tips filed blunted) or any Oetiker Clamp Tool to tighten it. Do not over do it. Just tighten it snug.
- The BJ side: adjust the Steering Knuckle a bit here and there (support with jack) so the BJ can go in.

21. Sway Bar Bushings: 13-m wrench and Allen wrench to counterhold. Driver's Side is easy.
Passenger's Side 13-mm Nut will drive you Nutttttttttt! The space is so tight to fit the 13-mm wrench. On the back side, there are two (2) nuts. The Top Nut holds the exhaust shield, which is lifted up a bit to work on the lower nut. Slide the Bracket out, rotate the Rubber Bushing upside down to slide it out. The Pass Side Bushing alone took me 1.5 h! It is a PITA. So, for The Pass Side Bushing, you are allowed to use the 4-letter word….....….....☺ The alternative is to turn on some nice radio music to soothe your pain dealing with this nut!



22. Now go around the car and torque ALL nuts/bolts *except for the nuts on Thrust Arm and Control Arm* (which need to be torque with car on the ground and properly loaded (150lb in each front seat, rear center seat, full gas tank and some luggage and all that blah blah blah….....☺).
Many people simply torque these *Nuts on Thrust Arm and Control Arm* with car on the ground **w/o** the extra weights. Any nuts/bolts that have been torqued, mark with liquid paper or paint touch-up so you know. These include:

- Sway Bar Endlink 16-mm Nuts: **65 Nm**
- Strut Suspension Tower 13-mm nuts: **24 Nm**
- Strut Main 22-mm Nut: **64 Nm**

- Thrust Arm Ball Joint 22-mm Nuts: **80 Nm**
- Control Arm Ball Joint 22-mm Nuts: **80 Nm**
- Thrust Arm Subframe 18-mm Nuts: **110 Nm*****
- Control Arm Subframe 18-mm Nuts: **110 Nm*****
**** Torque these bolts ONLY with car on the ground and weighed properly*
(150 lbs each front seats, 150 lbs center rear seat, full gas tank….....blah blah blah)

- Tierod 19-mm Ball Joint Nut (Stock 18-mm, Lemforder 19-mm): **65 Nm**
(Remember the Tierod 32-mm INNER Nut for the steering side, Torque is **71 Nm**, but it should have been tightened by now).

23. Now: Install Wheels, Remove Jackstands, LOWER the car and drive it up on ramps. Then:
Torque:
- Thrust Arm Subframe 18-mm Nuts: **110 Nm*****
- Control Arm Subframe 18-mm Nuts: **110 Nm*****
NOTE: As a practice, tighten the Wheel Bolts to 110 Nm using a Torque Wrench so you have an idea of what 110 Nm feels like because under the car, it is virtually impossible to fit a torque wrench, so use your muscles and feel (I did!!!).
*** Torque these bolts ONLY with car on the ground and weighed properly
(150 lb each front seats, 150 lb center rear seat, full gas tank)
I had my 16-year-old and 11-year old kids to sit in the front and that is good enough for me!

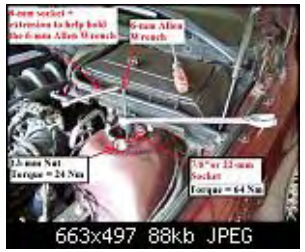
Also, after install, the car WILL appear higher than before, don't panic yet!
Give the Bilstein Strut 30 minutes to settle down before torquing these Thrust Arm and Control Arms Subframe 18-mm Nuts to **110 Nm**.

Attached Thumbnails

971x811 129kb JPEG

668x916 150kb JPEG

646x650 79kb JPEG



663x497 88kb JPEG

587x743 80kb JPEG

584x911 108kb

497x663 51kb JPEG

663x497 54kb JPEG

663x497 65kb JPEG

663x497 69kb JPEG

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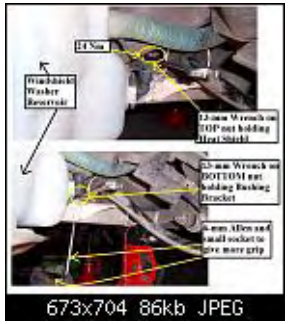
663x497 75kb JPEG


673x704 86kb JPEG

588x825 102kb

Last edited by cn90; Yesterday at 09:03 AM.

Quote

09-20-2009, 09:15 PM #2

cn90
Officially Welcomed to the 'Fest
Location: Omaha NE

Join Date: Mar 2006
Posts: 3,772
Mein auto: 1998 528i 5-sp 103K miles
View My Garage

NOTE:
- Old Bushings worn out:

- Car on Wood ramps when torquing the Thrust Arm and Control Arm Nuts. I had my 16-year-old and 11-tear old kids to sit in the front and that is good enough for me!

The Alignment DIY:
1998 BMW 528i (data from NTB Alignment Sheet)
Toe-in: -2 minutes to +6 minutes (or 2 minutes +/- 4 minutes) ---> Adjustable
Camber: -0.7 to 0.3 degrees (or -0.2 degrees +/- 0.5 degrees) ----> Unadjustable (unless you install a camber kit, off topic here!)
Caster: 6.0 to 7.0 degrees (or 6.5 degrees +/- 0.5 degrees) ----> Unadjustable

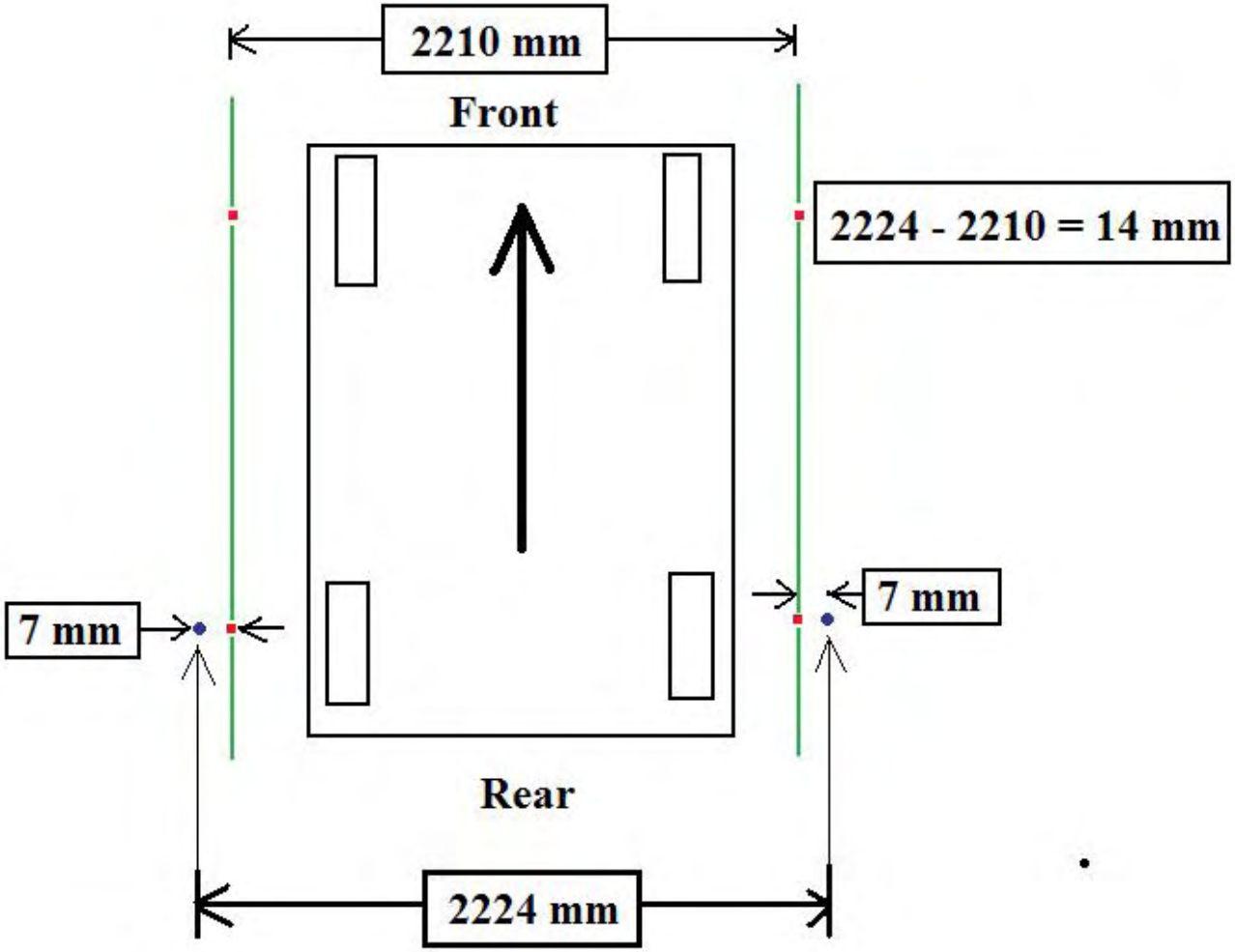
---> Only Toe-in is adjustable for E39.

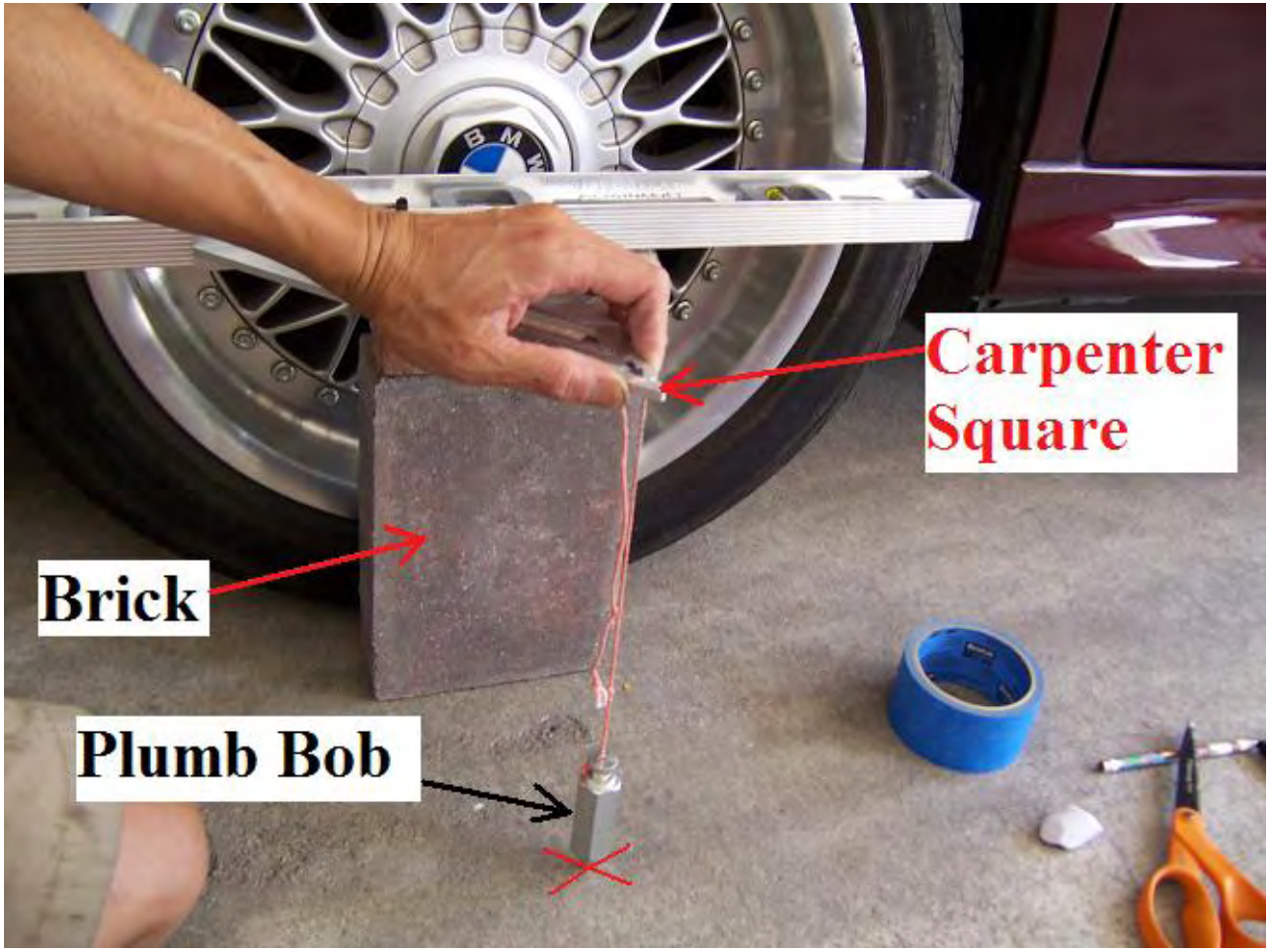
1. If you did not sleep through your High School Geometry Class, then I will share with you this best-kept secret: Alignment DIY.
There are 60 minutes (') in one degree (A circle = 360 degrees); and 60 seconds (") per minute.
If you read Alignment Sheets, very often car mfg's misuse these symbols (') and ("). For the most part, it is *minutes not seconds*.

- Review Tangent and Arctan. Basically, for each stock tire front to rear rubber part is 540 mm.
Since toe-in is given as degrees and most of us don't have the sophisticated alignment tool to measure degrees, I measure using the difference (in mm) in front and rear part of the same tire (front and rear measurements).
Tangent (2/60 degrees) x 540 mm = 0.314 mm TOE-IN!
Tangent (6/60 degrees) x 540 mm = 0.942 mm TOE-OUT!

2. Requirements:
- Car with full gas tank. I by-passed the weighing business (150 lbs front seats, 150 rear seat garbage).
- Tires at 35 psi. All 4 tires should be the same make.
- Level garage at spots where car parks. Take measurements using Carpenter Level.
- 16-mm wrench for tierod adjusting bolt and adjustable wrench for lock nut.

3. The whole idea is to **establish parallelism**. Using the carpenter square and level coupled with Plumb Bob (see pic), measure the track width at wheel (Front and Rear) Hub Centers.
Drive car straight out garage. Calculate the difference between Front and Rear Tracks.
Published Values are:
Front Track Width = 1512 mm
Rear Track Width = 1526 mm
Difference is approx. 14 mm

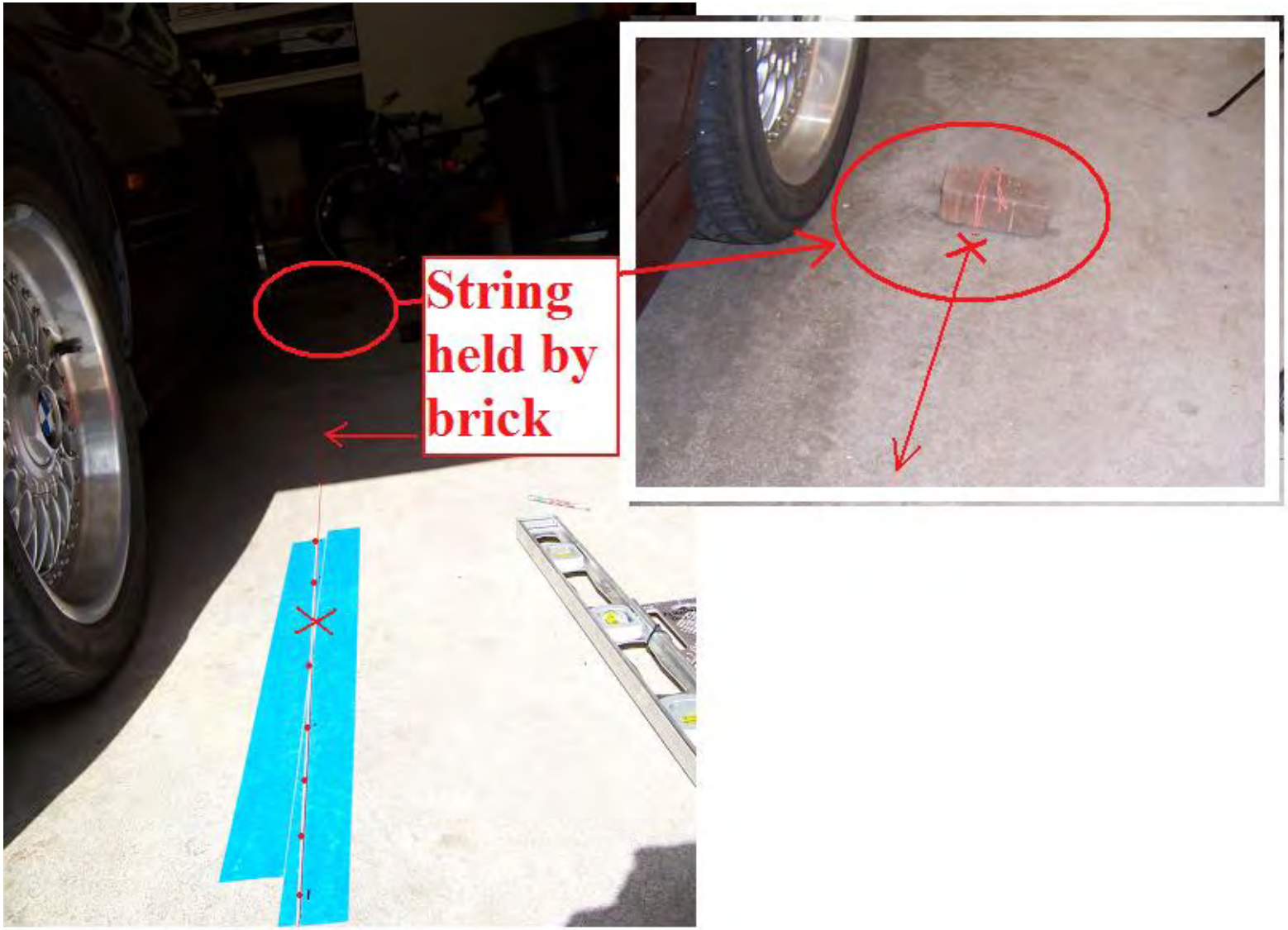

2210 mm
Front
2224 - 2210 = 14 mm
7 mm
7 mm
Rear
2224 mm



4. Put car back to similar spot. Apply Parking brake and whatever you do, do NOT move the car after this step, otherwise, **you will redo the whole thing again**. Remove key and rock steering R and L to lock it. Make sure SW is dead center.

5. Now mark the Front and Rear track widths (with carpenter square) on masking tape on the floor. Since the Front track width on each side is 7 mm (14 mm/2) less than the Rear track width, add 7 mm lateral to the Front Mark.

6. Using a string (held by brick) and draw a straight line between front and rear marks. This represents the straight axis of motion of the car. This line will be used a reference line:



7. Now measure Camber. I have calibrated my device so when the bubble is barely out of the marks, it is roughly 0.50 degrees (or 30 minutes, which is half of a degree). In fact this is –0.50 degrees, so it was good: