



BMW E46

struts
and
springs



installation instructions

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Proper service and repair procedures are vital to the safe, reliable operation of all motor vehicles as well as the personal safety of those performing the repairs. Standard safety procedures and precautions (including use of safety goggles and proper tools and equipment) should be followed at all times to eliminate the possibility of personal injury or improper service which could damage the vehicle or compromise its safety.

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Overview

BMW E46 lowering springs and struts



In this tutorial, we'll demonstrate how to install H&R Lowering springs and new struts on a 2001 BMW 330Ci. An eager highway warrior, our silver 3 Series coupe still performs with the silky, seamless power we've all come to expect from a Bavarian inline six.

Its the suspension that needs help. Lots of it. At 175,000 miles, the factory struts and springs are still in place, and showing their age.

- One rear spring is broken, a common occurrence in cars exposed to road salt.
- All four shocks are dangerously rusted, and one rear shock is completely dead.

We will install new H&R lowering springs and fresh dampers, front and rear, with new mounts and hardware.

Note: Experience has shown that reusing worn mounts is a false economy. To get the most from your springs and dampers, mount them in fresh strut mounts. Depending on the condition of your car, you may need some or all of the items shown on this page.



Front strut mounts and spring cushions keep your suspension taut and silent.



Not sure what to order? Eliminate guesswork by ordering a complete cup/kit installation package that includes front and rear mounts, rear reinforcement plates, spring pads, and mounting hardware. We have several kits for BMW sedans, coupes, and convertibles.



An ECS Tuning rear shock mount kit includes mounts, body sealing gaskets, and steel reinforcement plates with fresh hardware to keep your new shocks firmly anchored. We have kits for coupes, sedans, and convertibles. [ES2075240](#)

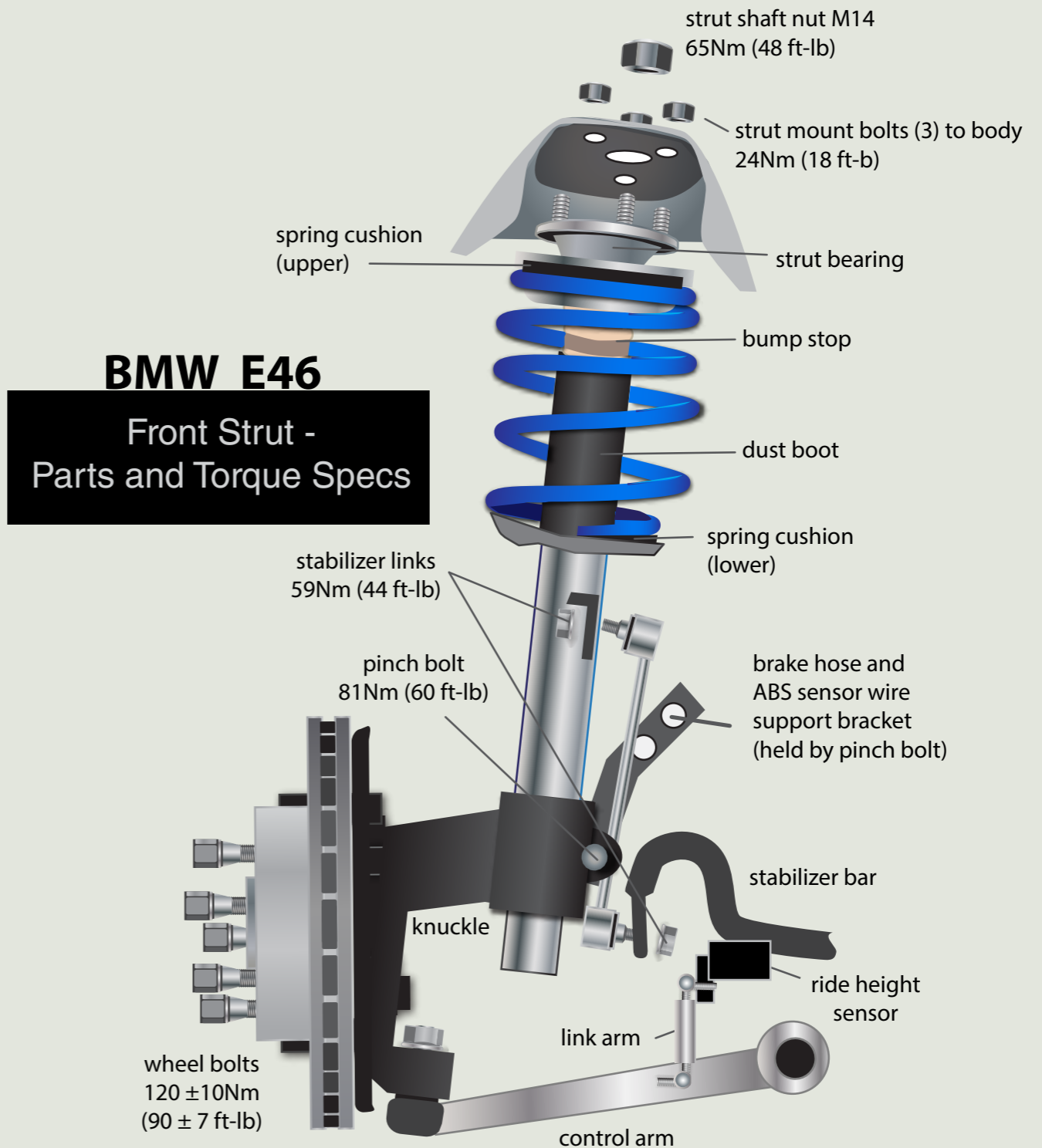
Front Strut Components

This illustration shows component locations in the front strut assembly and fastener torque values.

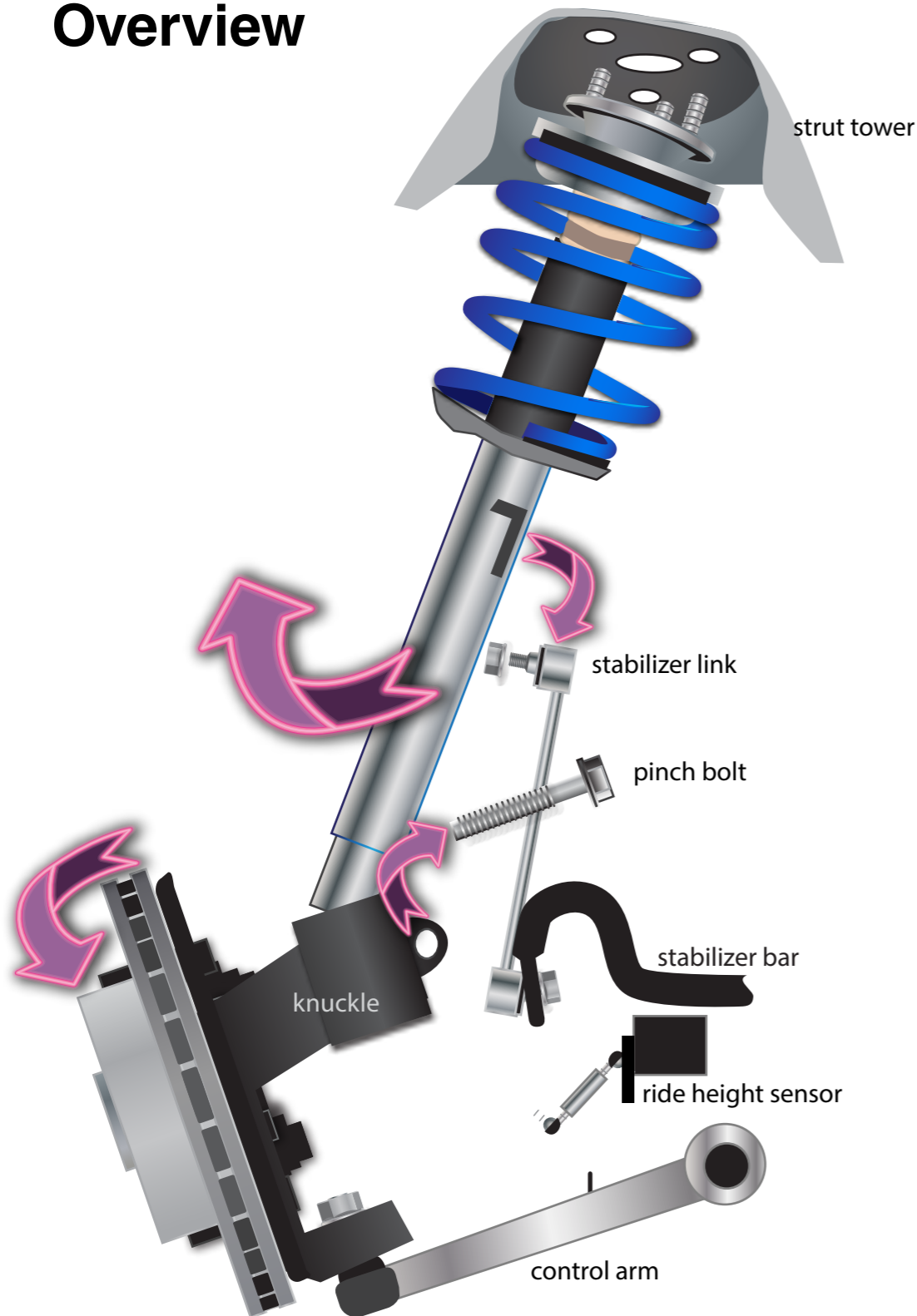
We recommend replacing critical hardware: the pinch bolt at the knuckle collar, and all self-locking nuts at the stabilizer links and strut mounts. If you reuse any self-locking fasteners, apply a few drops of medium strength thread locking compound.

Tool List

- metric socket set that includes 16 and 18mm sizes
- metric combination wrenches that include 16 and 18mm sizes
- thin 16mm open-end wrench to hold the stabilizer link while the self-locking nut is loosened/tightened
- 17mm lug bolt socket with breaker bar or impact
- 14 x 1.5mm wheel hanger stud
- 6mm hex key or driver
- ratchet with miscellaneous extensions
- torque wrench
- spring compressor
- long pry bar or small bottle jack or scissors jack
- lift, hydraulic jack, jack stands



Remove/Install the Front Strut Overview



Remove the Front Strut Assembly

- 1) Raise and safely support the car.
- 2) Remove the road wheels.
- 3) Disconnect the ride height sensor linkage (if equipped).
- 4) Unbolt and disconnect the upper stabilizer link from the strut tube bracket.
- 5) Remove the pinch bolt from the knuckle. Pull the brake hose bracket out of the way.
- 6) Remove the three 8mm nuts holding the strut mount to the strut tower.
- 7) Slide the strut tube out of the knuckle.
- 8) Pivot the bottom of the strut tube upward slightly as you remove the strut assembly from the wheel well.

Prepare the New Strut Assembly (see the next page for strut disassembly information)

Reinstall the Front Strut Assembly

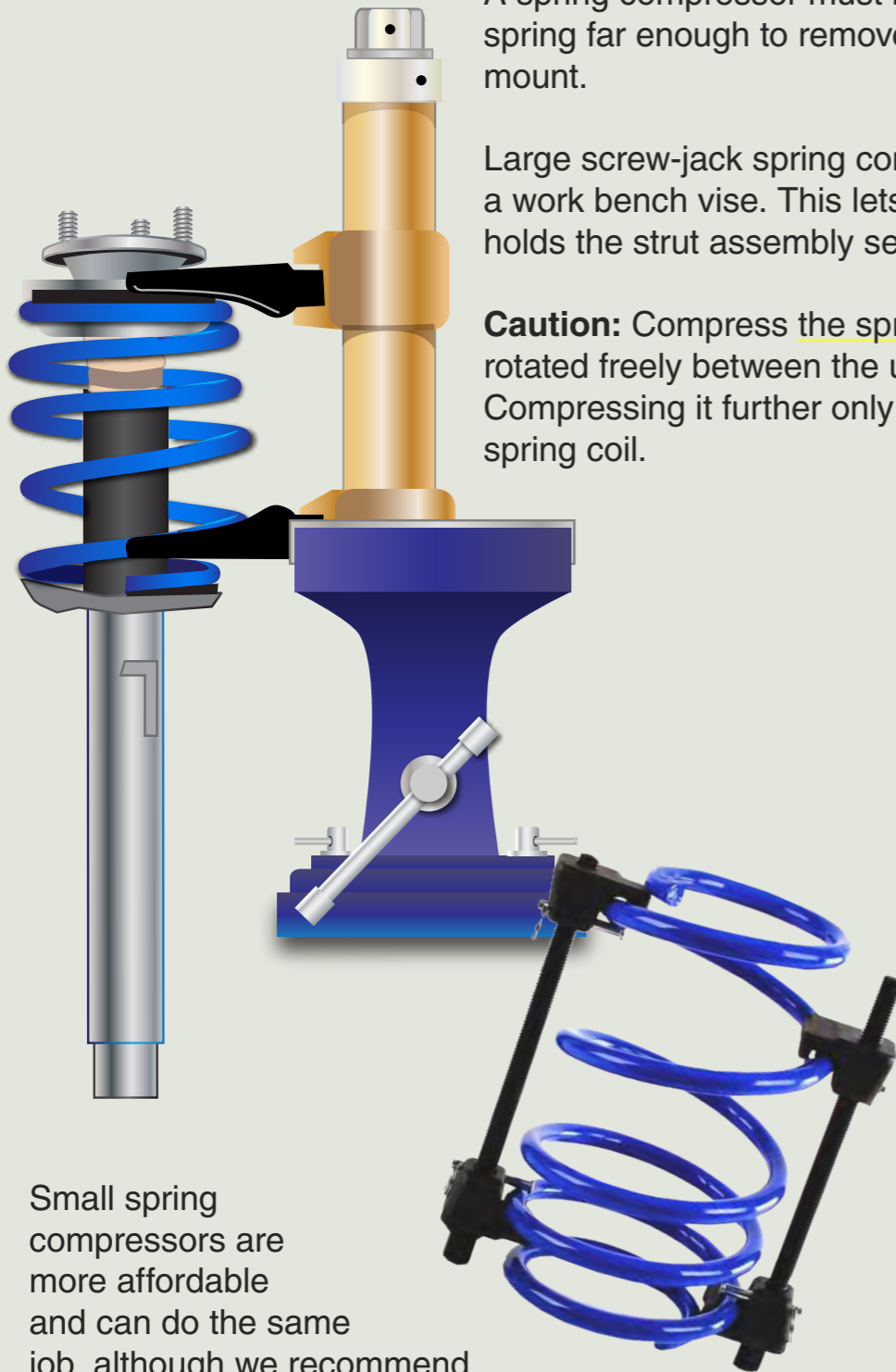
- 1) Insert the strut assembly into the wheel well, top end first.
- 2) Align the three threaded studs on the strut mount with the holes in the strut tower (making sure the indexing tab is also aligned with the reference hole in the metal).
- 3) Loosely thread three new self-locking nuts onto the studs to support the strut.
- 4) Insert the base of the strut shaft into the knuckle.
- 5) Slide the alignment pins into the slot in the pinch collar.
- 6) Slide the strut all the way into the collar until it bottoms.
- 7) Thread the pinch bolt into the collar.
- 8) Make sure the strut tube is fully bottomed in the collar, then tighten the pinch bolt.
- 9) Torque the strut bearing nuts.
- 10) Insert the stabilizer link threaded stud through the hole in the strut bracket; thread on a fresh self-locking nut and torque to spec.
- 11) Reattach the ride height sensor.
- 12) Reinstall the road wheels and torque the lug bolts.

Spring Compressors

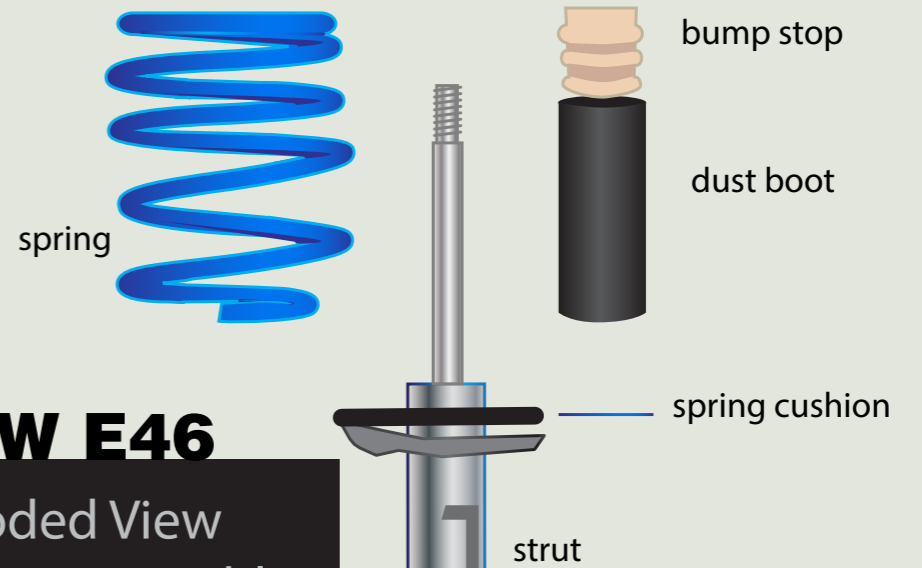
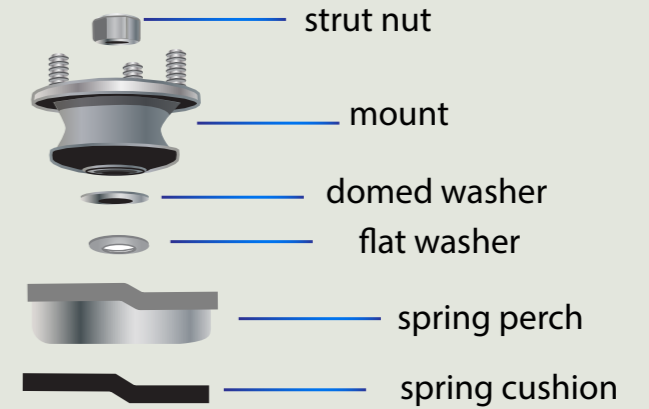
A spring compressor must be used to compress the spring far enough to remove tension from the upper mount.

Large screw-jack spring compressors can be mounted in a work bench vise. This lets you work standing up, and holds the strut assembly securely.

Caution: Compress the spring only until it can be rotated freely between the upper and lower perches. Compressing it further only stores more energy on the spring coil.



Small spring compressors are more affordable and can do the same job, although we recommend them only for occasional use.
ES1306817



BMW E46
Exploded View
Front Strut Assembly

The strut mount contains a roller bearing pivot. If the bearing is worn, loose, or rusted, install a new mount with bearing. Replace strut mounts that have cracked or torn rubber. (Even if the rubber looks good, it may be compressed and hard enough to compromise ride quality. Replacing the mounts is generally recommended when performing any suspension refresh or upgrade.)

Step 1

A wheel hanger stud ([ES2678092](#)) and a 17mm Protecta socket ([ES2221243](#) or [ES6225](#)) are helpful when you remove the road wheels. The hanger stud keeps the wheel in place and the plastic-wrapped head of the Protecta socket prevents wheel surface scarring, common with standard steel impact sockets.



Step 2

When removing the stabilizer link from the strut bracket, hold the head of the link with a narrow 16mm open end. Place the wrench over the two parallel flats on the link head to keep it from turning as you loosen/tighten the self-locking nuts.

Service Note: You need a **very narrow** wrench to fit into the gap between the link and strut bracket or stabilizer bar; a common thickness open end is too thick. Either grind down an old 16mm open end to the correct thickness, or grab a 16mm cone wrench from your bicycle tool bag.

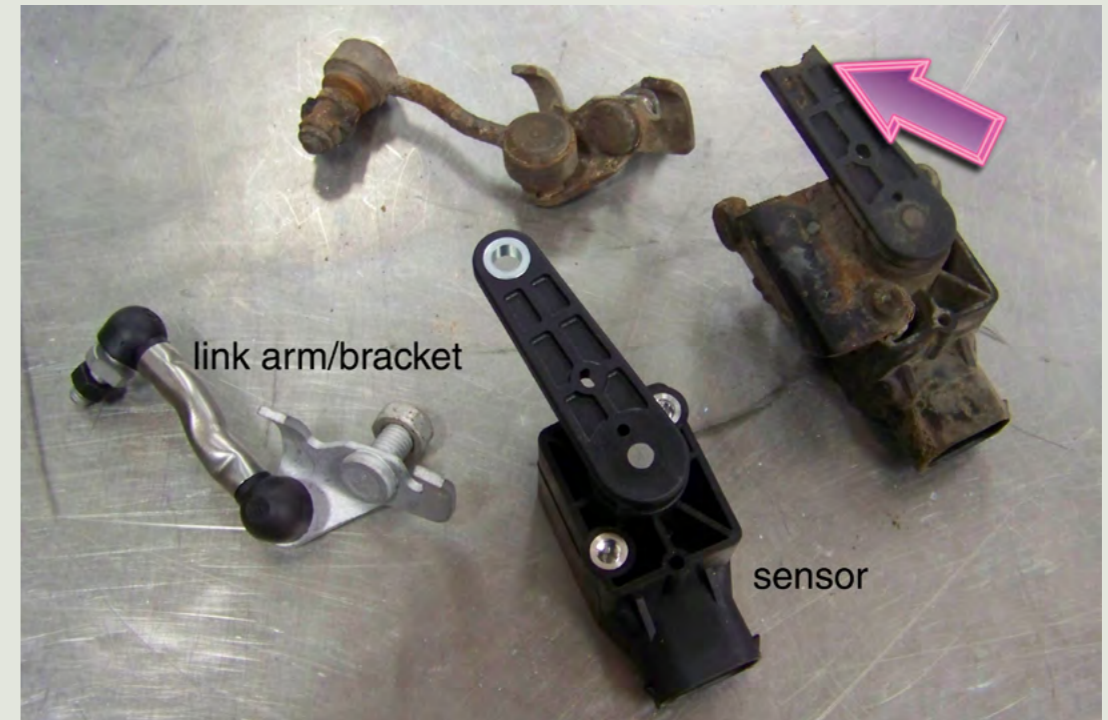


Step 3

Don't forget to unbolt the ride height sensor ([ES249205](#)) from the right control arm (on cars with self-leveling headlights).

Work carefully. Ten year old plastic can be very brittle; the pivot arms break very easily, as show by our photo (arrow).

If you need to replace the sensor, we suggest you order a new link arm ([ES66445](#)) to connect the sensor pivot arm to the suspension control arm.

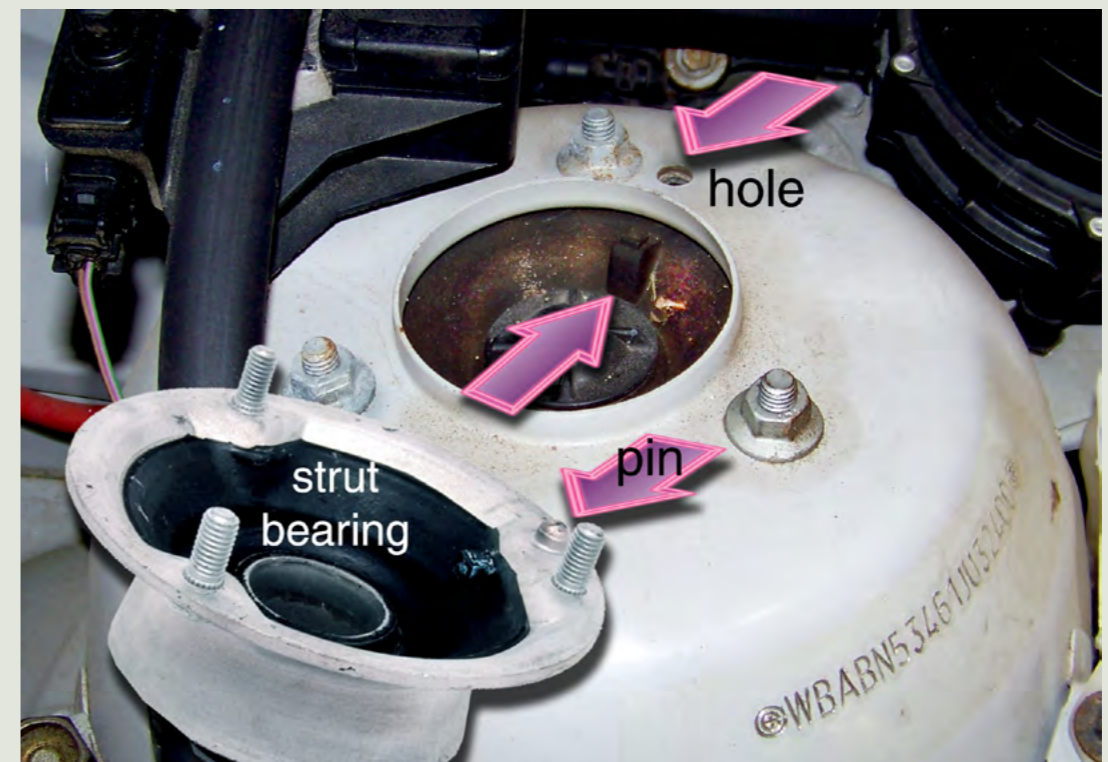


Step 4

New strut bearings come with a raised pin that indexes the mount in the strut tower. The pin aligns with a hole in the tower.

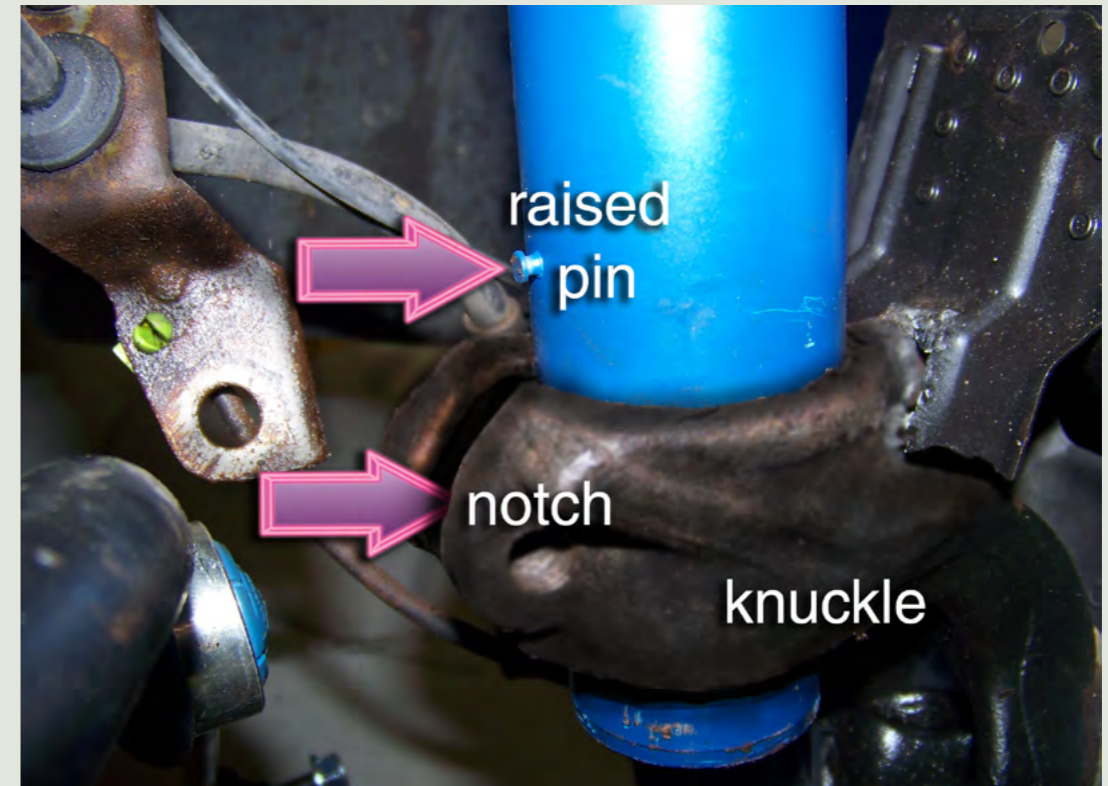
Old mounts may not have pins. If that is the case and you are reusing the old mounts, note how the raised boss on the mount rubber (arrow) points toward the hole in the strut tower (top arrow). Use this to index the mount when you reinstall it.

Service Tip: It is wise to check and adjust the wheel alignment after the suspension is installed and allowed to settle for a week or so. The strut tower has elongated slots for the mount studs that permit limited adjustment.



Step 5

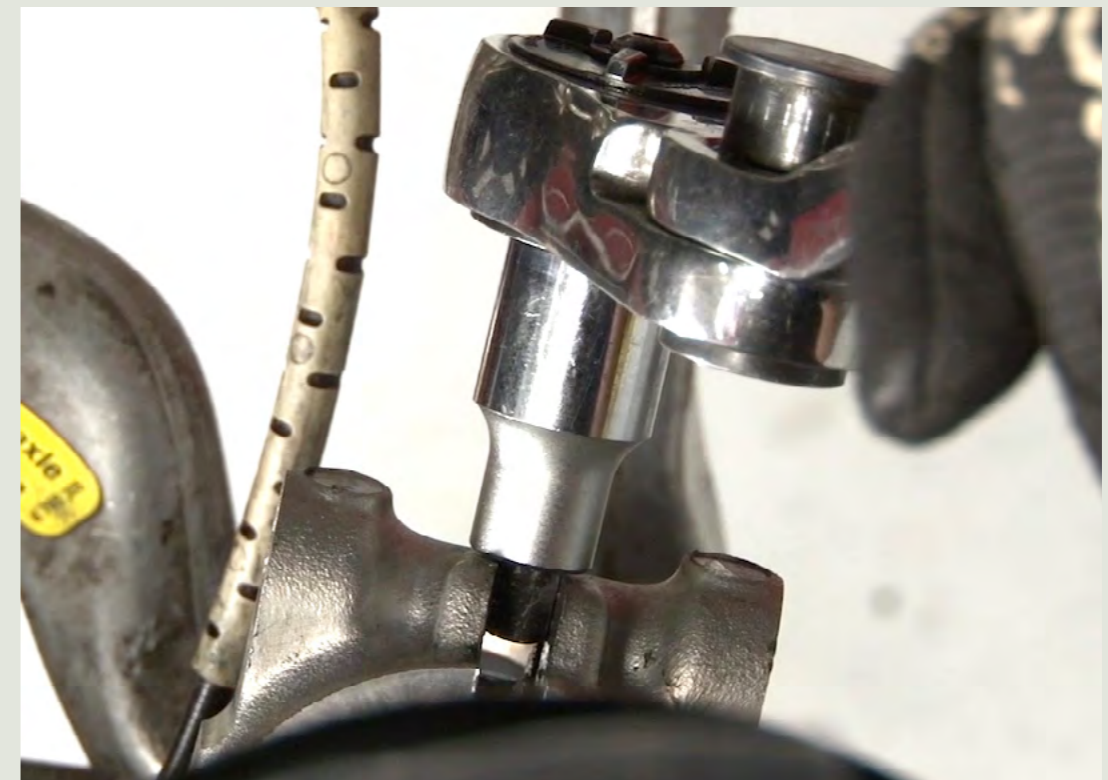
The front struts have raised pins that slide into a vertical notch at the back of the steering knuckle pinch collar. Make sure the pins are properly aligned with the slot as you slide the tube in place or it won't go into the knuckle.



Step 6

A knuckle spreader tool makes strut tube removal easier. After the pinch bolt is removed, insert the narrow face of the tool into the gap in the knuckle. Turn the tool 90 degrees with a ratchet to spread the knuckle pinch collar slightly. (We do not recommend forcing chisels or other metal wedges into the gap; doing so can stress and damage the knuckle.)

Service Tip: This tool ([ES3894](#)) works well on BMWs and other Euro-makes with a pinch collar strut mount front suspension.

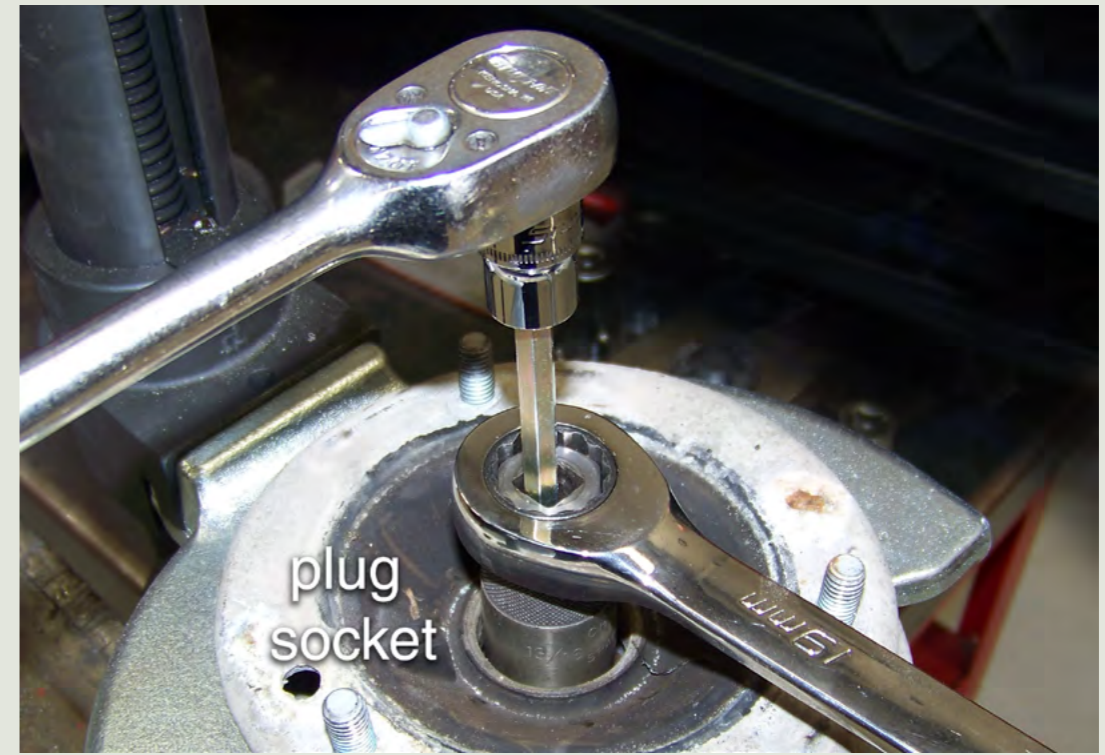


Step 7

The OE top strut shaft nut takes a 21mm socket. One way to remove and tighten it is to use a 13/16 spark plug socket with a 19mm external hex head and 6mm hex driver bit.

Hold the center shaft with the 6mm bit, then use a 19mm open end to turn the socket.

Service Tip: Using an impact can damage the strut.



Step 8

An alternative to the plug socket is a dedicated strut nut socket like this one. It takes a standard ratchet, and has a window cut in its side so you can insert a hex key.

Service Tip: Strut nut sockets are available in different sizes. It is common to see a 21mm nut on a factory strut and a different size nut (ours were 19mm) on an aftermarket replacement.



Step 9

Do not use an impact to loosen or tighten a strut nut on a strut you intend to put in service. The impact can spin the strut shaft and damage the strut internally.

Hold the shaft with a hex key, and torque the nut to specs.

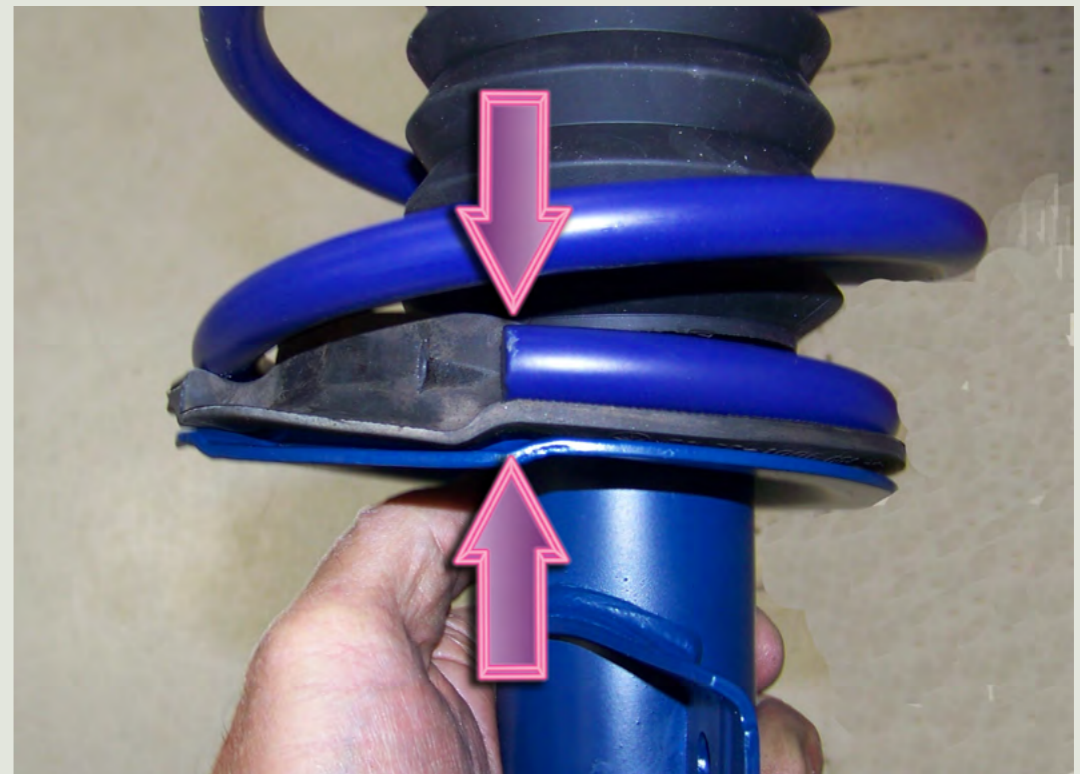
Service Tip: Take the guesswork out of fastener tightening with a Schwaben torque wrench from ECS Tuning. ([ES2221244](#) or [ES2221245](#))



Step 10

Original equipment springs have a **shaped** bottom coil that mirrors the shape of the oblong lower spring perch.

The H&R lowering spring has a **round** bottom coil. Align the end of the bottom coil over the step in the lower spring perch and cushion, as shown here.



Step 11

Align the top spring coil and upper strut cap/cushion as shown here.

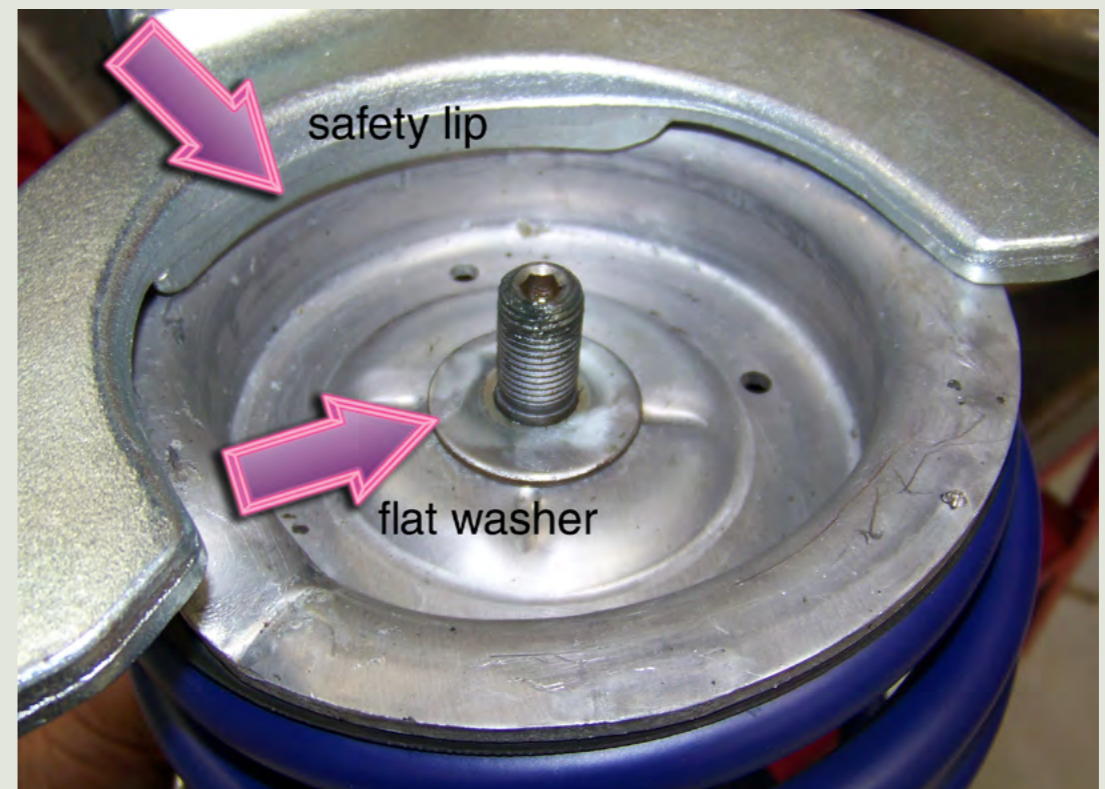
Service Tip: Some installers will choose to leave out the rubber spring cushions to lower the car an additional few millimeters. If you choose this approach, you may end up with a harder ride and suspension noise on some surfaces and possibly when steering.



Step 12

When using the spring compressor, make sure the spring cap is locked safely in the clamping jaw (upper arrow). The safety lip should penetrate into the cup so the spring can't shift. The lower clamping jaw safety lip should engage a spring coil in similar fashion.

Note the location of the flat washer on top of the spring cap (lower arrow). Don't forget it!



Step 13

There is a second washer at the base of the strut mount. It has a domed shape and fits over the roller bearing in the mount.

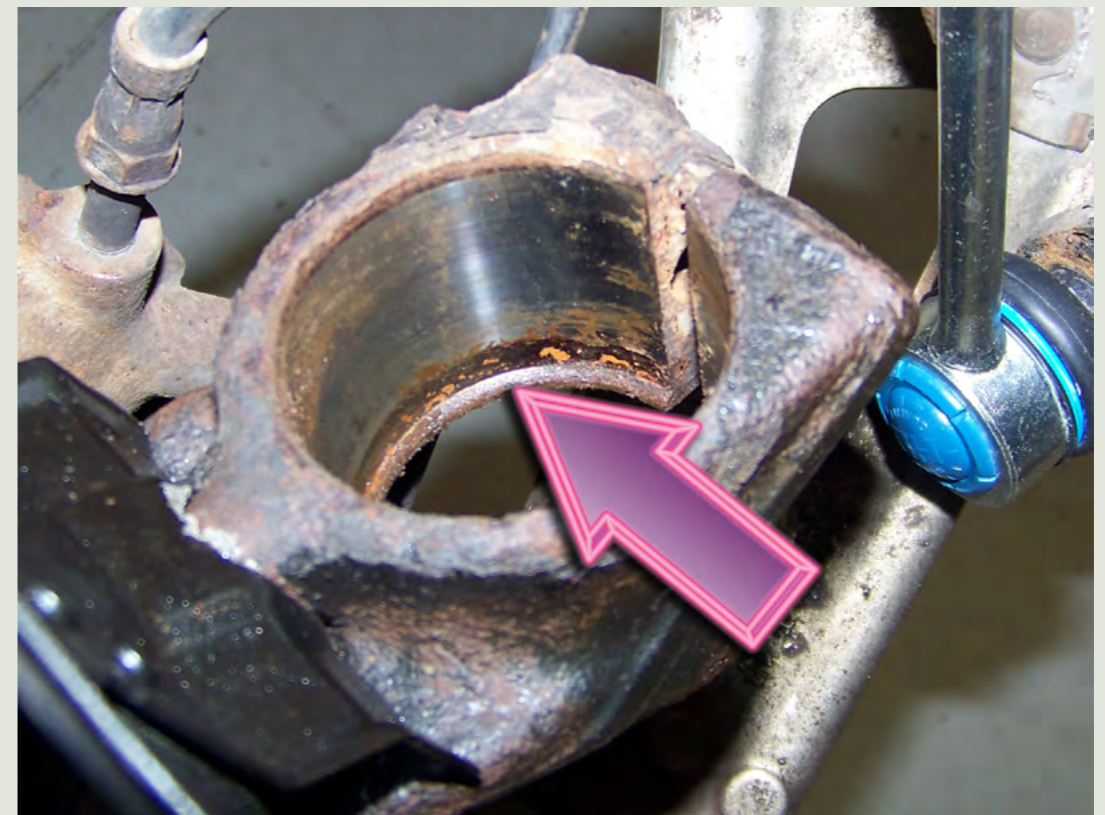
Service Tip: When the mount is flipped over and installed above the spring cap, this washer abuts the flat washer installed in the previous step.



Step 14

Before installing the strut tube into the knuckle, inspect the inside diameter of the pinch collar. Make sure it is clean and free of rust accumulations that would prevent the strut from seating on the ledge at the bottom of the collar.

Service Tip: If necessary, clean away scaly rust from the lower ledge (arrow); this is where the strut tube should ride.



Step 15

Apply vertical pressure to the base of the ball joint to push the control arm upward against the strut tube as you tighten the pinch bolt.



Step 16

If your strut cap has no alignment pin, use a tapered punch to align the strut cap with the mating hole in the strut tower. Then check the witness marks left by the strut mounting nuts to put the strut back to its initial settings. This will give you a base alignment setting until you can have the suspension geometry checked and adjusted.



Rear Springs Overview

Rear spring installation on the E46 is straightforward:

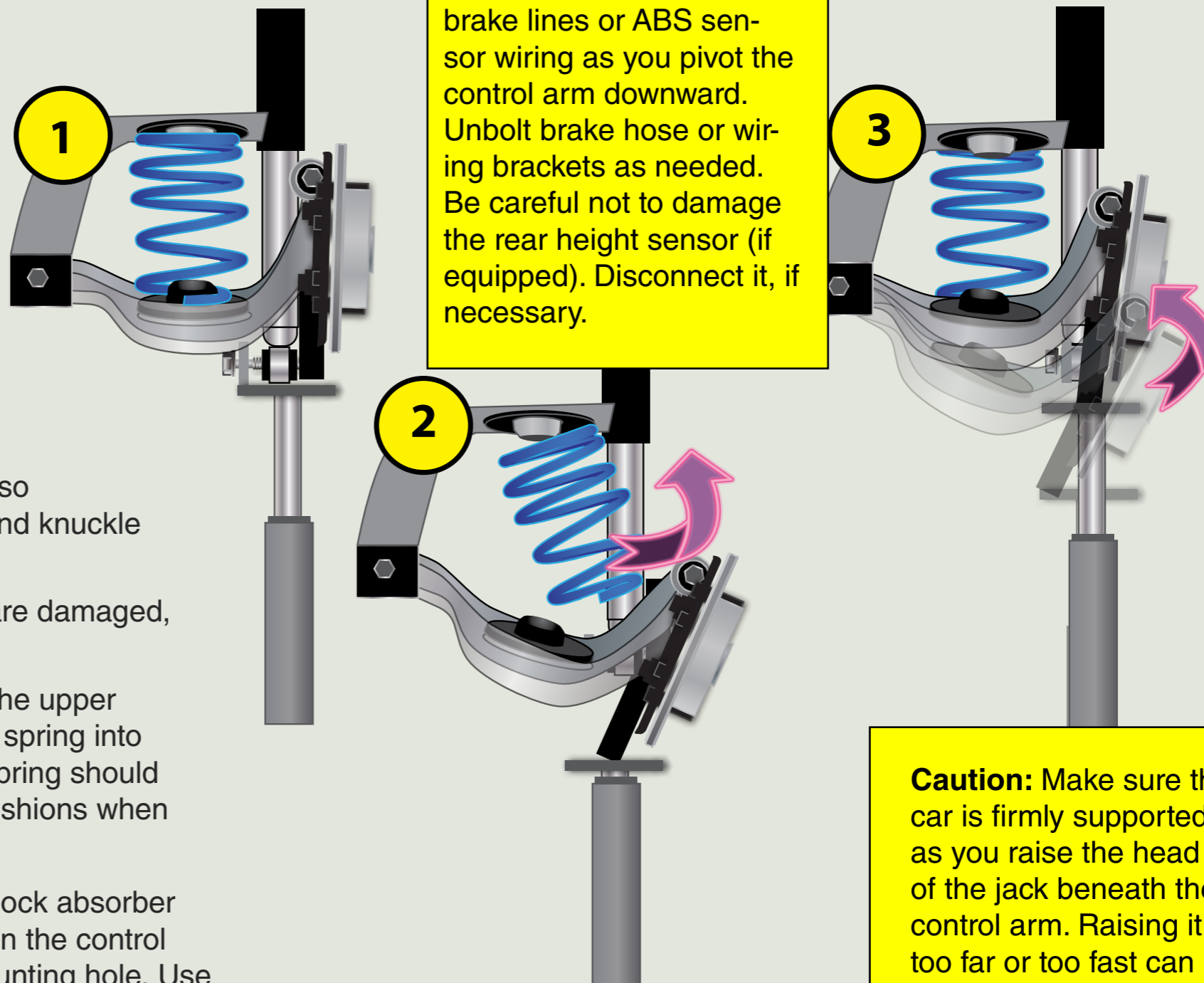
1) Position a hydraulic jack beneath the rear knuckle to keep it from falling too fast as you remove the lower shock bolt. Remove the shock bolt and lower the arm slowly until it stops.

2) Pry the control arm downward a little farther until you can lift the spring off its rubber cushion. Tip the spring slightly and remove it. (**Note:** A small bottle jack or screw jack can also be positioned between the chassis and knuckle to push the control arm downward.

Replace the spring cushions if they are damaged, cracked, etc.

Insert the top of the new spring into the upper cushion, then pivot the bottom of the spring into the lower control arm cushion. The spring should be centered in the top and bottom cushions when installed.

3) Raise the jack. Align the lower shock absorber bushing hole with the threaded hole in the control arm, then thread the bolt into the mounting hole. Use the jack to raise the control arm to its normal ride height, then torque the shock bolt to 100 Nm (74 ft-lb).



Caution: Do not stress brake lines or ABS sensor wiring as you pivot the control arm downward. Unbolt brake hose or wiring brackets as needed. Be careful not to damage the rear height sensor (if equipped). Disconnect it, if necessary.

Caution: Make sure the car is firmly supported as you raise the head of the jack beneath the control arm. Raising it too far or too fast can destabilize the car.

Step 1

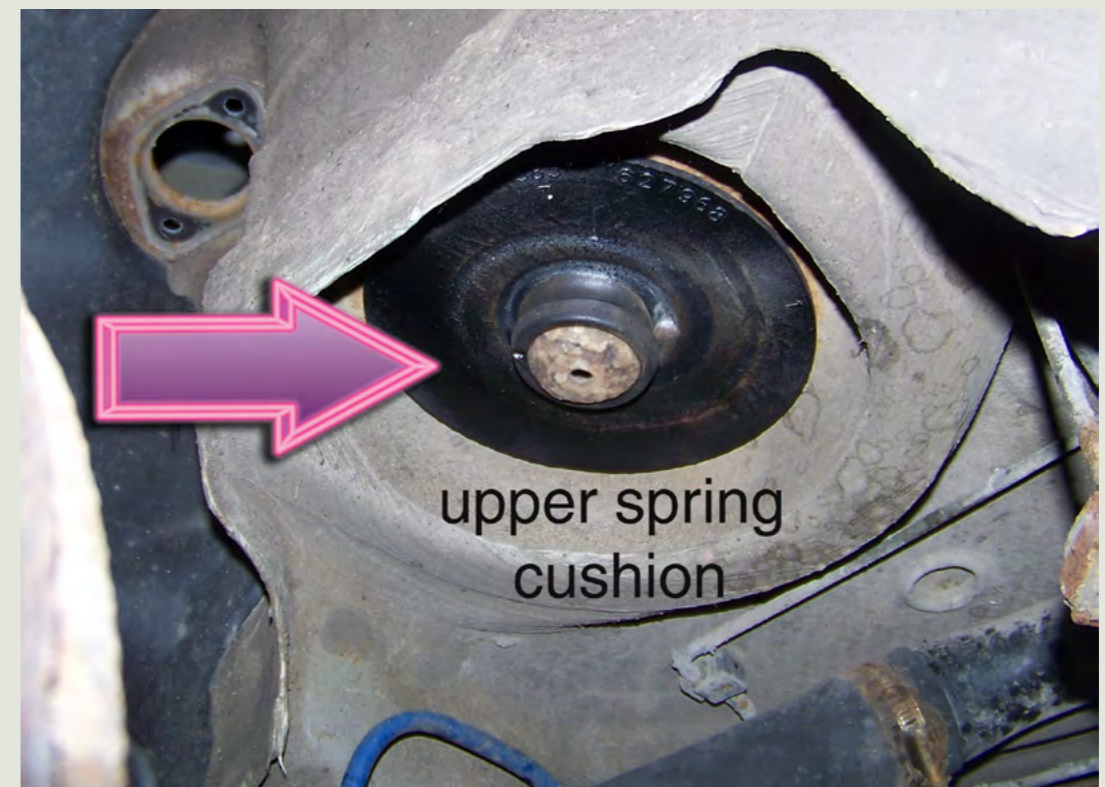
With the rear shock lower bolt removed, the control arm drops low enough to remove the old broken spring.



Step 2

Clean or replace the upper spring cushion. Note how the cushion fits over the raised centering boss on the chassis.

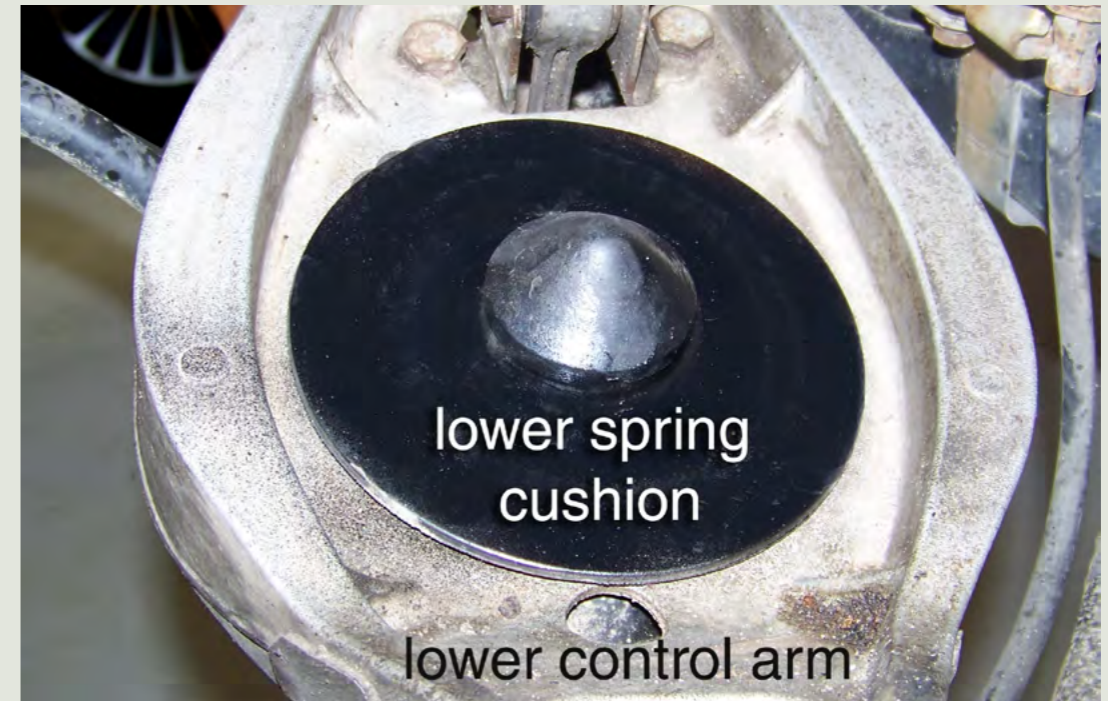
Service Tip: Removing the spring cushions will lower the car even more, but side effects may include suspension noise and a harsher ride.



Step 3

Clean or replace the lower spring cushion.

The lower cushion has a raised rubber centering boss.



Step 4

There are several ways to make extra room when installing the new spring. Since we are working on a lift, we'll insert a long pry bar as shown here, and lever the control arm downward to give us that extra inch or so we need to install the new spring.

Service Tip: Don't get too physical if your car is on jack stands. A small scissor jack or bottle jack may be a better option. Place it between the control arm and chassis and use it to push the arm downward gradually.

Service Tip: The control arm will move down more easily if you disconnect the rear stabilizer links.

Service Tip: Work carefully around the rear brake lines and cable. If necessary, unbolt the brake cable support bracket from the trailing arm. Keep an eye on the rear height sensor to prevent damaging it.



Rear Shocks

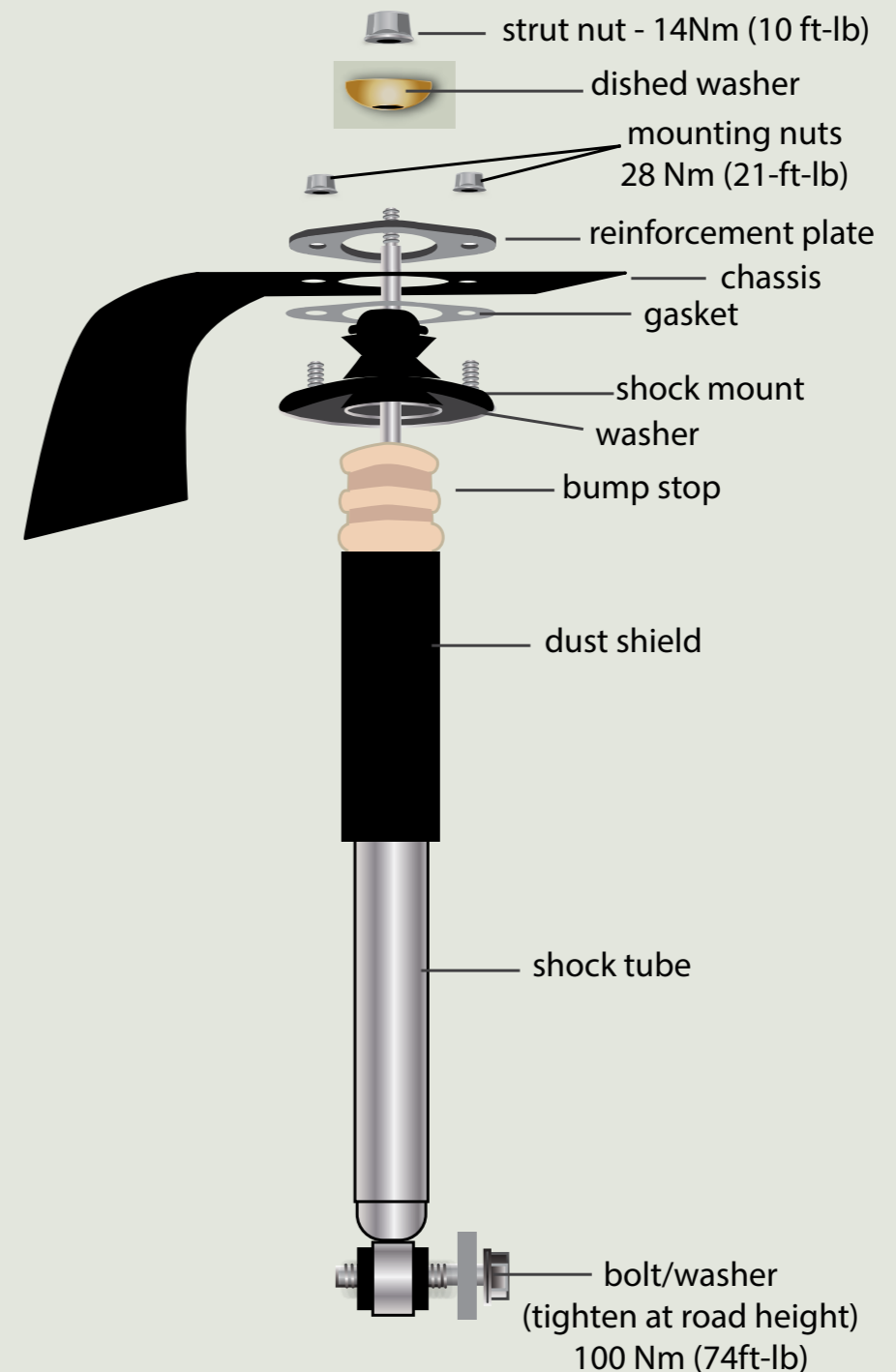
If you're installing new springs, it's a great time to bolt in a set of new rear shocks. (You already have the car raised and the lower shock bolts removed to install the rear springs.)

ECS Tuning sells rear strut mounts and reinforcement kits (see page 2 of this pdf). Installing steel reinforcement plates at the strut mounts strengthens the mount and reinforces the chassis. This helps prevent strut mount "blowout" that damages chassis metal.

Step 1



Open the trunk. Pull back the inner liners. Then pull back the rubberized insulation covering the upper shock mounts. (Be warned that this rubberized material may crumble from age when it is moved.)



This exploded view shows major rear shock components, their stacking order, and tightening torques.

Step 2

Use a 13mm socket and ratchet to remove the two 8mm self-locking nuts from the shock mount.

Service Tip: If you've already removed the lower shock bolt to install springs, have someone catch the old shock as it falls out.



Step 3

- Slide the new mount over the shock absorber shaft. Install the convex washer, cupped side facing up.
- Install a fresh self-locking nut on the threaded shaft. Hold the flats on the shaft with a wrench and torque the nut to spec. Do not use an impact.
- Install the shock mount gasket onto the strut mount as shown here. It will seal the mount to the chassis to prevent water from leaking into the trunk.



Step 4

- Slide the new mount assembly up through the chassis hole.
- Place the ECS Tuning reinforcement plate over the shock mount studs.
- Install fresh self-locking nuts on the mount studs, and torque them to specs.
- Reinstall the lower shock bolt at the rear knuckle and torque to specs.

Repeat this process on the opposite side.



Finishing Up

- Double check all fasteners for tightness.
- Check the operation of the self-leveling headlights (if equipped).
- Reinstall the road wheels and torque the lug bolts to specs.
- Drive the car. A week of normal driving is usually enough to settle the suspension before performing a wheel alignment or measuring for spacers.



Thanks!

For purchasing your springs and suspension components from ECS Tuning.

We appreciate your business and hope this tutorial has been useful and informative.

