

310 Front Suspension

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GENERAL

This repair group covers the repair and replacement of front suspension components.

See also:

- **300 Suspension, Steering and Brakes-General** for a general description of the suspension system
- **311 Front Axle Differential** for front drive components
- **320 Steering and Wheel Alignment** for ride height specifications

Front axle description

Most front axle components are made of aluminum. Weight and space are saved and front axle rigidity increased by the use of an aluminum reinforcement panel bolted to the front subframe. BMW specifies the following:

- Do not drive the vehicle with the front end reinforcement removed.
- When reinstalling the reinforcement panel after repairs, replace mounting fasteners with new.

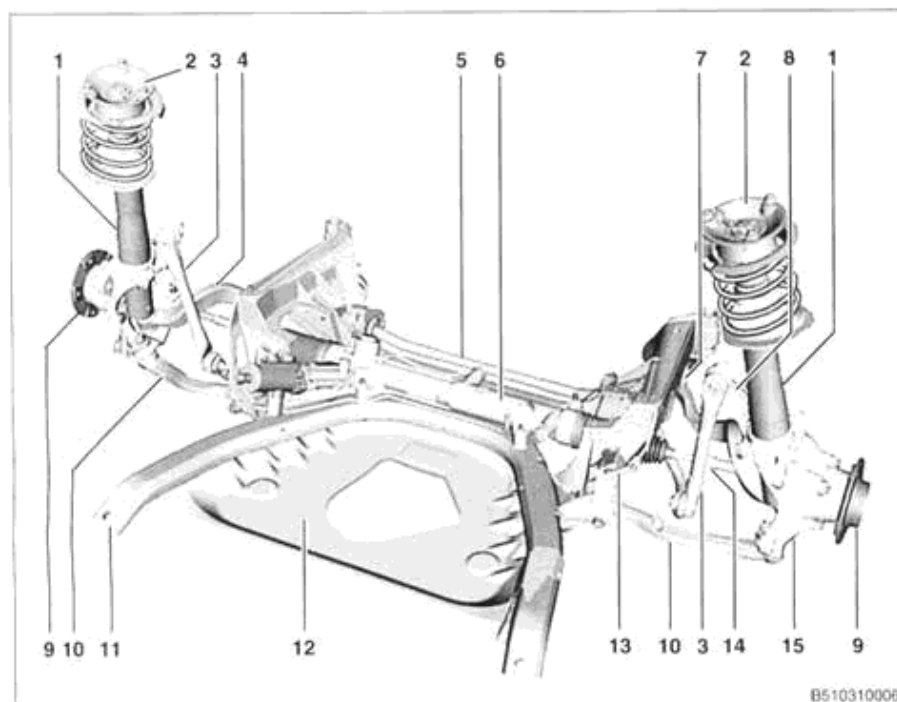
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Front suspension components (rear-wheel drive)

The suspension features double-pivot ball-joints at the base of each steering knuckle and a MacPherson strut at the top.

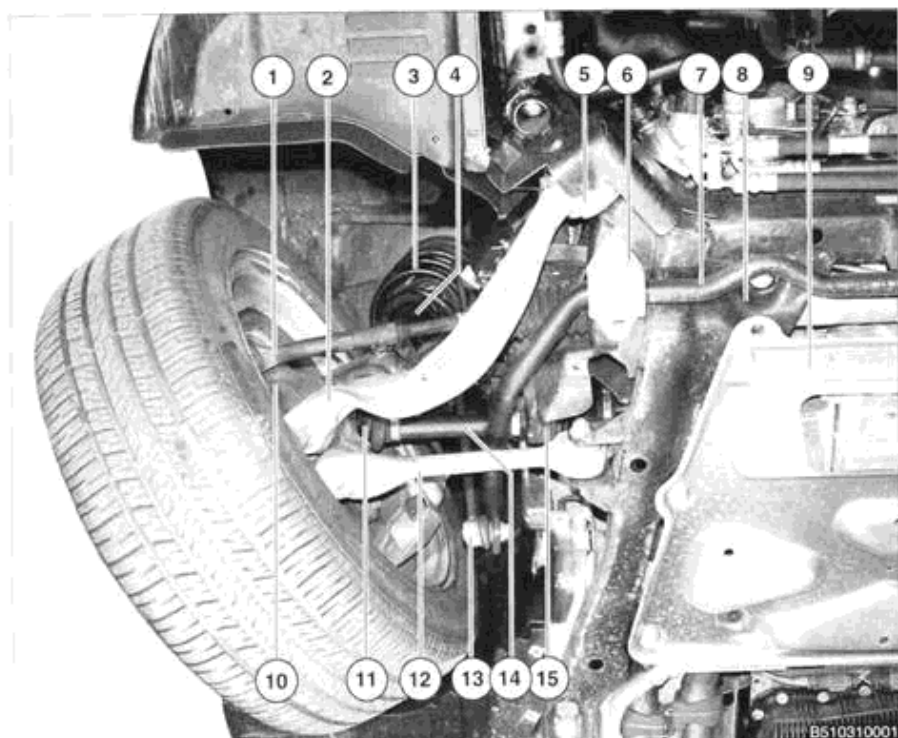
All models are equipped with rack-and-pinion steering. During wheel alignment, adjust toe at the tie rods. Correct camber by removing a locating pin on the strut top bearing and rotating the strut top inside the strut tower. See **320 Steering and Wheel Alignment**.

Front suspension components (rear-wheel drive)



1. Strut assembly
2. Strut top bearing
3. Stabilizer bar link
4. Tension strut
5. Stabilizer bar
6. Steering rack
7. Hydromount
8. Stabilizer link bracket
9. Wheel hub
10. Control arm
11. Front subframe (axle carrier)
12. Front end reinforcement
13. Ride level sensor
14. Steering tie rod
15. Steering knuckle (swivel bearing) and wheel bearing carrier

Front suspension components (xDrive)



1. Steering tie-rod
2. Tension strut
3. Coil spring
4. Strut tube
5. Hydromount
6. Stabilizer bar mount
7. Stabilizer bar
8. Front subframe
9. Front end reinforcement
10. Steering knuckle (swivel bearing) and wheel bearing carrier
11. Drive axle outer CV joint
12. Control arm
13. Stabilizer arm link
14. Drive axle
15. Drive axle inner CV joint

Front end reinforcement panel, removing and installing

- ▶ the aluminum front end reinforcement panel provides additional rigidity to the subframe (front axle carrier).

CAUTION—

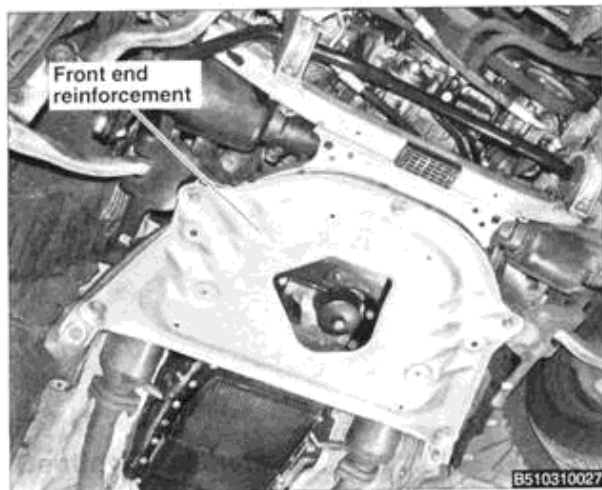
- Do not drive the vehicle with the front end reinforcement panel removed.

- Raise vehicle and support safely.

WARNING—

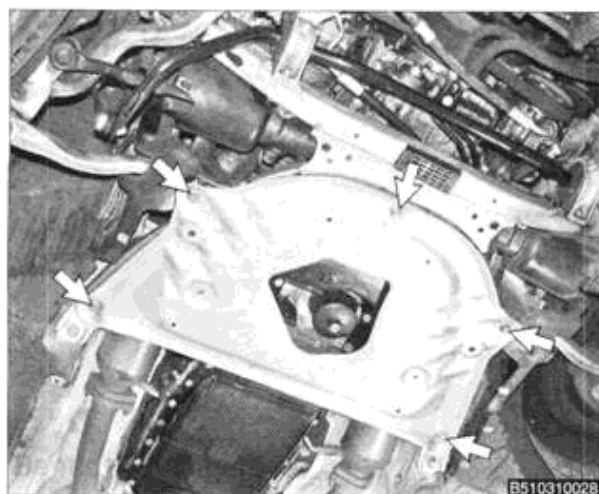
- Make sure the vehicle is stable and well supported at all times. Use a professional automotive lift or jack stands designed for the purpose. A floor jack is not adequate support.

- Remove underbody splash shields. See **020 Maintenance**.



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Strut tower brace, removing and installing



- Remove fasteners (**arrows**) and remove reinforcement panel.

- Installation is reverse of removal. Be sure to replace fasteners with new.

Tightening torque

Front end reinforcement panel to subframe
(replace M10 x 35 mm 10.9 grade ZNS bolts
with new):

- Stage 1
- Stage 2

56 Nm (41 ft-lb)
+ additional 90°

Strut tower brace, removing and installing

A strut tower brace in the engine compartment provide additional rigidity to the front suspension.

CAUTION—

- Do not drive the vehicle with strut tower brace removed.

- Working in engine compartment, detach wiring harness and remove upper and lower cabin microfilter housings on right and left. See **020 Maintenance**.

- If necessary, remove plastic strut tower covers. Remove plastic shield over strut tower brace at bulkhead.

- Remove strut tower brace fasteners (**arrows**) and lift off brace.

- When installing, replace bolts with new.



Tightening torque

Brace to strut tower or bulkhead
(use new M8 Torx bolts)

30.5 Nm (22 ft-lb)

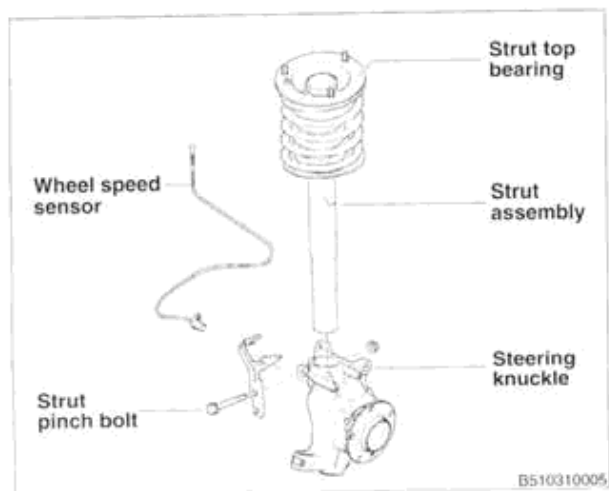
Warnings and Cautions

WARNING—

- Do not reuse self-locking fasteners. They are designed to be used only once and may fail if reused. Replace with new.
- Pentosin fluid (in active stabilizer hydraulic system) is injurious to skin and eyes. Wear protective gloves and eyewear.

CAUTION—

- Do not drive the vehicle with the front end reinforcement panel removed. See **Front end reinforcement panel, removing and installing** in this repair group.
- When reinstalling the panel after repairs, replace panel mounting fasteners with new.
- Due to the chemical and corrosion characteristics of aluminum, follow these precautions when working with aluminum components:
 - Do not bring into contact with battery acid.
 - Do not use wire brushes with brass or iron bristles. Only use brushes with stainless steel bristles.
 - Do not expose to flying sparks from grinding or cutting operations.
 - Do not subject to steel welding splashes.
 - Do not expose to temperatures over 80°C (176°F), even for short periods. Temperatures in painting facilities are not a problem.
- When filling or bleeding hydraulic system, do not allow contamination of fluid or reservoir.



FRONT STRUT ASSEMBLY

◀ The front suspension shock absorbers are MacPherson struts. The strut is a major component of the front suspension and supports the spring. Most strut assembly components are available as replacement parts.

If a shock absorber or strut is defective on one side of the vehicle, replace both shock absorbers on that axle. If a coil spring is broken due to corrosion, replace both coil springs on the axle.

Front strut, strut top bearing mount or spring replacement is a two-step procedure:

- Removal of strut assembly from vehicle.
- Disassembly and replacement of components on work bench.

Procedures for removal of the front strut assembly differ between rear-wheel drive and all-wheel drive (xDrive) models. Be sure to read the complete procedure before starting work.

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Front strut assembly, removing and installing (rear-wheel drive)

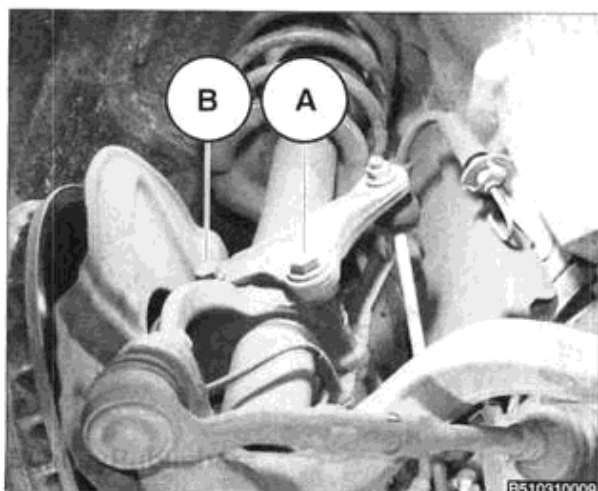
Front strut assembly, removing and installing (rear-wheel drive)

- Raise car and remove front wheel.

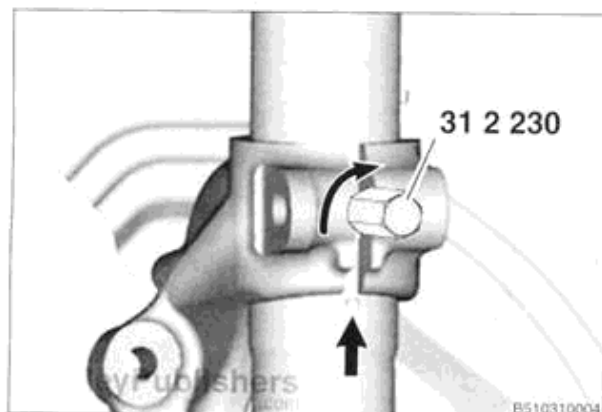
WARNING —

• Make sure the vehicle is stable and well supported at all times. Use a professional automotive lift or jack stands designed for the purpose. A floor jack is not adequate support.

- Detach front brake caliper from steering knuckle and suspend aside using stiff wire. Do not detach brake fluid hose. See **340 Brakes**.
- Remove brake rotor. See **340 Brakes**.
- Remove ABS wheel speed sensor from steering knuckle. See **340 Brakes**.
- Detach control arm and tension strut from steering knuckle. See **Front Suspension Arms** in this repair group.
- Detach tie rod end from steering knuckle. See **320 Steering and Wheel Alignment**.



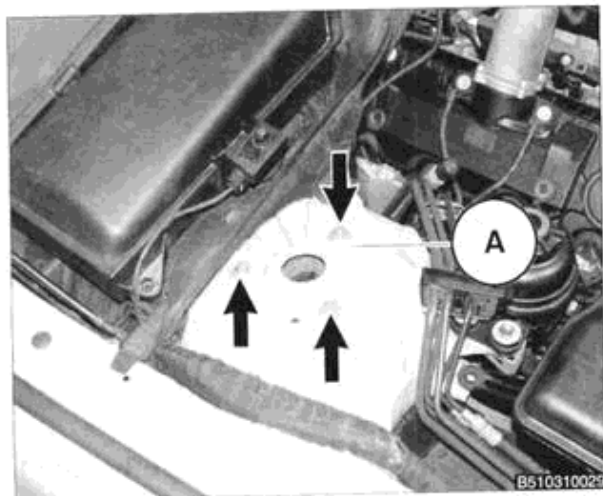
- ◀ Working at top of steering knuckle:
 - Remove strut pinch bolt (A) from upper steering knuckle.
 - Remove stabilizer link bracket bolt (B) and detach bracket from steering knuckle.



- ◀ If necessary, use BMW special tool 31 2 230 to spread (curved arrow) steering knuckle pinch collar. Slide steering knuckle downward to disengage from strut tube.
 - Note locating boss (arrow) for strut. During reassembly, boss slides in steering knuckle pinch collar gap.

Front Suspension 310-7

Front strut assembly, removing and installing (rear-wheel drive)



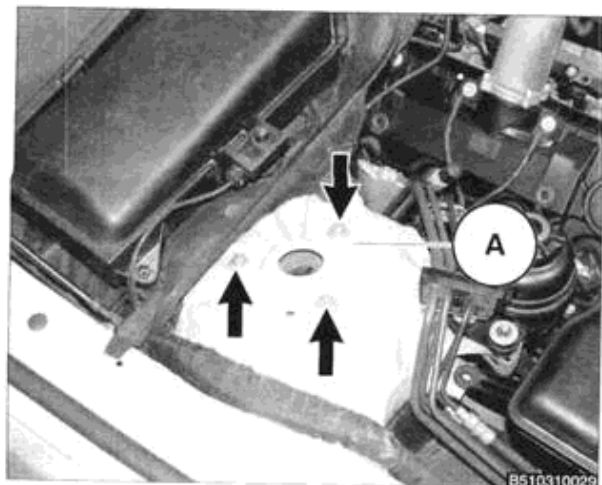
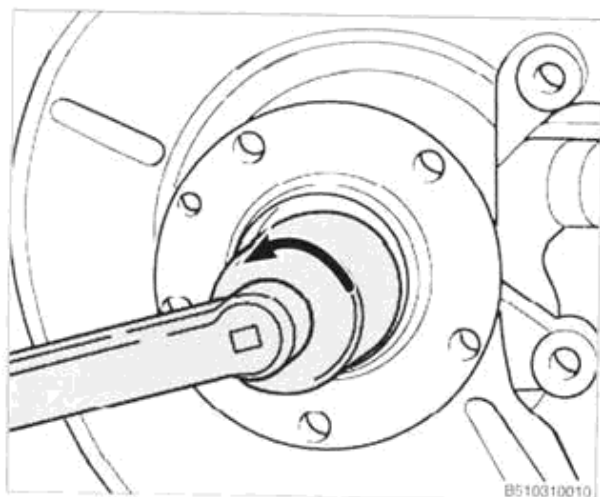
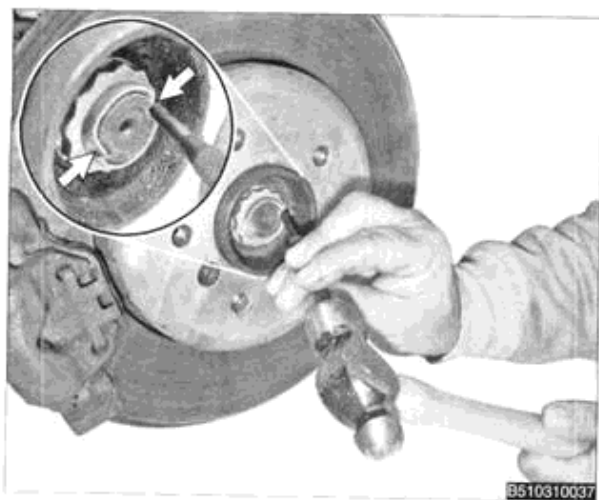
- Working in engine compartment at strut top bearing:
- Note position of strut centering pin (A). If centering pin is missing, mark position of strut top bearing studs on strut tower to maintain original camber.
 - Secure strut against falling out.
 - Remove strut top bearing fasteners (arrows).
- Lower strut out of wheel arch.
- If replacing strut, coil spring or strut top bearing, disassemble and reassemble strut assembly on bench. See **Front strut assembly, disassembling and assembling** in this repair group.
- Remainder of installation is reverse of removal. Note the following:
- Letter on strut tube designates mounting location. Struts are marked **R** for right and **L** for left.
 - Replace self-locking fasteners.
 - Strut top bearing without centering pin: Mount strut top to strut tower using marks made previously.
 - Make sure locating boss on strut tube slides in steering knuckle pinch collar gap.
 - Face strut pinch bolt head in direction of travel.
 - Make sure steering knuckle contacts stop on strut before tightening pinch bolt.
 - Clean wheel speed sensor bore hole and lubricate with Staburags® NBU 12/K or equivalent grease.
 - Align wheels when job is complete.

Tightening torques

Brake caliper to steering knuckle (replace M12 x 1.5 x 43 mm ZNS bolts with new)	110 Nm (81 ft-lb)
Brake rotor to wheel hub (replace M8 x 14 mm Allen bolt with new)	16 Nm (12 ft-lb)
Control arm to steering knuckle (replace M14 x 1.5 self-locking flange nut with new)	165 Nm (122 ft-lb)
Road wheel to hub	120 ± 10 Nm (89 ± 7 ft-lb)
Strut assembly pinch bolt (replace M12 x 100 mm 10.9 grade bolt with new)	81 Nm (60 ft-lb)
Strut top bearing to strut tower (replace M8 flanged nut with new)	34 Nm (25 ft-lb)
Tension strut to steering knuckle (replace M14 x 1.5 self-locking flange nut with new)	165 Nm (122 ft-lb)
Tie rod end to steering knuckle (replace M14 x 1.5 ZNS3 nut with new)	165 Nm (122 ft-lb)
Wheel speed sensor to steering knuckle	8 Nm (6 ft-lb)

310-8 Front Suspension

Front strut assembly, removing and installing (xDrive)



Front strut assembly, removing and installing (xDrive)

- Raise car and remove front wheel.

WARNING—

- Make sure the vehicle is stable and well supported at all times. Use a professional automotive lift or jack stands designed for the purpose. A floor jack is not adequate support.

- Using a suitable punch, straighten staked sides of wheel hub collar nut (arrows).

- With an assistant holding down brake pedal, remove collar nut and discard.

CAUTION—

- If necessary, reinstall road wheel and place vehicle on floor before breaking collar nut free.

- Detach front brake caliper from steering knuckle and suspend aside using stiff wire. Do not detach brake fluid hose. See **340 Brakes**.
- Remove brake rotor. See **340 Brakes**.
- Remove wheel speed sensor from steering knuckle. See **340 Brakes**. Detach sensor electrical harness from bracket on strut.
- Detach control arm and tension strut from steering knuckle. See **Front Suspension Arms** in this repair group.
- Detach tie rod end from steering knuckle. See **320 Steering and Wheel Alignment**.
- Detach stabilizer link from strut tube. Use Torx tool (T30) to counterhold shaft of stabilizer bar link ball joint while removing nut.
- Rotate steering knuckle to one side and use BMW special tools 32 2 200 or equivalent to press drive axle stub out of wheel bearing hub. Tie up drive axle end using stiff wire.

CAUTION—

- In order to avoid damaging drive axle threads, do not drive out stub axle using impact tool.

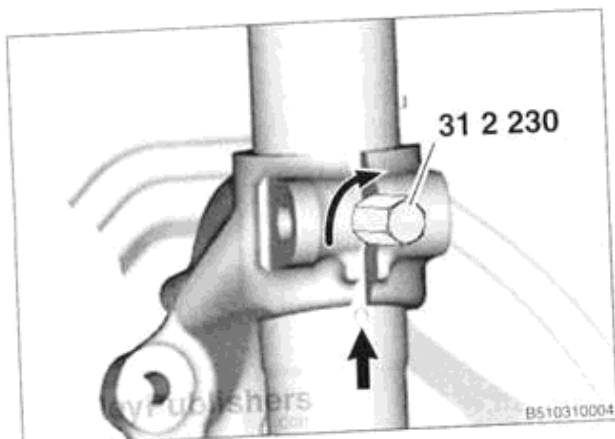
- Working at strut top bearing:

- Note position of strut centering pin (A). If centering pin is missing, mark position of strut top bearing studs on strut tower to maintain original camber.
- Support steering knuckle with floor jack to secure assembly against falling out.
- Remove strut top bearing fasteners (arrows).

- Lower strut and steering knuckle out of wheel arch.

Front Suspension 310-9

Front strut assembly, removing and installing (xDrive)



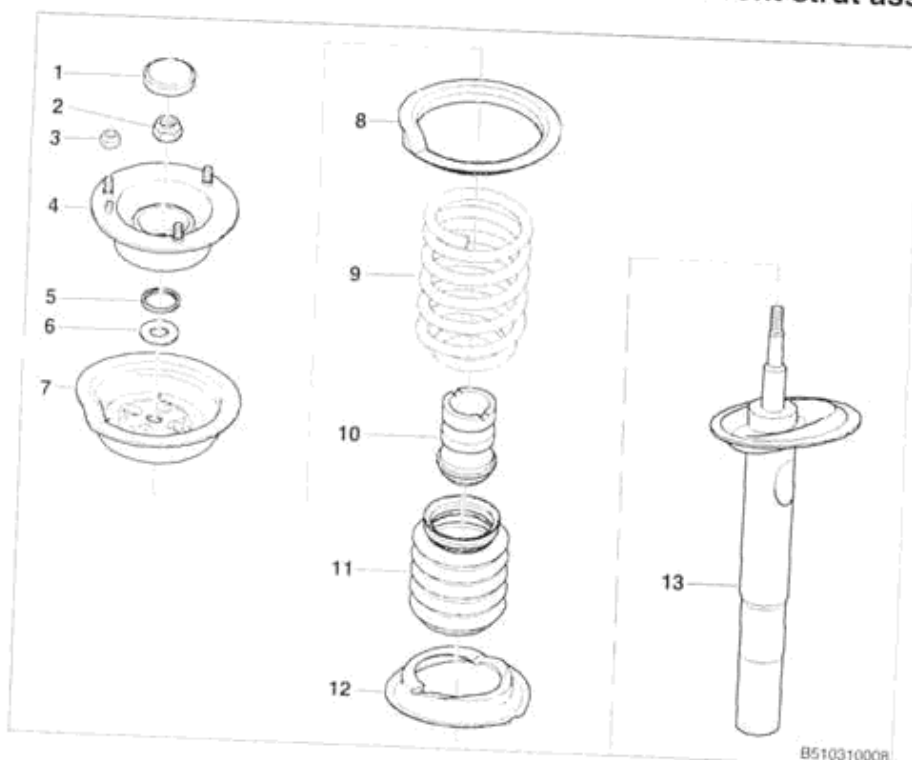
- Working at top of steering knuckle, remove strut pinch bolt.
- ◀ If necessary, use BMW special tool 31 2 230 to spread (**curved arrow**) steering knuckle pinch collar. Slide strut tube out of steering knuckle.
 - Note locating boss (**arrow**) for strut. During reassembly, boss slides in steering knuckle pinch collar gap.
- If replacing strut, disassemble and reassemble strut assembly on work bench. See **Front strut assembly, disassembling and assembling** in this repair group.
- Installation is reverse of removal. Note the following:
 - Letter on strut tube designates mounting location. Struts are marked **R** for right and **L** for left.
 - Make sure locating boss on strut tube slides in steering knuckle pinch collar gap.
 - Make sure steering knuckle contacts stop on strut before tightening pinch bolt. Face strut pinch bolt head in direction of travel.
 - Replace self-locking fasteners.
 - Strut top bearing without centering pin: Mount strut top to strut tower using marks made previously.
 - Use Torx tool (T30) to counterhold shaft of stabilizer bar link ball joint while tightening nut.
 - Clean ABS wheel speed sensor bore hole and lubricate with Staburags® NBU 12/K or equivalent grease.
 - Oil collar nut and wheel hub contact surfaces lightly. Do not allow oil to contaminate drive axle threads. Final tightening with wheel on ground. Stake collar nut after final tightening.
 - Align wheels when job is complete.

Tightening torques	
Brake caliper to steering knuckle (replace M12 x 1.5 x 43 mm ZNS bolts with new)	110 Nm (81 ft-lb)
Brake rotor to wheel hub (replace M8 x 14 mm Allen bolt with new)	16 Nm (12 ft-lb)
Control arm to steering knuckle (replace M14 x 1.5 self-locking flange nut with new)	165 Nm (122 ft-lb)
Drive axle to wheel hub (replace M27 x 1.5 collar nut with new)	420 Nm (310 ft-lb)
Road wheel to hub	120 ± 10 Nm (89 ± 7 ft-lb)
Stabilizer link to strut tube (replace M10 ZNS3 nut with new)	65 Nm (48 ft-lb)
Strut assembly pinch bolt (replace M12 x 1.5 x 80 mm ZNS3 bolt with new)	100 Nm (74 ft-lb)
Strut top bearing to strut tower (replace M8 flanged nut with new)	34 Nm (25 ft-lb)
Tension strut to steering knuckle ball joint (replace M14 x 1.5 self-locking flange nut with new)	165 Nm (122 ft-lb)
Tie rod end to steering knuckle (replace M14 x 1.5 ZNS3 nut with new)	165 Nm (122 ft-lb)
Wheel speed sensor to steering knuckle	8 Nm (6 ft-lb)

310-10 Front Suspension

Front strut assembly components

Front strut assembly components



1. Cap
2. Upper strut self-locking nut
 - Use new nut
 - Tighten to 64 Nm (47 ft-lb)
3. Strut top bearing mounting nut
 - Use new nut
 - Tighten to 34 Nm (25 ft-lb)
4. Strut top bearing
5. O-ring seal
6. Washer
7. Upper spring seat
8. Upper spring pad
9. Coil spring
10. Rubber bump stop
11. Dust boot
12. Lower spring pad
13. Strut with lower spring seat

Front strut assembly, disassembling and assembling

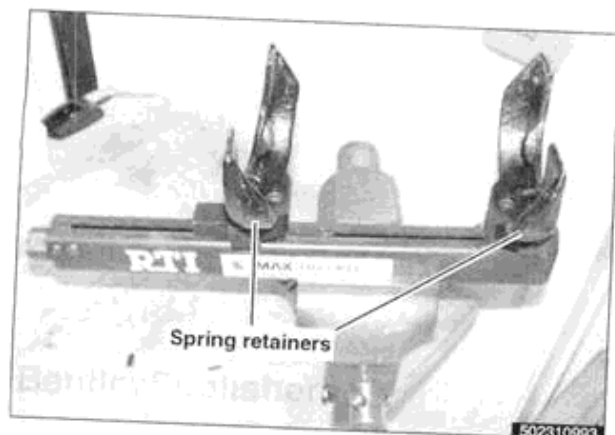
If replacing strut, upper strut mount or coil spring, first remove the strut assembly from the vehicle. See **Front strut assembly, removing and installing (rear-wheel drive)** or **Front strut assembly, removing and installing (xDrive)** in this repair group.

BMW recommends the use of BMW spring compressor (special tool 31 3 340). A number of different spring compressor tools are available. Photos in this section illustrate the function of one such tool in use.

WARNING—

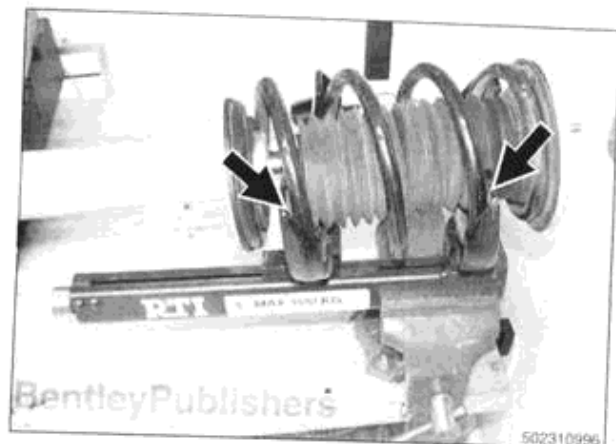
- Do not attempt to disassemble the strut assembly without a spring compressor designed specifically for this job.
- Prior to each use, check special tool for functionality.
- Do not use a damaged tool.
- Do not make any modifications to tool.
- Use correct size spring retainers when compressing coil spring.
- When assembling BMW spring compressor (special tool 31 3 340), make sure spring retainer plates are felt and heard snapping into place. Check seating of spring retainers carefully.

◀ Clamp spring compressor in shop vise.



Front Suspension 310-11

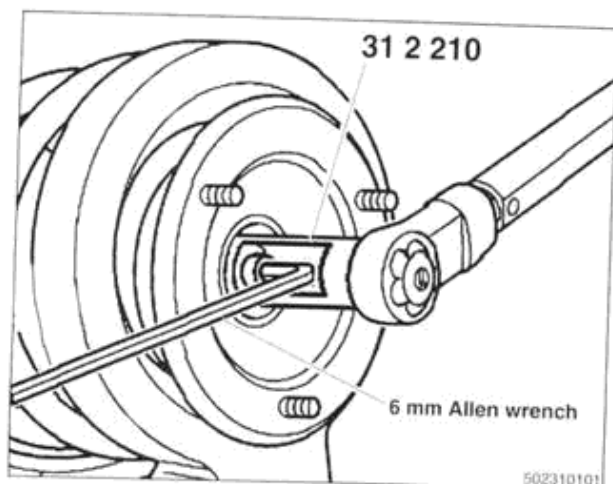
Front strut assembly, disassembling and assembling



- Position coil spring between spring retainers so that 3 coils lie between retainers (**arrows**). Compress spring.

WARNING—

- Make sure that when tensioned, the spring coil rests completely in the spring holder recess.
- Do not tighten or loosen spring compressor with an impact tool.
- Tighten down the coil spring until stress on the strut top bearing is relieved.
- Only loosen upper strut nut if spring coils are completely inserted in the spring holder grooves. If necessary, loosen compressor, reposition and recompress.



- Use BMW special tool 31 2 210 or equivalent to remove upper strut nut. Counterhold strut shaft using 6 mm Allen wrench.

CAUTION—

- Do not remove strut nut with impact tool.

- Remove upper strut bearing and related components.
- If a new coil spring is being installed, relieve tension on spring compressor and remove coil spring.
- Check strut dust boot, rubber stop and spring pads. Replace as necessary.
- Replace strut, upper strut mount or spring, as needed. If one spring is corroded or damaged, replace both springs as a matched pair.

- Reassemble components with spring held compressed.

- Use a new upper strut self-locking nut (**A**). Tighten nut fully before releasing spring compressor.
- Illustration shows a typical BMW strut assembly. 5 Series models are similar but not identical.

CAUTION—

- Do not tighten strut nut with impact tool.

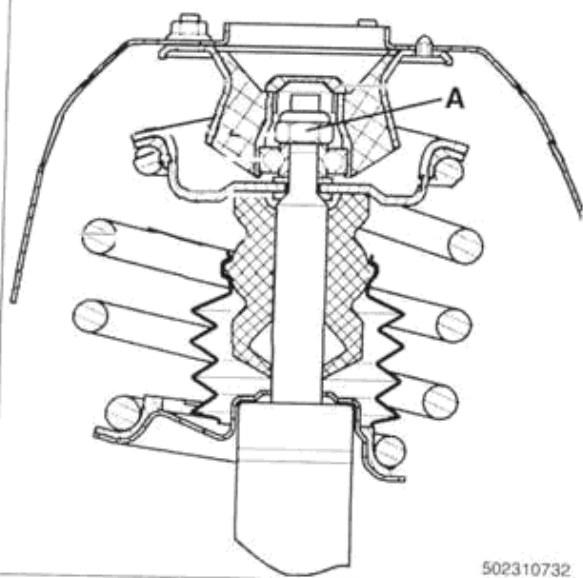
Tightening torques

Strut shaft to strut top bearing
(replace self-locking nut with new)

64 Nm (47 ft-lb)

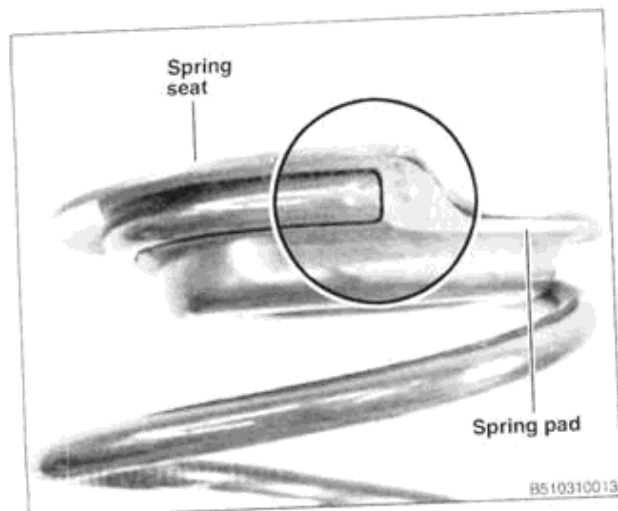
- Be sure coil spring ends and upper and lower spring pads are correctly installed to spring seats before releasing spring compressor. See following illustrations.

Front strut top



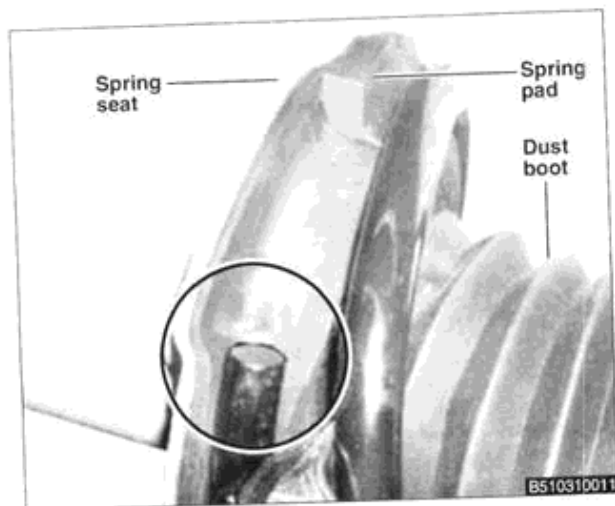
310-12 Front Suspension

Front strut assembly, disassembling and assembling



Upper coil spring end:

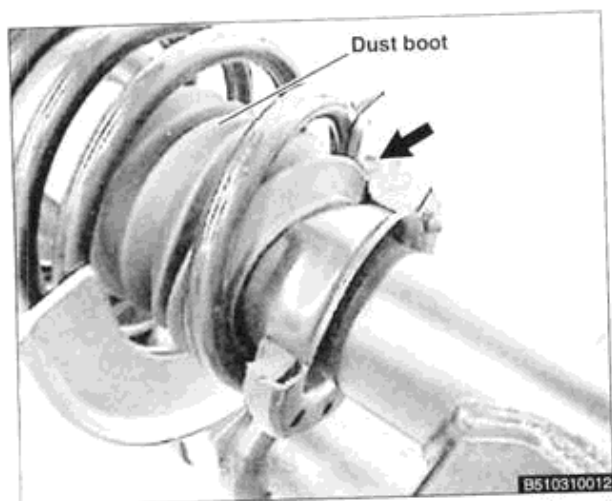
- Make sure spring pad aligns correctly with indentation in upper spring seat.
- Place coil spring end in spring pad stop (**inset**).



Rear-wheel drive lower coil spring end:

- Align lower end of coil spring (**inset**) to spring pad as illustrated.
- Check installation position of dust boot and correct folds if necessary.

Note that end of coil spring does not rest against shoulder of spring pad. Recess in pad serves to reinforce and correctly seat lower spring pad and does not serve as a stop for the spring end.



Drive lower coil spring end:

- Make sure spring end (**arrow**) rests on spring pad stop.
 - Check installation position of dust boot and correct folds if necessary.
- Release spring compressor carefully and evenly, allowing spring to expand slowly.
- Reinstall strut assembly in vehicle.
- Have vehicle professionally aligned when job is complete.

FRONT SUSPENSION ARMS

Control arms and tension struts are collectively known as suspension arms. Tension struts are sometimes called thrust arms or thrust rods.

Control arms and tension struts are attached to the front subframe through rubber bushings and to the steering knuckles by ball joints.

Note that steering wheel vibration during braking (usually at road speeds of 50 to 60 mph) may be caused by faulty suspension arm bushings, not out-of-true brake rotors.

Inspect ball joints for wear and looseness. Inspect bushings for wear or fluid leaks. On xDrive vehicles, the tension strut ball joint is available as a separate part. Otherwise, ball joints can only be replaced as part of an entire suspension arm assembly. Tension strut hydromount bushings are available as replacement parts. Replace bushings in pairs.

Special tools may be required to remove suspension arms and to replace bushings. Read the procedure through before beginning the job.

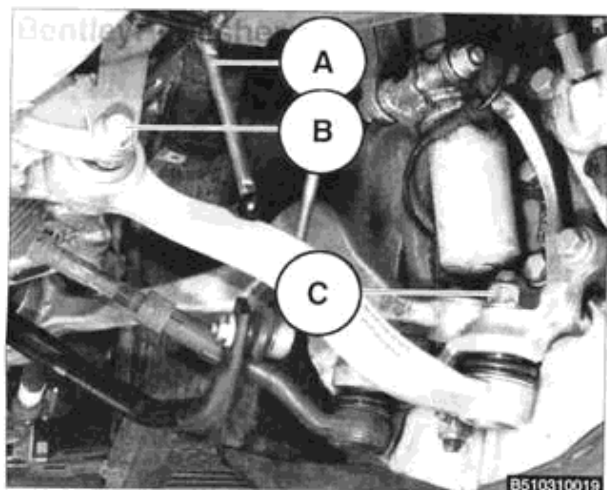
Control arm, removing and installing

- Raise car and remove front wheel.

WARNING —

- Make sure the vehicle is stable and well supported at all times. Use a professional automotive lift or jack stands designed for the purpose. A floor jack is not adequate support.

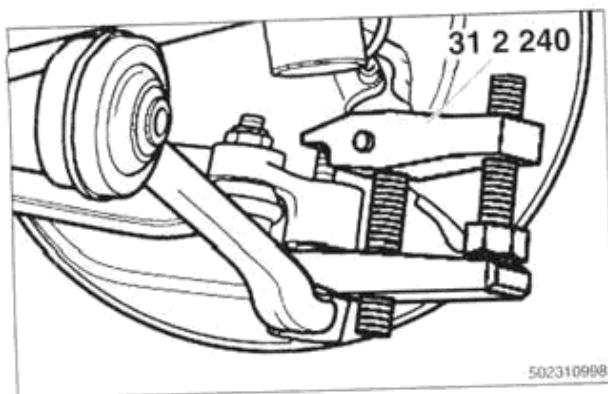
- Remove splash shield underneath vehicle front. See **020 Maintenance**.
- Remove suspension side splash shield screws (**insets**). Remove side splash shield.



- Working at control arm:
 - If equipped, detach ride height sensor link rod (**A**).
 - Remove control arm fastener (**B**) at subframe. Lightly tap mounting bolt out of subframe.
 - If necessary, counterhold ball joint shaft with Torx T40 socket while loosening ball joint nut (**C**).
 - xDrive: For space reasons, back off ball joint nut 3 - 4 threads before using special tool to break loose ball joint press fit.

310-14 Front Suspension

Tension strut, removing and installing (rear-wheel drive)



- ◀ Use BMW special tool 31 2 240 or equivalent to separate ball joint from steering knuckle.
- Inspect control arm ball joint and bushing. Replace both control arms if defects are found.
- Installation is reverse of removal. Remember to:
 - Make sure thread bores, bolts, nuts and mating surfaces are clean.
 - Install bushing end of control arm to subframe using new fasteners. Bolt head points to front of vehicle. Do not fully tighten nut at this time.
 - Install control arm ball joint to steering knuckle using new self-locking nut. Tighten fully.
 - If equipped, reattach ride height sensor link rod to control arm.
 - Install wheel and lower car.
 - Tighten bushing end of control arm to subframe with car on ground and loaded. Bounce suspension a few times before final tightening.
 - Use BMW scan tool to carry out steering angle sensor alignment.
 - Align wheels when job is complete.

Tightening torques

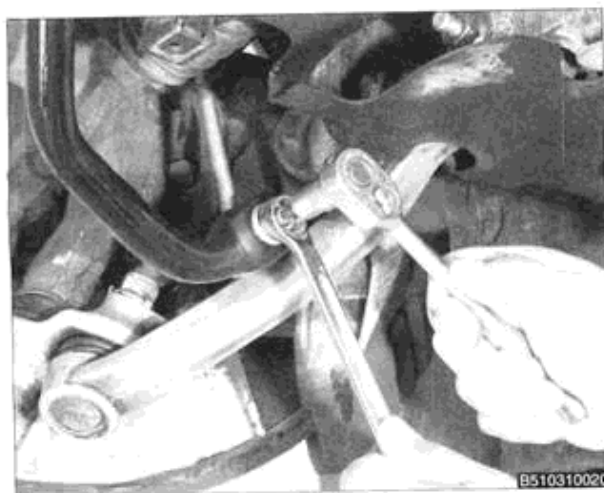
Control arm to steering knuckle (replace M14 x 1.5 self-locking flange nut with new)	165 Nm (122 ft-lb)
Control arm to subframe (replace M12 x 1.5 x 100 mm 10.9 grade bolt with new) • Stage 1 • Stage 2	100 Nm (74 ft-lb) additional 90° ± 15°
Road wheel to hub	120 ± 10 Nm (89 ± 7 ft-lb)

Tension strut, removing and installing (rear-wheel drive)

- Raise car and remove wheel.

WARNING —

- Make sure the vehicle is stable and well supported at all times. Use a professional automotive lift or jack stands designed for the purpose. A floor jack is not adequate support.



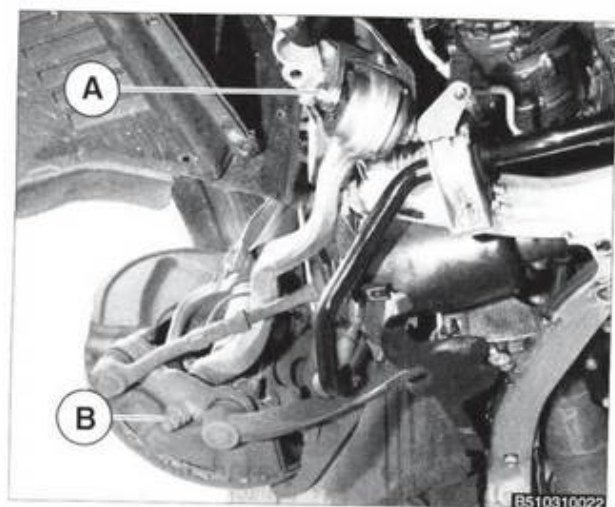
- Remove splash shield underneath vehicle front. See **020 Maintenance**.
- ◀ Detach stabilizer link from stabilizer bar. Use Torx tool (T30) to counterhold shaft of stabilizer bar link ball joint while loosening nut.
- Detach control arm from steering knuckle. See **Control arm, removing and installing** in this repair group.

Front Suspension 310-15

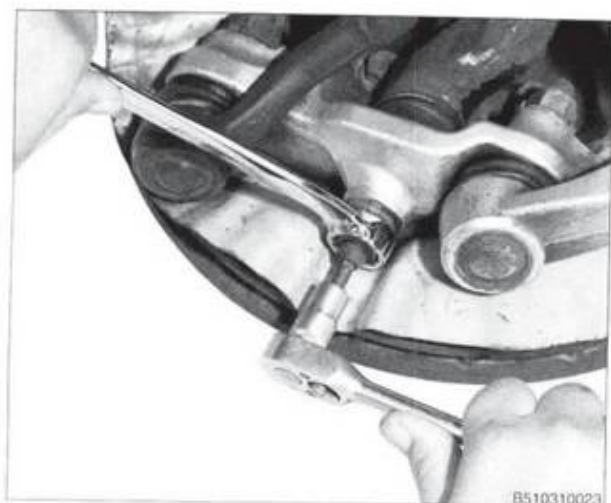
Tension strut, removing and installing (rear-wheel drive)

Working at tension strut:

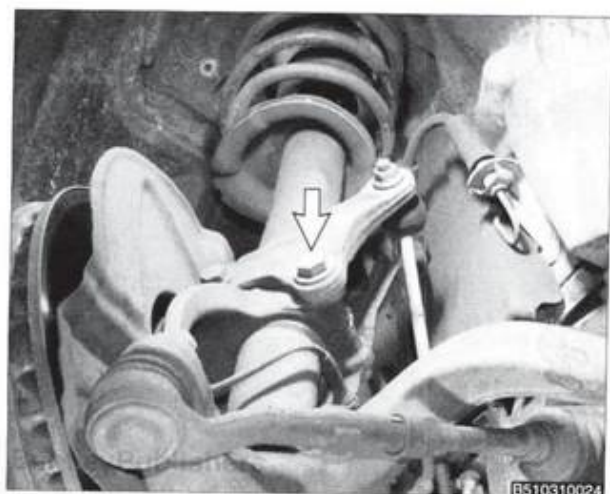
- Remove tension strut bushing fastener (A). Lightly tap tension strut bushing bolt out of front subframe.
- Remove tension strut ball joint nut (B).



If necessary, counterhold ball joint shaft with Torx tool (T40) while loosening ball joint nut.

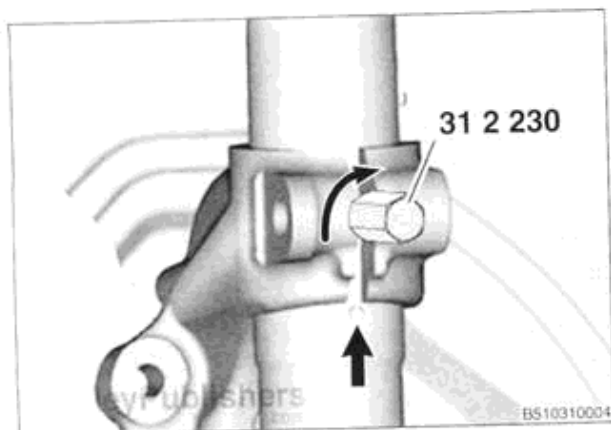


Support steering knuckle using floor jack. Working at top of steering knuckle, remove strut pinch bolt (arrow).



310-16 Front Suspension

Tension strut, removing and installing (rear-wheel drive)



- ◀ If necessary, use BMW special tool 31 2 230 to spread (**curved arrow**) steering knuckle pinch collar. Slide strut tube out of steering knuckle approx. 1 inch (2.5 cm).
 - Note locating boss (**arrow**) for strut. During reassembly, boss slides in steering knuckle pinch collar gap.
- Detach tension strut ball joint from steering knuckle and remove tension strut.
- Inspect torsion strut ball joint and bushing.
 - If ball joint is defective, replace both torsion struts.
 - If bushing is defective, replace both bushings, but this may only be done once per torsion strut. See **Tension strut bushing, replacing** in this repair group.
- Installation is reverse of removal
 - Make sure thread bores, bolts, nuts and mating surfaces are clean.
 - Install bushing end of tension strut to subframe using new fasteners. Do not fully tighten nut at this time.
 - Install tension strut ball joint to steering knuckle using new self-locking nut. Tighten fully.
 - Slide steering knuckle up in strut tube and tighten pinch bolt. Make sure steering knuckle contacts stop on strut before tightening pinch bolt. Face strut pinch bolt head in direction of travel.
 - Use Torx tool (T30) to counterhold shaft of stabilizer bar link ball joint while tightening nut.
 - Install wheel and lower car.
 - Tighten bushing end of tension strut to subframe with car on ground and loaded. Bounce suspension a few times before final tightening.
 - Use BMW scan tool to carry out steering angle sensor alignment.
 - Align wheels when job is complete.

Tightening torques

Control arm to steering knuckle (replace M14 x 1.5 self-locking flange nut with new)	165 Nm (122 ft-lb)
Road wheel to hub	120 ± 10 Nm (89 ± 7 ft-lb)
Stabilizer link to stabilizer bar (replace M10 ZNS3 nut with new)	65 Nm (48 ft-lb)
Strut assembly pinch bolt (replace M12 x 100 mm 10.9 grade bolt with new)	81 Nm (ft-lb)
Tension strut to steering knuckle (replace M14 x 1.5 self-locking flange nut with new)	165 Nm (122 ft-lb)
Tension strut to subframe (replace M12 x 1.5 x 100 mm 10.9 grade bolt with new) • Stage 1 • Stage 2	100 Nm (74 ft-lb) additional 90°

Tension strut, removing and installing (xDrive)

- Raise car and remove wheel.

WARNING —

- Make sure the vehicle is stable and well supported at all times. Use a professional automotive lift or jack stands designed for the purpose. A floor jack is not adequate support.

- Remove splash shield underneath vehicle front. See **020 Maintenance**.
- If equipped, detach ride height sensor link rod from tension strut.

▲ Working at tension strut:

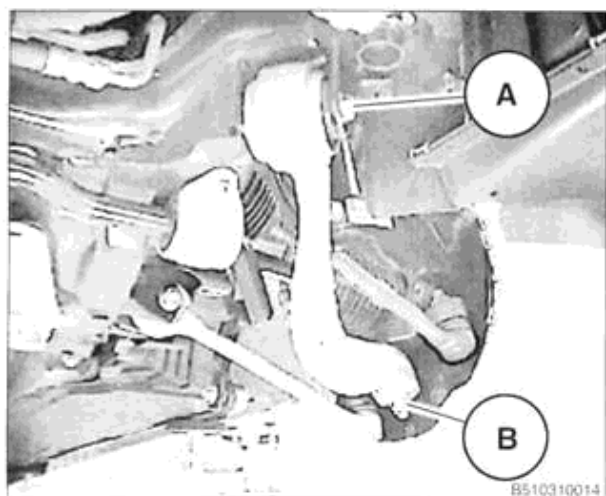
- Remove torsion strut bushing fastener (A).
- Remove ball joint nut. If necessary, counterhold ball joint shaft with Torx tool while loosening nut.
- Use ball joint press tool BMW special tool 31 2 240 or equivalent to separate tension strut from steering knuckle.

- Inspect torsion strut ball joint and bushing.

- If ball joint is defective, replace ball joint. See **Tension strut ball joint, replacing (xDrive)** in this repair group.
- If tension strut bushing is defective, replace both bushings, but this may only be done once per torsion strut. See **Tension strut bushing, replacing** in this repair group.

- Installation is reverse of removal

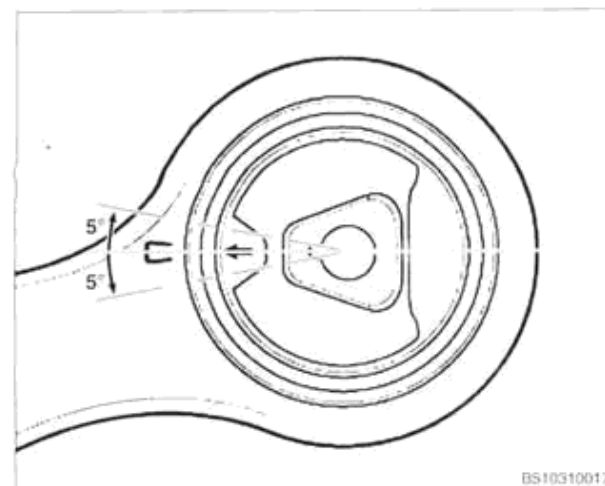
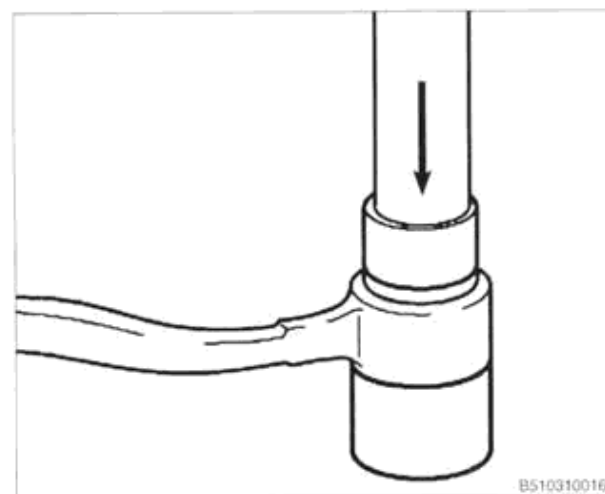
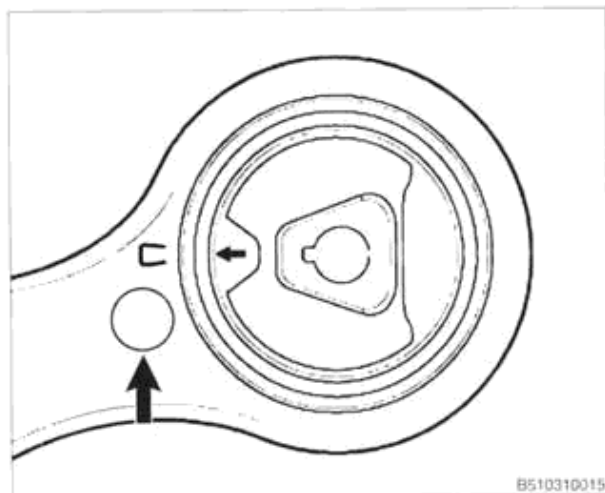
- Make sure thread bores, bolts, nuts and mating surfaces are clean.
- Install bushing end of tension strut to subframe using new fasteners. Do not fully tighten nut at this time.
- Install tension strut to steering knuckle ball joint using new self-locking nut. Tighten fully.
- Install wheel and lower car.
- Tighten bushing end of tension strut to subframe with car on ground and loaded. Bounce suspension a few times before final tightening.
- Use BMW scan tool to carry out steering angle sensor alignment.
- Align wheels when job is complete.

**Tightening torques**

Road wheel to hub	120 ± 10 Nm (89 ± 7 ft-lb)
Strut assembly pinch bolt (replace M12 x 1.5 x 80 mm ZNS3 bolt with new)	100 Nm (74 ft-lb)
Tension strut to steering knuckle ball joint (replace M14 x 1.5 self-locking flange nut with new)	165 Nm (122 ft-lb)
Tension strut to subframe (replace M12 x 1.5 x 100 mm 10.9 grade bolt with new)	100 Nm (74 ft-lb) additional 90°
• Stage 1	
• Stage 2	

310-18 Front Suspension

Tension strut bushing, replacing



Tension strut bushing, replacing

Replace tension strut bushings in pairs. Bushing may only be replaced once on a tension strut.

- Raise car and remove wheel.

WARNING—

- Make sure that the car is firmly supported on jack stands designed for the purpose. Place jack stands underneath structural chassis points. Do not place jack stands under suspension parts.

- Rear-wheel drive: Test tension strut ball joint. If defective, replace both tension struts. If ball joint is ok, proceed with bushing replacement procedure.
- Remove tension strut. See **Tension strut, removing and installing (rear-wheel drive)** or **Tension strut, removing and installing (xDrive)** in this repair group.

- Check circled area (arrow) of tension strut for punch mark:
 - If strut was previously punch-marked, replace both tension struts.
 - If not, punch mark strut to indicate bushing replacement.
- Using a service press and appropriate press tools, press bushing out of tension strut.

CAUTION—

- Make sure press tools are exactly flush with walls of bushing bore.

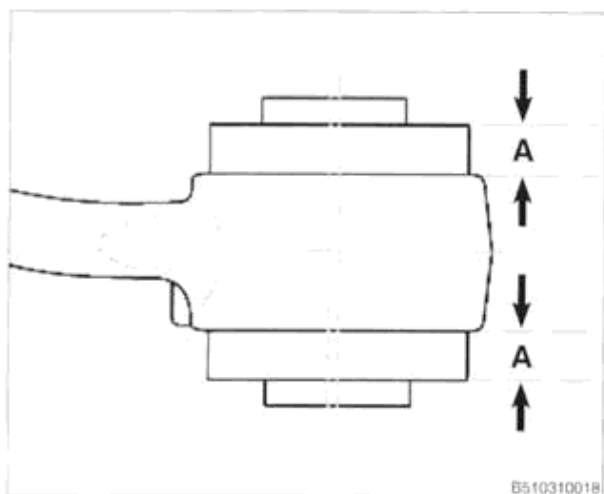
- Make sure bushing bore and new bushing are clean and grease-free.

- Press in new bushing. Make sure mark on bushing (small arrow) is aligned with mark on tension strut. Maximum deviation allowed = $\pm 5^\circ$.

CAUTION—

- To avoid damaging the new bushing, press only on the outer steel sleeve during installation.

Tension strut ball joint, replacing (xDrive)



- Press bushing in so it protrudes equally (dimension **A**) from both sides of tension strut.
- Install tension strut. See **Tension strut, removing and installing (rear-wheel drive)** or **Tension strut, removing and installing (xDrive)** in this repair group.

CAUTION—

- Tighten the tension strut bushing through-bolt to its final torque only with the vehicle on the ground and the suspension loaded.

Tension strut ball joint, replacing (xDrive)

- Raise car and remove wheel.

WARNING—

- Make sure that the car is firmly supported on jack stands designed for the purpose. Place jack stands underneath structural chassis points. Do not place jack stands under suspension parts.

- Detach tension strut from ball joint. See **Tension strut, removing and installing (xDrive)** in this repair group.

- Remove ball joint mounting bolts (**A**).

- Remove ball joint from steering knuckle. If necessary, use slide hammer to drive ball joint out of seat.

CAUTION—

- Do not reuse ball joint once it has been forcibly removed from steering knuckle.

- Install new ball joint using new self-locking bolts.

Tightening torque

Ball joint to steering knuckle (replace M10 x 20 mm 10.9 grade ZNS self-locking bolts with new)	60 Nm (44 ft-lb)
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- Attach tension strut to ball joint using new self-locking nut.

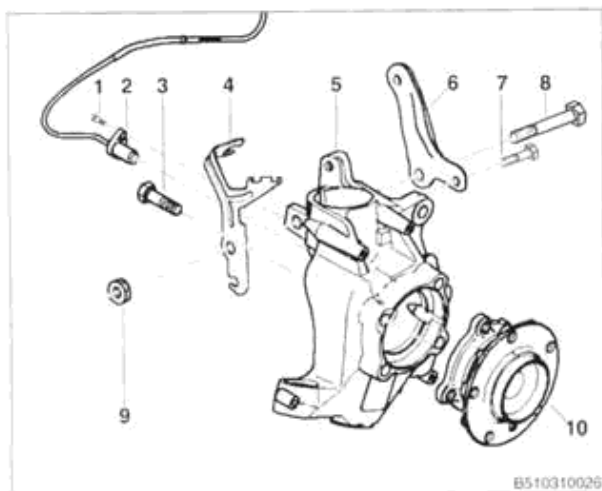
Tightening torque

Tension strut to steering knuckle ball joint (replace M14 x 1.5 self-locking flange nut with new)	165 Nm (122 ft-lb)
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310-20 Front Suspension

Steering knuckle components (rear-wheel drive)



STEERING KNUCKLE AND FRONT WHEEL BEARING

The steering knuckle (also called swivel bearing) serves as the outboard attachment point for the suspension arms and as the wheel hub / wheel bearing carrier. The wheel bearings are permanently sealed and require no maintenance.

Steering knuckle components (rear-wheel drive)

◀ The wheel bearing and hub assembly is bolted to the steering knuckle.

1. M6 x 16 mm 8.8 grade ZNS3 bolt
 - Tighten to 8 Nm (6 ft-lb)
2. ABS wheel speed sensor
 - Lubricate with Staburags® NBU 12/K or equivalent grease before installing.
3. M12 x 1.5 x 55 mm Z1 bearing hub bolt
 - Replace with new
 - Tighten to 110 Nm (81 ft-lb)
4. Electrical harness bracket
5. Steering knuckle (swivel bearing)
6. Stabilizer bar link bracket
7. M10 x 20 mm 10.9 grade bolt
8. M12 x 100 mm 10.9 grade strut pinch bolt
 - Replace with new
 - Tighten to 81 Nm (60 ft-lb)
9. M12 x 1.5 x ZNS3 self-locking collar nut
10. Wheel bearing hub

Steering knuckle, removing and installing (rear-wheel drive)

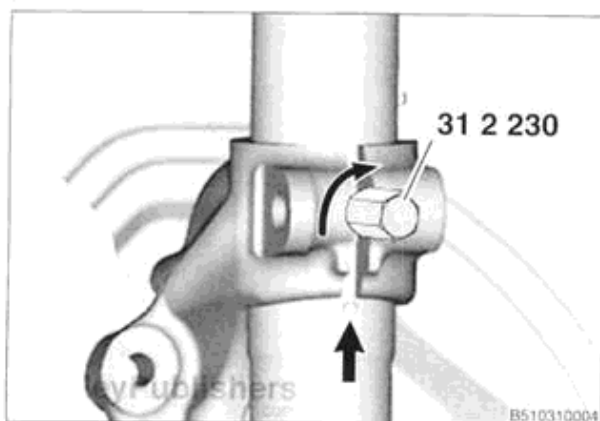
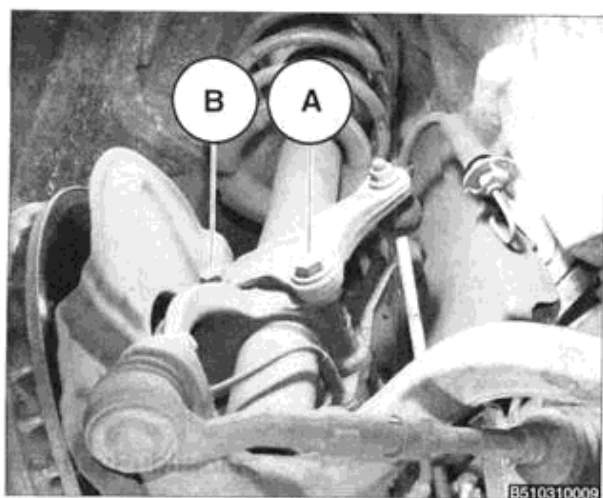
- Raise car and remove front wheel.

WARNING—

- Make sure the vehicle is stable and well supported at all times. Use a professional automotive lift or jack stands designed for the purpose. A floor jack is not adequate support.

- Detach front brake caliper from steering knuckle and suspend aside using stiff wire. Do not detach brake fluid hose. See **340 Brakes**.
- Remove brake rotor. See **340 Brakes**.
- Remove wheel speed sensor from steering knuckle. See **340 Brakes**.
- Detach control arm and tension strut from steering knuckle. See **Front Suspension Arms** in this repair group.
- Detach tie rod end from steering knuckle. See **320 Steering and Wheel Alignment**.

Steering knuckle, removing and installing (rear-wheel drive)



- Working at top of steering knuckle:
- Remove strut pinch bolt (A) from upper steering knuckle.
 - Remove stabilizer link bracket bolt (B) and detach bracket from steering knuckle.

- If necessary, use BMW special tool 31 2 230 to spread (curved arrow) steering knuckle pinch collar. Slide steering knuckle downward to disengage from strut tube.
- Note locating boss (arrow) for strut. During reassembly, boss slides in steering knuckle pinch collar gap.

- Replace wheel bearing if necessary. See **Front wheel bearing, replacing (rear-wheel drive)** in this repair group.
- Installation is reverse of removal. Note the following:
 - Replace self-locking fasteners.
 - Make sure locating boss on strut tube slides in steering knuckle pinch collar gap.
 - Face strut pinch bolt head in direction of travel.
 - Make sure steering knuckle contacts stop on strut before tightening pinch bolt.
 - Clean wheel speed sensor bore hole and lubricate with Staburags® NBU 12/K or equivalent grease.
 - Align wheels when job is complete.

Tightening torques

Brake caliper to steering knuckle (replace M12 x 1.5 x 43 mm ZNS bolts with new)	110 Nm (81 ft-lb)
Brake rotor to wheel hub (replace M8 x 14 mm Allen bolt with new)	16 Nm (12 ft-lb)
Control arm to steering knuckle (replace M14 x 1.5 self-locking flange nut with new)	165 Nm (122 ft-lb)
Road wheel to hub	120 ± 10 Nm (89 ± 7 ft-lb)
Strut assembly pinch bolt (replace M12 x 100 mm 10.9 grade bolt with new)	81 Nm (60 ft-lb)
Tension strut to steering knuckle (replace M14 x 1.5 self-locking flange nut with new)	165 Nm (122 ft-lb)
Tie rod end to steering knuckle (replace M14 x 1.5 ZNS3 nut with new)	165 Nm (122 ft-lb)
Wheel speed sensor to steering knuckle	8 Nm (6 ft-lb)

310-22 Front Suspension

Front wheel bearing, replacing (rear-wheel drive)

Front wheel bearing, replacing (rear-wheel drive)

- Raise car and remove front wheel.

WARNING—

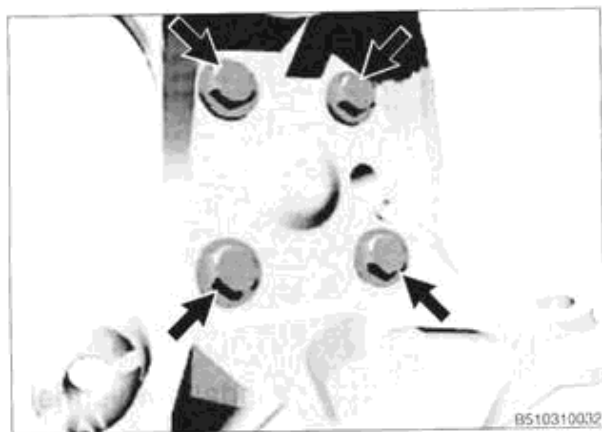
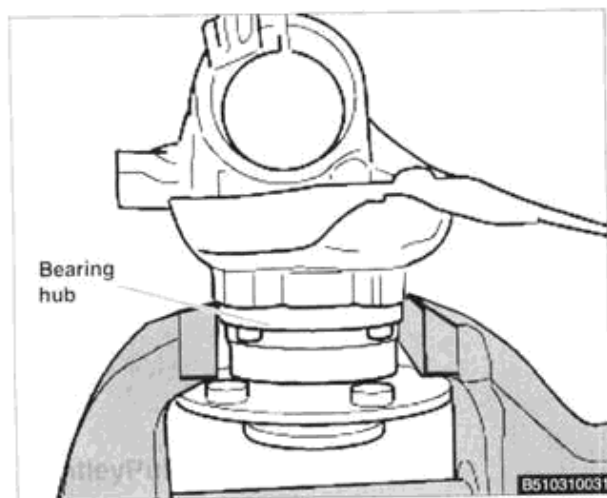
- Make sure the vehicle is stable and well supported at all times. Use a professional automotive lift or jack stands designed for the purpose. A floor jack is not adequate support.

- Remove steering knuckle. See **Steering knuckle, removing and installing (rear-wheel drive)** in this repair group.

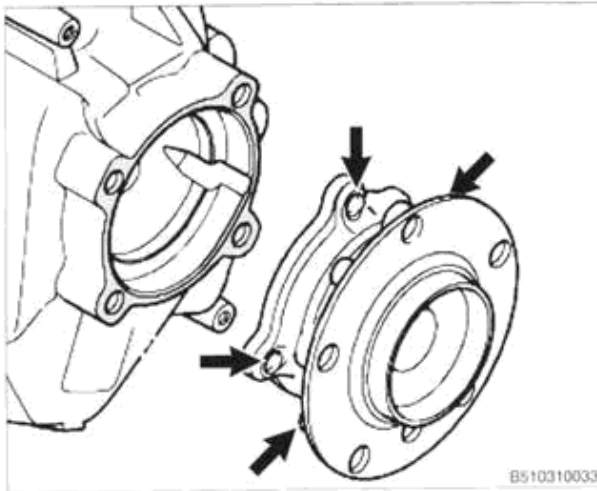
- ◀ Clamp wheel bearing hub in shop vise as illustrated.

CAUTION—

- Make sure unit is only clamped at bearing hub.



- ◀ Remove bearing hub mounting bolts (arrows). Lift off steering knuckle.



When installing:

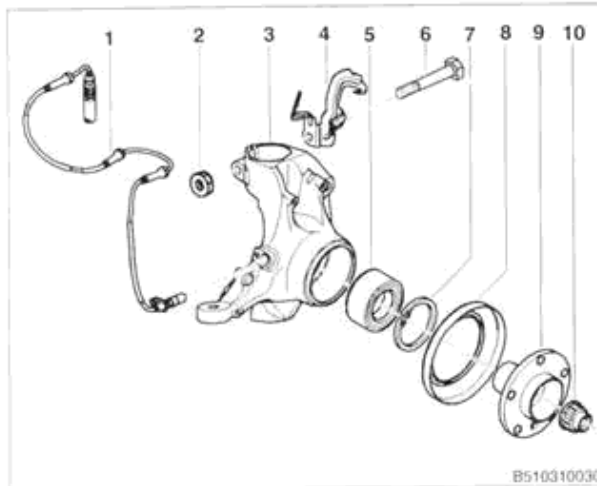
- Keep bearing hub contact area (**grey**) clean and grease-free.
- If reusing bearing hub, tap mounting bolt threaded holes (**arrows**).
- Replace mounting bolts with new.

Tightening torque

Bearing hub to steering knuckle (replace M12 x 1.5 x 55 mm Z1 bolt with new)	110 Nm (81 ft-lb)
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Steering knuckle components (xDrive)

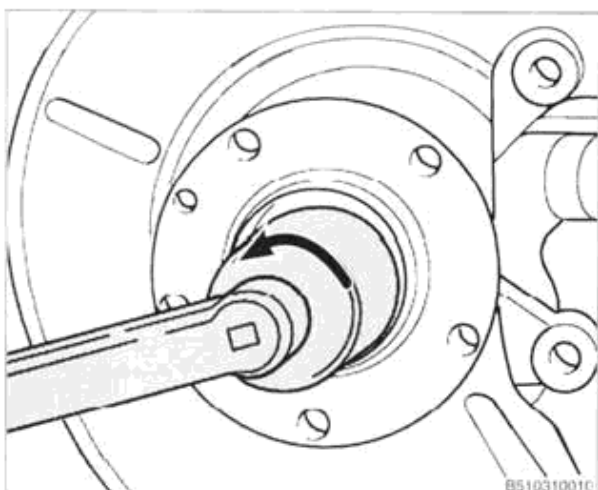
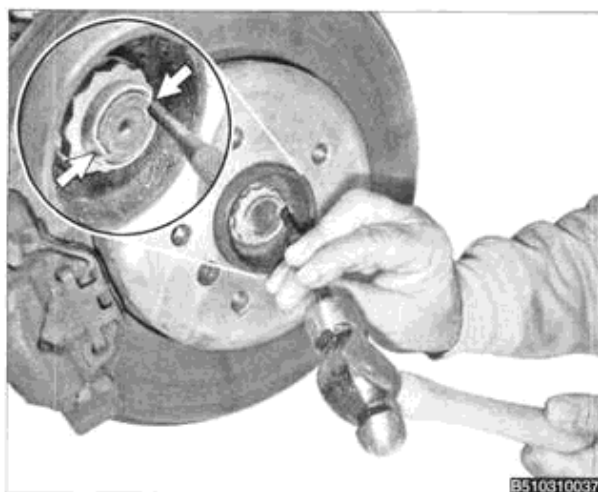
The wheel bearing is pressed on the steering knuckle and requires special tools to remove. The wheel bearing is destroyed when the wheel hub is removed.



1. ABS wheel speed sensor
 - Lubricate with Staburags® NBU 12/K or equivalent grease before installing.
2. M12 x 1.5 x ZNS3 self-locking collar nut
3. Steering knuckle (swivel bearing)
4. Brake hose bracket
5. Wheel bearing
6. M12 x 1.5 x 80 mm ZNS strut pinch bolt
 - Replace with new
 - Tighten to 100 Nm (74 ft-lb)
7. Circlip
8. Dust shield
9. Hub
10. M27 x 1.5 collar nut
 - Replace with new
 - Tighten (with wheel on ground) to 420 Nm (310 ft-lb)

310-24 Front Suspension

Steering knuckle, removing and installing (xDrive)



Steering knuckle, removing and installing (xDrive)

- Raise car and remove front wheel.

WARNING—

- Make sure the vehicle is stable and well supported at all times. Use a professional automotive lift or jack stands designed for the purpose. A floor jack is not adequate support.

- Using a suitable punch, straighten staked sides of wheel hub collar nut (arrows).

- With an assistant holding down brake pedal, remove collar nut and discard.

CAUTION—

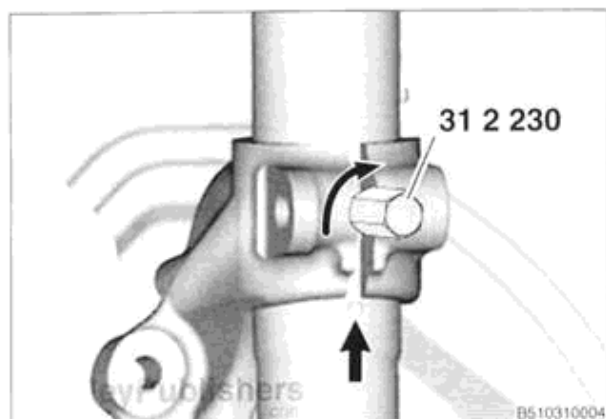
- The drive axle collar nut is tightened to a high torque. If necessary, reinstall road wheel and place vehicle on floor before breaking collar nut free.

- Detach front brake caliper from steering knuckle and suspend aside using stiff wire. Do not detach brake fluid hose. See **340 Brakes**.
- Remove brake rotor. See **340 Brakes**.
- Remove wheel speed sensor from steering knuckle. See **340 Brakes**. Detach sensor electrical harness from bracket on strut.
- Detach control arm and tension strut from steering knuckle. See **Front Suspension Arms** in this repair group.
- Detach tie rod end from steering knuckle. See **320 Steering and Wheel Alignment**.
- Detach stabilizer link from strut tube. Use Torx tool (T30) to counterhold shaft of stabilizer bar link ball joint while removing nut.
- Rotate steering knuckle to one side and press drive axle stub out of wheel bearing hub. Tie up drive axle end using stiff wire.

CAUTION—

- In order to avoid damaging drive axle threads, do not drive out stub axle using impact tool.

- Support steering knuckle with floor jack. Working at top of steering knuckle, remove strut pinch bolt.



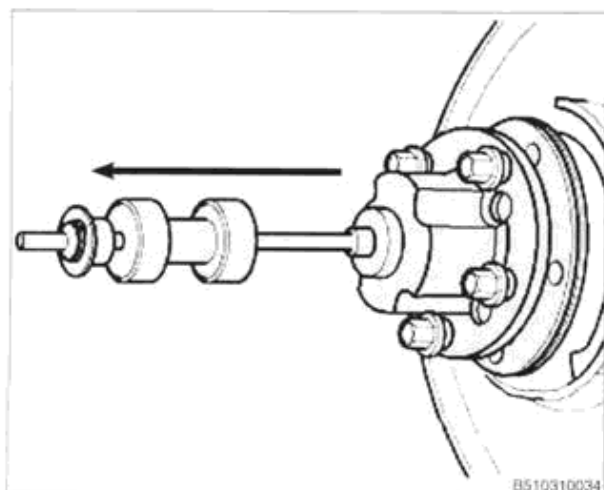
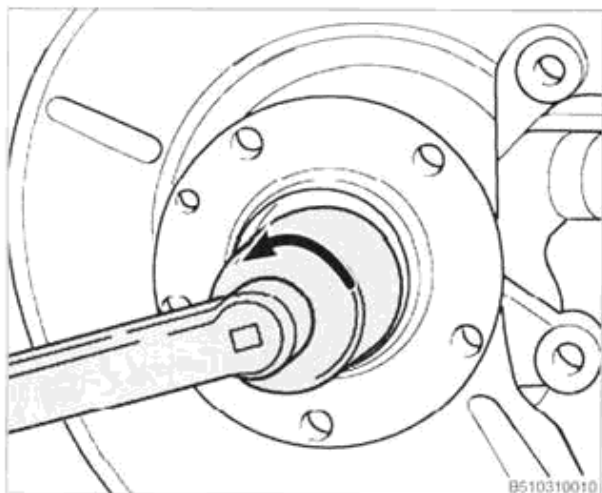
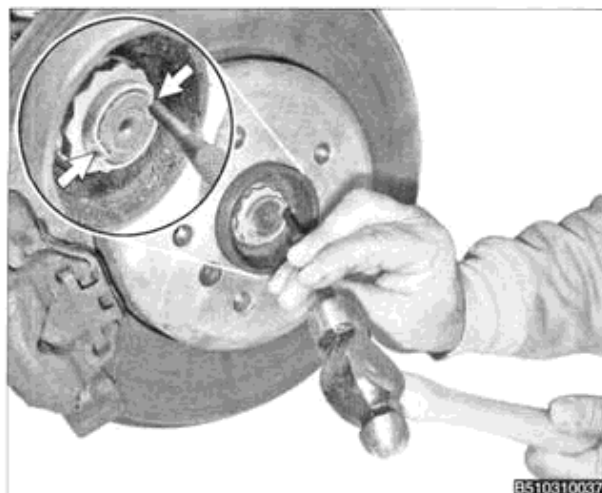
- If necessary, use BMW special tool 31 2 230 to spread (**curved arrow**) steering knuckle pinch collar. Slide steering knuckle down and off strut tube.
- Note locating boss (**arrow**) for strut. During reassembly, boss slides in steering knuckle pinch collar gap.
- If necessary, replace torsion strut ball joint. See **Tension strut ball joint, replacing (xDrive)**.
 - If necessary, replace wheel bearing. See **Front wheel bearing, replacing (xDrive)** in this repair group.
 - Installation is reverse of removal. Note the following:
 - Make sure locating boss on strut tube slides in steering knuckle pinch collar gap.
 - Make sure steering knuckle contacts stop on strut before tightening pinch bolt. Face strut pinch bolt head in direction of travel.
 - Replace self-locking fasteners.
 - Use Torx tool (T30) to counterhold shaft of stabilizer bar link ball joint while tightening nut.
 - Clean ABS wheel speed sensor bore hole and lubricate with Staburags® NBU 12/K or equivalent grease.
 - Oil and wheel hub contact surfaces lightly. Do not allow oil to contaminate drive axle threads. Final tightening with wheel on ground. Stake collar nut after final tightening.
 - Align wheels when job is complete.

Tightening torques

Brake caliper to steering knuckle (replace M12 x 1.5 x 43 mm ZNS bolts with new)	110 Nm (81 ft-lb)
Brake rotor to wheel hub (replace M8 x 14 mm Allen bolt with new)	16 Nm (12 ft-lb)
Control arm to steering knuckle (replace M14 x 1.5 self-locking flange nut with new)	165 Nm (122 ft-lb)
Drive axle to wheel hub (replace M27 x 1.5 collar nut with new)	420 Nm (310 ft-lb)
Road wheel to hub	120 ± 10 Nm (89 ± 7 ft-lb)
Stabilizer link to strut tube (replace M10 ZNS3 nut with new)	65 Nm (48 ft-lb)
Strut assembly pinch bolt (replace M12 x 1.5 x 80 mm ZNS3 bolt with new)	100 Nm (74 ft-lb)
Tension strut to steering knuckle ball joint (replace M14 x 1.5 self-locking flange nut with new)	165 Nm (122 ft-lb)
Tie rod end to steering knuckle (replace M14 x 1.5 ZNS3 nut with new)	165 Nm (122 ft-lb)
Wheel speed sensor to steering knuckle	8 Nm (6 ft-lb)

310-26 Front Suspension

Front wheel bearing, replacing (xDrive)



Front wheel bearing, replacing (xDrive)

- Raise car and remove front wheel.

WARNING—

- Make sure the vehicle is stable and well supported at all times. Use a professional automotive lift or jack stands designed for the purpose. A floor jack is not adequate support.

- Using a suitable punch, straighten staked sides of wheel hub collar nut (arrows).

- With an assistant holding down brake pedal, remove collar nut and discard.

CAUTION—

- The drive axle collar nut is tightened to a high torque. If necessary, reinstall road wheel and place vehicle on floor before breaking collar nut free.

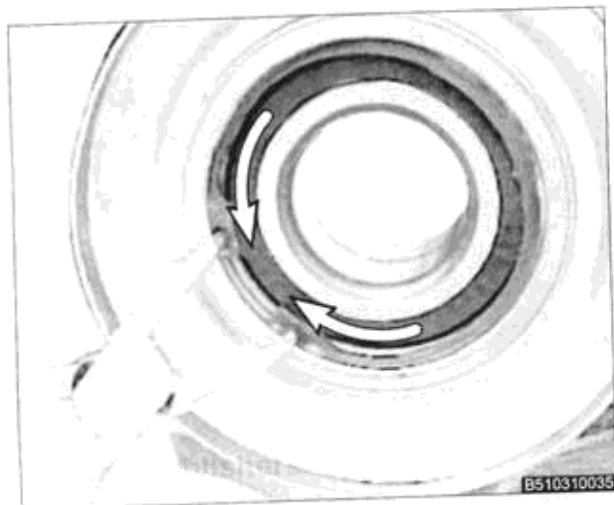
- Detach front brake caliper from steering knuckle and suspend aside using stiff wire. Do not detach brake fluid hose. See **340 Brakes**.
- Remove brake rotor. See **340 Brakes**.

- Attach slide hammer hub puller to bearing hub flange using 5 wheel bolts. Drive hub off wheel bearing.

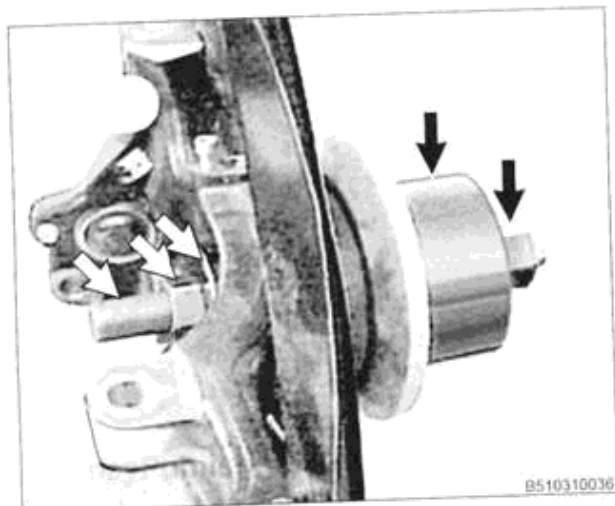
- Note that wheel bearing inner race is removed with flange, thus destroying bearing. Separate race from flange and discard race. Do not damage flange.
- Remove steering knuckle. See **Steering knuckle, removing and installing (xDrive)** in this repair group. Clamp in shop vice with aluminum jaws.

Front Suspension 310-27

Front wheel bearing, replacing (xDrive)



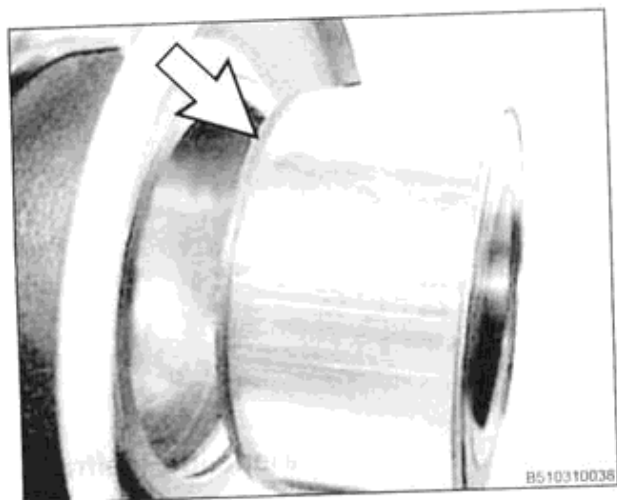
- Squeeze wheel bearing retaining circlip using needle-nosed pliers and lift out of hub.



- Use bearing removal tools (**arrows**) or shop press to remove bearing from steering knuckle.

— Before installing new bearing:

- Clean press-fit surface in steering knuckle and keep free of oil and grease.
- Coat 50% of press-fit surface in steering knuckle with Loctite® 638.



- Use bearing installation tools or shop press to press in new wheel bearing. Make sure wide chamfer on bearing (**arrow**) points to steering knuckle.

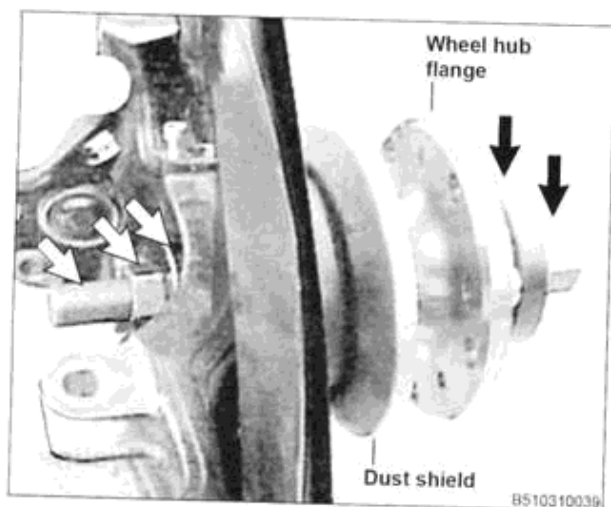
CAUTION—

- Press only on outer race when installing bearing in steering knuckle.

- Reinstall bearing retaining circlip using needle-nosed pliers. Make sure circlip is seated firmly in steering knuckle groove.

310-28 Front Suspension

Front wheel bearing, replacing (xDrive)



Use bearing installation tools (**arrows**) or shop press to press wheel hub flange into new bearing.

- Make sure dust shield is intact. Replace if necessary.

CAUTION—

- Press only on inner race when installing hub in wheel bearing.

- Install steering knuckle. See **Steering knuckle, removing and installing** in this repair group.
- Draw front axle into steering knuckle.
- Install front brake rotor and caliper. See **340 Brakes**.
- Apply light coating of oil to contact surfaces. With an assistant holding down brake, tighten axle collar nut to specified torque.

Tightening torques

Drive axle to wheel hub (replace M27 x 1.5 collar nut with new)	420 Nm (310 ft-lb)
Road wheel to hub	120 ± 10 Nm (89 ± 7 ft-lb)

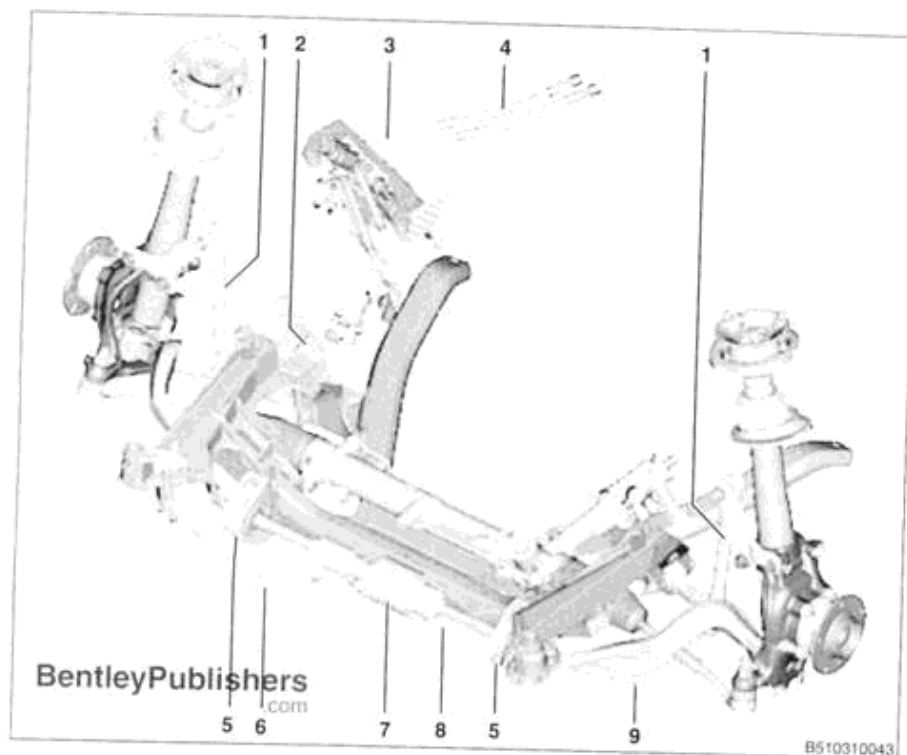
- Using a suitable drift, stake side of axle collar nut to stub axle.
- Align wheels when job is complete.

FRONT STABILIZER BAR**Active stabilizer bar (dynamic drive)**

5 Series vehicles may be equipped with the optional active stabilizer system (acronyms ARS). The system is also referred to as dynamic drive.

With this system, front and rear stabilizer bars are split in half, with the halves connected to each other via hydraulic oscillating motors. An electronic control module operates through a valve body to control coupling of the two stabilizer bar halves.

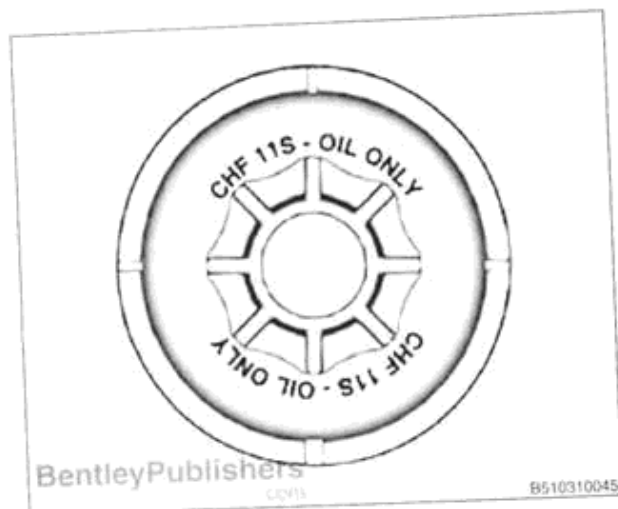
For additional details, including active stabilizer troubleshooting and commissioning, see **300 Suspension, Steering and Brakes-General**.

Active stabilizer bar components, front

1. Stabilizer bar link
2. Front ride-height sensor
3. Active stabilizer valve block
4. Rear oscillating motor pressure lines
5. Stabilizer bar mount
6. Front oscillating motor pressure lines
7. Front oscillating motor
8. Vent hose
9. Stabilizer bar

310-30 Front Suspension

Hydraulic system, bleeding



Hydraulic system, bleeding

CAUTION—

- When filling or bleeding hydraulic system, do not allow contamination of fluid or reservoir.
- Using contaminated equipment to add fluid may introduce dirt particles into the fluid reservoir and significantly reduce the service life of system components.

- Active stabilizer system and power steering share the fluid reservoir and fluid cooler. The reservoir cap indicates the fluid to be used.

Active stabilizer system fluid

Hydraulic fluid for tandem pump system	Pentosin CHF 11S
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- Thoroughly clean fluid reservoir and its immediate surroundings before opening reservoir cap. Check and top off fluid level with fluid temperature at approx. 20°C (68°F) and the engine stopped.
- Make sure reservoir cap is fully screwed in before checking fluid level. Check that fluid level is at MAX mark. Top off with correct fluid if necessary.

CAUTION—

- With fluid at operating temperature (50°-60°C or 122°-140°F), full fluid level is approximately 15 mm ($\frac{3}{8}$ in) above MAX marking. Do not siphon out fluid in that situation.

- Start engine.
- Turn steering wheel left and right twice in each direction to full lock, if necessary, top off hydraulic fluid again.
- Move steering wheel to straight-ahead position and switch engine OFF. Check and correct fluid level.
- To make sure all air is out of system, drive vehicle on a short trip, then perform bleed procedure again.
- Check hydraulic system for leaks. If extreme air or fluid leaks are detected, or rattling noises continue in the front end, replace the pressure relief valves and fluid lines, then bleed system again.

Front stabilizer bar, removing and installing (mechanical stabilizer)

The front stabilizer is attached to the front subframe.

- Raise front of vehicle and support safely.

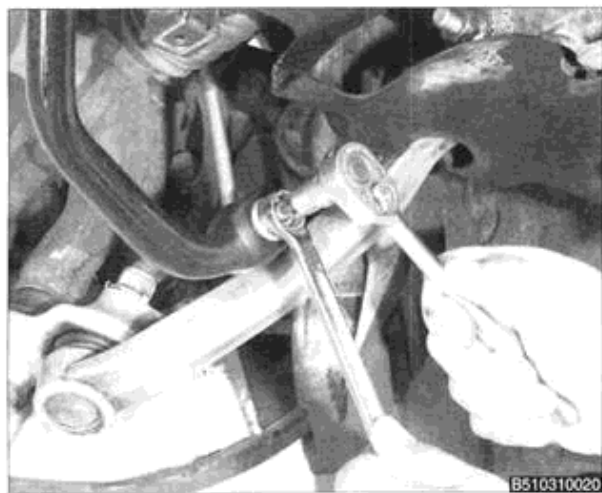
WARNING—

- Make sure the vehicle is stable and well supported at all times. Use a professional automotive lift or jack stands designed for the purpose. A floor jack is not adequate support.

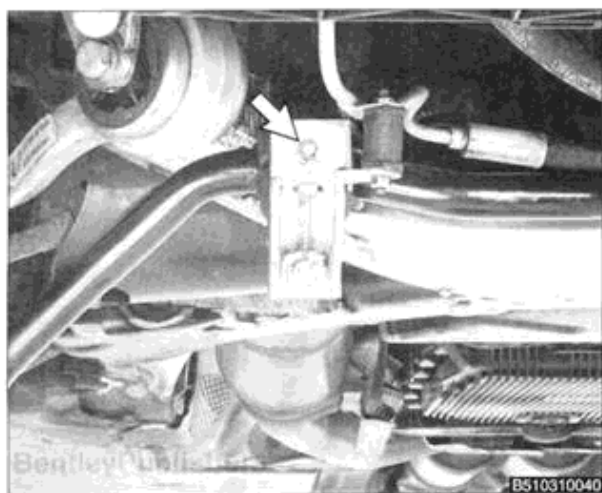
- Remove engine splash shield and front end reinforcement panel.

Front Suspension 310-31

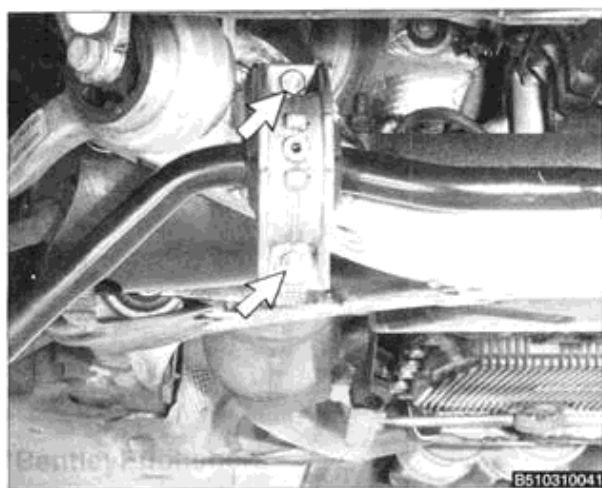
Front stabilizer bar, removing and installing (mechanical stabilizer)



- ⚡ Detach stabilizer links on both sides from stabilizer bar. Use Torx tool (T30) to counterhold shaft of stabilizer bar link ball joint while loosening nut.



- ⚡ Rear-wheel drive right side: Remove power steering line bracket mounting bolt (**arrow**) from stabilizer bar mount.



- ⚡ Remove stabilizer bar mount fasteners (**arrows**) and lower bar.
- Check rubber mount mounts for damage. Replace if necessary.
 - Installation is reverse of removal. Note the following.
 - Replace self-locking fasteners.
 - Use Torx tool (T30) to counterhold shaft of stabilizer bar link ball joint while tightening nut.
 - Install front end reinforcement using new fasteners. See **Front end reinforcement panel, removing and installing** in this repair group.

Tightening torques

Stabilizer bar mount to front subframe (replace M8 fasteners with new)	30.5 Nm (22 ft-lb)
Stabilizer link to stabilizer bar (replace M10 ZNS3 nut with new)	65 Nm (48 ft-lb)

310-32 Front Suspension

Front stabilizer bar, removing and installing (active stabilizer)

Front stabilizer bar, removing and installing (active stabilizer)

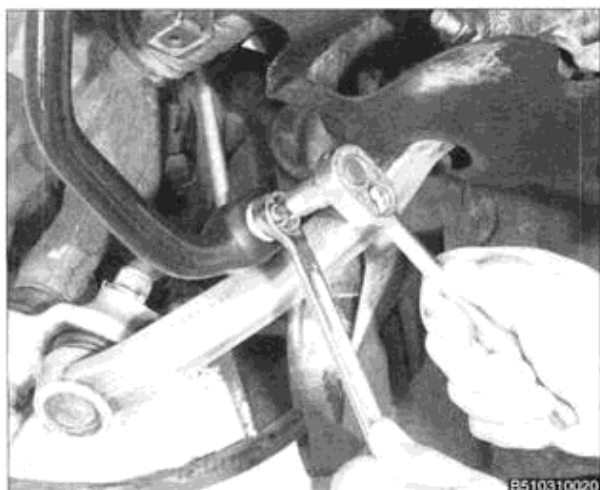
The front stabilizer is attached to the front subframe.

- Raise front of vehicle and support safely.

WARNING—

- Make sure the vehicle is stable and well supported at all times. Use a professional automotive lift or jack stands designed for the purpose. A floor jack is not adequate support.

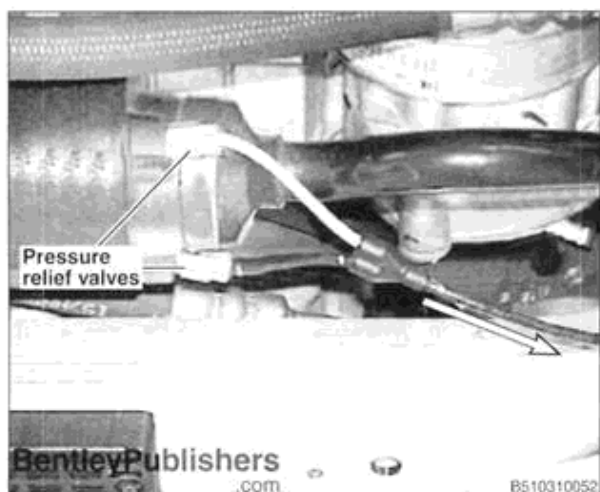
- Remove engine splash shield and front end reinforcement panel.
- ◀ Detach stabilizer links on both sides from stabilizer bar. Use Torx tool (T30) to counterhold shaft of stabilizer bar link ball joint while loosening nut.



- ◀ Working at front stabilizer oscillating motor, pull vent line out of Y-connector (arrow).

CAUTION—

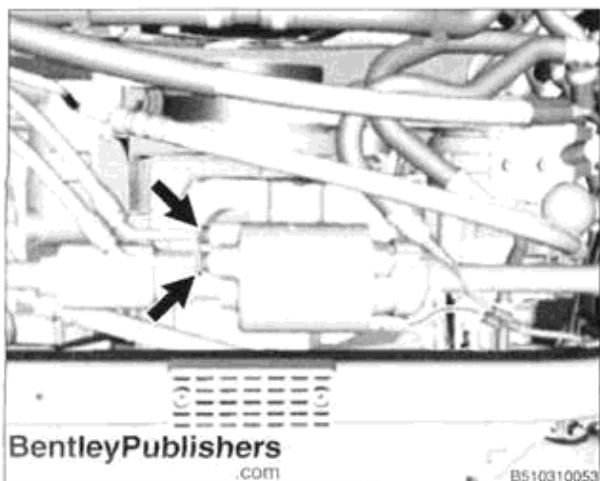
- Do not detach or disassemble pressure relief valves.



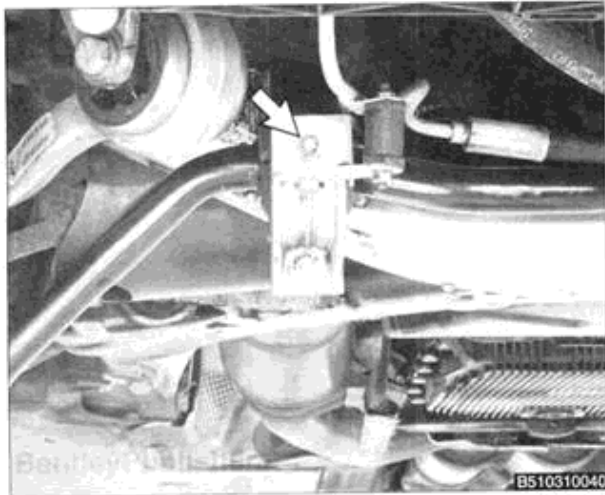
- ◀ Note carefully installation positions of fluid pressure lines and brackets at oscillating motor. Then detach pressure line unions (arrows) from motor. Be prepared to catch dripping hydraulic fluid and dispose in a safe manner.

CAUTION—

- Do not allow dirt to enter hydraulic lines. Plug fluid line openings.

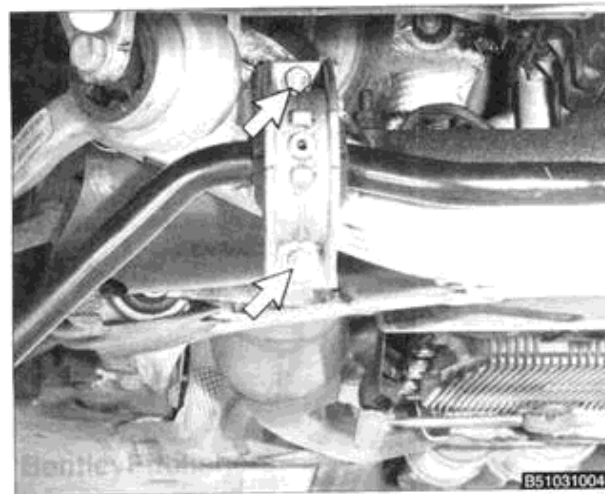


Front stabilizer bar, removing and installing (active stabilizer)

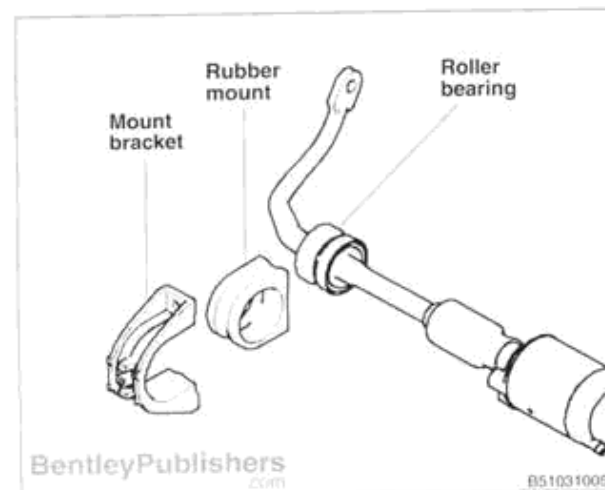


- Right side: If necessary, remove hydraulic line bracket mounting bolt (**arrow**) from stabilizer bar mount.

- Left side: If necessary, detach hydraulic line bracket from stabilizer bar mount.



- Remove stabilizer bar mount fasteners (**arrows**) and lower bar.



- Separate stabilizer bar mount brackets and rubber mounts from roller bearings.

- Check roller bearings for free movement. Slight discharge of grease from bearing is acceptable. Replace stabilizer bar if a bearing binds or is otherwise damaged.
- Replace rubber mounts if damaged. Keep rubber grease-free.

- When installing, note the following.

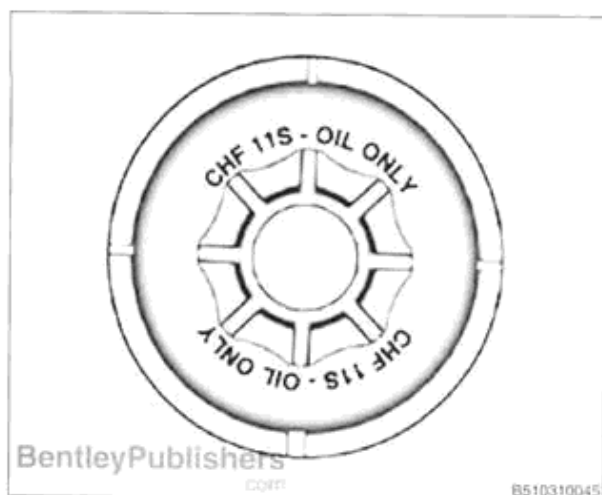
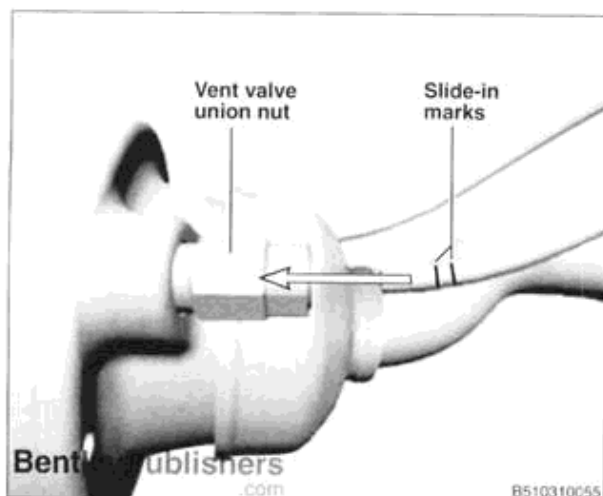
- Replace self-locking fasteners.
- To prevent stabilizer bar distortion, install left mount bracket first (without elongated holes). Then install right mount bracket (with elongated holes).
- Use Torx tool (T30) to counterhold shaft of stabilizer bar link ball joint while tightening nut.

Tightening torques

Stabilizer bar mount to front subframe (replace M8 fasteners with new)	30.5 Nm (22 ft-lb)
Stabilizer link to stabilizer bar (replace M10 ZNS3 nut with new)	65 Nm (48 ft-lb)

310-34 Front Suspension

Front stabilizer bar links, replacing



- Attach fluid pressure lines and brackets. Make sure pressure lines do not contact stabilizer bar. Minimum distance = 5 mm (1/4 in).

Tightening torque

Fluid pressure line to oscillating motor (union nut)	30 Nm (22 ft-lb)
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- ◀ New stabilizer bar is equipped with new pressure relief valves. Use new vent hoses and Y-connection.
 - Remove plugs from pressure relief valves. Loosen valve union nut.
 - Yellow vent hose is toward front of vehicle. Black hose is at rear.
 - Slide vent lines into pressure relief valves up to middle of marks and tighten union nuts.

Tightening torques

Vent hose to vent valve	5 Nm (4 ft-lb)
Vent valve to oscillating motor	14 Nm (10 ft-lb)

- ◀ Fill hydraulic fluid reservoir (same as power steering fluid reservoir).

Active stabilizer system fluid

Hydraulic fluid for tandem pump system	Pentosin CHF 11S
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- Use BMW scan tool to bleed air out of active stabilizer system. See **Hydraulic system, bleeding** in this repair group. Check lines and connections for leaks.
- Install front end reinforcement using new fasteners. See **Front end reinforcement panel, removing and installing** in this repair group.
- Carry out commissioning procedure. See **300 Suspension, Steering and Brakes-General**.

Front stabilizer bar links, replacing

The stabilizer bar links attach the stabilizer bar to the strut assemblies.

- Rear-wheel drive: Stabilizer bar link upper ball joint attaches to separate triangular bracket which bolts to steering knuckle.
- xDrive: Stabilizer bar link upper ball joint bolts directly to strut tube.

Replace stabilizer bar links in pairs.

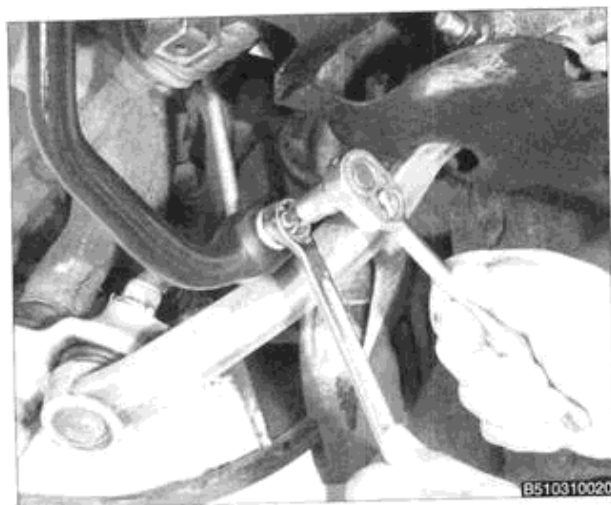
- Raise front of vehicle and remove front wheels.

WARNING —

- Make sure the vehicle is stable and well supported at all times. Use a professional automotive lift or jack stands designed for the purpose. A floor jack is not adequate support.

Front Suspension 310-35

Front stabilizer bar links, replacing



- Detach stabilizer links on both sides from stabilizer bar. Use Torx tool (T30) to counterhold shaft of stabilizer bar link ball joint while loosening nut.
- Similarly, detach stabilizer bar link from steering knuckle bracket or strut tube on each side.
- Installation is reverse of removal. Replace self-locking fasteners.

Tightening torques

Road wheel to hub	120 ± 10 Nm (89 ± 7 ft-lb)
Stabilizer link to stabilizer bar or upper link mount (replace M10 ZNS3 nut with new)	65 Nm (48 ft-lb)



