

# 310 Front Suspension

<b>GENERAL</b> .....	310-1	Control arm bushing, replacing .....	310-10
Front suspension components .....	310-2	Tension strut, removing and installing .....	310-11
Front end reinforcement plate, removing and installing .....	310-2	Tension strut bushing, replacing .....	310-12
Strut brace, removing and installing .....	310-3		
Warning .....	310-4	<b>STEERING KNUCKLE AND FRONT WHEEL BEARINGS</b> .....	310-13
<b>FRONT STRUT ASSEMBLY</b> .....	310-4	Front wheel bearing, removing and installing (rear drive models) .....	310-13
Front strut assembly, removing and installing .....	310-4	Front wheel bearing, removing and installing (xDrive models) .....	310-14
Front strut assembly components .....	310-6	Steering knuckle, removing and installing .....	310-16
Front strut assembly, disassembling and assembling .....	310-7	<b>FRONT STABILIZER BAR</b> .....	310-18
<b>FRONT SUSPENSION ARMS</b> .....	310-9	Stabilizer bar, removing and installing .....	310-18
Control arm, removing and installing .....	310-9		

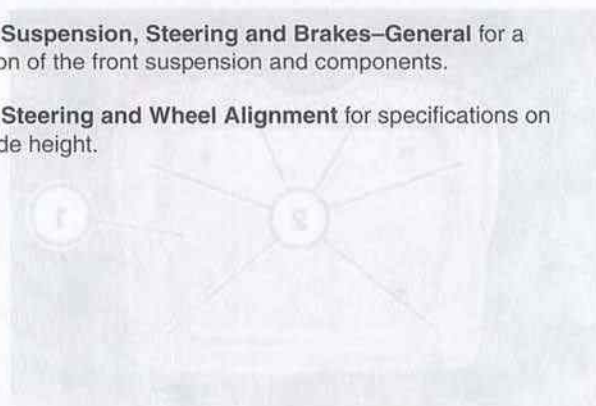
## GENERAL

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

All models are equipped with a rack and pinion type steering system mounted to a steel subframe. The subframe is strengthened by a reinforcing struts and, on xDrive models, a front end reinforcement plate.

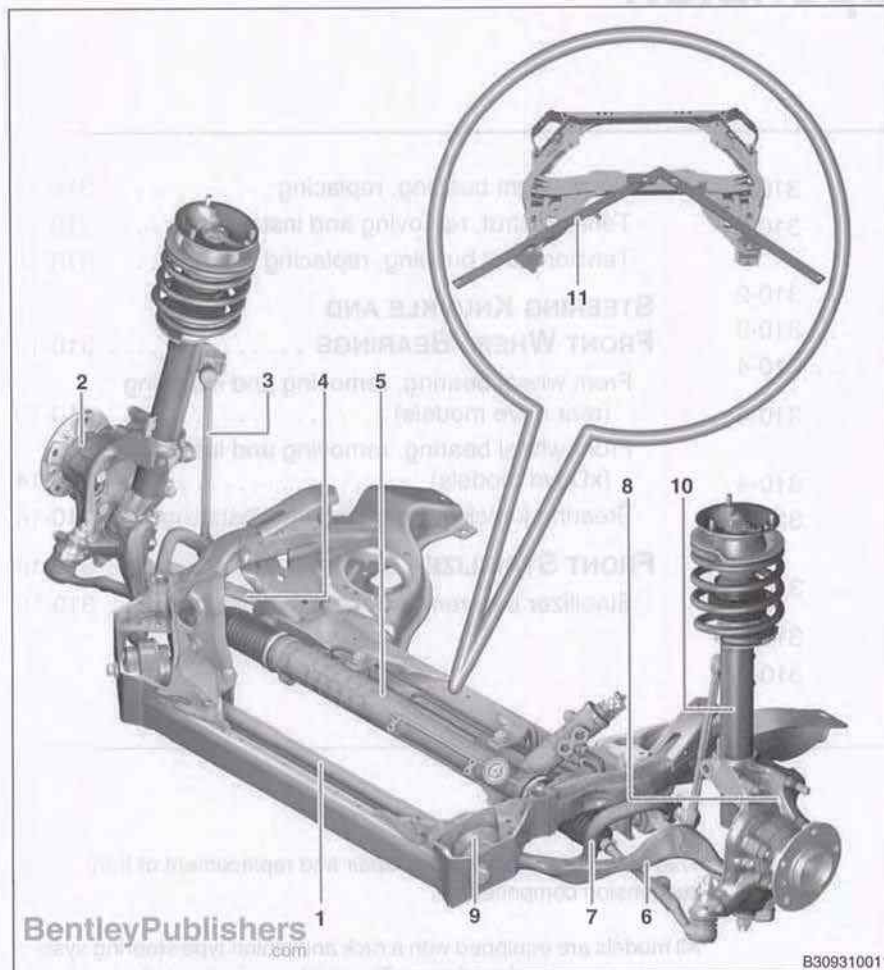
See **300 Suspension, Steering and Brakes—General** for a description of the front suspension and components.

See **320 Steering and Wheel Alignment** for specifications on setting ride height.



## 310-2 Front Suspension

### Front end reinforcement plate, removing and installing



#### Front suspension components

1. Front axle carrier
2. Wheel hub
3. Stabilizer bar link
4. Control arm
5. Steering rack
6. Tension strut
7. Stabilizer bar
8. Steering knuckle (swivel bearing)
9. Hydro-mount
10. Spring strut
11. Reinforcing strut



#### Front end reinforcement plate, removing and installing

- ◀ xDrive models include a reinforcement plate (1) to provide additional rigidity to the subframe (front axle carrier).

#### CAUTION—

- Do not drive vehicle with front end reinforcement plate removed.

- Raise vehicle 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 fasteners (2) and remove reinforcement plate.

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

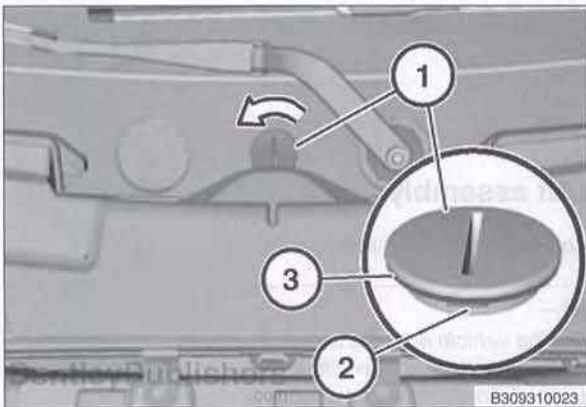
Tightening torque	
Front end reinforcement plate to subframe (use new fasteners):	
• Stage 1	56 Nm (41 ft-lb) + additional 90°
• Stage 2	

### Strut brace, removing and installing

3 Series models include 2 strut tower braces to provide additional rigidity to the front suspension.

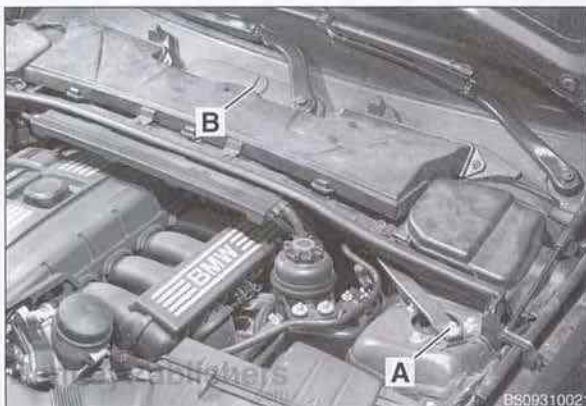
#### CAUTION—

- Do not drive vehicle with strut tower brace removed.



- Working at cowl cover, use a large flat blade screwdriver to release center cover (1) for left and right strut brace fastener.

- Make sure tab (2) and seal (3) are not damaged. A damaged cover can allow water to infiltrate the cabin.



- Release fastener (A) at strut top. Loosen fastener (B) under center cover at cowl cover.

- Slide strut brace out of engine compartment.

#### NOTE—

- A grommet in cowl cover properly locates strut brace when reinstalling. If grommet becomes dislodged, remove microfilter housing to access. See 640 Heating and Air-conditioning.

- Installation is reverse of removal.

Tightening torque	
Strut brace to chassis (M12 use new fasteners):	
• Stage 1	100 Nm (74 ft-lb) + additional 100°
• Stage 2	
Strut brace to strut tower (M10 use new fasteners):	
• Stage 1	40 Nm (30 ft-lb) + additional 60°
• Stage 2	

## 310-4 Front Suspension

### Warning

### Warning

#### **WARNING—**

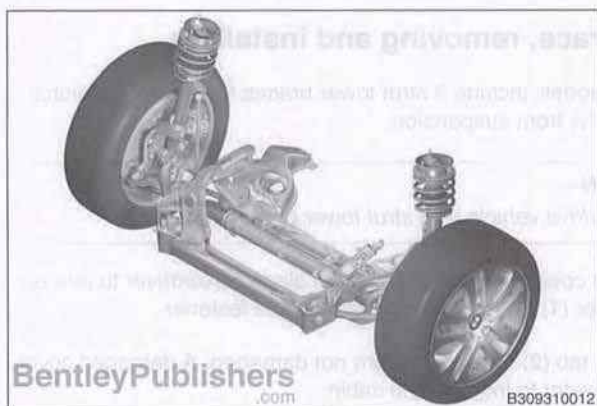
- Do not reuse self-locking fasteners. They are designed to be used only once and may fail if reused. Replace with new.

### FRONT STRUT ASSEMBLY

- The front suspension shock absorbers on 3-Series models 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. Replace struts and springs in pairs.

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

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



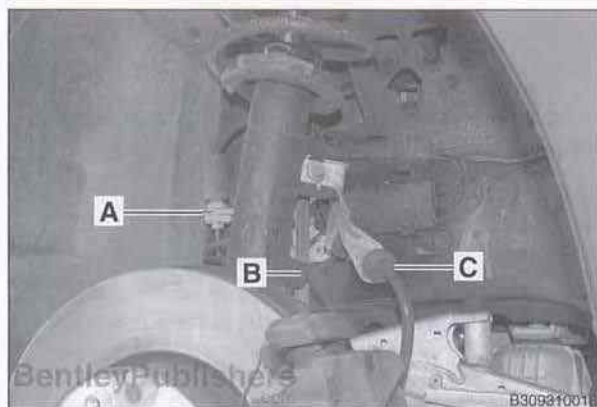
### Front strut assembly, removing and installing

- Raise car and remove front wheel.

#### **WARNING—**

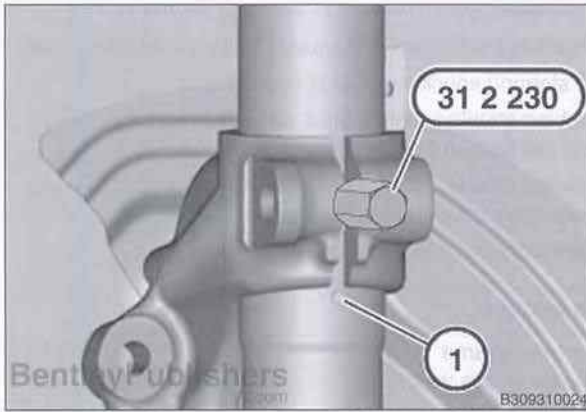
- Make sure the vehicle is stable and well supported at all times. Use a professional automotive lift or jack stands designed for the purpose. A floor jack is not adequate support.

- Remove clips (A) securing brake fluid hydraulic line to front strut.
  - Detach wheel speed sensor wire harness and brake pad wear sensor wire harness (B and C) from strut housing.
  - Remove upper stabilizer bar connecting link mounting nut. Use a thin wrench to counterhold shaft of stabilizer bar link ball joint while removing nut.
  - Support steering knuckle with suitable jack.



- Remove front strut pinch bolt (arrow).
  - Loosen control arm and tension strut bolts at subframe to avoid damaging bonded rubber bushings.





➤ If necessary, use BMW special too 31 2 230 to spread steering knuckle pinch collar.



➤ Working in engine compartment, remove strut brace (A). See **Strut brace, removing and installing** in this repair group.



➤ Note position of strut centering pin (A). If centering pin is missing, mark position of strut top bearing studs on strut tower.

**CAUTION—**

• If strut centering pin is missing from strut top bearing, mark the position of the studs to the strut tower to maintain original camber.

- Secure spring strut against falling out.
- Remove upper strut top bearing fasteners (arrows).

**WARNING—**

• Do not remove center strut retaining nut.

- Remove strut downwards out of wheel arch.
- If replacing strut, disassemble and reassemble strut assembly on bench. See **Front strut assembly, disassembling and assembling** in this repair group.

**NOTE—**

• Letter on strut tube designates mounting location. Struts are marked R for right and L for left.

## 310-6 Front Suspension

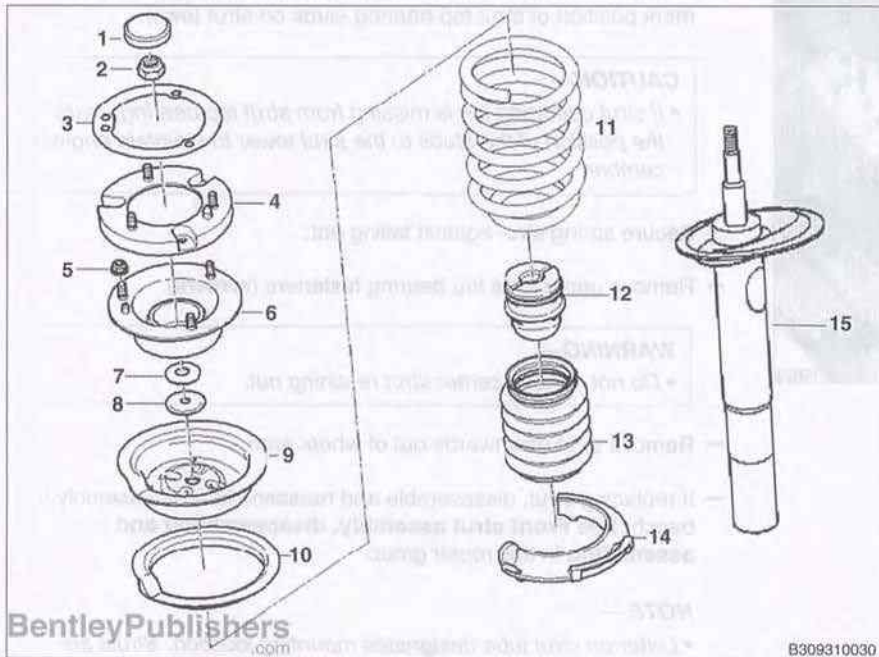
### Front strut assembly, removing and installing

- Remainder of installation is reverse of removal. Remember to:
  - Face bolt head of strut to steering knuckle bolt in direction of travel.
  - Make sure steering knuckle contacts stop on strut.
  - When attaching stabilizer link to strut, use a thin wrench to counterhold link ball joint while tightening nut.
  - Tighten bonded rubber fasteners with car on ground and loaded. Bounce suspension a few times before final tightening.
  - Check alignment when job is complete.

Tightening torques	
Control arm to subframe <ul style="list-style-type: none"><li>• M12 8.8 bolt (replace with new)</li><li>• M12 10.9 bolt (replace with new)</li></ul>	68 Nm (50 ft-lb) +90° 100 Nm (74 ft-lb) +90°
Tension strut to subframe <ul style="list-style-type: none"><li>• M12 8.8 bolt (replace with new)</li><li>• M12 10.9 bolt (replace with new)</li></ul>	68 Nm (50 ft-lb) +90° 100 Nm (74 ft-lb) +90°
Road wheel to hub	120 Nm (89 ft-lb)
Stabilizer bar link to strut <ul style="list-style-type: none"><li>• M10 bolt (replace with new)</li></ul>	58 Nm (43 ft-lb)
Strut assembly to steering knuckle <ul style="list-style-type: none"><li>• M10 pinch bolt (replace with new)</li><li>• M12 pinch bolt (replace with new)</li></ul>	45 Nm (34 ft-lb) 81 Nm (60 ft-lb)
Strut top bearing to chassis <ul style="list-style-type: none"><li>• M8 bolt (replace with new)</li></ul>	34 Nm (25 ft-lb)

### Front strut assembly components

1. Cap
2. Upper strut self-locking nut
3. Washer
4. Strut top bearing reinforcement
5. Strut mount self-locking nut
6. Upper strut mount
7. Dust protector collar
8. Spacer
9. Upper spring seat
10. Upper spring pad
11. Coil spring
12. Rubber stop
13. Dust boot
14. Lower spring pad
15. Strut with lower spring seat



#### NOTE—

- Illustration shows a typical E90 strut assembly. Other models are similar but not identical.

### Front strut assembly, disassembling and assembling

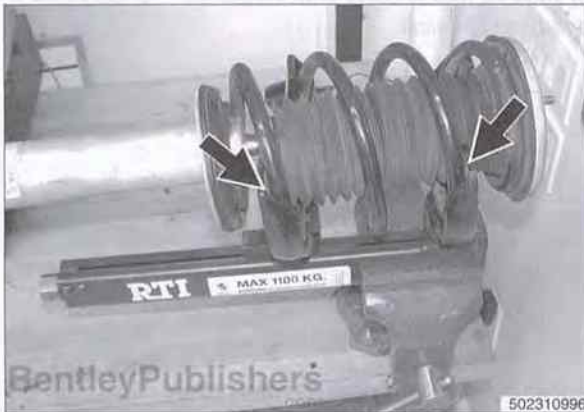
Replacing the strut, upper strut mount or spring requires that the strut assembly first be removed from the car and disassembled. See **Front strut assembly, removing and installing** in this repair group.

- ◀ Clamp spring compressor (BMW special tool 31 3 340 or equivalent) in shop vise.



#### WARNING—

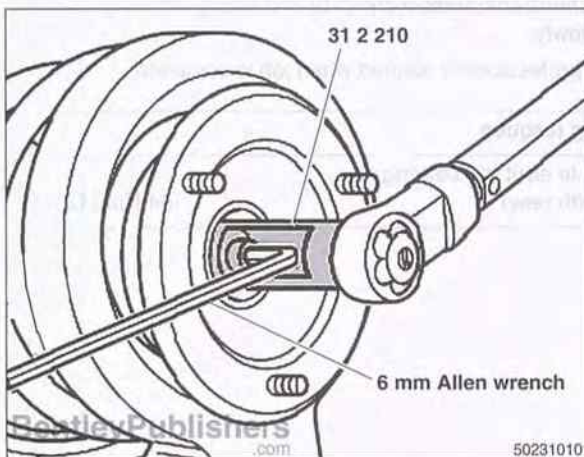
- Do not attempt to disassemble the strut assembly without a spring compressor designed specifically for this job.
- Prior to each use, check special tool for functionality.
- Do not use a damaged tool.
- Do not make any modifications to tool.
- Use correct size spring retainers when compressing coil 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.



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

#### WARNING—

- When tensioned, the spring coils must rest completely in the spring holder recess.
- Do not tighten or loosen spring compressor with an impact tool.
- Only tighten down the coil springs until stress on the thrust bearing is relieved.
- Only loosen 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 strut nut. Counterhold strut shaft using 6 mm Allen wrench.

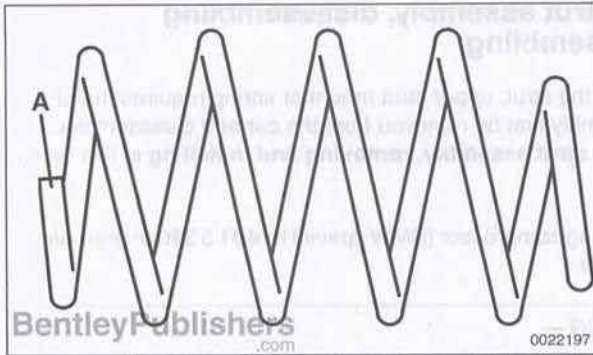
#### CAUTION—

- Do not remove strut nut with impact tool.

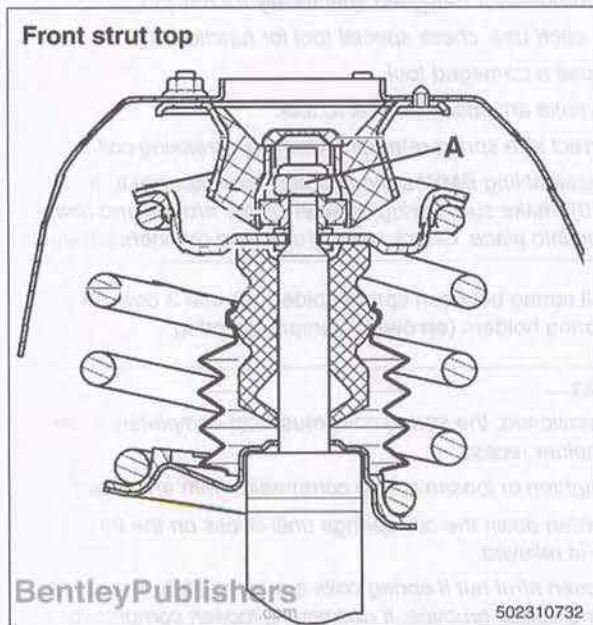
- Remove upper strut bearing and related components.
- If a new coil spring is being installed, relieve tension on spring compressor and remove coil spring.
- Check strut dust boot, rubber stop and spring pads. Replace as necessary.
- Replace strut, upper strut mount or spring, as needed.

## 310-8 Front Suspension

### Front strut assembly, disassembling and assembling



- Replace springs in matched pairs only. BMW ID number is stamped near end (A).



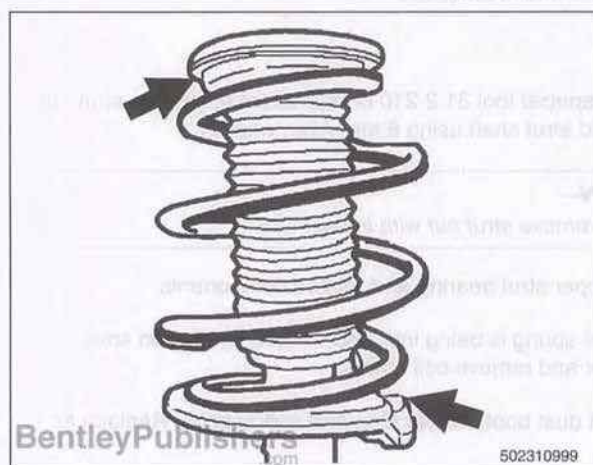
- Assembly is reverse of disassembly, noting the following:
  - Use a new upper strut self-locking nut (A). Tighten nut fully before releasing spring compressor.

#### CAUTION—

- Do not tighten strut nut with impact tool.

#### NOTE—

- Illustration shows a typical BMW strut assembly. 3 Series models are similar but not identical.



- Be sure upper and lower spring pads (arrows) are correctly installed to spring seats before releasing spring compressor.
- Release spring compressor carefully and evenly, allowing spring to expand slowly.
- Have car professionally aligned when job is complete.

#### Tightening torques

Strut shaft to strut top bearing (replace with new)	64 Nm (47 ft-lb)
-----------------------------------------------------	------------------



## FRONT SUSPENSION ARMS

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

### NOTE—

- Tension struts are sometimes called thrust arms or thrust rods.
- Control arms or tension struts are sometimes called lower front arms or lower rear arms.

Inspect ball joints for wear and looseness. Inspect bushings for wear or fluid leaks. The ball joint can only be replaced as part of an entire suspension arm assembly. Some suspension arm bushings are available as replacement parts. Always replace in pairs.

### NOTE—

- Steering wheel vibration during braking (usually at road speeds of 50 to 60 mph) are often caused by faulty suspension arm bushings, not out-of-true brake rotors.

Some special tools may be required to remove suspension arms and to replace bushings. Read procedures through before beginning the job.

## Control arm, removing and installing

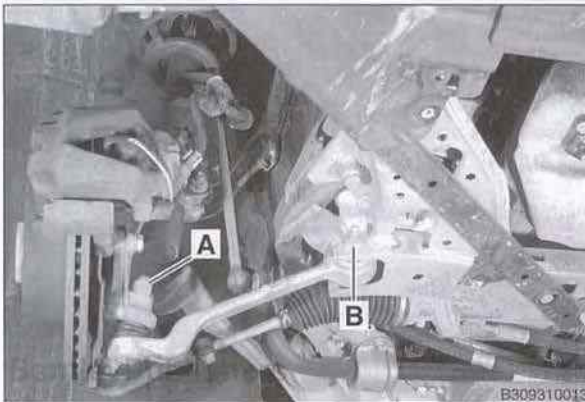
- Raise car and remove front wheel.

### 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.

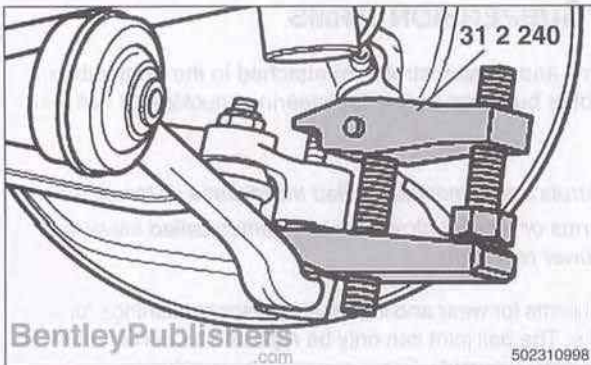
- If equipped, remove ride height sensor link rod clamp from control arm.

- Remove control arm fasteners (A and B). Lightly tap inner control arm mounting bolt out of front subframe.



## 310-10 Front Suspension

### Control arm bushing, replacing



Use BMW special tool 31 2 240 or equivalent to separate ball joint from steering knuckle.

- 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. Do not tighten nut at this time.
  - Install control arm ball joint to steering knuckle using new self-locking nut. Tighten fully.
  - Install ride height sensor link rod to control arm (if applicable).
  - 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.
  - Check vehicle alignment.

#### Tightening torques

Control arm to steering knuckle <ul style="list-style-type: none"><li>• M14 8.8 bolt (replace with new)</li><li>• M14 10.9 bolt (replace with new)</li></ul>	80 Nm (59 ft-lb) 165 Nm (122 ft-lb)
Control arm to subframe <ul style="list-style-type: none"><li>• M12 8.8 bolt (replace with new)</li><li>• M12 10.9 bolt (replace with new)</li></ul>	68 Nm (50 ft-lb) + 90° 100 Nm (74 ft-lb) + 90°
Road wheel to hub	120 Nm (89 ft-lb)

### Control arm bushing, replacing

- 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.

- Remove control arm. See **Control arm, removing and installing** in this repair group.
- Using a service press and appropriate press tools, press bushing out of control arm.
- Clean bushing bore and press in new bushing.

#### CAUTION—

- Draw in rubber mount from chamfered side of control arm bore.

- Press bushing in so it protrudes equally from both sides of arm.
- Install control arm.

### Tension strut, removing and installing

- 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.

- Remove lower engine cover.

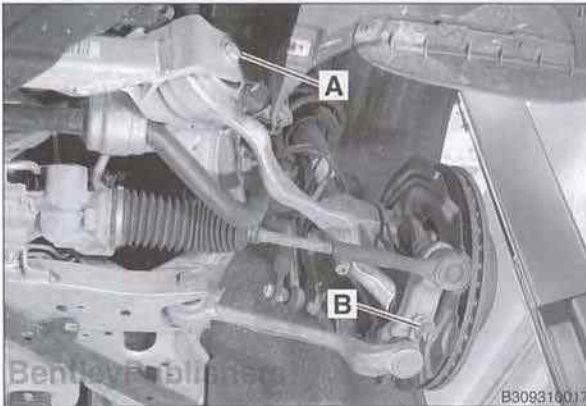
- Remove tension strut fasteners (A). Lightly tap tension strut mounting bolt out of front subframe.

- Remove tension strut nut (B). If necessary, use a Torx socket (T40) to prevent joint from turning.

- Separate ball joint from steering knuckle and remove tension strut.

**CAUTION—**

- Take care not to damage the ball joint threads if the tension strut is to be reused.



- 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 tighten nut at this time.
- Install tension strut ball joint to steering knuckle 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.
- Check vehicle alignment.

Tightening torques	
Road wheel to hub	120 Nm (89 ft-lb)
Tension strut to steering knuckle (replace with new)	165 Nm (122 ft-lb)
Tension strut to subframe	
• M12 8.8 (replace with new)	68 Nm (50 ft-lb) + 90°
• M12 10.9 (replace with new)	100 Nm (74 ft-lb) + 90°

## 310-12 Front Suspension

### Tension strut bushing, replacing

#### Tension strut bushing, replacing

Replace tension strut bushings in pairs. Bushings may only be replaced once.

- 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.*

- Remove tension strut. See **Tension strut, removing and installing** in this repair group.
- Using a service press and appropriate press tools, press bushing out of tension strut.
- Clean bushing bore and press in new bushing while aligning mark on bushing with mark on tension strut (**arrows**).

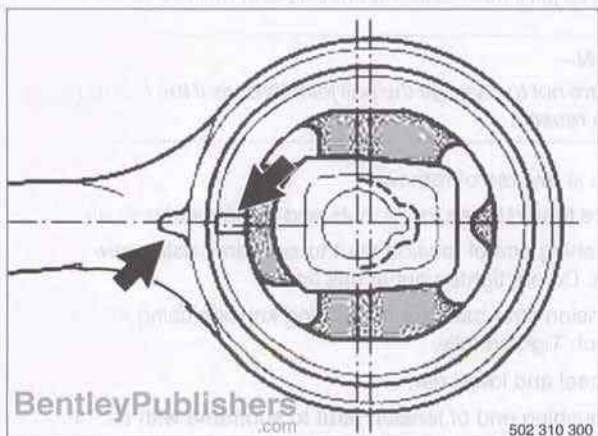
#### **CAUTION—**

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

- Press bushing in so it protrudes equally from both sides of tension strut.
- Install tension strut.

#### **CAUTION—**

- *Tighten the tension strut bushing through-bolt to its final torque only with car on the ground and the suspension normally loaded as described earlier.*



### STEERING KNUCKLE AND FRONT WHEEL BEARINGS

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. The wheel bearing and hub assembly is either bolted to the steering knuckle (rear drive models), or pressed onto the steering knuckle and requires several special tools to remove (xDrive models).

On xDrive models, the bearing is destroyed when the wheel hub is removed. Consult the procedure appropriate for your model.

### Front wheel bearing, removing and installing (rear drive models)

- Raise car and remove front 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.

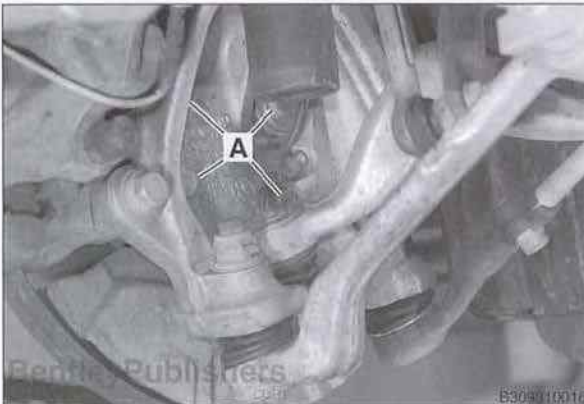
- Unbolt brake caliper and hang to side with stiff wire. Do not disconnect brake hose. Remove brake disc. See **340 Brakes**.

- Remove wheel hub fasteners (A).

- Remove wheel bearing / hub unit off steering knuckle.

- Installation is reverse of removal. Remember to:

- Make sure wheel hub and steering knuckle mating surfaces are clean.
- If reusing wheel bearing / hub unit, recut bolt hole threads.
- Replace fasteners with new.



#### Tightening torques

Road wheel to hub	120 Nm (89 ft-lb)
Wheel bearing / hub unit to steering knuckle (replace bolts with new)	110 Nm (81 ft-lb)

## 310-14 Front Suspension

### Front wheel bearing, removing and installing (xDrive models)

#### Front wheel bearing, removing and installing (xDrive models)

- Raise car and remove front wheel.

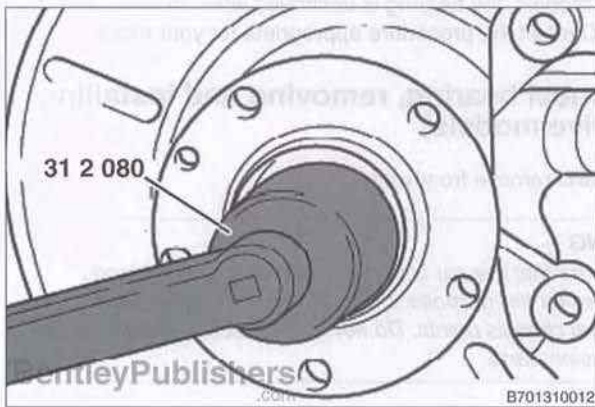
##### **WARNING—**

- *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.*

- Using a suitable drift, release staked side of collar nut.

- ◀ With an assistant holding down brake, remove collar nut using BMW special tool 31 2 080. Do not reuse collar nut.

- Unbolt brake caliper and hang to side with stiff wire. Do not disconnect brake hose. Remove brake disc. See **340 Brakes**.



- ◀ Remove wheel hub using BMW special tools 33 2 160 / 33 2 116 / 33 4 200 and 5 wheel lugs.

##### **NOTE—**

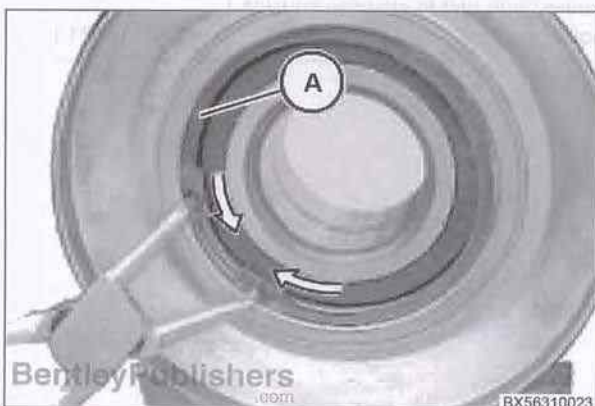
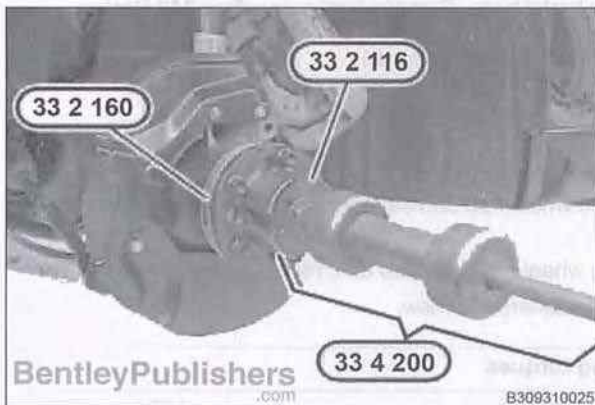
- *Point rounded inside edge of special tool 33 2 160 towards wheel hub.*

##### **WARNING—**

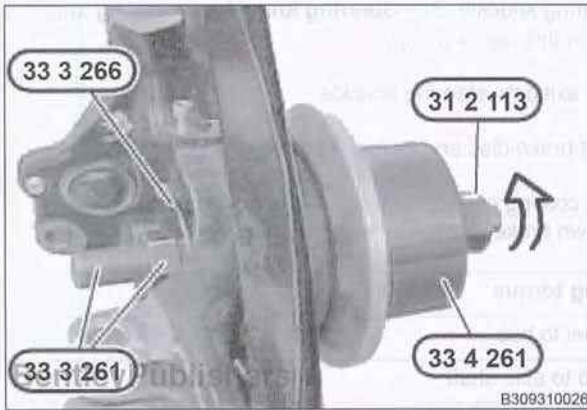
- *Bearing is destroyed when wheel hub is removed. Replace wheel bearing and wheel hub together.*

- Remove steering knuckle and clamp in bench vice with aluminum clamping jaws. See **Steering knuckle, removing and installing** in this repair group.

- ◀ Use snap ring pliers to remove wheel bearing circlip.

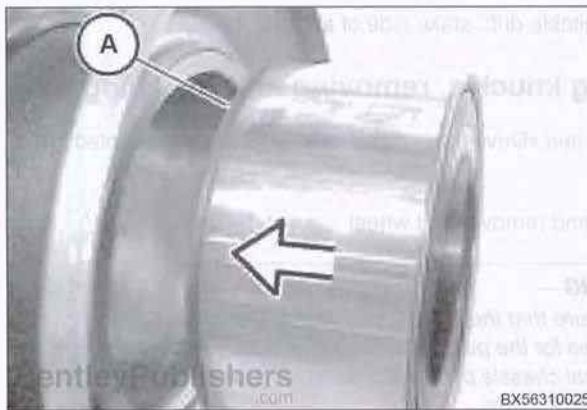


## Front wheel bearing, removing and installing (xDrive models)

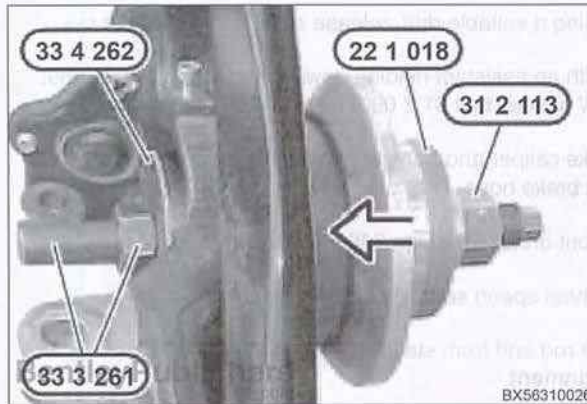


Remove wheel bearing using BMW special tools 31 2 113 / 33 4 261 / 33 3 266 / 33 3 261.

– Check dust sleeve. Replace if necessary.

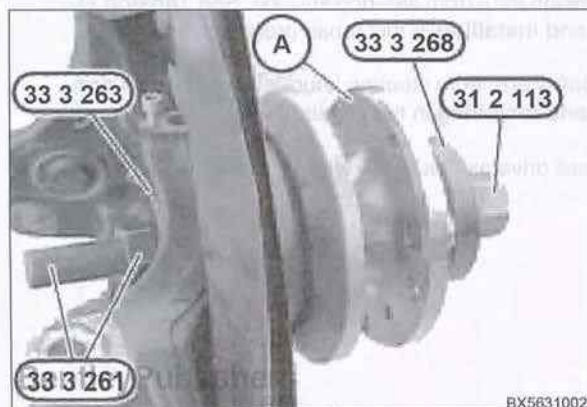


Make sure steering knuckle bearing surface is clean and coat 50% of its length with Loctite 638®. Note that wide chamfer of bearing (A) points towards steering knuckle.



With wide chamfer of bearing pointing towards steering knuckle, draw new bearing into hub using BMW special tools 31 2 113 / 22 1 018 / 33 4 262 / 33 3 261.

– Install new wheel bearing circlip. Make sure circlip is correctly seated.



Replace wheel hub (A) and draw into steering knuckle using BMW special tools 32 2 113 / 33 3 268 / 33 3 263 / 33 3 261.

## 310-16 Front Suspension

### Steering knuckle, removing and replacing

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

Tightening torque	
Road wheel to hub	120 Nm (89 ft-lb)
Wheel hub to axle shaft (replace axle nut with new)	420 Nm (310 ft-lb)

- Using a suitable drift, stake side of axle nut to axle.

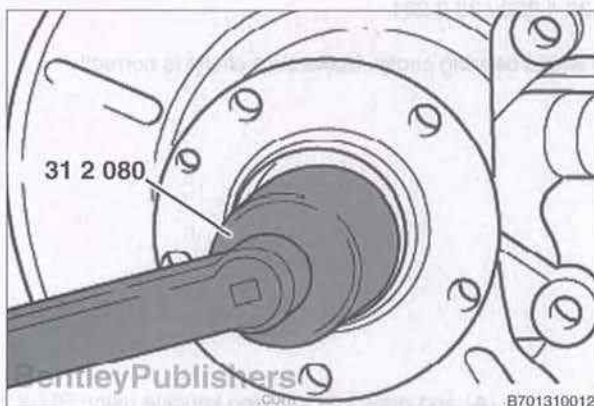
### Steering knuckle, removing and replacing

Rear drive and xDrive procedures vary. Differences are noted in the text.

- Raise car and remove front 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.

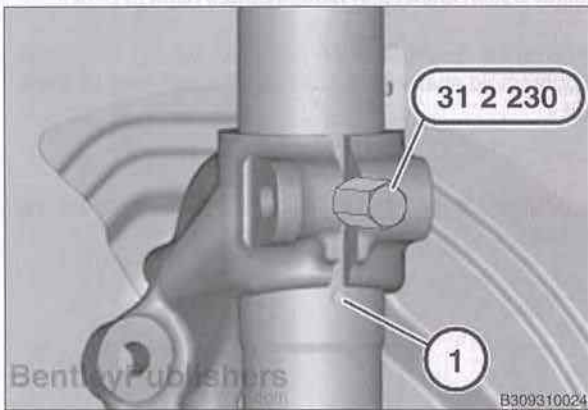


- **xDrive:** Using a suitable drift, release staked side of collar nut.
- **xDrive:** With an assistant holding down brake, remove collar nut using BMW special tool 31 2 080. Do not reuse collar nut.
- Unbolt brake caliper and hang to side with stiff wire. Do not disconnect brake hose.
- Remove front brake disc. See **340 Brakes**.
- Remove wheel speed sensor. See **340 Brakes**.
- Remove tie rod end from steering knuckle. See **320 Steering and Wheel Alignment**.
- Remove tension strut from steering knuckle. See **Tension strut, removing and installing** in this repair group.
- Remove control arm from steering knuckle. See **Control arm, removing and installing** in this repair group.
- **xDrive:** Press drive axle out of steering knuckle.





Using a suitable jack, support steering knuckle. Remove pinch bolt (arrow) securing front strut to steering knuckle.



If necessary, use BMW special too 31 2 230 to spread steering knuckle pinch clamp. Remove steering knuckle.

- Remainder of installation is reverse of removal. Remember to:
  - Face bolt head of steering knuckle pinch bolt in direction of travel.
  - Replace self locking fasteners with new.
  - Make sure steering knuckle contacts stop on strut.
  - Tighten bonded rubber fasteners to final torque specification with car on ground and loaded. Bounce suspension a few times before final tightening.

### Tightening torques

Control arm to steering knuckle	
• M14 8.8 bolts (replace with new)	80 Nm (59 ft-lb)
• M14 10.9 bolts (replace with new)	165 Nm (122 ft-lb)
Control arm to subframe	
• M12 8.8 bolts (replace with new)	68 Nm (50 ft-lb)+90°
• M12 10.9 bolts (replace with new)	100 Nm (74 ft-lb)+90°
Road wheel to hub	120 Nm (89 ft-lb)
Stabilizer bar link to strut	
• M10 bolts (replace with new)	58 Nm (43 ft-lb)
Strut assembly to steering knuckle	
• M10 bolts (replace with new)	45 Nm (34 ft-lb)
• M12 bolts (replace with new)	81 Nm (60 ft-lb)
Strut top bearing to chassis	
• M8 bolts (replace with new)	34 Nm (25 ft-lb)
Tension strut to steering knuckle	165 Nm (122 ft-lb)
Tension strut to subframe	
• M12 8.8 bolts (replace with new)	68 Nm (50 ft-lb)+90°
• M12 10.9 bolts (replace with new)	100 Nm (74 ft-lb)+90°
Tie rod end to steering knuckle (replace nut with new)	80 Nm (59 ft-lb)
Wheel bearing / hub unit to steering knuckle (replace bolts with new)	110 Nm (81 ft-lb)
Wheel hub to axle shaft (replace with new)	420 Nm (310 ft-lb)