Fastener Tightening Specifications

Application	Specification	
	Metric	English
Brake Hose Bracket Bolt	15 N·m	11 lb ft
Lower Ball Joint to Control Arm Bolt and Nut	68 N·m	50 lb ft
Lower Ball Joint Stud Nut	40 N·m	30 lb ft
Lower Control Arm to Frame Front Bolt and Nut	150 N·m +150°	110 lb ft +150°
Lower Control Arm to Frame Rear Bolt and Nut	70 N·m	52 lb ft
Lower Control Arm Rear Bushing Nut	150 N·m	111 lb ft
Outer Tie Rod End Nut	25 N·m + 90° rotation	18 lb ft + 90° rotation
Stabilizer Shaft Insulator Clamp Bolt	50 N·m	37 lb ft
Stabilizer Shaft to Link Nut	75 N·m	55 lb ft
Stabilizer Shaft Link to Strut Nut	85 N·m	63 lb ft
Strut Assembly Shaft Nut	85 N·m	63 lb ft
Strut Upper Mount Nut	25 N·m	18 lb ft
Strut to Steering Knuckle Bolt and Nut	200 N·m	148 lb ft
Tie Rod Retention Nut	60 N·m	44 lb ft
Wheel Bearing/Hub Mounting Bolt	130 N·m	96 lb ft
Wheel Drive Shaft Nut	205 N·m	151 lb ft

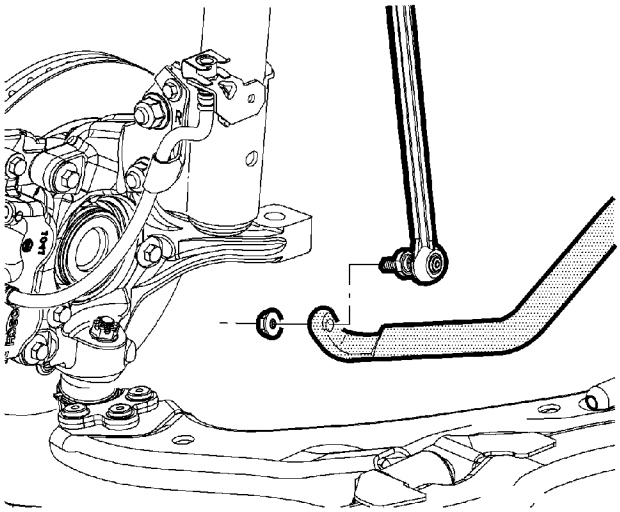
Stabilizer Shaft Replacement

Special Tools

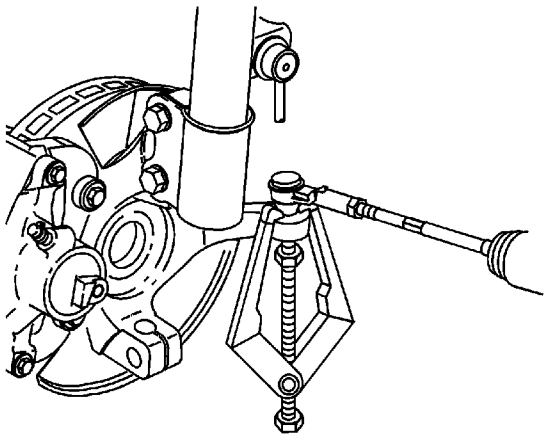
- J 44015 Steering Linkage Installer
- SA91100C Tie Rod Separator

Removal Procedure

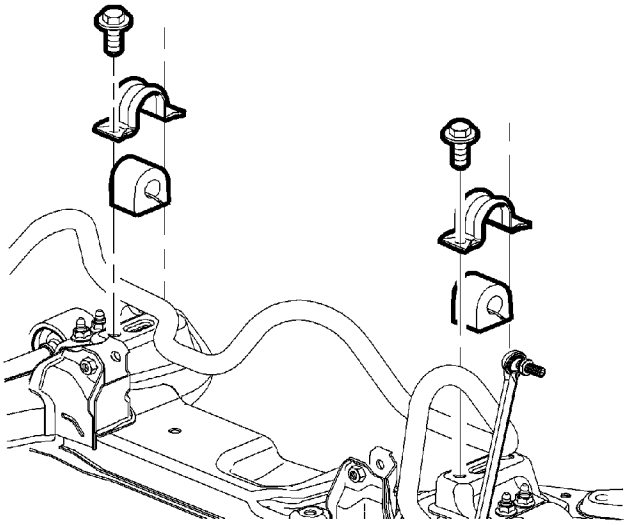
1. Turn the front to the full right position.
2. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle.
3. Remove the front tire and wheels. Refer to Tire and Wheel Removal and Installation.



4. Disconnect the stabilizer link from the stabilizer bar.
5. Remove the left outer tie rod to steering knuckle nut. Discard the nut.



6. Using the SA91100C , separate the outer tie rod from the steering knuckle.



7. Remove the stabilizer bar clamp to cradle bolts.
8. Remove the stabilizer bar clamps and bushings from the stabilizer bar.

Note: Take care not to catch the transmission shift cable or left wheel house plastic trim when removing the stabilizer bar.

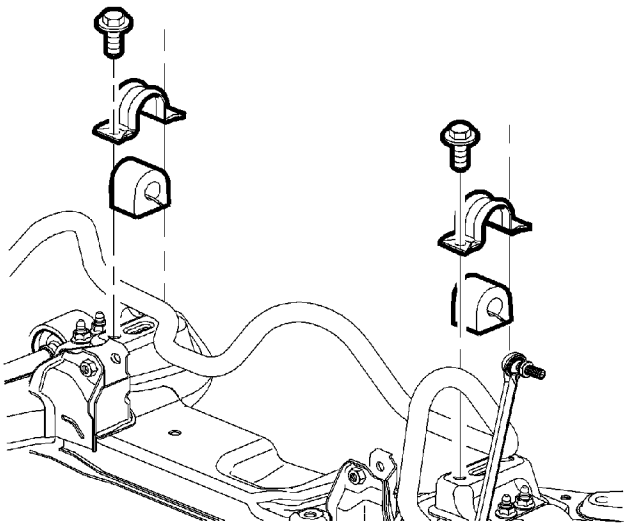
9. Remove the stabilizer bar from the vehicle through the left wheel opening.

Installation Procedure

Note: Take care not to catch the transmission shift cable or left wheel house plastic trim

when installing the stabilizer bar.

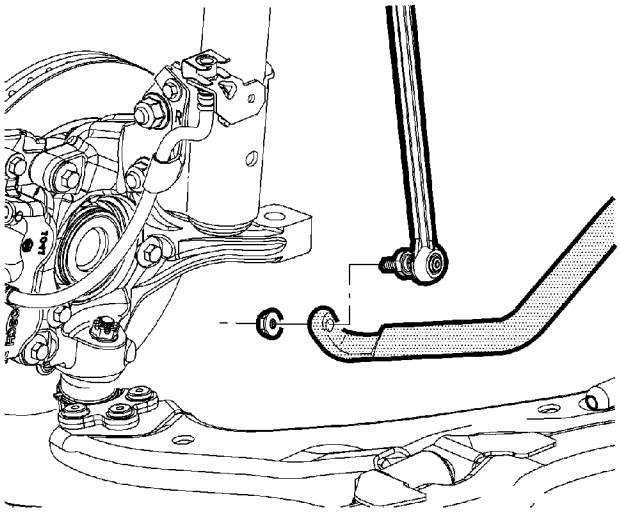
1. Install the stabilizer bar to the vehicle through the left wheel opening.



2. Install the stabilizer bar clamps and bushings to the stabilizer bar.

Caution: Refer to Fastener Caution in the Preface section.

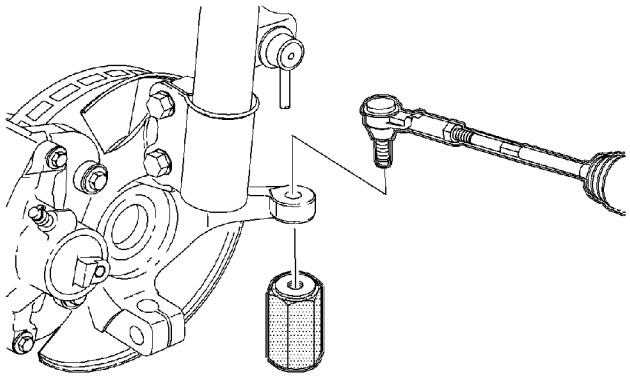
3. Install the stabilizer bar clamp bolts and tighten to **50 N·m (37 lb ft)**.
4. Inspect the stabilizer link boots for damage and replace the stabilizer link if needed.



Note: Hold the ball stud when tightening the nut.

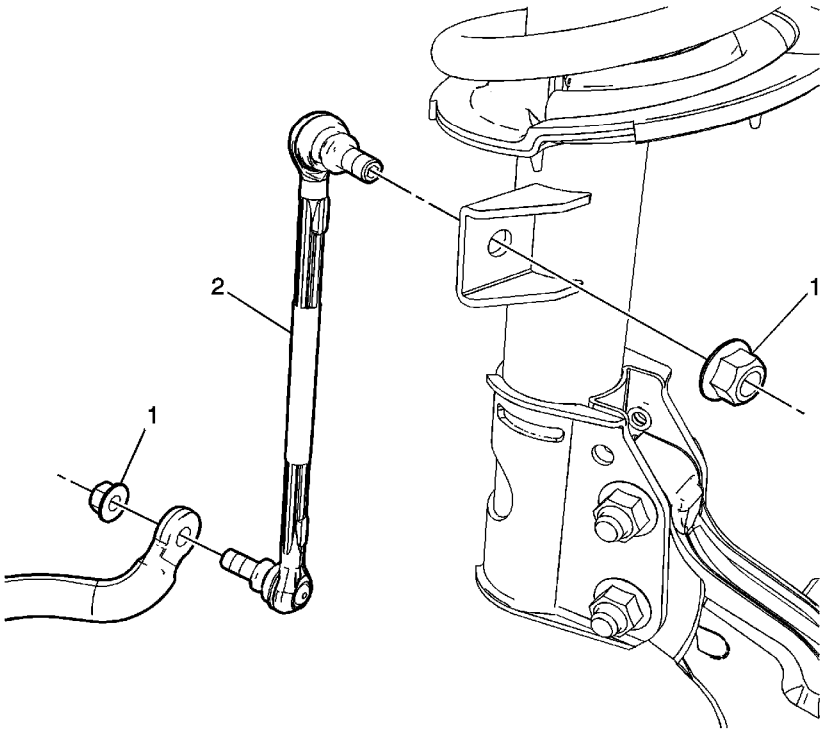
5. Connect the stabilizer links to the stabilizer bar. Do not allow the boot to twist.

Tighten the bar to link nut to **65 N·m (48 lb ft)**.



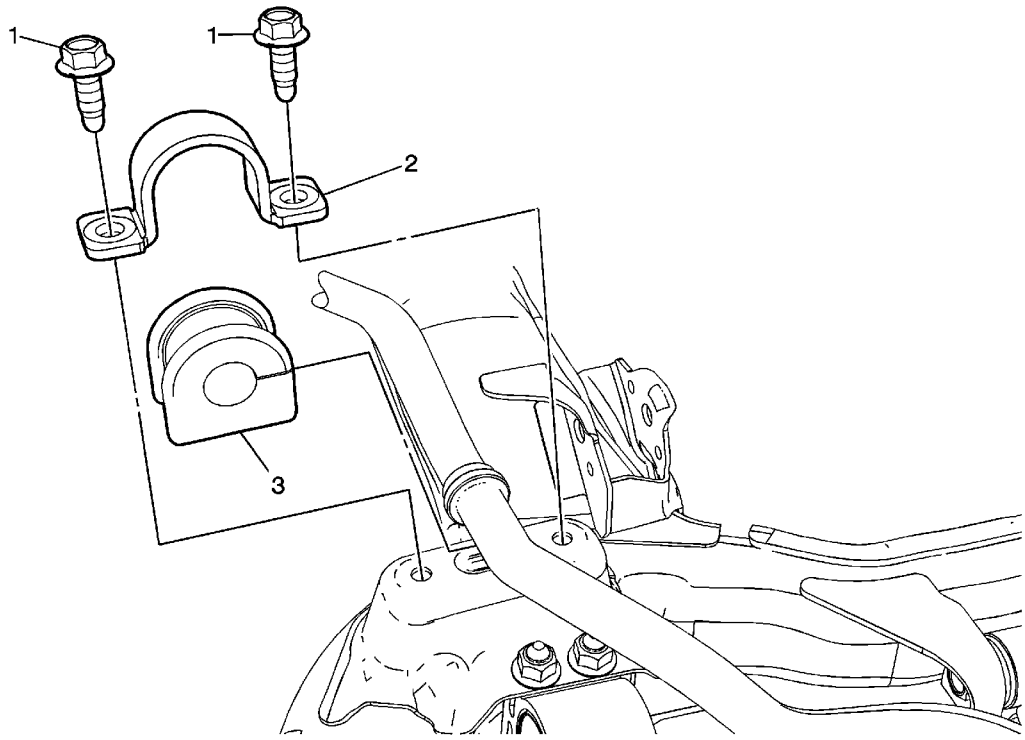
6. Connect the left outer tie rod to the steering knuckle.
7. Use the J 44015 to seat the ball stud taper to **40 N·m (30 lb ft)**.
8. Remove the J 44015 .
9. Install a new tie rod retention nut and tighten to **50 N·m (37 lb ft)**.
10. Install the front tire and wheels. Refer to Tire and Wheel Removal and Installation.
11. Lower the vehicle.

Stabilizer Shaft Link Replacement



Callout	Component Name
Preliminary Procedures 1. Raise the vehicle. Refer to Lifting and Jacking the Vehicle. 2. Remove the front wheel and tire assembly. Refer to Tire and Wheel Removal and Installation.	
1	Stabilizer Shaft Link Ball Stud Nut (Qty: 2) **Caution:** Refer to Fastener Caution in the Preface section. **Tip** Use the proper size allen wrench to keep the stabilizer link ball stud from rotate while removing or installing the nut. **Tighten** 85 N·m (63 lb ft).
2	Stabilizer Shaft Link

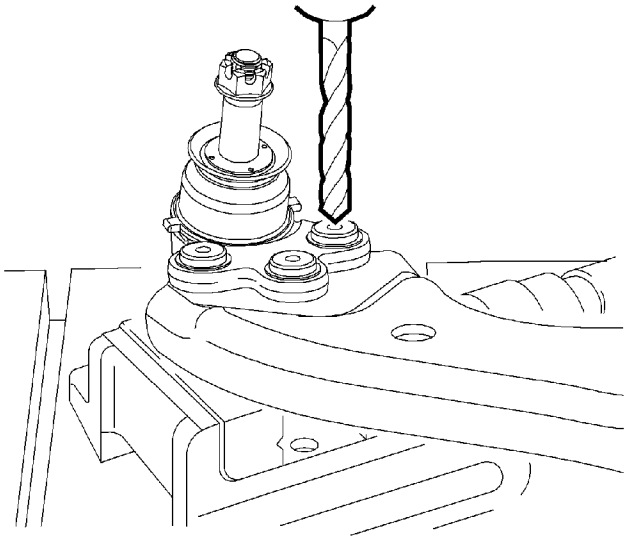
Stabilizer Shaft Insulator Replacement



Callout	Component Name
Preliminary Procedures 1. Raise the vehicle. Refer to Lifting and Jacking the Vehicle. 2. Remove the front wheel and tire assemblies. Refer to Tire and Wheel Removal and Installation.	
1	Stabilizer Shaft Insulator Bolt (Qty: 4) **Caution:** Refer to Fastener Caution in the Preface section. **Tighten** 50 N·m (37 lb ft).
2	Stabilizer Shaft Insulator Clamp (Qty: 2)
3	Stabilizer Shaft Insulator (Qty: 2)

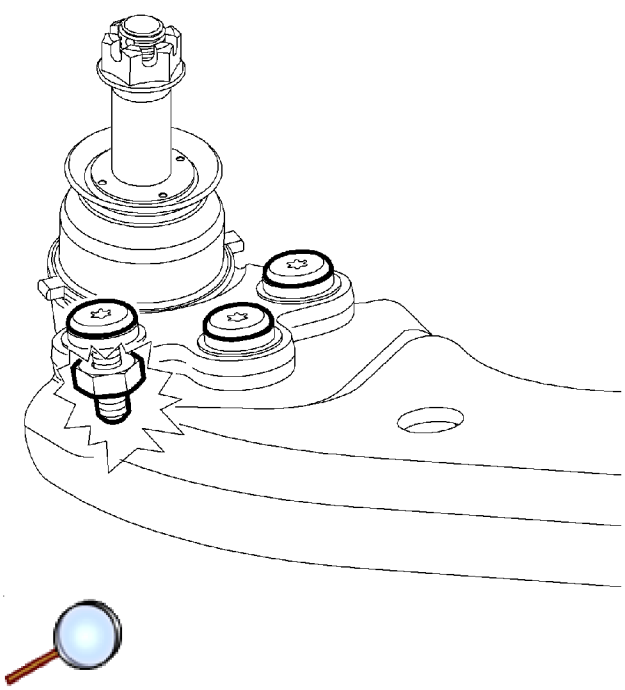
Lower Control Arm Ball Joint Replacement

Removal Procedure



1. Remove the lower control arm. Refer to Lower Control Arm Replacement.
2. Place the control arm in a vise or suitable holding device.
3. Remove the ball joint rivets using the following procedure.
   3.1. Drill through the rivets using a 8 mm (5/16 in) drill bit.
   3.2. Enlarge the hole using a 12 mm (31/64 in) drill bit.
   3.3. Remove any remaining burs from the control arm.
4. Remove the ball joint from the control arm. Note the position of the ball joint for reassembly.

Installation Procedure



Note: The control arm must be clean and free of debris.

1. Install the ball joint to the control arm as previously noted.

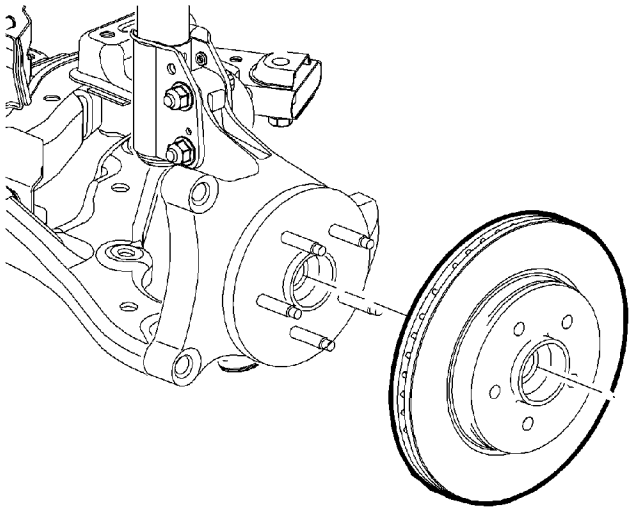
   Caution: Refer to Fastener Caution in the Preface section.

   Note:
   - Only use hardware provided with the new ball joint.
   - The bolts must be installed with the bolt head on top of the ball joint.

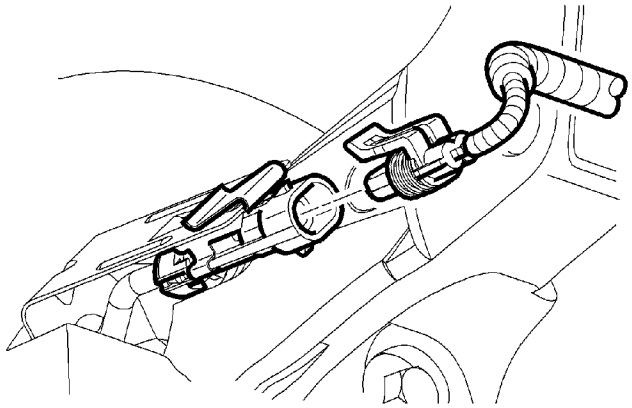
2. Install the ball joint to control arm bolts and tighten the bolts/nuts to **68 N·m (50 lb ft)**.
3. Install the lower control arm. Refer to Lower Control Arm Replacement.

Front Wheel Bearing and Hub Replacement

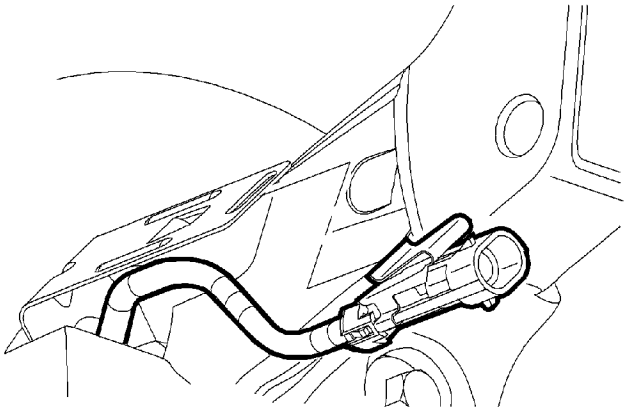
Removal Procedure



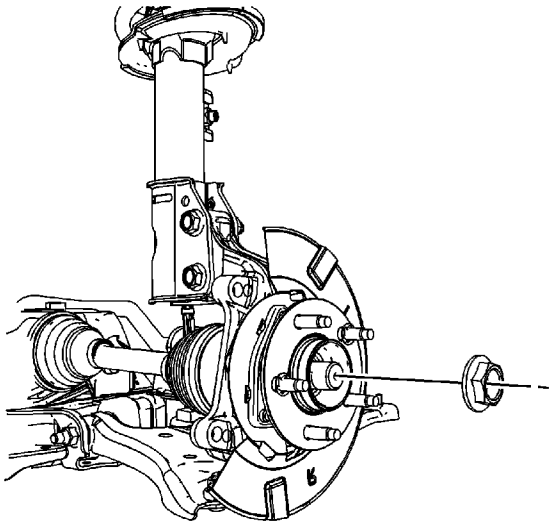
1. Remove the front brake rotor. Refer to Front Brake Rotor Replacement.



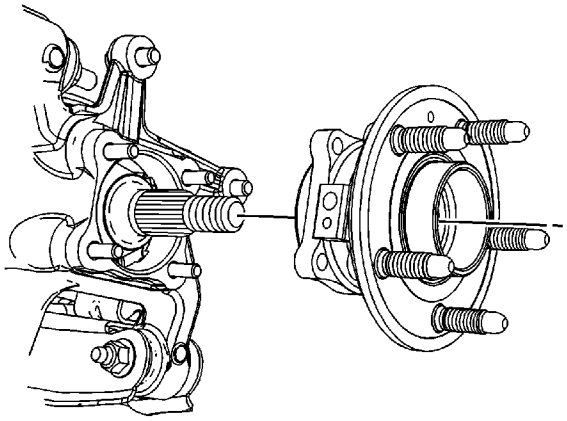
2. Disconnect the wheel speed sensor electrical connector, if equipped.



3. Remove the wheel speed sensor electrical connector from the connector bracket.

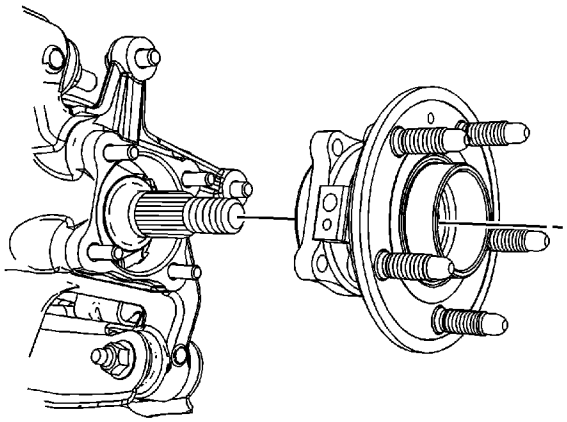


4. Remove the front wheel drive shaft spindle nut.
5. Remove the speed sensor. Refer to Front Wheel Speed Sensor Replacement.



6. Support the wheel drive shaft with heavy mechanic's wire or equivalent.
7. Remove and discard the wheel bearing/hub mounting bolts.
8. Remove the wheel bearing/hub assembly from the steering knuckle.

Installation Procedure



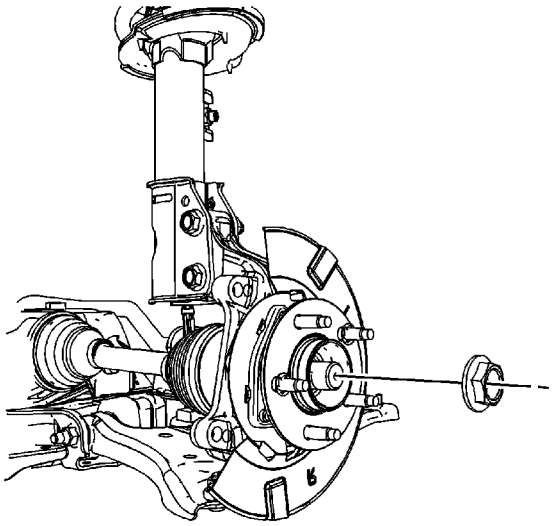
1. Install the wheel bearing/hub assembly to the steering knuckle.
2. Clean the threads of the bolts with the proper cleaner.

Note: Allow the threadlocker to set for 10 minutes before using.

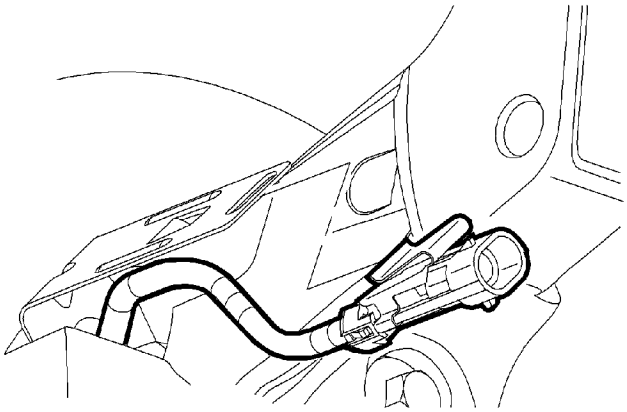
3. Apply threadlocker GM P/N 89021297 (Canadian P/N 10953488) on 2/3 of the bolts threads.

   Caution: Refer to Fastener Caution in the Preface section.

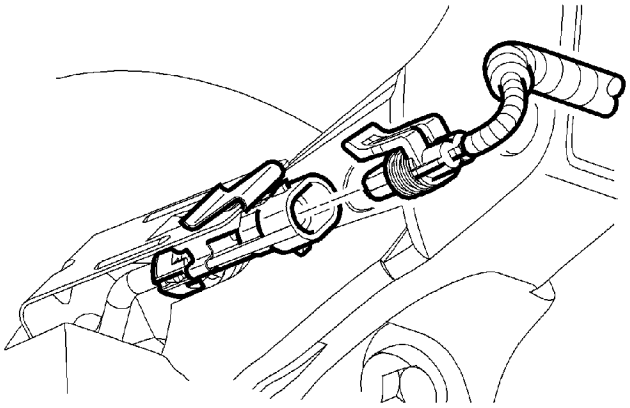
4. Install the wheel bearing/hub mounting bolts and tighten to **130 N·m (96 lb ft)**.



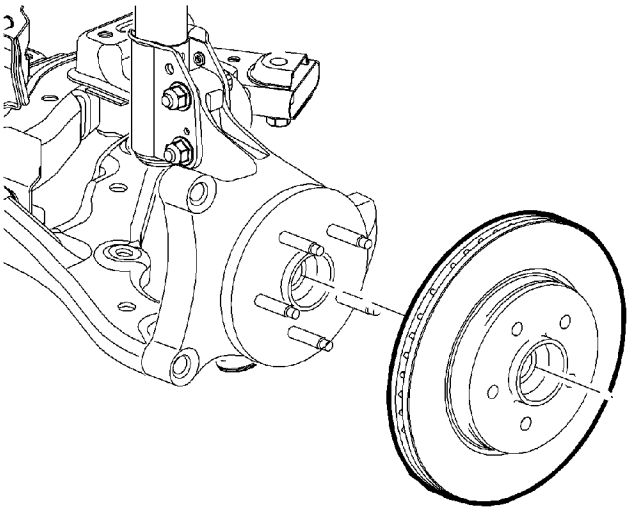
5. Install the wheel drive shaft spindle nut and tighten to **205 N·m (151 lb ft)**.



6. Install the wheel speed sensor electrical connector to the mounting bracket, if equipped.



7. Connect the wheel speed sensor electrical connector.
8. Install the speed sensor. Refer to Front Wheel Speed Sensor Replacement.



9. Install the front brake rotor. Refer to Front Brake Rotor Replacement.

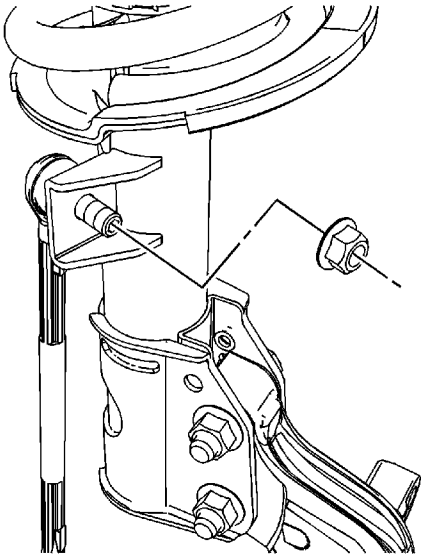
Steering Knuckle Replacement

Special Tools

J-42188-B Ball Joint Separator

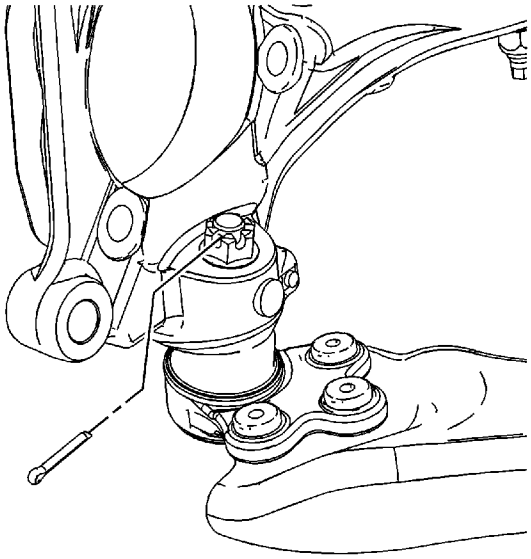
Removal Procedure

1. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle.
2. Remove the tire and wheel. Refer to Tire and Wheel Removal and Installation.
3. Remove the wheel bearing/hub assembly. Refer to Front Wheel Bearing and Hub Replacement.

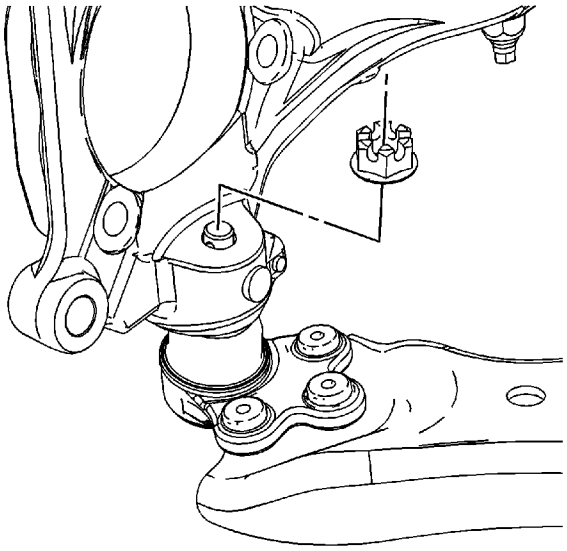


Note: Do not allow the stabilizer link ball stud to rotate while removing the link nut.

4. Remove the nut and separate the stabilizer link from the strut assembly.
5. Loosen the steering knuckle to strut bolts and nuts.



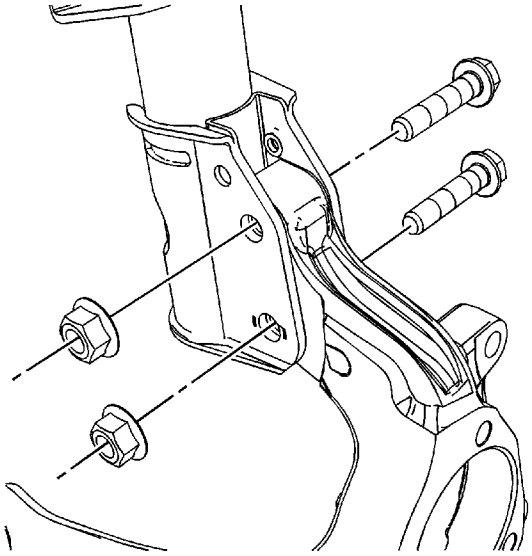
6. Remove and discard the lower ball joint cotter pin.
7. Loosen the ball stud nut, until level with the top of the ball stud.
8. Using the J-42188-B , separate the lower ball joint from the steering knuckle.



9. Remove the lower control arm and nut.

Note: Do not free the ball stud from the steering knuckle by use of a pickle fork or a wedge type tool. Damage to the seal or bushing may result.

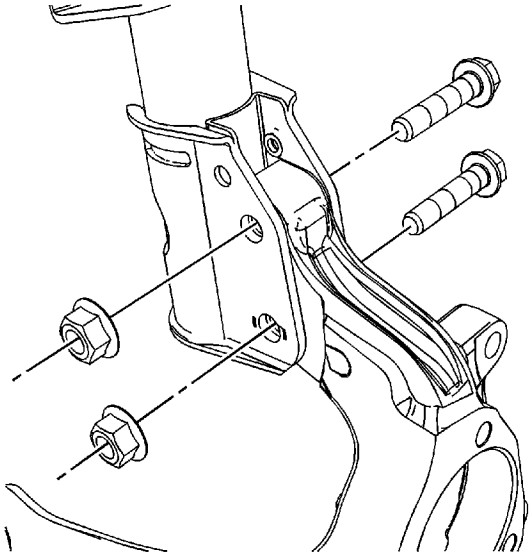
10. Remove the tie rod. Refer to Steering Linkage Outer Tie Rod Replacement.



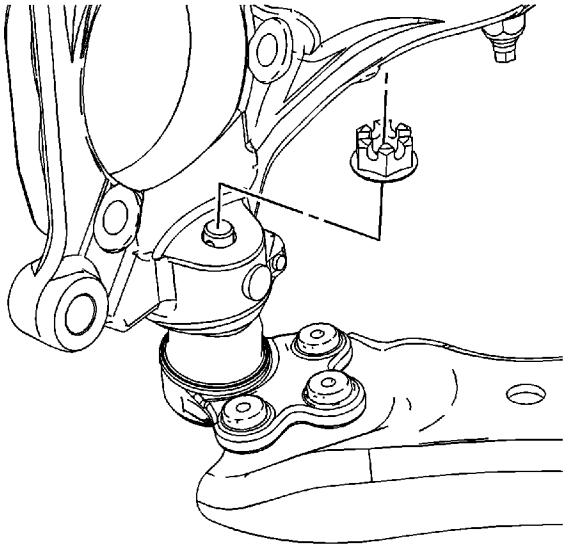
11. Remove the steering knuckle to strut bolts and nuts.
12. Remove the steering knuckle from the vehicle.

Installation Procedure

1. Position the steering knuckle to strut assembly.



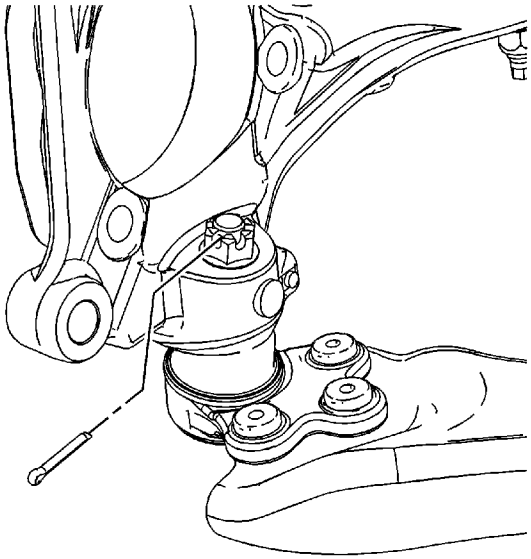
2. Loosely install the strut to steering knuckle bolts and nuts.



3. Position the lower ball joint stud into the steering knuckle.

Caution: Refer to Fastener Caution in the Preface section.

4. Using the SA9140E , install the ball stud nut and tighten to **40 N·m (30 lb ft)**.
5. Tighten the strut to steering knuckle bolts and nuts to **180 N·m (133 lb ft)**.

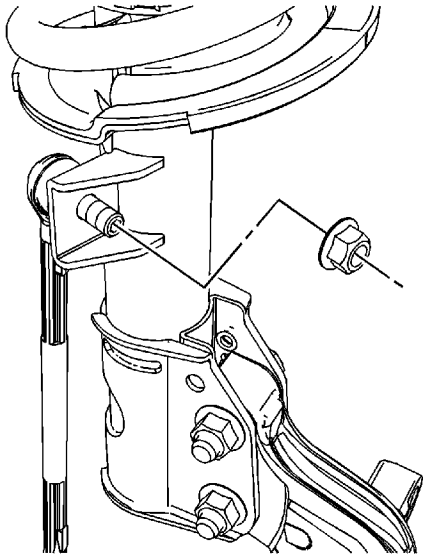


Note: Do not loosen the castle nut for cotter pin installation.

6. Tighten the castle nut enough to allow for cotter pin installation.

Note: The cotter pin must not contact the wheel speed sensor or drive axle.

7. Install a new cotter pin.
8. Install the tie rod. Refer to Steering Linkage Outer Tie Rod Replacement.



Note: Do not allow the stabilizer link ball stud to rotate while installing the link nut.

9. Position the stabilizer shaft link to the strut assembly and install the nut. Tighten the nut to **65 N·m (48 lb ft)**.
10. Install the wheel bearing/hub assembly. Refer to Front Wheel Bearing and Hub Replacement.
11. Install the tire and wheel. Refer to Tire and Wheel Removal and Installation.
12. Lower the vehicle.
13. Perform a wheel alignment. Refer to Wheel Alignment Measurement.

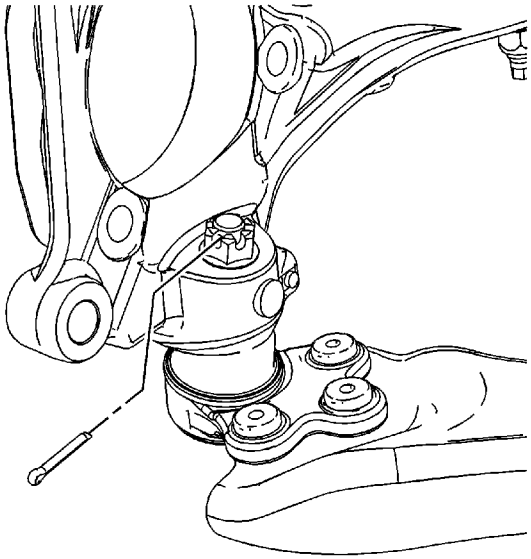
Lower Control Arm Replacement

Special Tools

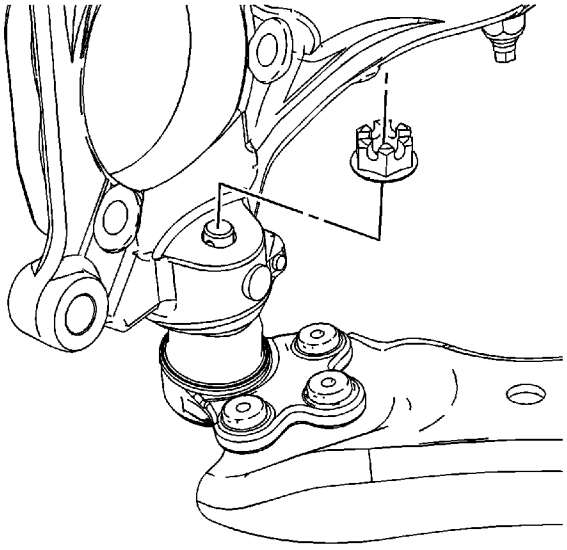
J-42188-B Ball Joint Separator

Removal Procedure

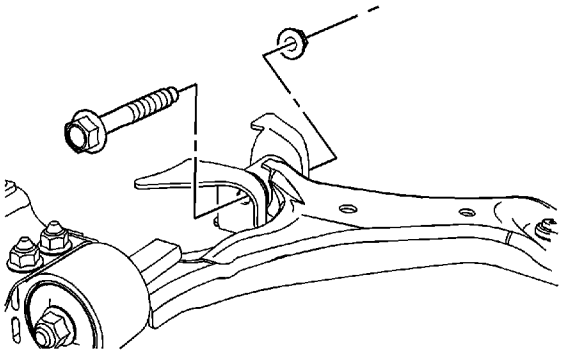
1. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle.
2. Remove the wheel and tire assembly. Refer to Tire and Wheel Removal and Installation.



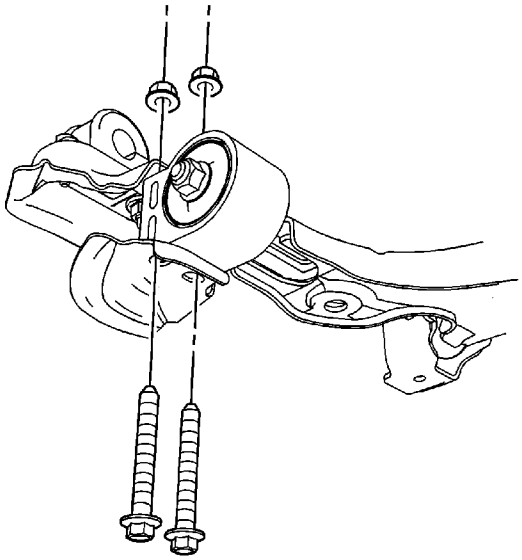
3. Remove the lower ball joint stud cotter pin. Discard the cotter pin.
4. Loosen the ball stud nut until the nut is level with the top of the ball stud.
5. Using J-42188-B , separate the lower control arm from the steering knuckle.



6. Remove the lower ball joint stud nut.



7. Remove the control arm-to-frame front bolt and nut. Discard the bolt and nut.

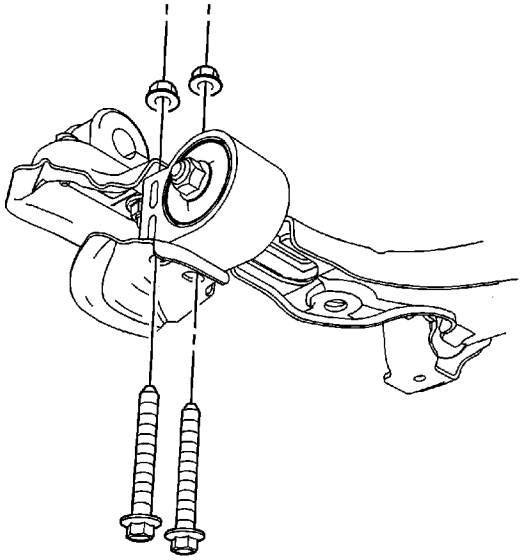


8. Remove the control arm-to-frame rear bolts and nuts. Discard the bolts and nuts.
9. Remove the control arm.

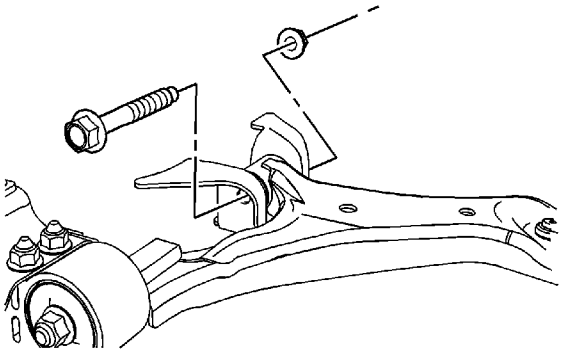
Installation Procedure

1. Position the control arm to the cradle/frame.

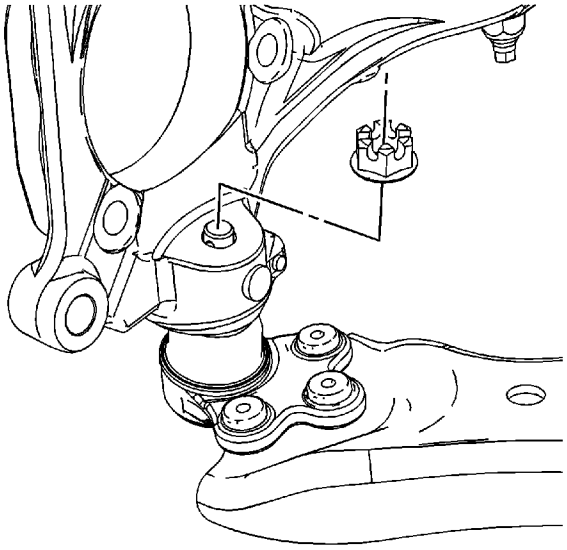
   Caution: Refer to Fastener Caution in the Preface section.



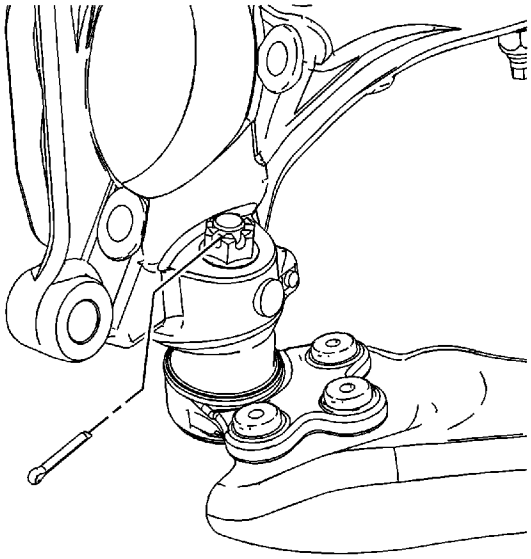
2. Install new control arm-to-frame rear bolts and nuts and tighten to **70 N·m (52 lb ft)**.



3. Install a new arm-to-frame front bolt and nut. Tighten the control arm front bolt and nut to **150 N·m (110 lb ft) plus 130 degrees**.



4. Position the control arm ball stud into the steering knuckle and install the nut. Tighten the nut to **40 N·m (30 lb ft)**.



Note:

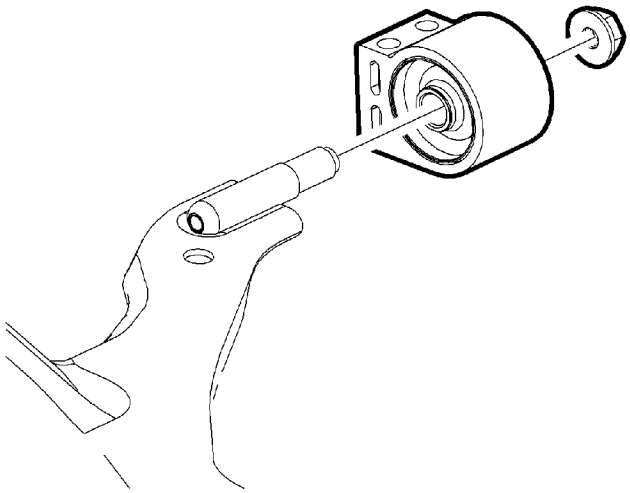
- Do not loosen the castle nut, only tighten to align the ball stud slot.
- Ensure that the cotter pin ends do not contact the antilock brake system (ABS) sensor harness or drive axle.

5. Continue to tighten the nut only enough to align the castle nut slots with the ball stud, install a new cotter pin.
6. Install the wheel and tire assembly. Refer to Tire and Wheel Removal and Installation.
7. Verify front end alignment. Refer to Wheel Alignment Specifications.
8. Lower the vehicle.

Front Lower Control Arm Bushing Replacement

Removal Procedure

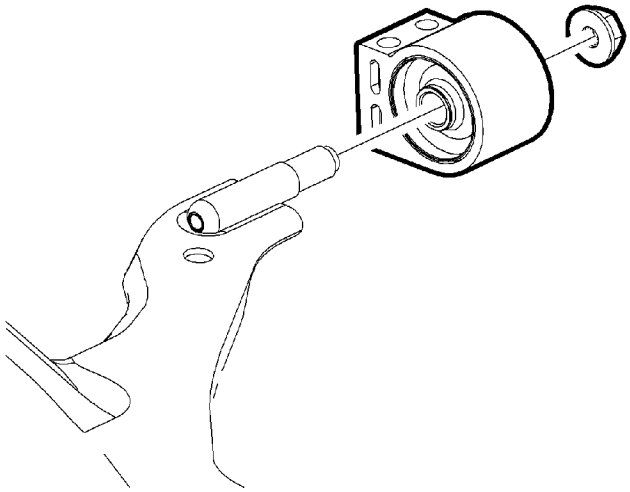
1. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle.
2. Remove the front tire and wheel assembly. Refer to Tire and Wheel Removal and Installation.
3. Remove the lower control arm. Refer to Lower Control Arm Replacement.



4. Remove the rear bushing nut.
5. Remove the rear bushing.

Installation Procedure

Caution: Refer to Fastener Caution in the Preface section.



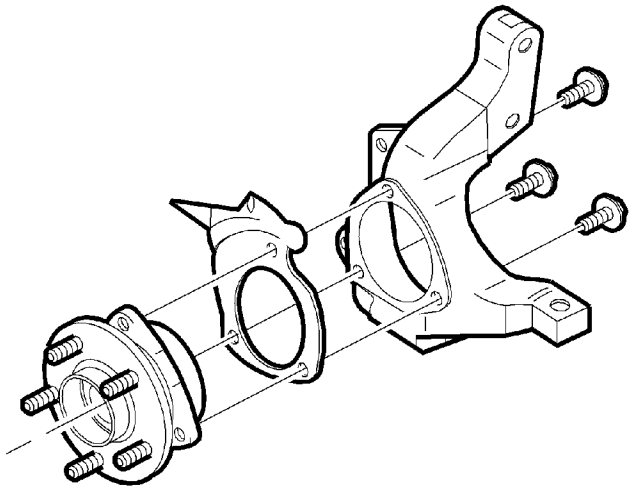
1. Install the rear bushing to the lower control arm. Tighten the nut to **150 N·m (110 lb ft)**.
2. Install the lower control arm. Refer to Lower Control Arm Replacement.
3. Install the front tire and wheel assembly. Refer to Tire and Wheel Removal and Installation.
4. Lower the vehicle.

Wheel Stud Replacement

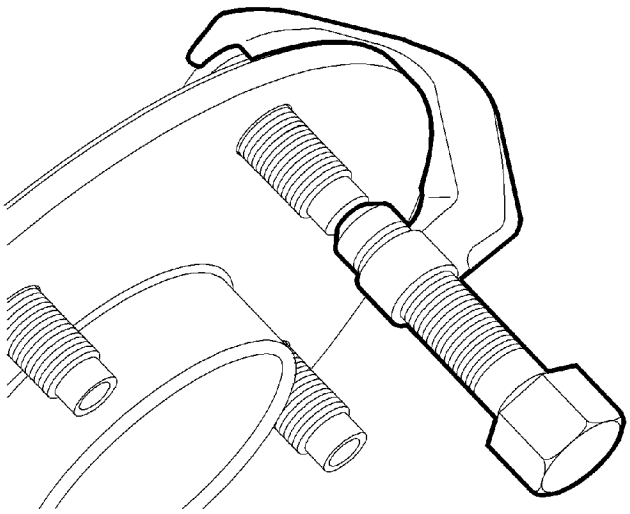
Tools Required

J 43631 Ball Joint Remover

Removal Procedure

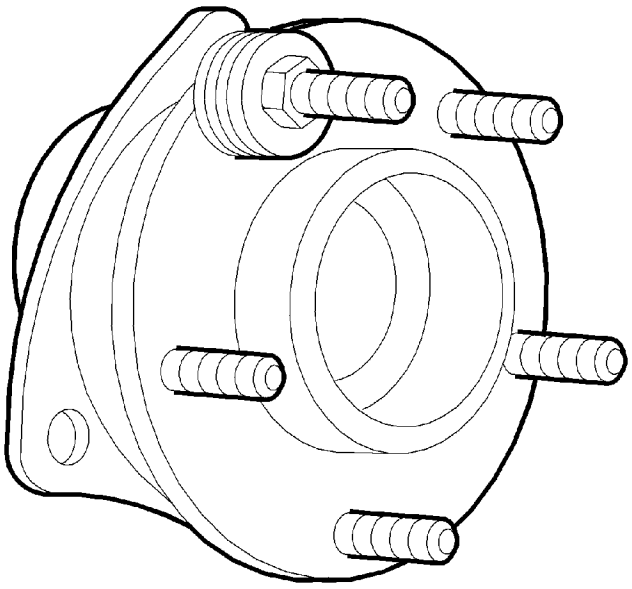


1. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle .
2. Remove the tire and wheel assembly. Refer to Tire and Wheel Removal and Installation .
3. Remove the wheel bearing/hub assembly. Refer to Front Wheel Bearing and Hub Replacement .

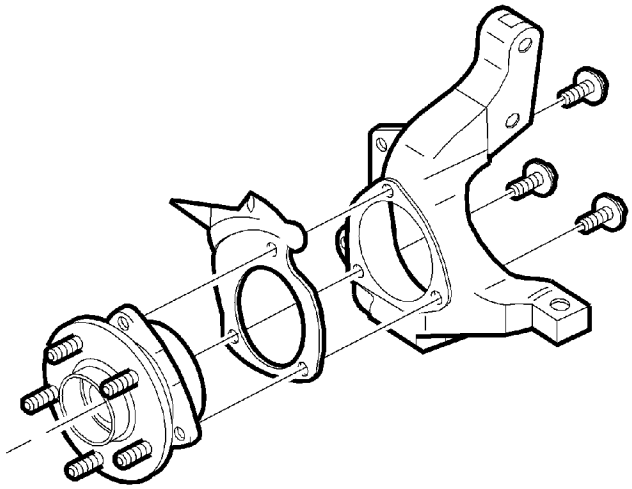


4. Using the J 43631 , press out the wheel stud from the wheel bearing/hub assembly.

Installation Procedure



1. Install the wheel stud to the wheel bearing/hub assembly from the bearing side of the hub flange.
2. Place flat washers over the wheel stud being installer.
3. Install the wheel nut or a hex head nut to the wheel stud.
4. Gradually tighten the nut in order to draw the stud into the hub flange until the head of the wheel stud is fully seated against the hub flange.
5. Remove the nut and flat washers.

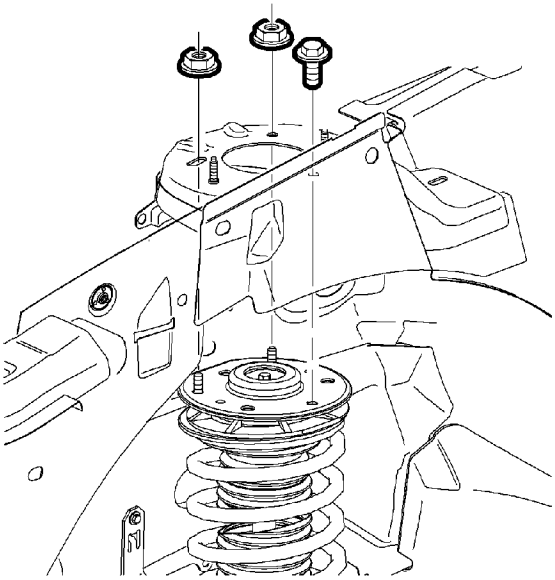


6. Install the wheel bearing/hub assembly to the steering knuckle. Refer to Front Wheel Bearing and Hub Replacement .
7. Install the tire and wheel assembly. Refer to Tire and Wheel Removal and Installation .
8. Lower the vehicle.

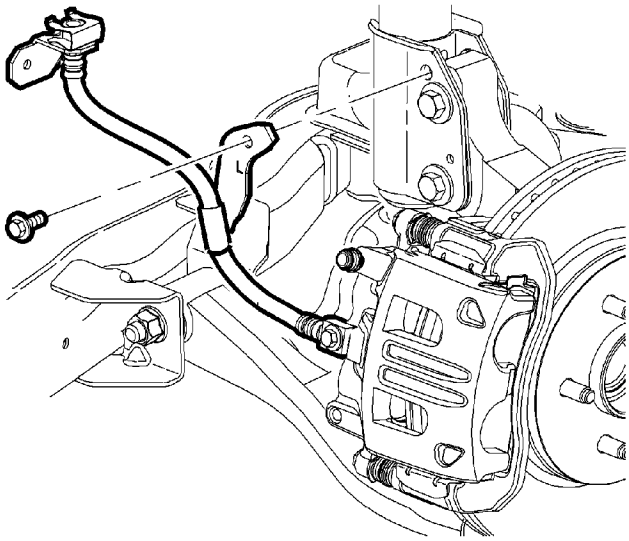
Strut Assembly Replacement

Removal Procedure

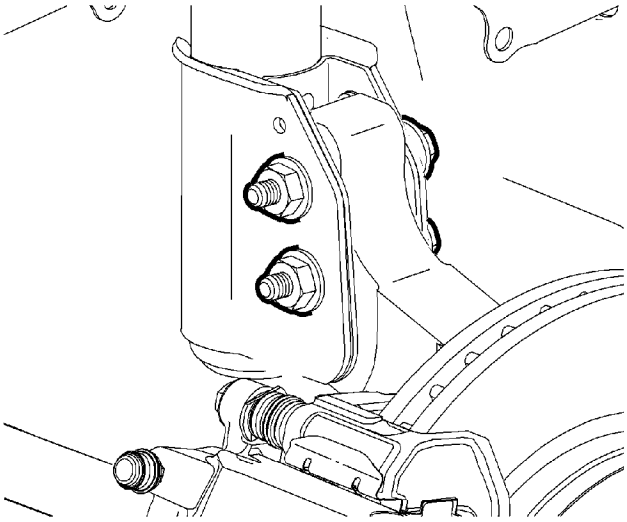
1. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle.



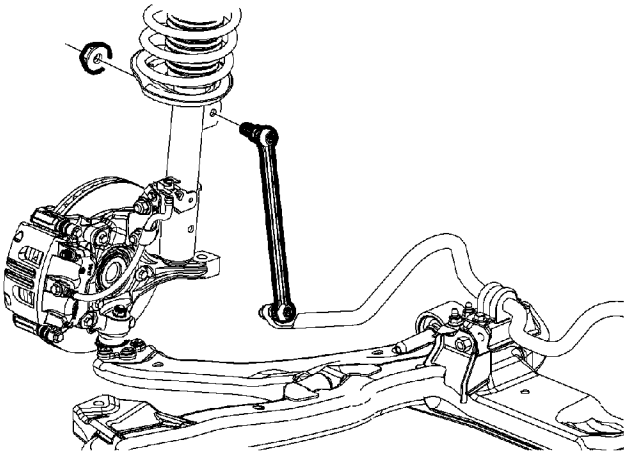
2. Remove the strut assembly to body fasteners.
3. Remove the wheel and tire. Refer to Tire and Wheel Removal and Installation.



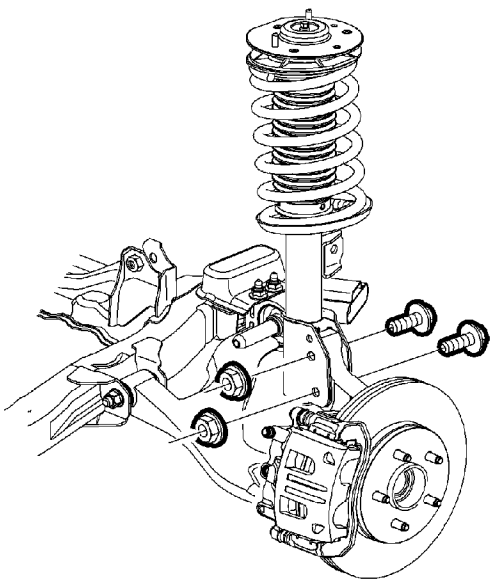
4. Remove the brake hose bracket from the strut assembly.



5. Loosen, do not remove the strut to knuckle bolts and nuts.



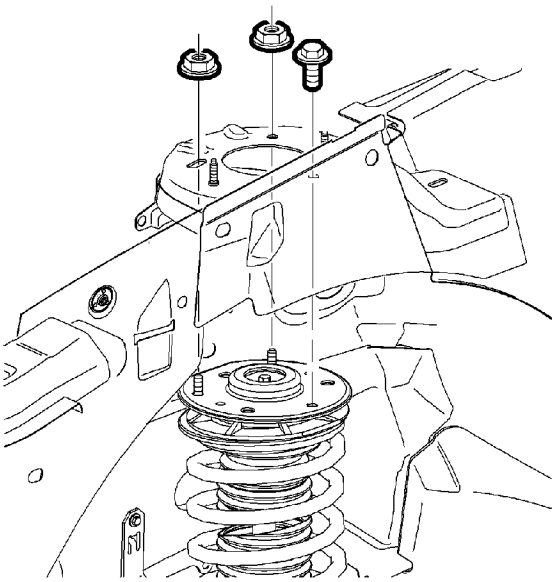
6. Disconnect the stabilizer link from the strut assembly.



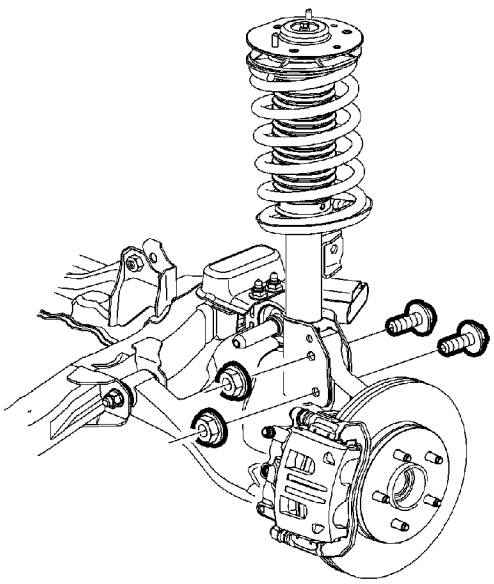
7. Remove the strut to knuckle bolts and nuts. Discard the bolts and nuts.
8. Remove the strut assembly from the vehicle.

Installation Procedure

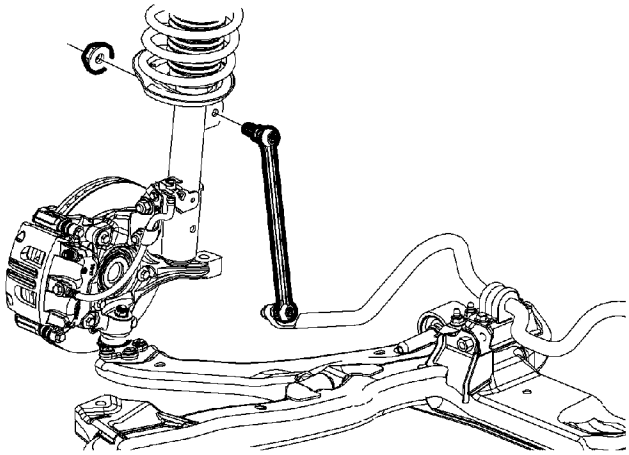
Caution: Refer to Fastener Caution in the Preface section.



1. Install the strut assembly to the vehicle.
   - Tighten the strut to body nuts to **25 N·m (18 lb ft)**.
   - Tighten the strut to body bolt to **25 N·m (18 lb ft)**.

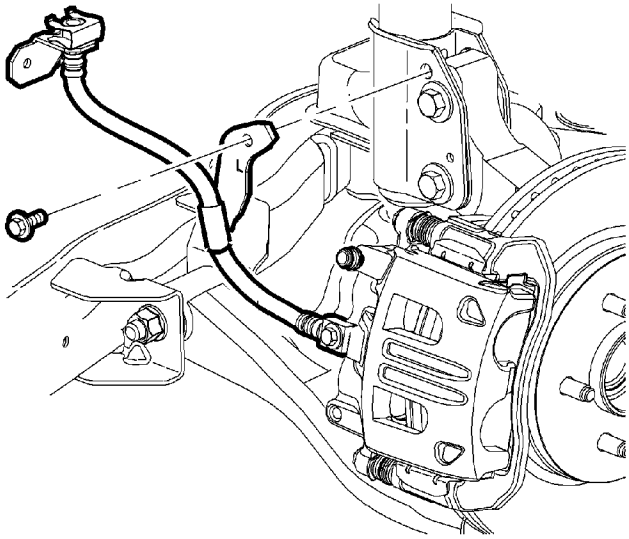


2. Attach the strut to the steering knuckle using new bolts and nuts. Tighten the bolts and nuts to **180 N·m (133 lb ft)**.
3. Inspect the stabilizer link seals for damage and replace the link as necessary.



Note: Do not allow the stabilizer link ball stud to rotate while installing the link nut.

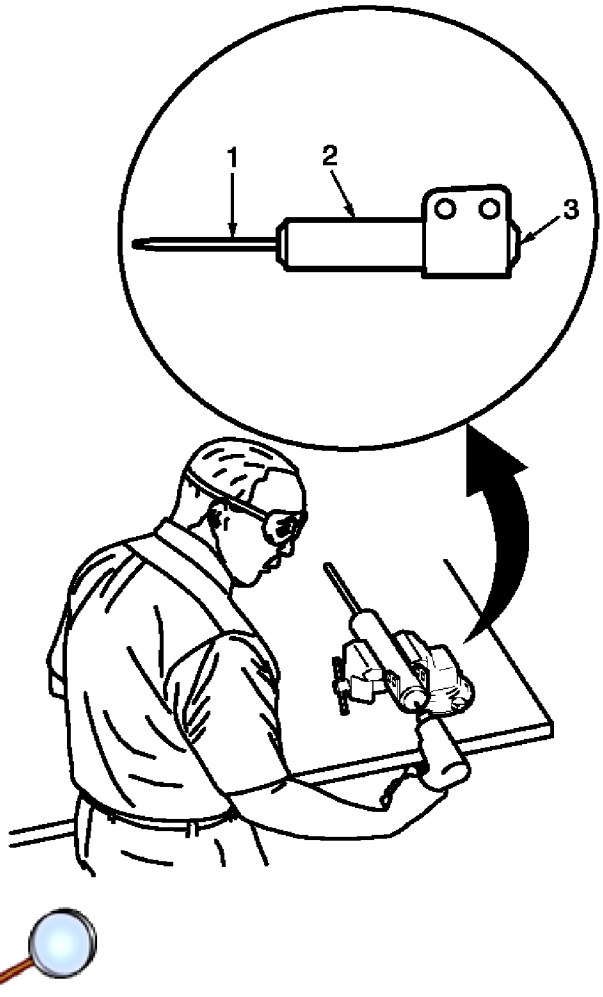
4. Connect the stabilizer link to the strut and tighten the nut to **65 N·m (48 lb ft)**.



5. Install the brake hose bracket to the strut assembly. Tighten the brake bracket bolt to **15 N·m (11 lb ft)**.
6. Install the wheel and tire. Refer to Tire and Wheel Removal and Installation.
7. Lower the vehicle.
8. Perform a wheel alignment. Refer to Wheel Alignment Measurement.

Suspension Shock/Strut Disposal

Warning: Use the proper eye protection when drilling to prevent metal chips from causing physical injury.



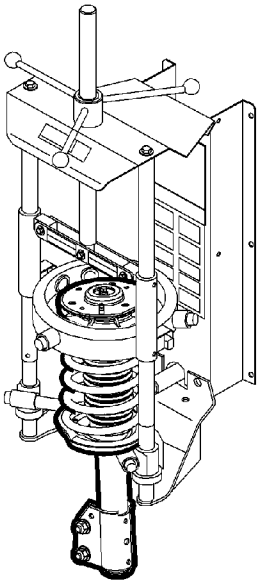
1. Clamp the strut in a vise horizontally with the rod (1) completely extended.
2. Drill a hole in the strut at the center of the end cap (3) using a 5 mm (3/16 in) drill bit. Gas or a gas/oil mixture will exhaust when the drill bit penetrates the strut. Use shop towels in order to contain the escaping oil.
3. Remove the strut from the vise.
4. Hold the strut over a drain pan vertically with the hole down.
5. Move the rod (1) in and out of the tube (2) to completely drain the oil from the strut.

Strut, Strut Component, and Spring Replacement

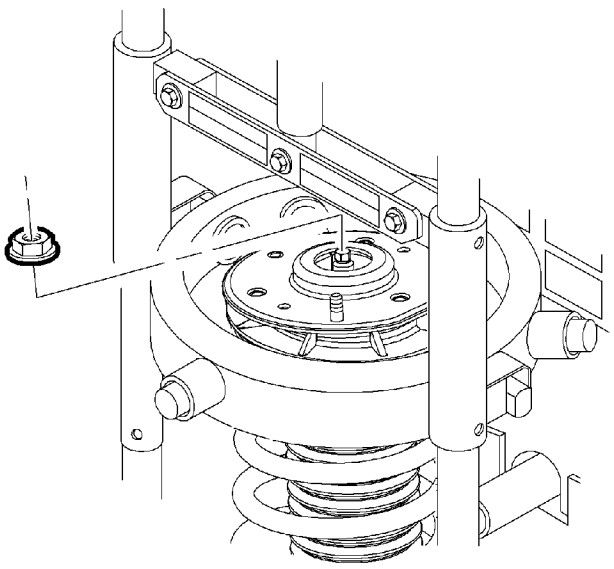
Special Tools

- J 42991 Strut Rod Nut Socket
- J 45400 Strut Spring Compressor

Removal Procedure

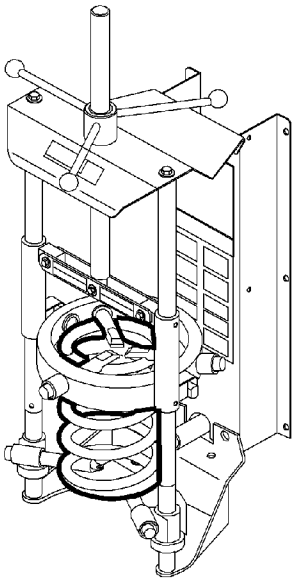


1. Install the strut assembly in the J 45400 using the following procedure.
   1.1. Adjust the lower legs of the J 45400 to the lowest possible coil of the spring.
   1.2. Adjust the upper legs of the J 45400 to the highest possible coil of the spring.
   1.3. Inspect the strut assembly to insure hooks on the strut compress legs are properly installed on the spring coils.
   1.4. Verify the strut assembly is parallel with the J 45400 .
2. Compress the spring enough to unload the upper strut mount.



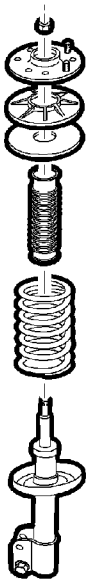
Caution: Do not allow the absorber rod to rotate during disassembly/reassembly. Use hand tools to keep the absorber rod from rotating. If air tools are used, and the rod is allowed to rotate, damage to the absorber may occur.

3. Use the J 42991 or equivalent hand tools to remove the strut shaft nut.



Note: Leave the spring in the spring compressor.

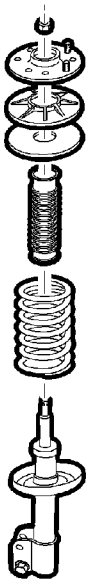
4. Lower the strut from the spring assembly.



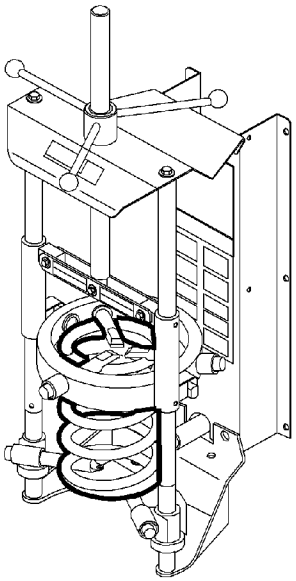
Caution: Do not handle the top mount assembly by the plastic portion. Handle the top mount assembly by the metal portion when removing/installing the top mount from/to the strut assembly. Holding the top mount assembly by the plastic portion may loosen the snap fit of the bearing components and cause the bearing to fall apart.

5. Remove the upper mount assembly, inspect for damage and deterioration. Replace as necessary.
6. Remove the strut dust shield and inspect for damage and deterioration. Replace as necessary.
7. Remove the hollow bumper from the strut shaft and inspect for damage and deterioration. Replace as necessary.
8. Inspect the spring for damage. Replace as necessary.

Installation Procedure



1. Extend the strut to its limit of travel.
2. Install the hollow bumper and dust boot to the strut shaft.



Note: The tag identifying the spring will be closer to the bottom of the spring. The end of the cold sits up against the tab on the spring seat.

3. With the spring in the compressor, install the strut into the spring.

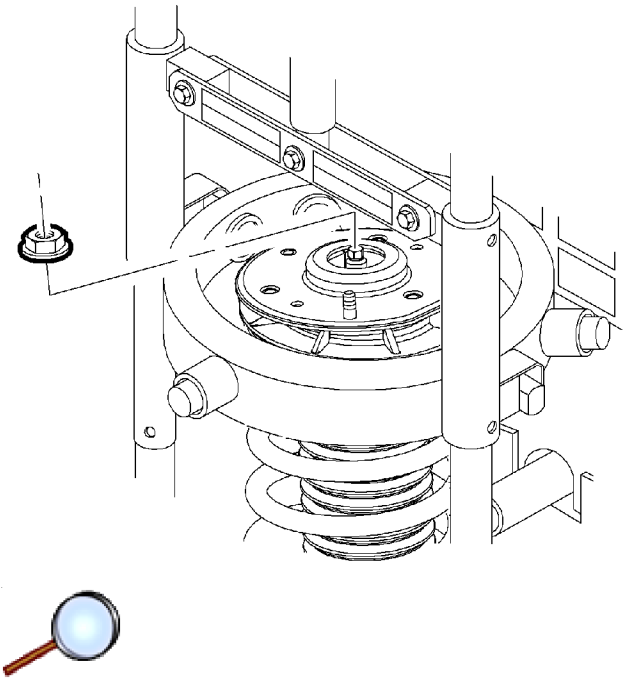
Note: The anti-rotation tab on the spring seat must face 180 degrees from the direction that the knuckle bracket points.

4. Assemble the upper spring seat onto the strut shaft and align the flat with the strut to knuckle mounting bracket.

Caution: Do not handle the top mount assembly by the plastic portion. Handle the top mount assembly by the metal portion when removing/installing the top mount from/to the strut assembly. Holding the top mount assembly by the plastic portion may loosen the snap fit of the bearing components and cause the bearing to fall apart.

Note: The flat on the metal plate of the top mount assembly must face the same direction of the anti-rotation tab on the spring seat.

5. Assemble the top mount onto the strut shaft and align the flat 180 degrees from flat on the upper spring seat.



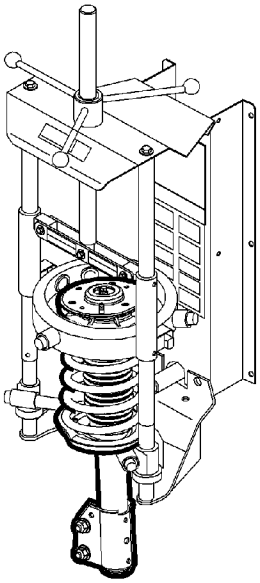
6. Loosely install the strut shaft nut.

Caution: Refer to Fastener Caution in the Preface section.

Caution: Do not allow the absorber rod to rotate during disassembly/reassembly. Use hand tools to keep the absorber rod from rotating. If air tools are used, and the rod is allowed to rotate, damage to the absorber may occur.

7. Hold the strut shaft and use the J 42991 or equivalent hand tools to tighten the shaft while verifying that the upper spring seat flats align with the top mount.

   Tighten the strut shaft to **75 N·m (55 lb ft)**.



8. Release the tension on the J 45400 .
9. Remove the strut assembly from the J 45400 .