

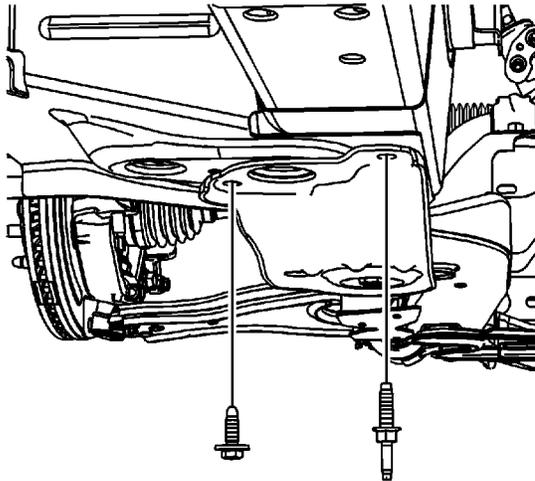
## Fastener Tightening Specifications

Application	Specification	
	Metric	English
Ball Joint to Lower Control Arm Mounting Nuts and Bolts	68 N·m	50 lb ft
Front Frame Reinforcement Mounting Bolts	50 N·m	37 lb ft
Front Frame to Body Bolts		
First Pass	100 N·m	74 lb ft
Final Pass	+ 90°	
Front Wheel Bearing and Hub to Knuckle Bolts	140 N·m	103 lb ft
Front Lower Control Arm Front Nut	195 N·m	144 lb ft
Front Lower Control Arm Bushings Nuts	75 N·m	55 lb ft
Front Lower Control Arm Bushing Rear Nut	150 N·m	111 lb ft
Lower Control Arm Ball Stud Nuts		
First Pass	40 N·m	30 lb ft
Final Pass	+ 120°	
Stabilizer Link to Stabilizer Shaft Nuts	75 N·m	55 lb ft
Stabilizer Link to Strut Nuts	70 N·m	52 lb ft
Stabilizer Shaft Clamp to Frame Bolts	50 N·m	37 lb ft
Steering Knuckle to Strut Bolts	195 N·m	144 lb ft
Strut Mount Nut	85 N·m	63 lb ft
Strut to Body Mounting Nuts	45 N·m	33 lb ft
Upper Strut to Bearing Plate Nuts	83 N·m	61 lb ft

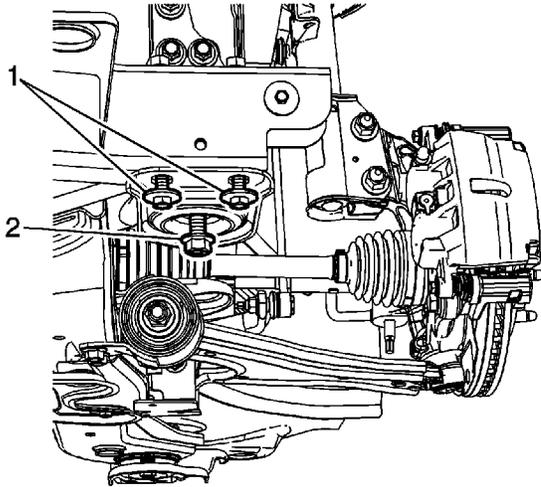
## Stabilizer Shaft Replacement

### Removal Procedure

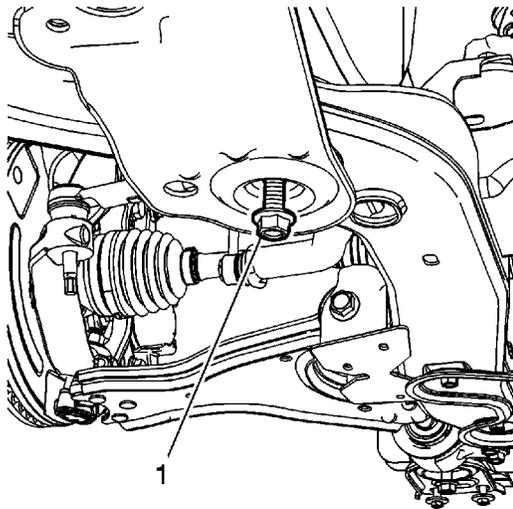
1. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).
2. Remove the front tires and wheels. Refer to [Tire and Wheel Removal and Installation](#).
3. Remove the bolt from the intermediate shaft bracket to the front cradle. Refer to [Intermediate Drive Shaft Replacement](#).
4. Remove the rear propeller shaft, if equipped. Refer to [Propeller Shaft Replacement](#).
5. Remove the outer tie rod ends from the steering knuckle. Refer to [Steering Linkage Outer Tie Rod Replacement](#).
6. Remove the stabilizer shaft links at the stabilizer bar. Refer to [Stabilizer Shaft Link Replacement](#).
7. Position adjustable jack stand underneath the left and right side at the rear of the front cradle.



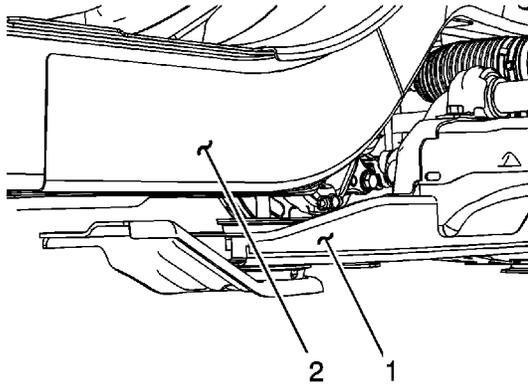
8. Remove the left and right frame reinforcement mounting bolts. Left side shown, right side similar.



9. Loosen the front frame reinforcement mounting bolts (1). Left side shown, right side similar.
10. Loosen the front frame mounting bolts (2). Left side shown, right side similar.



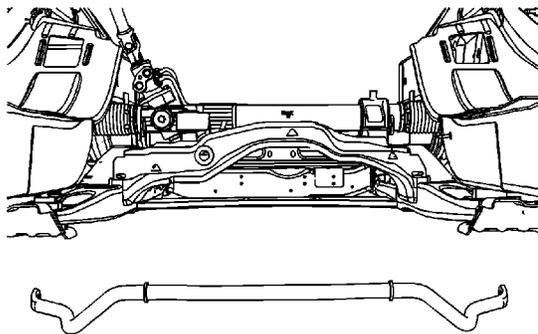
11. Loosen the rear frame mounting bolts (1).



12. Lower the frame (1) from the frame rail (2) until enough clearance is gained to remove the stabilizer shaft.

**Note:** If replacing the stabilizer shaft, use NEW insulators.

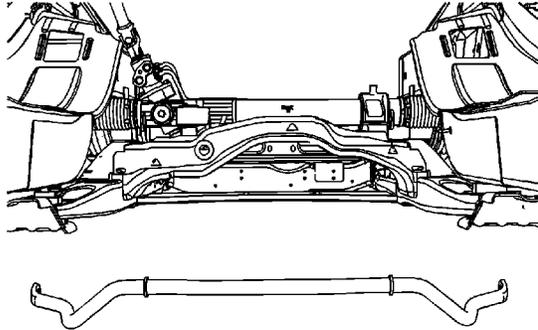
13. Remove both left and right stabilizer shaft insulators. Refer to [Stabilizer Shaft Insulator Replacement](#).



**Note:** It may be necessary to maneuver the stabilizer shaft in such a way to remove it from the front cradle.

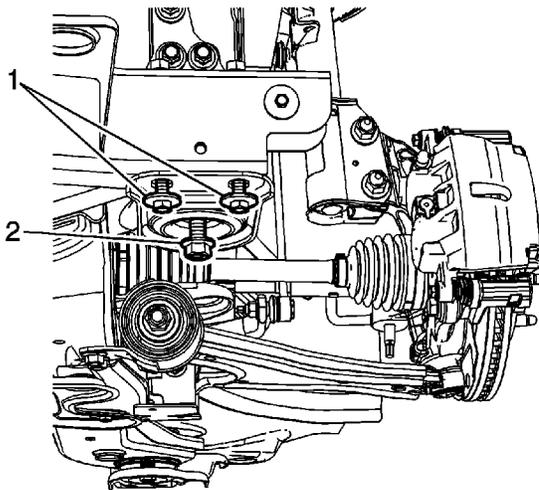
14. Remove the stabilizer shaft from the vehicle.

## Installation Procedure



1. Position the stabilizer shaft on the frame.
2. Install the left and right stabilizer shaft insulators and brackets. Refer to [Stabilizer Shaft Insulator Replacement](#).
3. Install the stabilizer shaft links to the stabilizer shaft. Refer to [Stabilizer Shaft Link Replacement](#).
4. Using the jack stands, raise the front cradle into position.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.



5. Tighten the front frame (2) bolts.

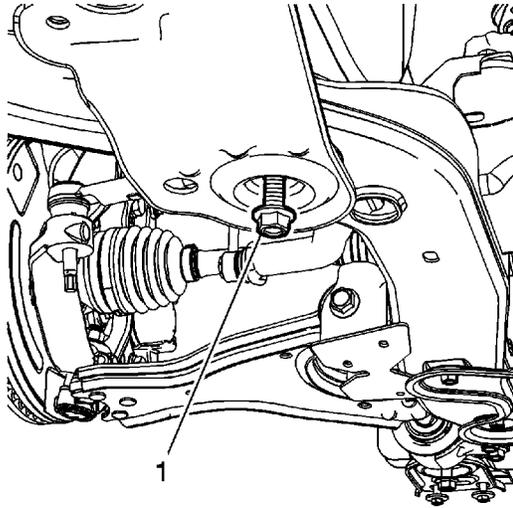
**Tighten**

Tighten the frame to body bolts to 100 N·m (74 lb ft) plus 90 degrees.

6. Tighten the front frame reinforcement mounting bolts (1). Left side shown, right side similar.

**Tighten**

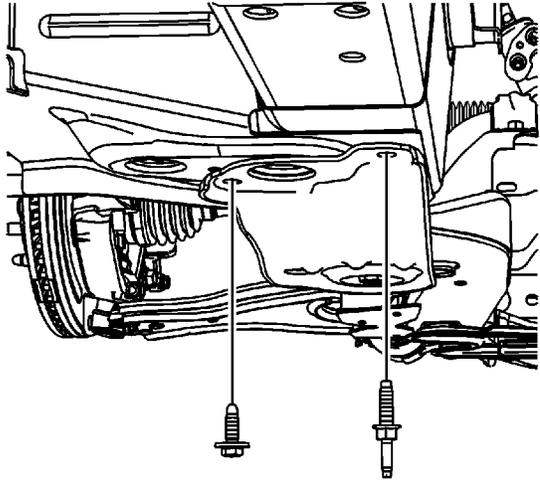
Tighten the reinforcement bolts to 50 N·m (37 lb ft).



7. Tighten the rear frame mounting bolts (1). Left side shown, right side similar.

**Tighten**

Tighten the frame to body bolts to 100 N·m (74 lb ft) plus 90 degrees.



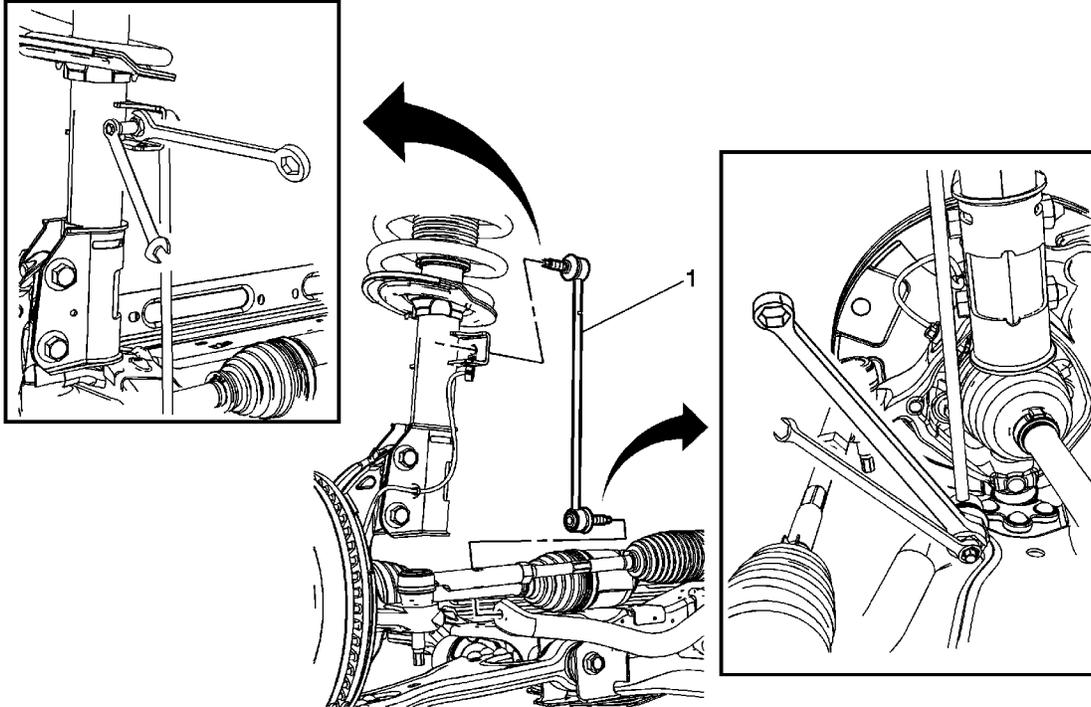
8. Tighten the rear reinforcement bolts. Left side shown, right side similar.

#### **Tighten**

Tighten the reinforcement bolts to 50 N·m (37 lb ft).

9. Remove the adjustable jack stands.
10. Install the bolt from the intermediate shaft bracket to the front cradle. Refer to [Intermediate Drive Shaft Replacement](#).
11. Install the outer tie rod ends to the knuckle. Refer to [Steering Linkage Outer Tie Rod Replacement](#).
12. Install the rear propeller shaft, if equipped. Refer to [Propeller Shaft Replacement](#).
13. Install the front tires and wheels. Refer to [Tire and Wheel Removal and Installation](#).
14. Remove the support and lower the vehicle.

# Stabilizer Shaft Link Replacement



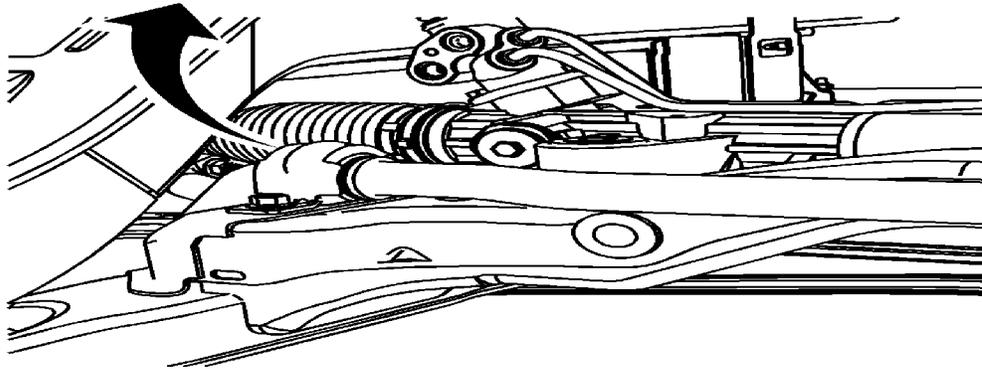
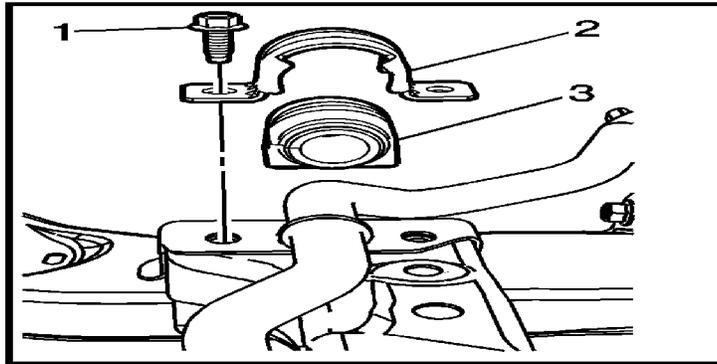
Callout	Component Name
<b>Preliminary Procedures</b>	
<ol style="list-style-type: none"> <li>1. Raise and support the vehicle. Refer to <a href="#">Lifting and Jacking the Vehicle</a>.</li> <li>2. Remove the tire and wheel. Refer to <a href="#">Tire and Wheel Removal and Installation</a>.</li> </ol>	
1	<p>Stabilizer Shaft Link (left side shown, right side similar).</p> <p><b>Caution:</b> Refer to <a href="#">Fastener Caution</a> in the Preface section.</p> <p><b>Procedure</b></p> <ol style="list-style-type: none"> <li>1. Use a wrench to prevent the stub link from rotating.</li> <li>2. Using the proper size wrench, remove the retaining nut for the upper stabilizer shaft link stub link.</li> <li>3. Repeat the previous steps to remove the lower stabilizer shaft stub link retaining nut.</li> <li>4. Remove the stabilizer shaft link from the vehicle.</li> </ol> <p><b>Tip</b> Use the wrench to hold the stabilizer shaft stub link while torquing to the specified torque.</p>

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**Tighten**

- Tighten the stabilizer link to strut nut to 70 N·m (52 lb ft)
- Tighten the stabilizer link to stabilizer shaft nut to 75 N·m (55 lb ft)

## Stabilizer Shaft Insulator Replacement

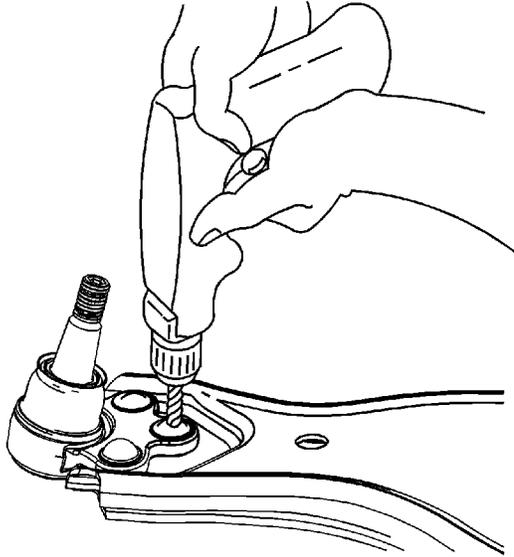


Callout	Component Name
<b>Preliminary Procedure</b>	
Raise and support the vehicle. Refer to <a href="#">Lifting and Jacking the Vehicle</a> .	
1	Stabilizer Shaft Clamp Bolt (Qty: 4) <b>Caution:</b> Refer to <a href="#">Fastener Caution</a> in the Preface section.  <b>Tighten</b> 50 N·m (37 lb ft)
2	Stabilizer Shaft Insulator Clamp (Qty: 2)
3	Stabilizer Shaft Insulator (Qty: 2)  <b>Tip</b> Lift up on the stabilizer shaft to gain enough clearance to remove the insulator.

## Lower Control Arm Ball Joint Replacement

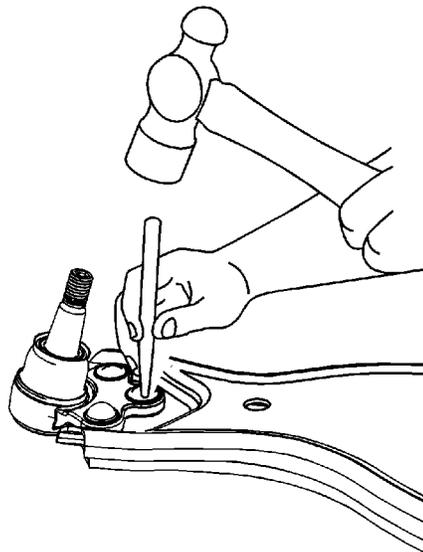
### Removal Procedure

1. Remove the lower control arm assembly. Refer to [Lower Control Arm Replacement](#).
2. Install the lower control arm in a vise.



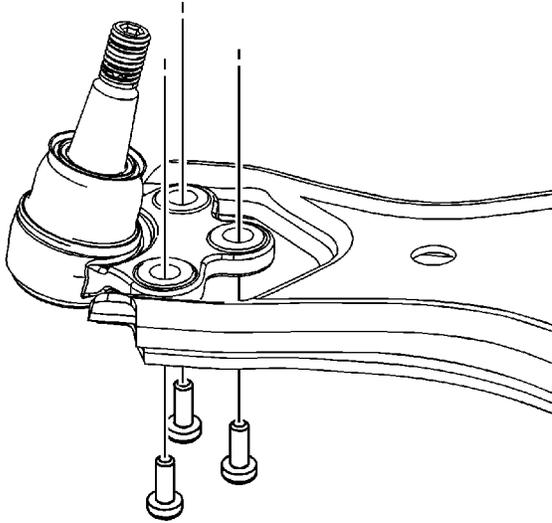
**Note:** Use a center punch to aid in starting the drill if drilling the rivet.

3. Drill or grind off the head of the rivet.

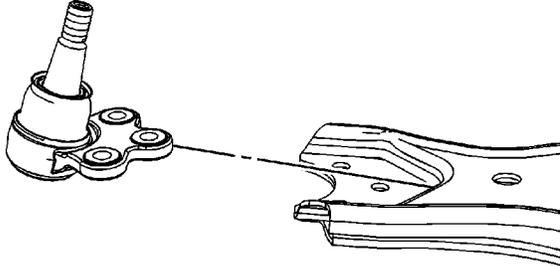


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4. Use a punch and a hammer to loosen the rivets from the lower control arm.

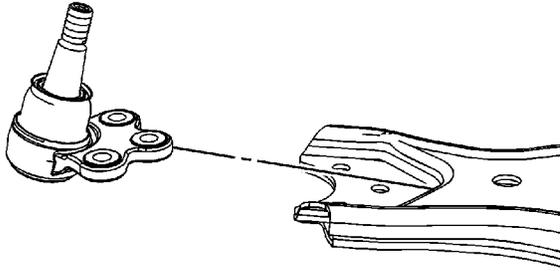


5. Remove the rivets from the lower control arm.



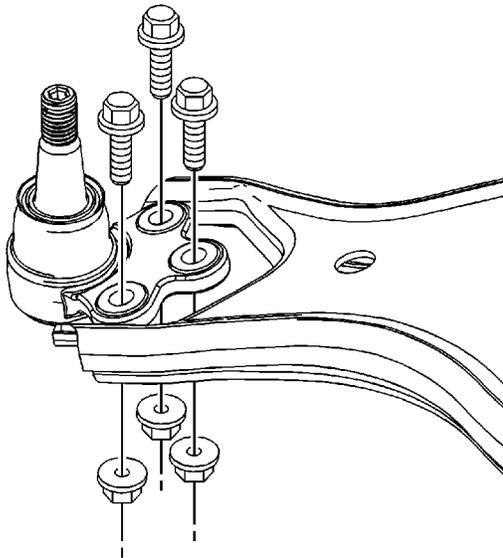
6. Remove the ball joint from the lower control arm.

## Installation Procedure



1. Position the ball joint on the lower control arm.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.



**Note:** When tightening the mounting nuts and bolts for the ball joint, hold the bolt and torque the nut for the proper torque measure.

2. Install the ball joint mounting nuts and bolts.

#### **Tighten**

Tighten the mounting nuts to 68 N·m (50 lb ft).

3. Remove the lower control arm assembly from the vise.
4. Install the lower control arm. Refer to [Lower Control Arm Replacement](#).
5. Check the front end alignment of the vehicle. Refer to [Wheel Alignment Specifications](#).

## Front Wheel Bearing and Hub Replacement

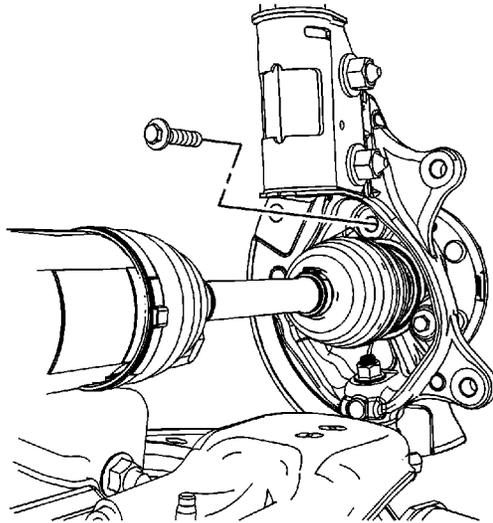
### Tools Required

[J 42129](#) Wheel Hub Puller

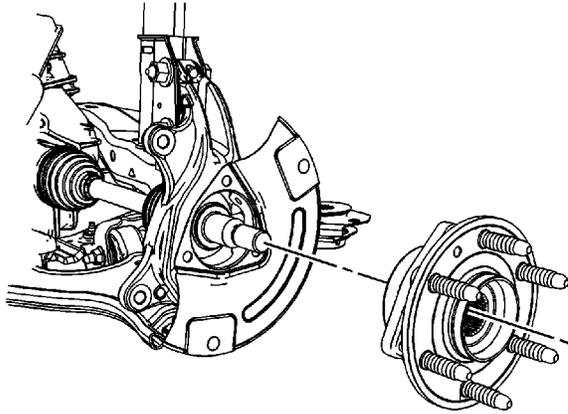
**Caution:** The wheel bearing and hub assembly includes a magnetic encoder with built-in permanent magnets that the wheel speed sensor senses. Any contact with another magnet will damage the encoder magnets. The damage will cause a diagnostic trouble code to be set and will require wheel bearing and hub replacement.

### 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 front brake rotor. Refer to [Front Brake Rotor Replacement](#).
4. Remove the wheel drive shaft retaining nut and washer. Refer to [Front Wheel Drive Shaft Replacement](#).
5. Install the [J 42129](#) to the wheel bearing and hub.
6. Using the [J 42129](#) , separate the wheel drive shaft from the wheel bearing and hub.
7. Remove the [J 42129](#) from the wheel bearing and hub assembly.

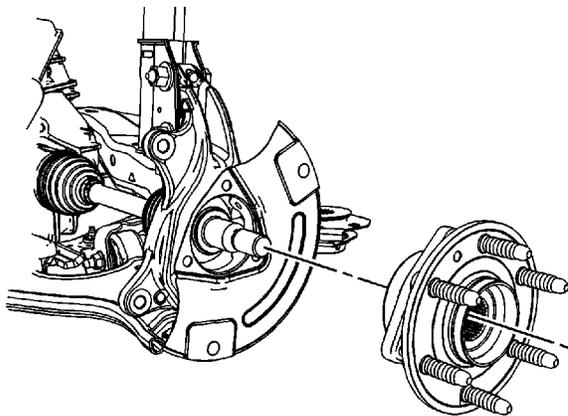


8. Remove the retaining bolts for the wheel bearing and hub.



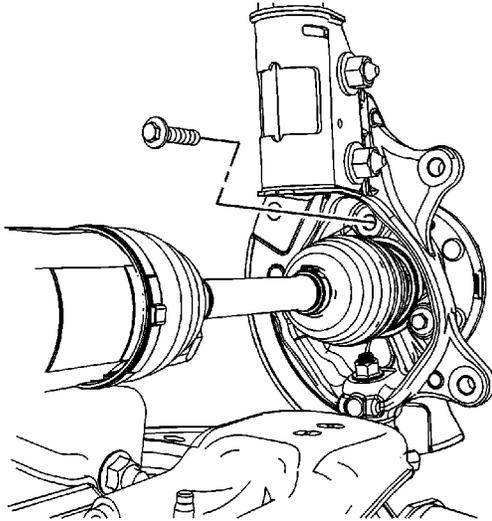
9. Remove the wheel bearing and hub assembly.

## **Installation Procedure**



1. Position the wheel bearing and hub assembly in the knuckle.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.



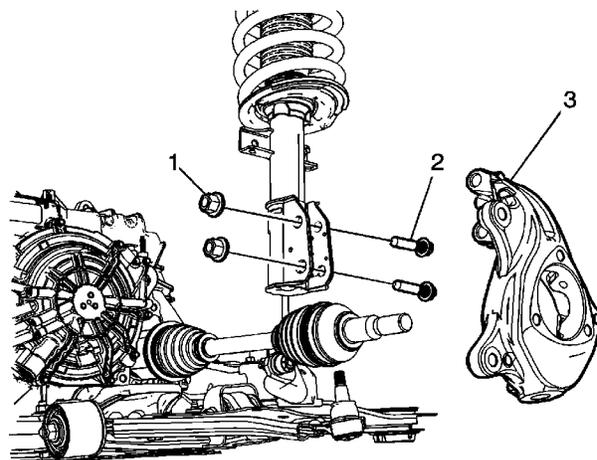
2. Install the retaining bolts for the wheel bearing and hub.

**Tighten**

Tighten the bolts to 140 N·m (103 lb ft).

3. Install the front brake rotor. Refer to [Front Brake Rotor Replacement](#).
4. Install the wheel drive shaft retaining nut and washer. Refer to [Front Wheel Drive Shaft Replacement](#).
5. Install the tire and wheel. Refer to [Tire and Wheel Removal and Installation](#).
6. Remove the support and lower the vehicle.

# Steering Knuckle Replacement



Callout	Component Name
<p><b>Preliminary Procedures</b></p> <ol style="list-style-type: none"> <li>1. Raise and support the vehicle. Refer to <a href="#">Lifting and Jacking the Vehicle</a>.</li> <li>2. Remove the wheel bearing/hub assembly. Refer to <a href="#">Front Wheel Bearing and Hub Replacement</a>.</li> <li>3. Remove the outer tie rod end from the steering knuckle. Refer to <a href="#">Steering Linkage Outer Tie Rod Replacement</a>.</li> <li>4. Separate the lower ball joint from the steering knuckle. Refer to <a href="#">Lower Control Arm Ball Joint Replacement</a>.</li> </ol>	
1	Front Strut Suspension Nut (Qty: 2)
2	<p>Front Strut Suspension Bolt (Qty: 2)</p> <p><b>Caution:</b> Refer to <a href="#">Fastener Caution</a> in the Preface section.</p> <p><b>Tip</b> Support the wheel drive shaft with mechanics wire after the knuckle has been removed.</p> <p><b>Tighten</b> 195 N·m (144 lb ft)</p>
3	Steering Knuckle

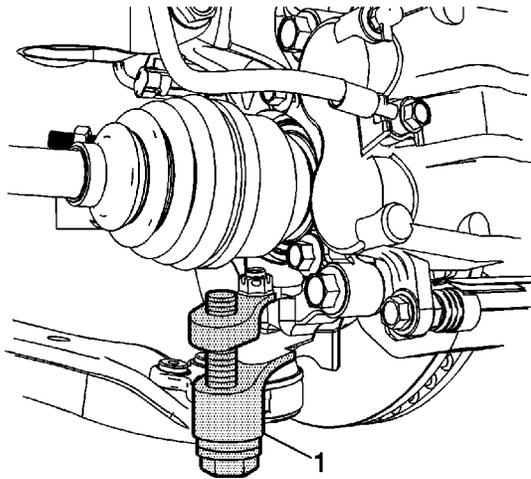
# Lower Control Arm Replacement

## Special Tools

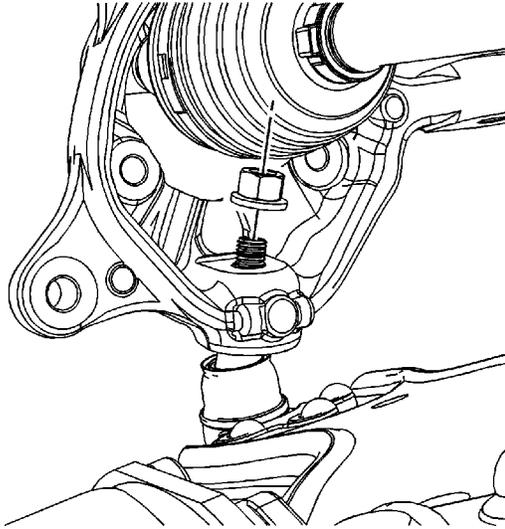
*J 42188* Ball Joint Separator

## Removal Procedure

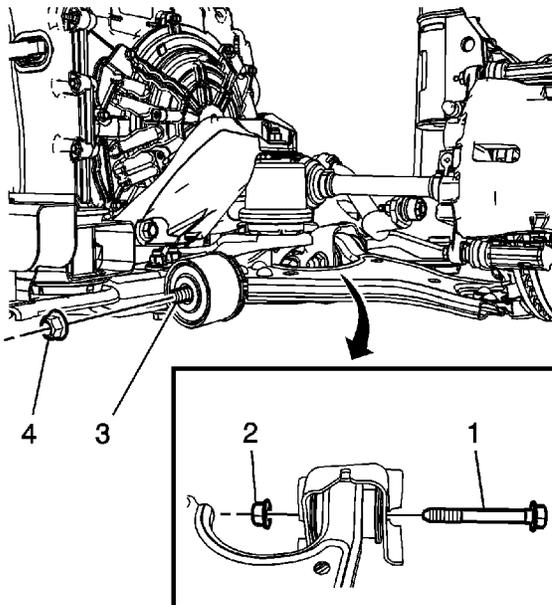
1. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).
2. Remove the tire and wheel. Refer to [Tire and Wheel Removal and Installation](#).
3. Remove the outer tie rod end from the steering knuckle. Refer to [Steering Linkage Outer Tie Rod Replacement](#).
4. Turn the knuckle to the left.
5. Using the proper size allen wrench and wrench, loosen the lower ball joint nut.



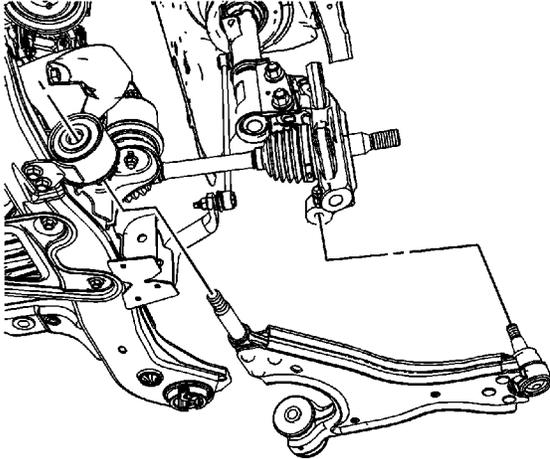
6. Using the *J 42188* Ball Joint Separator (1), remove the lower ball joint from the knuckle.



7. Remove the lower ball joint nut.

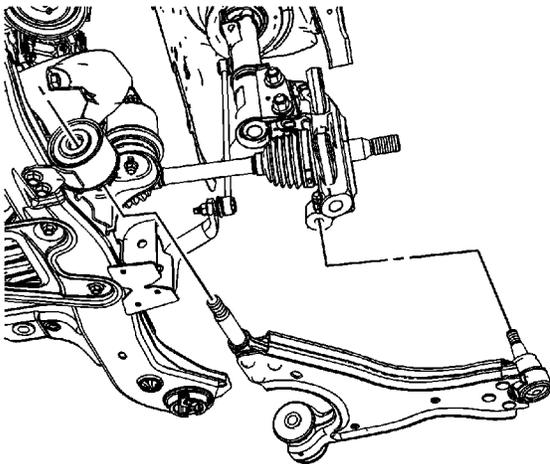


8. Remove the front lower control arm front nut (4) from the stud (3).
9. Remove the lower control arm rear nut (2) and bolt (1).

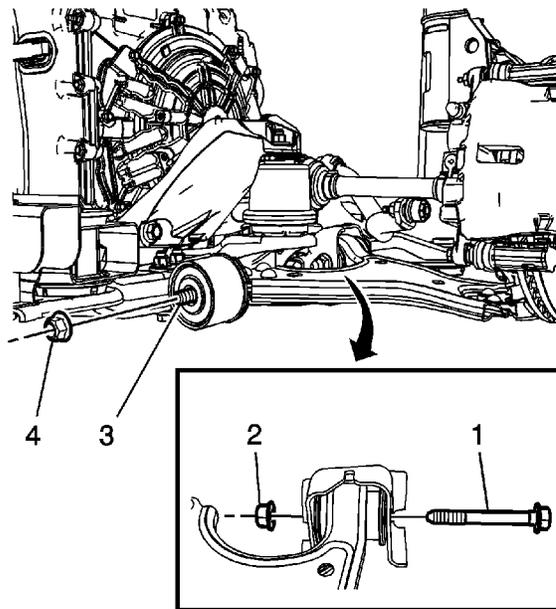


10. Remove the front lower control arm from the vehicle.

## **Installation Procedure**



1. Position the front lower control arm in the frame.



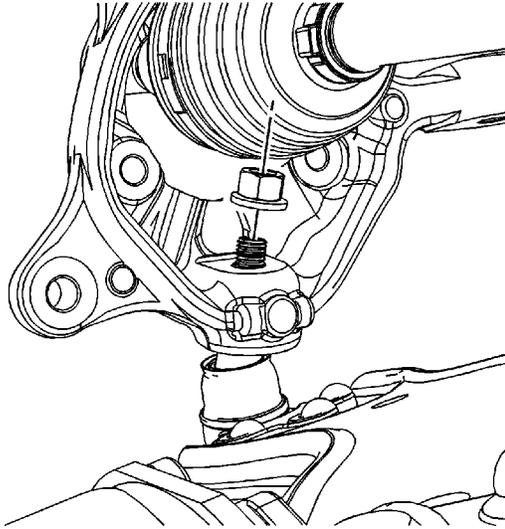
2. Install the front lower control arm rear nut (2) and bolt (1). Hand tighten the rear nut (2).

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

3. Install the front lower control arm front nut (4) and the stud (3) and tighten to **195 N·m (144 lb ft)**.

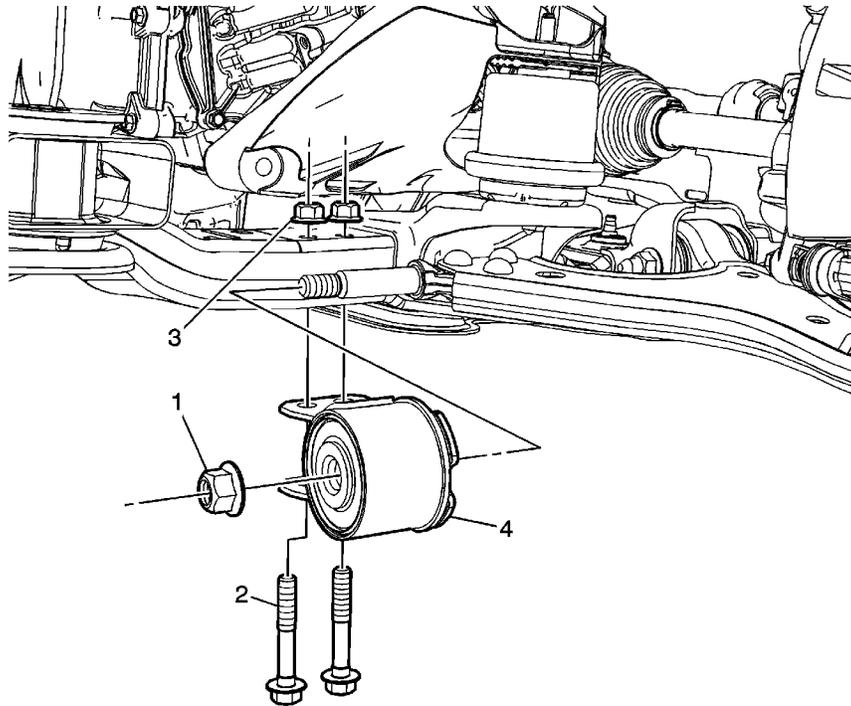
**Note:** Use the appropriate size wrench to hold the bolt while torquing the nut.

4. Tighten the front rear lower control arm rear nut (2) to **150 N·m (111 lb ft)**.



5. Install the lower ball joint in the knuckle.
6. Install the ball joint nut and tighten to **40 N·m (30 lb ft) plus 120 degrees**.
7. Install the outer tie rod end. Refer to [Steering Linkage Outer Tie Rod Replacement](#).
8. Install the tire and wheel assembly. Refer to [Tire and Wheel Removal and Installation](#).
9. Remove the support and lower the vehicle.

## Front Lower Control Arm Bushing Replacement



Callout	Component Name
<b>Preliminary Procedures</b>	
1. Raise and support the vehicle. Refer to <a href="#">Lifting and Jacking the Vehicle</a> . 2. Remove the tire and wheel. Refer to <a href="#">Tire and Wheel Removal and Installation</a> .	
1	Front Lower Control Arm Bushing Nut <b>Caution:</b> Refer to <a href="#">Fastener Caution</a> in the Preface section.  <b>Tighten</b> 195 N·m (144 lb ft)
2	Front Lower Control Arm Bushing Bolt (Qty: 2)  <b>Note:</b> When tightening the bolt to specifications, hold the bolt and torque the nut for the proper torque.
3	Lower Control Arm Front Bushing Nut (Qty: 2)  <b>Tighten</b> 75 N·m (55 lb ft)
	Front Lower Control Arm Bushing © 2010 General Motors Corporation. All rights reserved.

4

**Note:** The control arm bushing is NOT serviced separately, but with the mounting bracket

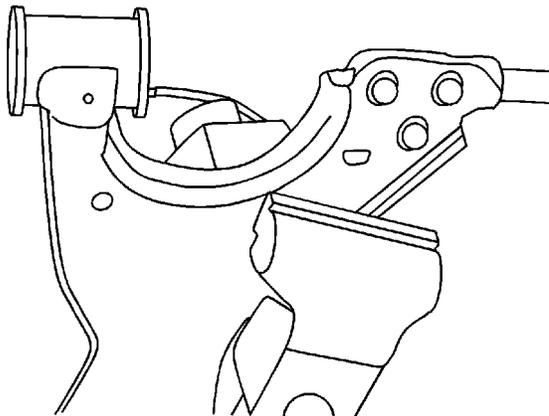
## Front Lower Control Arm Rear Bushing Replacement

### Tools Required

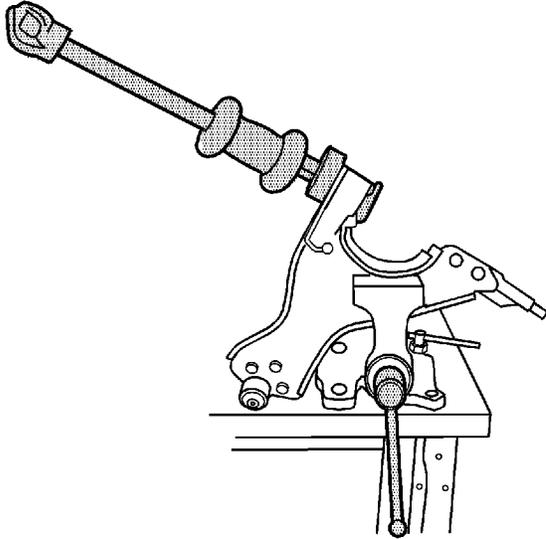
- [J 5590](#) Installer and Remover
- [J 2619-01](#) Slide Hammer and Adapter
- [CH-48107](#) Bushing Remover and Installer

### Removal Procedure

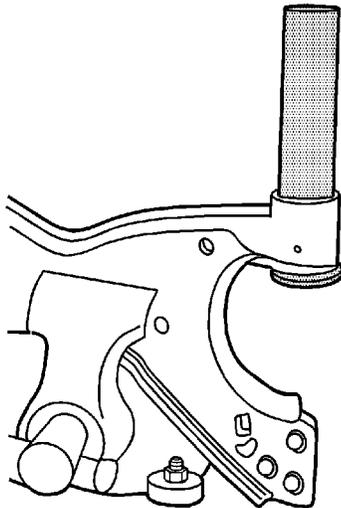
1. Remove the front lower control arm assembly. Refer to [Lower Control Arm Replacement](#).



2. Install the lower control arm in a soft jawed vise.

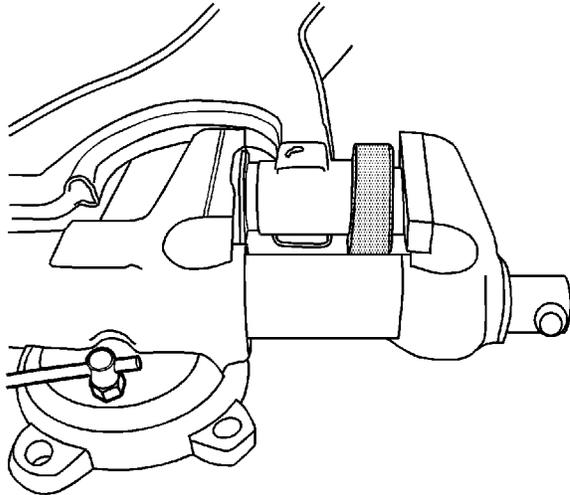


3. Assemble the [J 2619-01](#) and the [CH-48107](#) .
4. Position the [J 2619-01](#) and the [CH-48107](#) lower control arm bushing.
5. Using the [J 2619-01](#) and the [CH-48107](#) , remove the front lower control arm bushing.



6. Using the [J 5590](#) , remove the rear lower control arm bushing.

## Installation Procedure



1. Position the front and rear bushings so that they are equally in the control arm.
2. Position the [CH-48107](#) on the front bushing.
3. Using the vise, compress the front and rear bushings until they are seated.
4. Remove the lower control arm from the vise.
5. Remove the [CH-48107](#) from the front bushing.
6. Install the lower control arm in the vehicle. Refer to [Lower Control Arm Replacement](#).

## Wheel Stud Replacement

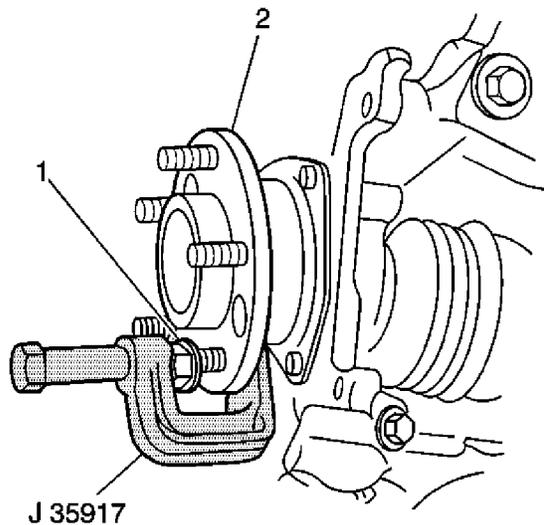
### Tools Required

[J 35917](#) Ball Joint Remover

### Removal Procedure

**Warning:** If you are replacing the wheel(s), the wheel stud(s), the wheel nut(s) or the wheel bolt(s), install only new GM original equipment parts. Installation of used parts or non-GM original equipment parts may cause the wheel to loosen, loss of tire air pressure, poor vehicle handling and loss of vehicle control resulting in personal injury.

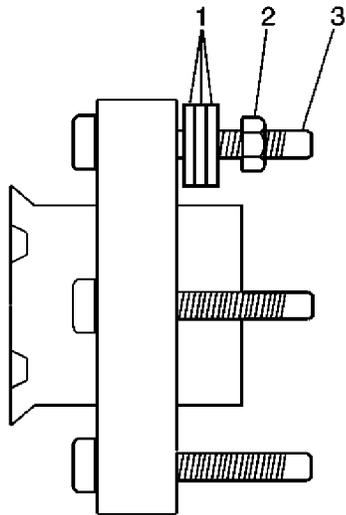
1. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).
2. Remove the tire and wheel. Refer to [Tire and Wheel Removal and Installation](#).
3. Remove the brake rotor. Refer to [Front Brake Rotor Replacement](#).



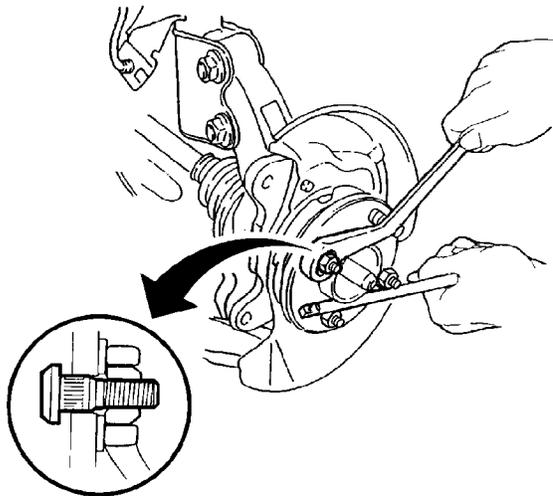
4. Use the [J 35917](#) in order to press the wheel stud (1) from the bearing/hub (2).

### Installation Procedure

1. Install a new wheel stud from the back side of the bearing/hub.



2. Install 3 flat washers (1) to the wheel stud (3).
3. Install a hex nut (2) to the wheel stud (3).

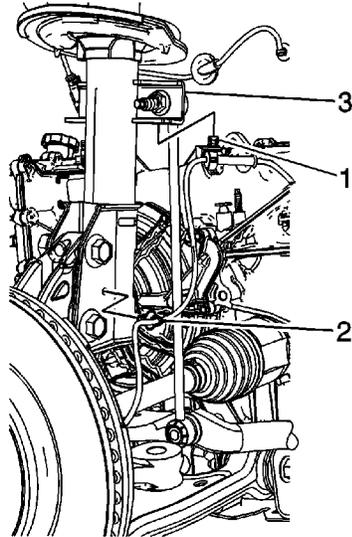


4. Tighten the hex nut until the stud head is fully seated in the bearing/hub flange.
5. Remove the hex nut and the washers from the wheel stud.
6. Install the brake rotor. Refer to [Front Brake Rotor Replacement](#).
7. Install the tire and wheel. Refer to [Tire and Wheel Removal and Installation](#).
8. Lower the vehicle.

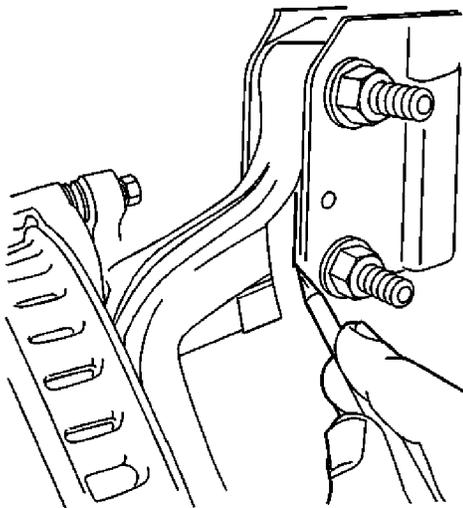
## Strut Assembly Replacement

### Removal Procedure

1. Remove the air inlet grille. Refer to [Air Inlet Grille Panel Replacement](#).
2. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).
3. Remove the stabilizer link at the front strut. Refer to [Stabilizer Shaft Link Replacement](#).



4. Remove the wheel speed sensor wiring harness (1) and (2) from the front strut (3).

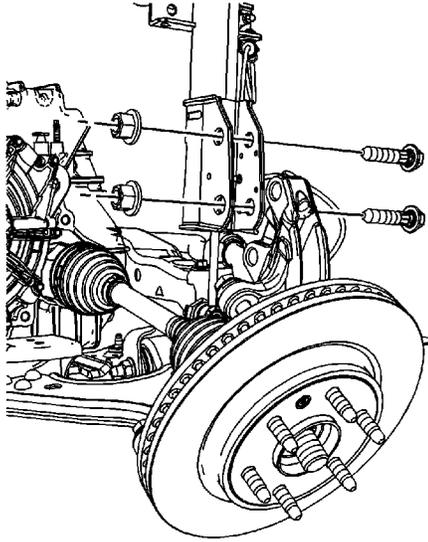


5. If removing the front strut to service any other suspension or steering component, scribe a

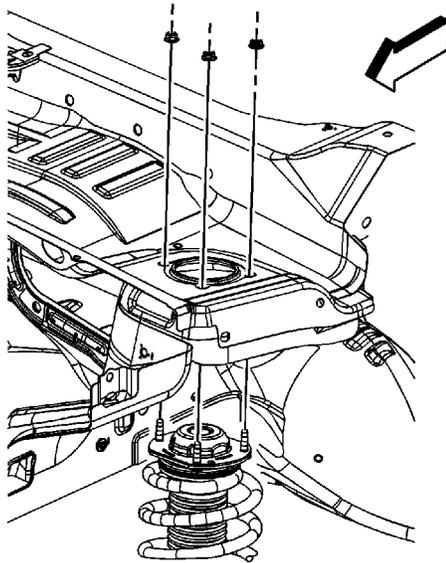
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line in the steering knuckle against the front strut. This will aid in the realigning the front suspension.

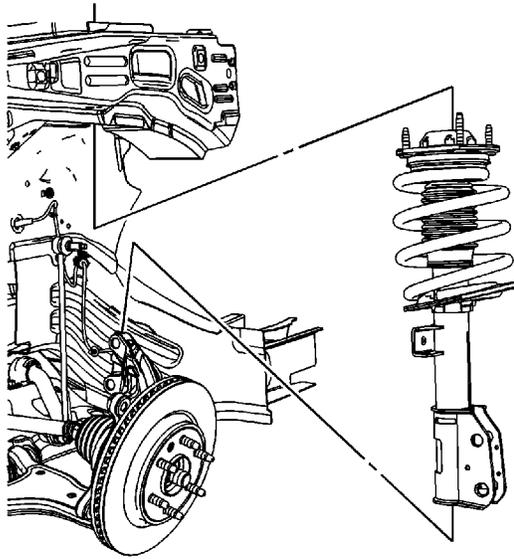
6. Lower the vehicle to gain access to the upper strut mounting bolts.



7. Remove the front strut mounting bolts and nuts.

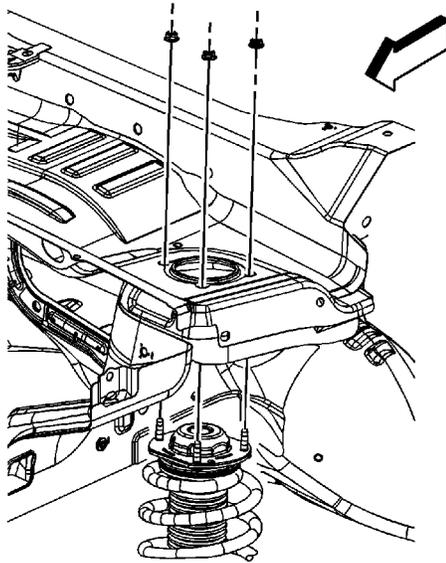


8. Remove the upper strut mounting nuts.



9. Separate the front strut from the steering knuckle.
10. Remove the front strut assembly from the vehicle.
11. If replacing the strut or the spring, refer to [Strut, Strut Component, and Spring Replacement](#).

## Installation Procedure



1. Position the front strut in the strut tower.

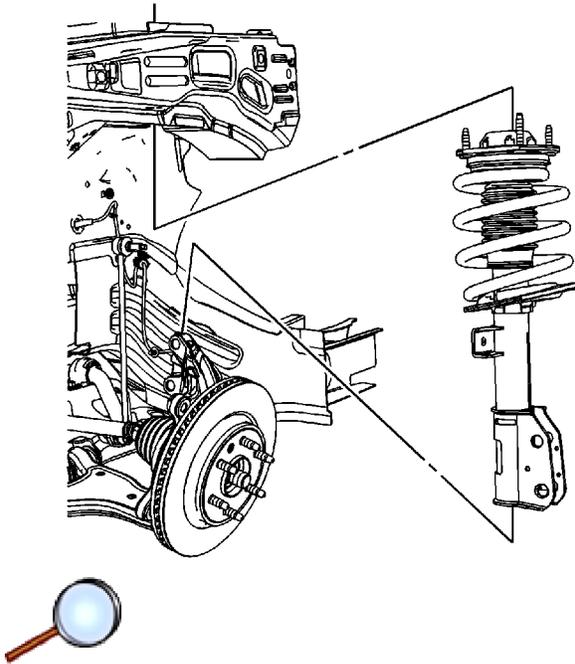
**Caution:** Refer to [Fastener Caution](#) in the Preface section.

2. Install the upper strut mounting nuts.

**Tighten**

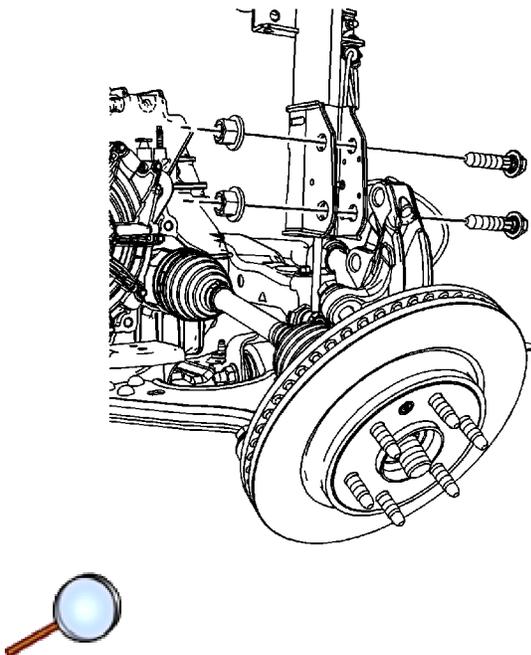
Tighten the mounting nut to 45 N·m (33 lb ft).

3. Raise the vehicle.



**Note:** If installing the front strut after servicing another steering or suspension component, align the front strut to the scribe mark on the steering knuckle.

4. Position the front strut on the steering knuckle.

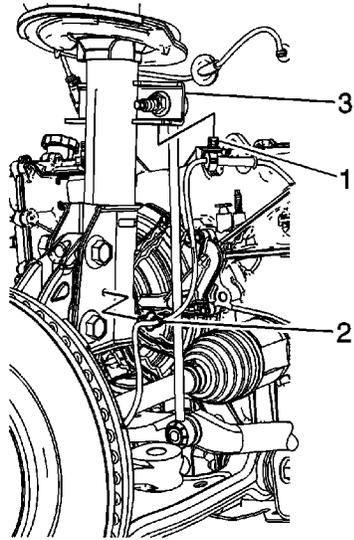


5. Install the front strut to steering knuckle mounting nuts and bolts.

**Tighten**

Tighten the mounting nut to 195 N·m (144 lb ft).

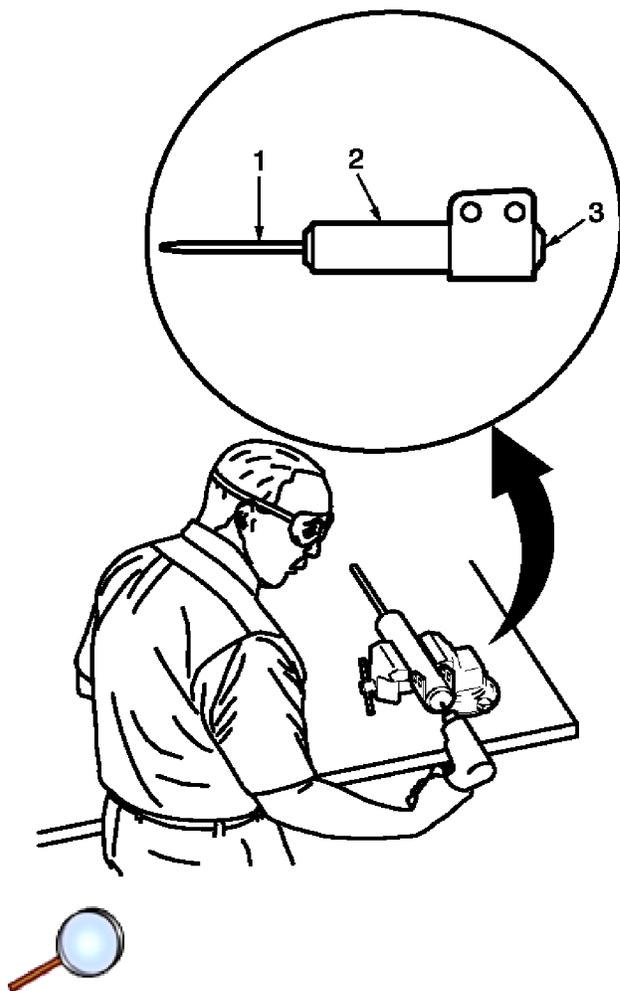
6. Install the stabilizer link at the front strut. Refer to [Stabilizer Shaft Link Replacement](#).



7. Install the wheel speed sensor wiring harness (1) and (2) on the front strut (3).
8. Install the air inlet grille. Refer to [Air Inlet Grille Panel Replacement](#).
9. Align the front end. 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.

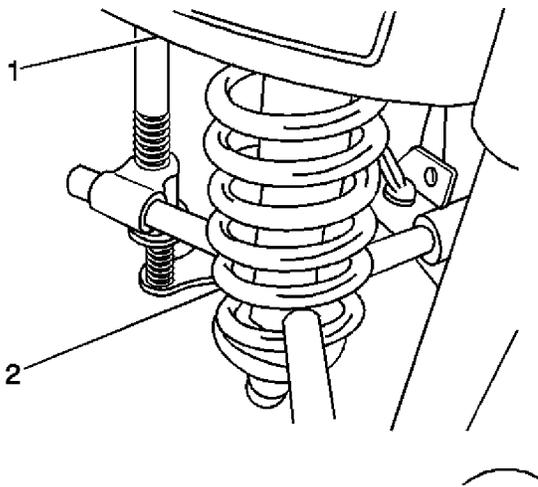
## Strut, Strut Component, and Spring Replacement

### Tools Required

- [J 42991](#) Strut Rod Nut Socket
- [J 45400](#) Strut Spring Compressor

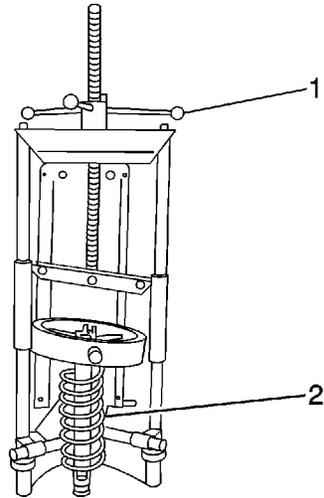
### Disassembly Procedure

1. Remove the strut from the vehicle. Refer to [Strut Assembly Replacement](#).



2. Install the strut (2) in the [J 45400](#) (1).

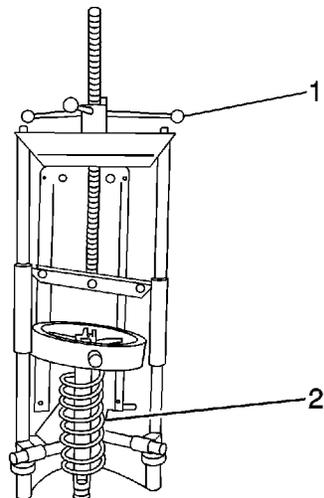
**Note:** The spring is compressed when the strut moves freely.



3. Turn the spring compressor forcing screw (1) until the coil spring (2) is compressed.
4. Use a 45 TORX® socket in order to hold the strut shaft. Use the [J 42991](#) to remove the upper strut mount nut.
5. Remove the strut from the [J 45400](#) .
6. Loosen the compressor forcing screw (1) until the upper strut mount and coil spring (2) may be removed.
7. Remove the upper strut mount and the coil spring from the [J 45400](#) .

## Assembly Procedure

1. Install the coil spring and upper strut mount to the [J 45400](#) .



2. Turn the spring compressor forcing screw (1) until the coil spring is compressed.
3. Install the strut to the coil spring and upper strut mount.

4. Loosely install the strut retaining nut.

**Caution:** Refer to [Fastener Caution](#) in the Preface section.

5. Use a 45 TORX® socket in order to hold the strut shaft. Use the [J 42991](#) to install the upper strut mount nut.

**Tighten**

Tighten the strut mount nut to 85 N·m (63 lb ft).

6. Remove the strut from the [J 45400](#) .
7. Install the strut to the vehicle. Refer to [Strut Assembly Replacement](#).