

2006 Chevrolet HHR LT

2006 SUSPENSION Front Suspension - HHR

2006 SUSPENSION

Front Suspension - HHR

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Ball Joint to Control Arm Nut and Bolts	68 N.m	50 lb ft
Ball Joint to Steering Knuckle Nut		
• First Pass	50 N.m Reverse Nut 3/4 turn	37 lb ft Reverse Nut 3/4 turn
• Second Pass	50 N.m + 30°	37 lb ft +30°
Control Arm to Front Frame Bolts	55 N.m	41 lb ft
Control Arm to Rear Frame Bolts	100 N.m + 180°	74 lb ft +180°
Drive Axle Nut	210 N.m	155 lb ft
Frame to Chassis Bolts	100 N.m + 180°	74 lb ft +180°
Intermediate Shaft Pinch Bolt	34 N.m	25 lb ft
Stabilizer Link to Strut Nut	65 N.m	48 lb ft
Stabilizer Shaft Clamp Bolt	50 N.m	37 lb ft
Stabilizer Shaft Clamp Nut	50 N.m	37 lb ft
Stabilizer Shaft Link to Stabilizer Bar Nut	80 N.m	59 lb ft
Strut Assembly to Steering Knuckle Nut	120 N.m	89 lb ft
Strut to Body Nut	20 N.m	15 lb ft
Strut Shaft Nut	70 N.m	52 lb ft
Tie Rod to Knuckle Nut	60 N.m	44 lb ft
Transmission Mount Through Bolt	100 N.m	74 lb ft
Transmission Mount to Frame Bolt	50 N.m	37 lb ft
Wheel Bearing/Hub Assembly Mounting Bolts	115 N.m	85 lb ft

REPAIR INSTRUCTIONS

STABILIZER SHAFT REPLACEMENT

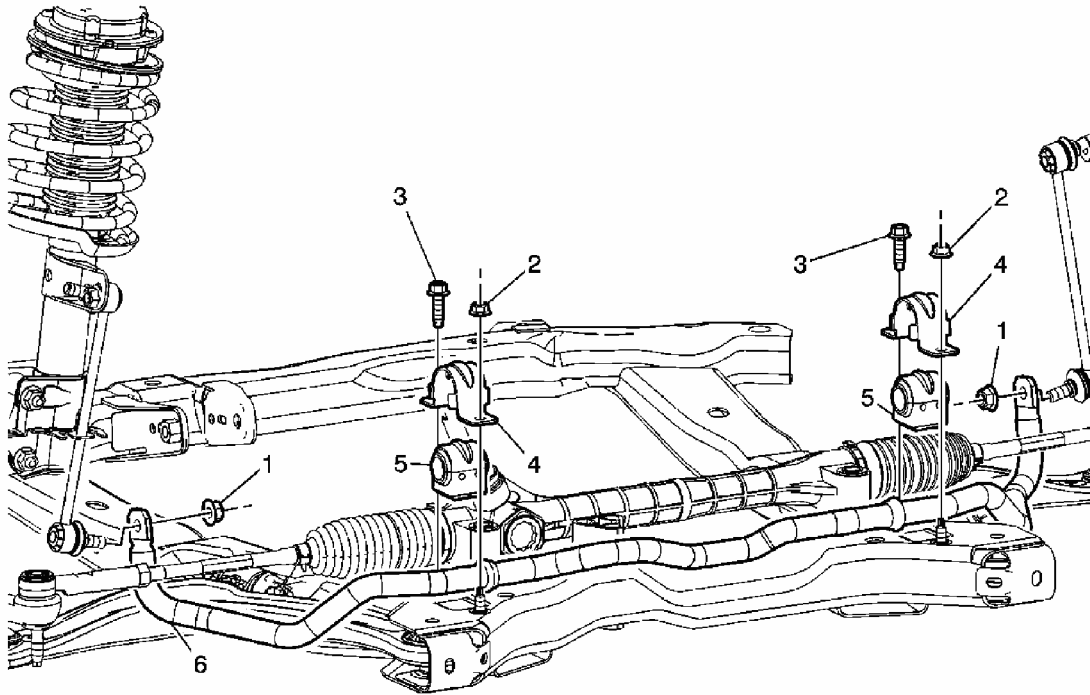


Fig. 1: Stabilizer Shaft Replacement
 Courtesy of GENERAL MOTORS CORP.

Stabilizer Shaft Replacement

Callout	Component Name
NOTE: Refer to <u>Fastener Notice</u> .	
Fastener Tightening Specifications: Refer to <u>Fastener Tightening Specifications</u> .	
Preliminary Procedures	
1. Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> . 2. Remove the front tire and wheel assemblies. Refer to <u>Tire and Wheel Removal and Installation</u> .	
1	Front Stabilizer Shaft Link Lower Nut (Qty: 2) Tip: Remove only the lower stabilizer shaft link nuts. Tighten: 65 N.m (48 lb ft)
2	Front Stabilizer Shaft Clamp Nut (Qty: 2) Tighten: 50 N.m (37 lb ft)
3	Front Stabilizer Shaft Clamp Bolt (Qty: 2)

	Tighten: 50 N.m (37 lb ft)
4	Front Stabilizer Shaft Clamp
5	Front Stabilizer Shaft Insulator Tip: Place the cut line of the insulator facing the rear of the vehicle.
6	Front Stabilizer Shaft Tip: Remove the front stabilizer shaft from the right side of the vehicle.

STABILIZER SHAFT LINK REPLACEMENT

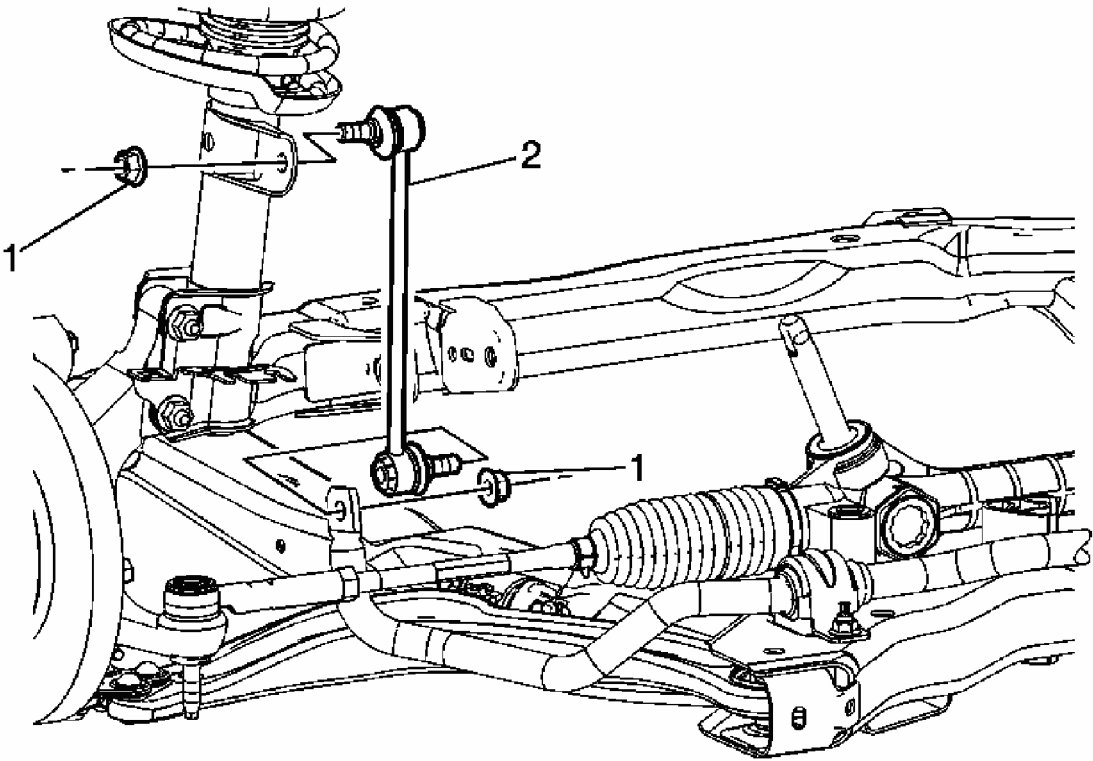


Fig. 2: Stabilizer Shaft Link Replacement
Courtesy of GENERAL MOTORS CORP.

Stabilizer Shaft Link Replacement

Callout	Component Name
NOTE: Refer to <u>Fastener Notice</u> .	
Fastener Tightening Specifications: Refer to <u>Fastener Tightening Specifications</u> .	
Preliminary Procedures	
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**.

1	Front Stabilizer Shaft Link Nut (Qty: 2) Tighten: 65 N.m (48 lb ft)
2	Front Stabilizer Shaft Link

STABILIZER SHAFT INSULATOR REPLACEMENT

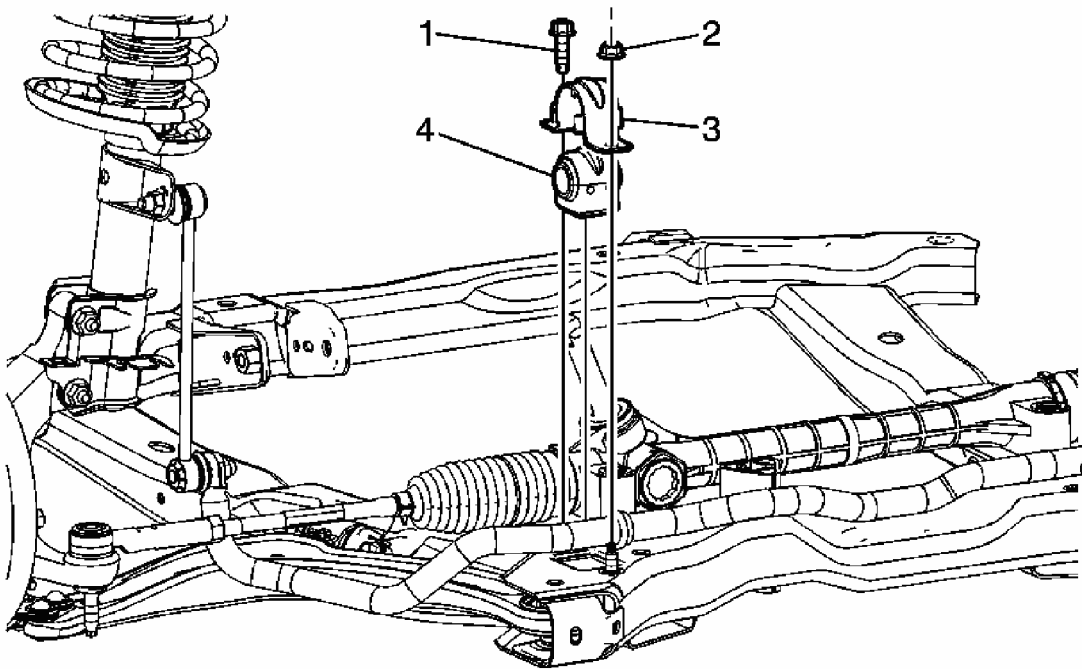


Fig. 3: Stabilizer Shaft Insulator Replacement
Courtesy of GENERAL MOTORS CORP.

Stabilizer Shaft Insulator Replacement

Callout	Component Name
NOTE: Refer to <u>Fastener Notice</u> .	
Fastener Tightening Specifications: Refer to <u>Fastener Tightening Specifications</u> . Preliminary Procedure: Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> .	
1	Front Stabilizer Shaft Clamp Bolt Tighten: 50 N.m (37 lb ft)
	Front Stabilizer Shaft Clamp Nut

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2	Tighten: 50 N.m (37 lb ft)
3	Front Stabilizer Shaft Clamp
4	Front Stabilizer Shaft Insulator Tip: Place the cut line of the insulator facing the rear of the vehicle.

LOWER BALL JOINT REPLACEMENT

Removal Procedure

1. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle in General Information.
2. Remove the lower control arm. Refer to Lower Control Arm Replacement.
3. Place the lower control arm in a vise.

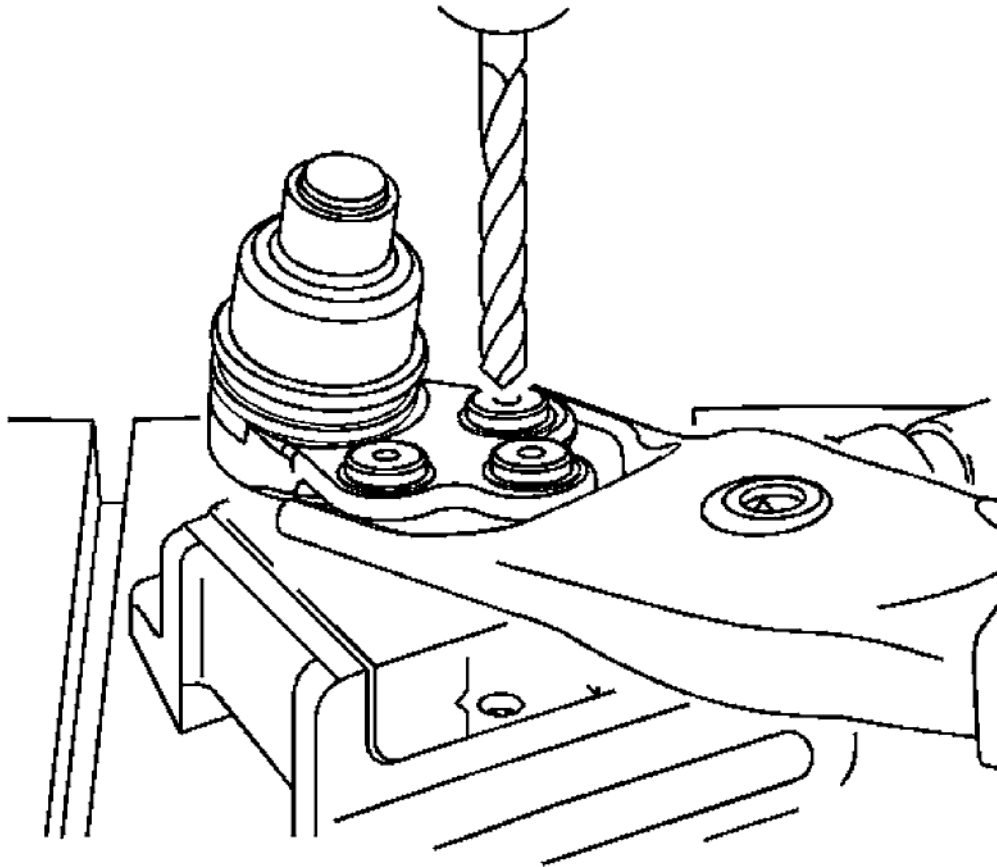


Fig. 4: Removing Ball Joint-To-Control Arm Rivets
Courtesy of GENERAL MOTORS CORP.

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4. Remove the ball joint to control arm rivets using the following procedure:
 1. Use a 3 mm (1/8 in) drill bit in order to make a pilot hole through the rivets.
 2. Use a 13 mm (31/64 in) drill bit to complete drilling the rivets.
5. Remove the ball joint from the lower control arm.

Installation Procedure

1. Install the ball joint to the lower control arm.

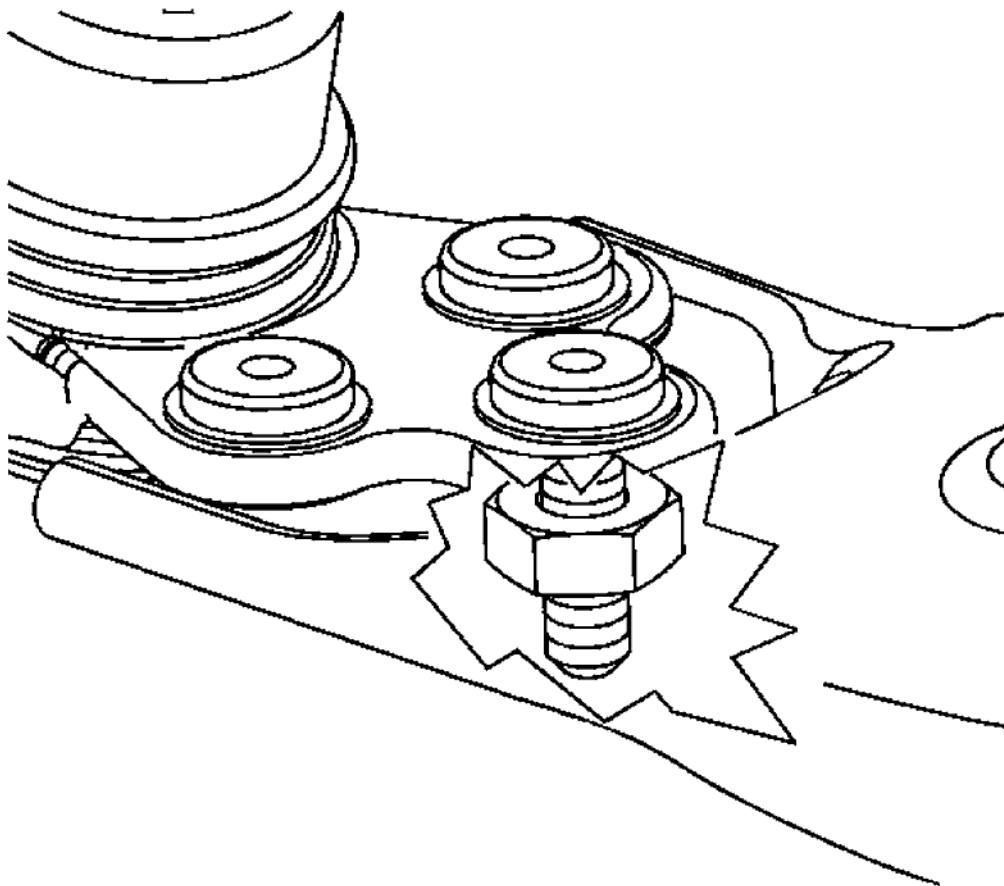


Fig. 5: Installing Ball Joint Bolts & Nuts
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

2. Install the ball joint bolts and the nuts. Follow the instructions in the ball joint kit.

Tighten: Tighten the ball joint bolts to 68 N.m (50 lb ft).

3. Install the lower control arm. Refer to **Lower Control Arm Replacement**.
4. Lower the vehicle.

WHEEL BEARING/HUB REPLACEMENT - FRONT

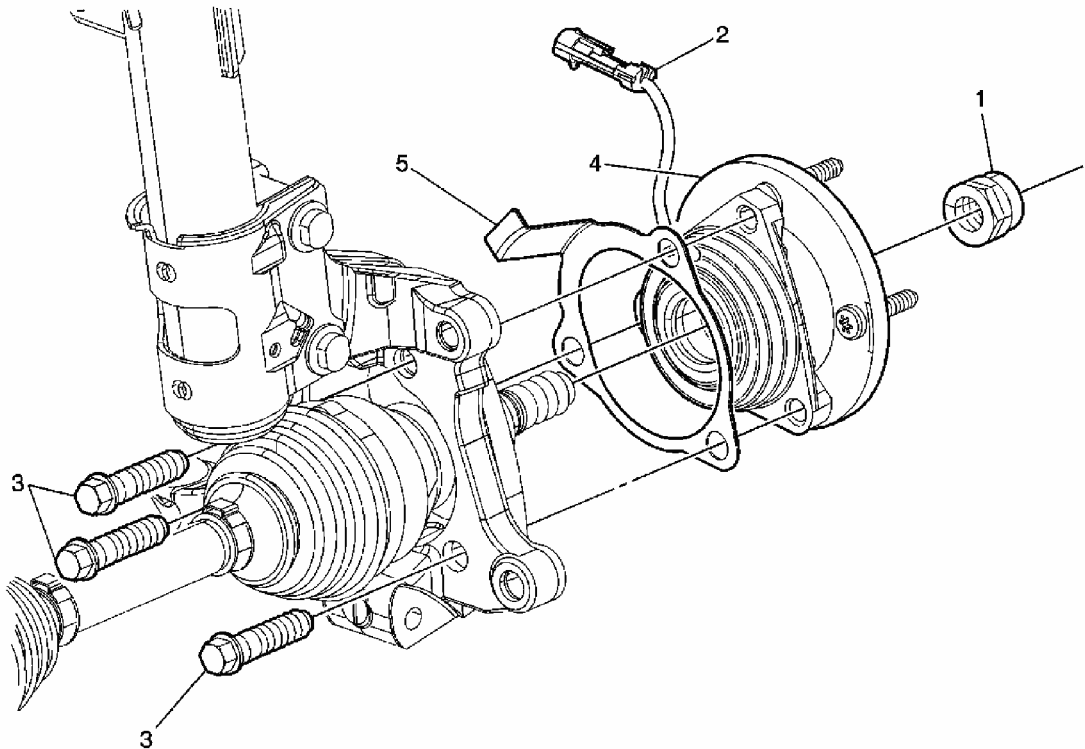


Fig. 6: Wheel Bearing/Hub Replacement - Front
Courtesy of GENERAL MOTORS CORP.

Wheel Bearing/Hub Replacement - Front

Callout	Component Name
NOTE: Refer to <u>Fastener Notice</u> .	
Fastener Tightening Specifications: Refer to <u>Fastener Tightening Specifications</u> .	
Preliminary Procedures	
1. Refer to <u>Lifting and Jacking the Vehicle</u> .	
2. Refer to <u>Tire and Wheel Removal and Installation</u> .	
3. Refer to <u>Brake Rotor Replacement</u> .	
	Axle Shaft Nut

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1	Tighten: 110 N.m (81 lb ft)
2	Wheel Speed Sensor Connector Tip: If equipped.
3	Wheel Bearing Bearing/Hub Assembly Bolt (Qty: 3) Tighten: 115 N.m (85 lb ft)
4	Wheel Bearing/Hub Assembly Bearing
5	Wheel Bearing/Hub Assembly Spacer

STEERING KNUCKLE REPLACEMENT

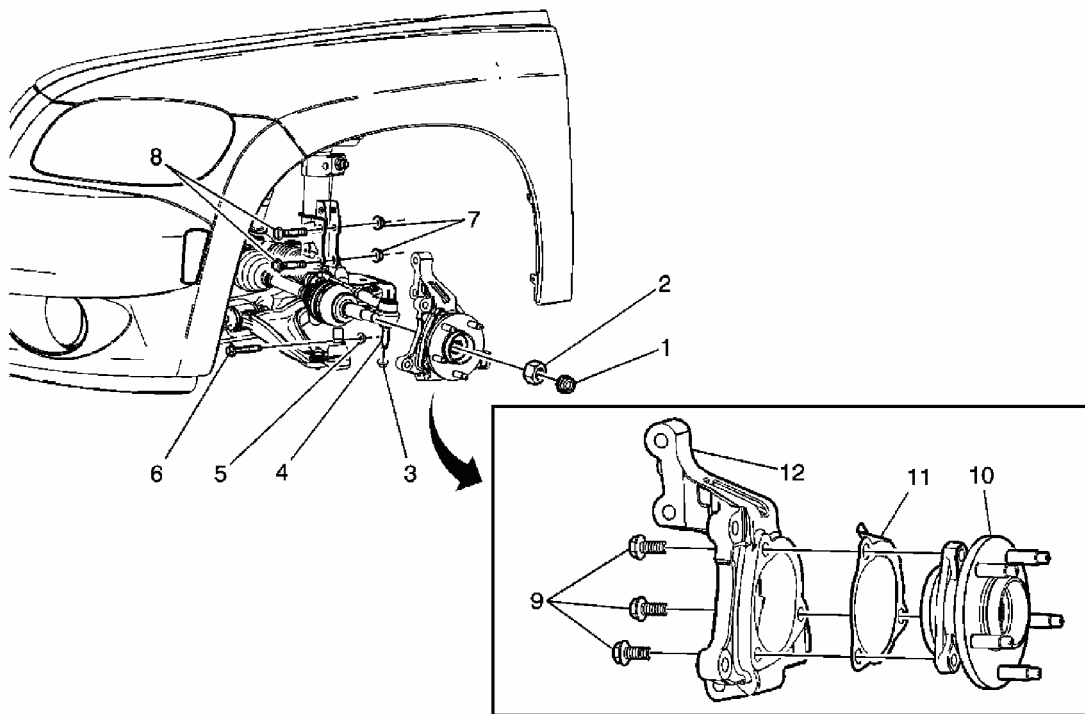


Fig. 7: Steering Knuckle Replacement
Courtesy of GENERAL MOTORS CORP.

Steering Knuckle Replacement

Callout	Component Name
NOTE: Refer to Fastener Notice .	
Fastener Tightening Specifications: Refer to Fastener Tightening Specifications . Tool Required: J 24319-B Steering Linkage and Tie Rod Puller.	
Preliminary Procedures	

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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 brake rotor from the wheel hub/bearing. Refer to **Brake Rotor Replacement** .

1	Wheel Drive Shaft Nut Tip: Use a suitable tool to prevent the wheel hub/bearing from rotating while removing the axle nut. Tighten: 210 N.m (155 lb ft)
2	Wheel Drive Shaft Washer
3	Outer Tie Rod End Nut Tighten: 60 N.m (44 lb ft)
4	Outer Tie Rod End Tip: Use the J 24319-B to separate the outer tie rod end from the steering knuckle.
5	Ball Joint to Steering Knuckle Nut Tighten: First pass 50 N.m (37 lb ft) reverse nut 3/4 turn. Second pass 50 N.m (37 lb ft) plus 30° rotation.
6	Ball Joint to Steering Knuckle Bolt
7	Strut to Steering Knuckle Nut (Qty: 2) Tighten: 120 N.m (89 lb ft)
8	Strut to Steering Knuckle Bolt (Qty: 2)
9	Wheel Bearing/Hub Bolt (Qty: 3) Tighten: 115 N.m (85 lb ft)
10	Wheel Bearing/Hub Tip: 1. Disconnect the wheel speed sensor connector, if equipped. 2. Pull the wheel/bearing/hub from the steering knuckle.
11	Wheel Bearing/Hub Spacer
12	Steering knuckle

LOWER CONTROL ARM REPLACEMENT

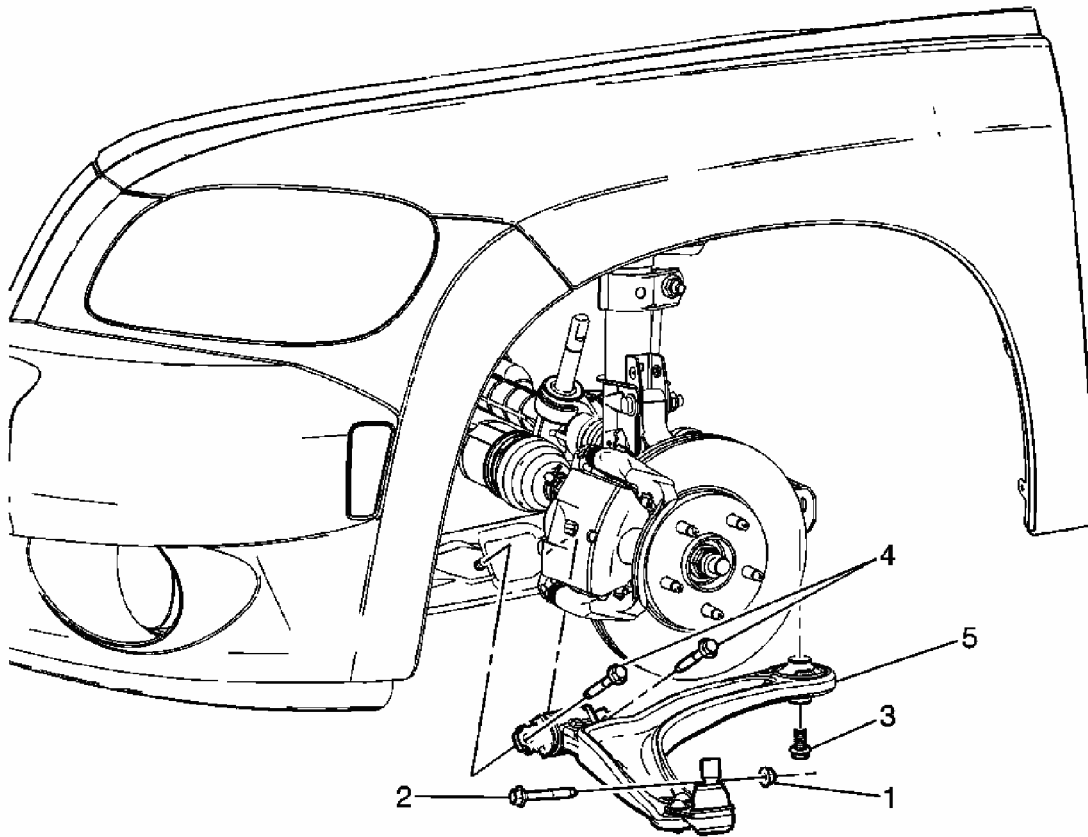


Fig. 8: Lower Control Arm Replacement
 Courtesy of GENERAL MOTORS CORP.

Lower Control Arm Replacement

Callout	Component Name
NOTE: Refer to <u>Fastener Notice</u> . Fastener Tightening Specifications: Refer to <u>Fastener Tightening Specifications</u>. Preliminary Procedures 1. Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> . 2. Remove the front tire and wheel assembly. Refer to <u>Tire and Wheel Removal and Installation</u> .	
1	Ball Joint to Steering Knuckle Nut Tighten: First pass 50 N.m (37 lb ft) reverse nut 3/4 turn. Second pass 50 N.m (37 lb ft) plus 30° rotation.
2	Ball Joint to Steering Knuckle Bolt

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3	Lower Control Arm to Rear Frame Bolt Tighten: 100 N.m (74 lb ft) plus 180° rotation.
4	Lower Control Arm to Front Frame Bolt (Qty: 2) Tighten: 55 N.m (41 lb ft)
5	Lower Control Arm

LOWER CONTROL ARM BUSHINGS REPLACEMENT

Tools Required

J 41211 Front Control Arm Bushing Set. See Special Tools.

Removal Procedure

1. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle in General Information.
2. Remove the lower control arm. Refer to Lower Control Arm Replacement.
3. Wrap the control arm with a shop towel and place it in a vise.

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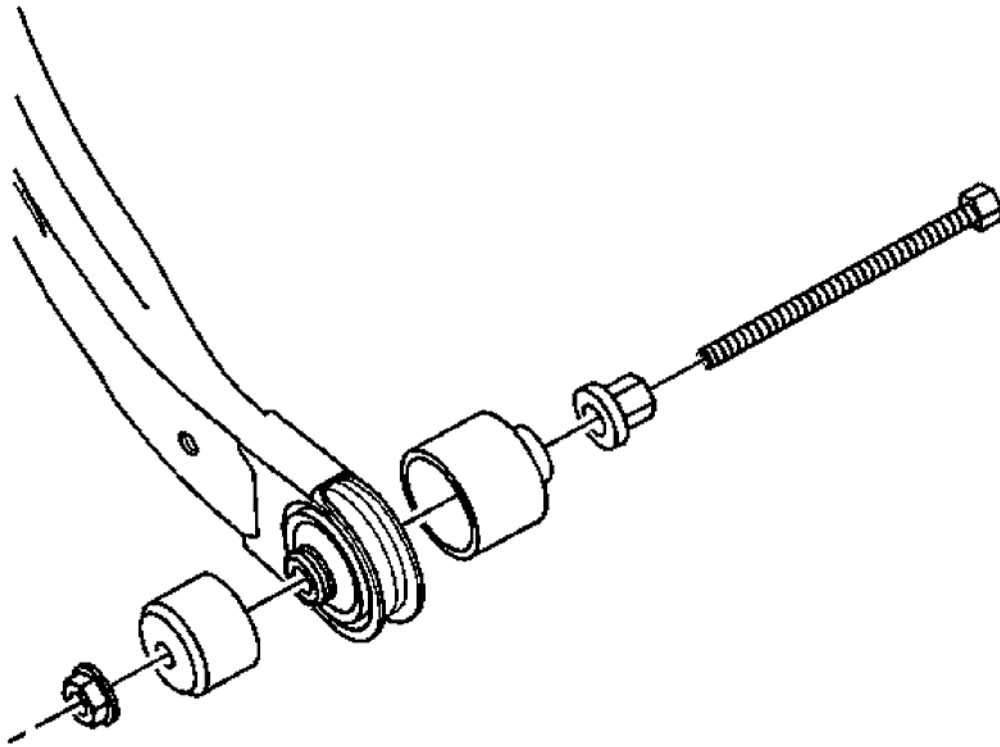


Fig. 9: Removing Control Arm Bushing
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Note the depth and orientation of the old bushing before removal.

4. Using the **J 41211** , pull the control arm bushing through the control arm. See **Special Tools**.
5. Disassemble the tools and remove the bushing.

Installation Procedure

1. Place the NEW bushing to the tapered side of the control arm.

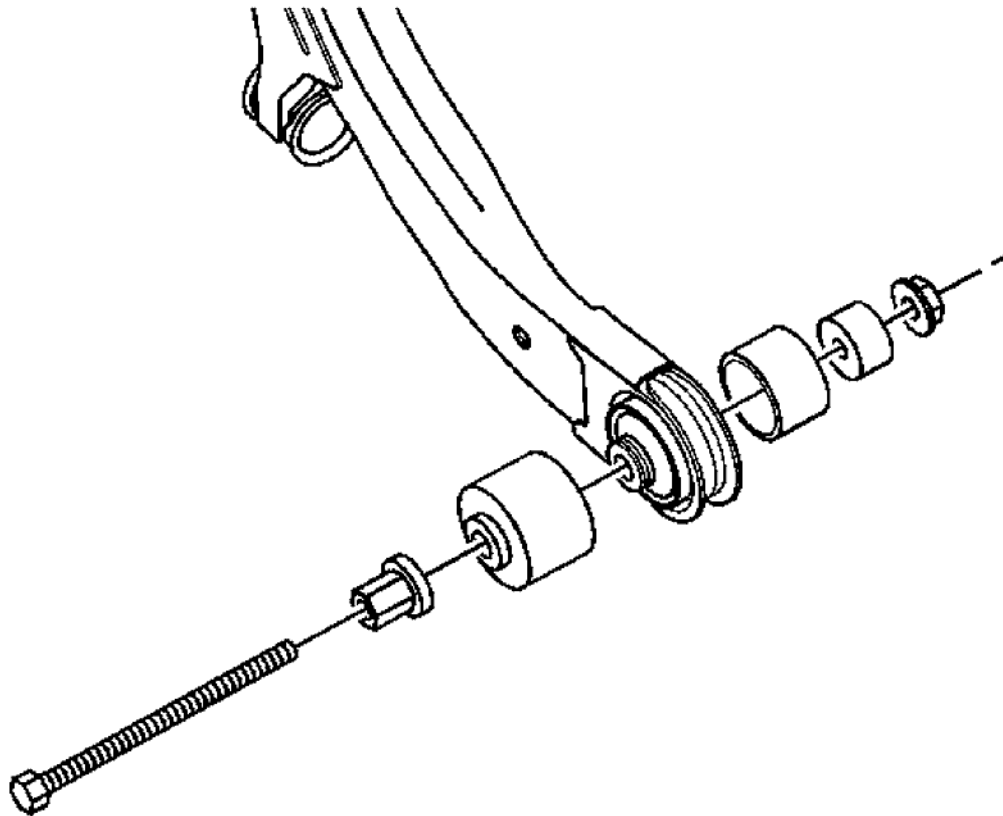


Fig. 10: Installing Control Arm Bushing
Courtesy of GENERAL MOTORS CORP.

2. Using the **J 41211** , pull the control arm bushing through the opposite direction of the control arm. See **Special Tools**.
3. Install the bushing to the same depth and orientation as noted during removal.
4. Remove the **J 41211** from the control arm. See **Special Tools**.
5. Install the control arm. Refer to **Lower Control Arm Replacement**.

WHEEL STUD REPLACEMENT

Tools Required

J 43631 Ball Joint Remover

Removal Procedure

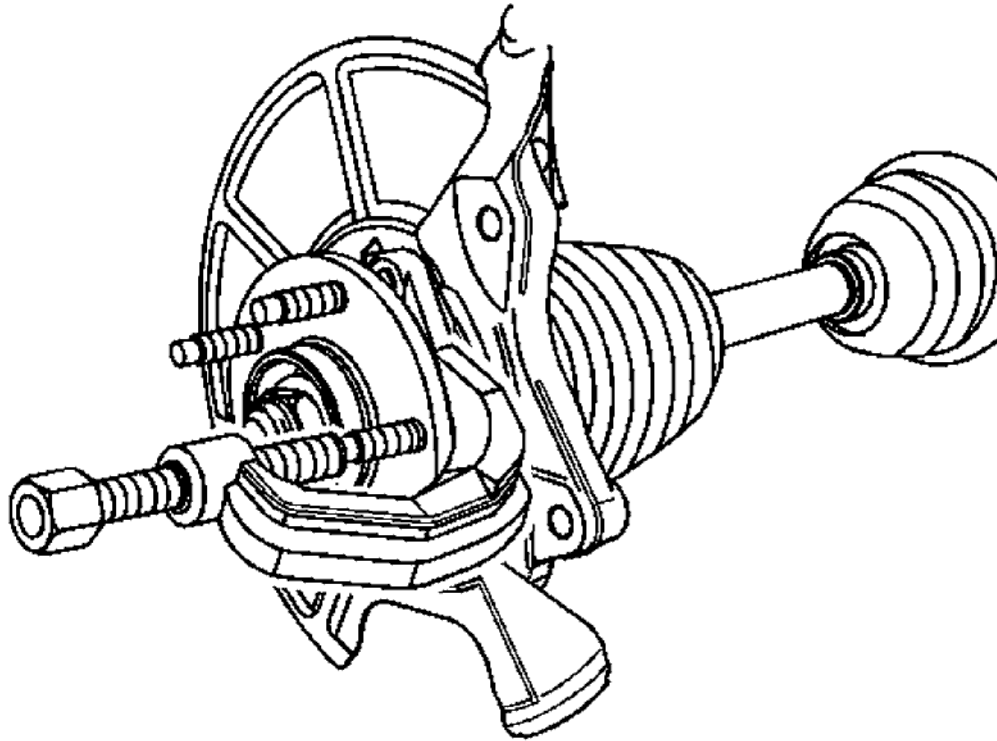


Fig. 11: Removing Wheel Stud - 5-Stud Pattern
Courtesy of GENERAL MOTORS CORP.

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Remove the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.
3. Without disconnecting the hydraulic brake flex hose, remove and support the brake caliper and bracket as an assembly, and remove the brake rotor. Refer to **Brake Rotor Replacement**.
4. Rotate the bearing hub to a position where the least amount of interference between the stud and the steering knuckle exists.
5. Using the **J 43631**, release the wheel stud from the bearing hub and discard the stud.

Installation Procedure

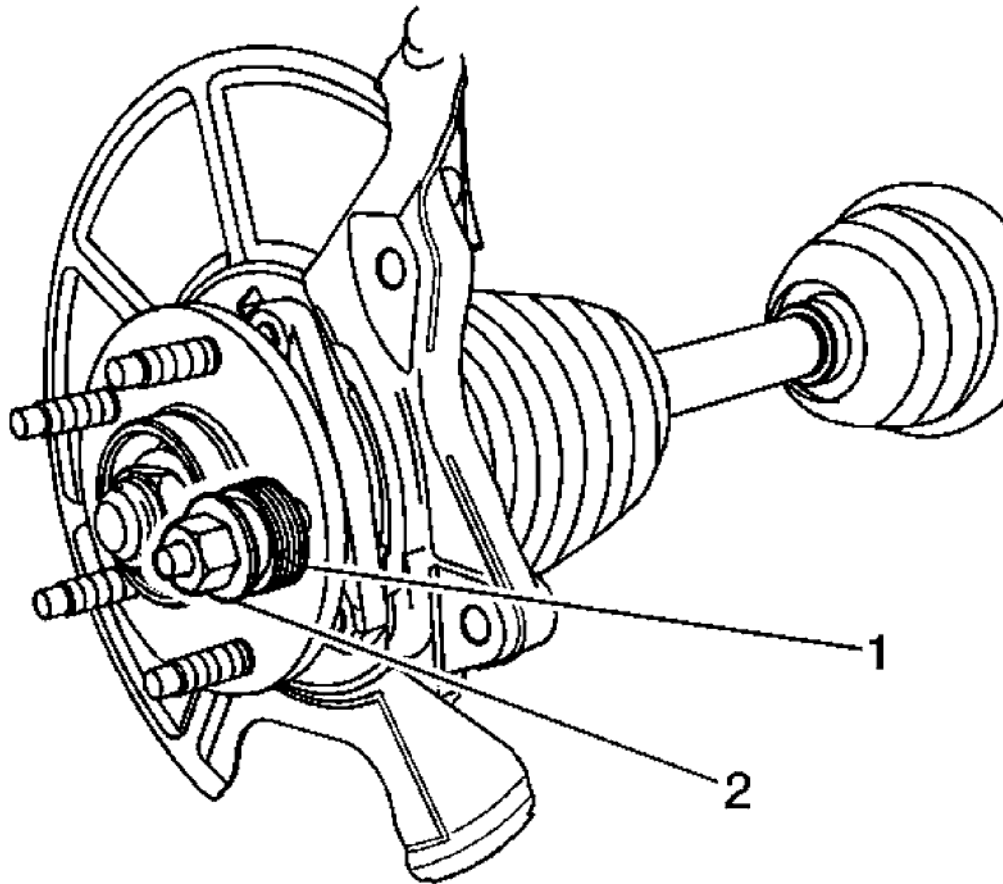


Fig. 12: Identifying Washers & Wheel Nut - 5-Stud Pattern
Courtesy of GENERAL MOTORS CORP.

1. With the bearing hub still in position, install the NEW stud into the bearing/hub assembly.
2. Add enough washers (1) in order to draw the stud into the hub.
3. Install the wheel nut (2) with the flat side against the washers.
4. Tighten the wheel nut until the head of the wheel stud is fully seated against the back of the bearing hub flange.
5. Remove the wheel nut and the washers.
6. Install the brake rotor, and install the brake caliper and bracket as an assembly. Refer to **Brake Rotor Replacement**.
7. Install the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.
8. Lower the vehicle.

STRUT ASSEMBLY REPLACEMENT

Removal Procedure

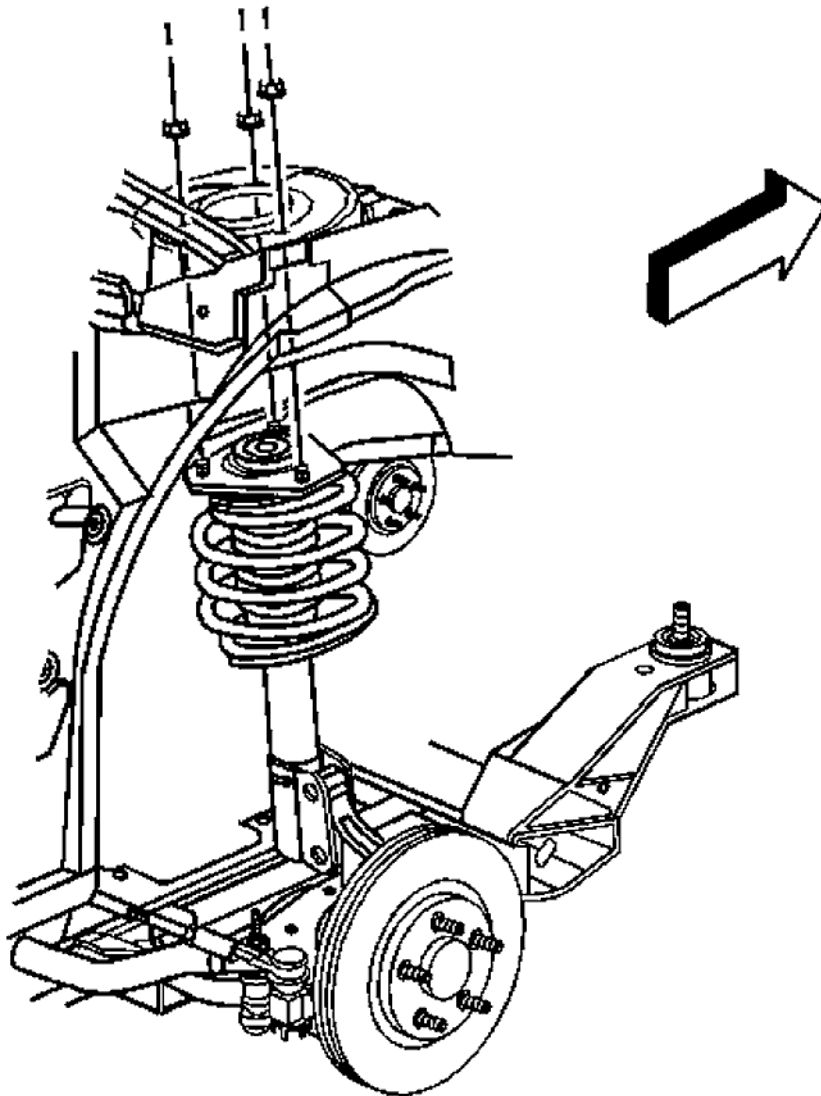


Fig. 13: Strut Upper Mounting Nuts
Courtesy of GENERAL MOTORS CORP.

1. Remove the strut upper mounting nuts.

IMPORTANT: Lift the vehicle using **ONLY** a frame-contact vehicle lift. Do **NOT** lift the vehicle using a suspension-contact vehicle lift.

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

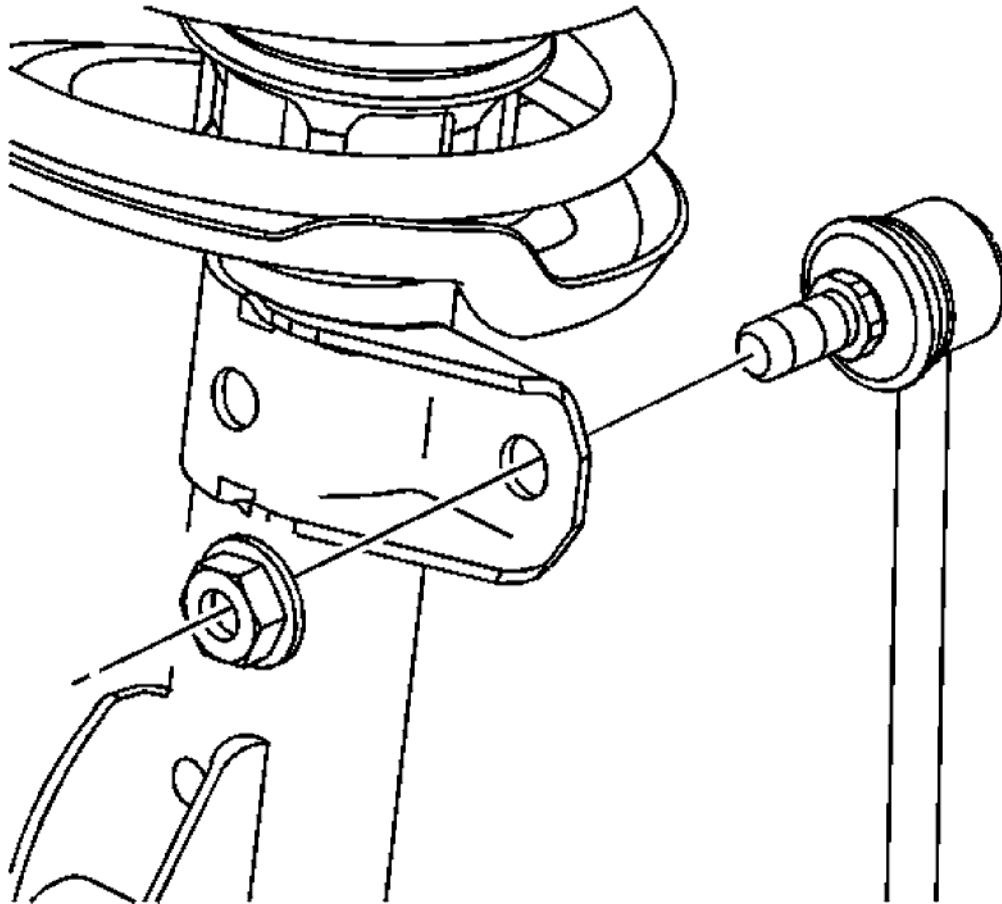


Fig. 14: View Of Stabilizer Link At Strut Assembly
Courtesy of GENERAL MOTORS CORP.

4. Disconnect the stabilizer shaft link from the strut assembly.

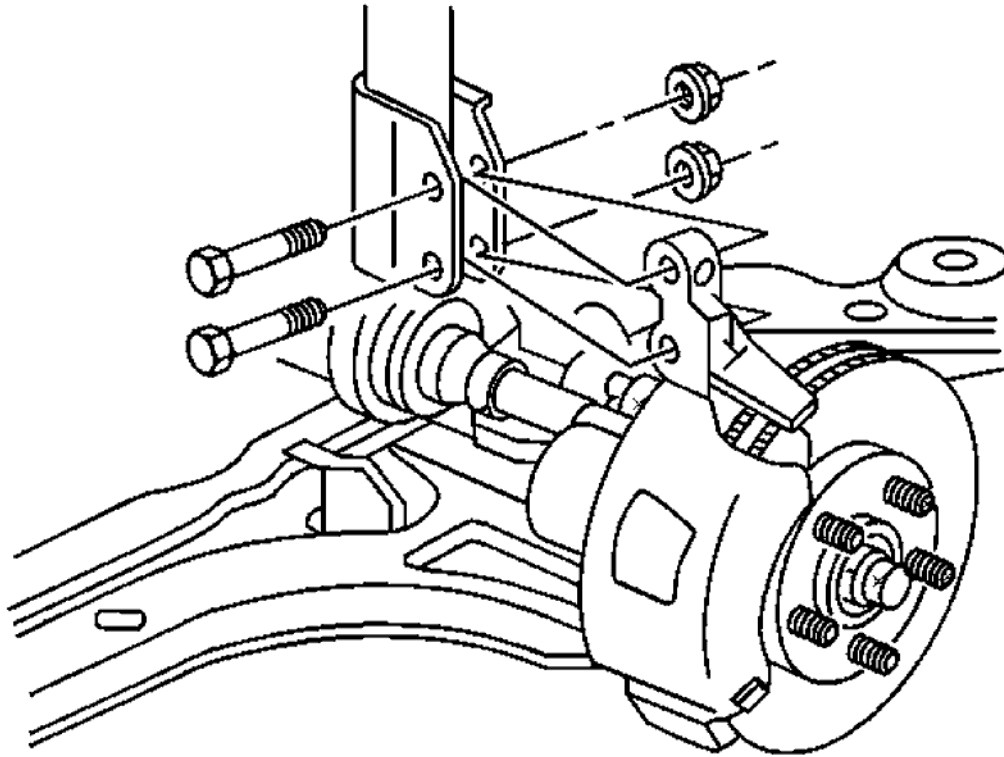


Fig. 15: View Of Steering Knuckle To Strut Bolts
Courtesy of GENERAL MOTORS CORP.

5. Remove the strut lower bolts, nuts and antilock brake system (ABS) wiring bracket, if equipped.
6. Remove the strut.

Installation Procedure

1. Install the strut.

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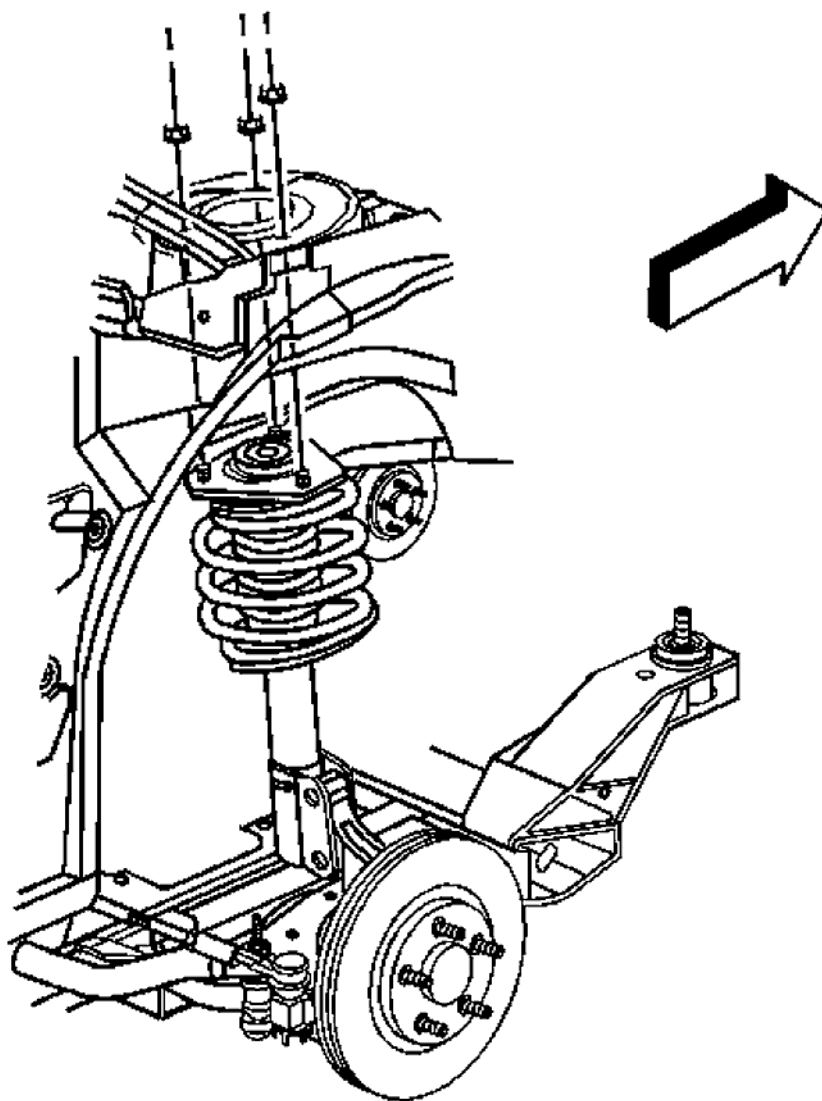


Fig. 16: Strut Upper Mounting Nuts
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

2. Install the strut upper mounting nuts.

Tighten: Tighten the nuts to 20 N.m (15 lb ft).

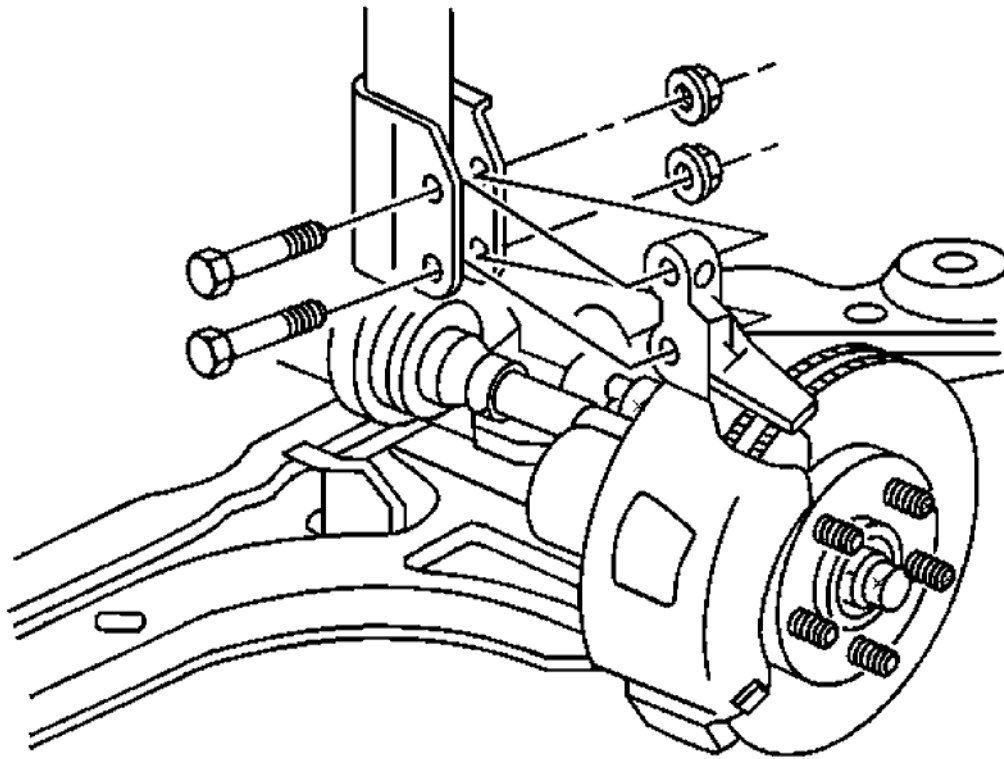


Fig. 17: View Of Steering Knuckle To Strut Bolts
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: This is a prevailing torque type fastener. This fastener may be reused **ONLY** if:

- The fastener and its counterpart are clean and free from rust.
- The fastener develops 3 N.m (27 lb in) of torque/drag against its counterpart prior to the fastener seating.

If the fastener does not meet these criteria, **REPLACE** the fastener.

3. Install the strut lower bolts, nuts and ABS wiring bracket, if equipped.

Tighten: Tighten the strut lower nuts to 120 N.m (89 lb ft).

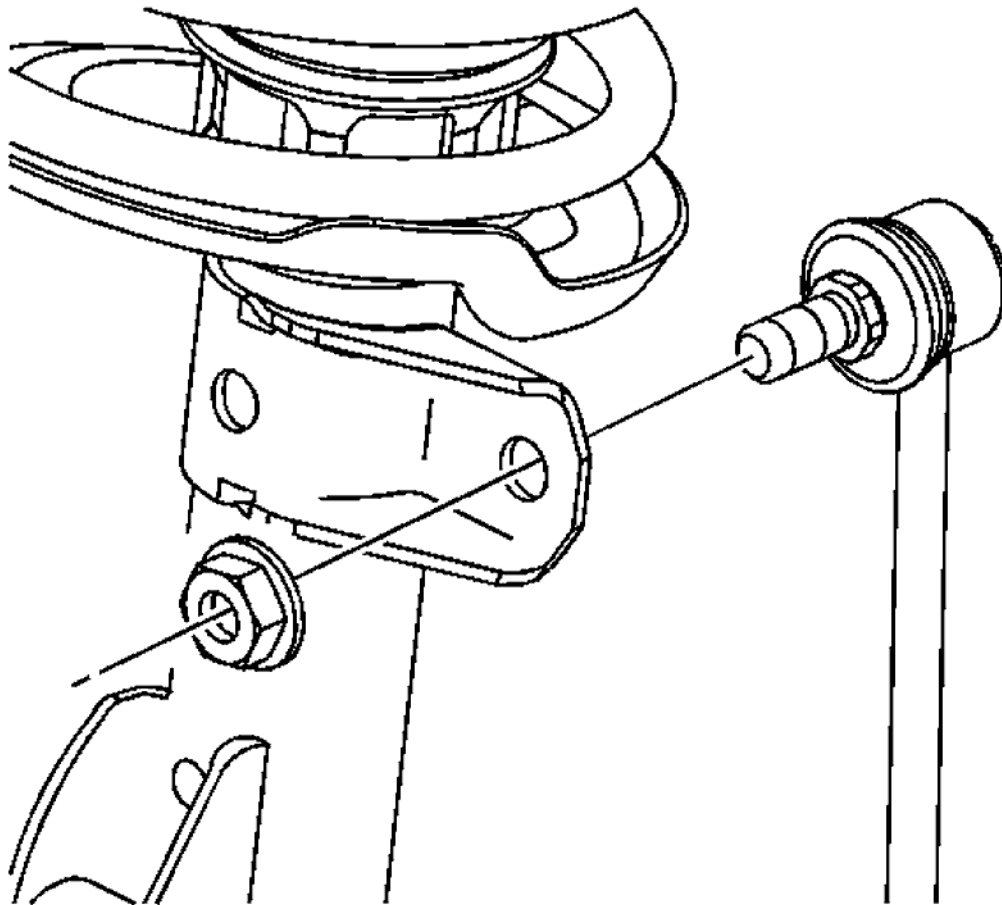


Fig. 18: View Of Stabilizer Link At Strut Assembly
Courtesy of GENERAL MOTORS CORP.

4. Connect the stabilizer shaft link to the strut assembly.

Tighten: Tighten the stabilizer shaft link nut to 65 N.m (48 lb ft).

5. Install the tire and wheel. Refer to **Tire and Wheel Removal and Installation** .
6. Lower the vehicle.
7. Align the front wheels. Refer to **Measuring Wheel Alignment** .

SUSPENSION SHOCK/STRUT DISPOSAL

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

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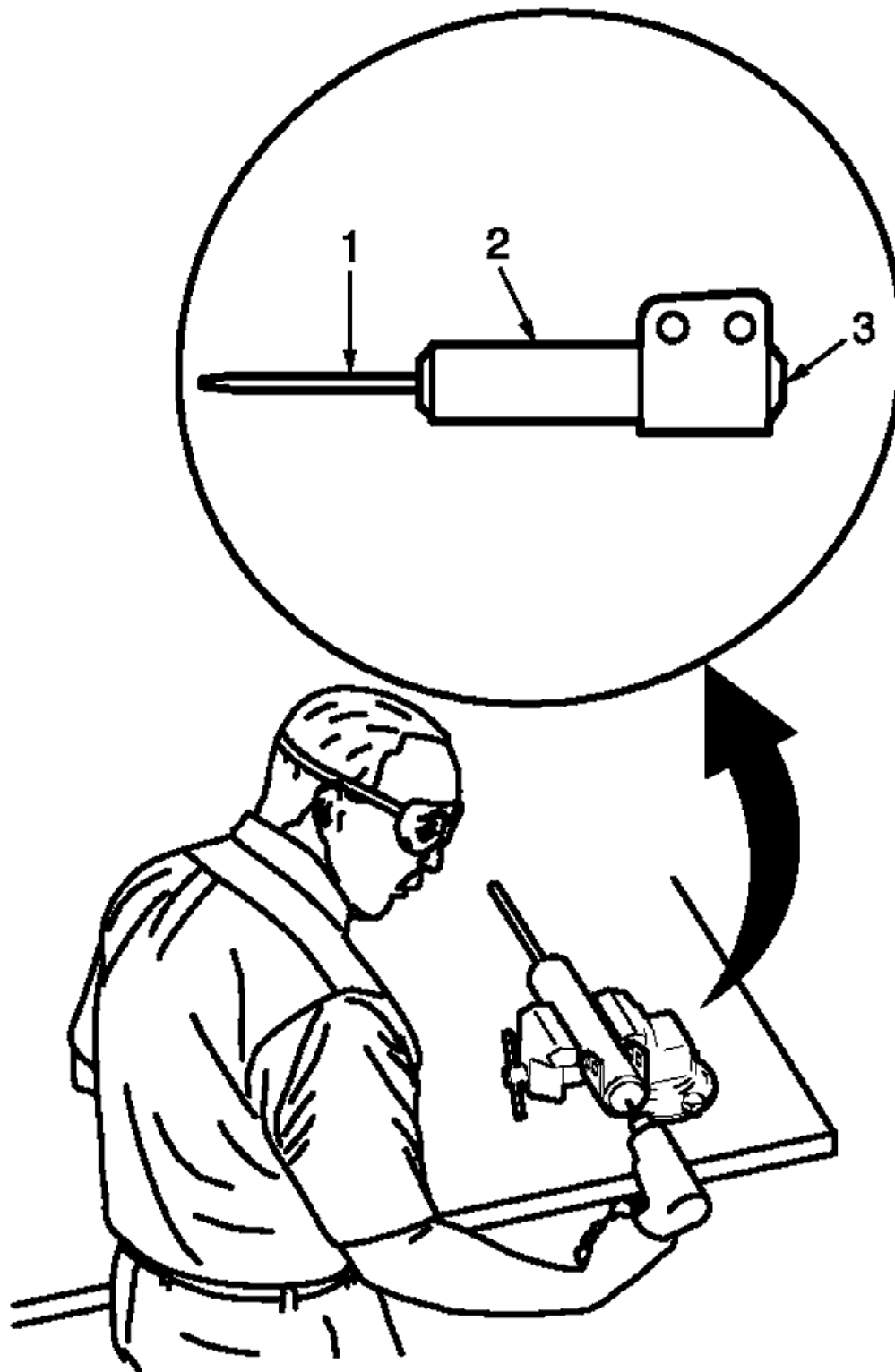


Fig. 19: Drilling Hole In Strut At Center Of End Cap

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Courtesy of GENERAL MOTORS CORP.

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/OR SPRING REPLACEMENT

Tools Required

J 45400 Strut Spring Compressor. See Special Tools.

Disassembly Procedure

1. Remove the strut from the vehicle. Refer to Strut Assembly Replacement.

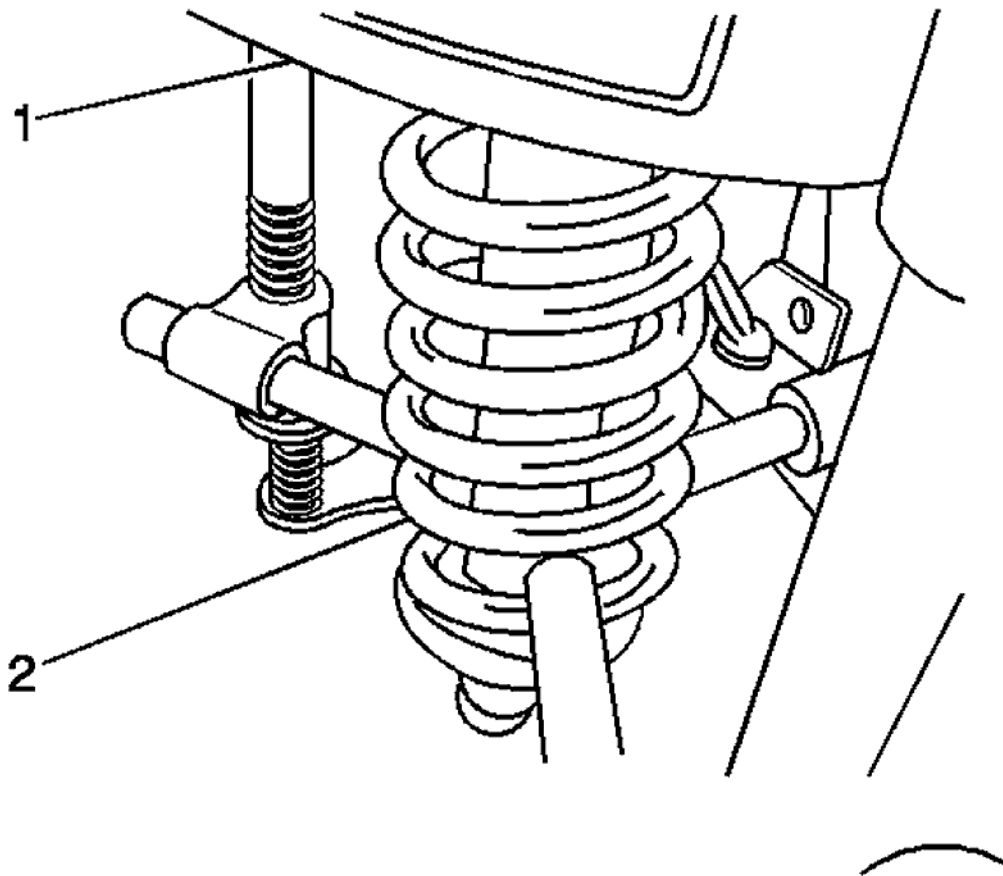


Fig. 20: Compressing/Releasing Lower Part Of Shock Spring
Courtesy of GENERAL MOTORS CORP.

2. Install the strut (2) in the J 45400 (1). See Special Tools.

IMPORTANT: The spring is compressed when the strut moves freely.

3. Turn the spring compressor forcing screw until the coil spring is compressed.
4. Loosen the compressor forcing screw until the upper strut mount and coil spring may be removed.

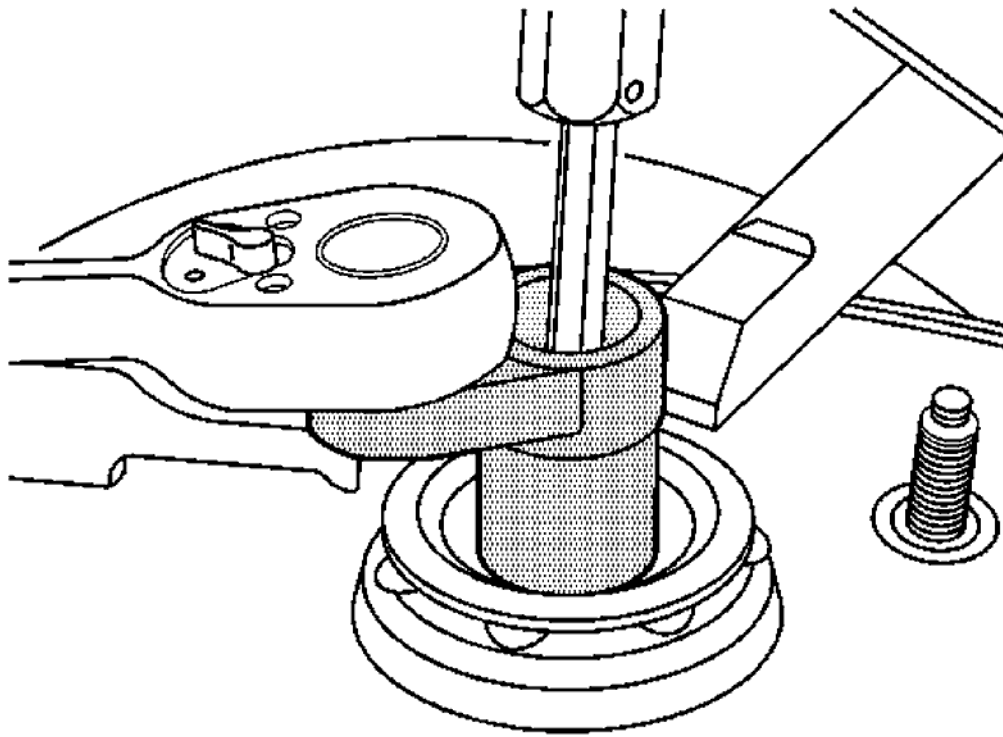


Fig. 21: Removing/Installing Strut Retaining Nut
Courtesy of GENERAL MOTORS CORP.

5. Use a 45 TORX® socket in order to hold the strut shaft. Use a strut rod socket or equivalent to remove the upper strut mount nut.

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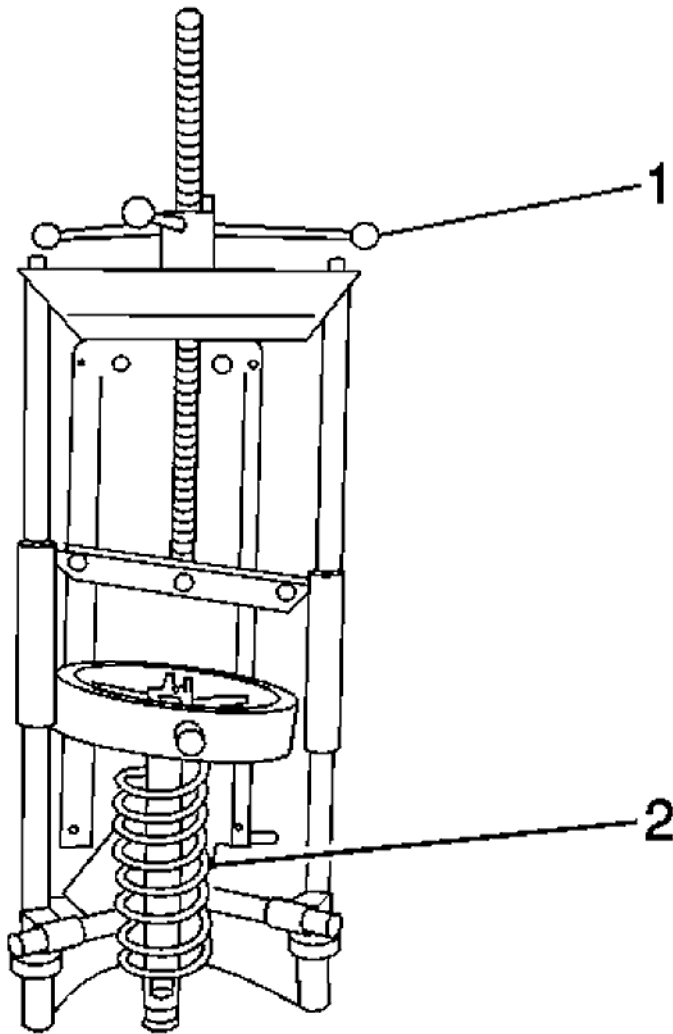


Fig. 22: View Of Compressor Forcing Screw & Coil Spring
Courtesy of GENERAL MOTORS CORP.

6. Remove the upper strut mount and the coil spring from the **J 45400** . See Special Tools.
7. Remove the strut (2) from the **J 45400** . See Special Tools.

Assembly Procedure

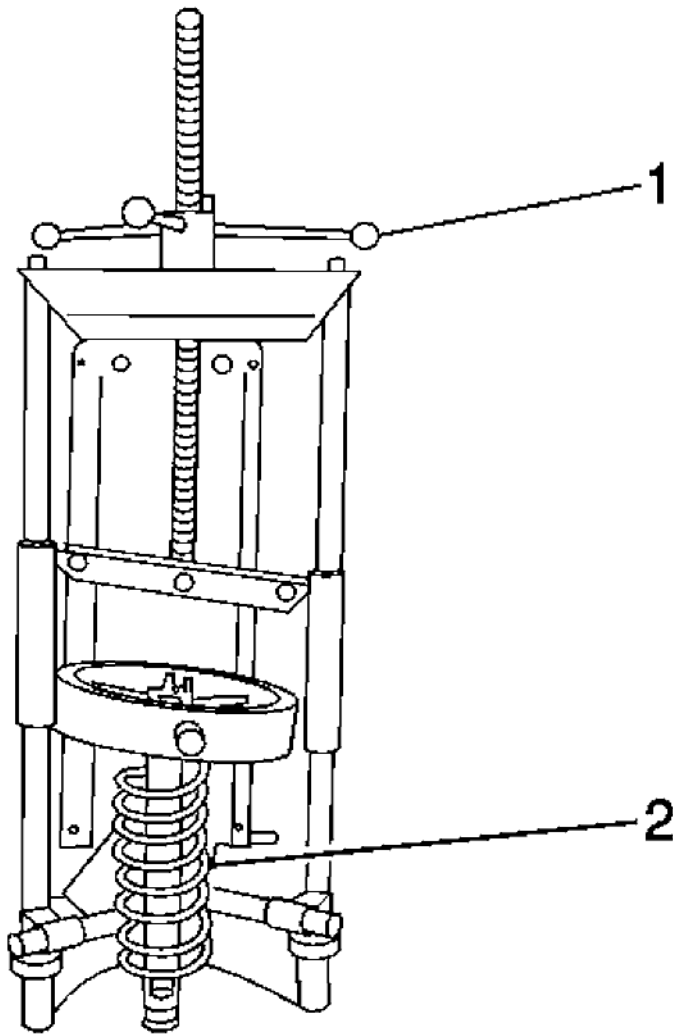


Fig. 23: View Of Compressor Forcing Screw & Coil Spring
Courtesy of GENERAL MOTORS CORP.

1. Install the coil spring and upper strut mount to the **J 45400** . See **Special Tools**.
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.

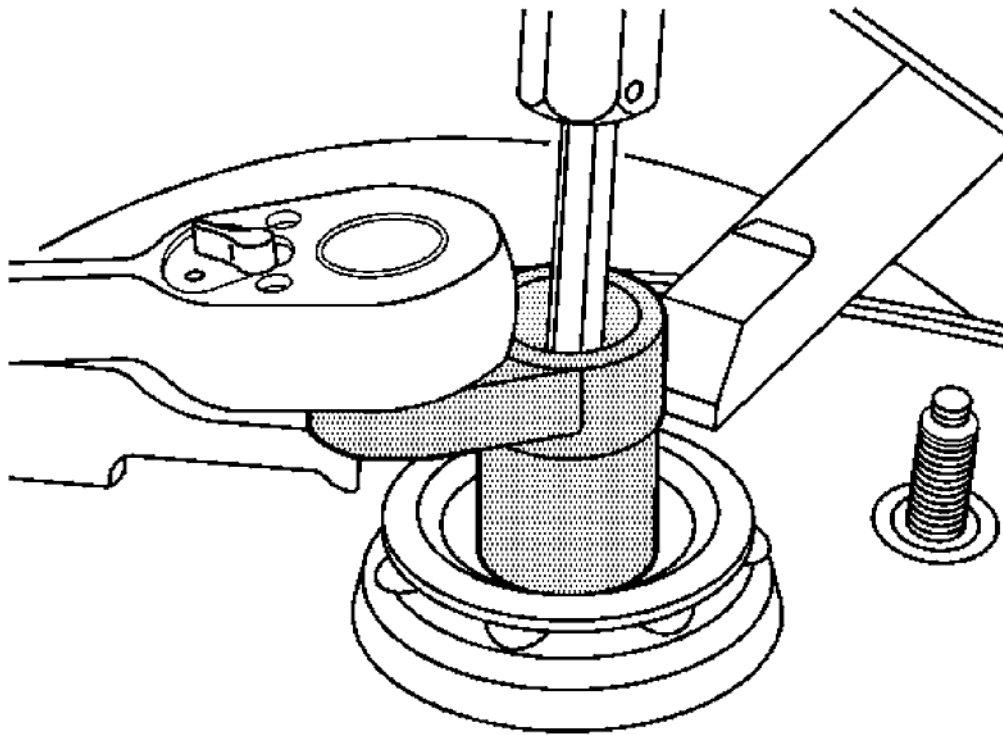


Fig. 24: Removing/Installing Strut Retaining Nut
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

5. Use a 45 TORX® socket in order to hold the strut shaft. Use a strut rod socket or equivalent to Install the upper strut mount nut.

Tighten: Tighten the strut mount nut to 75 N.m (55 lb ft).

6. Remove the strut from the **J 45400** . See Special Tools.
7. Install the strut to the vehicle. Refer to Strut Assembly Replacement.

DESCRIPTION AND OPERATION

FRONT SUSPENSION DESCRIPTION AND OPERATION

The front suspension has 2 primary purposes:

- Isolate the driver from irregularities in the road surface.
- Define the ride and handling characteristics of the vehicle.

The front suspension absorbs the impact of the tires travelling over irregular road surfaces and dissipates this energy throughout the suspension system. This process isolates the vehicle occupants from the road surface. The rate at which the suspension dissipates the energy and the amount of energy that is absorbed is how the suspension defines the vehicles ride characteristics. Ride characteristics are designed into the suspension system and are not adjustable. The ride characteristics are mentioned in this description in order to aid in the understanding of the functions of the suspension system. The suspension system must allow for the vertical movement of the tire and wheel assembly as the vehicle travels over irregular road surfaces while maintaining the tire's horizontal relationship to the road.

This requires that the steering knuckle be suspended between a lower control arm and a strut assembly. The lower control arm attaches from the steering knuckle at the outermost point of the control arm. The attachment is through a ball and socket type joint. The innermost end of the control arm attached at 2 points to the vehicle frame through semi-rigid bushings. The upper portion of the steering knuckle is attached to a strut assembly. The strut assembly then connects to the vehicle body by way of an upper bearing. The steering knuckle is allowed to travel up and down independent of the vehicle body structure and frame.

This up and down motion of the steering knuckle as the vehicle travels over bumps is absorbed predominantly by the coil spring. This spring is retained under tension over the strut assembly. A strut is used in conjunction with this system in order to dampen out the oscillations of the coil spring. A strut is a basic hydraulic cylinder. The strut is filled with oil and has a moveable shaft that connects to a piston inside the strut. Valves inside the shock absorber offer resistance to oil flow and consequently inhibit rapid movement of the piston and shaft. Each end of the shock absorber is connected in such a fashion to utilize this recoil action of a spring alone. Each end of the strut is designed as the connection point of the suspension system to the vehicle and acts as the coil spring seat. This allows the strut to utilize the dampening action to reduce the recoil of a spring alone. The lower control arm is allowed to pivot at the vehicle frame in a vertical fashion. The ball joint allows the steering knuckle to maintain the perpendicular relationship to the road surface.

Front suspensions systems utilize a stabilizer shaft. The stabilizer bar connects between the left and right lower control arm assemblies through the stabilizer link and stabilizer shaft insulators. This bar controls the amount of independent movement of the suspension when the vehicle turns. Limiting the independent movement defines the vehicles handling characteristics on turns.

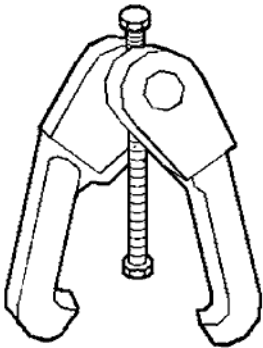
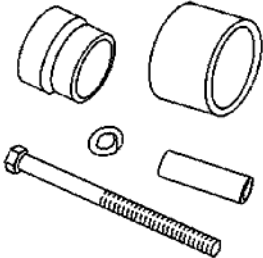
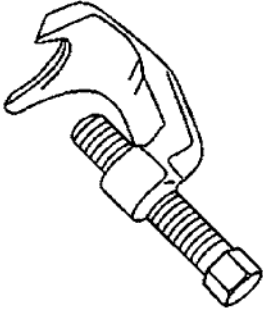
SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS

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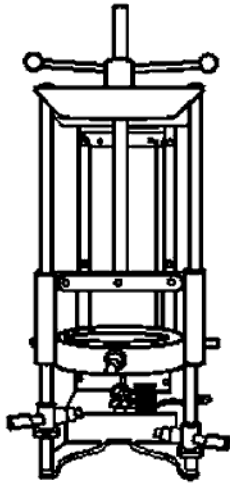
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Special Tools

Illustration	Tool Number/ Description
	J-24319-B Steering Linkage and Tie Rod Puller
	J-41211 Front Control Arm Bushing Set
	J-43631 Ball Joint Remover

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J-45400
Strut Spring Compressor