

2006 Chevrolet Impala LS

2006 SUSPENSION Front Suspension - Impala

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Front Suspension - Impala

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Fastener Tightening Specifications

Application	Specification	
	Metric	English
¹ Front Lower Control Arm Ball Stud to Steering Knuckle Nut	20 N.m + 120 degrees	15 lb ft + 120 degrees
Front Lower Control Ball Stud to Control Arm Nuts	68 N.m	50 lb ft
Front Lower Control Arm Mounting Nuts	125 N.m	92 lb ft
Front Stabilizer Shaft Bracket Bolt	42 N.m	31 lb ft
Front Stabilizer Shaft Link Nut	23 N.m	17 lb ft
Front Suspension Strut Mount to Body Nut	33 N.m	24 lb ft
Front Suspension Strut Rod to Strut Mount Nut	70 N.m	52 lb ft
Front Suspension Strut to Steering Knuckle Bolts	130 N.m	96 lb ft
Front Wheel Bearing/Hub Bolts	130 N.m	96 lb ft
Front Wheel Driveshaft Nut	190 N.m	140 lb ft
Powertrain Cradle to Body Bolts (Front)	145 N.m	107 lb ft
Powertrain Cradle to Body Bolts (Rear)	160 N.m	118 lb ft
¹ Tighten the nut to 20 N.m(15 lb ft) plus 2 nut flats (120°) to align the cotter pin hole with the front lower control arm ball stud. Turn the nut clockwise. DO NOT loosen the nut in order to align the cotter pin hole. Minimum torque is 55 N.m (41 lb ft).		

REPAIR INSTRUCTIONS

STABILIZER SHAFT REPLACEMENT

Removal Procedure

CAUTION: Failure to disconnect intermediate shaft from rack and pinion stub shaft can result in damage to steering gear and/or intermediate shaft. This damage can cause loss of steering control which could result in personal injury.

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

Installation .

3. Remove the pinch bolt from the lower intermediate steering shaft. Refer to **Intermediate Steering Shaft Replacement .**
4. Loosen all insulator clamp attaching bolts.
5. Place a jackstand under the center of the rear frame crossmember.
6. Remove the rear frame-to-body bolts.
7. Lower the rear of the frame just enough to gain access to the stabilizer shaft.

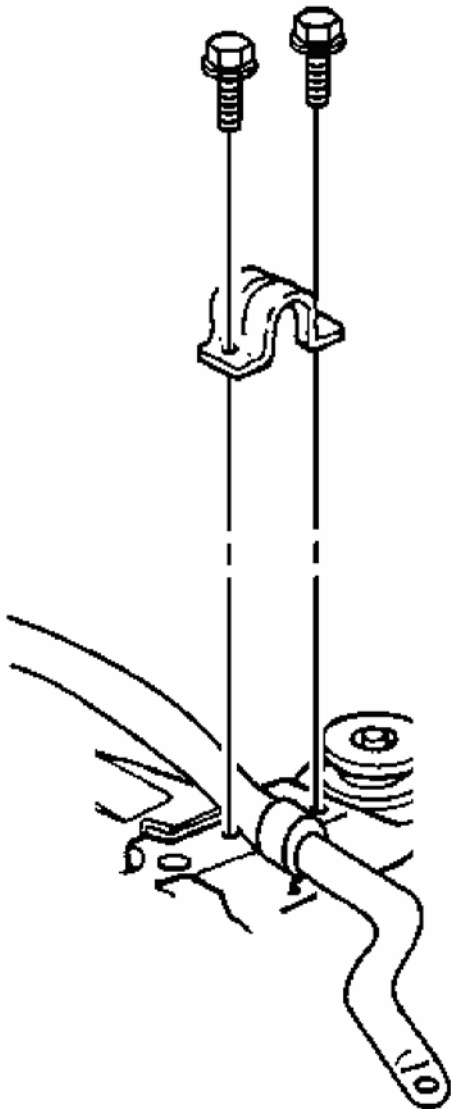


Fig. 1: View Of Insulator Brackets

Courtesy of GENERAL MOTORS CORP.

8. Remove the insulator clamp bolts and the clamps from the frame.

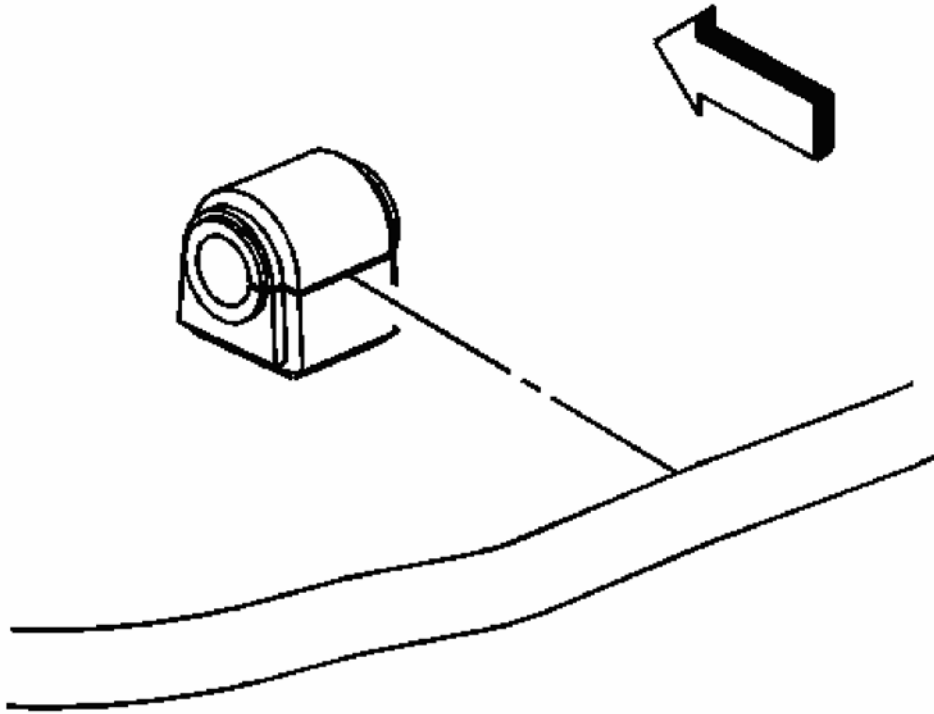


Fig. 2: View Of Insulator For Stabilizer Bar
Courtesy of GENERAL MOTORS CORP.

9. Remove the insulators from the stabilizer bar.

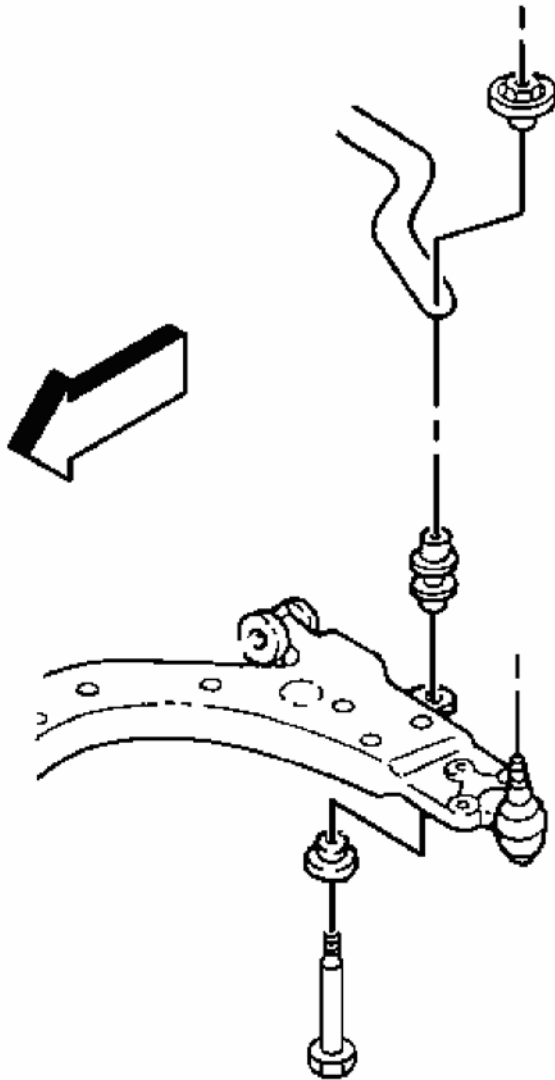


Fig. 3: View Of Stabilizer Shaft Link
Courtesy of GENERAL MOTORS CORP.

10. Remove the stabilizer bar links from the control arms. Refer to **Stabilizer Shaft Link Replacement**.
11. Pull the stabilizer shaft rearward.
12. Swing the stabilizer shaft down to remove the stabilizer shaft from the left side of the vehicle.

CAUTION: When installing the intermediate shaft make sure that the shaft is seated prior to pinch bolt installation. If the pinch bolt is inserted into the coupling before shaft installation, the two mating shafts may disengage. Disengagement of the two mating shafts will cause loss of steering control which could result in personal injury.

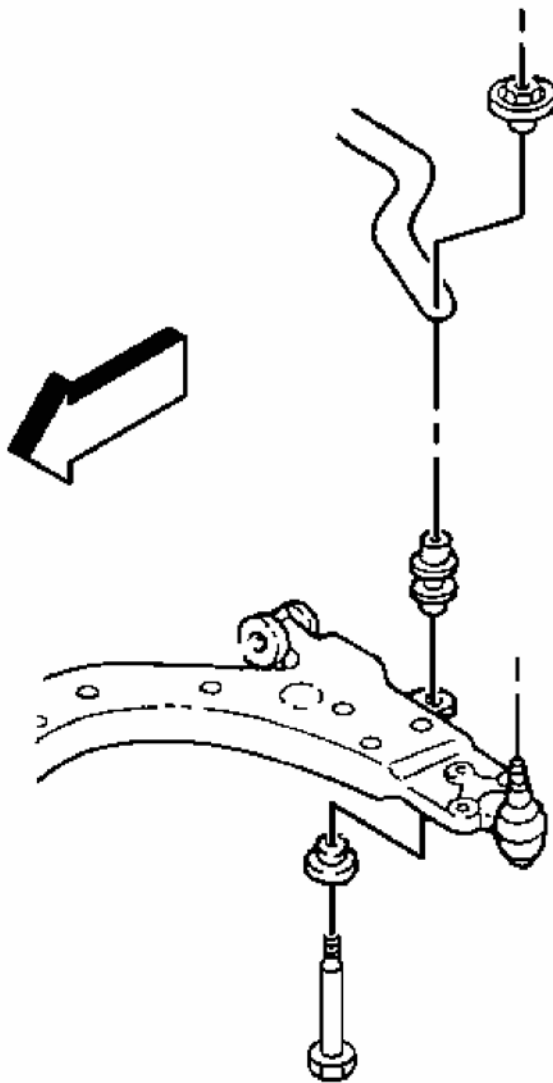


Fig. 4: View Of Stabilizer Shaft Link
Courtesy of GENERAL MOTORS CORP.

1. Insert the stabilizer shaft to the left side of the vehicle.

IMPORTANT: DO NOT tighten the stabilizer link nut at this time. The weight of the vehicle must be supported by the control arms such that you can obtain the vehicle design trim heights before tightening the link nut.

2. Loosely install the stabilizer shaft link at the control arm.

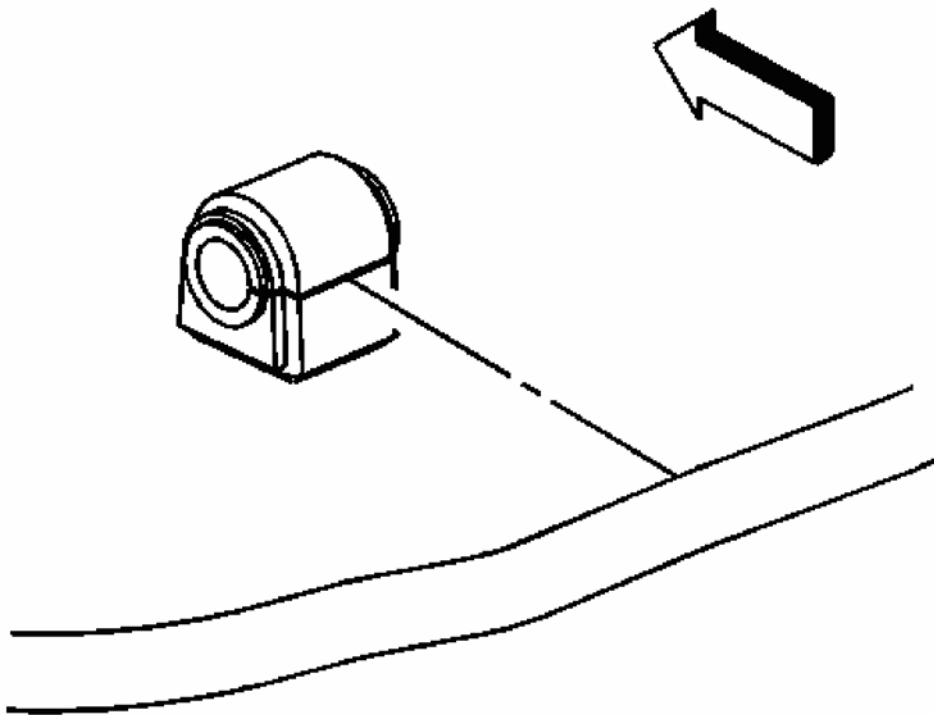


Fig. 5: View Of Insulator For Stabilizer Bar
Courtesy of GENERAL MOTORS CORP.

3. Install the insulators on to the stabilizer bar.

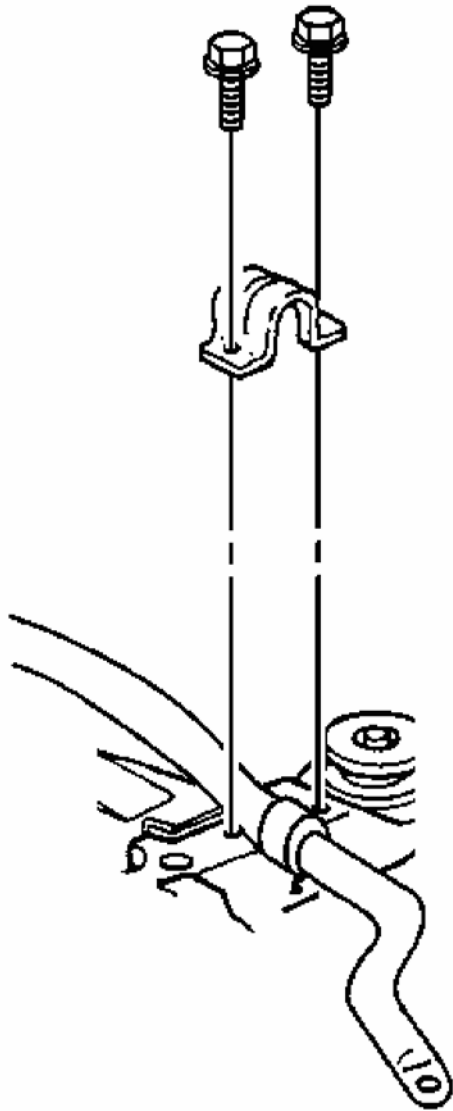


Fig. 6: View Of Insulator Brackets
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice .

4. Connect the insulator clamps to the frame.

Tighten: Tighten the stabilizer shaft bracket bolt to 42 N.m (31 lb ft).

5. Raise the frame into position while you guide the steering shaft onto the gear.
6. Install the rear frame-to-body attaching bolts.

Tighten: Tighten the frame to body attaching bolts to 160 N.m (118 lb ft).

7. Remove the jackstand.
8. Install the pinch bolt and tighten. Refer to **Intermediate Steering Shaft Replacement** .
9. Install the left tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** .
10. Lower the vehicle.
11. Support the weight of the vehicle by the control arms.
12. Tighten the stabilizer link nut.

Tighten: Tighten the stabilizer shaft link nut to 23 N.m (17 lb ft).

STABILIZER SHAFT LINK REPLACEMENT

Removal Procedure

1. Raise the vehicle and suitably 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** .

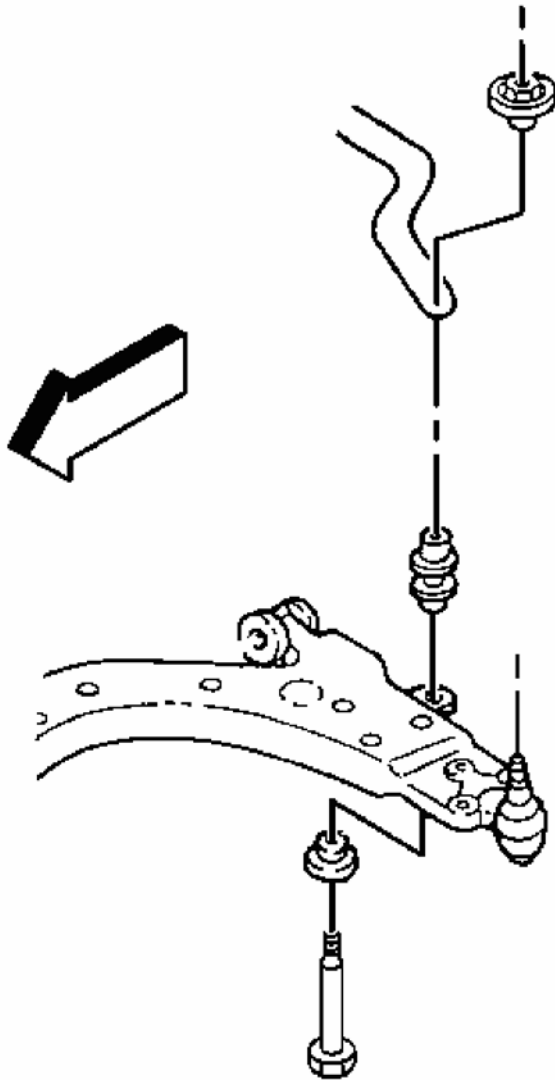


Fig. 7: View Of Stabilizer Shaft Link
Courtesy of GENERAL MOTORS CORP.

3. Remove the stabilizer shaft link bolt and nut.
4. Remove the stabilizer shaft link from the vehicle.

Installation Procedure

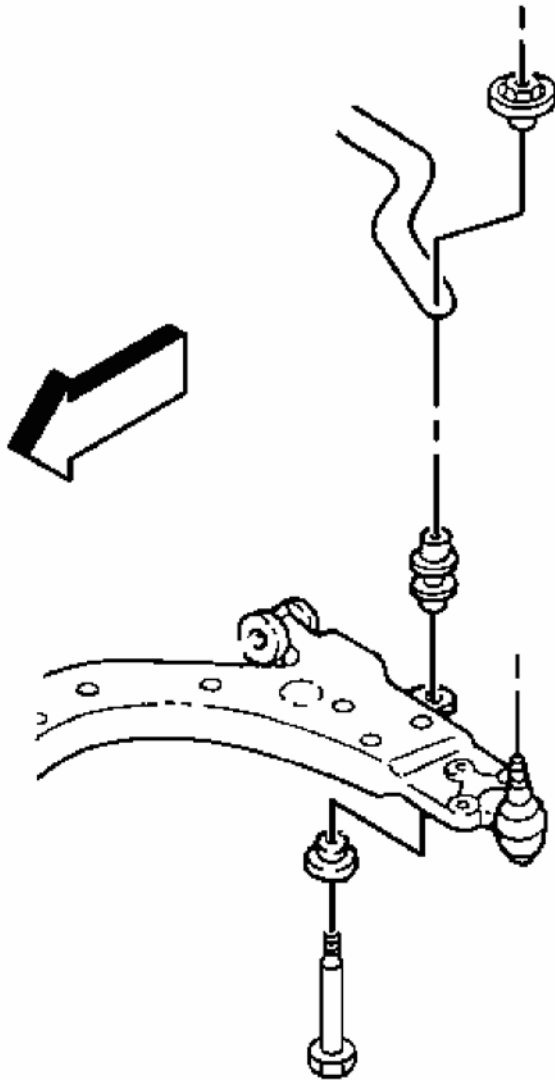


Fig. 8: View Of Stabilizer Shaft Link
Courtesy of GENERAL MOTORS CORP.

1. Install the stabilizer link into the vehicle.

NOTE: Refer to Fastener Notice .

2. Install the stabilizer shaft link bolt and nut.

Tighten: Tighten the stabilizer shaft link nut to 23 N.m (17 lb ft).

3. Install the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** .
4. Lower the vehicle.

STABILIZER SHAFT INSULATOR REPLACEMENT

Removal Procedure

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

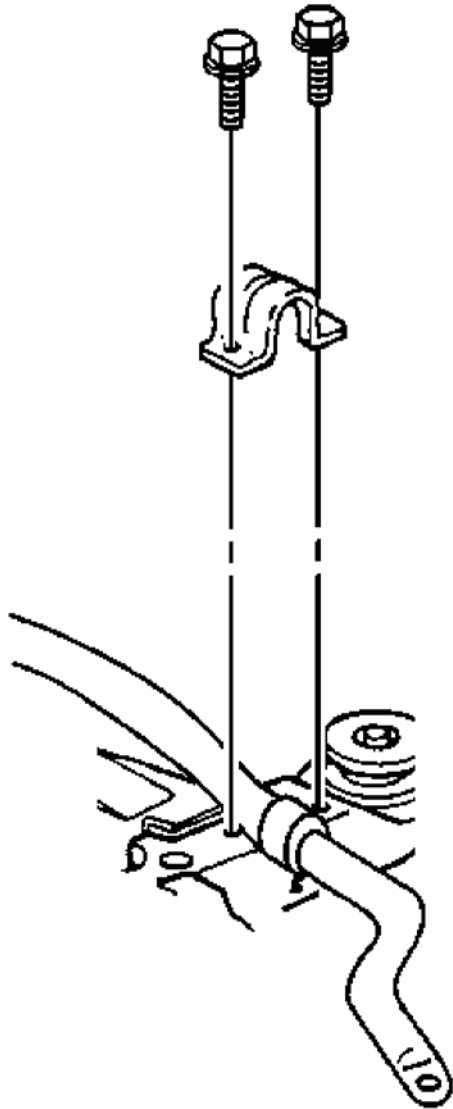


Fig. 9: View Of Insulator Brackets
Courtesy of GENERAL MOTORS CORP.

2. Remove the left and right side stabilizer shaft insulator bracket bolts.
3. Remove the left and right side stabilizer shaft insulator brackets.

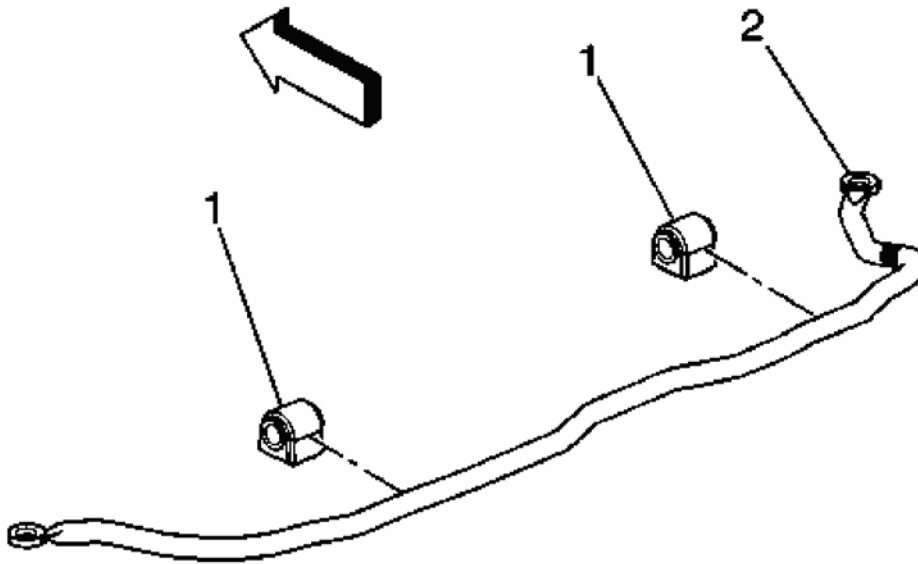


Fig. 10: Stabilizer Shaft Insulators
Courtesy of GENERAL MOTORS CORP.

4. Remove the left and right side stabilizer shaft insulators (1) from the stabilizer shaft (2).

Installation Procedure

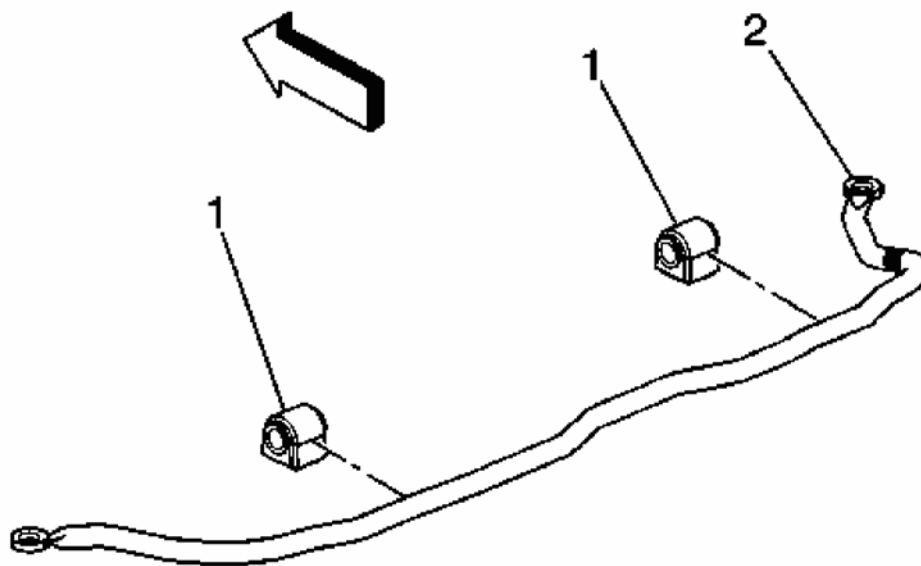


Fig. 11: Stabilizer Shaft Insulators
Courtesy of GENERAL MOTORS CORP.

1. Install the left and right side stabilizer shaft insulators (1) to the stabilizer shaft (2).

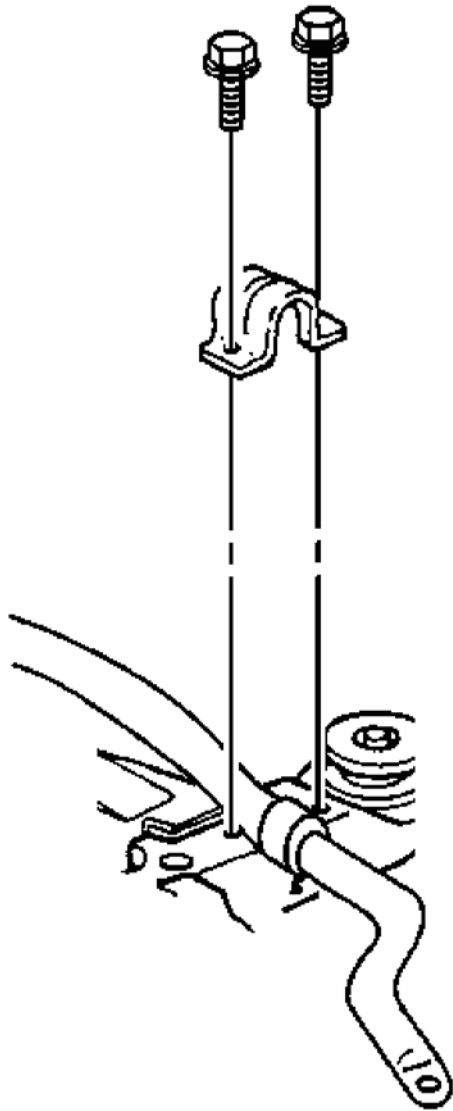


Fig. 12: View Of Insulator Brackets
Courtesy of GENERAL MOTORS CORP.

2. Install the left and right side stabilizer shaft insulator brackets.

NOTE: **Refer to Fastener**
 Notice .

3. Install the left and right side stabilizer shaft insulator bracket bolts.

Tighten: Tighten the stabilizer shaft insulator bracket bolts to 42 N.m (31 lb ft).

4. Lower the vehicle.

LOWER BALL JOINT REPLACEMENT

Tools Required

J 41820 Ball Joint/Stud Separator. See **Special Tools**.

Removal Procedure

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Remove the tire and wheel. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.
3. Drill a pilot hole through the rivets.
4. Drill the remainder of the rivets.
5. Use a hammer and a chisel in order to remove the remainder of the rivet heads.
6. Remove the cotter pin from the ball stud.
7. Loosen the ball stud nut.

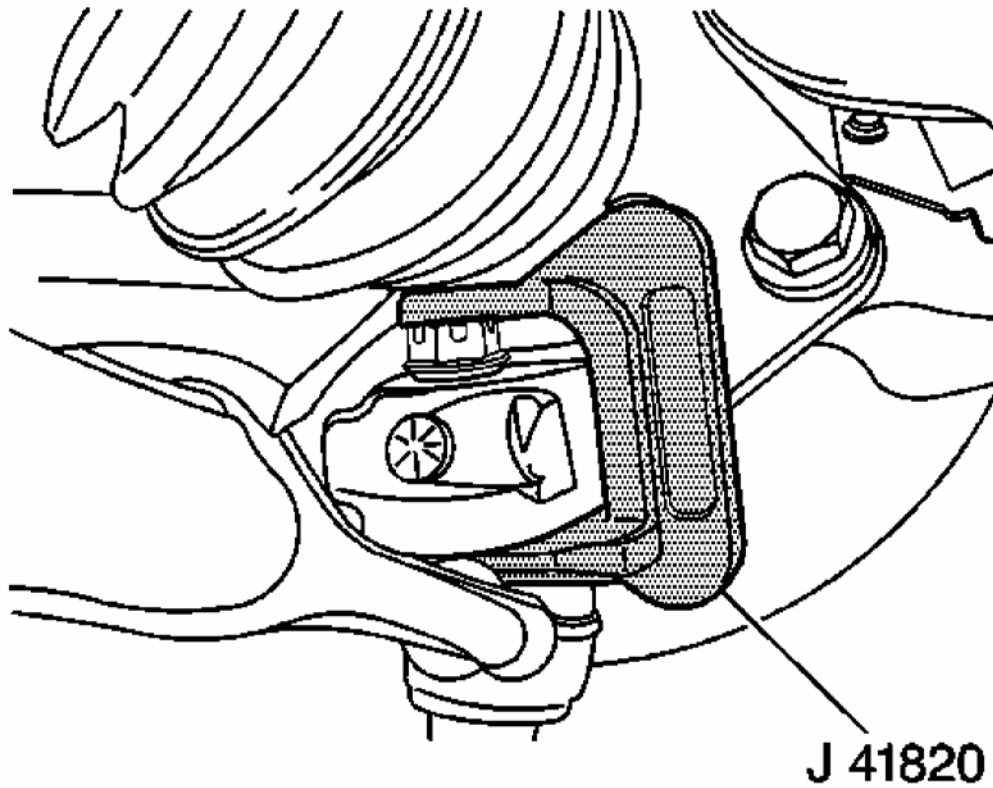


Fig. 13: Separating Ball Stud From Steering Knuckle
Courtesy of GENERAL MOTORS CORP.

8. Install the **J 41820** over the ball stud and lower control arm. See **Special Tools**.
9. Rotate the ball stud nut counterclockwise in order to separate the ball stud from the steering knuckle.
10. Remove the **J 41820** . See **Special Tools**.
11. Remove the ball stud nut.

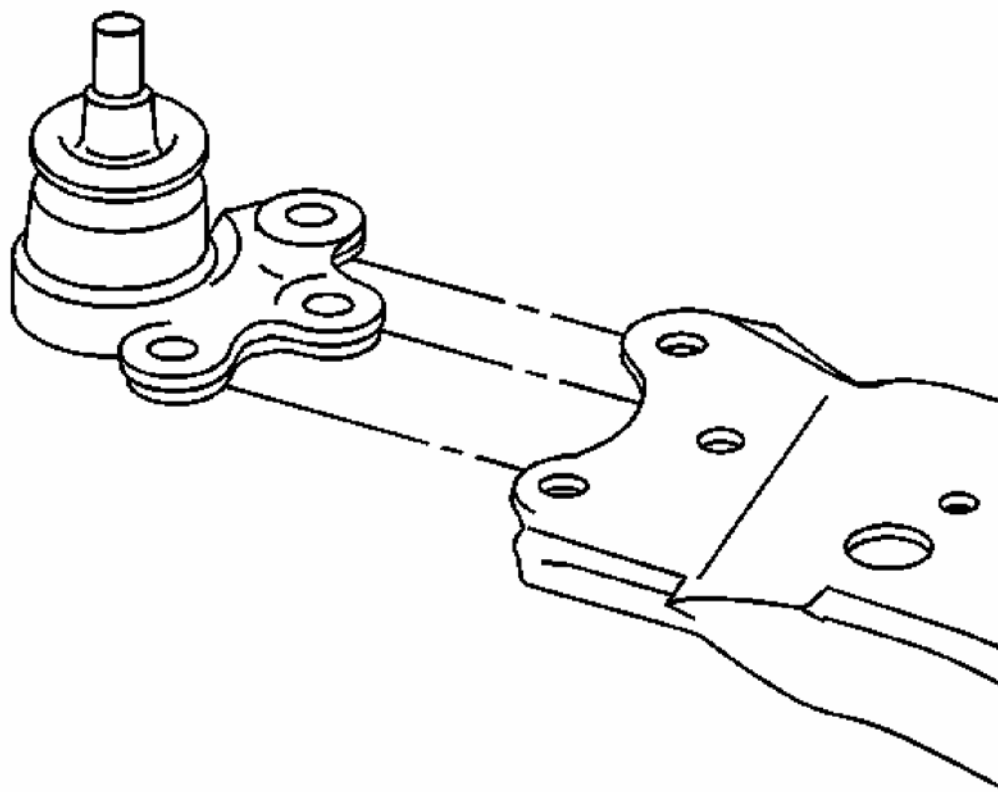


Fig. 14: Removing/Installing Lower Ball Joint
Courtesy of GENERAL MOTORS CORP.

12. Remove the ball stud from the lower control arm.

Installation Procedure

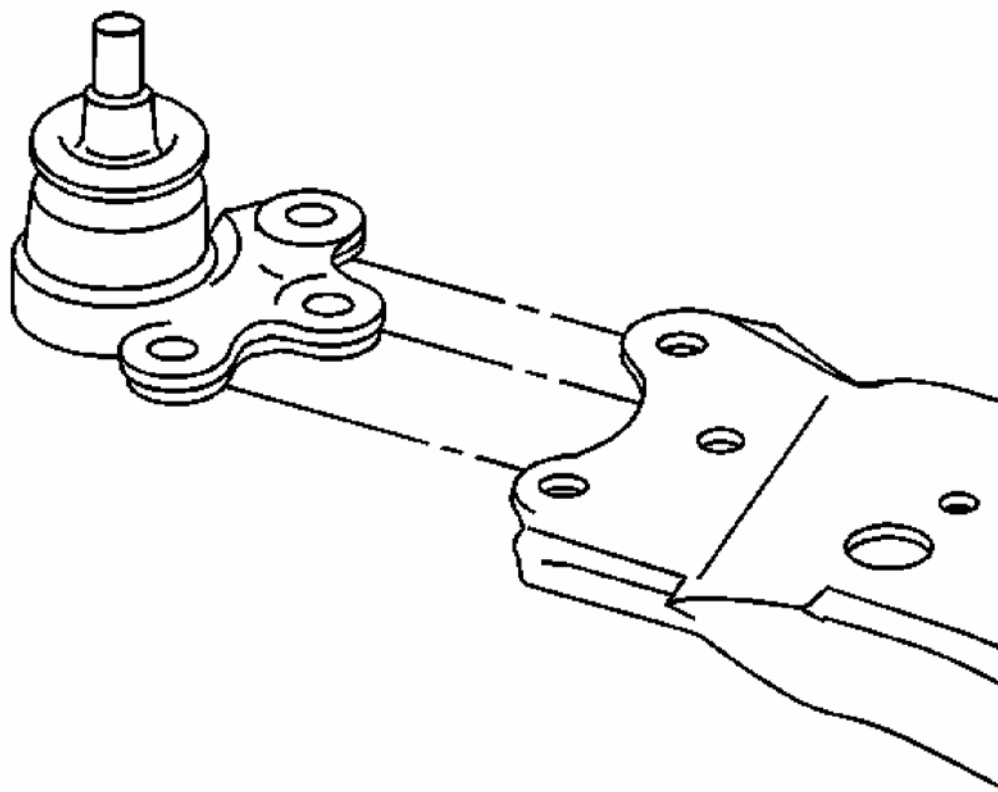


Fig. 15: Removing/Installing Lower Ball Joint
Courtesy of GENERAL MOTORS CORP.

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

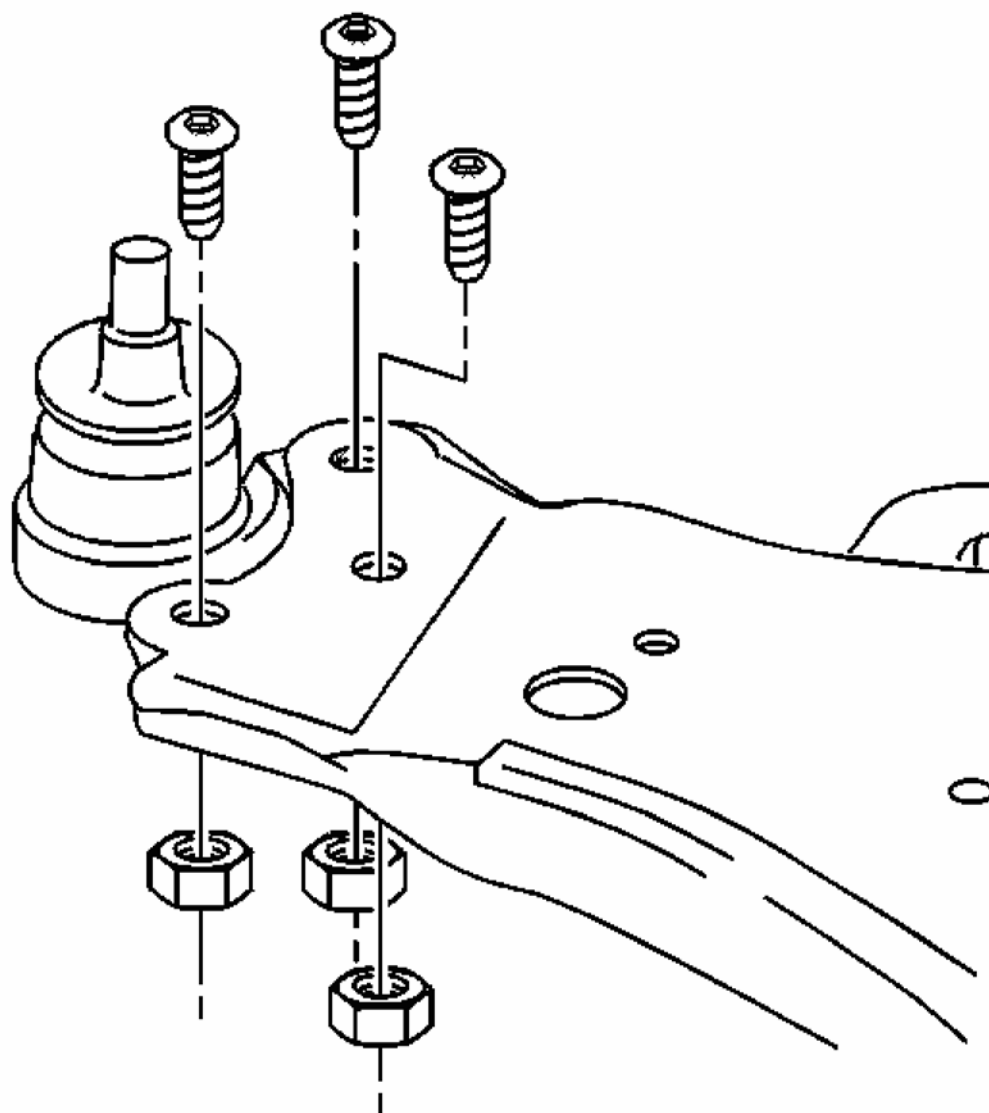


Fig. 16: Identifying Ball Joint Retaining Nuts
Courtesy of GENERAL MOTORS CORP.

2. Install the NEW ball stud bolts facing down, away from the ball stud.

NOTE: Refer to Fastener Notice in Cautions and Notices.

3. Install the NEW ball stud nuts.

Tighten: Tighten the NEW ball stud nuts to 68 N.m (50 lb ft).

4. Install the ball stud to the steering knuckle.

IMPORTANT: Verify the nut is torqued to a minimum of 55 N.m.

5. Install the ball stud castle nut.

Tighten: Tighten the nut to 20 N.m (15 lb ft) plus an additional 120 degrees

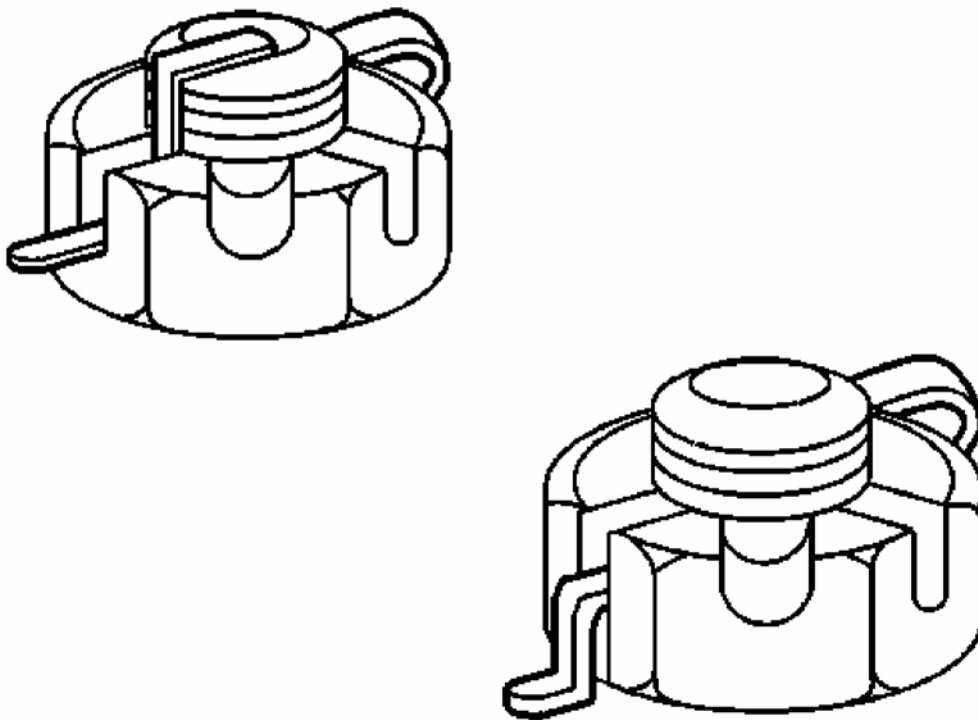


Fig. 17: Securing Cotter Pin In Ball Joint Castle Nut
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Do NOT loosen the ball stud nut in order to align the ball stud nut slots to the ball stud cotter pin hole. If necessary, tighten the ball stud castle nut in order to align the ball stud castle nut slot to the ball stud cotter pin hole.

IMPORTANT: Ensure the cotter pin ends do NOT contact the ABS wheel speed sensor, the ABS sensor connector or the drive axle.

6. Install a new cotter pin and bend the ends.
7. Install the tire and wheels. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.
8. Lower the vehicle.
9. Check the wheel alignment. Refer to **Measuring Wheel Alignment** in Wheel Alignment.

FRONT WHEEL BEARING/HUB REPLACEMENT

Tools Required

J 42129 Wheel Hub Remover. See **Special Tools**.

Removal Procedure

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Remove the tire and wheel. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.

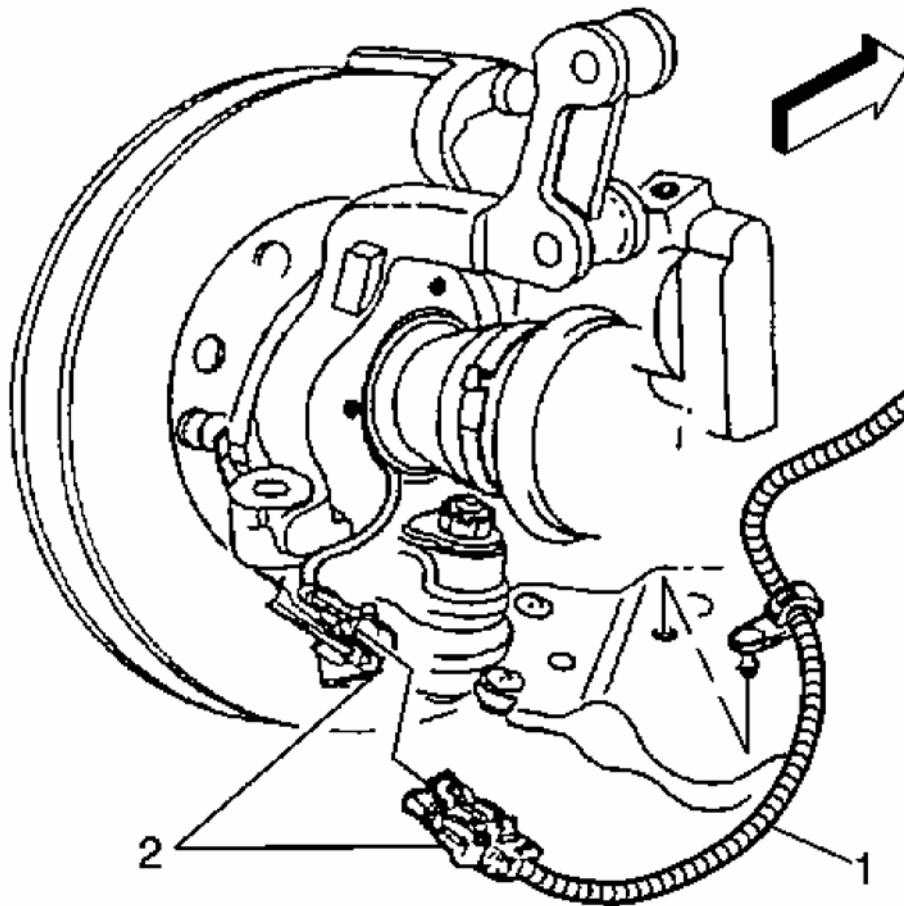


Fig. 18: View Of Wheel Speed Sensor, Connector And Harness
Courtesy of GENERAL MOTORS CORP.

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

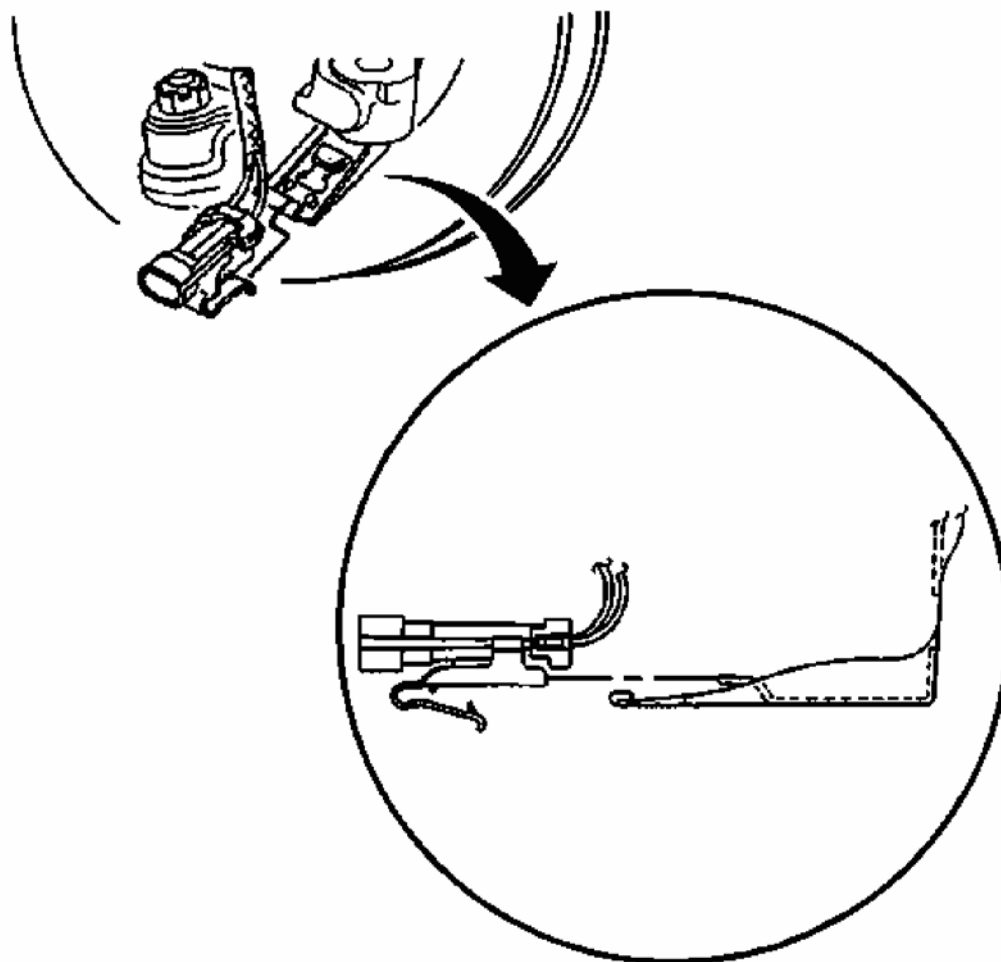


Fig. 19: View Of Wheel Speed Sensor Electrical Connector & Bracket
Courtesy of GENERAL MOTORS CORP.

4. Remove the wheel speed sensor electrical connector from the bracket, if equipped.

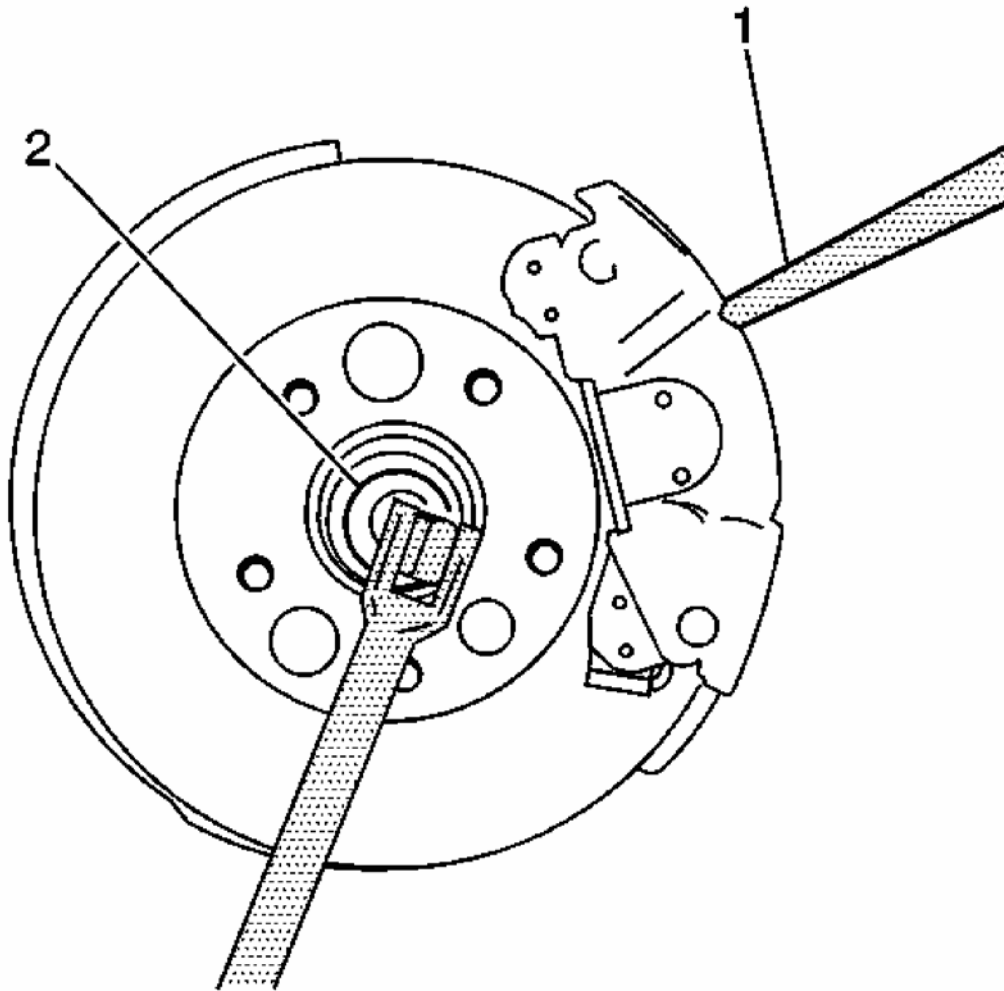


Fig. 20: Preventing Rotor Turning Using Drift Or Punch
Courtesy of GENERAL MOTORS CORP.

5. Remove the front wheel drive shaft nut (2). Insert a drift or flat bladed tool (1) into the caliper and rotor to prevent from turning.
6. Remove the brake rotor. Refer to **Brake Rotor Replacement - Front** in Disc Brakes.

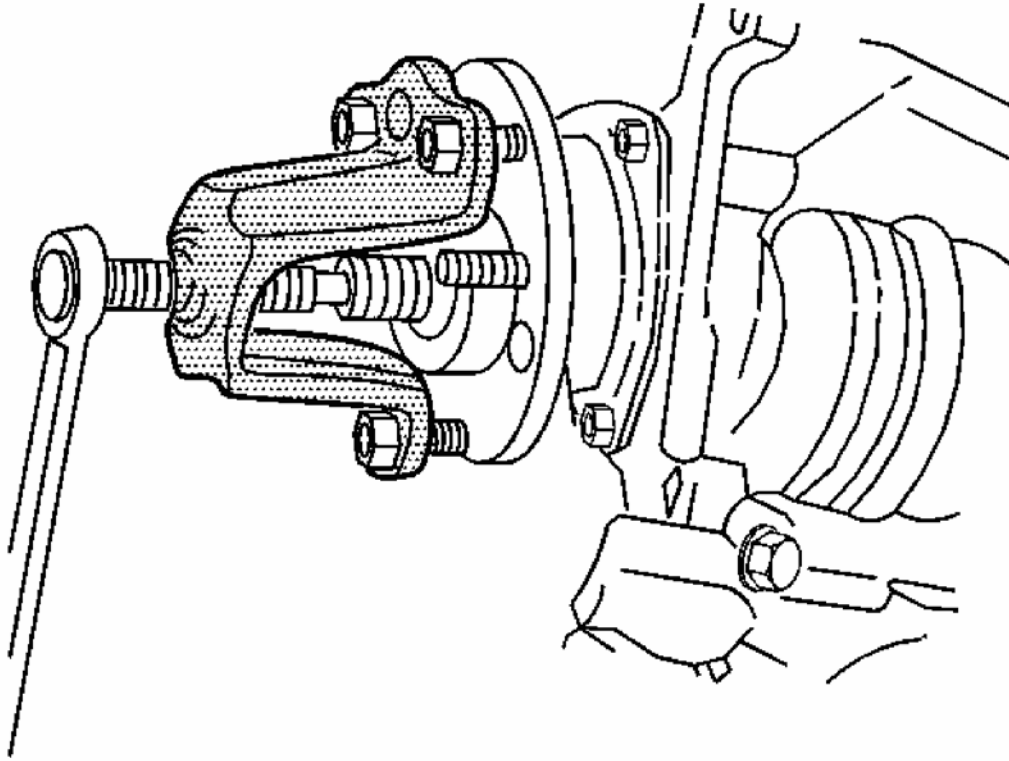


Fig. 21: Using J 28733-B To Push Wheel Drive Shaft Out Of Wheel Bearing/Hub
Courtesy of GENERAL MOTORS CORP.

7. Use 3 wheel nuts in order to attach the **J 42129** to the wheel bearing/hub. See **Special Tools**.
8. Use the **J 42129** in order to push the wheel drive shaft out of the wheel bearing/hub. See **Special Tools**.

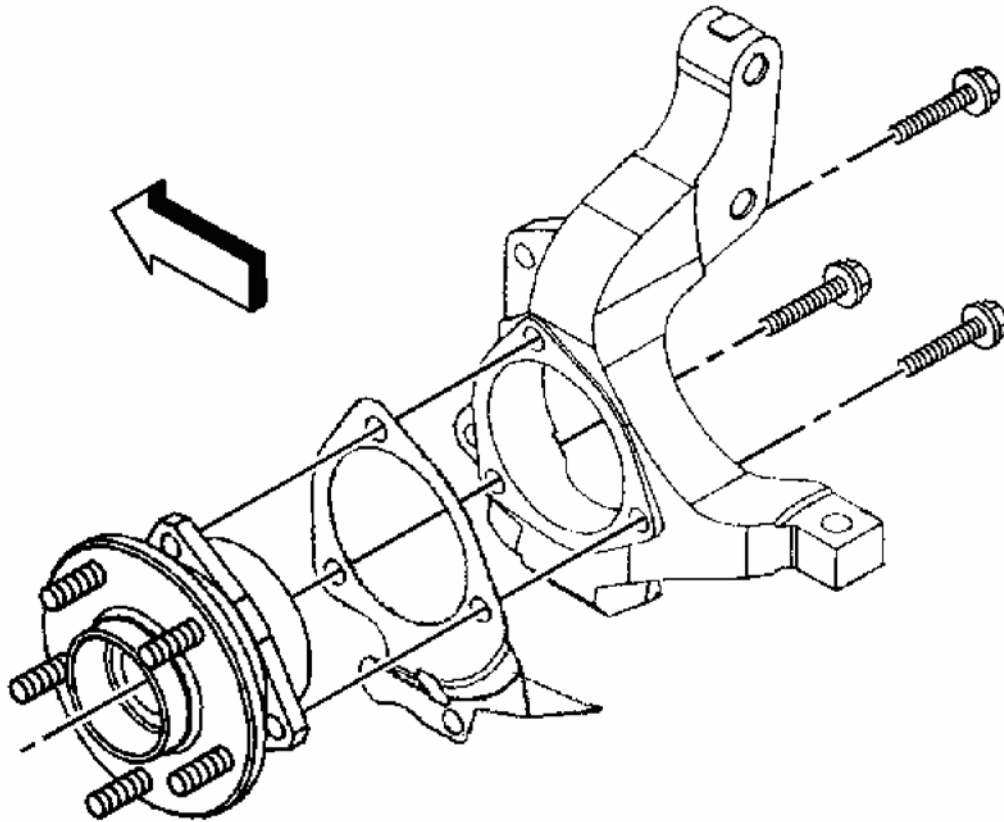


Fig. 22: View Of Wheel Bearing/Hub & Splash Shield
Courtesy of GENERAL MOTORS CORP.

9. Remove and DISCARD the wheel bearing/hub bolts. Remove the **J 42129** from the hub. See **Special Tools**.

IMPORTANT: Ensure that the wheel drive shaft outer seal/boot is not damaged.

10. Remove the wheel bearing/hub and splash shield-noting the position of the shield for re-installation.

Installation Procedure

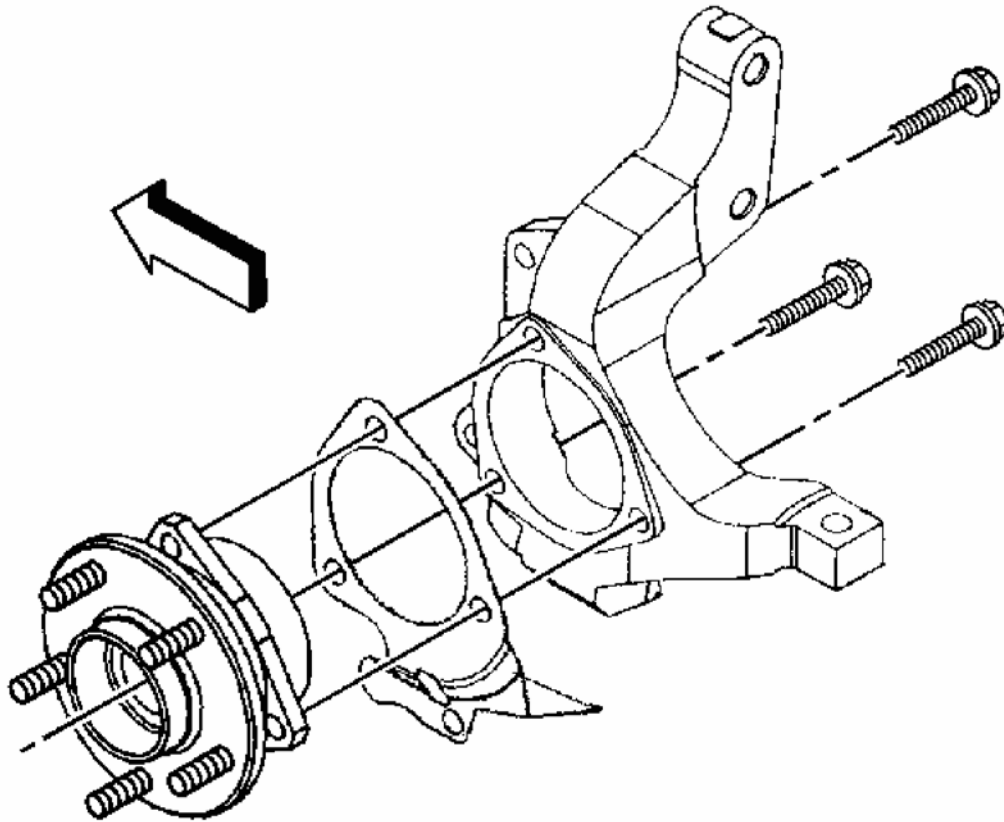


Fig. 23: View Of Wheel Bearing/Hub & Splash Shield
Courtesy of GENERAL MOTORS CORP.

1. Install the wheel bearing/hub with the splash shield as noted during removal.

NOTE: Refer to Fastener Notice in Cautions and Notices.

CAUTION: These fasteners **MUST** be replaced with new fasteners anytime they become loose or are removed. Failure to replace these fasteners after they become loose or are removed may cause loss of vehicle control and personal injury.

2. Install NEW wheel bearing/hub bolts.

Tighten: Tighten the NEW wheel bearing/hub bolts to 130 N.m (96 lb ft).

3. Install the brake rotor and caliper. Refer to **Brake Rotor Replacement - Front** in Disc Brakes.
4. Install the front wheel drive shaft nut. Insert a drift on a flat bladed tool into caliper and rotor to prevent the rotor from turning.

Tighten: Tighten the front wheel drive shaft nut to 190 N.m (140 lb ft).

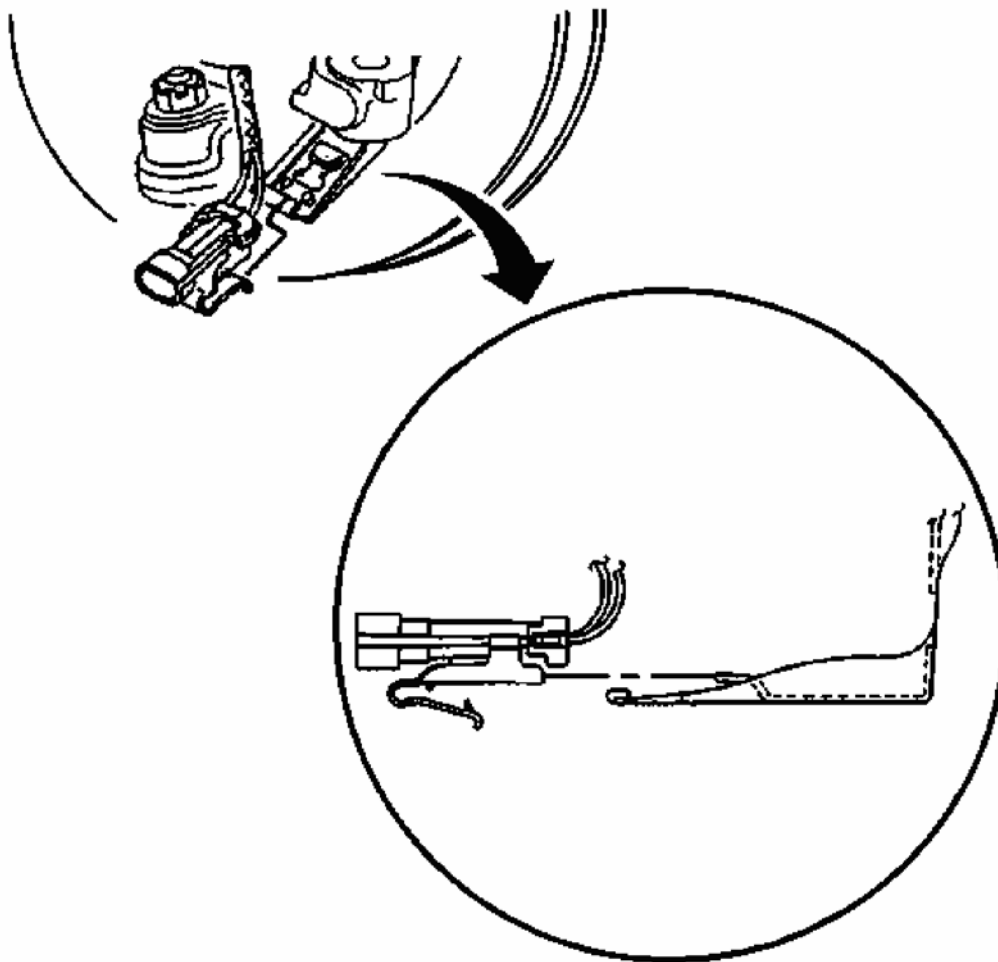


Fig. 24: View Of Wheel Speed Sensor Electrical Connector & Bracket
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Ensure that the connector clip engages the bracket properly.

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

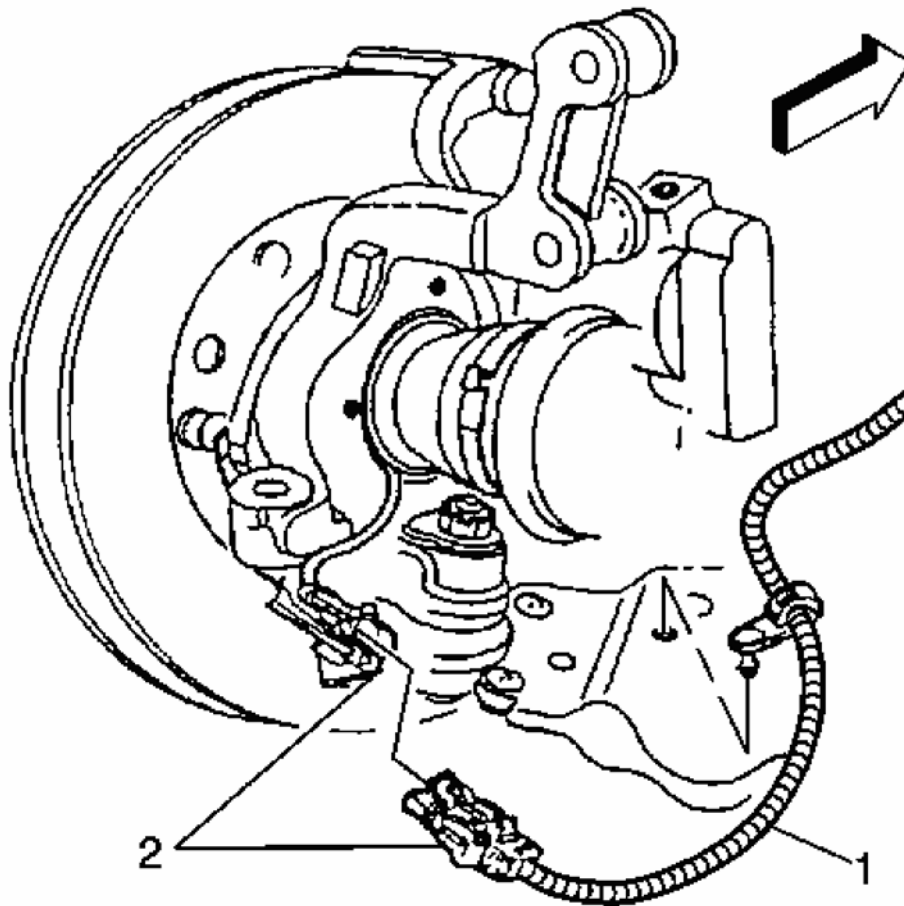


Fig. 25: View Of Wheel Speed Sensor, Connector And Harness
Courtesy of GENERAL MOTORS CORP.

6. Connect the wheel speed sensor electrical connector (2), if equipped.
7. Install the tire and wheel. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.
8. Lower the vehicle.

STEERING KNUCKLE REPLACEMENT

Removal Procedure

1. Raise and suitably support the vehicle. Refer to **Lifting and Jacking the Vehicle**.
2. Remove the bearing/hub assembly. Refer to **Wheel Bearing/Hub Replacement - Front**.

3. Remove the front lower control arm ball stud. Refer to **Lower Control Arm Replacement**.
4. Remove the outer tie rod end from the steering knuckle. Refer to **Rack and Pinion Outer Tie Rod End Replacement**.

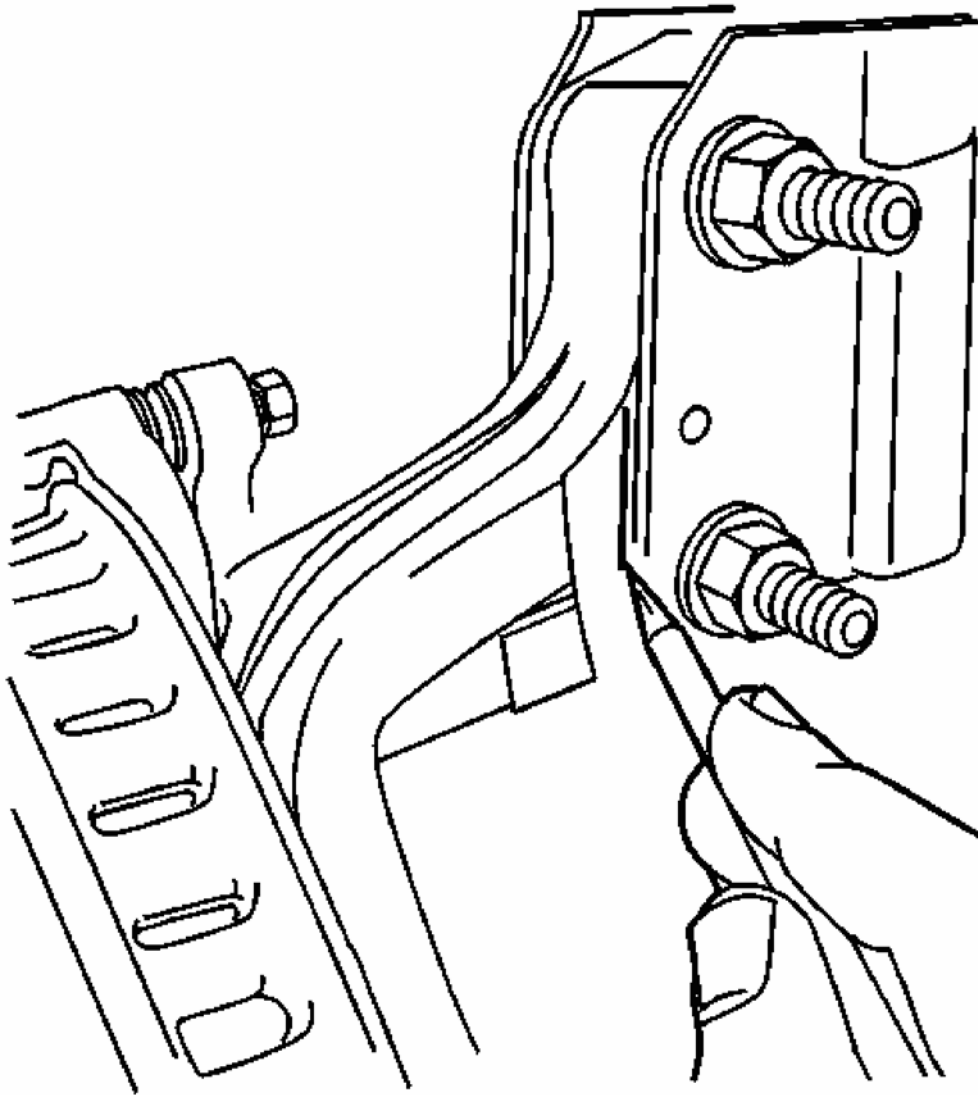


Fig. 26: Scribing Strut To Knuckle
Courtesy of GENERAL MOTORS CORP.

5. Scribe the strut to the knuckle.

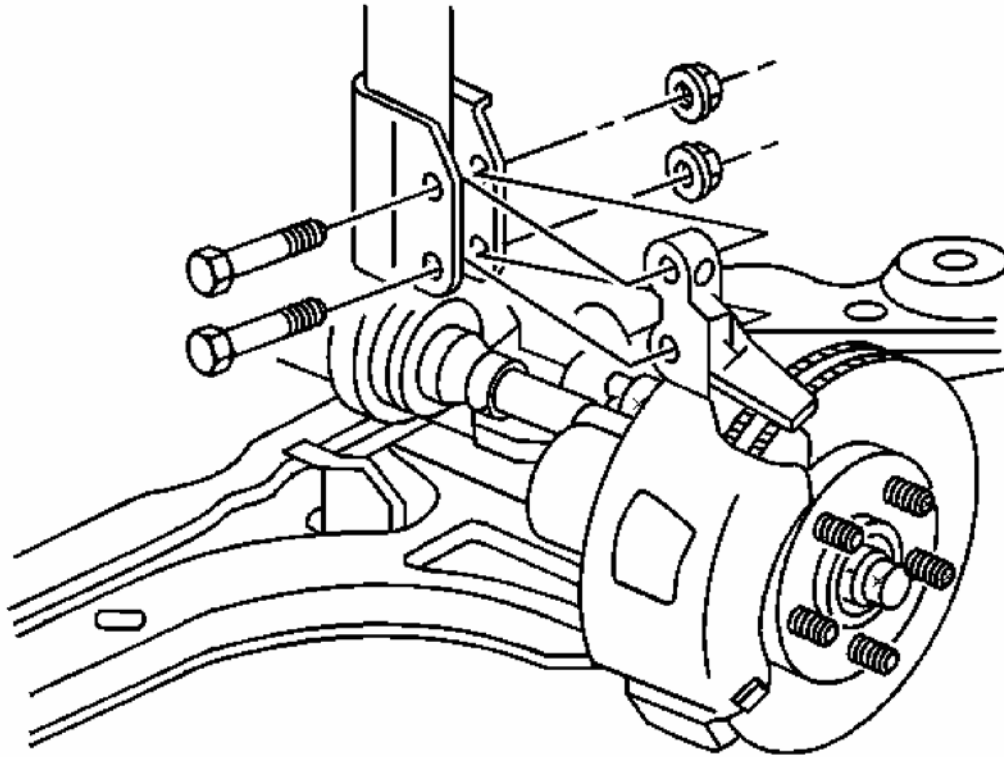


Fig. 27: View Of Steering Knuckle To Strut Bolts
Courtesy of GENERAL MOTORS CORP.

6. Remove the bolts and nuts attaching the strut to the knuckle.
7. Remove the knuckle from the vehicle.

Installation Procedure

1. Install the knuckle to the vehicle.

NOTE: **Refer to Fastener**
 Notice .

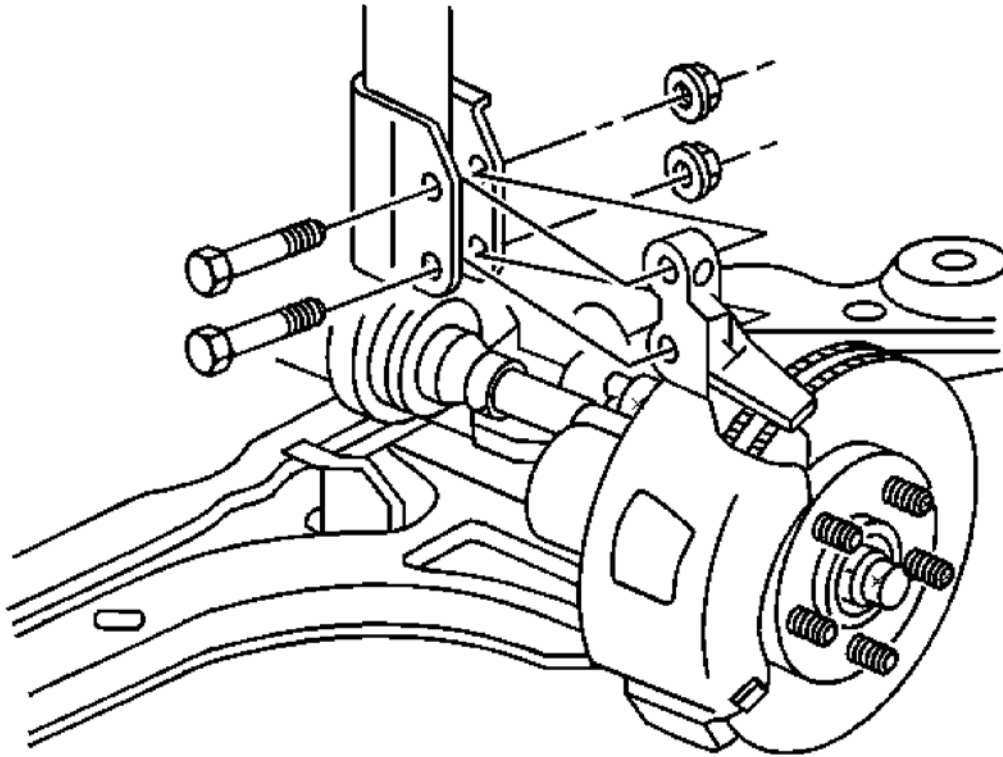


Fig. 28: View Of Steering Knuckle To Strut Bolts
Courtesy of GENERAL MOTORS CORP.

2. Install the bolts and nuts attaching the strut to the knuckle.

Tighten: Tighten the strut to knuckle bolts to 130 N.m (96 lb ft).

3. Install the outer tie rod to the steering knuckle. Refer to **Rack and Pinion Outer Tie Rod End Replacement** .
4. Connect the front lower control arm ball stud to the knuckle. Refer to **Lower Control Arm Replacement**.
5. Install the front wheel drive shaft bearing. Refer to **Wheel Bearing/Hub Replacement - Front**.
6. Lower the vehicle.
7. Inspect the front wheel alignment and adjust, if necessary. Refer to **Measuring Wheel Alignment** .

LOWER CONTROL ARM REPLACEMENT

Tools Required

J 41820 Ball Joint/Stud Separator. See Special Tools.

Removal Procedure

NOTE: Use only the recommended tools for separating the ball joint from the knuckle. Do NOT hammer or pry the ball joint from the knuckle. Failure to use the recommended tools may cause damage to the ball joint and seal.

IMPORTANT: Use the ignition key in order to unlock the steering column.

1. Turn the steering wheel in order to move the front of the applicable wheel to the outboard most position.

IMPORTANT: Use ONLY a frame-contact type vehicle lift or a floor jack at the recommended lift points. Do NOT use a suspension-contact type vehicle lift. Do NOT lift the vehicle by the lower control arms.

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 .

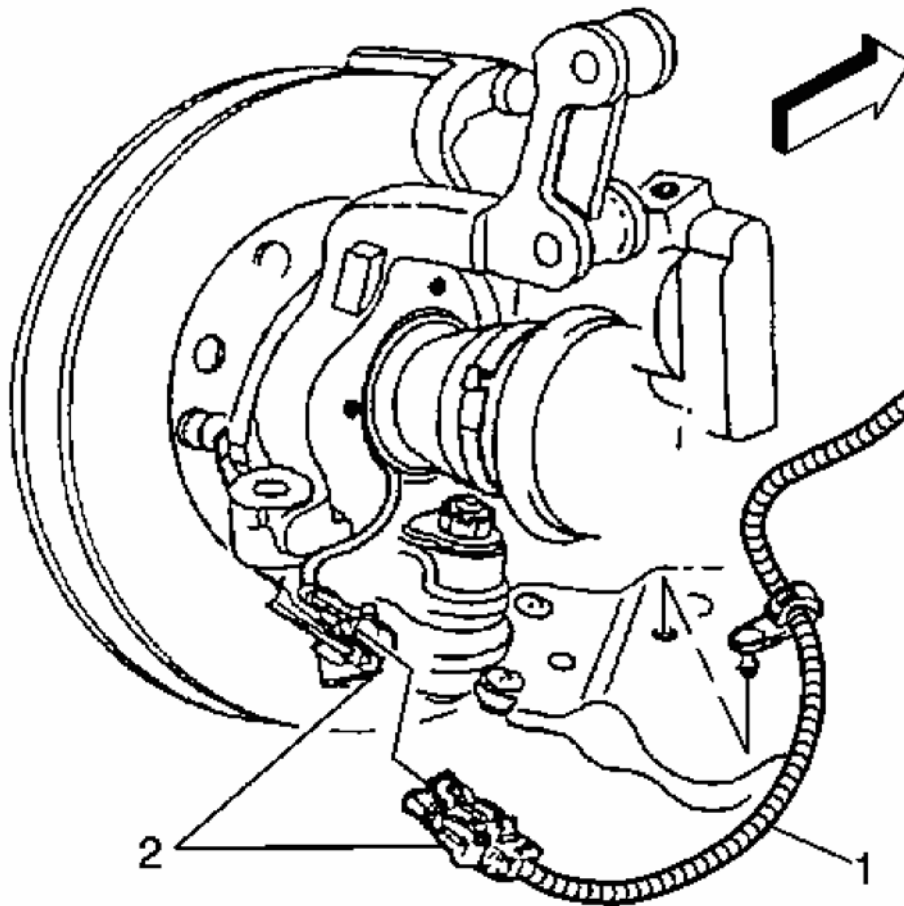


Fig. 29: View Of Wheel Speed Sensor, Connector And Harness
Courtesy of GENERAL MOTORS CORP.

4. Disconnect the ABS wheel speed sensor connector (2), if equipped.
5. Disconnect the ABS wheel speed sensor jumper harness from the harness retainer clips, if equipped.
6. Remove the stabilizer shaft link. Refer to **Stabilizer Shaft Link Replacement**.

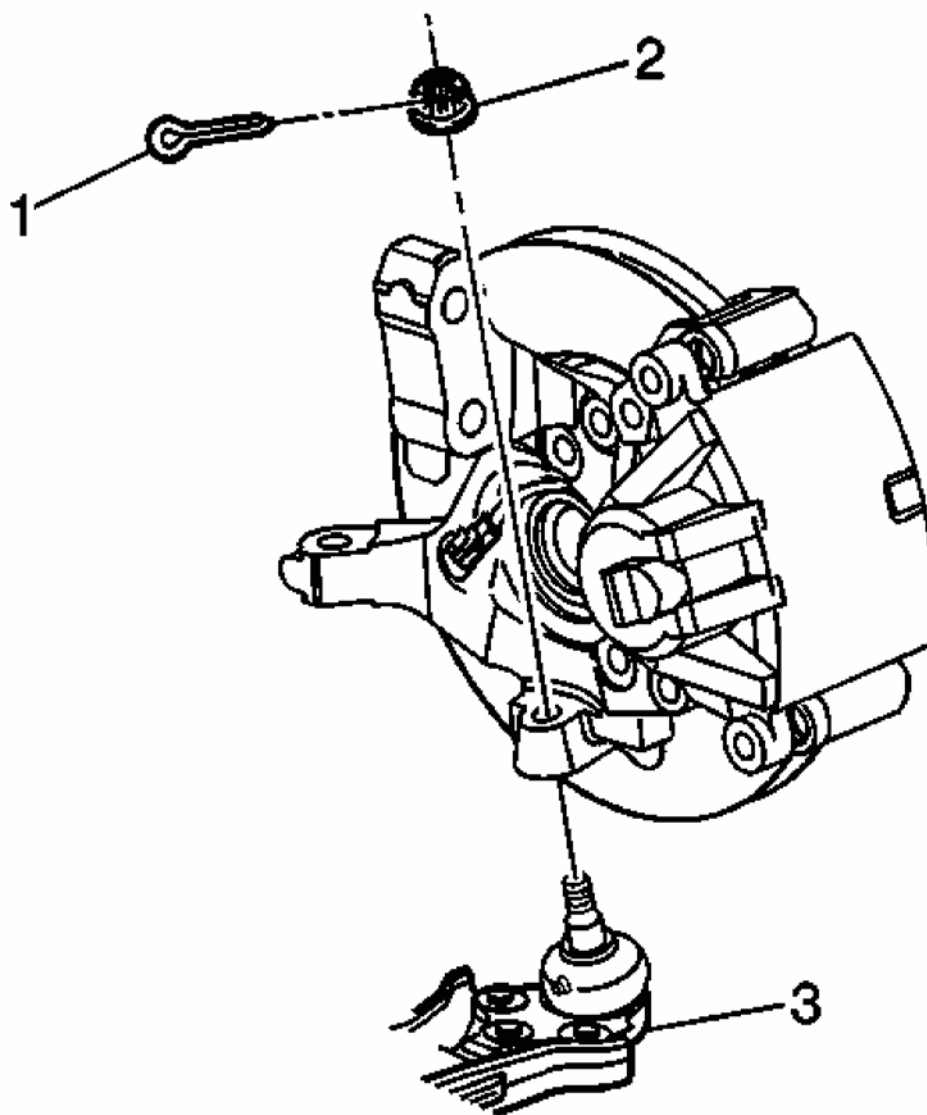


Fig. 30: Identifying Ball Stud Cotter Pin
Courtesy of GENERAL MOTORS CORP.

7. Remove the cotter pin (1) from the ball stud (3).
8. Loosen the ball stud nut (2).

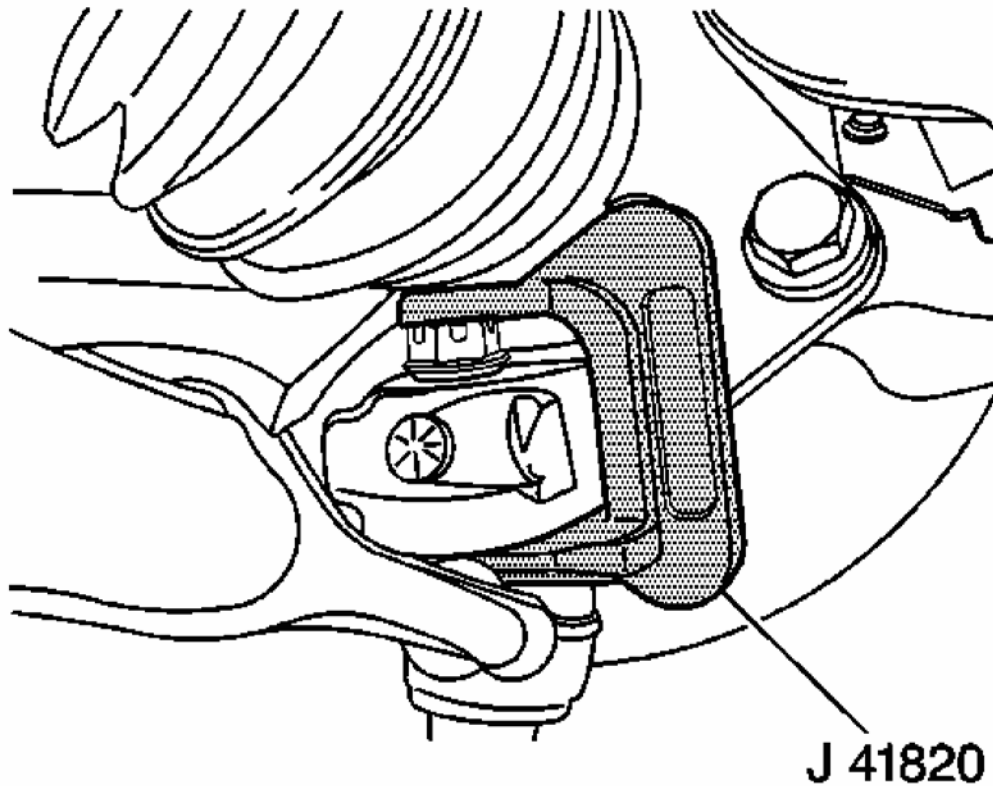
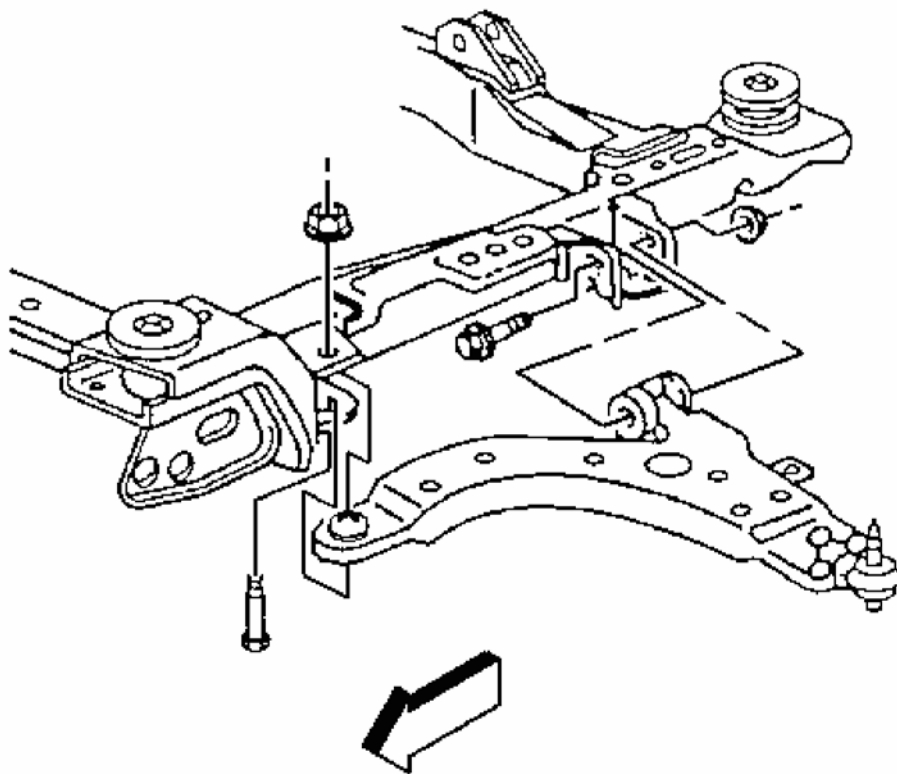


Fig. 31: Separating Ball Stud From Steering Knuckle
Courtesy of GENERAL MOTORS CORP.

9. Install the **J 41820** over the ball stud and lower control arm, as shown. See **Special Tools**.
10. Rotate the ball stud nut counterclockwise in order to separate the ball stud from the steering knuckle.
11. Remove the **J 41820** . See **Special Tools**.
12. Remove the ball stud nut.



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13. Remove the lower control arm bolts and nuts.
14. Remove the lower control arm.

Installation Procedure

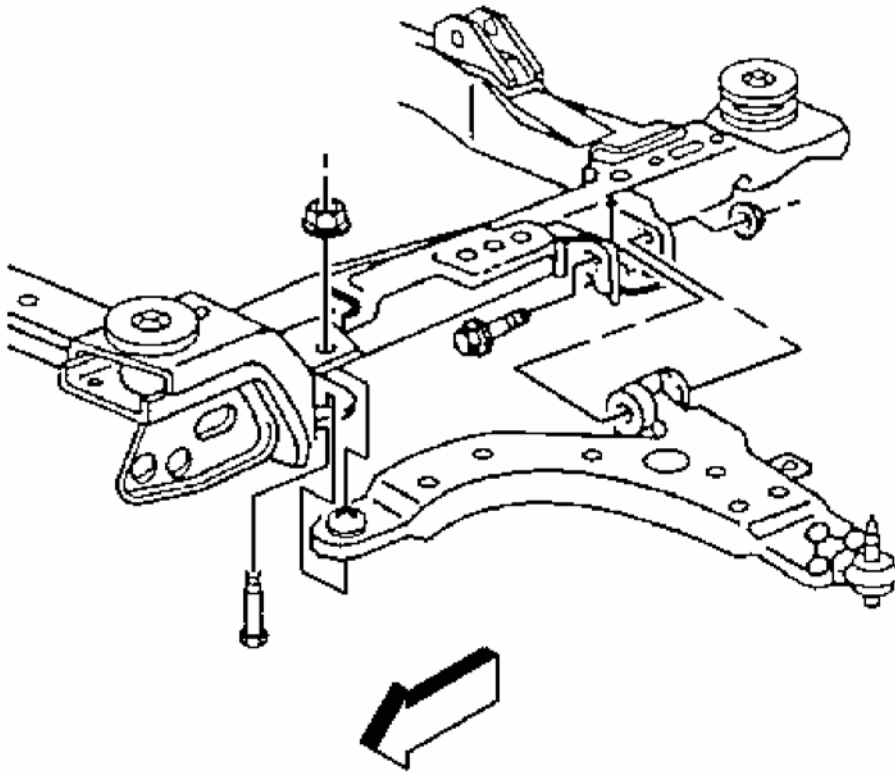


Fig. 33: View Of Lower Control Arm
Courtesy of GENERAL MOTORS CORP.

1. Install the lower control arm.
2. Install the control arm bolts and nuts. Do not tighten at this time.

IMPORTANT: Align the ball stud cotter pin hole parallel to the knuckle in order to ease the cotter pin installation.

3. Install the ball stud to the knuckle.

NOTE: Refer to Fastener Notice .

IMPORTANT: Verify the nut is torqued to a minimum of 55 N.m.

4. Install the ball stud castle nut.

Tighten: Tighten the ball stud castle nut to 20 N.m + 120 degrees (15 lb ft + 120 degrees).

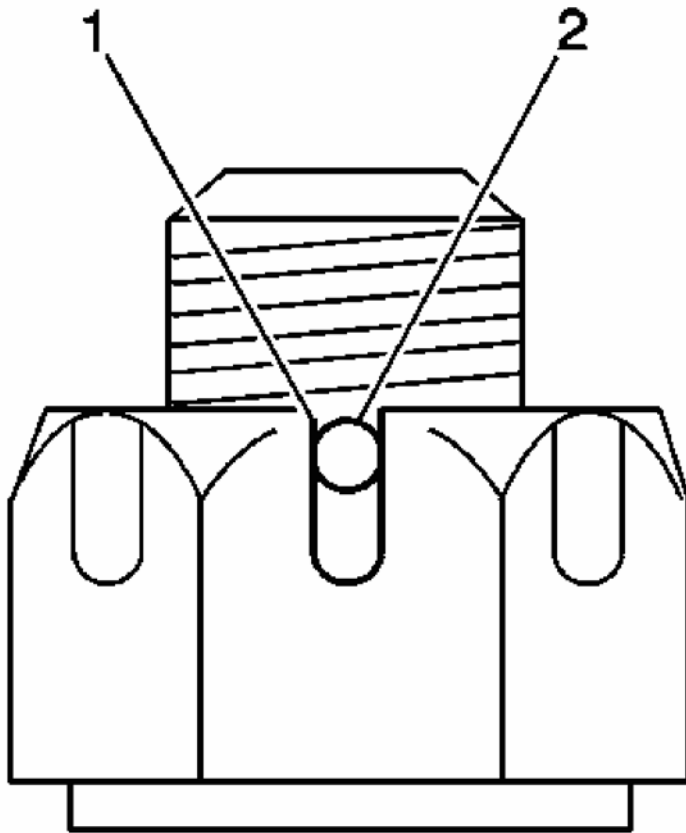


Fig. 34: Aligning Ball Stud Castle Nut Slot To The Ball Stud Cotter Pin Hole
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Do NOT loosen the ball stud nut in order to align the ball stud nut slots to the ball stud cotter pin hole.

5. If necessary, tighten the ball stud castle nut in order to align the ball stud castle nut slot (1) to the ball stud cotter pin hole (2), as shown.

IMPORTANT: Ensure that the cotter pin ends do NOT contact the ABS wheel speed sensor, the ABS sensor connector, or the drive axle.

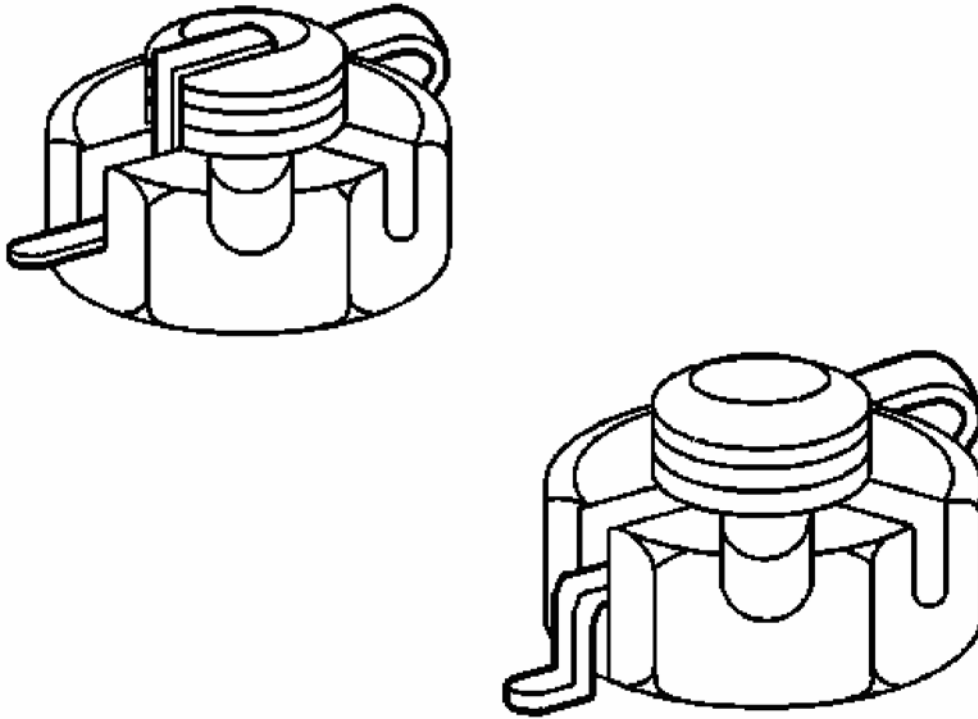


Fig. 35: Securing Cotter Pin In Ball Joint Castle Nut
Courtesy of GENERAL MOTORS CORP.

6. Install a NEW cotter pin and bend the ends as shown in either example.
7. Install the stabilizer shaft link. Refer to **Stabilizer Shaft Link Replacement**.
8. Install the ABS wheel speed sensor jumper harness to the harness retainer clips, if equipped.

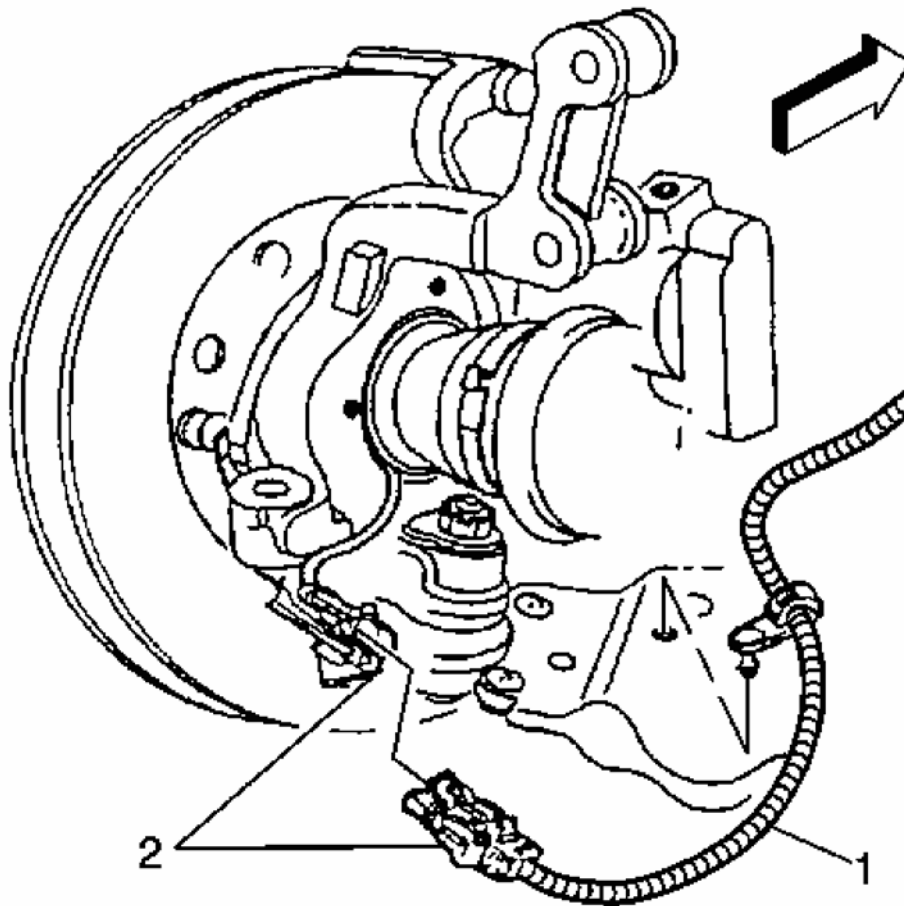


Fig. 36: View Of Wheel Speed Sensor, Connector And Harness
Courtesy of GENERAL MOTORS CORP.

9. Install the ABS wheel speed sensor connector (2), if equipped.

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 against its counterpart prior to the fastener seating.

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

fastener.

10. Install the lower control arm nuts.

Tighten: Tighten the lower control arm nuts to 125 N.m (92 lb ft).

11. Install the tire and wheel. Refer to **Tire and Wheel Removal and Installation** .

12. Lower the vehicle.

FRONT LOWER CONTROL ARM BUSHINGS REPLACEMENT (VERTICAL)

Tools Required

- **J 21474-01** Control Arm Bushing Set. See **Special Tools**.
 - **J 21474-27** 1/2 Inch Puller Bolt Thrust Bearing. See **Special Tools**.
 - **J 21474-2** Bushing Installer Remover. See **Special Tools**.
 - **J 21474-4** Nut
 - **J 21474-13** Control Arm Bushing Installer
- **J 23444-A** High Pressure Lubricant. See **Special Tools**.
- **J 34126** Driven Sprocket Support Bearing Installer. See **Special Tools**.
- **J 35379** Front Knuckle Support. See **Special Tools**.

Removal Procedure

1. Remove the lower control arm. Refer to **Lower Control Arm Replacement**.
2. Secure the lower control arm in a vice.

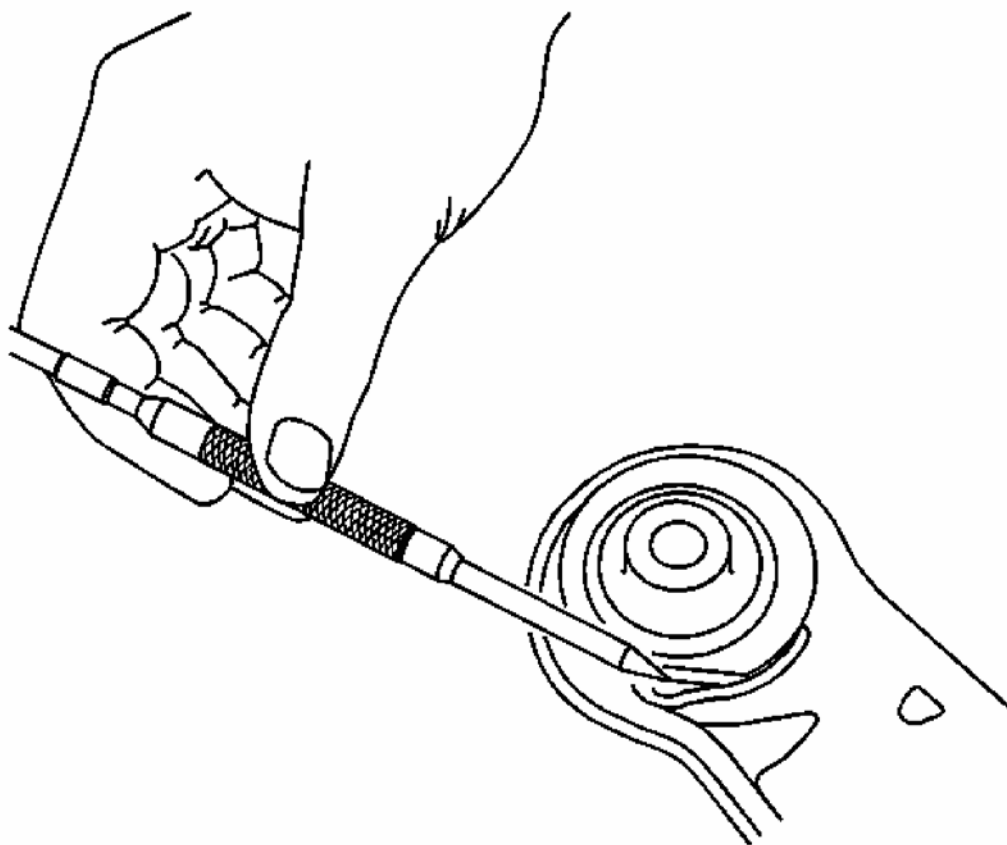


Fig. 37: Scribing Orientation Of Control Arm Bushing On Lower Control Arm
Courtesy of GENERAL MOTORS CORP.

3. Mark the lower control arm along the flat edge of the bushing flange.

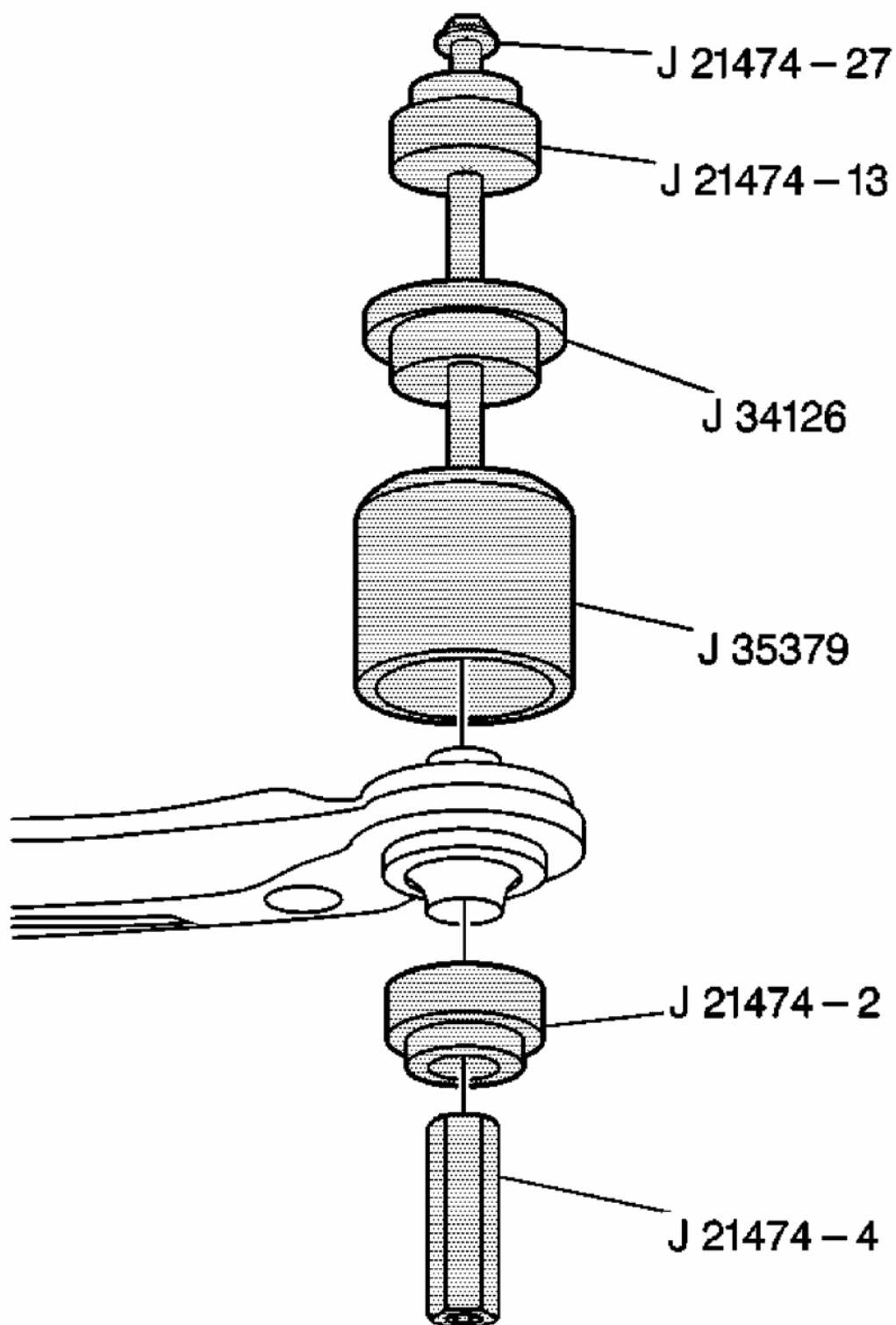


Fig. 38: View Of J 21474-01

Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Apply J 23444-A or equivalent to the threads of J 21474-27 . See Special Tools.

4. Assemble the following bushing removal tools as shown:
 1. **J 21474-27** . See Special Tools.
 2. **J 21474-13**
 3. **J 34126** . See Special Tools.
 4. **J 35379** . See Special Tools.
 5. **J 21474-2** . See Special Tools.
 6. **J 21474-4**
5. Tighten **J 21474-4** .
6. Disassemble the bushing removal tools.

Installation Procedure

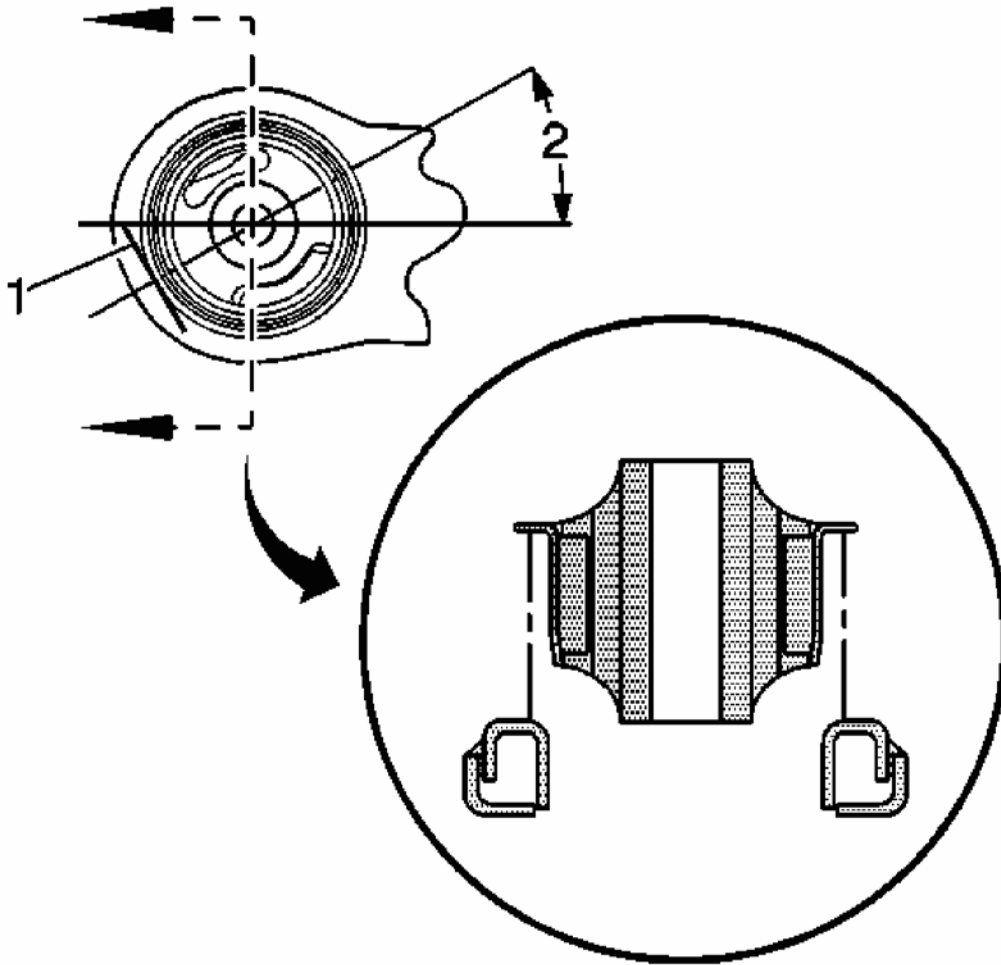


Fig. 39: Aligning Flat Edge Of Bushing Flange To Mark In Control Arm
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: You **MUST** install the lower control arm vertical bushing in the same position in order to maintain the original vehicle ride, handling, and road feel.

1. Align the flat edge of the bushing flange to the mark in the control arm (1). Ensure that the flat edge of the bushing flange is 30 degrees (2) from the centerline of the lower control arm. Ensure that the thin slot in the bushing is facing outboard.
2. Insert the bushing into the control arm.

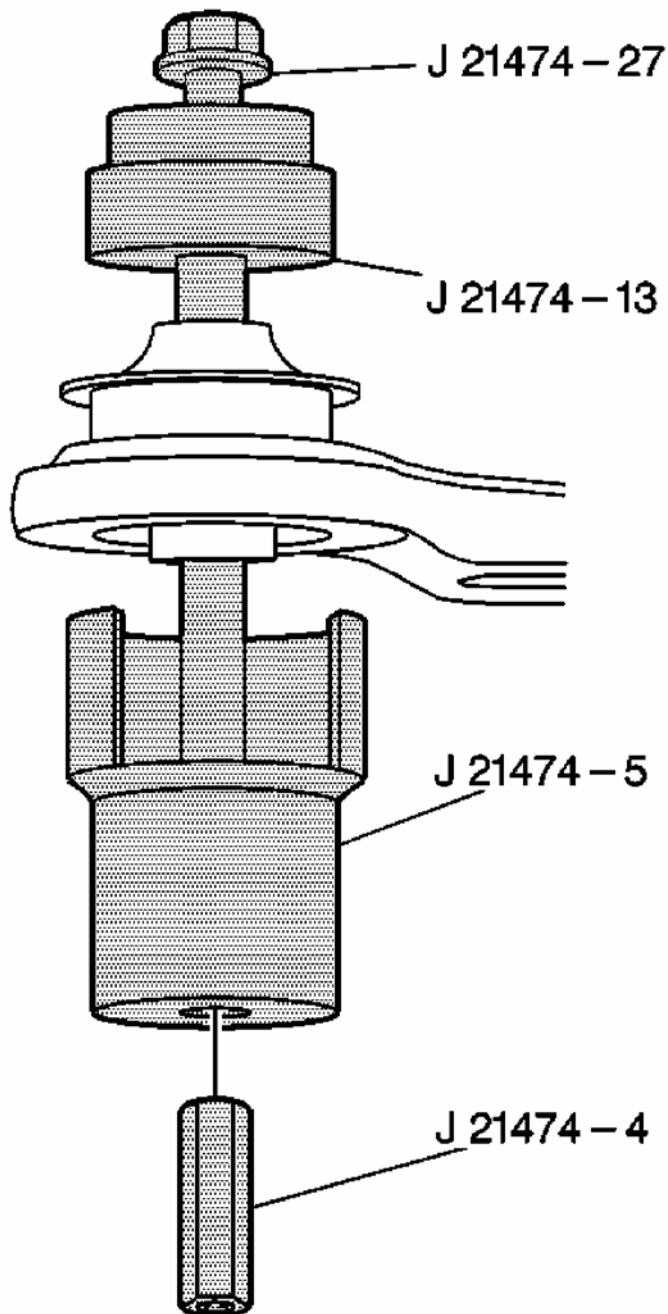


Fig. 40: Illustrating Proper Installation Of Bushing Tools
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Apply J 23444-A or equivalent to the threads of J 21474-27 . See Special Tools.

3. Assemble the following bushing installation tools as shown:

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1. **J 21474-27** . See Special Tools.
2. **J 21474-13**
3. **J 21474-5** . See Special Tools.
4. **J 21474-4**
4. Tighten **J 21474-4** .
5. Disassemble the bushing installation tools.
6. Install the lower control arm. Refer to Lower Control Arm Replacement.

FRONT LOWER CONTROL ARM BUSHINGS REPLACEMENT (HORIZONTAL)

Tools Required

- **J 21474-01** Control Arm Bushing Service Set. See Special Tools.
- **J 21474-5** Control Arm Bushing Receiver. See Special Tools.

Removal Procedure

1. Remove the lower control arm. Refer to Lower Control Arm Replacement.
2. Secure the lower control arm in a vise.

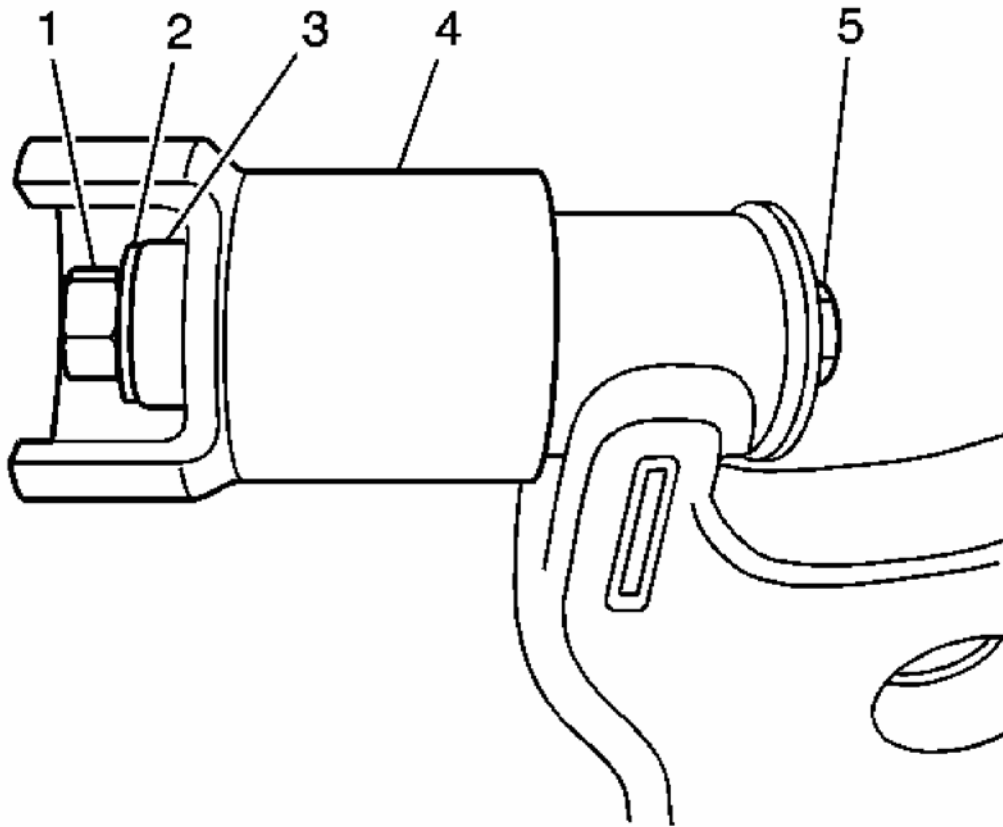


Fig. 41: Assembling Bushing Removal Tools
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Use a 1/2 x 20 in standard thread nut with the puller bolt.

3. Assemble the bushing removal tools as indicated:
 1. The nut (1)
 2. The J 21474-01 washer (2). See Special Tools.
 3. The J 21474-01 bearing (3). See Special Tools.
 4. The J 21474-5 (4). See Special Tools.
 5. The J 21474-01 puller bolt (5). See Special Tools.
4. Tighten the puller bolt (5) until the bushing is removed.
5. Disassemble the J 21474-01 and J 21474-5 . See Special Tools.

Installation Procedure

1. Lubricate the bushing with liquid hand soap or equivalent.

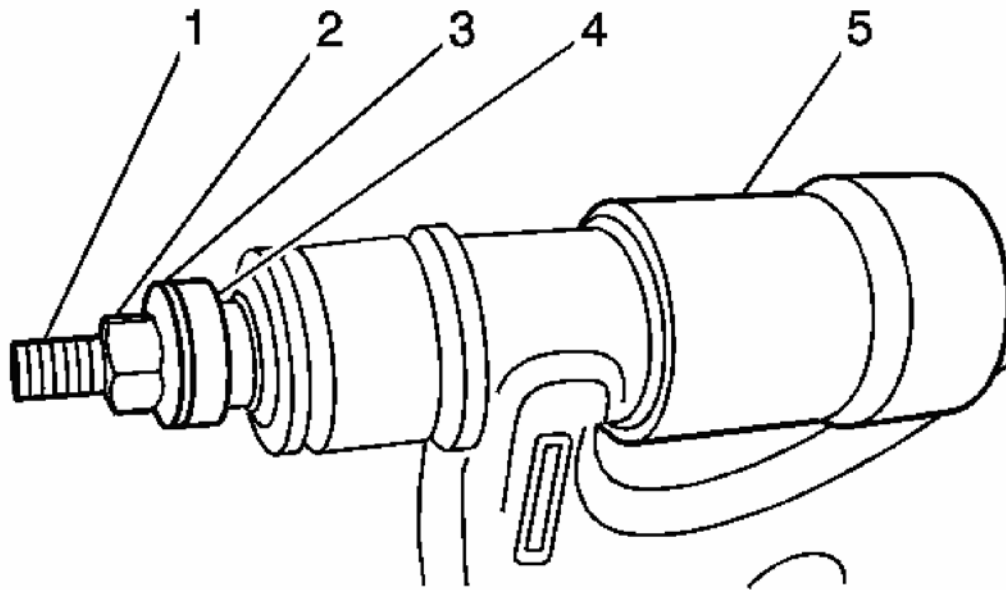


Fig. 42: Assembling Bushing Installation Tools
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Use a 1/2 x 20 in standard thread nut with the puller bolt.

2. Assemble the following bushing installation tools as indicated :
 1. The nut (1)
 2. The J 21474-01 washer (2). See Special Tools.
 3. The J 21474-01 bearing (3). See Special Tools.
 4. The J 21474-5 (4). See Special Tools.
 5. The J 21474-01 puller bolt (5). See Special Tools.
3. Tighten the puller bolt (5) until the bushing is installed into the control arm.
4. Disassemble the J 21474-01 and J 21474-5 . See Special Tools.
5. Remove the control arm from the vice.
6. Install the lower control arm. Refer to Lower Control Arm Replacement.

WHEEL STUD REPLACEMENT

Tools Required

J 6627-A Tie Rod Puller. See Special Tools.

Removal Procedure

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. Remove the brake caliper and bracket. Hang the caliper and the bracket from the vehicle. DO NOT allow the caliper and the bracket to hang by the brake hose. Refer to **Brake Caliper Replacement - Front** in Disc Brakes.
4. Remove the brake rotor. Refer to **Brake Rotor Replacement - Front** in Disc Brakes.

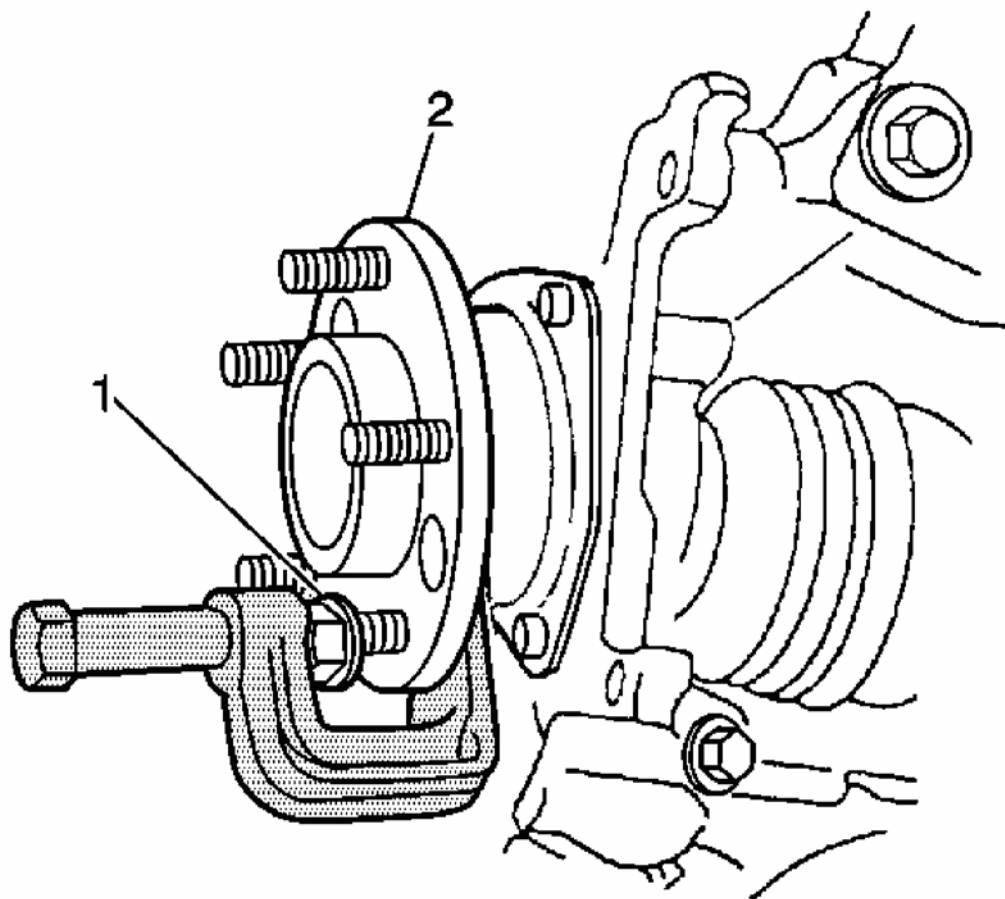


Fig. 43: Extracting Stud From Hub
Courtesy of GENERAL MOTORS CORP.

5. Use the **J 6627-A** in order to extract the stud (1) from the hub (2). See **Special Tools**.

Installation Procedure

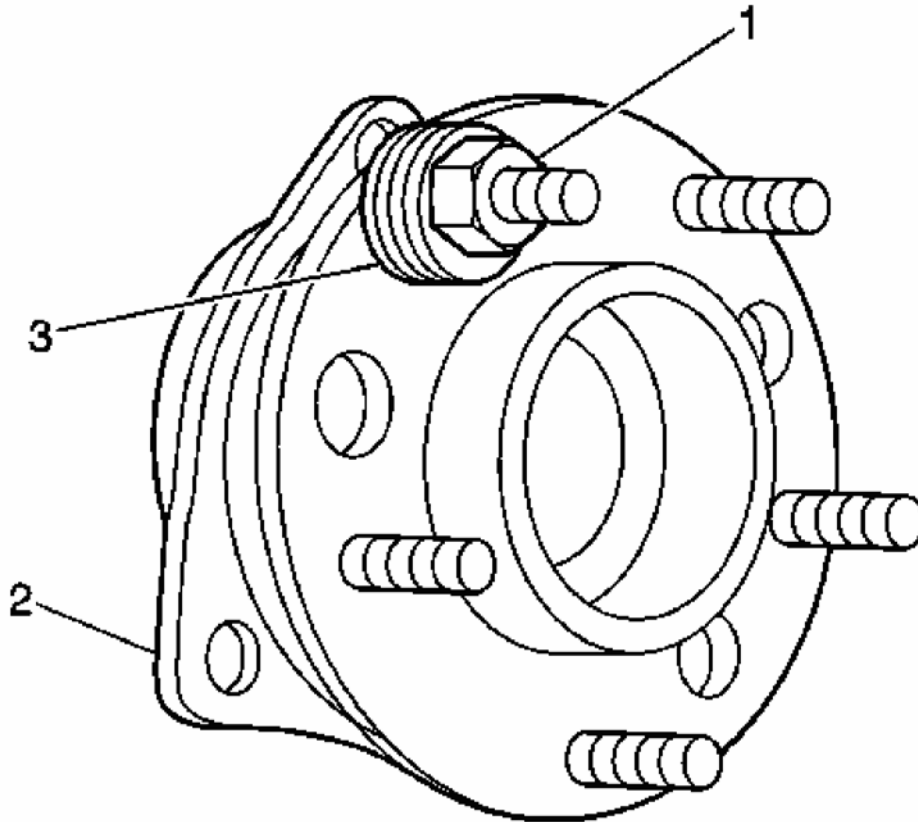


Fig. 44: Installing Wheel Stud
Courtesy of GENERAL MOTORS CORP.

1. Install a replacement stud in the wheel hub.
2. Add enough washers (3) in order to draw the stud into the hub (2).
3. Install the wheel nut (1) with the flat side against the washers (3).

IMPORTANT: Fully seat the wheel stud against the hub flange (2).

4. Tighten the wheel nut (1) until the wheel stud is fully seated against the hub flange.
5. Back off the wheel nut (1) and remove the washers (3).
6. Install the brake rotor. Refer to **Brake Rotor Replacement - Front** in Disc Brakes.
7. Install the brake caliper and bracket. Refer to **Brake Caliper Replacement - Front** in

Disc Brakes.

8. Install the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.
9. Lower the vehicle.

STRUT ASSEMBLY REPLACEMENT

Removal Procedure

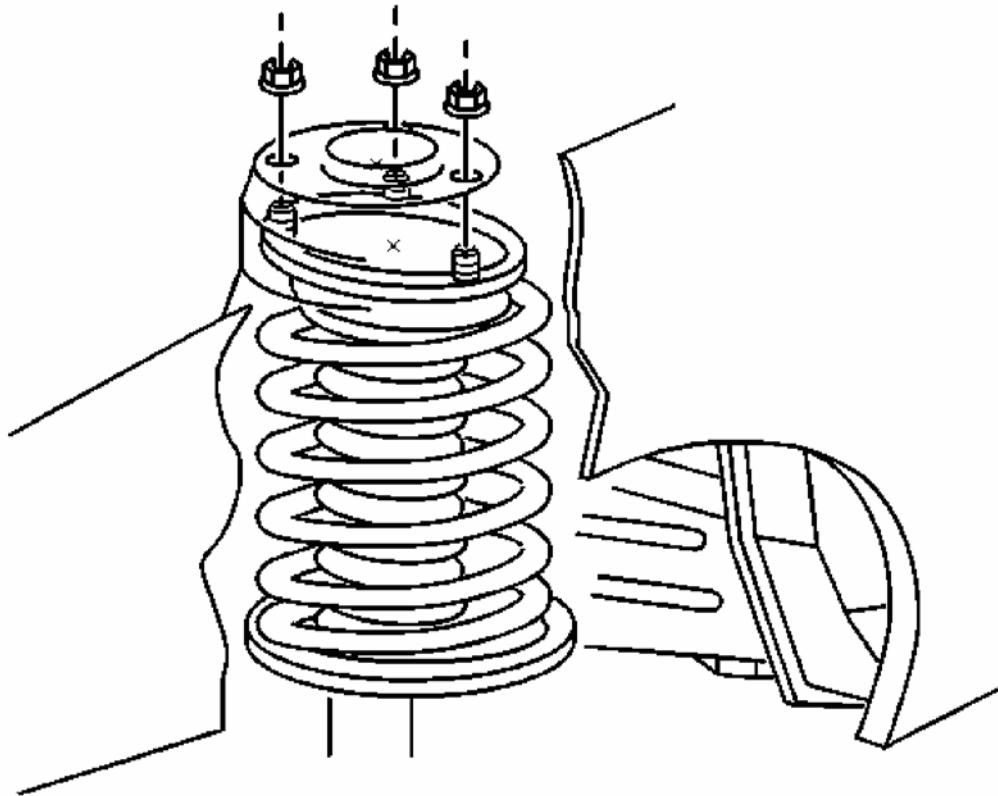


Fig. 45: Identifying Upper Strut Mounting Nuts
Courtesy of GENERAL MOTORS CORP.

1. Remove the strut upper nuts.

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

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** .

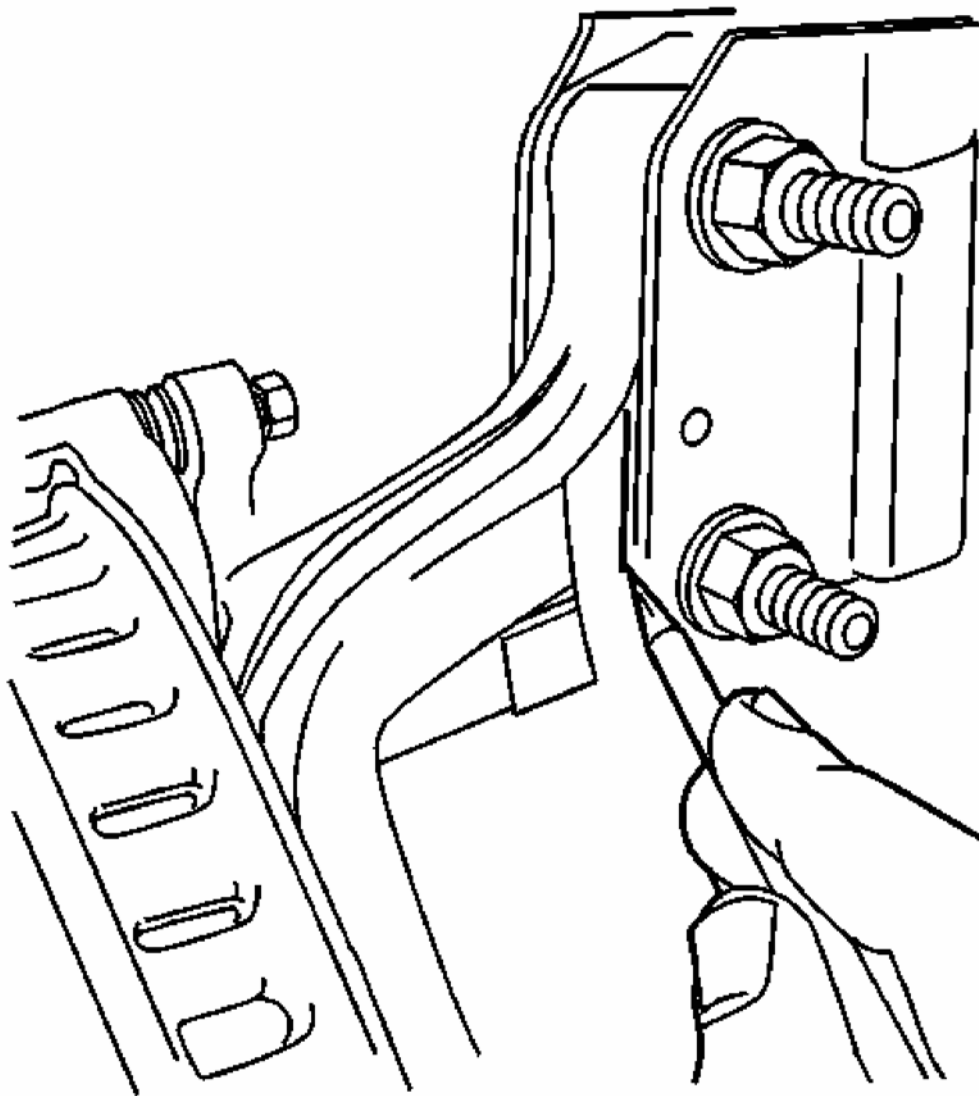


Fig. 46: Scribing Strut To Knuckle
Courtesy of GENERAL MOTORS CORP.

4. Scribe the strut to the knuckle.

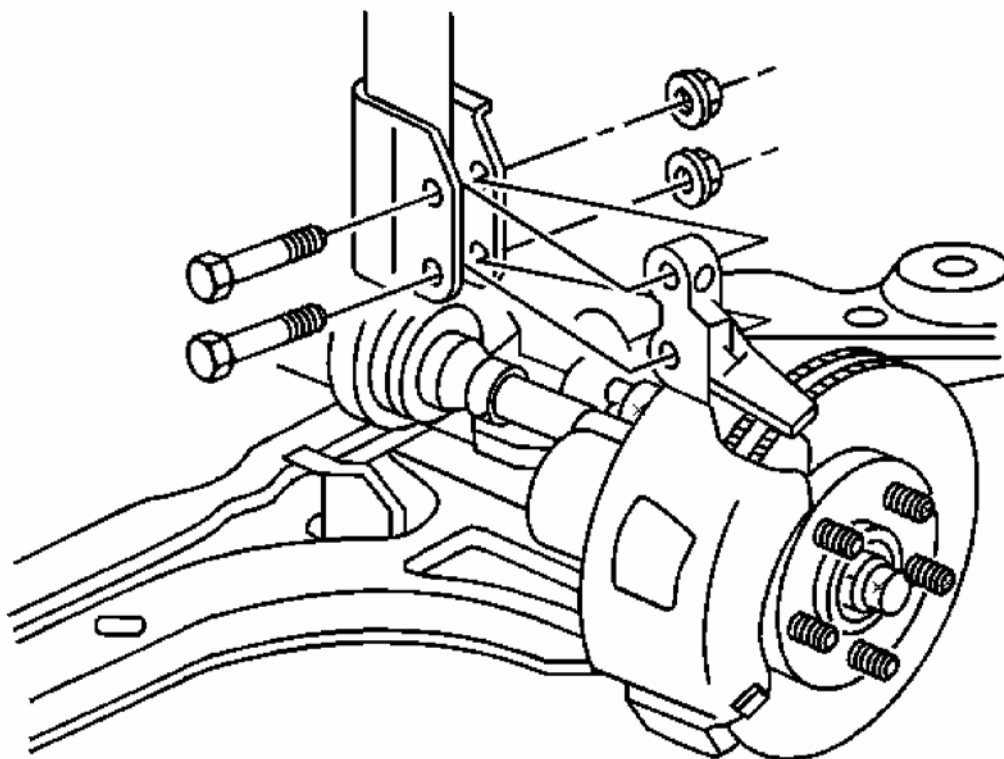


Fig. 47: View Of Steering Knuckle To Strut Bolts
Courtesy of GENERAL MOTORS CORP.

5. Remove the strut lower bolts and nuts.
6. Remove the strut.

Installation Procedure

1. Install the strut.

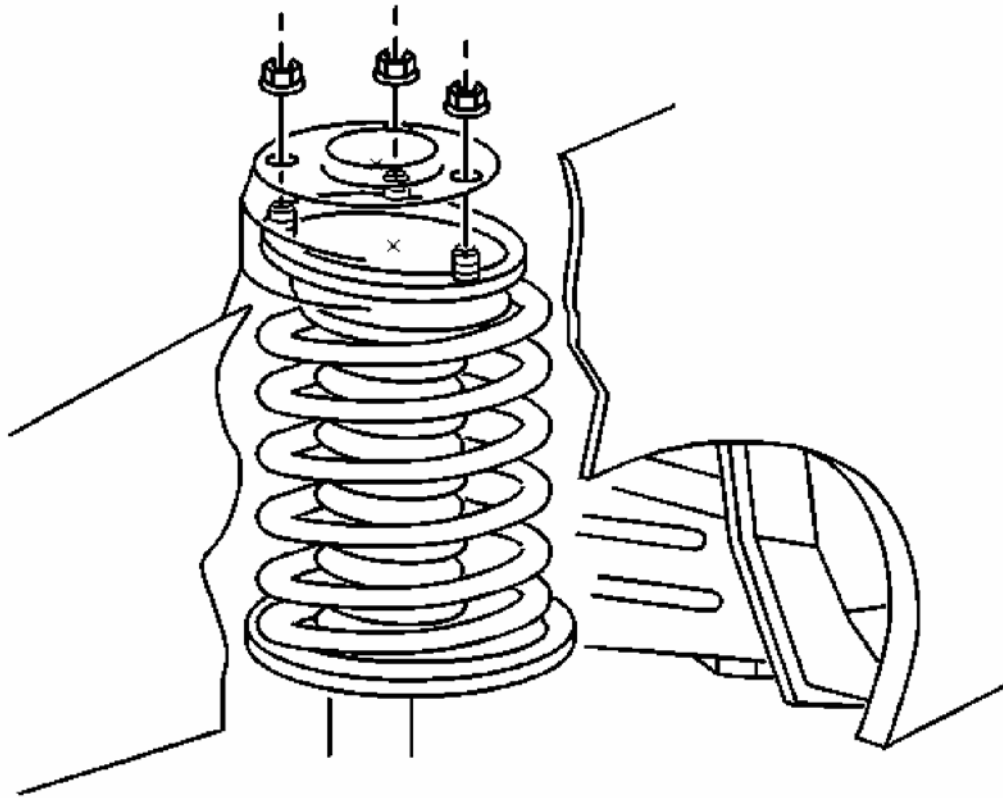


Fig. 48: Identifying Upper Strut Mounting Nuts
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to **FASTENER NOTICE** .

2. Install the strut upper nuts.

Tighten: Tighten the strut upper nuts to 33 N.m (24 lb ft).

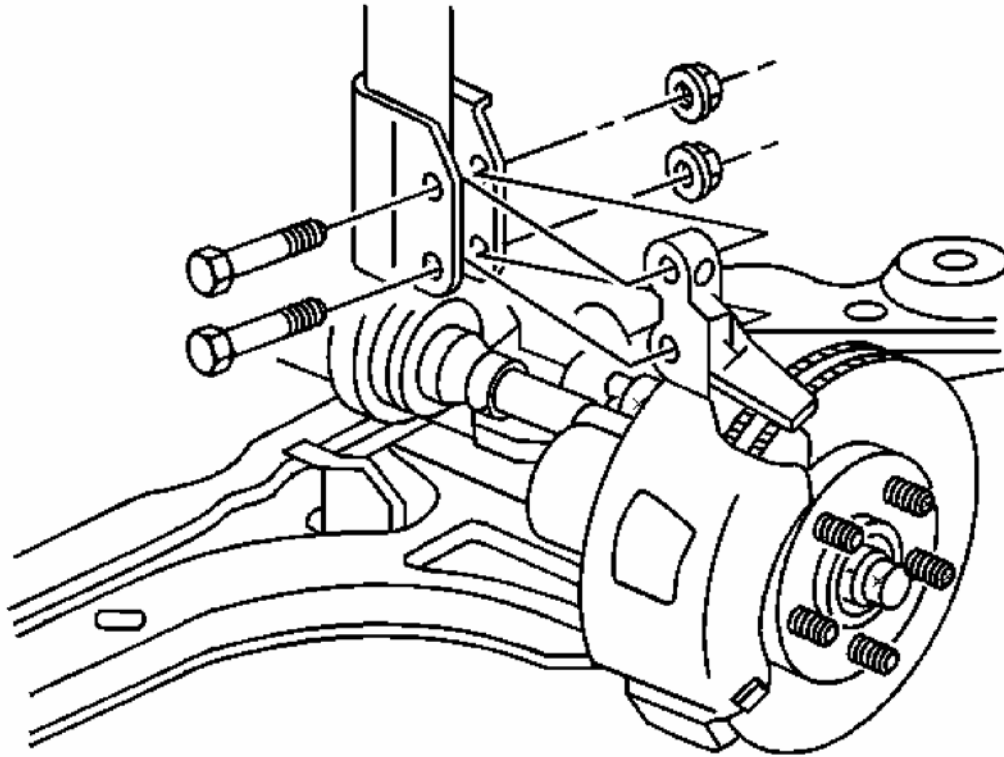


Fig. 49: View Of Steering Knuckle To Strut Bolts
Courtesy of GENERAL MOTORS CORP.

3. Install the strut lower bolts and nuts.

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.

4. Align the strut to the mark on the knuckle.

Tighten: Tighten the strut lower nuts to 130 N.m (96 lb ft).

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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.

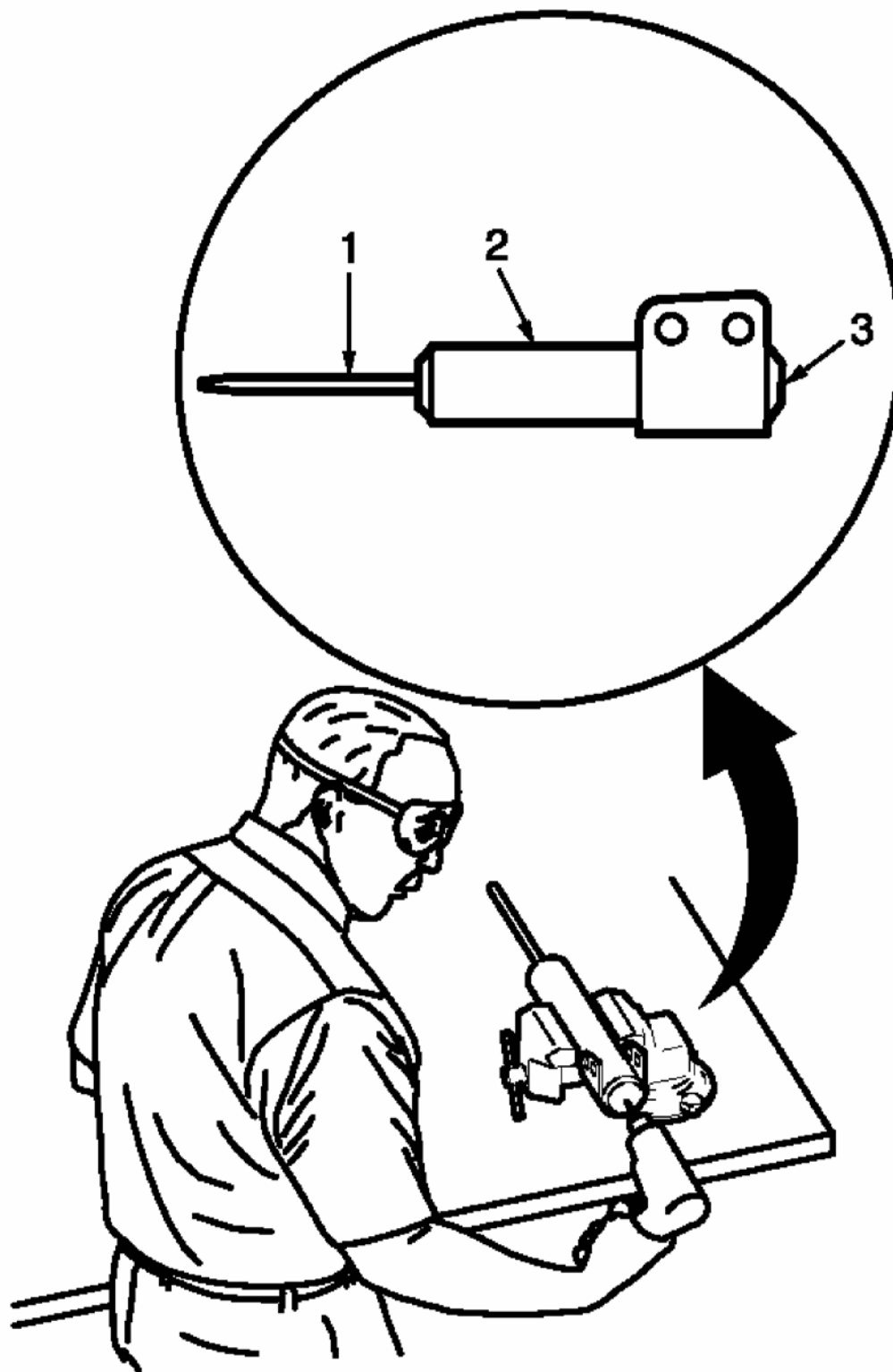


Fig. 50: Drilling Hole In Strut At Center Of End Cap

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 42991** Strut Rod Nut Socket. See Special Tools.
- **J 45400** Strut Spring Compressor. See Special Tools.

Disassembly Procedure

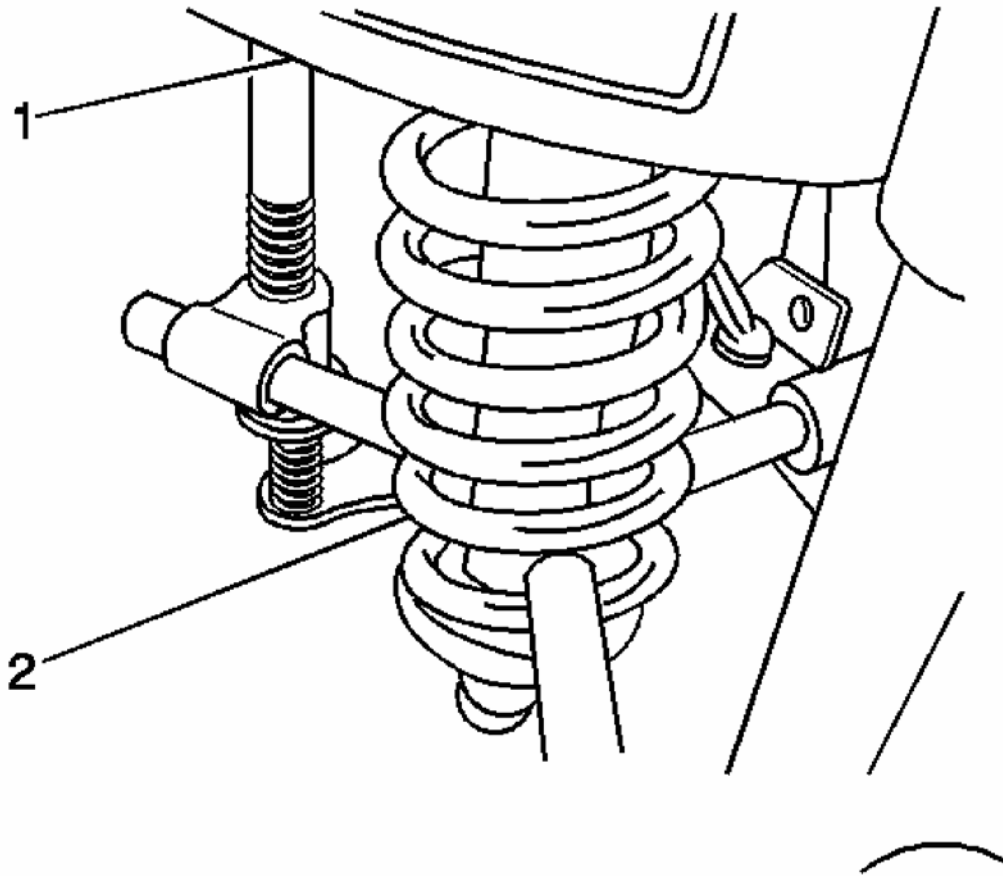


Fig. 51: Compressing/Releasing Lower Part Of Shock Spring
Courtesy of GENERAL MOTORS CORP.

1. Remove the strut from the vehicle. Refer to **Strut Assembly Replacement** .
2. Install the strut (2) in the **J 45400** (1). See **Special Tools**.

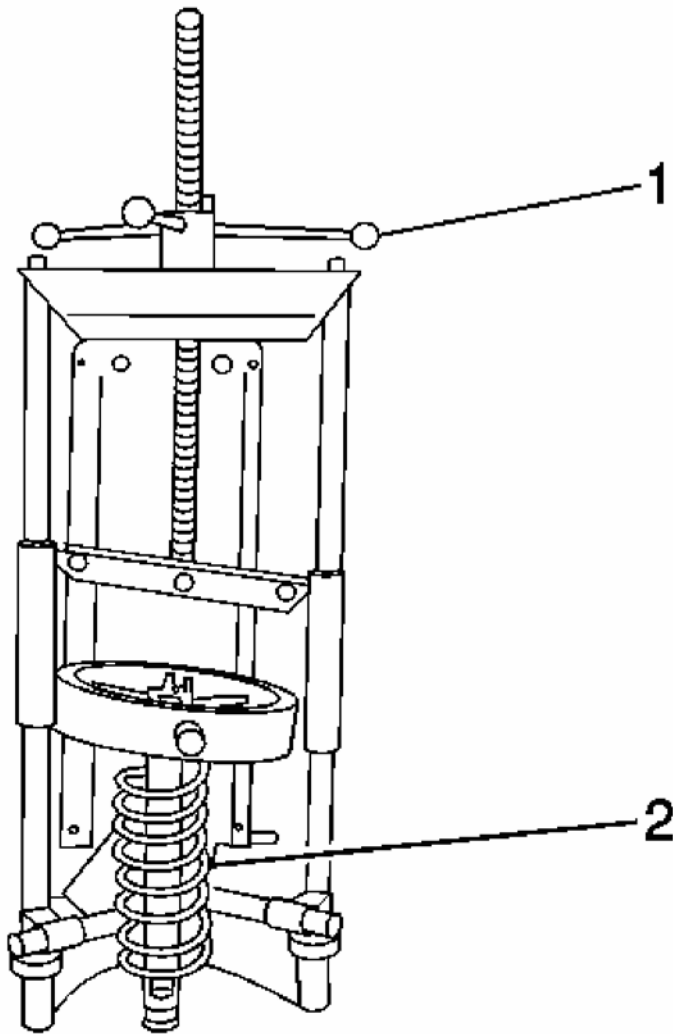


Fig. 52: View Of Compressor Forcing Screw & Coil Spring
Courtesy of GENERAL MOTORS CORP.

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

3. Turn the spring compressor forcing screw (1) until the coil spring (2) is compressed.

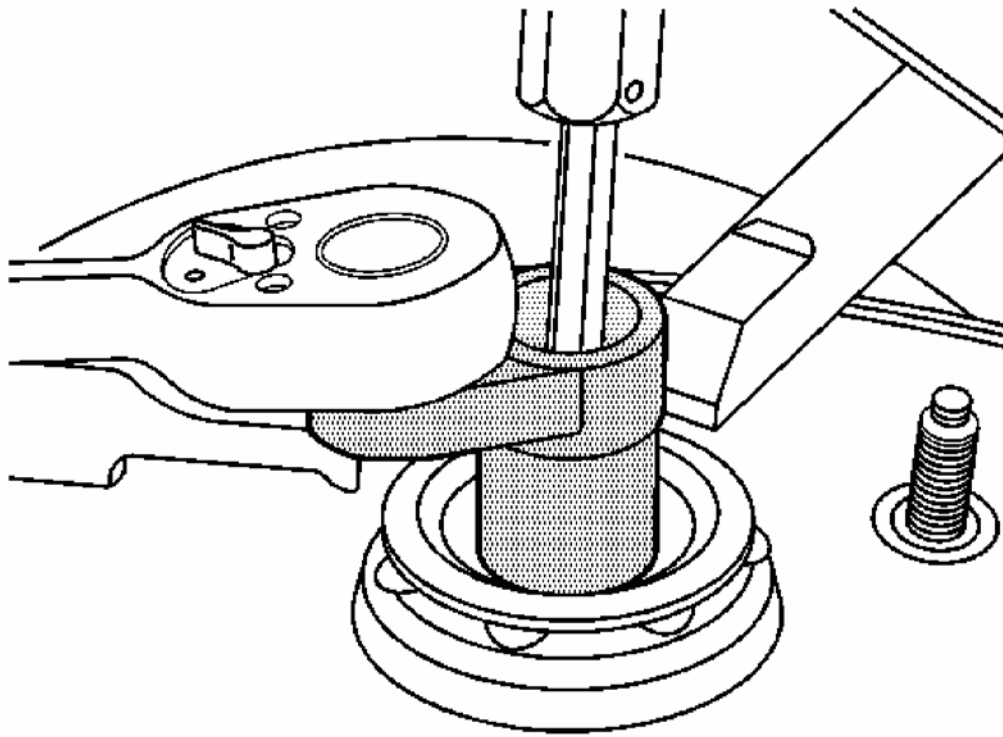


Fig. 53: Removing/Installing Strut Retaining Nut
Courtesy of GENERAL MOTORS CORP.

4. Use a 45 TORX® socket in order to hold the strut shaft. Remove the upper strut mount nut by turning with **J 42991** . See **Special Tools**.
5. Remove the strut from the **J 45400** . See **Special Tools**.

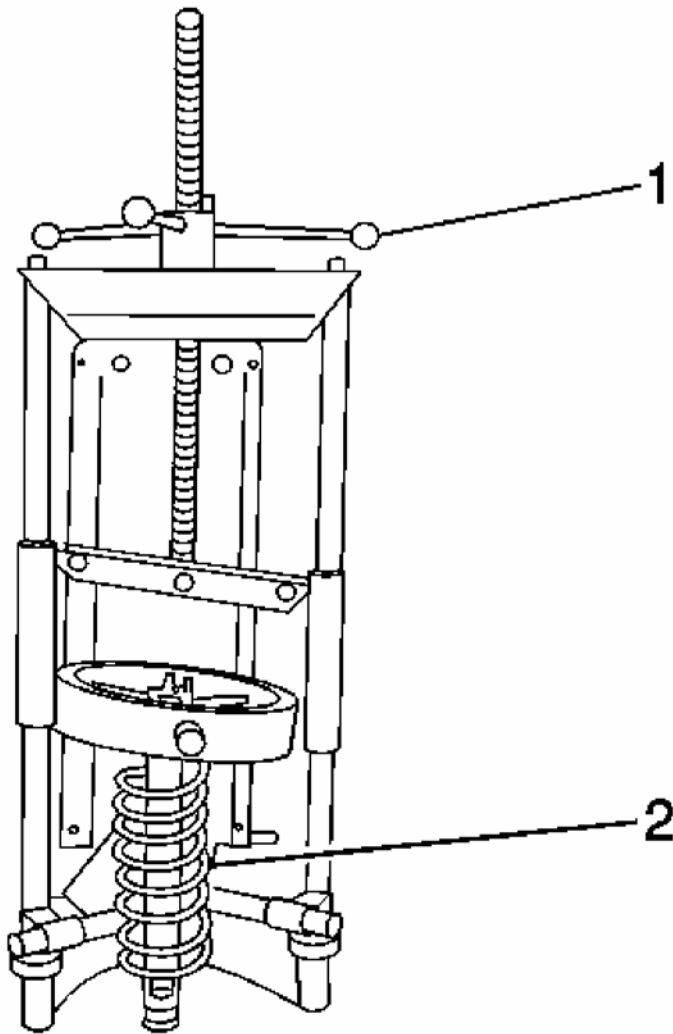


Fig. 54: View Of Compressor Forcing Screw & Coil Spring
Courtesy of GENERAL MOTORS CORP.

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** . See **Special Tools**.

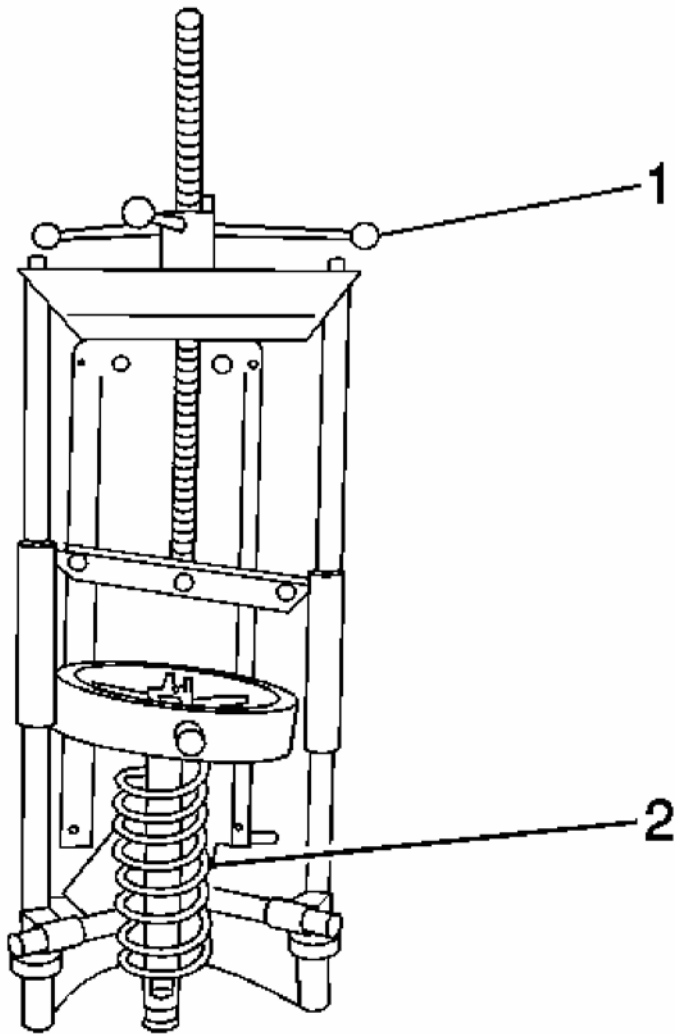


Fig. 55: View Of Compressor Forcing Screw & Coil Spring
Courtesy of GENERAL MOTORS CORP.

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.

NOTE: Refer to **Fastener**
 Notice .

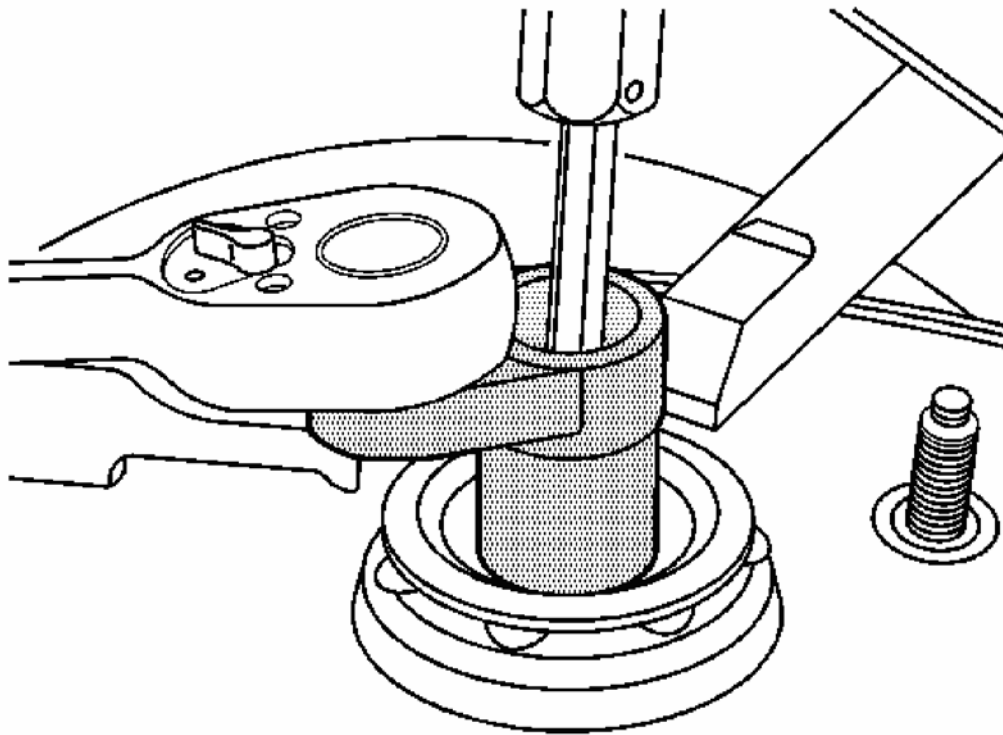


Fig. 56: Removing/Installing Strut Retaining Nut
Courtesy of GENERAL MOTORS CORP.

4. Install the strut retaining nut.

Using the **J 42991** and a 45 TORX® socket, install the strut mount nut. See **Special Tools**.

Tighten: Tighten the strut mount nut to 70 N.m (52 lb ft).

5. Remove the strut from the **J 45400** . See **Special Tools**.
6. 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

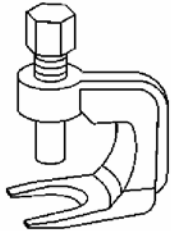
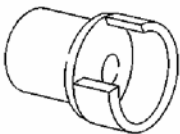
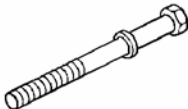
SPECIAL TOOLS

Special Tools

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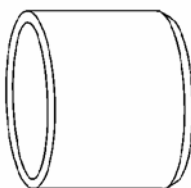
Illustration	Tool Number/ Description
	J 6627-A Tie Rod Puller
	J 21474-01 Control Arm Bushing Set
	J 21474-2 Bushing Installer Remover
	J 21474-4 1/2 Inch Nut
	J 21474-5 Control Arm Bushing Receiver
	J 21474-27 1/2 Inch Puller Bolt Thrust Bearing
	J 23444-A Extreme Press Lubricant - 1/4-Ounce Tube

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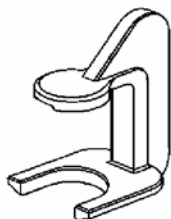
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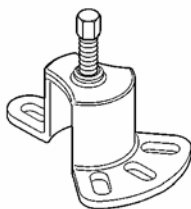
J 34126
Sprocket Bearing Remover



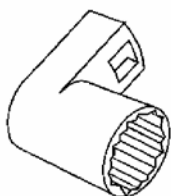
J 35379
Front Knuckle Support



J 41820
Ball Joint Separator



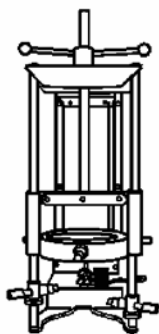
J 42129
Wheel Hub Remover



J 42991
Strut Rod Nut Socket

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J 45400
Strut Spring Compressor