2004 SUSPENSION

Front Suspension - C/K SUV

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Axle Shaft Nut	240 N.m	177 lb ft
Brake Hose Bracket Bolt	9 N.m	80 lb in
Brake Hose Clip Bolts	12 N.m	106 lb in
Hub and Bearing Assembly to Steering Knuckle Bolts	180 N.m	133 lb ft
Jounce Bumper Stud Nut	30 N.m	22 lb ft
Lower Ball Joint Stud Nut	100 N.m	74 lb ft
Lower Ball Joint to Lower Control Arm Nuts	70 N.m	52 lb ft
Lower Control Arm to Frame Nuts	175 N.m	129 lb ft
Oil Pan Skid Plate Bolts	20 N.m	15 lb ft
Shock Absorber Tennon Nut (4WD)	20 N.m	15 lb ft
Shock Absorber to Lower Control Arm Bolts (2WD)	25 N.m	18 lb ft
Shock Absorber to Lower Control Arm Nut (4WD)	80 N.m	59 lb ft
Stabilizer Shaft Insulator Clamp Bolts	50 N.m	37 lb ft
Stabilizer Shaft Link Nuts	10 N.m	89 lb in
Torsion Bar Crossmember Bolts	95 N.m	70 lb ft
Torsion Bar Support Mounting Nuts	95 N.m	70 lb ft
Upper Ball Joint Stud Nut	50 N.m	37 lb ft
Upper Control Arm to Frame Nuts	190 N.m	140 lb ft
Wheel Speed Sensor Mounting Bolt	18 N.m	13 lb ft

REPAIR INSTRUCTIONS

STABILIZER SHAFT REPLACEMENT

Removal Procedure

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

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Information.

2. Remove the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.
3. Remove the stabilizer links. Refer to **Stabilizer Shaft Link Replacement**.

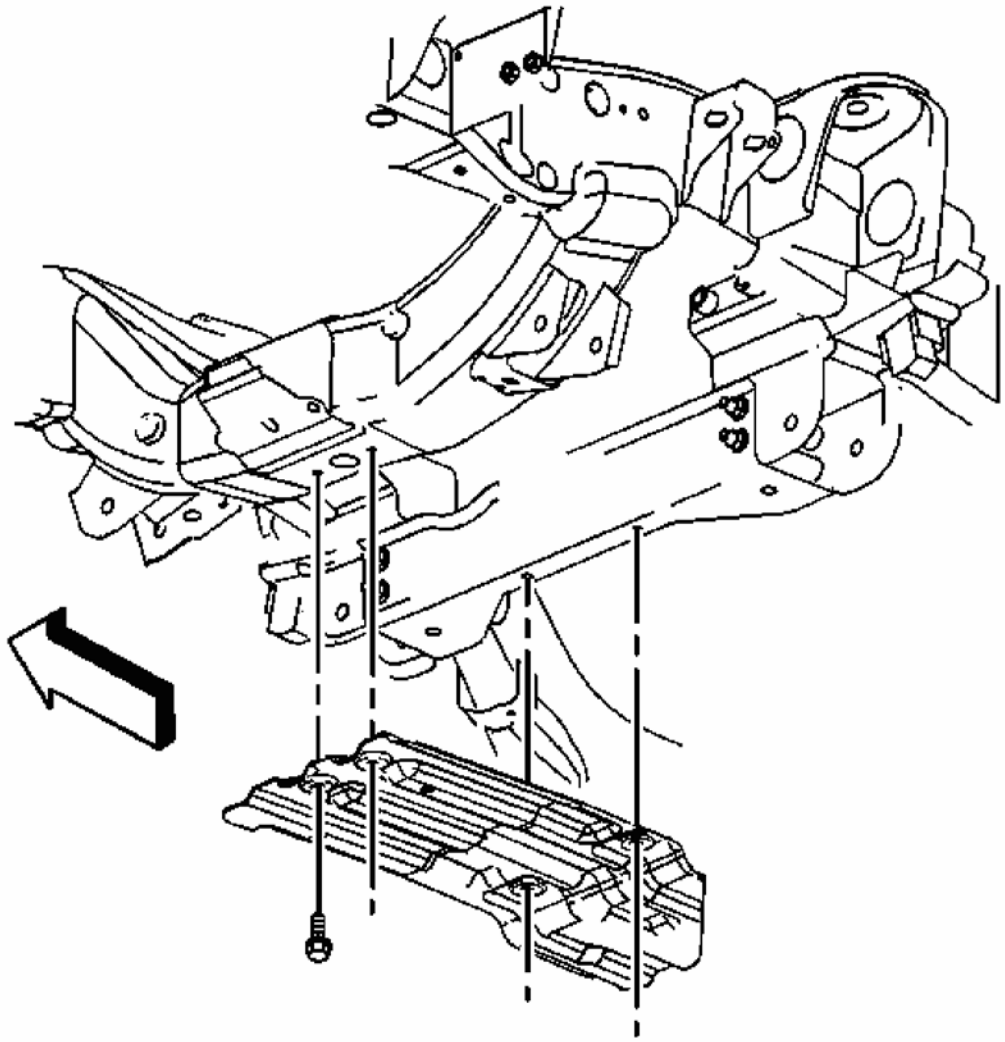

Fig. 1: Identifying Oil Pan Skid Plate
Courtesy of GENERAL MOTORS CORP.

4. Remove the oil pan skid plate, if equipped.

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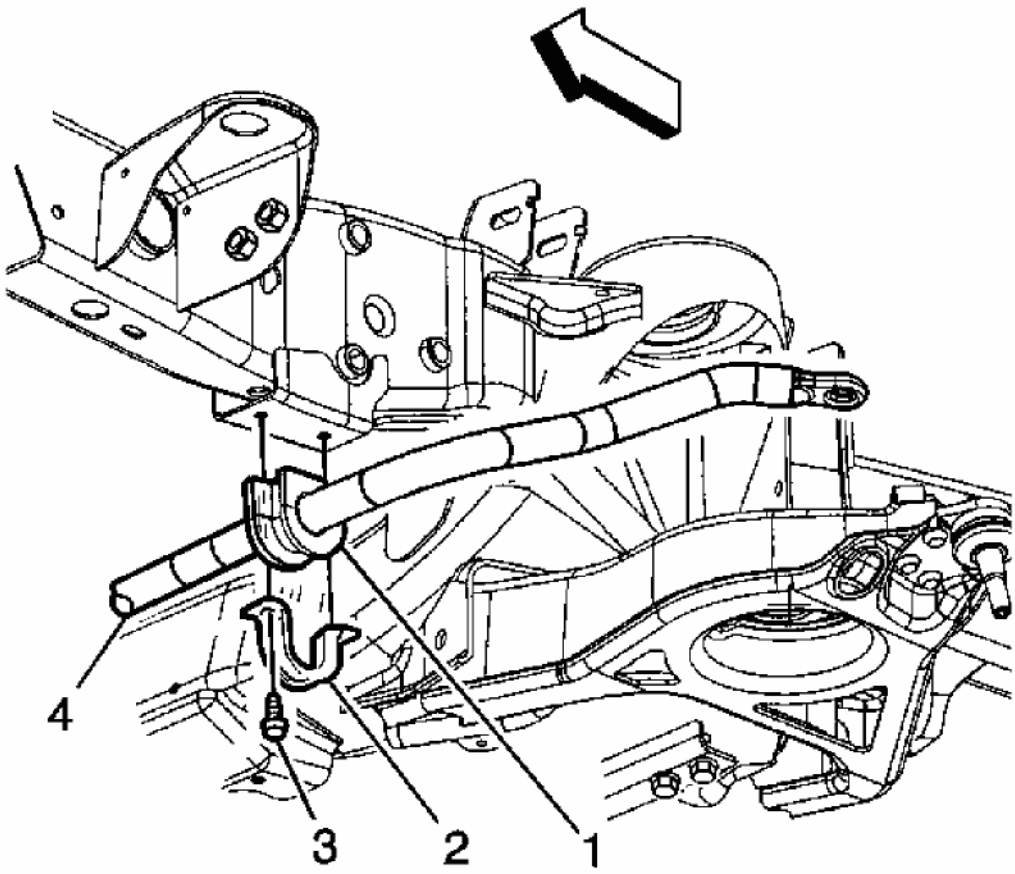

Fig. 2: Stabilizer Shaft, Bracket, Bolts & Insulators
Courtesy of GENERAL MOTORS CORP.

5. Remove the stabilizer shaft insulator bracket bolts (3).
6. Remove the stabilizer shaft bracket (2).
7. Remove the stabilizer shaft (4).
8. Remove the stabilizer shaft insulators (1).
9. Inspect all of the parts for wear and damage.

Installation Procedure

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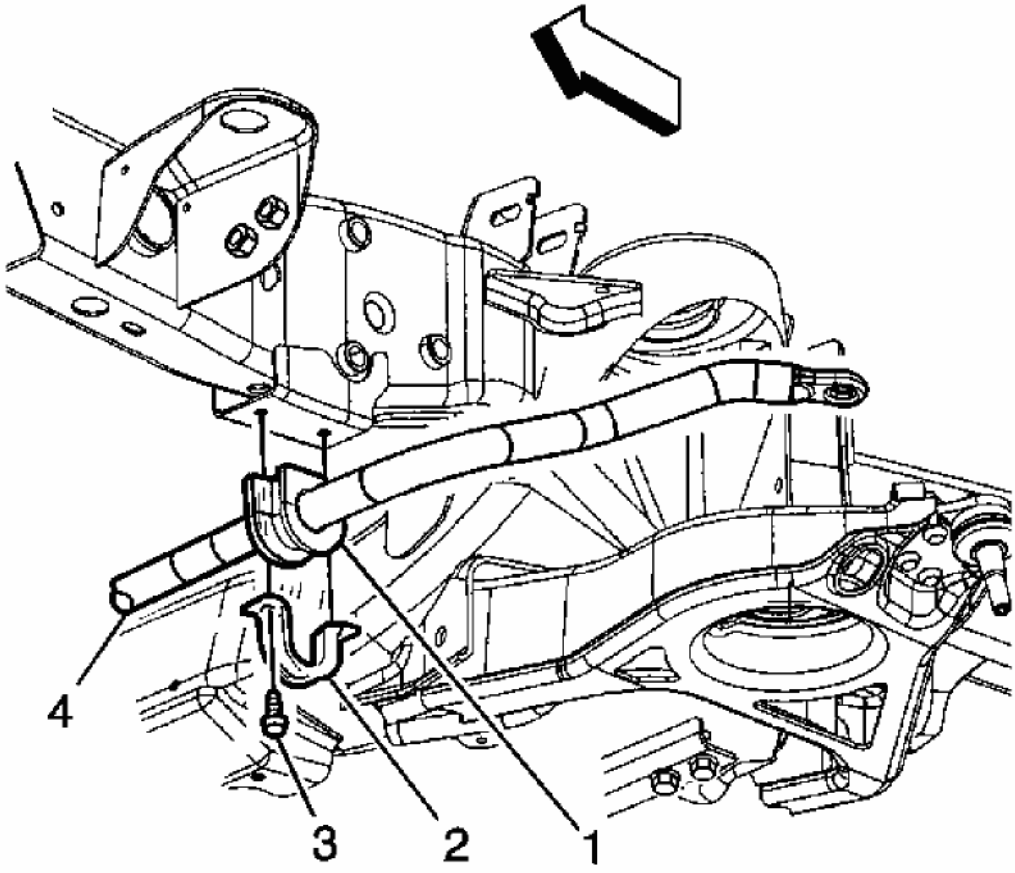

Fig. 3: Stabilizer Shaft, Bracket, Bolts & Insulators
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Place the insulators on the stabilizer shaft with the slits facing toward the front of the vehicle.

1. Install the insulators (1) to the stabilizer shaft (4).
2. Install the stabilizer shaft (4).
3. Install the brackets (2) over the insulators and the stabilizer shaft.

NOTE: Refer to Fastener Notice in Cautions and Notices.

4. Install insulator bracket bolts (3).

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

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5. Install the stabilizer links. Refer to **Stabilizer Shaft Link Replacement**.

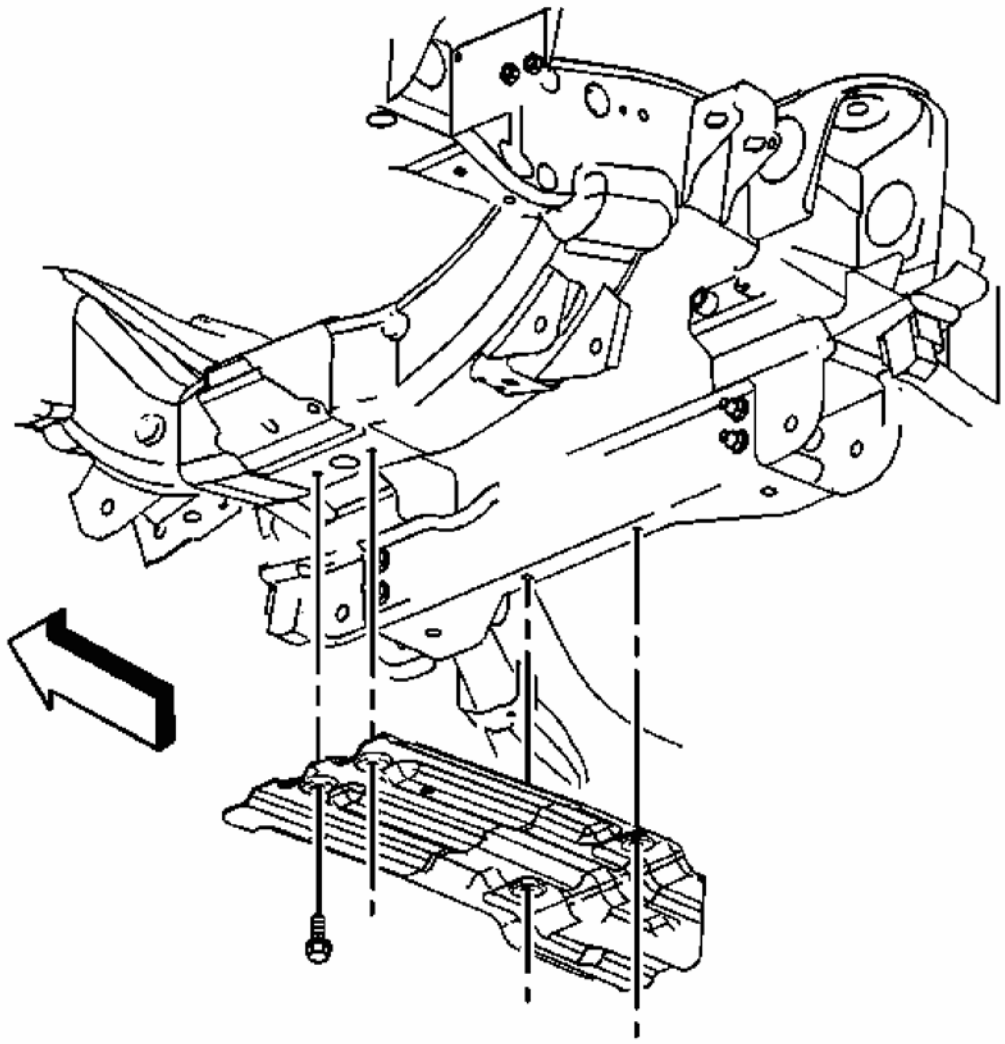

Fig. 4: Identifying Oil Pan Skid Plate
Courtesy of GENERAL MOTORS CORP.

6. Install the oil pan skid plate, if equipped.

   Tighten: Tighten the oil pan skid plate retaining bolts to 20 N.m (15 lb ft).

7. Install the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.
8. Remove the safety stands

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9. Lower the vehicle.

STABILIZER SHAFT LINK REPLACEMENT

Removal Procedure

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

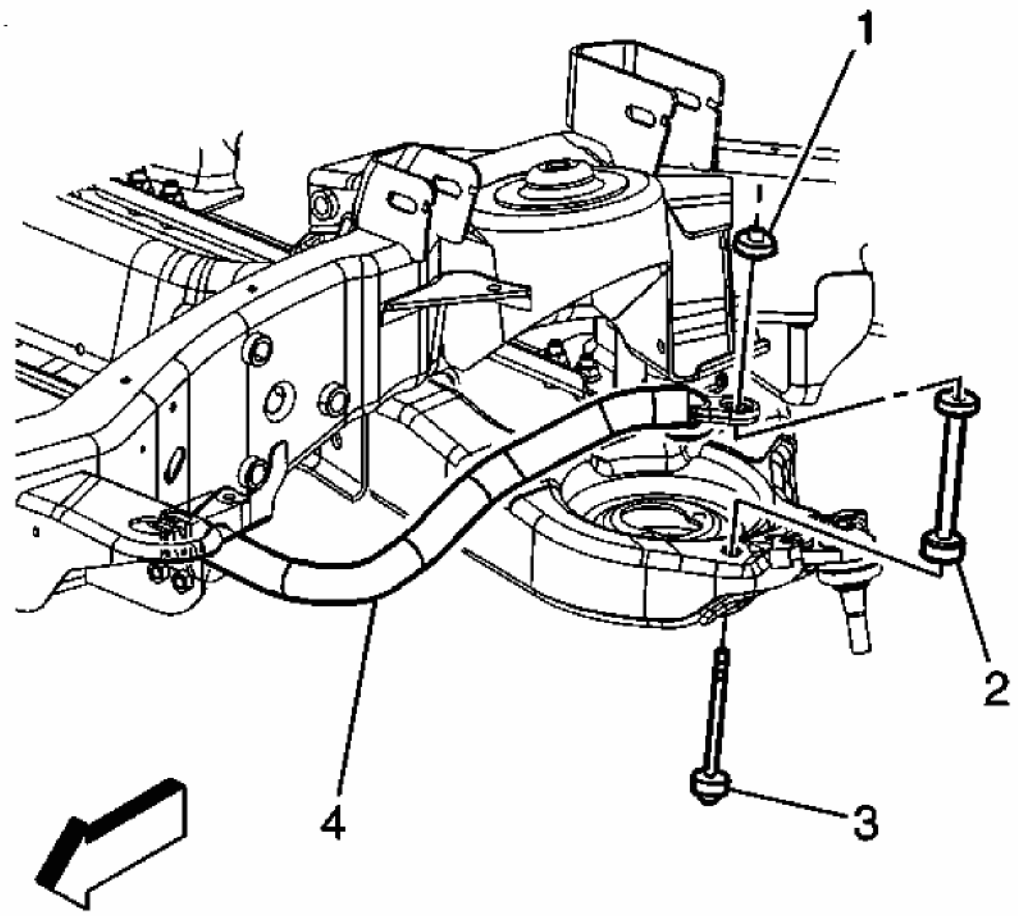

Fig. 5: Stabilizer Shaft Link, Spacers & Bolt
Courtesy of GENERAL MOTORS CORP.

2. Remove the stabilizer shaft nut (1) from the link bolt.
3. Remove the stabilizer shaft link bolt (3).
4. Remove the stabilizer shaft link insulators and spacers (2).
5. Inspect all of the parts for wear and damage.

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Installation Procedure

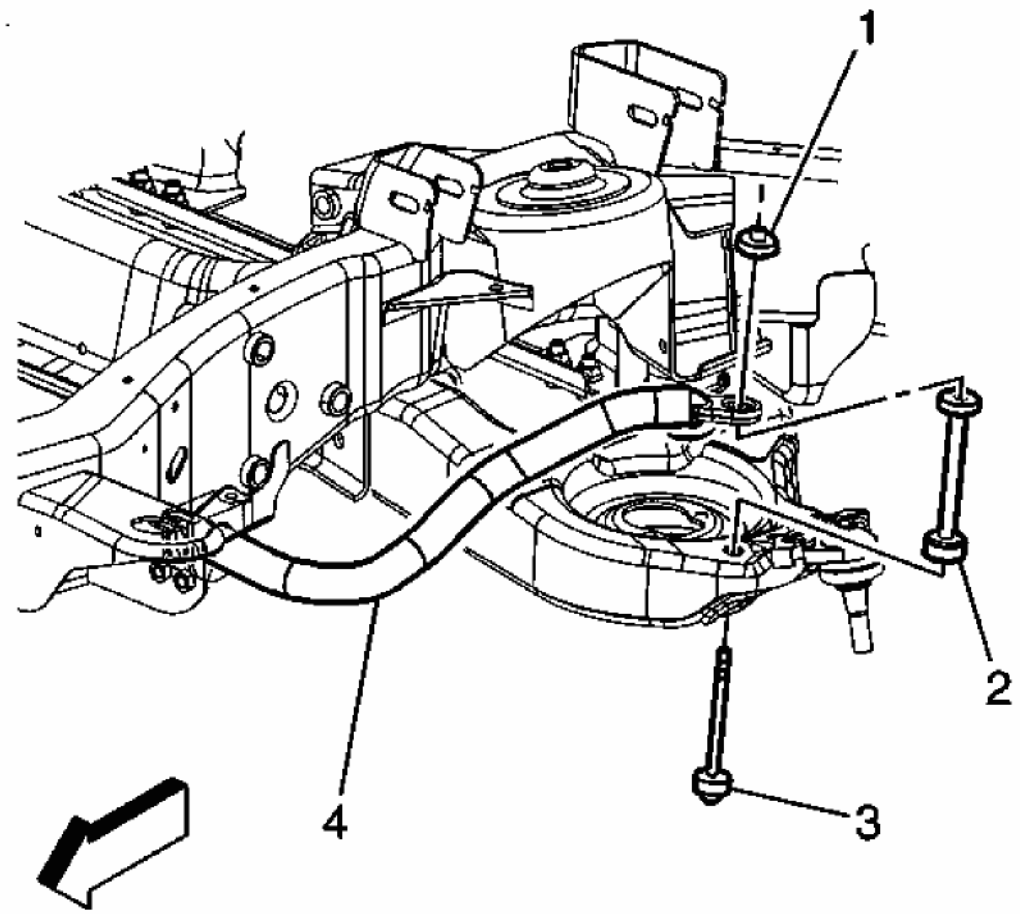

Fig. 6: Stabilizer Shaft Link, Spacers & Bolt
Courtesy of GENERAL MOTORS CORP.

1. Install the stabilizer shaft link insulators and spacers (2).
2. Perform the following procedure before installing the stabilizer link bolts.
   - Remove all traces of the original adhesive patch.
   - Apply Threadlocker GM P/N 12345382 (Canadian P/N 10953489) BLUE LOCTITE # 242 on the threads of the bolts.
3. Install the stabilizer shaft link bolts (3).

NOTE: Refer to Fastener Notice in Cautions and Notices.

4. Install the stabilizer shaft nut (1) to the link bolt.

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Tighten: Tighten the nut to 10 N.m (89 lb in).

5. Remove the safety stands
6. Lower the vehicle.

STABILIZER SHAFT INSULATOR REPLACEMENT

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.

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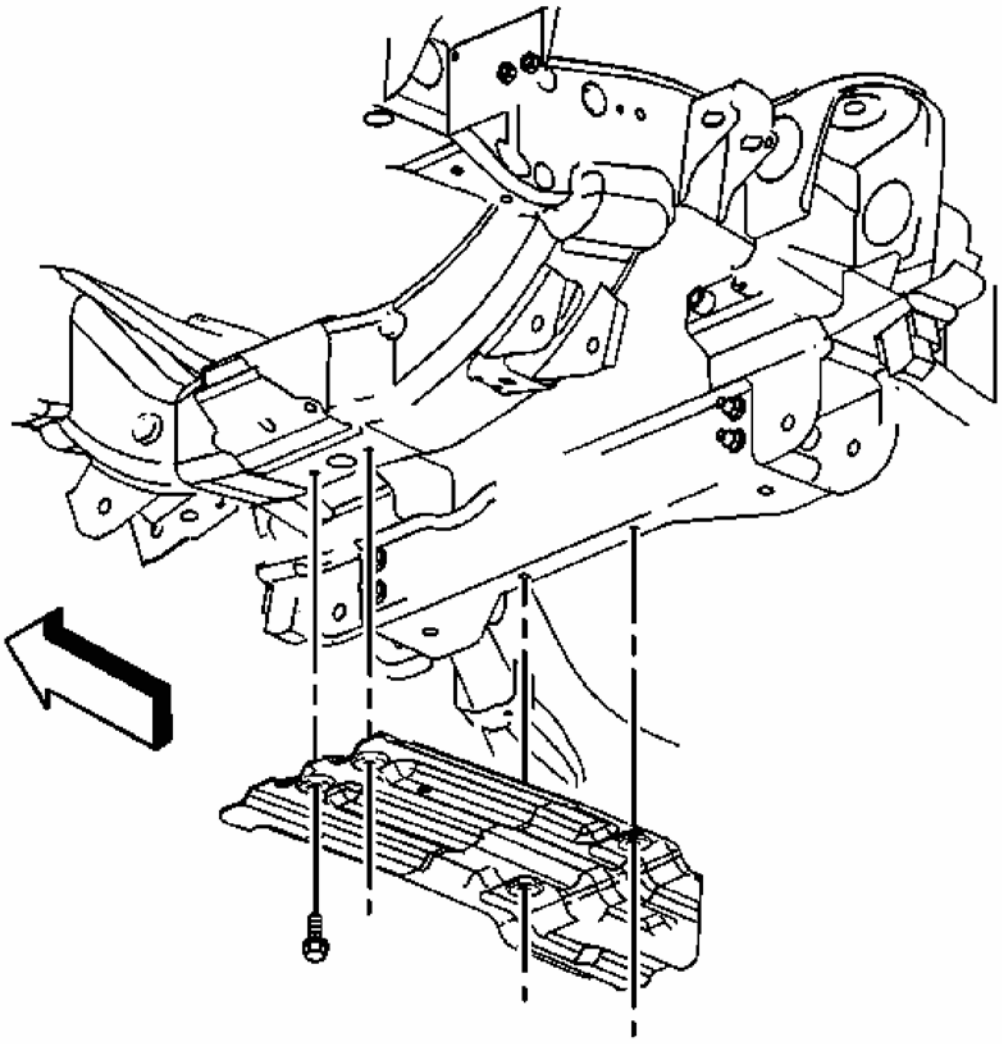

Fig. 7: Identifying Oil Pan Skid Plate
Courtesy of GENERAL MOTORS CORP.

3. Remove the oil pan skid plate, if equipped.

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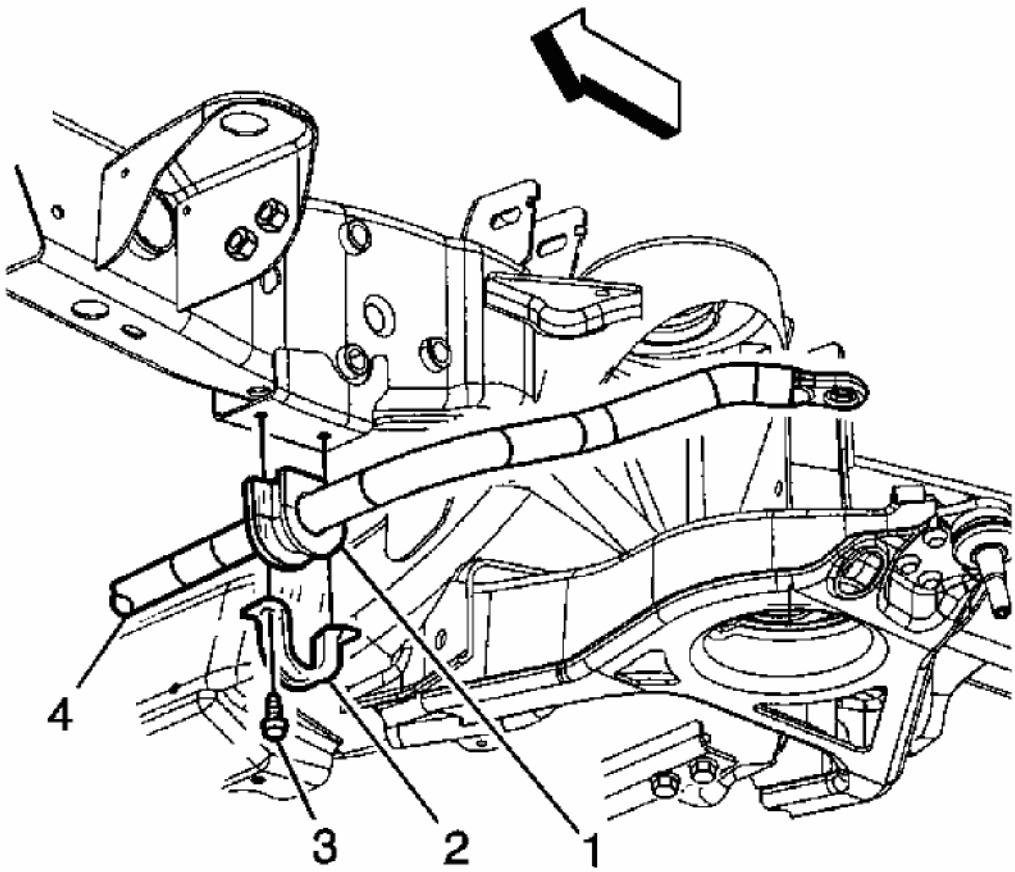

Fig. 8: Stabilizer Shaft, Bracket, Bolts & Insulators
Courtesy of GENERAL MOTORS CORP.

4. Remove the stabilizer shaft insulator bracket bolts (3).
5. Remove the stabilizer shaft bracket (2).
6. Lower the stabilizer bar to remove the stabilizer shaft insulators (1).
7. Inspect all of the parts for wear and damage.

Installation Procedure

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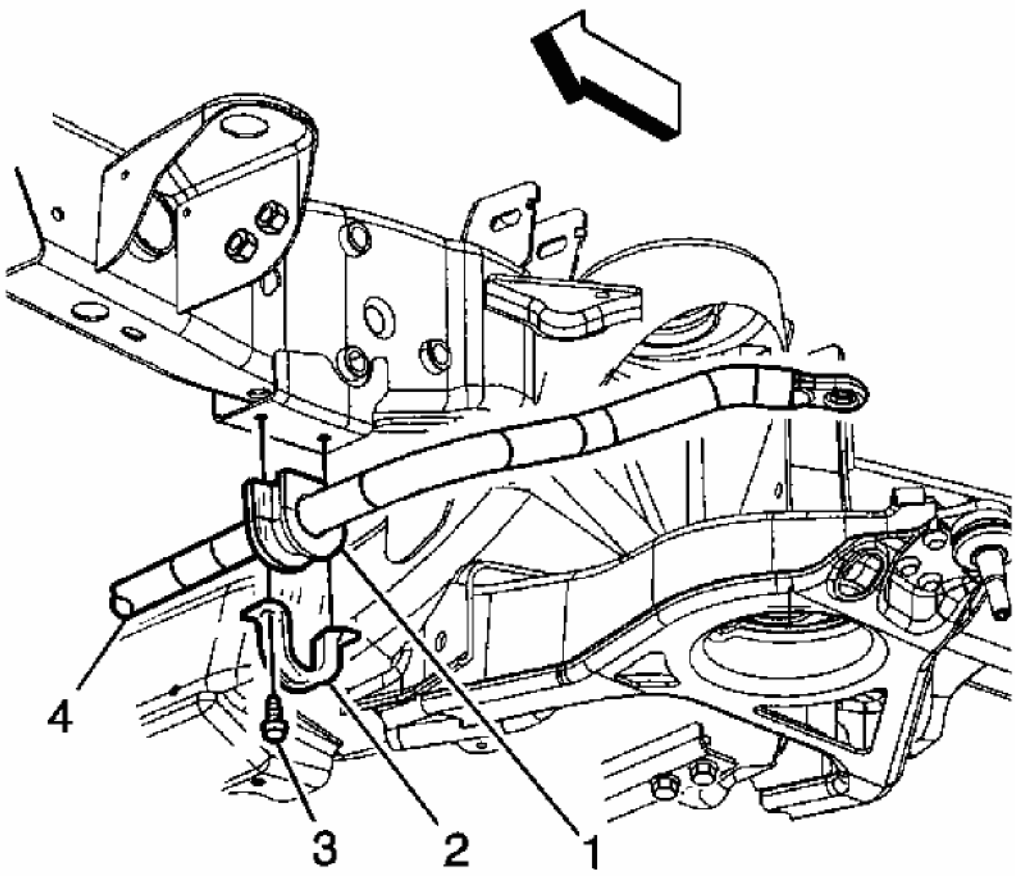

Fig. 9: Stabilizer Shaft, Bracket, Bolts & Insulators
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Place the insulators on the stabilizer shaft with the slits facing toward the front of the vehicle.

1. Install the stabilizer shaft insulators (1) to the stabilizer shaft (4).
2. Install the stabilizer shaft (4) brackets (2) over the insulators.

NOTE: Refer to Fastener Notice in Cautions and Notices.

3. Install stabilizer shaft insulator bracket bolts (3).

Tighten:

1. Tighten the bolts to 33 N.m (24 lb ft), 15 series.
2. Tighten the bolts to 50 N.m (39 lb ft), 25/35 series.

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4. Install the stabilizer links. Refer to **Stabilizer Shaft Link Replacement**.

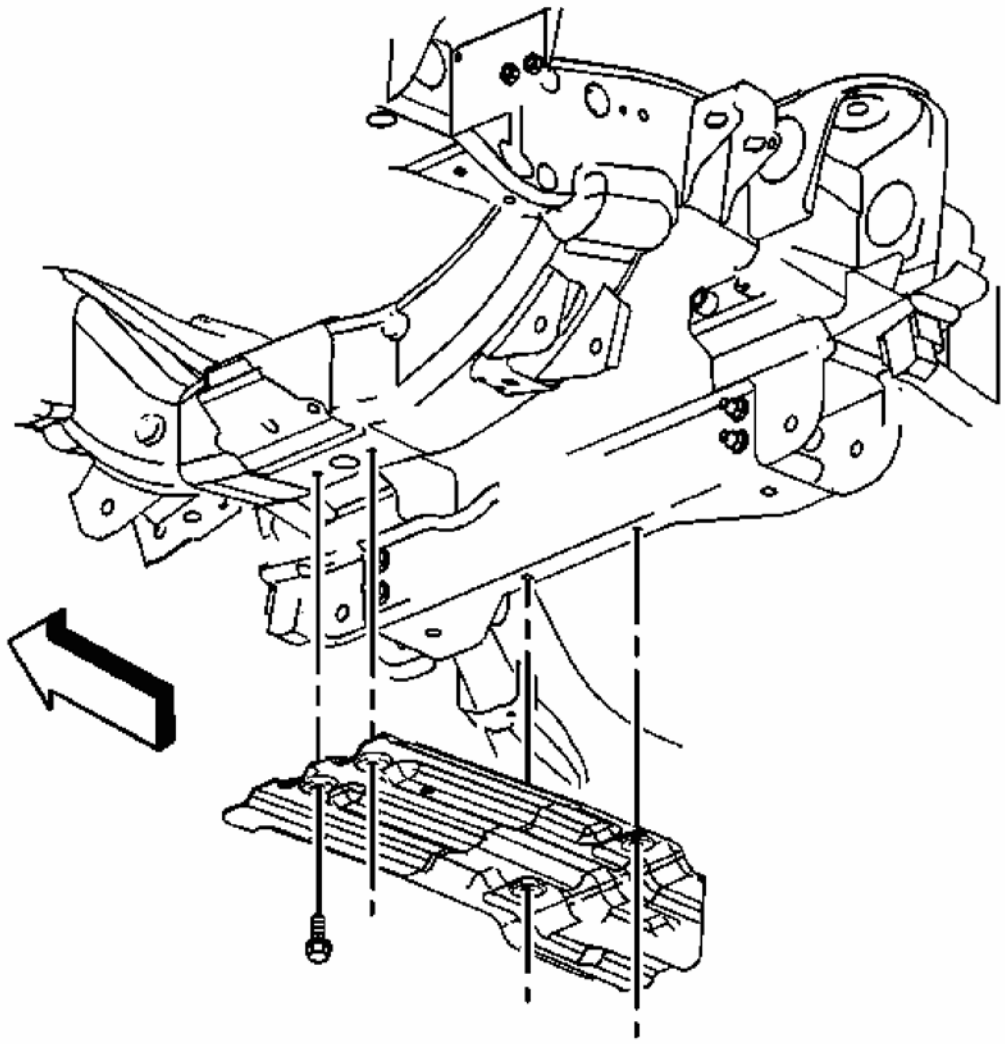

Fig. 10: Identifying Oil Pan Skid Plate
Courtesy of GENERAL MOTORS CORP.

5. Install the oil pan skid plate, if equipped.

   Tighten: Tighten the oil pan skid plate retaining bolts to 20 N.m (15 lb ft).

6. Install the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.
7. Remove the safety stands.

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8. Lower the vehicle.

LOWER BALL JOINT REPLACEMENT (COIL SPRING SUSPENSION)

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 lower control arm. Refer to **Lower Control Arm Replacement**.
4. Secure the lower control arm in a bench vice or equivalent.
5. Center punch the rivet heads.
6. Drill out the rivets.
7. Remove the lower ball joint.

Installation Procedure

1. Install the ball joint to the lower control arm.
2. Install the replacement bolts to the lower control arm.

NOTE: Refer to Fastener Notice in Cautions and Notices.

3. Install the nuts to the bolts.

   Tighten: Tighten the nuts to 70 N.m (52 lb ft).

4. Remove the lower control arm from the bench vice.
5. Install the lower control arm. Refer to **Lower Control Arm Replacement**.
6. Install the tire and wheel tire assembly. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.
7. Remove the safety stands.
8. Lower the vehicle.
9. Verify the wheel alignment. Refer to **Measuring Wheel Alignment (w/Rear Wheel Steering)** or **Measuring Wheel Alignment (w/o Rear Wheel Steering)** in Wheel Alignment.

LOWER BALL JOINT REPLACEMENT (TORSION BAR SUSPENSION)

Removal Procedure

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

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Information.

2. Remove the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.
3. Remove the lower control arm. Refer to **Lower Control Arm Replacement**.
4. Place the lower control arm in a bench vice.
5. Using a chisel, remove the securing crimps from the ball joint body, if equipped.
6. Using a press, remove the ball joint from the lower control arm.

Installation Procedure

IMPORTANT: Use the outer flange of the ball joint in order to press the ball joint into place.

1. Install the new ball joint using a press.
2. Place the lower control arm in a bench vice.
3. Using a punch, install crimps to the ball joint, if necessary. Use the replaced ball joint as a reference.
4. Install the lower control arm. Refer to **Lower Control Arm Replacement**.
5. Install the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.
6. Remove the safety stands.
7. Lower the vehicle.
8. Verify the wheel alignment. Refer to **Measuring Wheel Alignment (w/Rear Wheel Steering)** or **Measuring Wheel Alignment (w/o Rear Wheel Steering)** in Wheel Alignment.

STEERING KNUCKLE REPLACEMENT (COIL SPRING SUSPENSION)

- **J 43631** Ball Joint Remover
- **J 45851** Ball Joint Separator Protector Adapters. See **Special Tools and Equipment**.

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.

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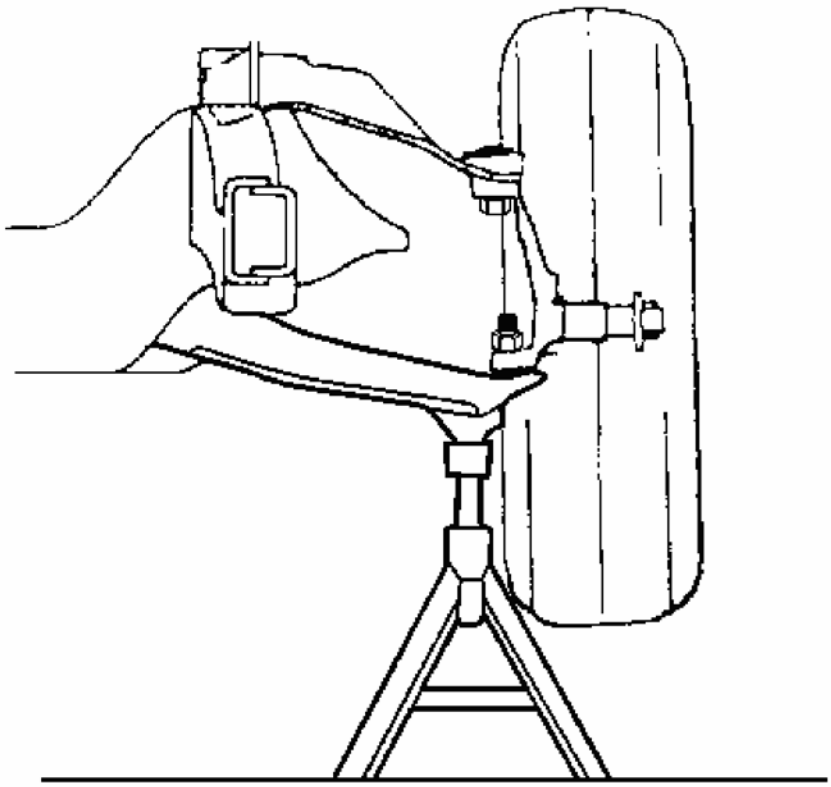

Fig. 11: Supporting Lower Control Arm With Jack Stand
Courtesy of GENERAL MOTORS CORP.

3. Support the lower control arm with a suitable jack.
4. Remove the wheel hub and bearing. Refer to **Wheel Hub, Bearing, and Seal Replacement (RWD)** or **Wheel Hub, Bearing, and Seal Replacement (4WD)**.
5. Disconnect the Electronic Suspension Control (ESC) link rod from the sensor, if equipped. Refer to **Front Position Sensor Link Assembly Replacement - Electronic Suspension** in Electronic Suspension Control.
6. Disconnect the outer tie rod from the knuckle. Refer to **Tie Rod Replacement** in Steering Linkage (Non- Rack and Pinion).

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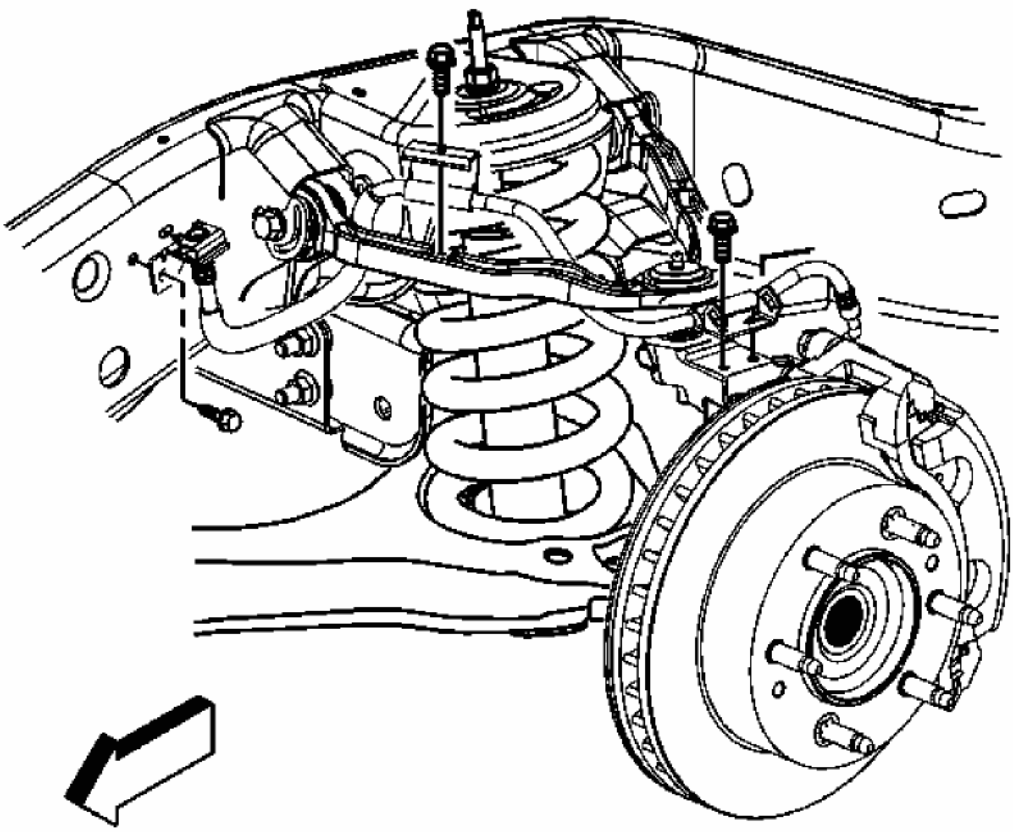

Fig. 12: View Of Retaining Bolts For Brake Hose And Wheel Speed Sensor Brackets
Courtesy of GENERAL MOTORS CORP.

7. Remove the brake hose bracket retaining bolt from the knuckle.

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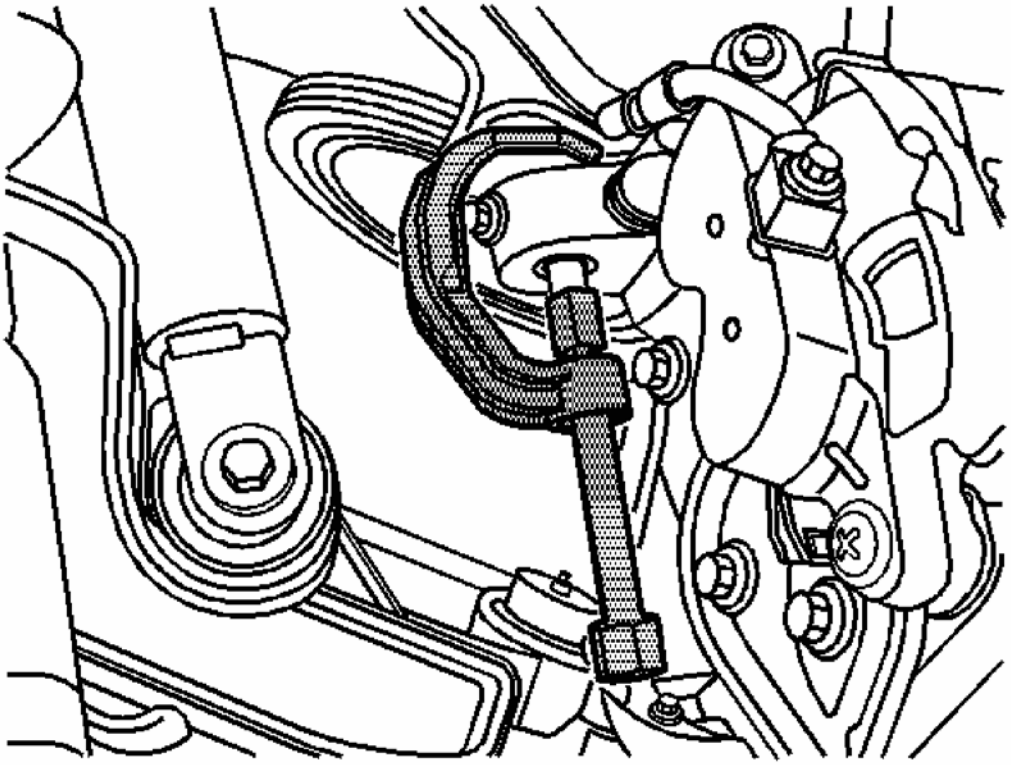

Fig. 13: Disconnecting Upper Control Arm From The Steering Knuckle
Courtesy of GENERAL MOTORS CORP.

8. Remove the retaining nut and separate the upper ball joint from the steering knuckle using the **J 43631** and **J 45851** . See **Special Tools and Equipment**.

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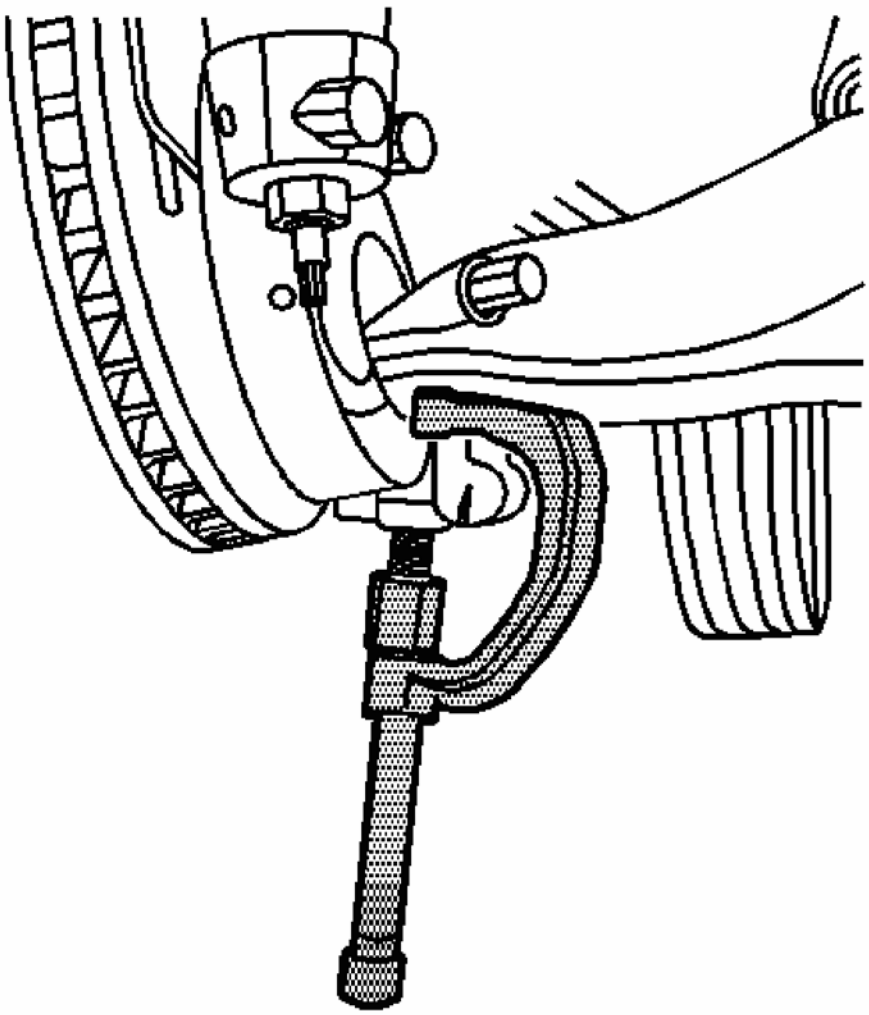

Fig. 14: Separating The Lower Ball Joint From The Steering Knuckle
Courtesy of GENERAL MOTORS CORP.

9. Remove the retaining nut and separate the lower ball joint from the steering knuckle using the **J 43631** and **J 45851** . See **Special Tools and Equipment**.

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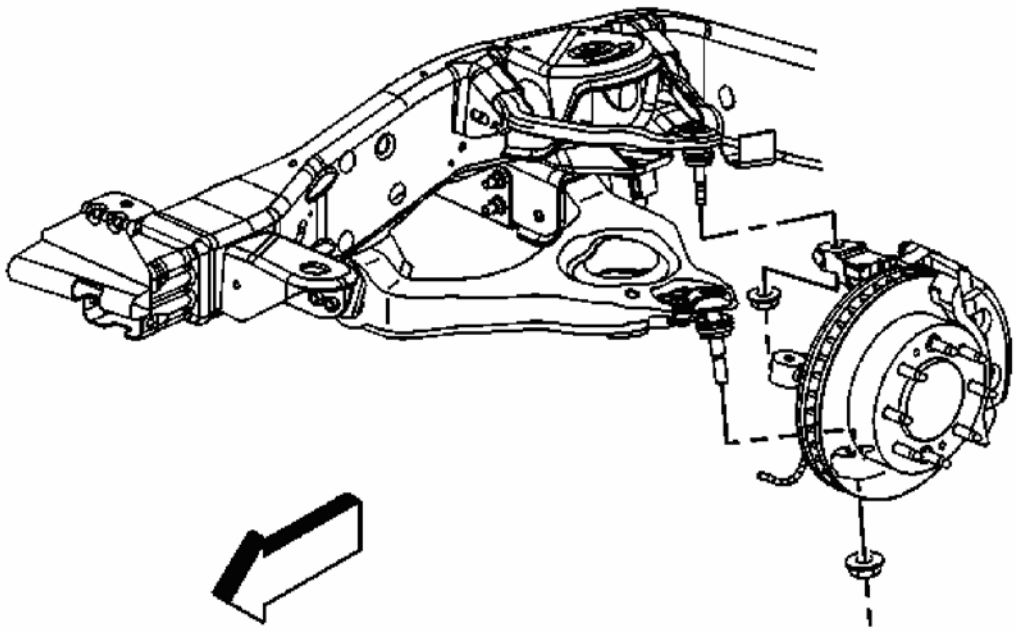

Fig. 15: Steering Knuckle (Coil Spring Suspension)
Courtesy of GENERAL MOTORS CORP.

10. Remove the steering knuckle.

Installation Procedure

1. Clean all grease and contaminants from the tapered section and the threads of the upper ball joint, the lower ball joint, and the tie rod end.
2. Clean and inspect the taper holes and the mounting surfaces of the steering knuckle. If any of the tapered holes are elongated, out of round, or damaged, the replace the steering knuckle.

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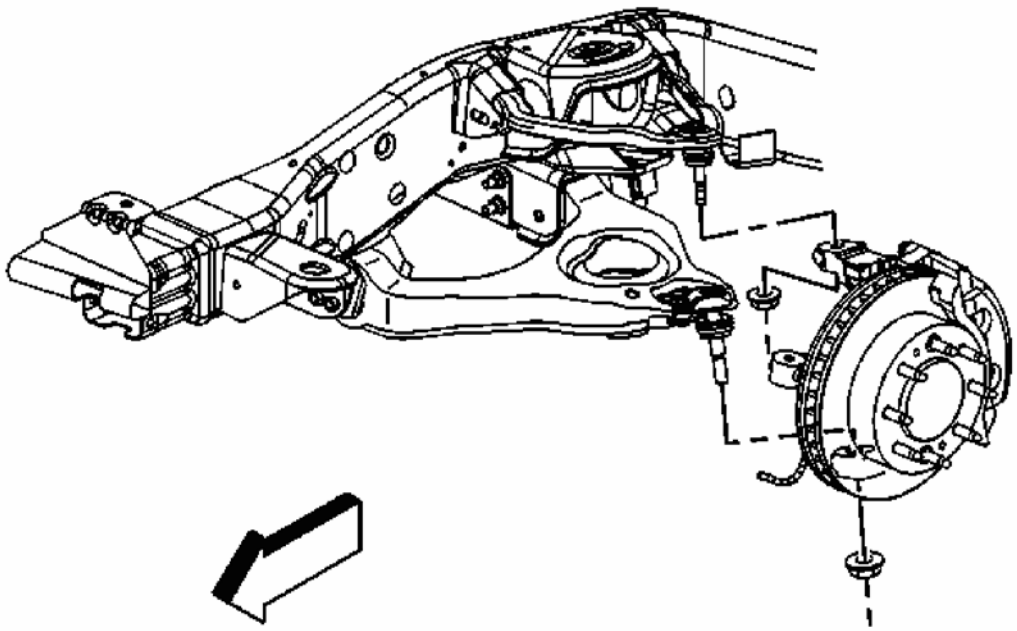

Fig. 16: Steering Knuckle (Coil Spring Suspension)
Courtesy of GENERAL MOTORS CORP.

3. Install the steering knuckle.

NOTE: Refer to Fastener Notice in Cautions and Notices.

4. Connect the lower ball joint to the steering knuckle and install the retaining nut.

   Tighten: Tighten the retaining nut to 100 N.m (74 lb ft).

5. Connect the upper ball joint to the steering knuckle and install the retaining nut.

   Tighten: Tighten the retaining nut to 50 N.m (37 lb ft).

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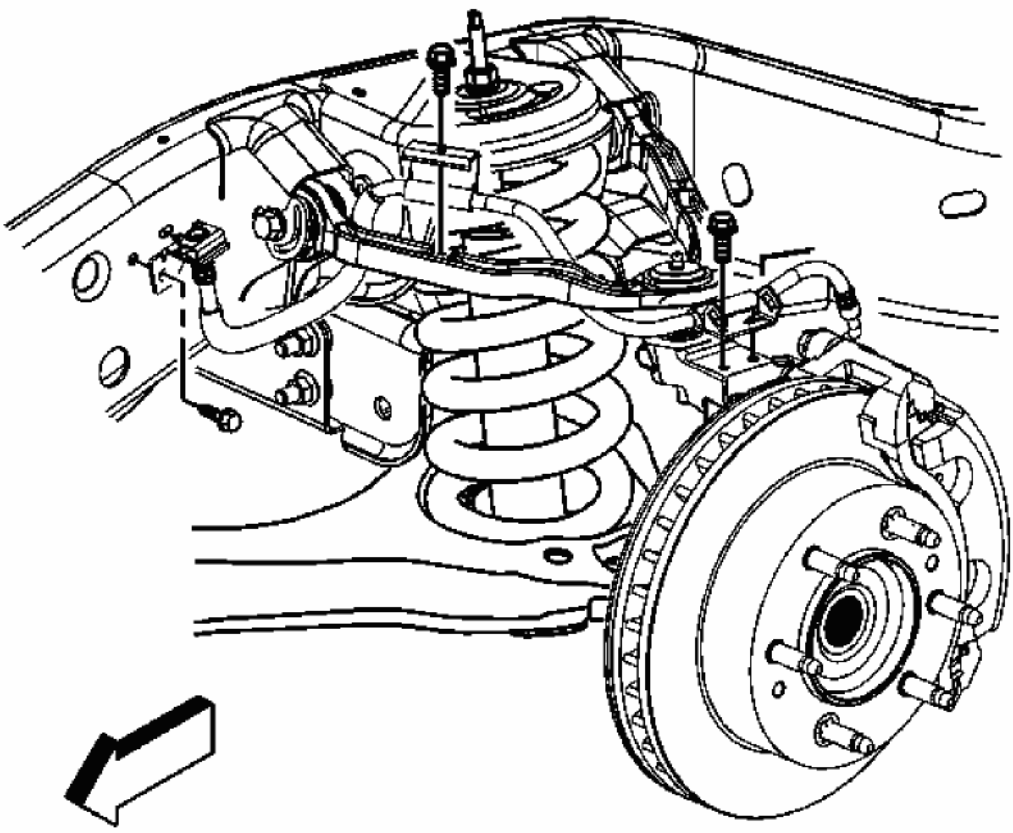

Fig. 17: View Of Retaining Bolts For Brake Hose And Wheel Speed Sensor Brackets
Courtesy of GENERAL MOTORS CORP.

6. Install the brake hose bracket retaining bolt to the knuckle.

   Tighten: Tighten the bolt to 9 N.m (80 lb in).

7. Install the outer tie rod to the steering knuckle. Refer to **Tie Rod Replacement** in Steering Linkage (Non- Rack and Pinion).
8. Install the wheel hub and bearing. Refer to **Wheel Hub, Bearing, and Seal Replacement (RWD)** or **Wheel Hub, Bearing, and Seal Replacement (4WD)**.
9. Connect the ESC link rod to the sensor, if equipped. Refer to **Front Position Sensor Link Assembly Replacement - Electronic Suspension** in Electronic Suspension Control.
10. Install the tire and wheel. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.

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11. Remove the safety stands.
12. Lower the vehicle.

STEERING KNUCKLE REPLACEMENT (TORSION BAR SUSPENSION)

- **J 43631** Ball Joint Remover
- **J 45851** Ball Joint Separator Protector Adapters. See **Special Tools and Equipment**.

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.

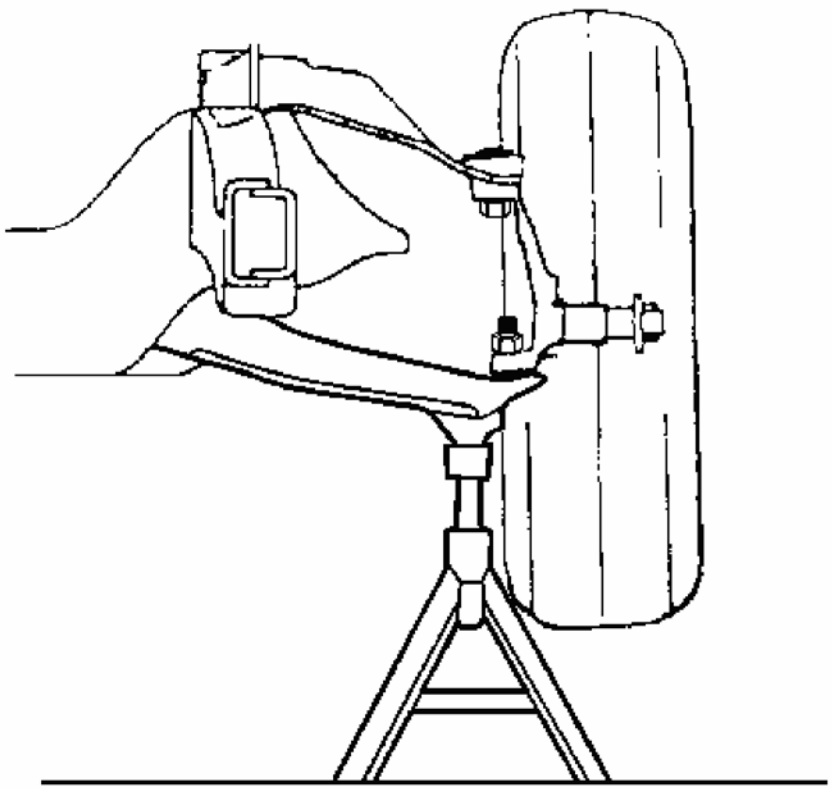

Fig. 18: Supporting Lower Control Arm With Jack Stand
Courtesy of GENERAL MOTORS CORP.

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3. Support the control arm with a safety stand.
4. Disconnect the Electronic Suspension Control (ESC) link rod from the sensor, if equipped. Refer to **Front Position Sensor Link Assembly Replacement - Electronic Suspension** in Electronic Suspension Control.
5. Unload the torsion bars. Refer to **Torsion Bar Replacement**.
6. Remove the wheel hub and bearing assembly. Refer to **Wheel Hub, Bearing, and Seal Replacement (RWD)** or **Wheel Hub, Bearing, and Seal Replacement (4WD)**.
7. Remove the outer tie rod to the steering knuckle. Refer to **Tie Rod Replacement** in Steering Linkage (Non- Rack and Pinion).

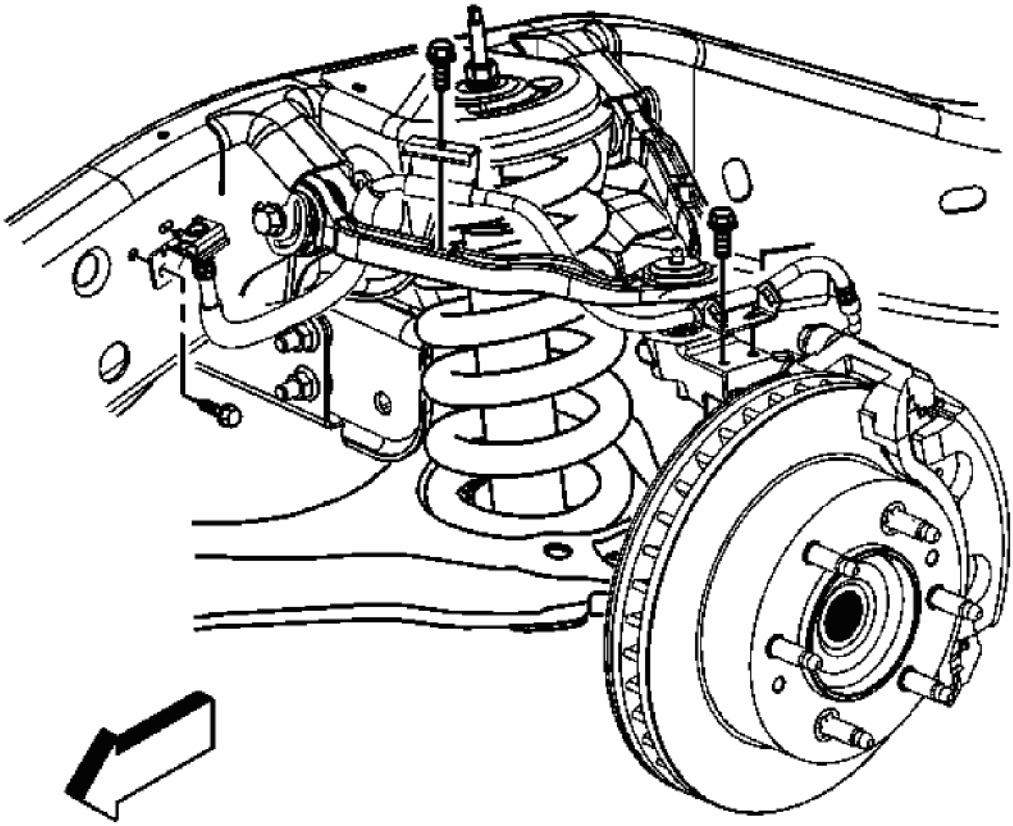

Fig. 19: View Of Retaining Bolts For Brake Hose And Wheel Speed Sensor Brackets
Courtesy of GENERAL MOTORS CORP.

8. Remove the brake hose bracket retaining bolt from the steering knuckle.

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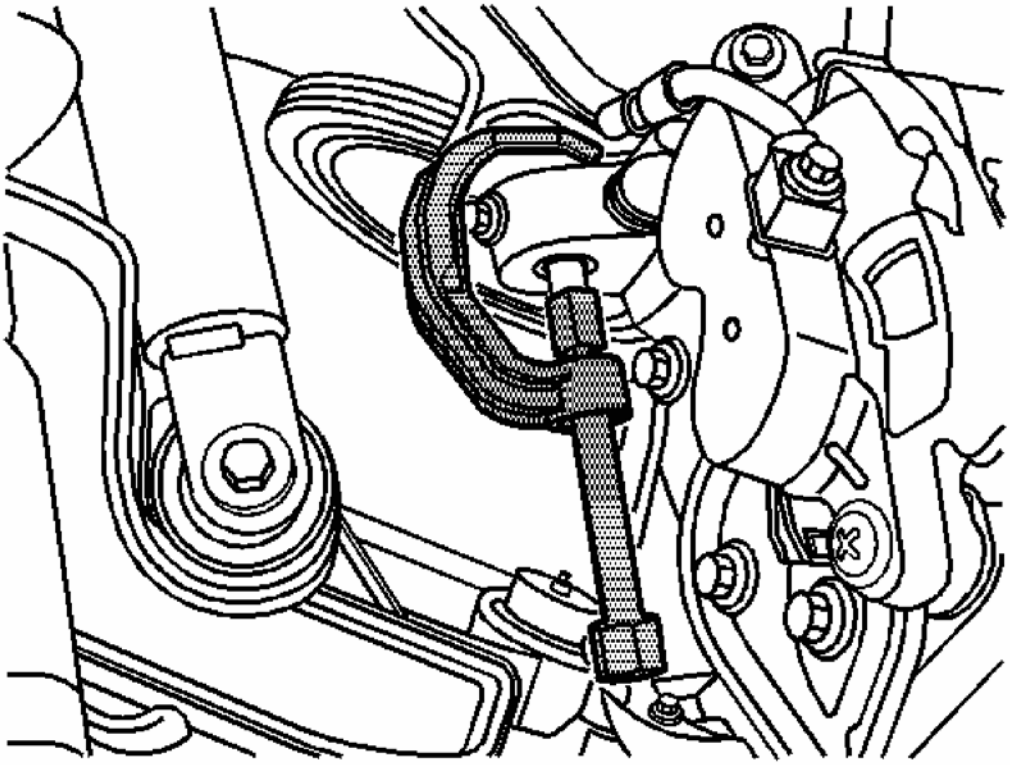

Fig. 20: Disconnecting Upper Control Arm From The Steering Knuckle
Courtesy of GENERAL MOTORS CORP.

9. Remove the upper control arm retaining nut and separate the upper ball joint from the steering knuckle using the **J 43631** and **J 45851** . See **Special Tools and Equipment**.

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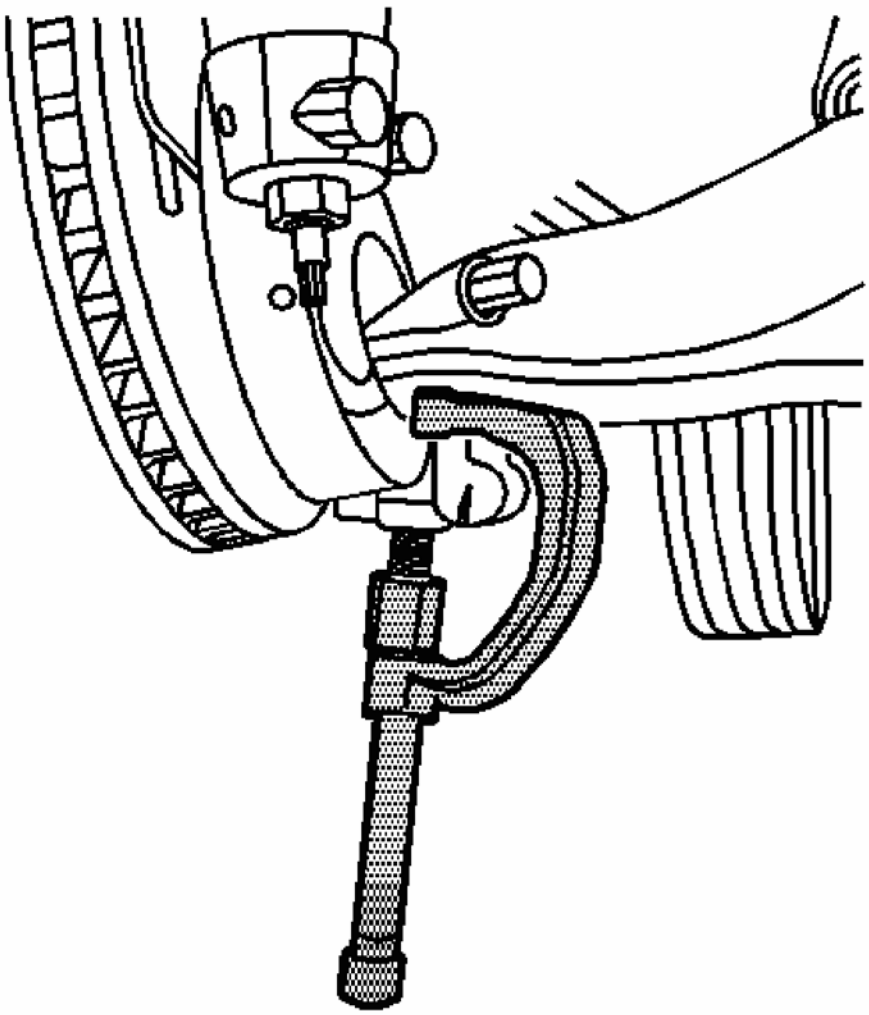

Fig. 21: Separating The Lower Ball Joint From The Steering Knuckle
Courtesy of GENERAL MOTORS CORP.

10. Remove the lower ball joint retaining nut. Separate the lower ball joint from the steering knuckle using the **J 43631** and **J 45851** . See **Special Tools and Equipment**.

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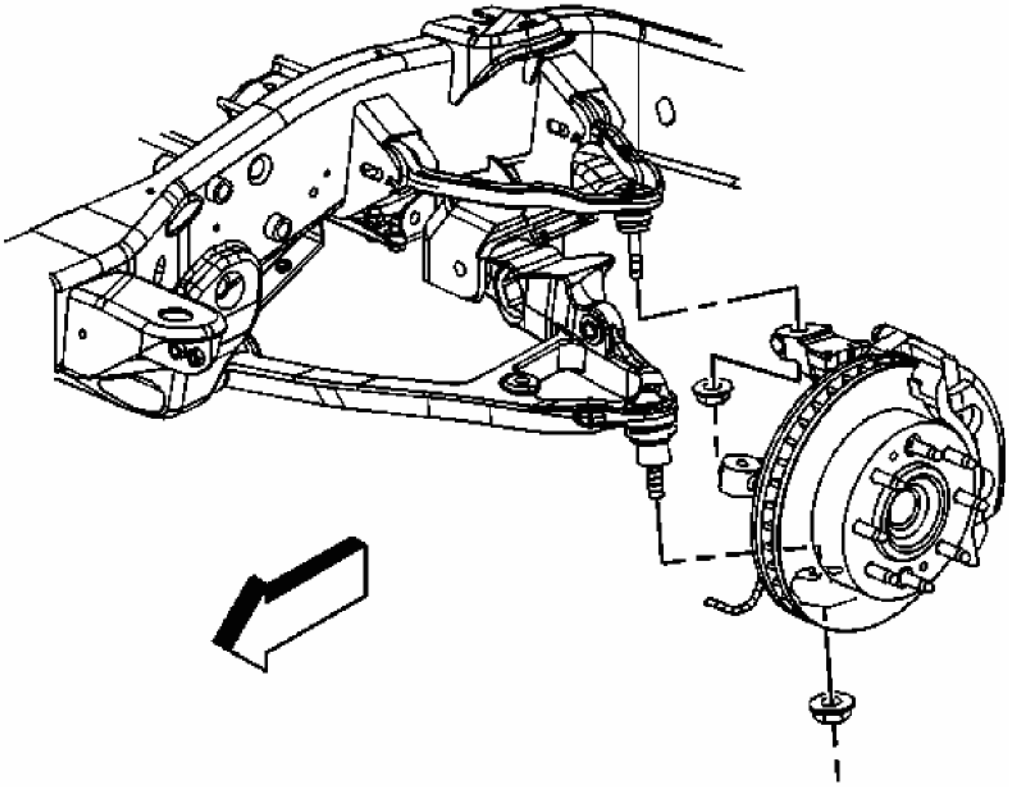

Fig. 22: Steering Knuckle (Torsion Bar Suspension)
Courtesy of GENERAL MOTORS CORP.

11. Remove the steering knuckle.

Installation Procedure

1. Clean all grease and contaminants from the tapered section and the threads of the upper ball joint, the lower ball joint, and the tie rod end.
2. Clean and inspect the taper holes and the mounting surfaces of the steering knuckle. If any of the tapered holes are elongated, out of round, or damaged, replace the steering knuckle.

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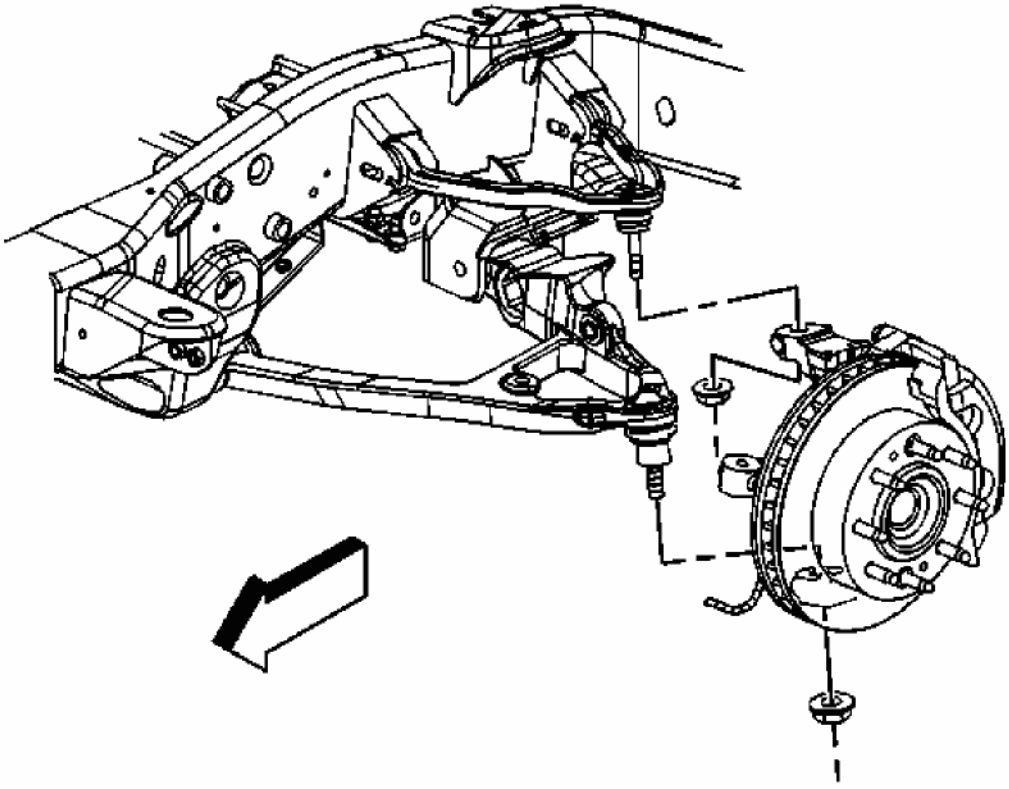

Fig. 23: Steering Knuckle (Torsion Bar Suspension)
Courtesy of GENERAL MOTORS CORP.

3. Install the steering knuckle.

NOTE: Refer to Fastener Notice in Cautions and Notices.

4. Connect the lower ball joint to the steering knuckle and install the retaining nut.

   Tighten: Tighten the lower control arm retaining nut to 100 N.m (74 lb ft).

5. Connect the upper ball joint to the steering knuckle and install the retaining nut.

   Tighten: Tighten the upper control arm retaining nut to 50 N.m (37 lb ft).

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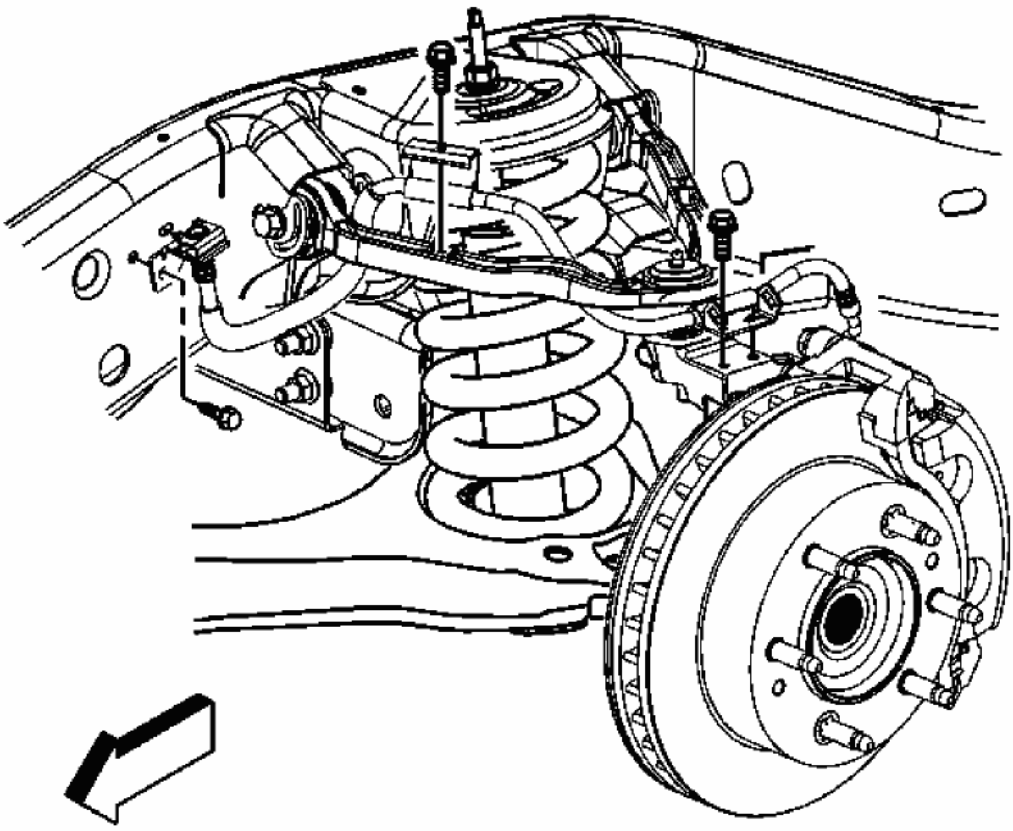

Fig. 24: View Of Retaining Bolts For Brake Hose And Wheel Speed Sensor Brackets
Courtesy of GENERAL MOTORS CORP.

6. Install the brake hose and the bracket retaining bolt to the steering knuckle

   Tighten: Tighten the bolt to 9 N.m (80 lb in).

7. Install the outer tie rod to the steering knuckle. Refer to **Tie Rod Replacement** in Steering Linkage (Non- Rack and Pinion).
8. Install the wheel hub and bearing assembly. Refer to **Wheel Hub, Bearing, and Seal Replacement (RWD)** or **Wheel Hub, Bearing, and Seal Replacement (4WD)**.
9. Connect the ESC link rod to the sensor, if equipped. Refer to **Front Position Sensor Link Assembly Replacement - Electronic Suspension** in Electronic Suspension Control.
10. Install the tire and wheel. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.

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11. Load the torsion bars. Refer to **Torsion Bar Replacement**.
12. Remove the safety stands.
13. Lower the vehicle.
14. Check the wheel alignment. Refer to **Measuring Wheel Alignment (w/Rear Wheel Steering)** or **Measuring Wheel Alignment (w/o Rear Wheel Steering)** in Wheel Alignment.

UPPER CONTROL ARM REPLACEMENT

Tools Required

- **J 43631** Ball Joint Separator
- **J 45851** Ball Joint Separator Protector Adapters. See **Special Tools and Equipment**.

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. Disconnect the electronic suspension control (ESC) link rod from the sensor, if equipped. Refer to **Front Position Sensor Link Assembly Replacement - Electronic Suspension** in Electronic Suspension Control.

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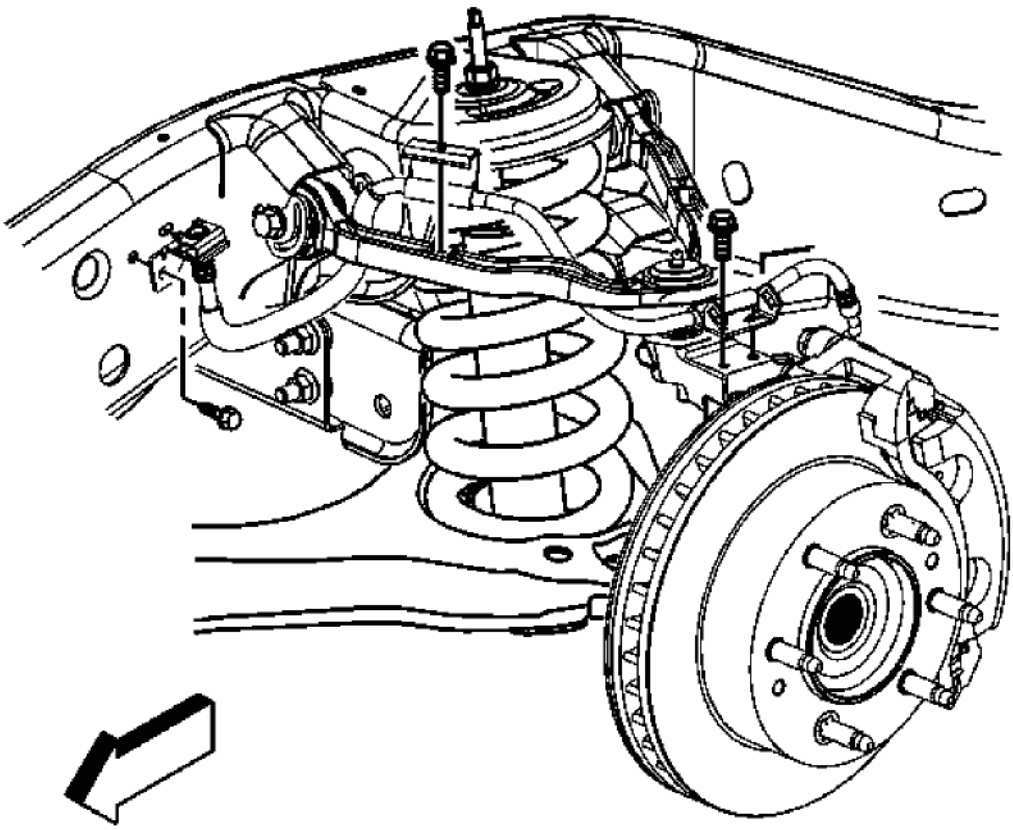

Fig. 25: View Of Retaining Bolts For Brake Hose And Wheel Speed Sensor Brackets
Courtesy of GENERAL MOTORS CORP.

4. Remove the retaining bolt for the brake hose and the wheel speed sensor brackets.
5. Remove the wheel drive shaft. Refer to **Wheel Drive Shaft Replacement** in Wheel Drive Shafts.

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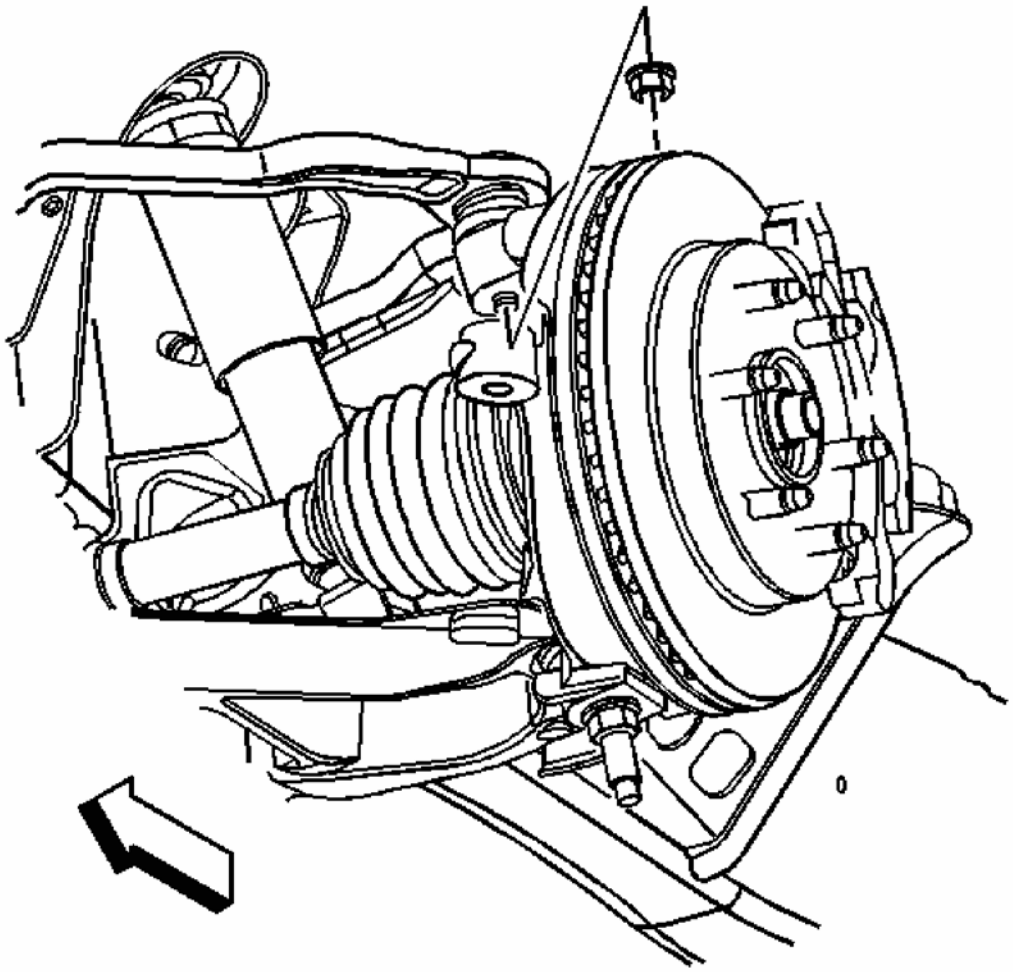

Fig. 26: Upper Ball Joint Retaining Nut
Courtesy of GENERAL MOTORS CORP.

6. Remove the upper ball joint retaining nut.

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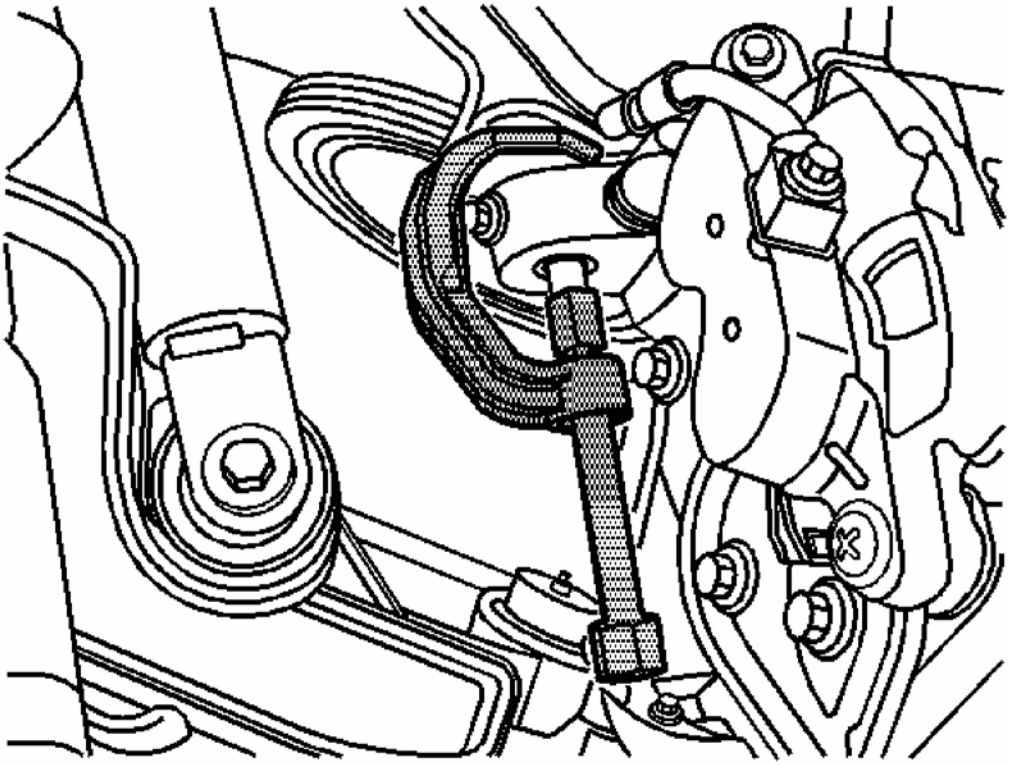

Fig. 27: Disconnecting Upper Control Arm From The Steering Knuckle
Courtesy of GENERAL MOTORS CORP.

7. Disconnect the upper control arm from the steering knuckle using the **J 43631** and **J 45851** . See **Special Tools and Equipment**.

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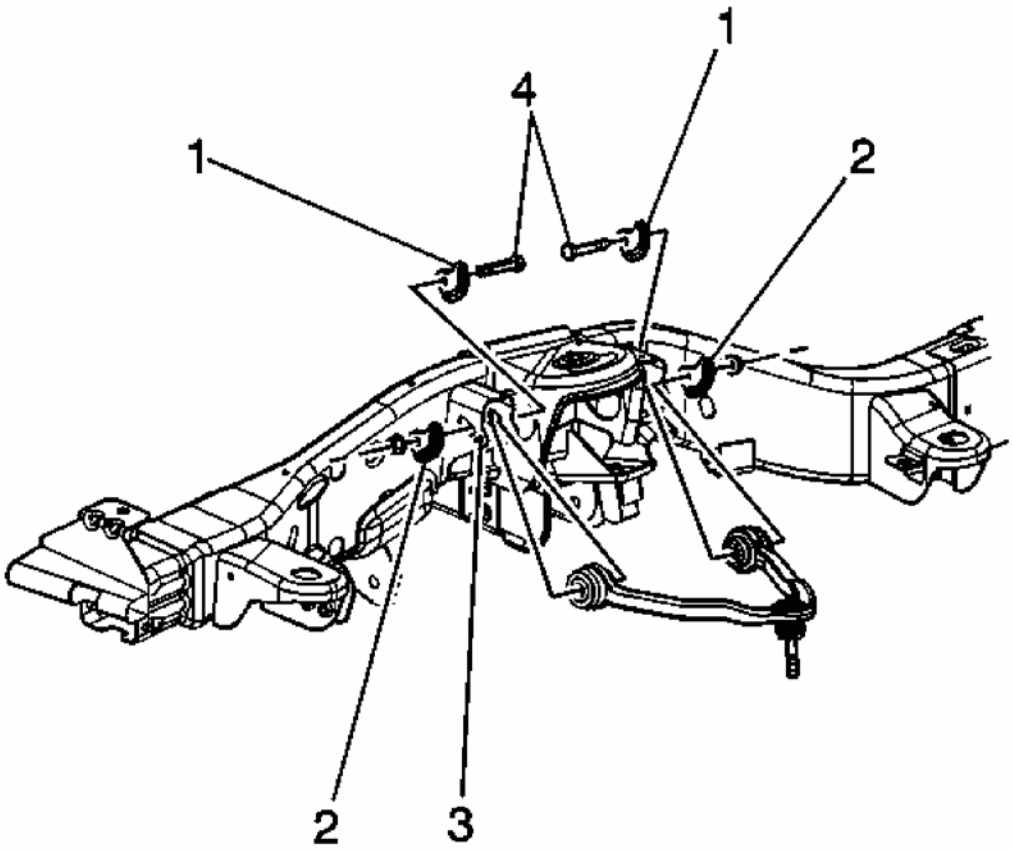

Fig. 28: Upper Control Arm, Nuts, Bolts & Adjustment Cams (25/35 Series 2WD)
Courtesy of GENERAL MOTORS CORP.

8. Remove the upper control arm nuts and the adjustment cams (2) for the 15 Series 2WD, 4WD, and 25/35 Series 2WD.
9. Remove the upper control arm bolts (4) for the 15 Series 2WD, 4WD, and 25/35 Series 2WD.

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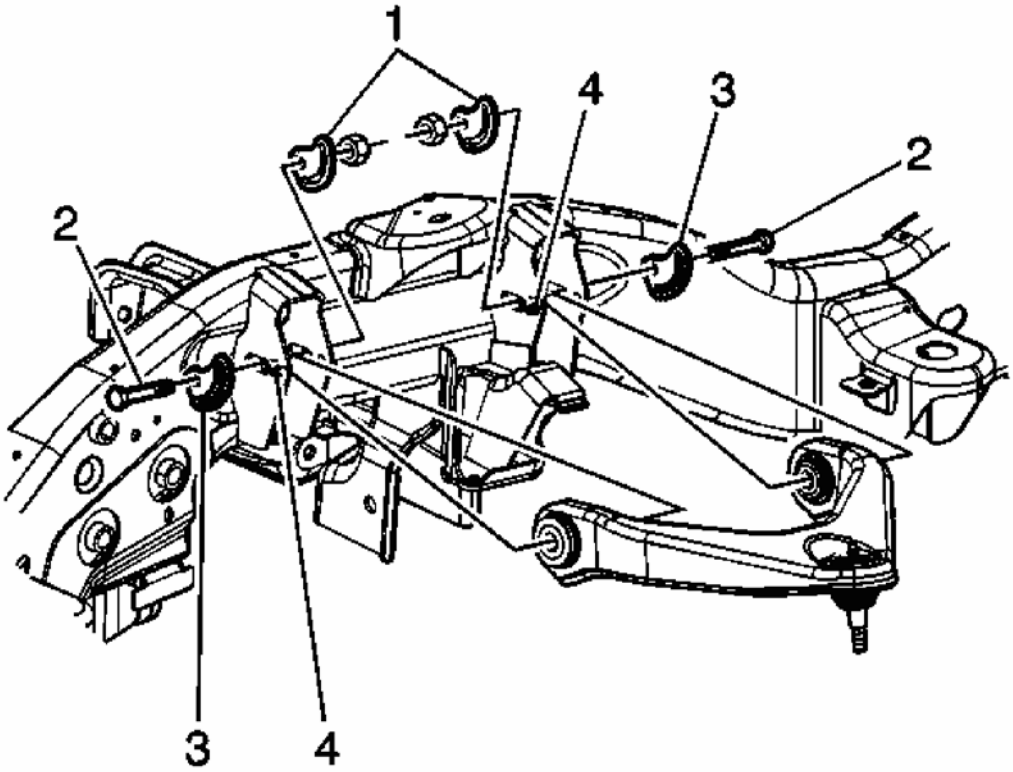

Fig. 29: Upper Control Arm, Nuts, Bolts & Adjustment Cams (25/35 Series 4WD)
Courtesy of GENERAL MOTORS CORP.

10. Remove the upper control arm nuts and the adjustment cams (2) for the 25/35 Series 4WD.
11. Remove the upper control arm bolts (4) for the 25/35 Series 4WD.
12. Remove the upper control arm.

Installation Procedure

1. Install the upper control arm.

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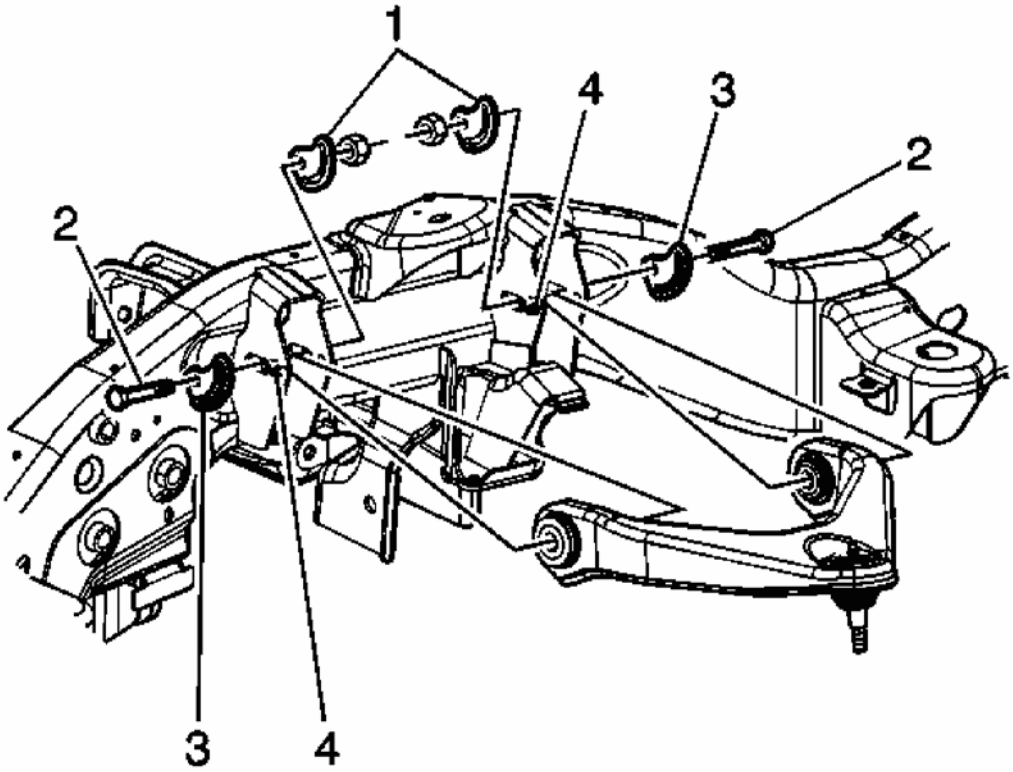

Fig. 30: Upper Control Arm, Nuts, Bolts & Adjustment Cams (25/35 Series 4WD)
Courtesy of GENERAL MOTORS CORP.

2. Install the upper control arm bolts (4) for the 25/35 Series 4WD.

NOTE: Refer to Fastener Notice in Cautions and Notices.

3. Install the upper control arm nuts and the adjustment cams (2) 25/35 Series 4WD.

Tighten: Tighten the nuts to 190 N.m (140 lb ft).

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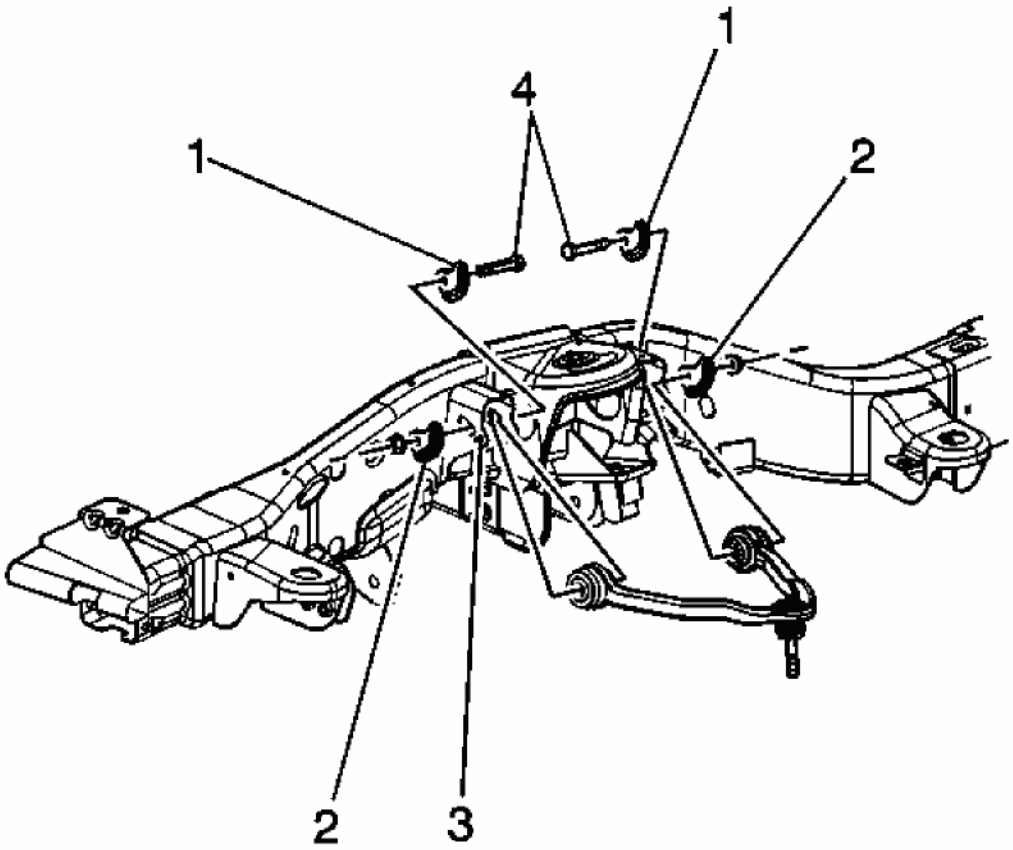

Fig. 31: Upper Control Arm, Nuts, Bolts & Adjustment Cams (25/35 Series 2WD)
Courtesy of GENERAL MOTORS CORP.

4. Install the upper control arm bolts (4) for the 15 Series 2WD, 4WD, and 25/35 Series 2WD.
5. Install the upper control arm nuts and the adjustment cams (2) for the 15 Series 2WD, 4WD, and 25/35 Series 2WD.

   Tighten: Tighten the nuts to 190 N.m (140 lb ft).

6. Connect the upper control arm to the steering knuckle.
7. Install the wheel drive shaft. Refer to **Wheel Drive Shaft Replacement** in Wheel Drive Shafts.

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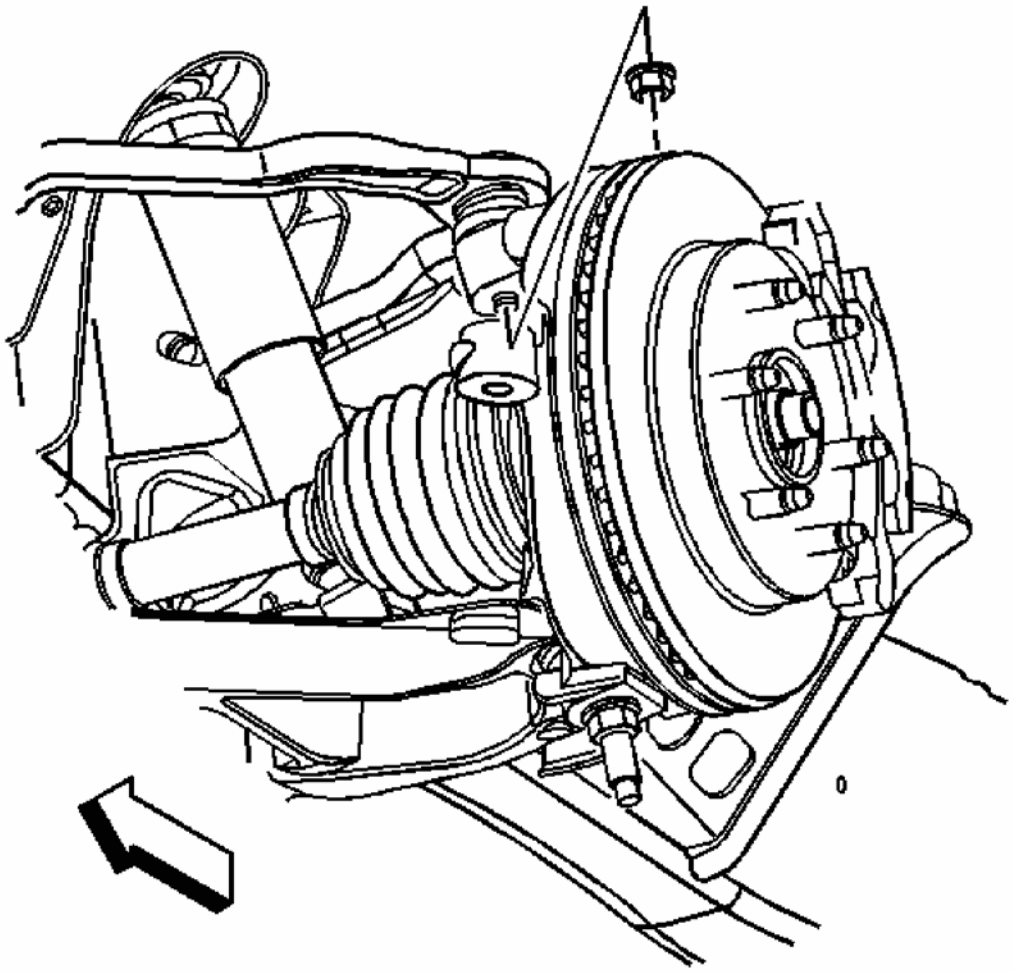

Fig. 32: Upper Ball Joint Retaining Nut
Courtesy of GENERAL MOTORS CORP.

8. Install the new nut to the upper ball joint stud.

   Tighten: Tighten the nut to 50 N.m (37 lb ft).

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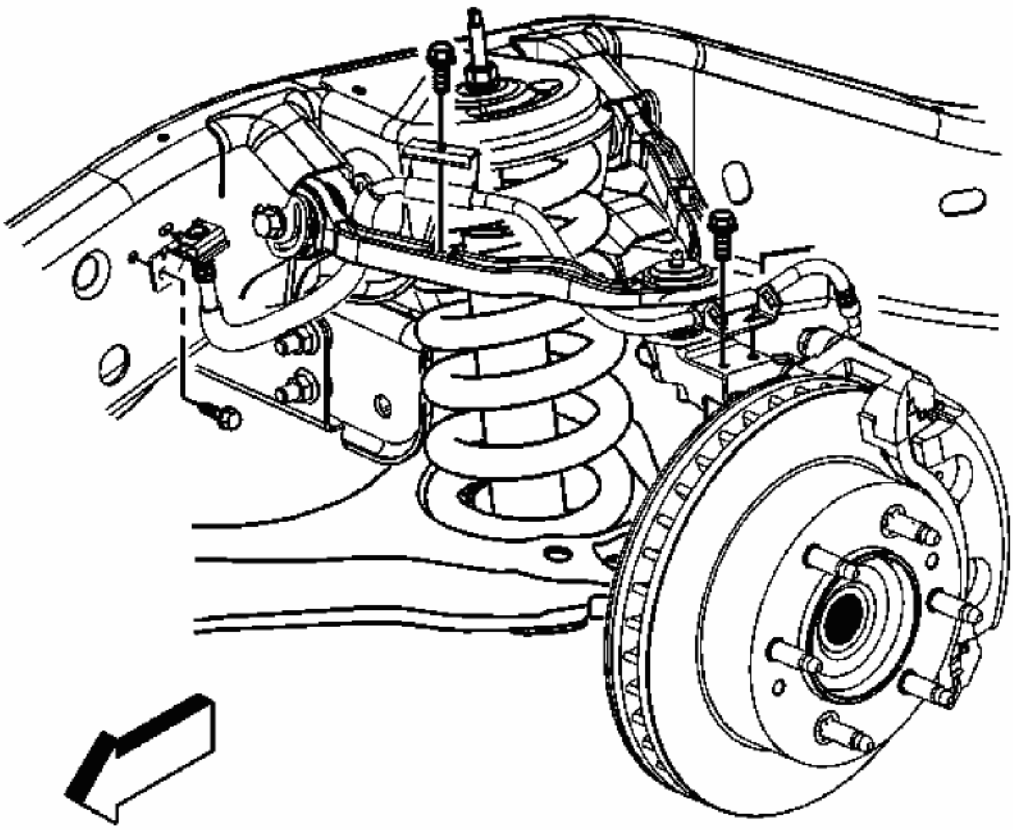

Fig. 33: View Of Retaining Bolts For Brake Hose And Wheel Speed Sensor Brackets
Courtesy of GENERAL MOTORS CORP.

9. Install the retaining bolts for the brake hose and wheel speed sensor brackets.

   Tighten: Tighten the bolts to 9 N.m (80 lb in).

10. Connect the ESC link rod to the sensor, if equipped. Refer to **Front Position Sensor Link Assembly Replacement - Electronic Suspension** in Electronic Suspension Control.
11. Install the tire and wheel. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.
12. Remove the safety stands.
13. Lower the vehicle.
14. Verify the wheel alignment. Refer to **Measuring Wheel Alignment (w/Rear Wheel Steering)** or **Measuring Wheel Alignment (w/o Rear Wheel Steering)** in Wheel

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Alignment.

LOWER CONTROL ARM REPLACEMENT

Tools Required

- **J 43631** Ball Joint Separator
- **J 45851** Ball Joint Separator Protector Adapters. See **Special Tools and Equipment**.

Removal Procedure

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

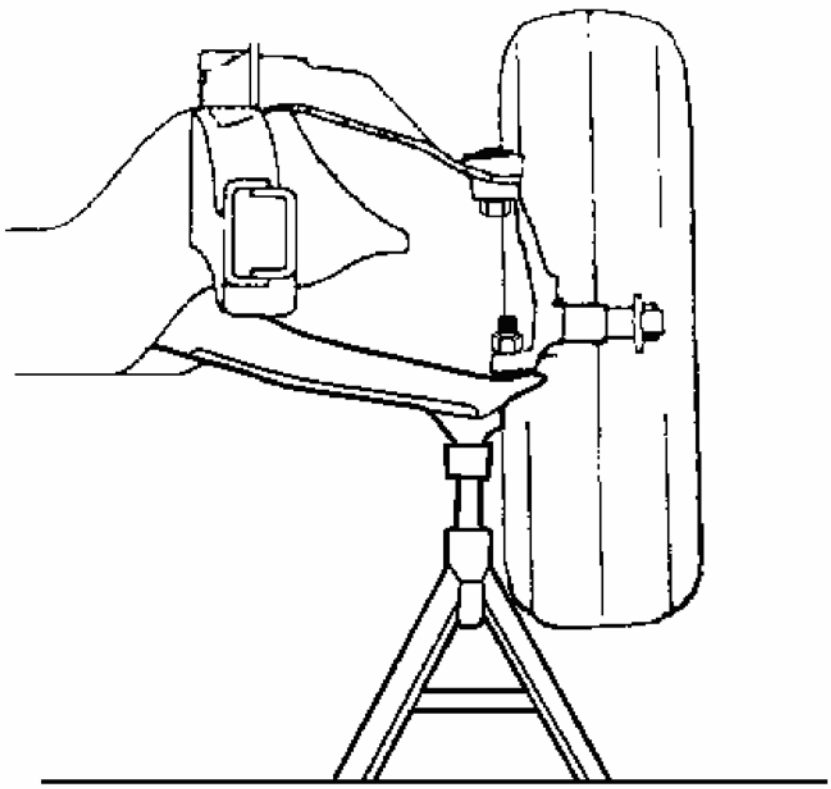

Fig. 34: Supporting Lower Control Arm With Jack Stand
Courtesy of GENERAL MOTORS CORP.

2. Support the lower control arm with a safety stand.

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3. Remove the tire and wheel. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.
4. Remove the stabilizer shaft links from the lower control arm. Refer to **Stabilizer Shaft Replacement**.
5. Remove the shock absorber lower nut and the bolt. Refer to **Shock Absorber Replacement**.
6. Remove the torsion bars. Refer to **Torsion Bar Replacement**.
7. Remove the wheel drive shaft. Refer to **Wheel Drive Shaft Replacement** in Wheel Drive Shafts.

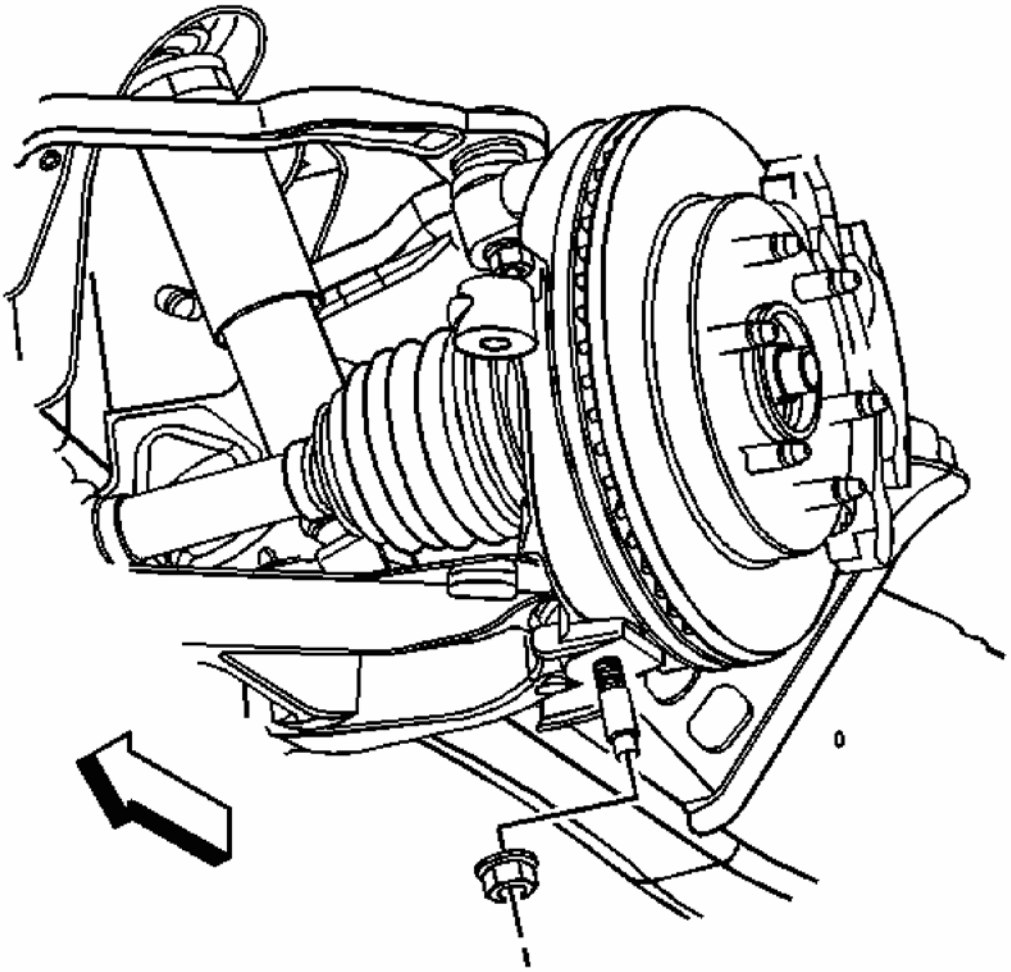

Fig. 35: Removing/Installing The Lower Ball Joint Retaining Nut
Courtesy of GENERAL MOTORS CORP.

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8. Remove the lower ball joint retaining nut.

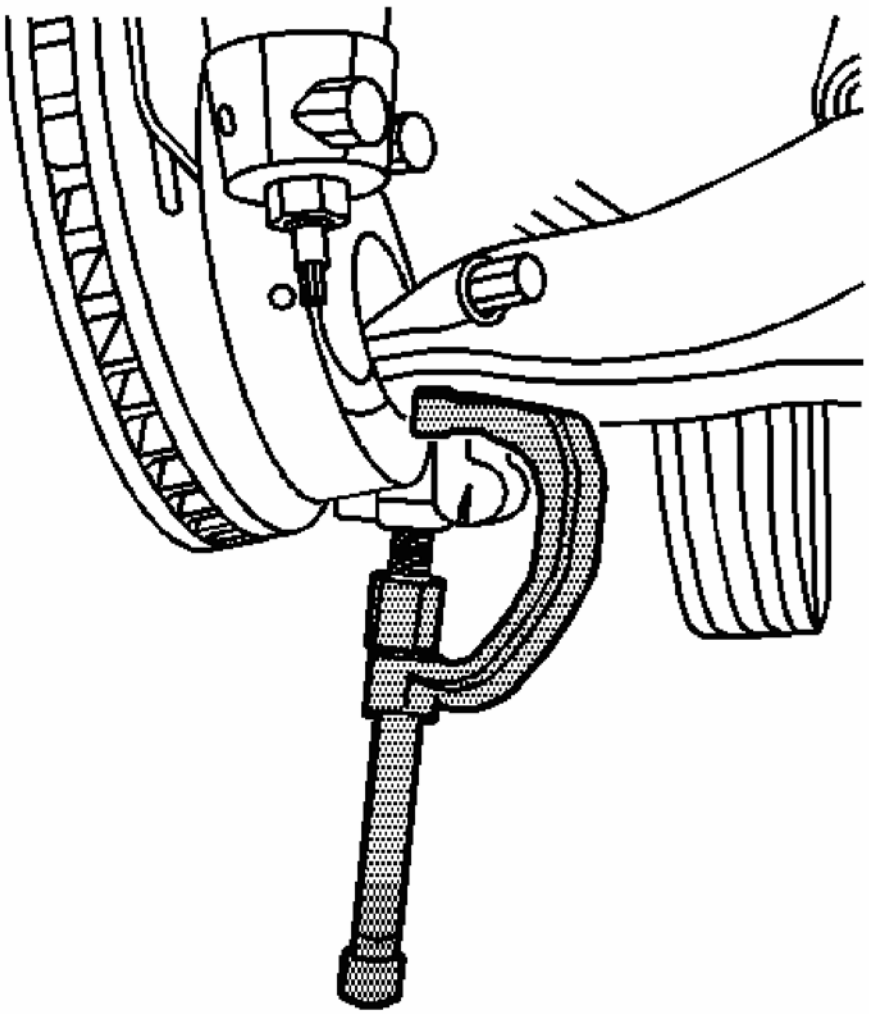

Fig. 36: Separating The Lower Ball Joint From The Steering Knuckle
Courtesy of GENERAL MOTORS CORP.

9. Disconnect the lower ball joint stud from the steering knuckle using **J 43631** and **J 45851** . See **Special Tools and Equipment**.

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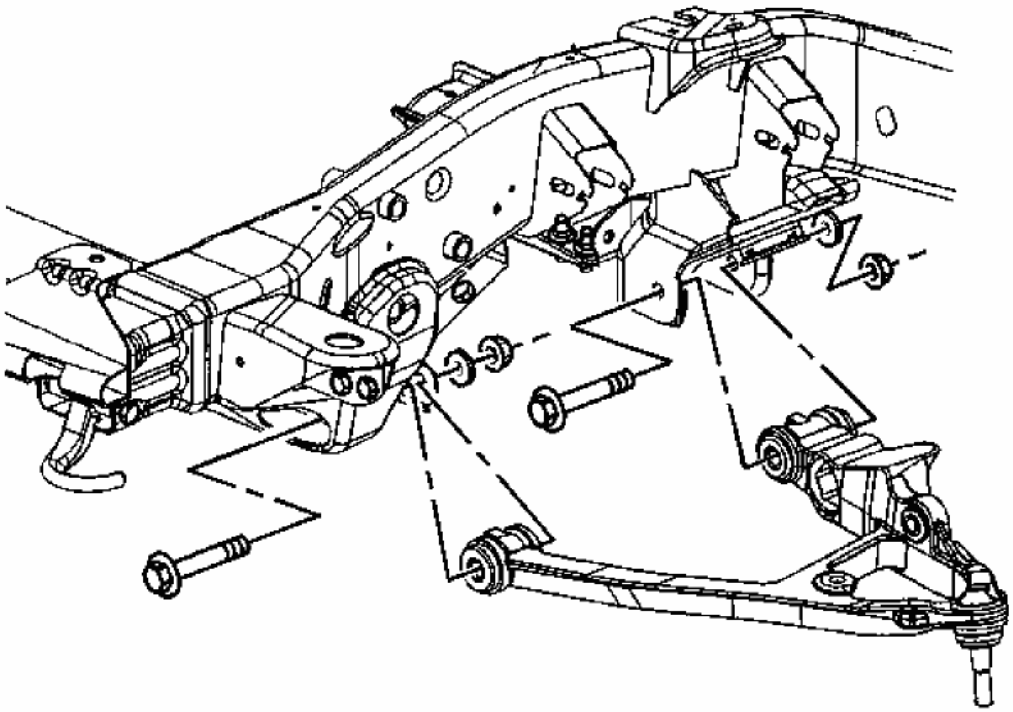

Fig. 37: Lower Control Arm, Nuts, Bolts & Washers (15 Series)
Courtesy of GENERAL MOTORS CORP.

10. Remove the lower control arm nuts and the 15-series washers.
11. Remove the lower control arm bolts.

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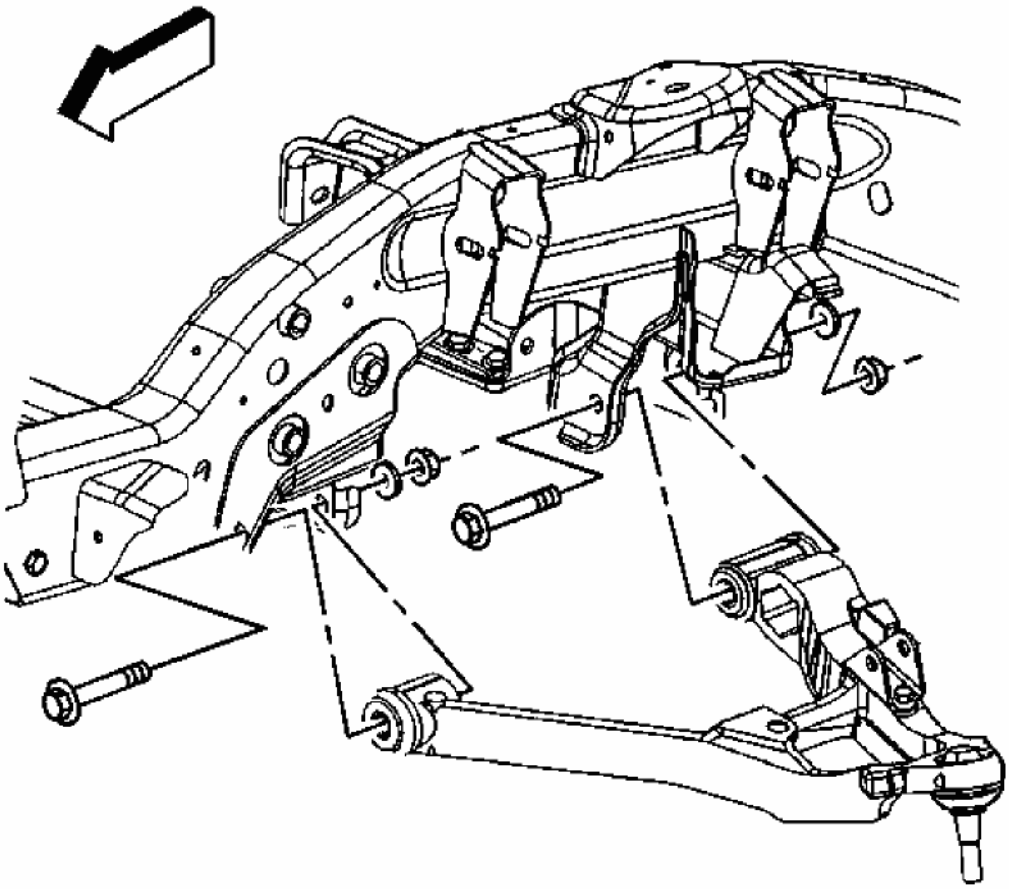

Fig. 38: Lower Control Arm, Nuts, Bolts & Washers (25/35 Series)
Courtesy of GENERAL MOTORS CORP.

12. Remove the lower control arm nuts and the 25/35-series washers.
13. Remove the lower control arm bolts.
14. Remove the lower control arm.

Installation Procedure

1. Install the lower control arm.

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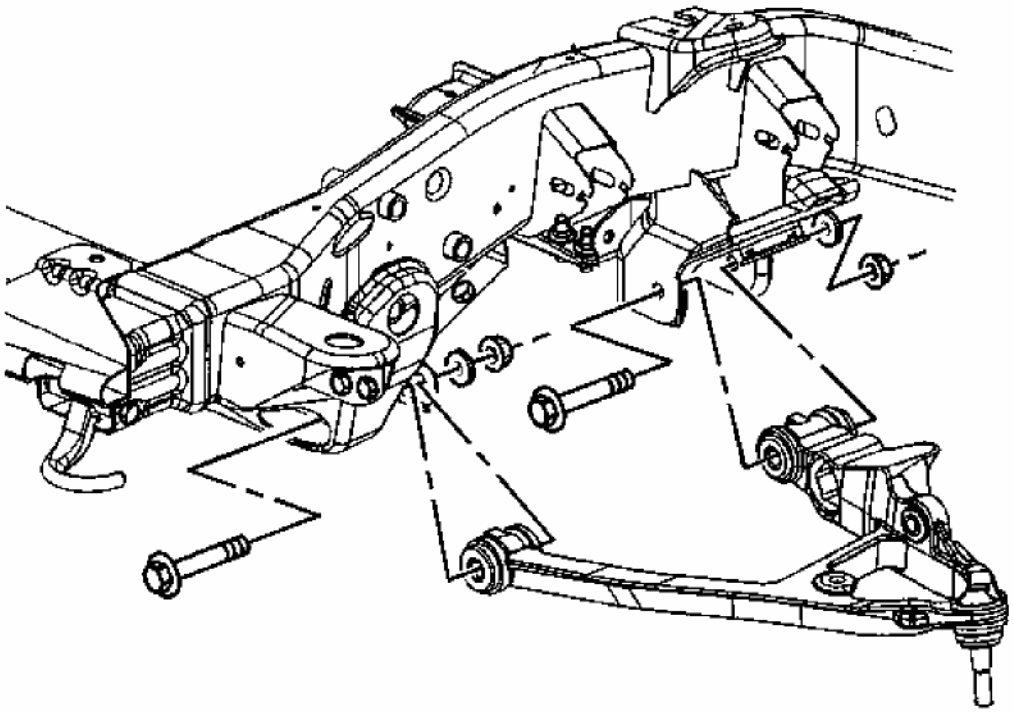

Fig. 39: Lower Control Arm, Nuts, Bolts & Washers (15 Series)
Courtesy of GENERAL MOTORS CORP.

2. Install the lower control arm 15-series bolts.

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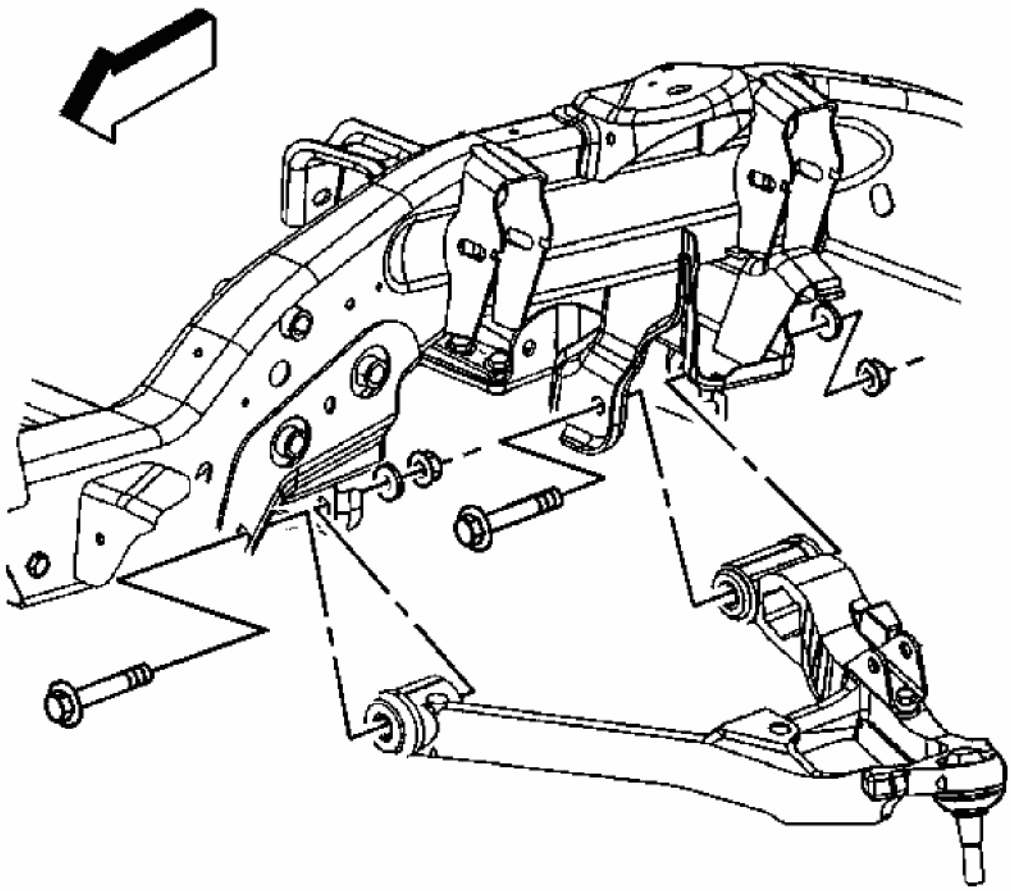

Fig. 40: Lower Control Arm, Nuts, Bolts & Washers (25/35 Series)
Courtesy of GENERAL MOTORS CORP.

3. Install the lower control arm 25/35-series bolts.

NOTE: Refer to Fastener Notice in Cautions and Notices.

4. Install the lower control arm retaining nuts.

   Tighten: Tighten the nuts to 175 N.m (129 lb ft).

5. Connect lower ball joint stud to the steering knuckle.
6. Install the wheel drive shaft. Refer to **Wheel Drive Shaft Replacement** in Wheel Drive Shafts.

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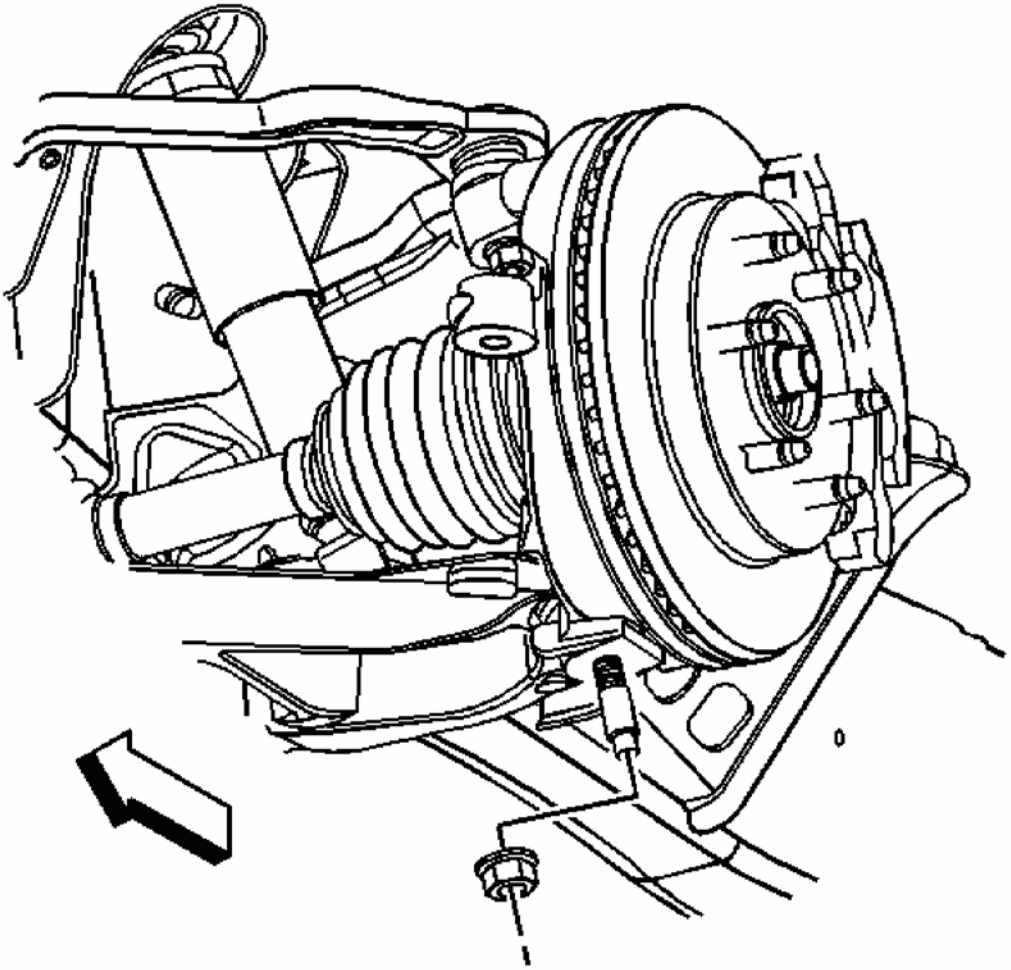

Fig. 41: Removing/Installing The Lower Ball Joint Retaining Nut
Courtesy of GENERAL MOTORS CORP.

7. Install the nut to the lower ball joint stud.

   Tighten: Tighten the nut to 100 N.m (74 lb ft).

8. Install the torsion bars. Refer to **Torsion Bar Replacement**.
9. Install the shock absorber lower nut and bolt. Refer to **Shock Absorber Replacement**.
10. Install the stabilizer shaft links to the lower control arm. Refer to **Stabilizer Shaft Replacement**.
11. Install the tire and wheel. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.

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12. Remove the safety stands.
13. Lower the vehicle.
14. Align the vehicle. Refer to **Measuring Wheel Alignment (w/Rear Wheel Steering)** or **Measuring Wheel Alignment (w/o Rear Wheel Steering)** in Wheel Alignment.

SPRING BUMPER REPLACEMENT

Removal Procedure

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

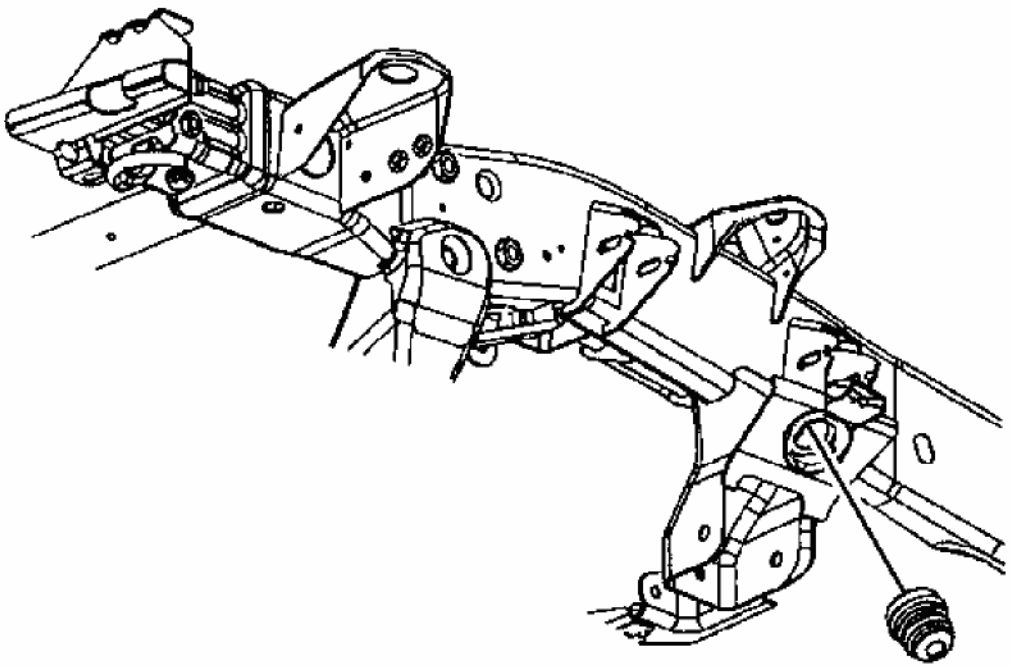

Fig. 42: Jounce Bumper (4WD 15 Series)
Courtesy of GENERAL MOTORS CORP.

2. Unsnap the jounce bumper from the mounting cup (4WD 15 Series).

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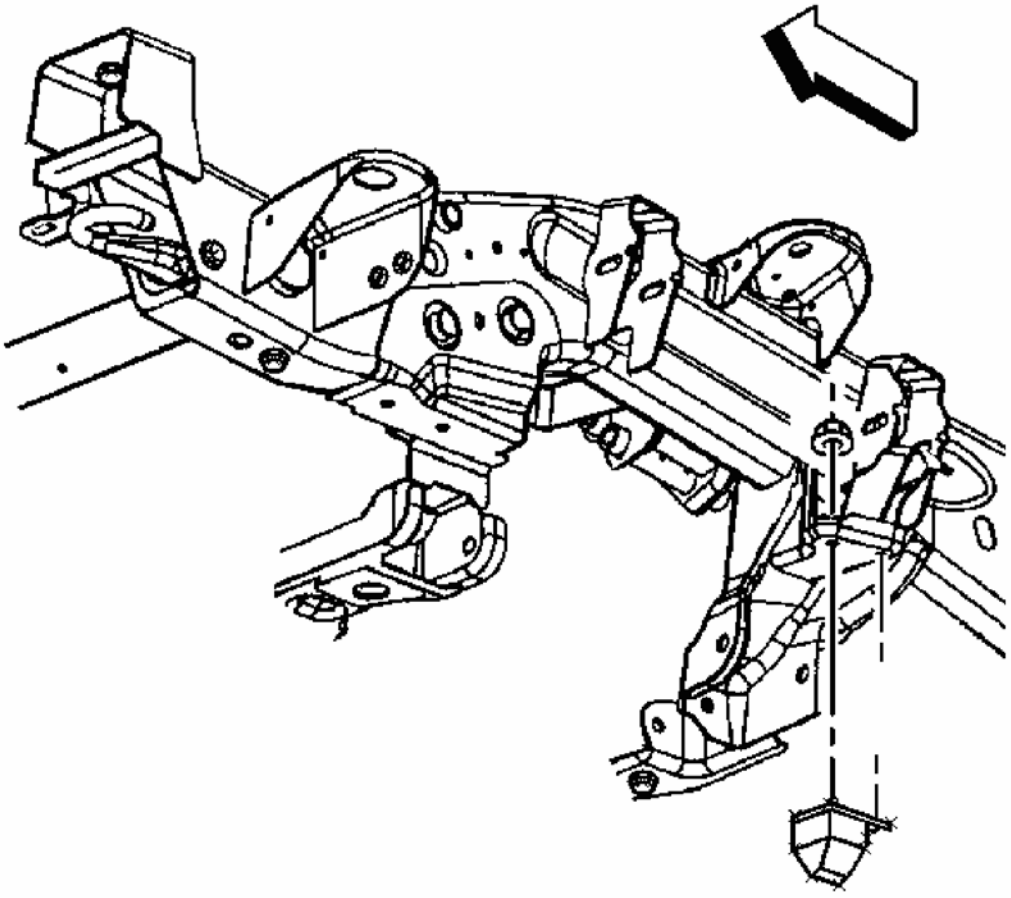

Fig. 43: Jounce Bumper (All 25/35 Series And RWD 15 Series With Coil Spring)
Courtesy of GENERAL MOTORS CORP.

3. Remove the nut from the jounce bumper stud (All 25/35 Series and RWD 15 Series with coil spring).
4. Remove the jounce bumper.

Installation Procedure

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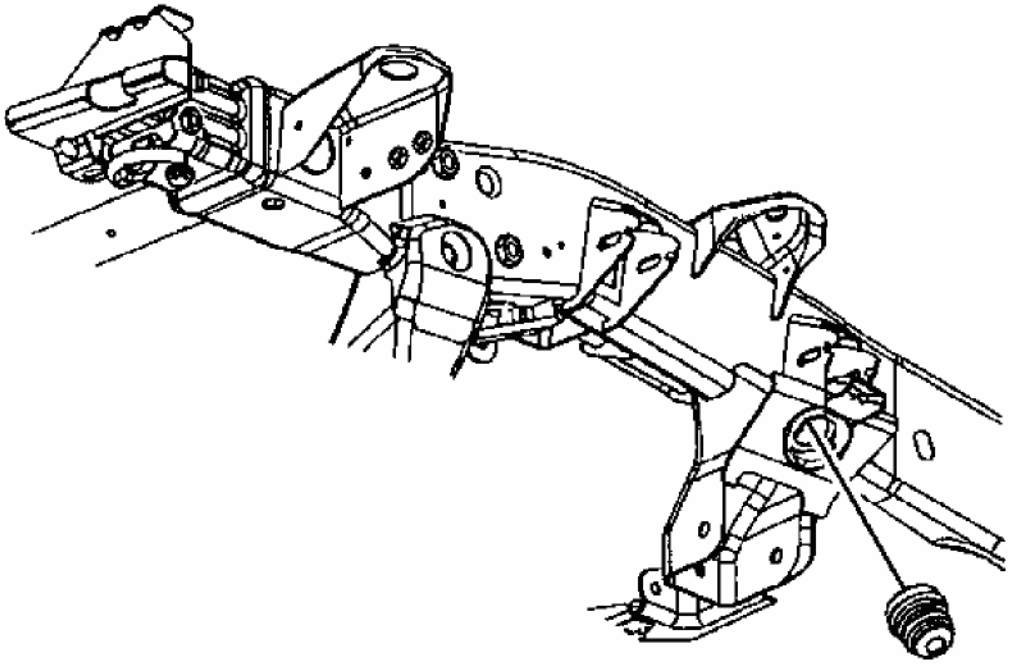

Fig. 44: Jounce Bumper (4WD 15 Series)
Courtesy of GENERAL MOTORS CORP.

1. Snap the jounce bumper to the mounting cup (4WD 15 Series).

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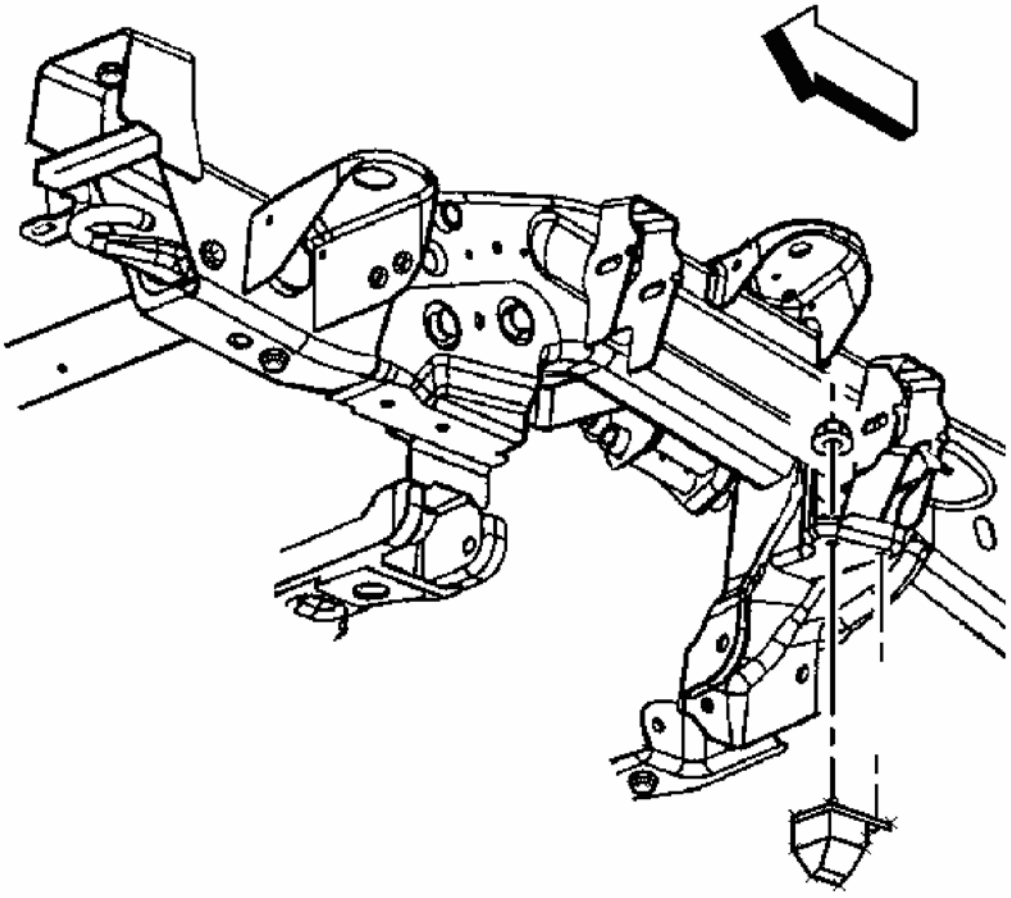

Fig. 45: Jounce Bumper (All 25/35 Series And RWD 15 Series With Coil Spring)
Courtesy of GENERAL MOTORS CORP.

2. Install the jounce bumper (All 25/35 Series and RWD 15 Series with coil spring).

NOTE: Refer to Fastener Notice in Cautions and Notices.

3. Install the nut to the jounce bumper stud.

   Tighten: Tighten the nut to 30 N.m (22 lb ft).

4. Remove the safety stands.
5. Lower the vehicle.

WHEEL STUD REPLACEMENT

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Tools Required

J 43631 Ball Joint Remover

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. Remove the brake rotor. Refer to **Brake Rotor Replacement - Front** in Disc Brakes.

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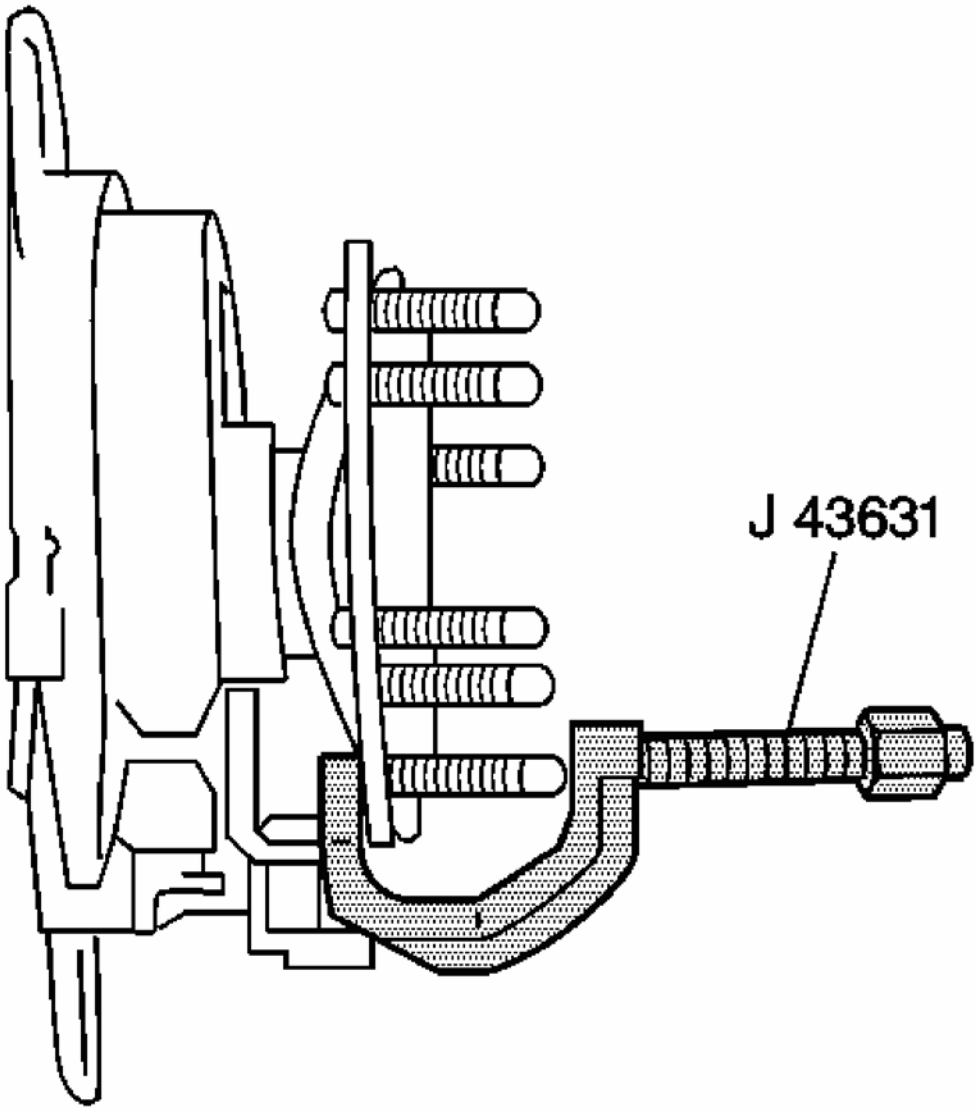

Fig. 46: Removing The Wheel Stud From The Hub Flange
Courtesy of GENERAL MOTORS CORP.

4. Remove the wheel stud from the hub flange using the **J 43631** .
5. Remove the wheel stud from the hub flange.

Installation Procedure

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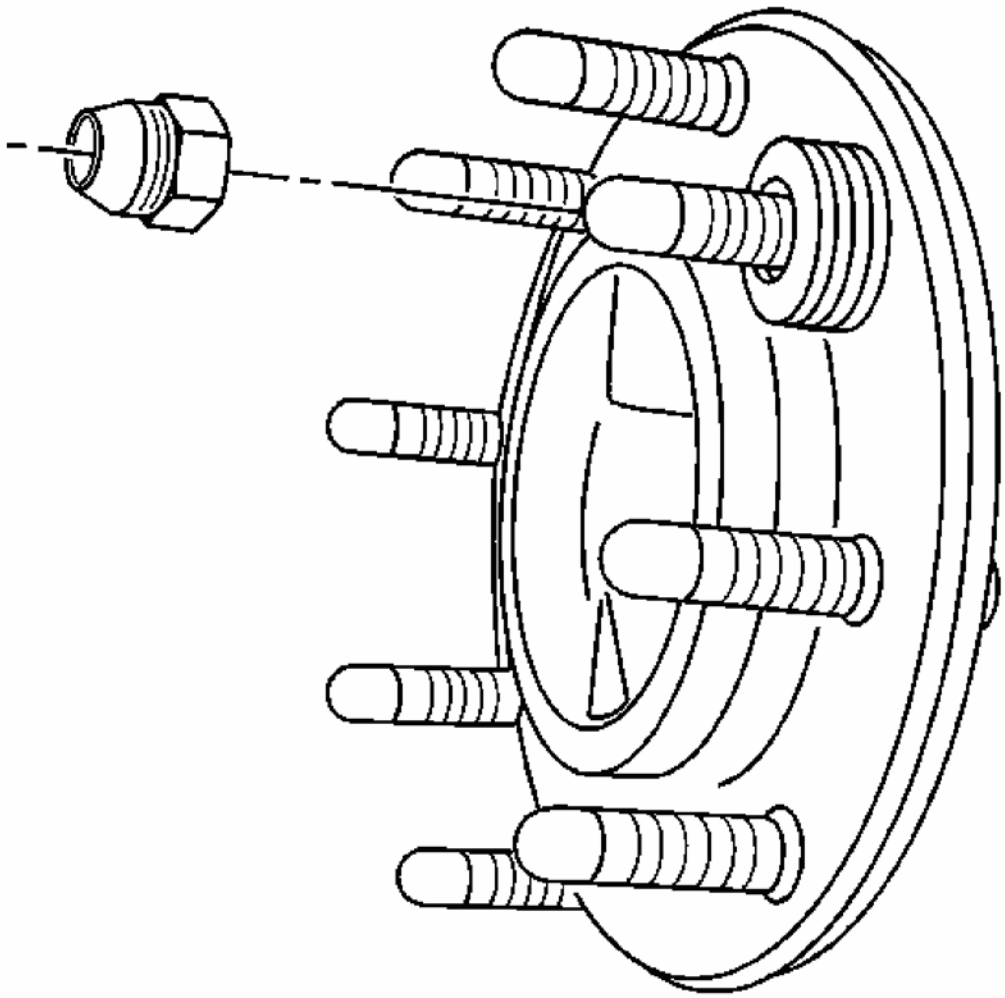

Fig. 47: View Of Wheel Studs, Hub & Rotor Assembly - Rear (W/Dual Wheels)
Courtesy of GENERAL MOTORS CORP.

1. Install the new stud into the hub flange hole using firm hand pressure.
2. Install 4 washers to the new wheel stud.
3. Thread a wheel nut onto the new stud with the flat side facing the front hub flange.
4. Tighten the lug nut until the stud contacts the back of the hub flange.
5. Remove the wheel nut.
6. Remove the washers.
7. Install the brake rotor. Refer to **Brake Rotor Replacement - Front** in Disc Brakes.
8. Install the tire and wheel. Refer to **Tire and Wheel Removal and Installation** in Tires

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and Wheels.

9. Remove the safety stands.
10. Lower the vehicle.

WHEEL HUB, BEARING, AND SEAL REPLACEMENT (RWD)

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. Remove the rotor. Refer to **Brake Rotor Replacement - Front** in Disc Brakes.
4. Remove the wheel speed sensor and brake hose mounting bracket bolt from the steering knuckle.

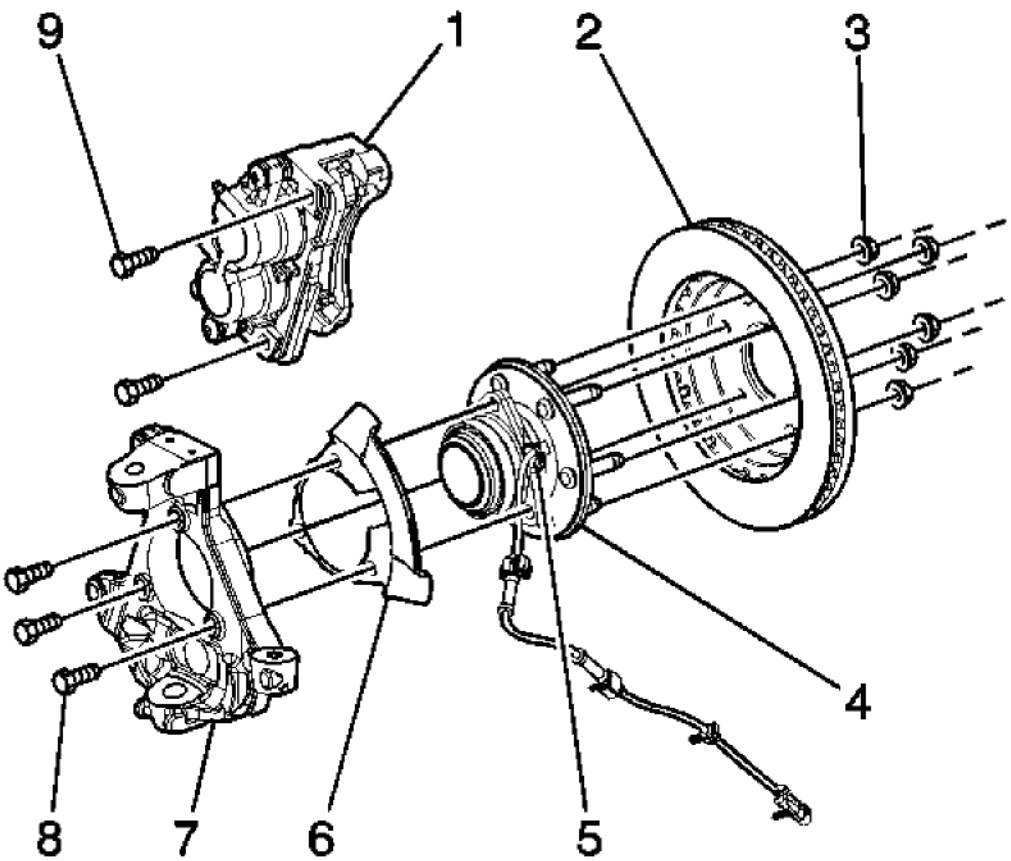

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Fig. 48: Wheel Hub And Bearing (15-Series)
Courtesy of GENERAL MOTORS CORP.

5. Remove the wheel hub and bearing (4) 15-series mounting bolts.

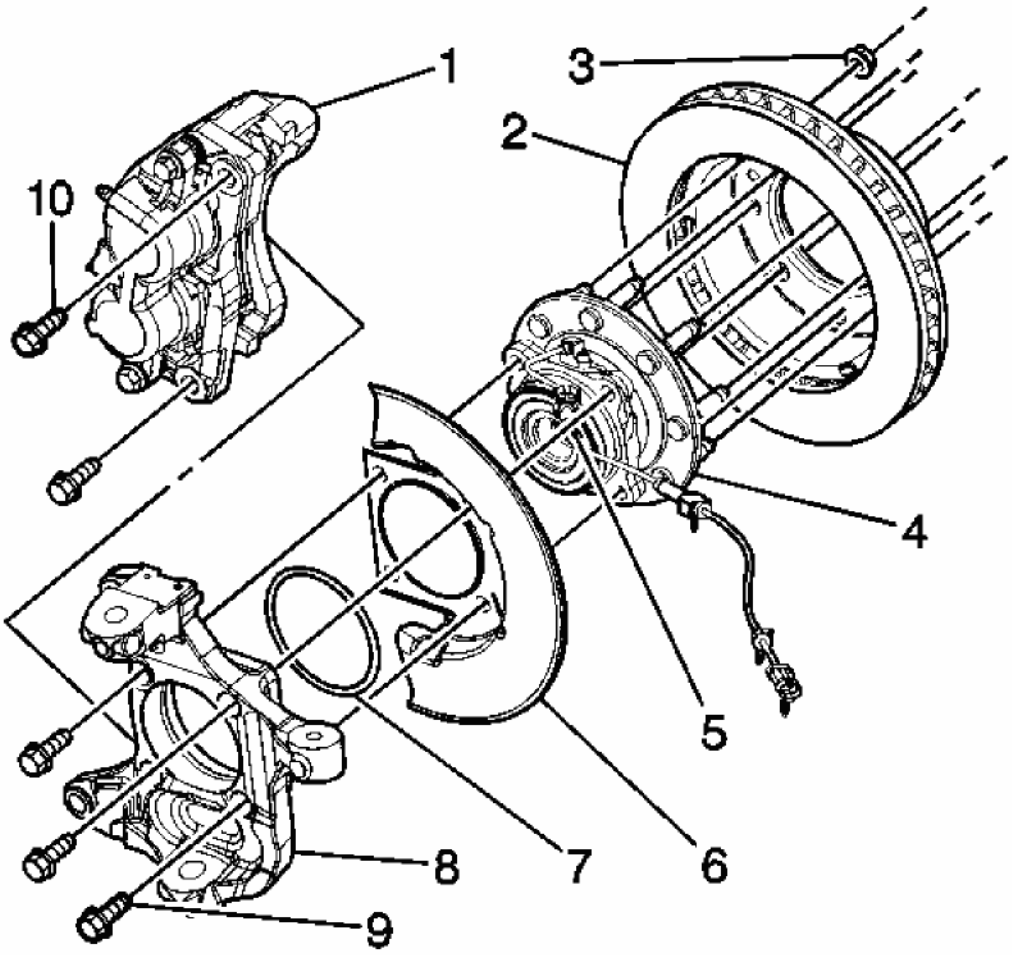

Fig. 49: Identifying Brake/Hub Components
Courtesy of GENERAL MOTORS CORP.

6. Remove the wheel hub and bearing mounting bolts (4), the 25/35 series.
7. Remove the wheel hub and bearing and splash shield from the vehicle.
8. Remove the O-ring seal from the steering knuckle bore, the 25/35 series.
9. Remove the wheel speed sensor mounting bolt (5).
10. Clean and inspect the O-ring seal, the 25/35 series.
11. Replace the seal if the following conditions exist:

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- Nicks
- Cuts
- Dry or brittle
- Compression set

Installation Procedure

1. Clean all corrosion or contaminates from the steering knuckle bore and the hub and bearing.
2. Lubricate the steering knuckle bore with wheel bearing grease or the equivalent.

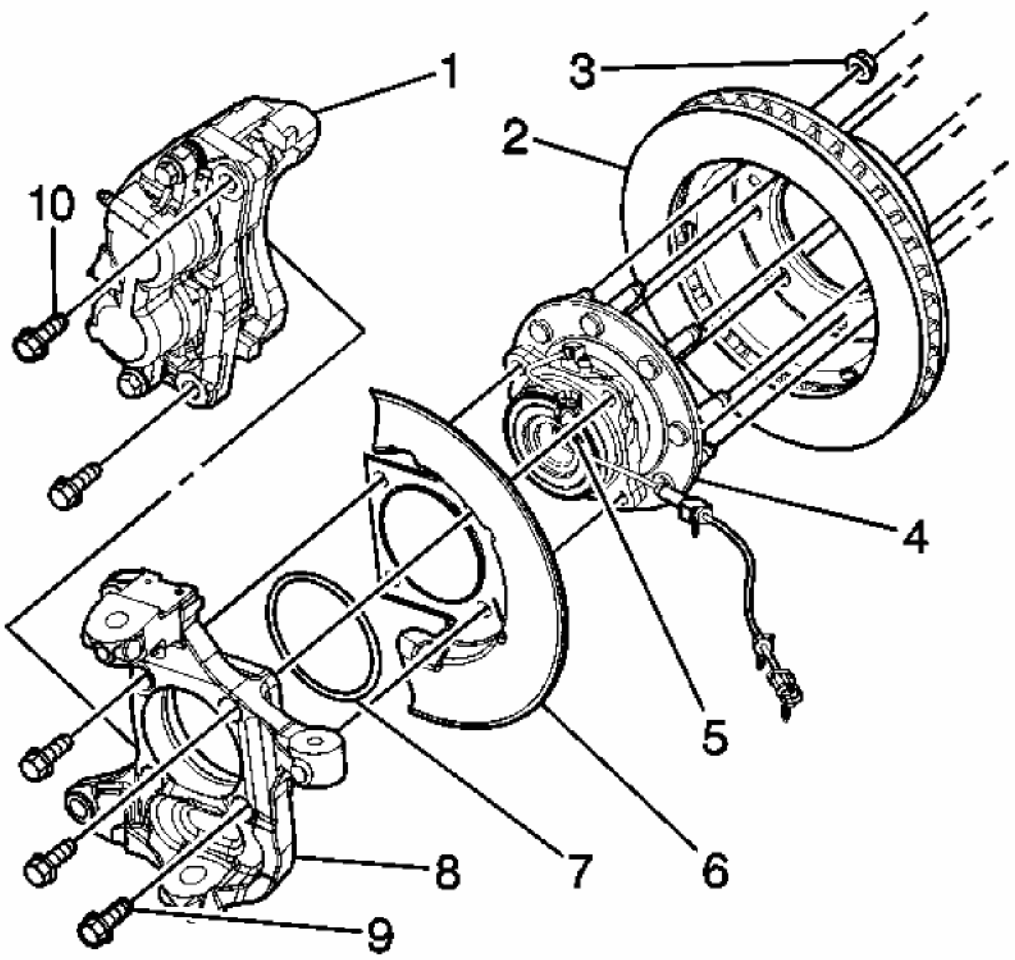

Fig. 50: Identifying Brake/Hub Components
Courtesy of GENERAL MOTORS CORP.

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3. Install the O-ring (7) to the steering knuckle, 25/35 series.

NOTE: Refer to Fastener Notice in Cautions and Notices.

4. Install the wheel speed sensor mounting bolt.

   Tighten: Tighten the bolt to 18 N.m (13 lb ft).

5. Install the wheel hub and bearing and splash shield to the vehicle, 25/35 series.

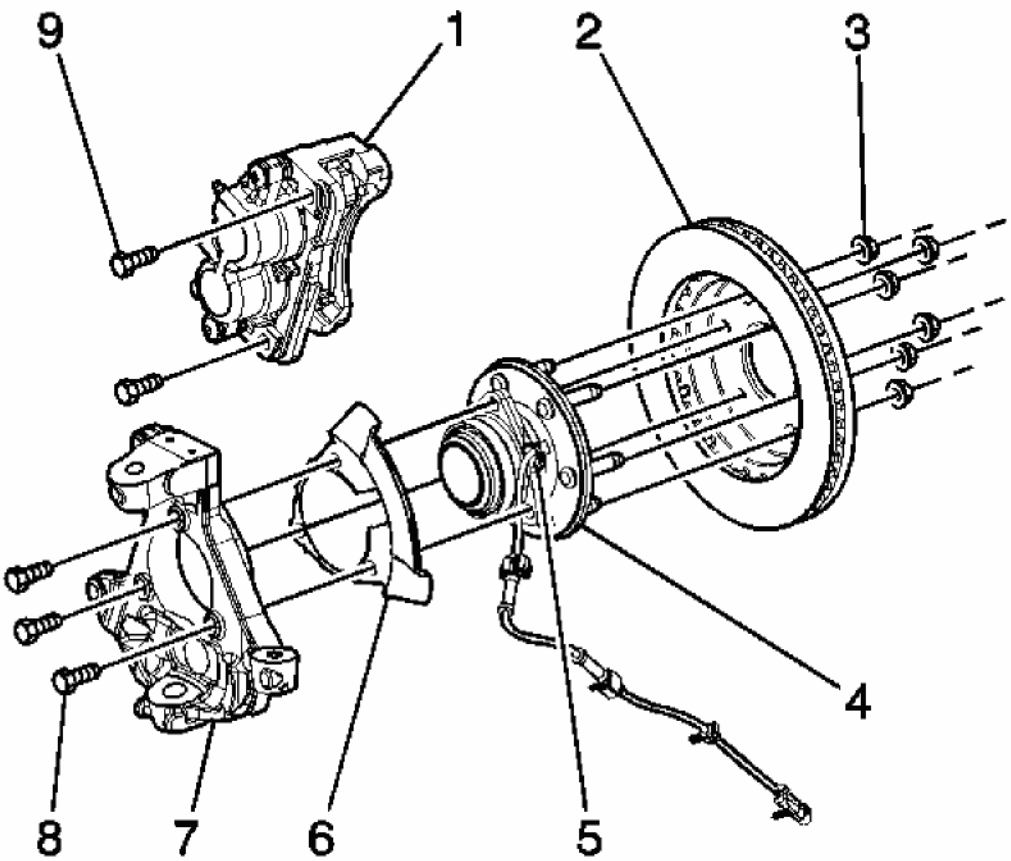

Fig. 51: Wheel Hub And Bearing (15-Series)
Courtesy of GENERAL MOTORS CORP.

6. Install the wheel hub and bearing (4) and splash shield to the 15-series steering knuckle.
7. Install the wheel hub and the 15-series bearing mounting bolts.

   Install the wheel hub and bearing mounting bolts, the 25/35 series.

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Tighten: Tighten the bolts to 180 N.m (133 lb ft).

8. Install the wheel speed sensor and brake hose mounting bracket bolt to the steering knuckle.

   Tighten: Tighten the brake hose clip bolt to 12 N.m (106 lb in).

9. Install the rotor. Refer to **Brake Rotor Replacement - Front** .
10. Install the tire and wheel. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.
11. Lower the vehicle.

WHEEL HUB, BEARING, AND SEAL REPLACEMENT (4WD)

Tools Required

J 45859 Axle Remover

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. Remove the rotor. Refer to **Brake Rotor Replacement - Front** in Disc Brakes.

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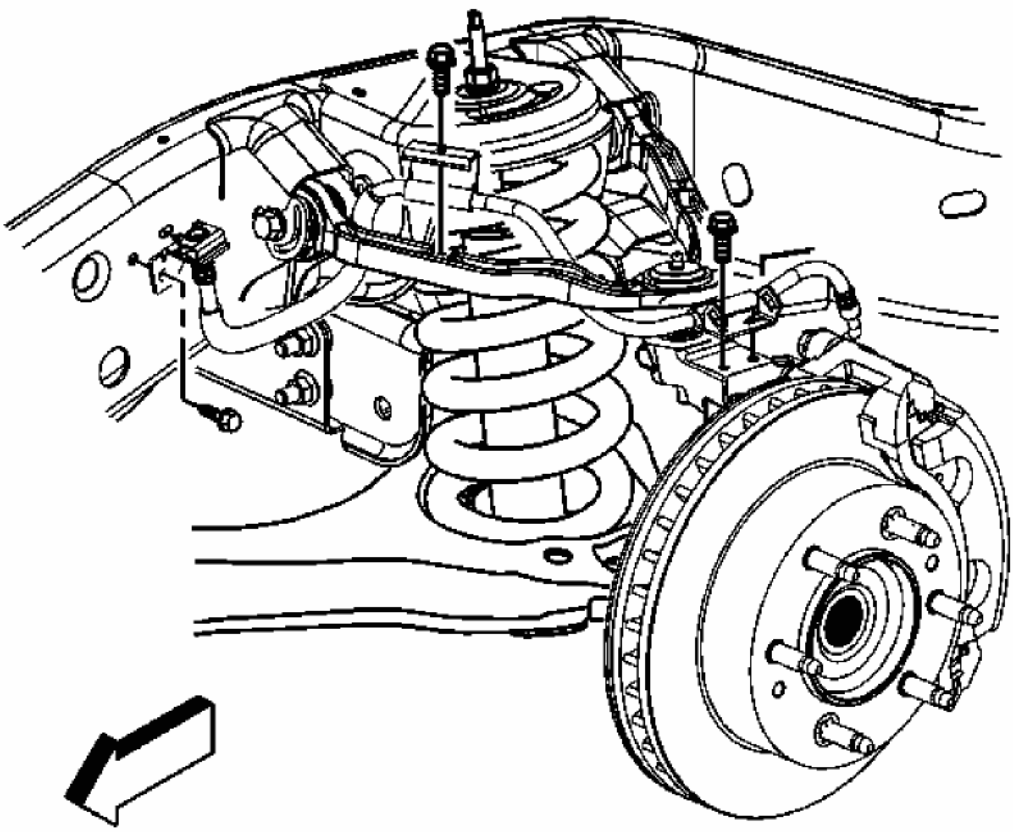

Fig. 52: View Of Retaining Bolts For Brake Hose And Wheel Speed Sensor Brackets
Courtesy of GENERAL MOTORS CORP.

4. Remove the wheel speed sensor and brake hose mounting bracket bolt from the steering knuckle.

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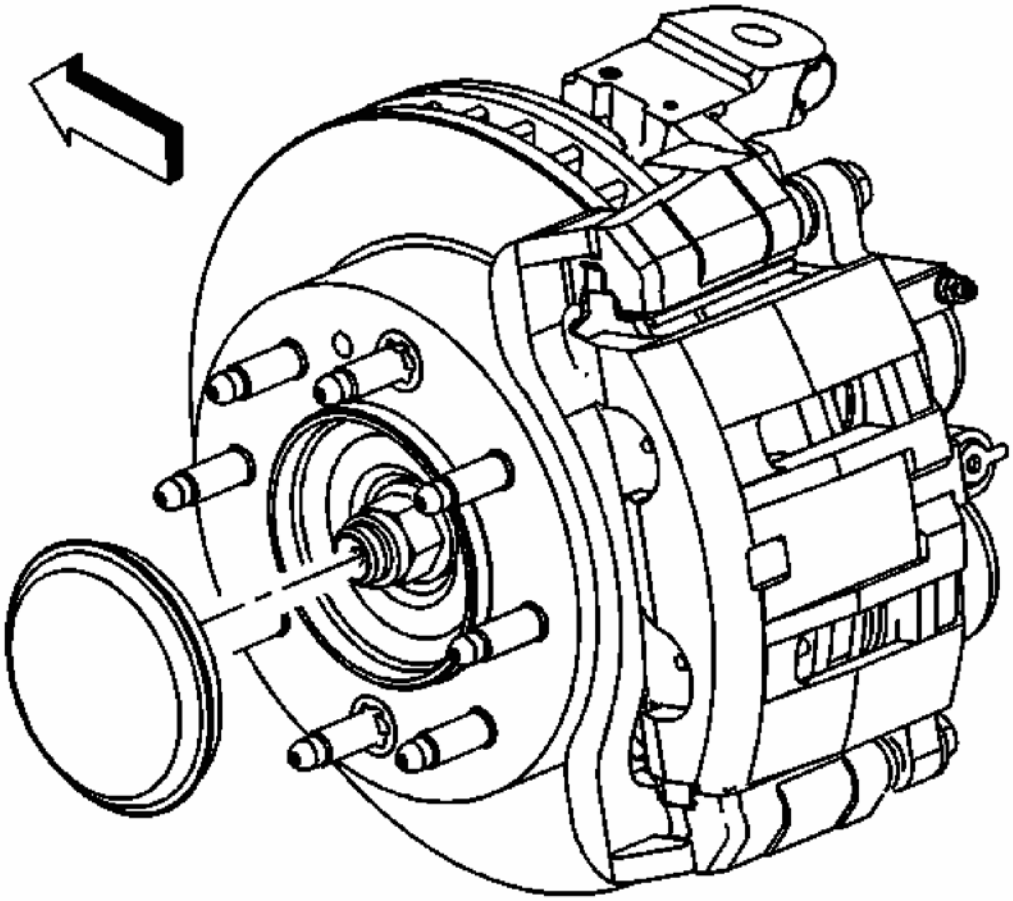

Fig. 53: Wheel Drive Shaft Nut Retaining Cover
Courtesy of GENERAL MOTORS CORP.

5. Remove the wheel drive shaft nut retaining cover.

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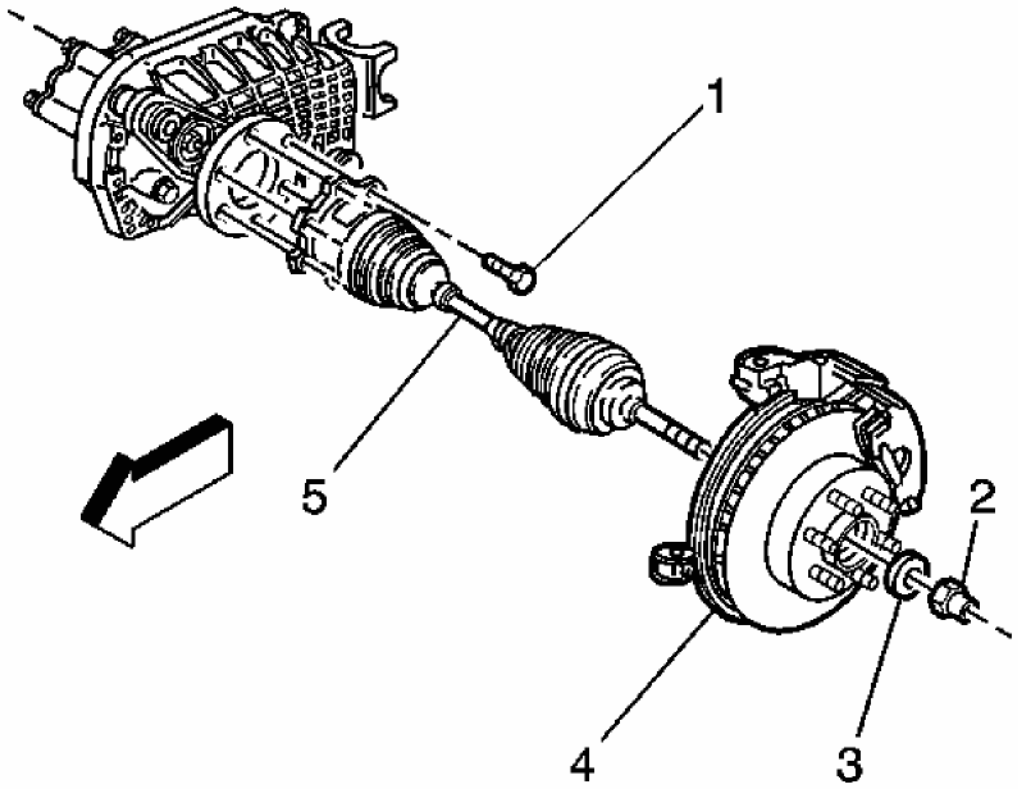

Fig. 54: View Of Wheel Drive Shaft & Components
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Do not reuse the nut. A new nut must be used when installing the wheel drive shaft.

6. Remove the wheel driveshaft assembly retaining nut (2) and washer (3) from the wheel driveshaft.

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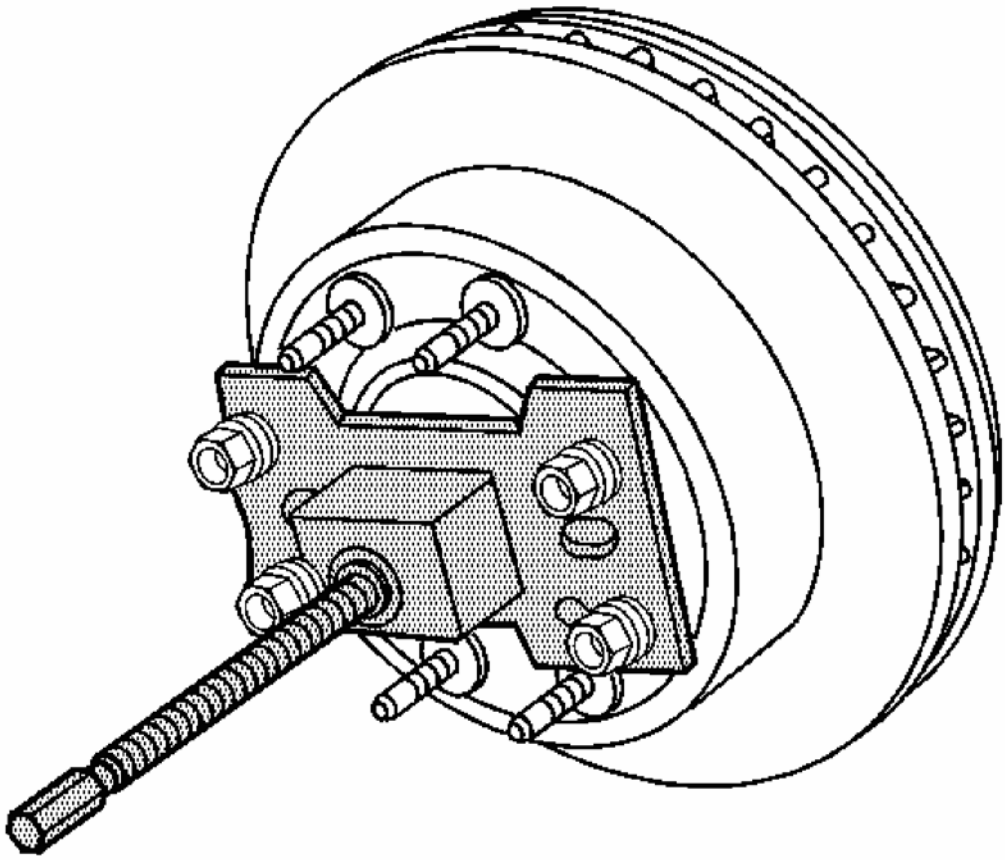

Fig. 55: Disengaging Wheel Drive Shaft From Wheel Hub And Bearing Using J 45859
Courtesy of GENERAL MOTORS CORP.

7. Disengage the wheel drive shaft from the wheel hub and bearing using **J 45859** or equivalent.

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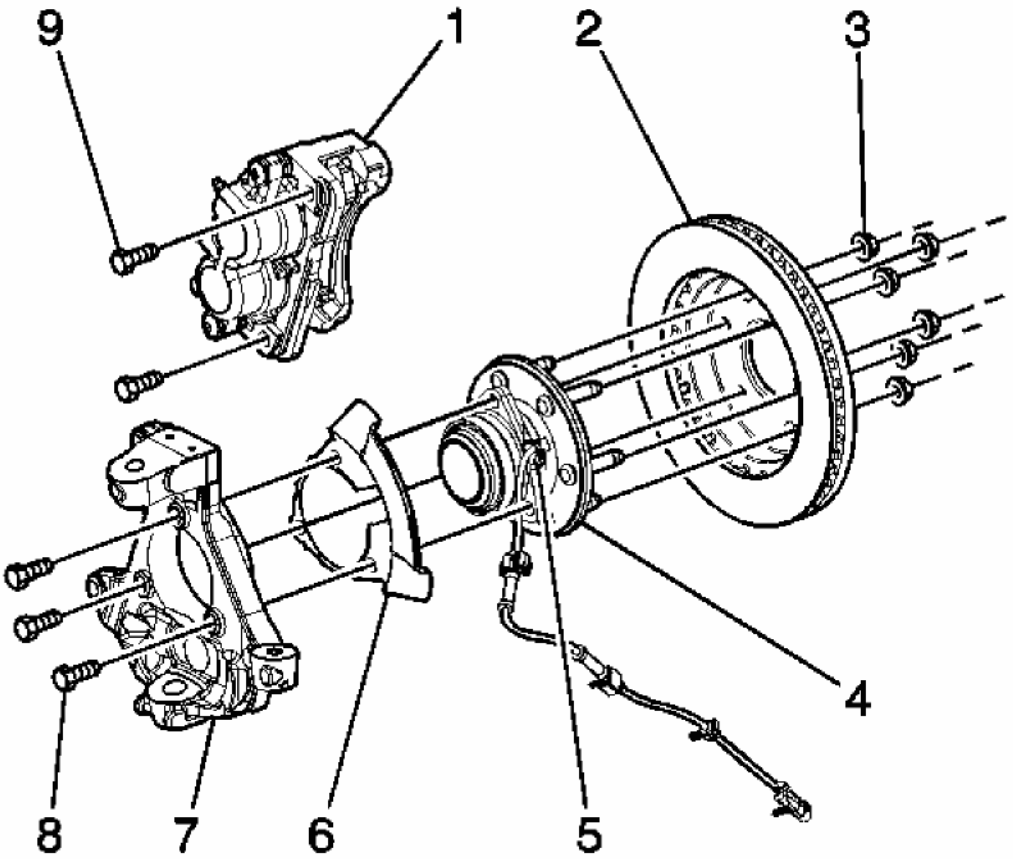

Fig. 56: Wheel Hub And Bearing (15-Series)
Courtesy of GENERAL MOTORS CORP.

8. Remove the wheel hub and the 15-series bearing mounting bolts (4).

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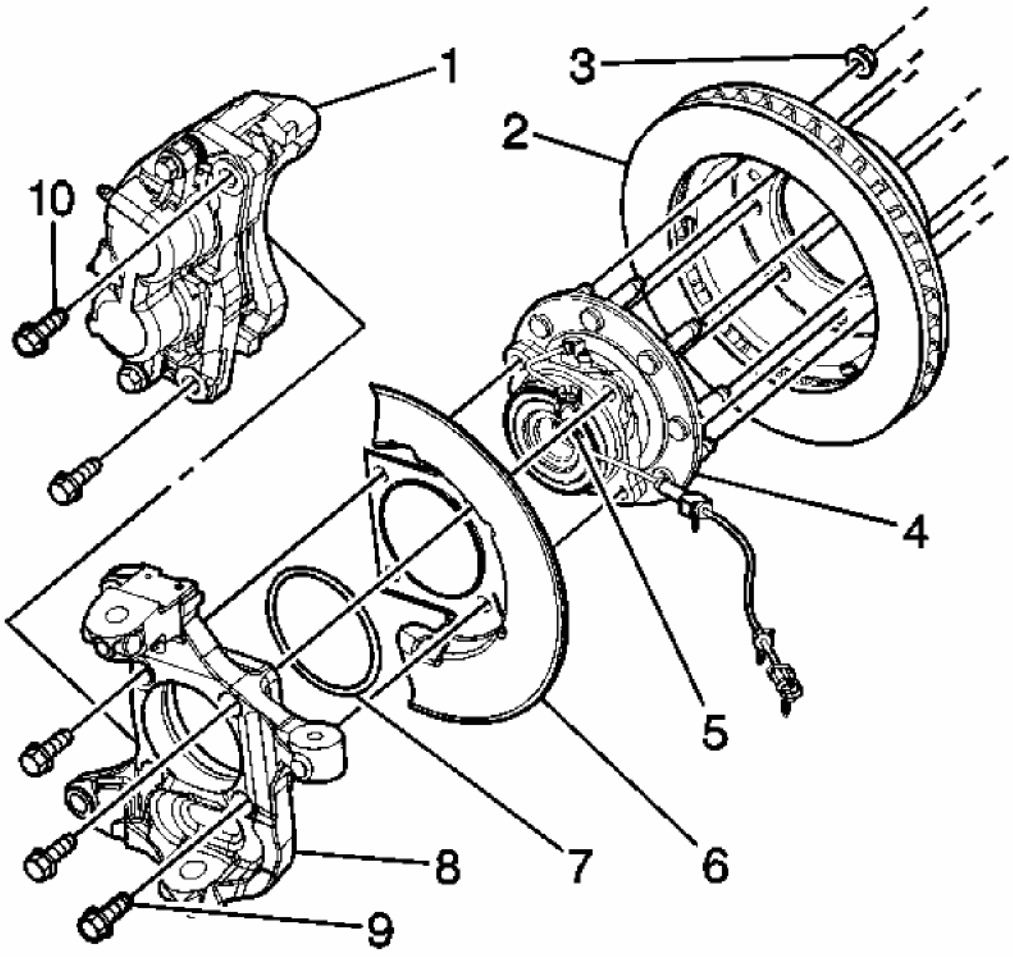

Fig. 57: Identifying Brake/Hub Components
Courtesy of GENERAL MOTORS CORP.

9. Remove the wheel hub and bearing (4) mounting bolts, 25/35 series.
10. Remove the wheel hub and bearing and splash shield from the vehicle.
11. Remove the O-ring seal from the steering knuckle bore, 25/35 series.
12. Remove the wheel speed sensor mounting bolt (5).
13. Clean and inspect the O-ring seal, 25/35 series.
14. Replace the seal if the following conditions exist:
    - Nicks
    - Cuts
    - Dry or brittle
    - Compression set

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Installation Procedure

1. Clean all corrosion or contaminates from the steering knuckle bore and the hub and bearing assembly.
2. Lubricate the steering knuckle bore with wheel bearing grease or the equivalent.

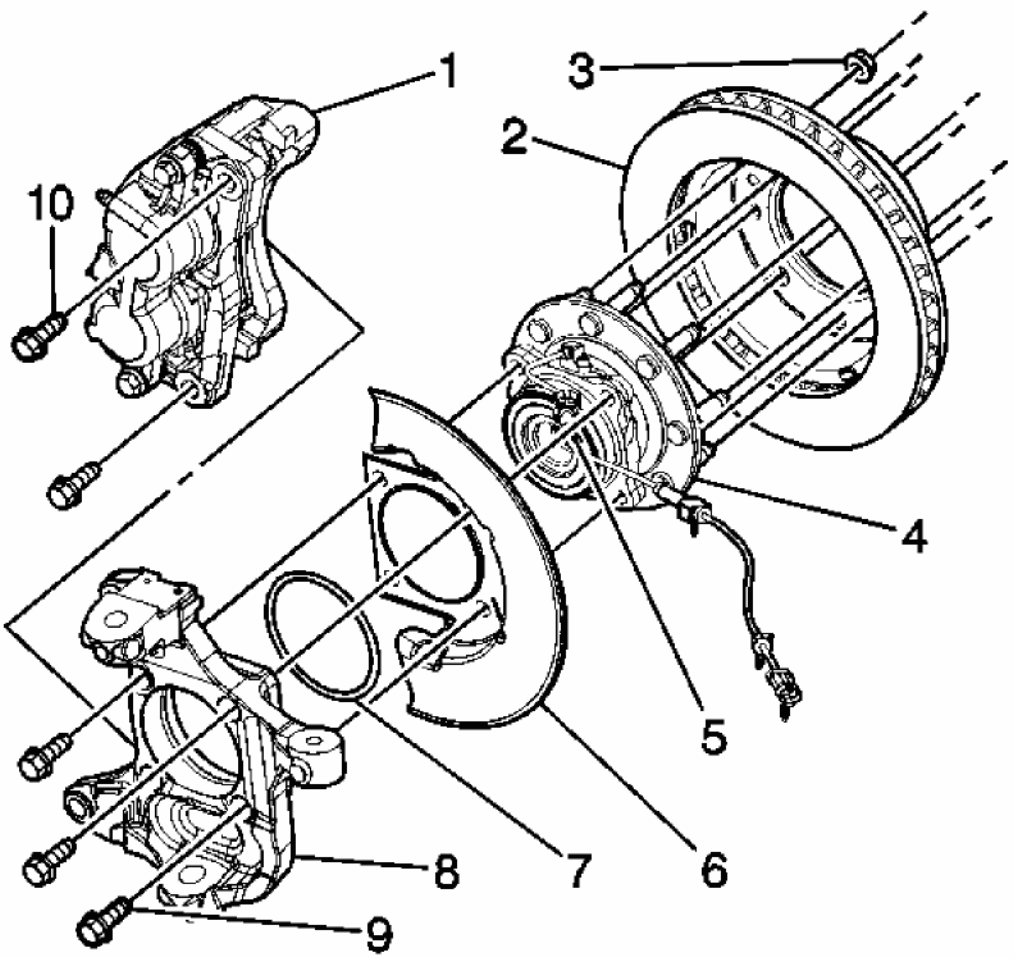

Fig. 58: Identifying Brake/Hub Components
Courtesy of GENERAL MOTORS CORP.

3. Install the O-ring (7) to the steering knuckle, the 25/35 series.

NOTE: Refer to Fastener Notice in Cautions and Notices.

4. Install the wheel speed sensor mounting bolt to the wheel hub and bearing.

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Tighten: Tighten the sensor mounting bolt to 18 N.m (13 lb ft).

5. Install the wheel hub and bearing and splash shield to the vehicle, 25/35 series.

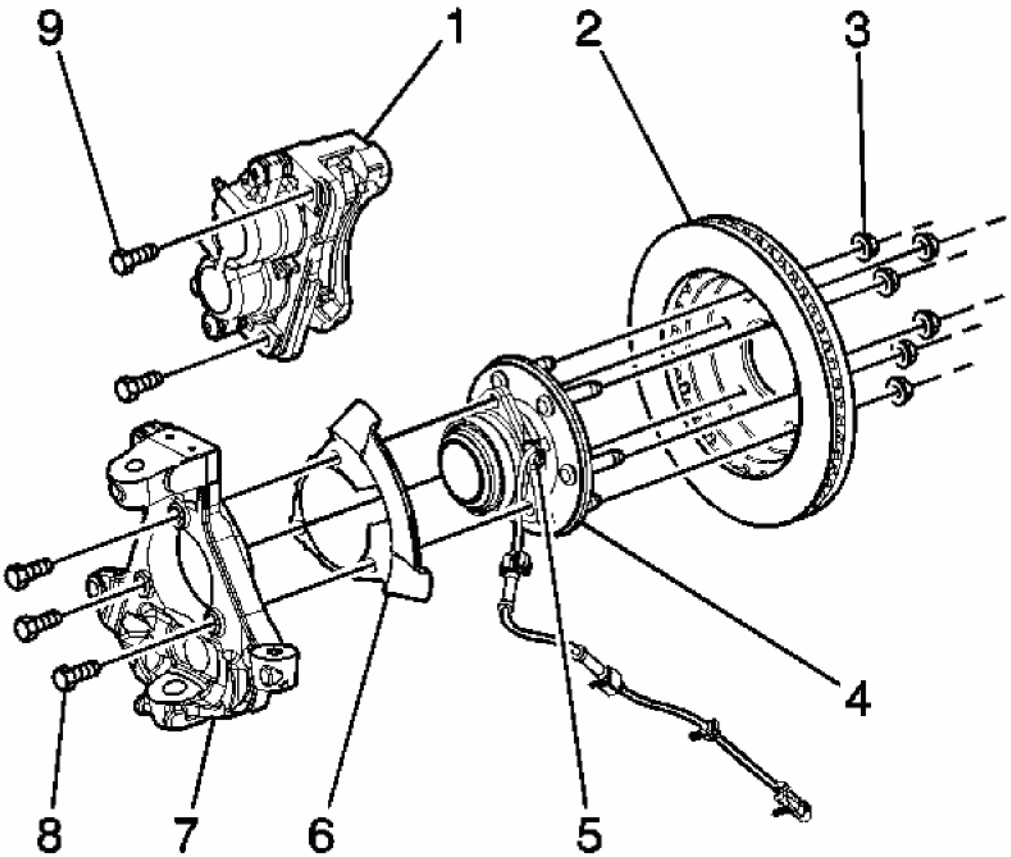

Fig. 59: Wheel Hub And Bearing (15-Series)
Courtesy of GENERAL MOTORS CORP.

6. Install the wheel hub and bearing (5) and splash shield (6) to the vehicle, 15 series.
7. Install the wheel hub and bearing mounting bolts, the 15 series.
8. Install the wheel hub and bearing mounting bolts, 25/35 series.

Tighten: Tighten the wheel hub to knuckle bolts to 180 N.m (133 lb ft).

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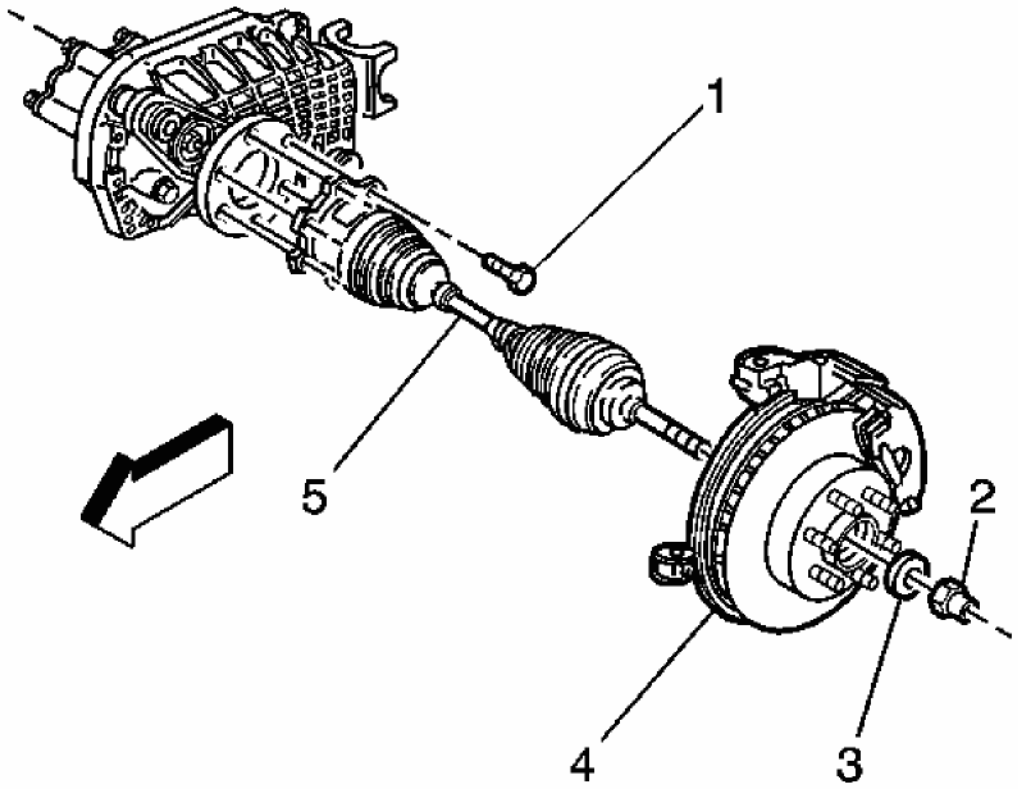

Fig. 60: View Of Wheel Drive Shaft & Components
Courtesy of GENERAL MOTORS CORP.

9. Install the nut (2) and washer (3) retaining the wheel drive shaft assembly to the wheel hub and bearing.

   Tighten: Tighten the nut to 240 N.m (177 lb ft).

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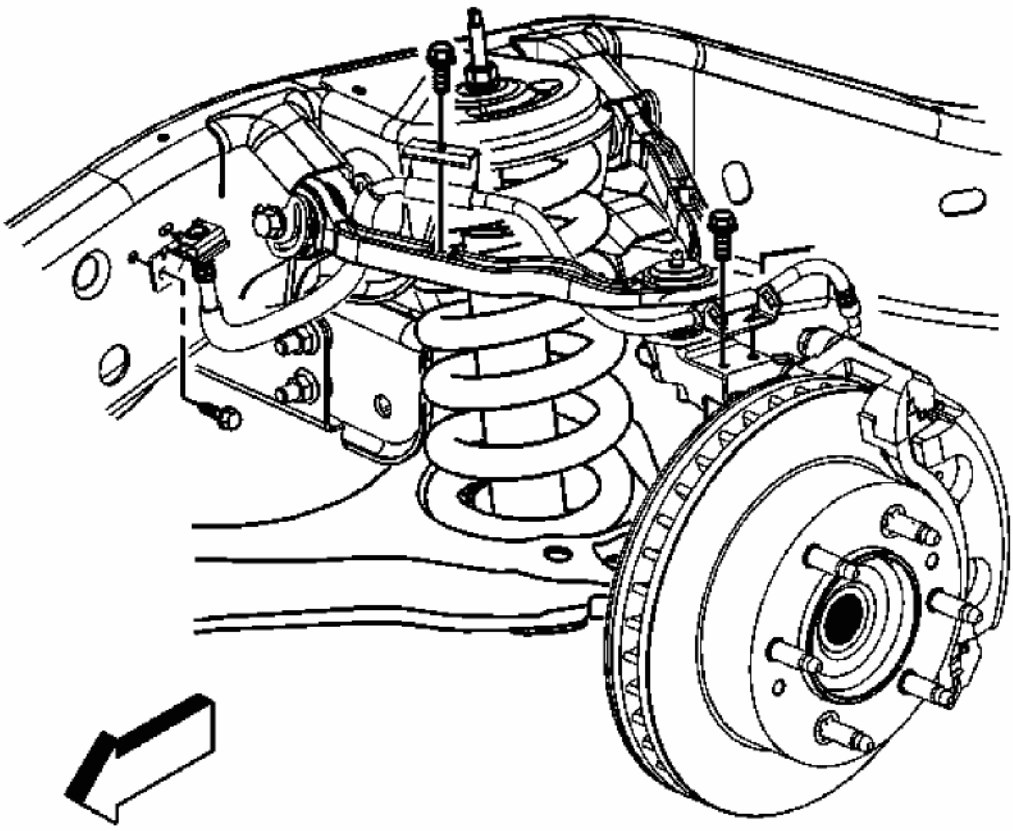

Fig. 61: View Of Retaining Bolts For Brake Hose And Wheel Speed Sensor Brackets
Courtesy of GENERAL MOTORS CORP.

10. Install the wheel speed sensor and brake hose mounting bracket bolt to the steering knuckle.

    Tighten: Tighten the brake hose clip bolt to 12 N.m (106 lb in).

11. Install the rotor. Refer to **Brake Rotor Replacement - Front** in Disc Brakes.
12. Install the tire and wheel. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.
13. Lower the vehicle.

TORSION BAR REPLACEMENT

Tools Required

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J 36202 Torsion Bar Unloading/Loading Tool. See **Special Tools and Equipment**.

Removal Procedure

NOTE: Use care when handling the torsion bars in order to avoid chipping or scratching the coating. Damage to the coating will result in premature failure of the torsion bars.

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

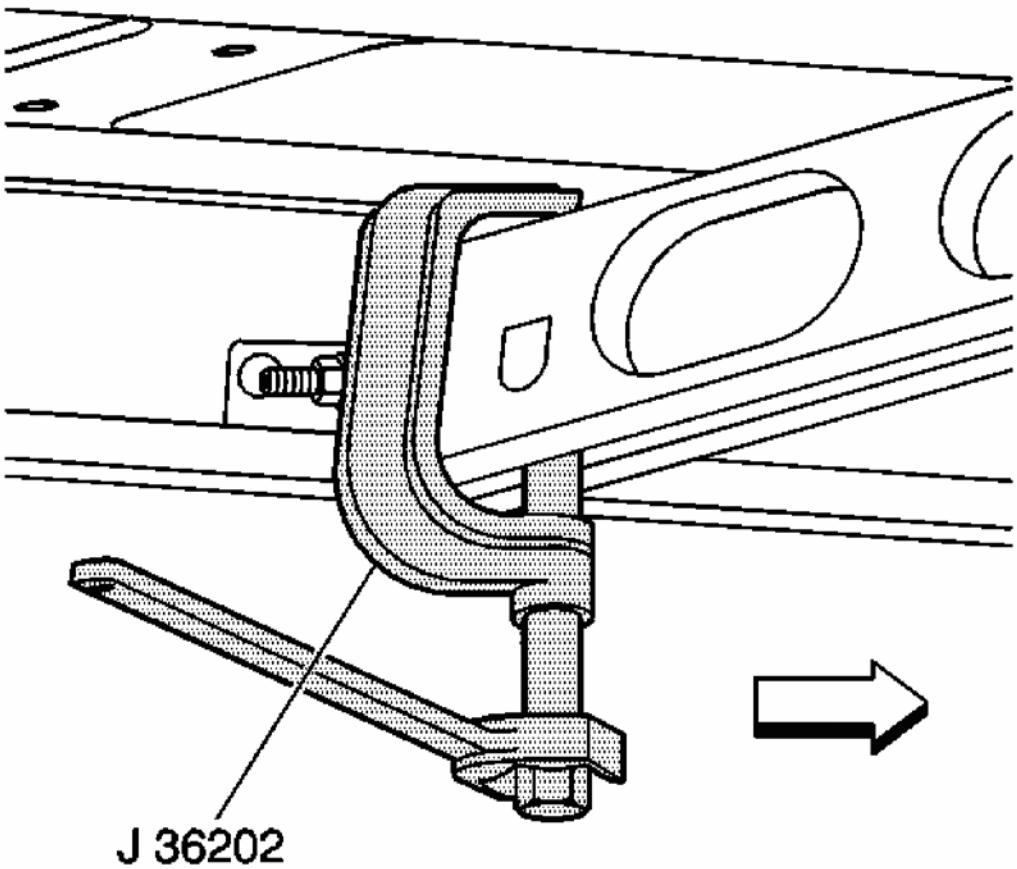

Fig. 62: Installing The J 36202 To The Adjustment Arm And The Crossmember
Courtesy of GENERAL MOTORS CORP.

2. Install the **J 36202** to the adjustment arm and the crossmember. See **Special Tools and Equipment**.
3. Increase the tension on the adjustment arm until the load is removed from the adjustment

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bolt and the adjuster nut.

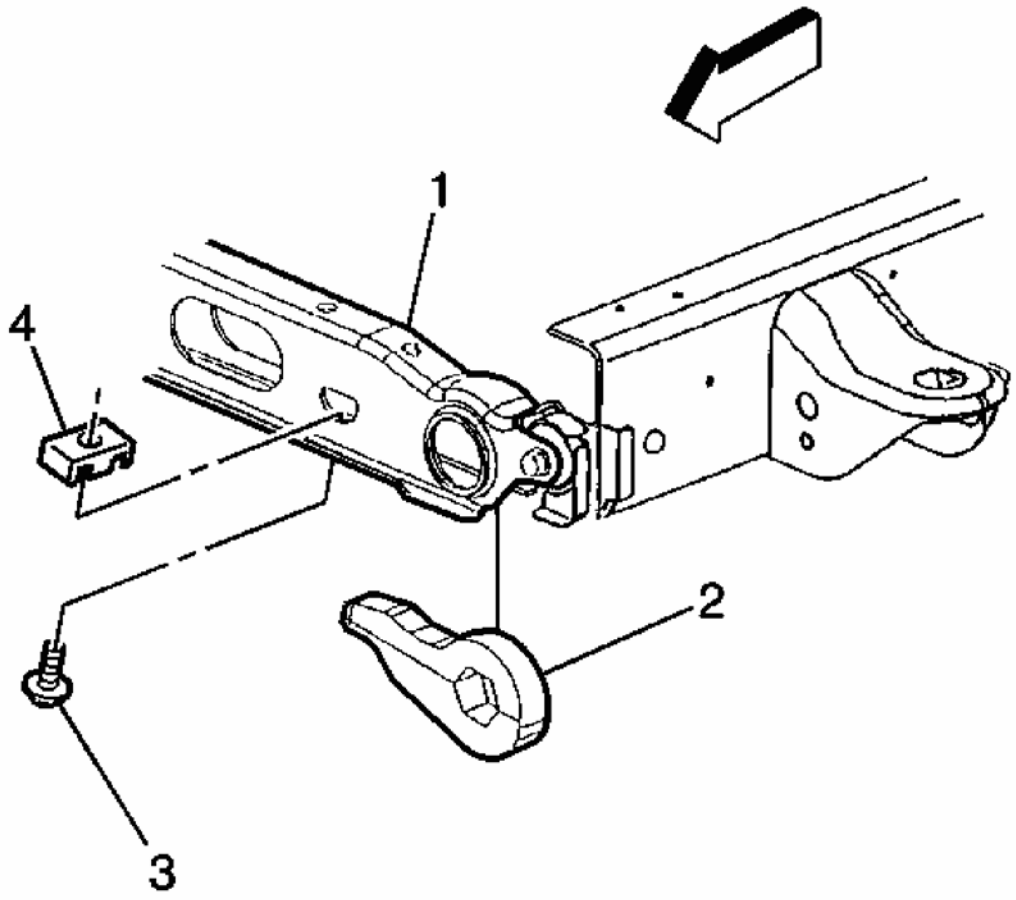

Fig. 63: Torsion Bar, Adjustment Bolt & Nut
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Mark the adjustment bolt and count the number of times that is required to remove the adjustment bolt.

4. Remove the adjustment bolt (3) and the adjuster nut (4).

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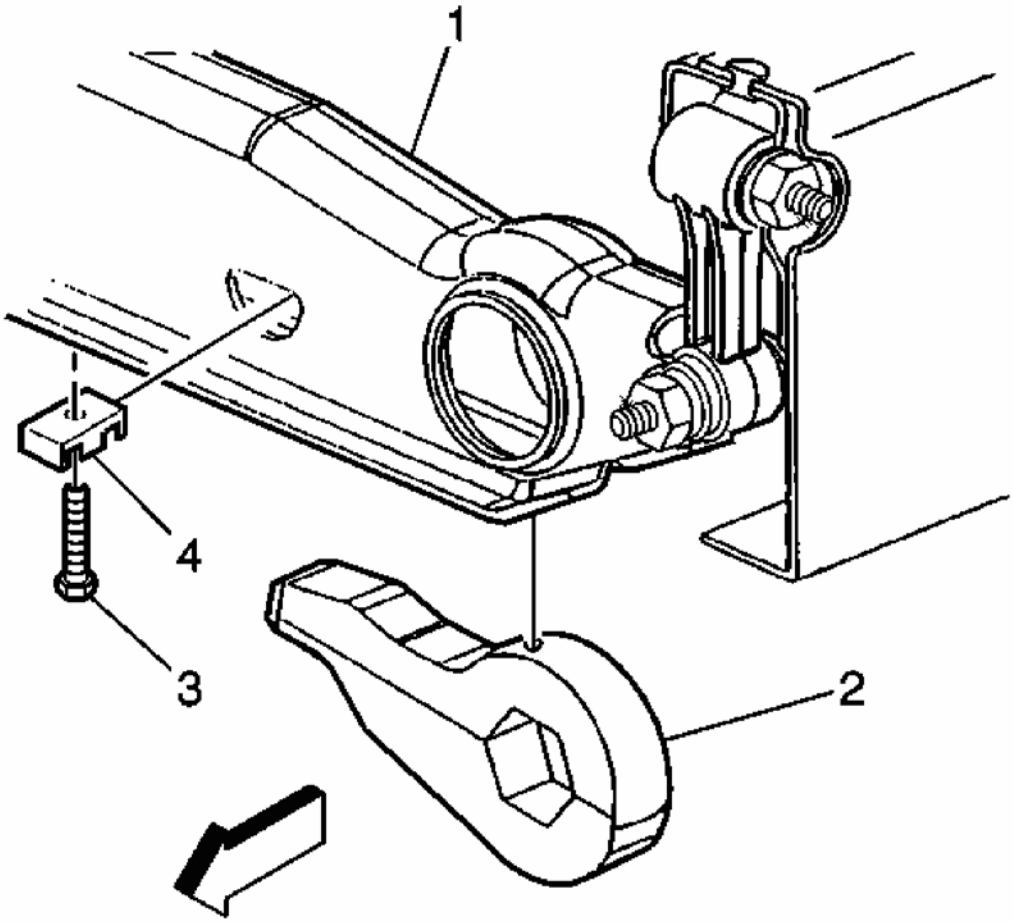

Fig. 64: Torsion Bar, Adjustment Bolt & Nut (MN8, MT1 And MW3)
Courtesy of GENERAL MOTORS CORP.

5. Remove the adjustment bolt (3) and the adjuster nut (4), for vehicles with MN8, MT1 AND MW3.
6. Remove the **J 36202** , allowing the torsion bar to unload. See **Special Tools and Equipment**.

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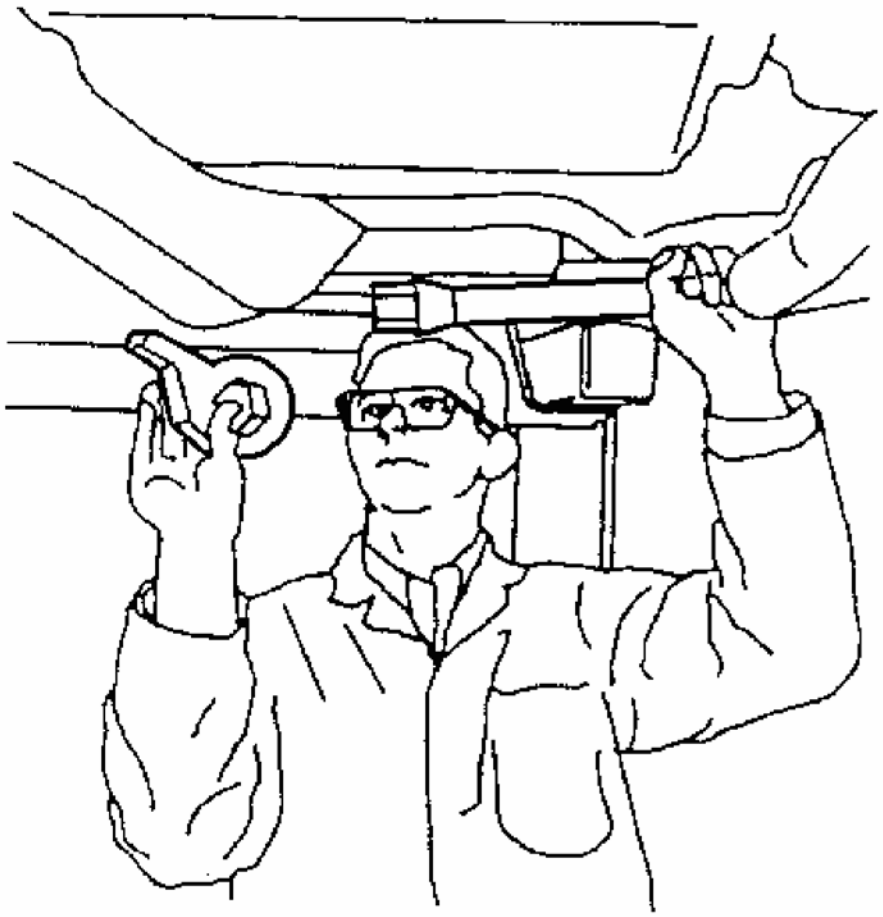

Fig. 65: Supporting Adjustment Arm While Releasing From Torsion Bar
Courtesy of GENERAL MOTORS CORP.

7. Remove the adjustment arm by sliding the torsion bar forward until the torsion bar clears the adjustment arm. Use your hand to support the adjustment arm as the adjustment arm releases from the torsion bar.

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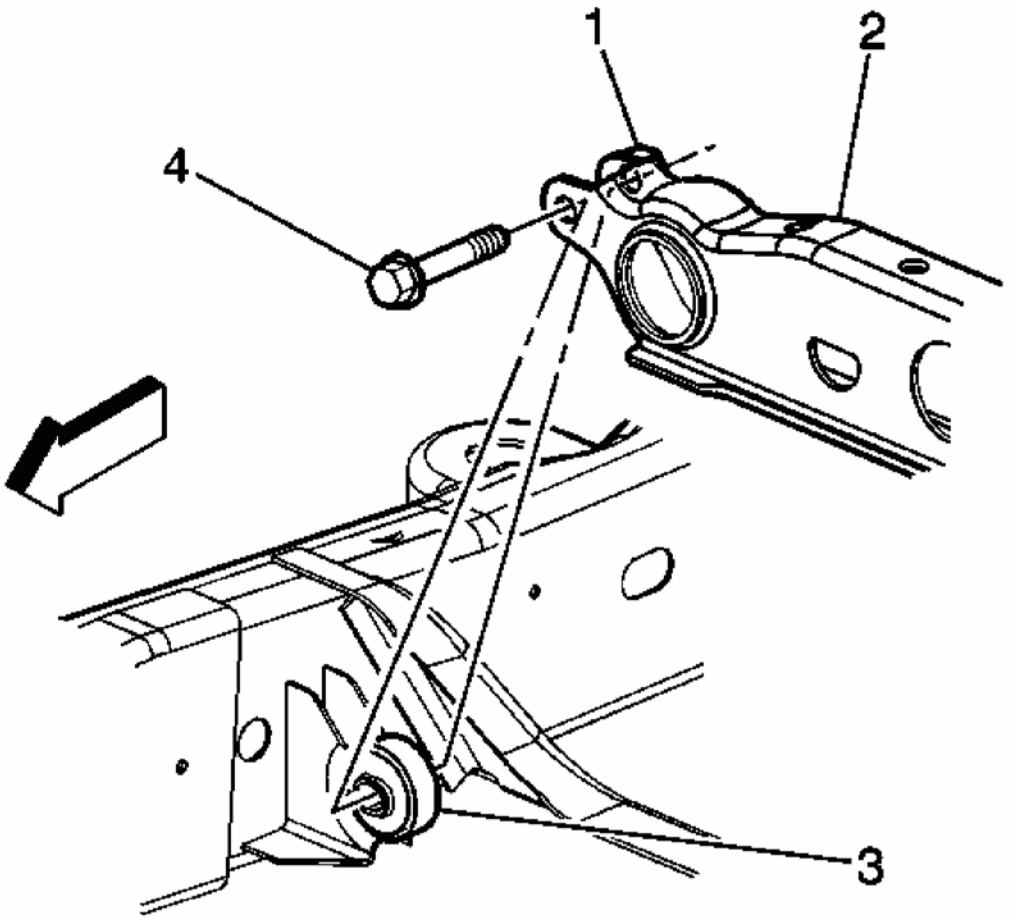

Fig. 66: Torsion Bar Crossmember, Bolts & Weld Nuts
Courtesy of GENERAL MOTORS CORP.

8. Remove the torsion bar crossmember bolts (4) from the weld nuts (1).

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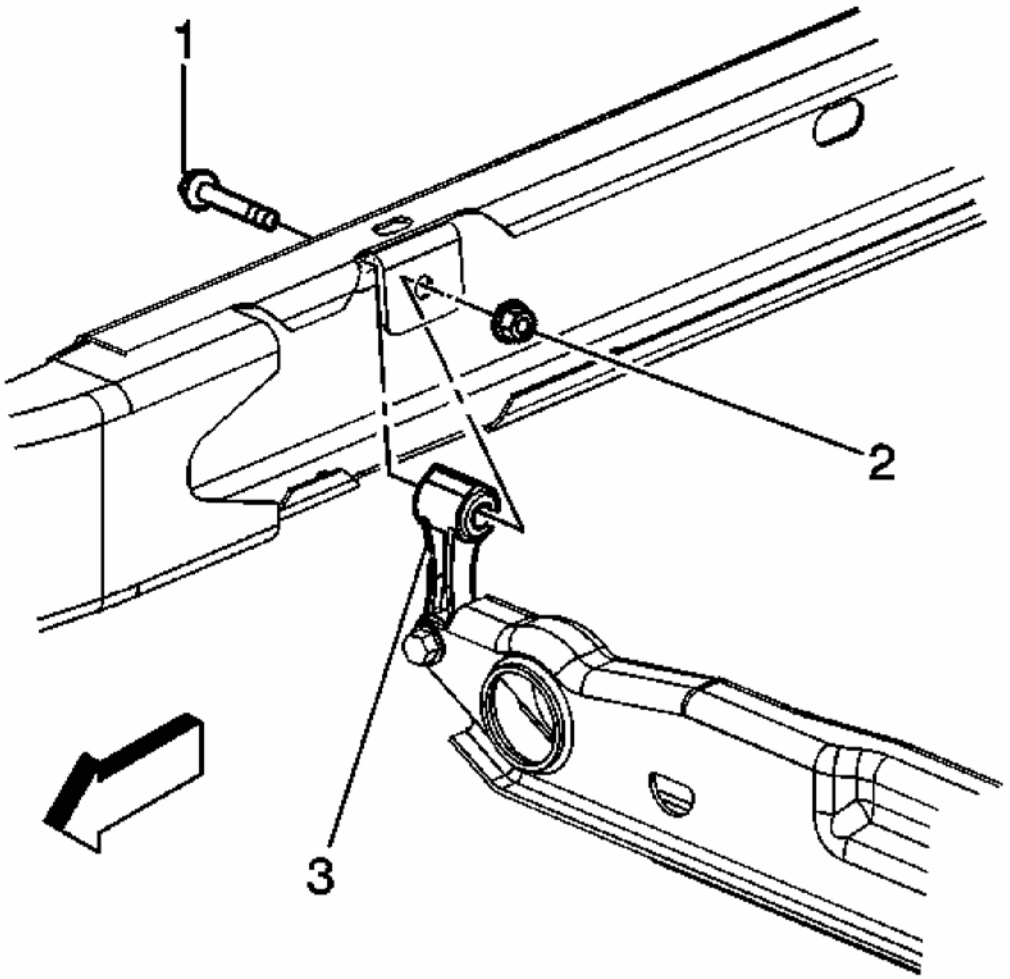

Fig. 67: Upper Link, Mounting Nuts & Bolts
Courtesy of GENERAL MOTORS CORP.

9. Remove the upper link mounting nuts (1) and the bolts (2).
10. Remove the torsion bar crossmember.

IMPORTANT: Note the position of the torsion bars as the left and right bars are different.

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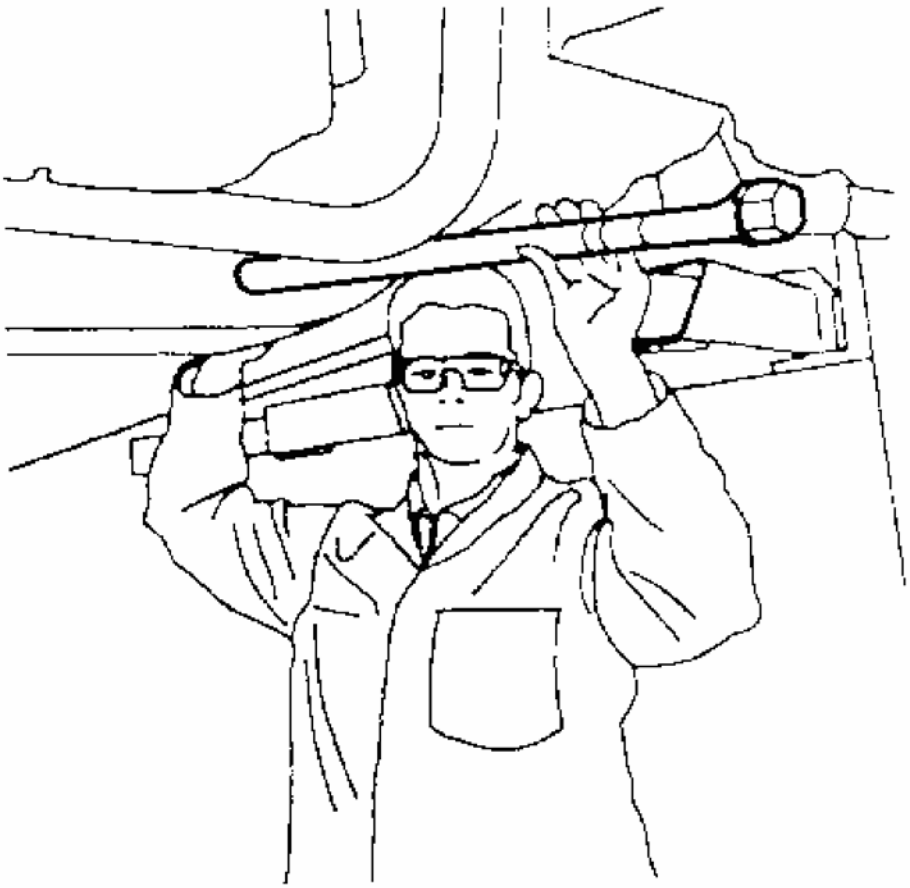

Fig. 68: Removing/Installing Torsion Bar
Courtesy of GENERAL MOTORS CORP.

11. Remove the torsion bars from the vehicle.

Installation Procedure

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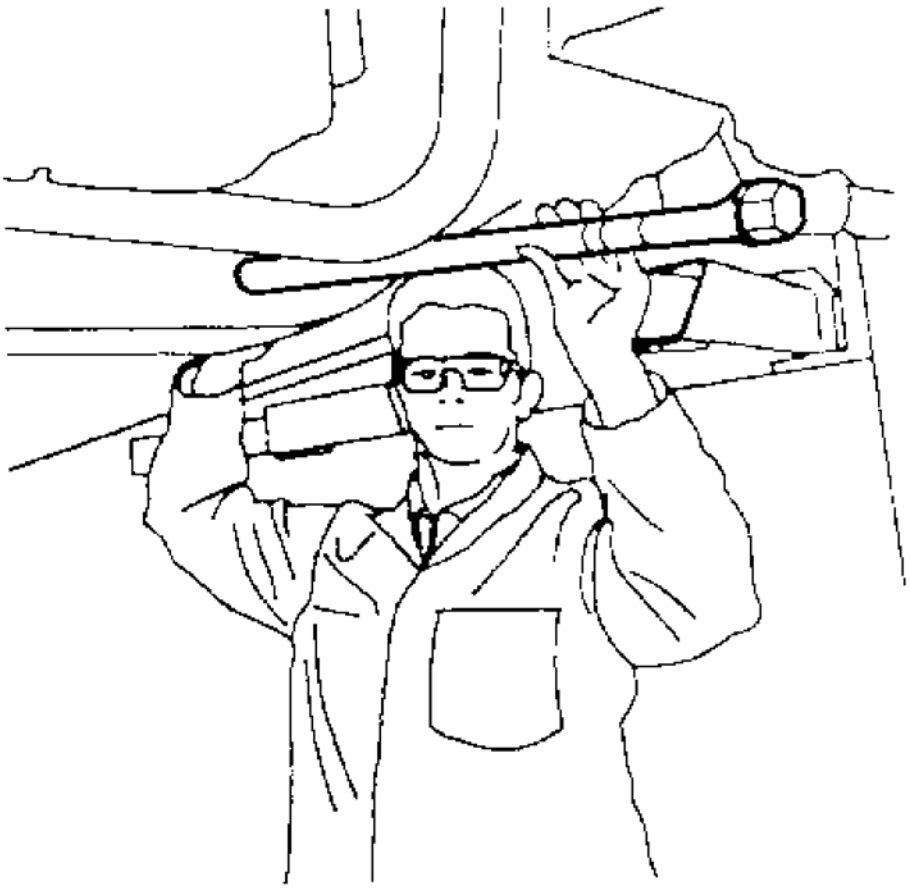

Fig. 69: Removing/Installing Torsion Bar
Courtesy of GENERAL MOTORS CORP.

1. Install the torsion bars to the lower control arm.
2. Install the torsion bar crossmember.

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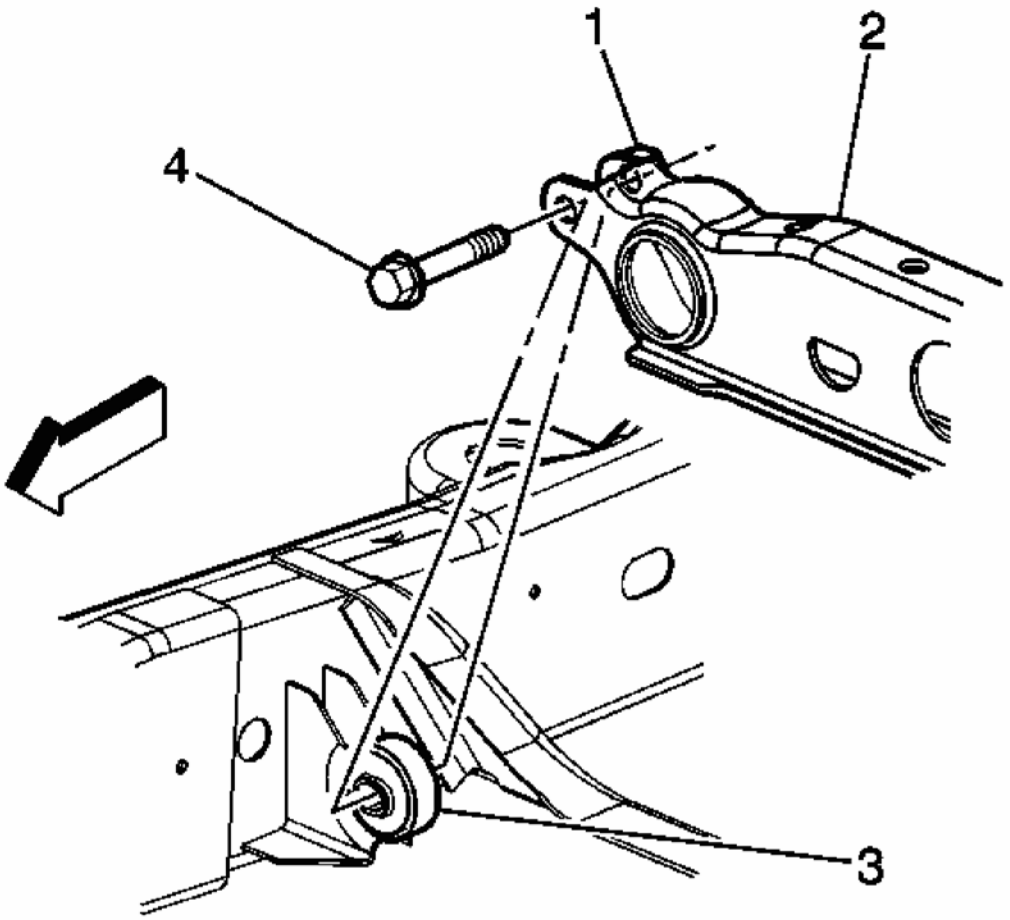

Fig. 70: Torsion Bar Crossmember, Bolts & Weld Nuts
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

3. Install the torsion bar crossmember bolts (1) to the weld nuts (4).

   Tighten: Tighten the bolt to 95 N.m (70 lb ft).

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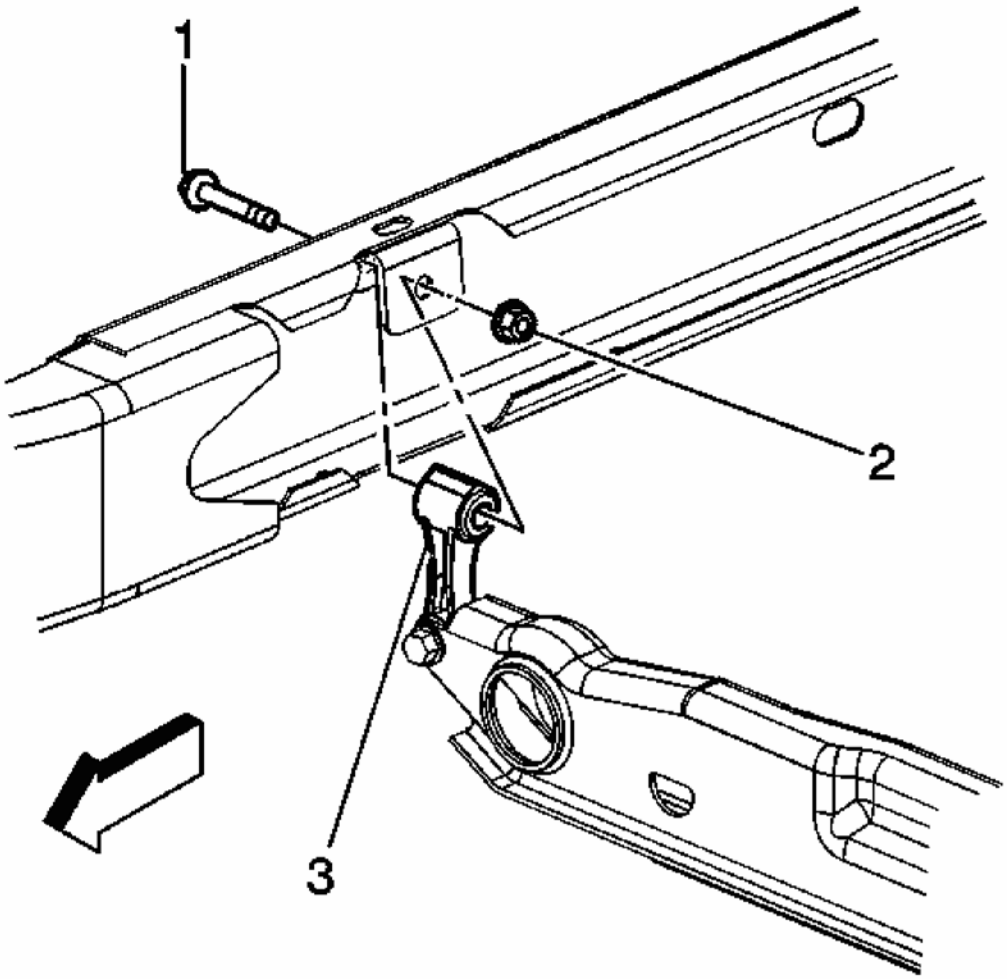

Fig. 71: Upper Link, Mounting Nuts & Bolts
Courtesy of GENERAL MOTORS CORP.

4. Install the upper link mounting nuts and the bolts (3).

   Tighten: Tighten the nut to 95 N.m (70 lb ft).

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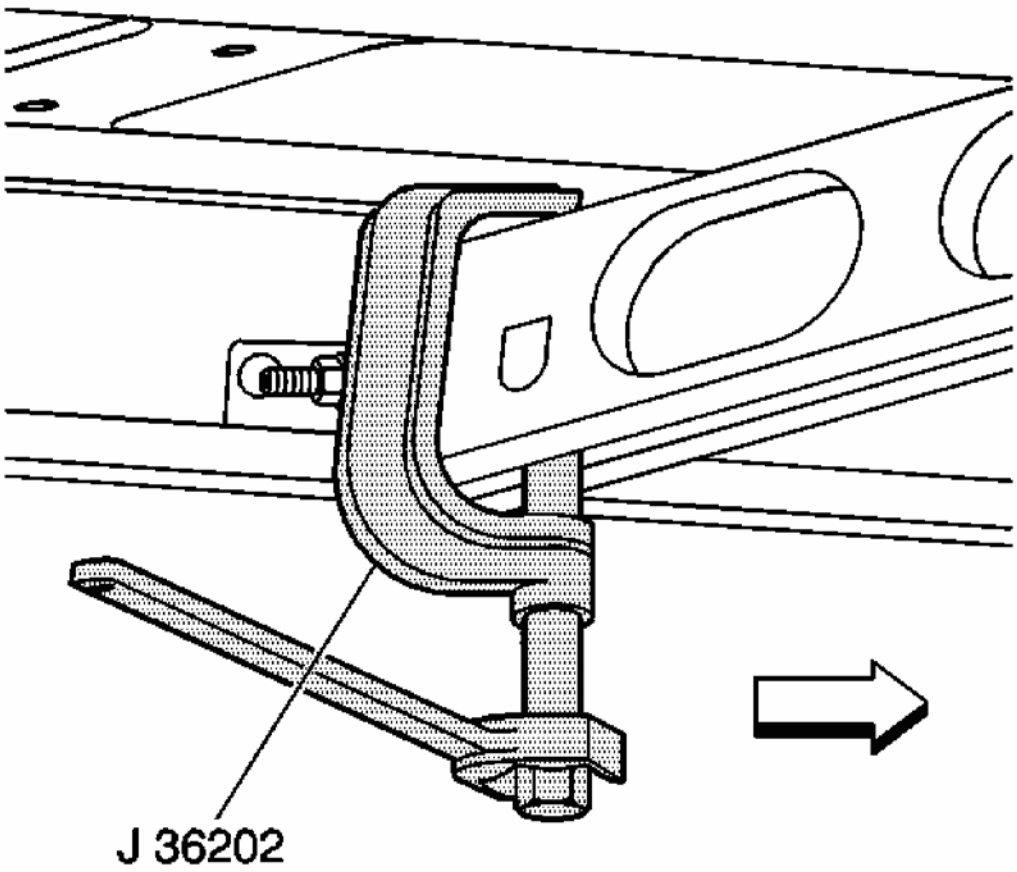

Fig. 72: Installing The J 36202 To The Adjustment Arm And The Crossmember
Courtesy of GENERAL MOTORS CORP.

5. While supporting the adjustment arm, slide the torsion bar rearward until the torsion bar fully engages the adjustment arm.
6. Install the **J 36202** to the adjustment arm and the crossmember. See **Special Tools and Equipment**.
7. Increase the tension on the adjustment arm in order to load the torsion bar.

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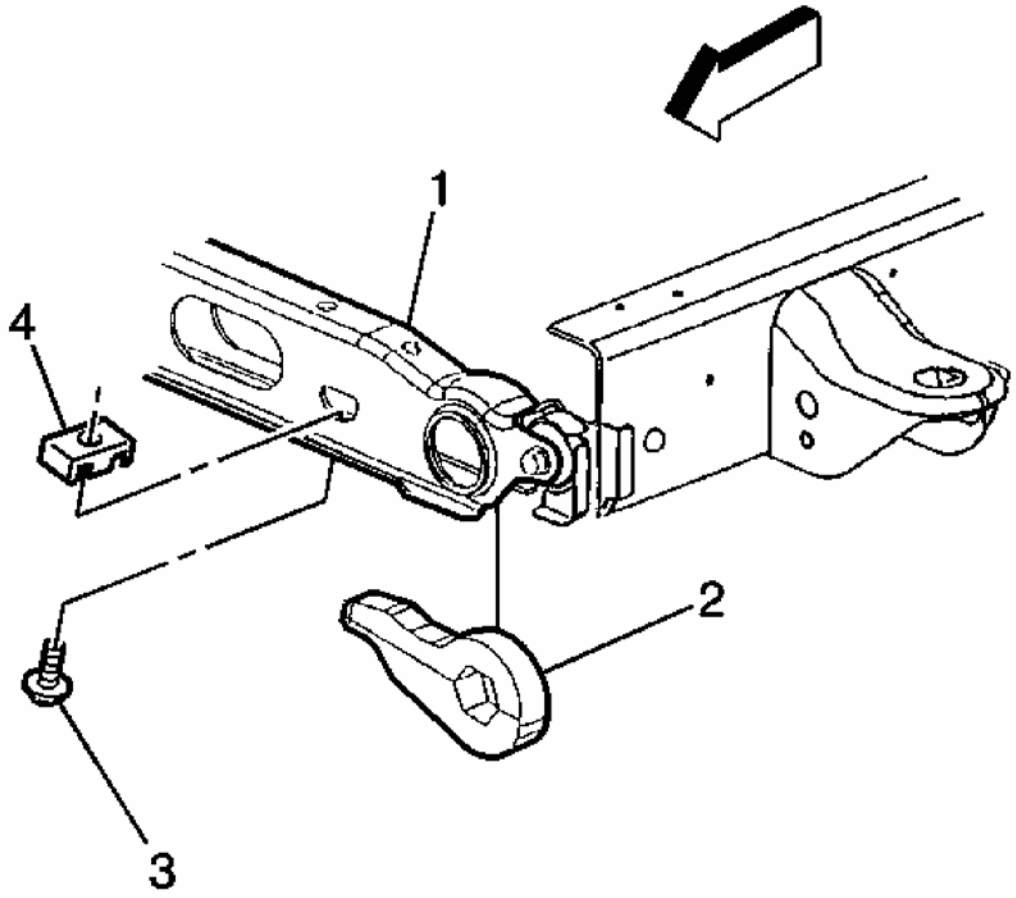

Fig. 73: Torsion Bar, Adjustment Bolt & Nut
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Install the adjustment bolt the same amount of turns that were required to remove the bolt during removal.

8. Install the adjustment bolt (3) and the adjuster nut (4).

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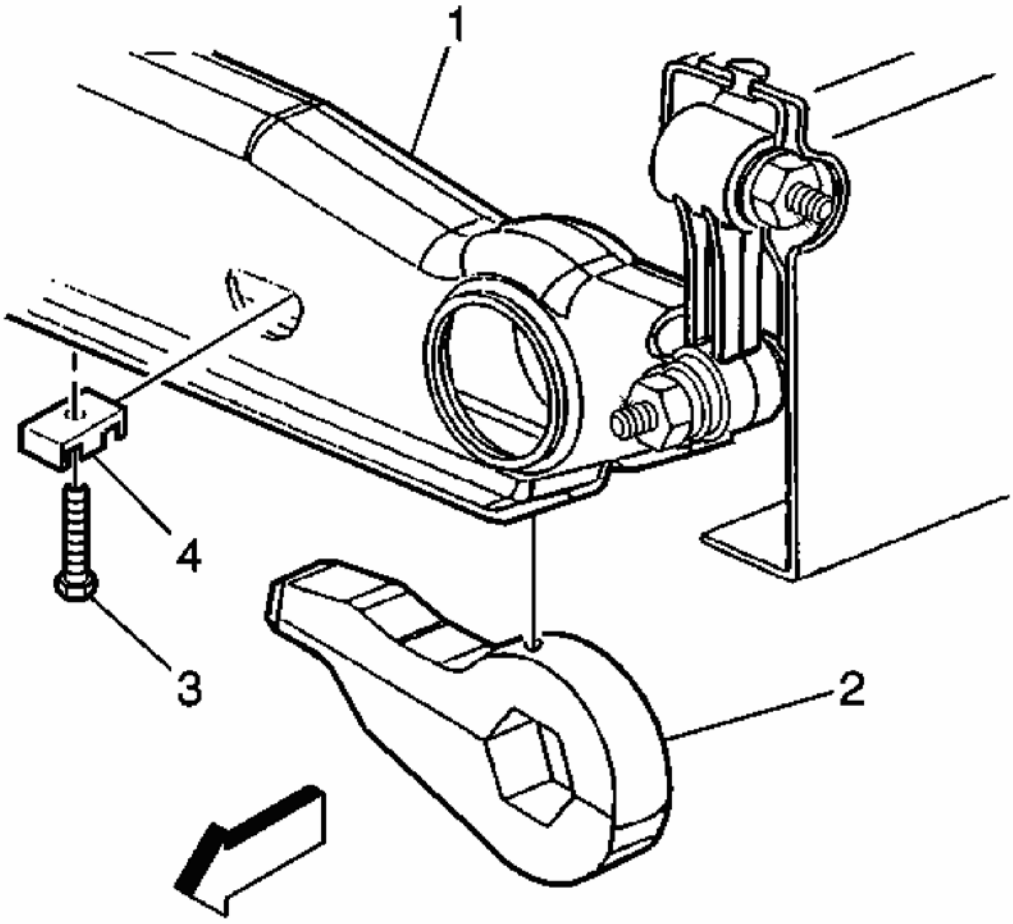

Fig. 74: Torsion Bar, Adjustment Bolt & Nut (MN8, MT1 And MW3)
Courtesy of GENERAL MOTORS CORP.

9. Install the adjustment bolt (3) and the adjuster nut (4), for vehicles with MN8, MT1 AND MW3.
10. Remove the **J 36202** releasing the tension on the torsion bar until the load is taken up by the adjustment bolt. See **Special Tools and Equipment**.
11. Remove the safety stands.
12. Lower the vehicle.
13. Measure the Z height. Refer to **Trim Height Inspection Procedure** in Suspension General Diagnosis.

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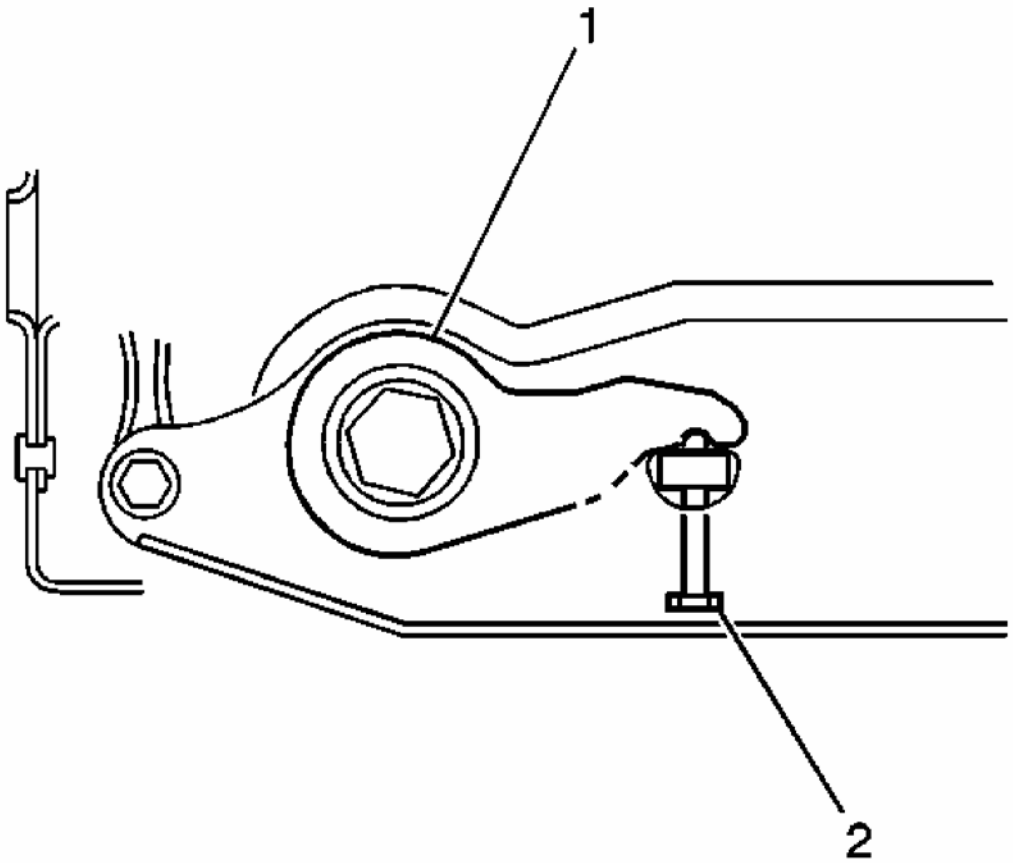

Fig. 75: Torsion Bar Adjustment Bolt
Courtesy of GENERAL MOTORS CORP.

14. Turn the adjustment bolt (2) clockwise to increase the Z height and counterclockwise to decrease the Z height.

SHOCK ABSORBER REPLACEMENT

Removal Procedure

NOTE: The front shock absorbers of the vehicle are multifunctional. In addition to contributing to a smooth ride they also provide the only stop to the front suspension when fully extended. Therefore, when servicing the shock absorber, service replacement shock absorbers must be equivalent to original shock absorbers in both extended length and strength. Use of shocks not complying to original equipment or strength could result in suspension over-

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travel or shock breakage. Suspension over-travel may result in suspension component breakage.

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

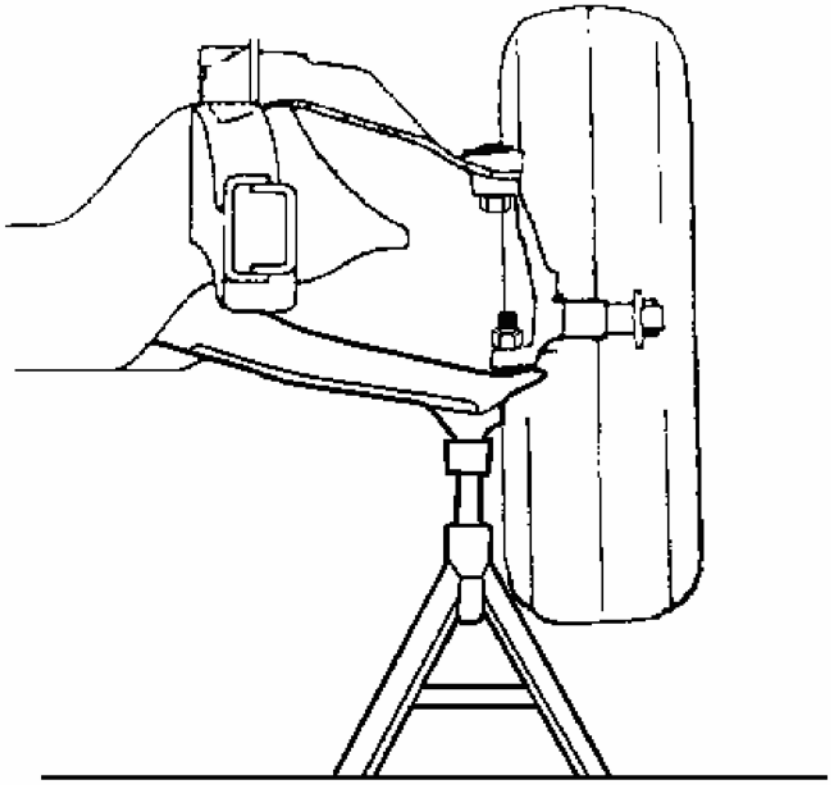

Fig. 76: Supporting Lower Control Arm With Jack Stand
Courtesy of GENERAL MOTORS CORP.

2. Support the lower control arm with a jack stand.
3. Disconnect the Electronic suspension Control (ESC) link rod from the sensor, if equipped. Refer to **Front Position Sensor Link Assembly Replacement - Electronic Suspension** in Electronic Suspension Control.

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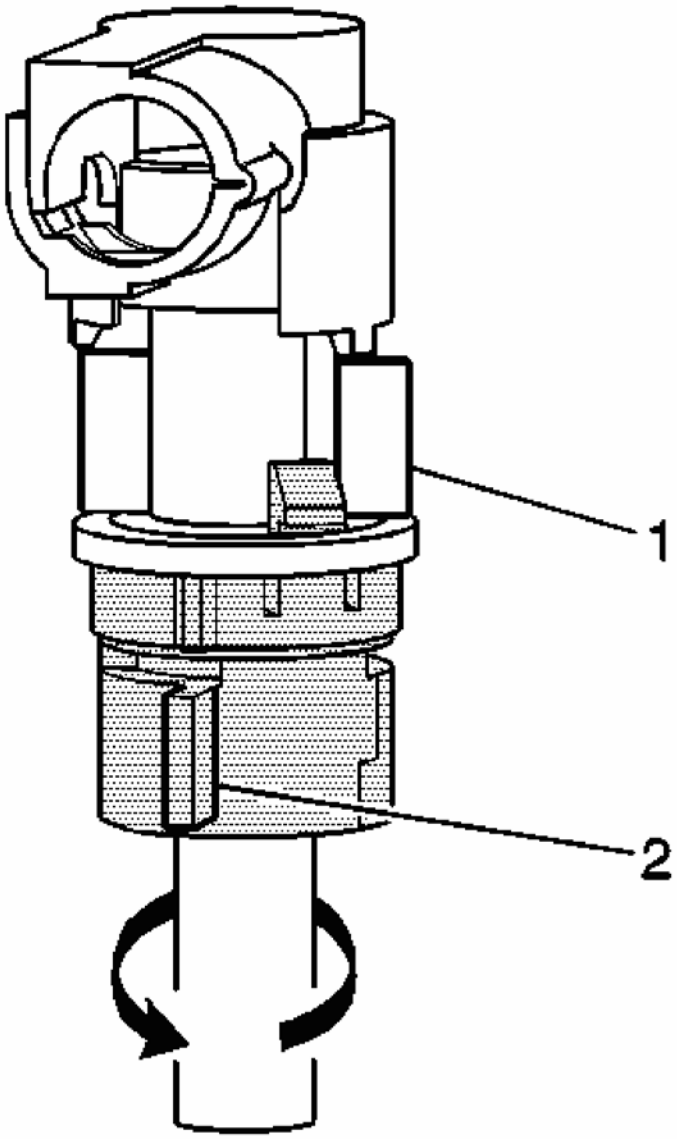

Fig. 77: Connector Lock Tabs
Courtesy of GENERAL MOTORS CORP.

4. Grasp the connector lock tabs (1, 2). Rotate the connector tabs counterclockwise until the connector is unlocked.
5. Disengage the connector from the tennon by firmly pulling the connector up.
6. Hold the tennon end with a wrench while removing the nut.
7. Remove the nut.

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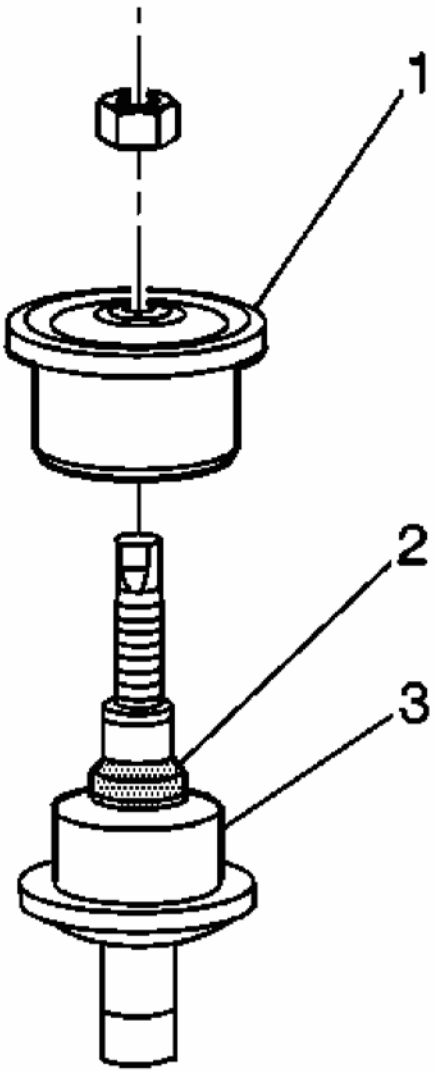

Fig. 78: Identifying Upper Insulator
Courtesy of GENERAL MOTORS CORP.

8. Remove the upper insulator (1). Do not discard the plastic pilot ring (2).

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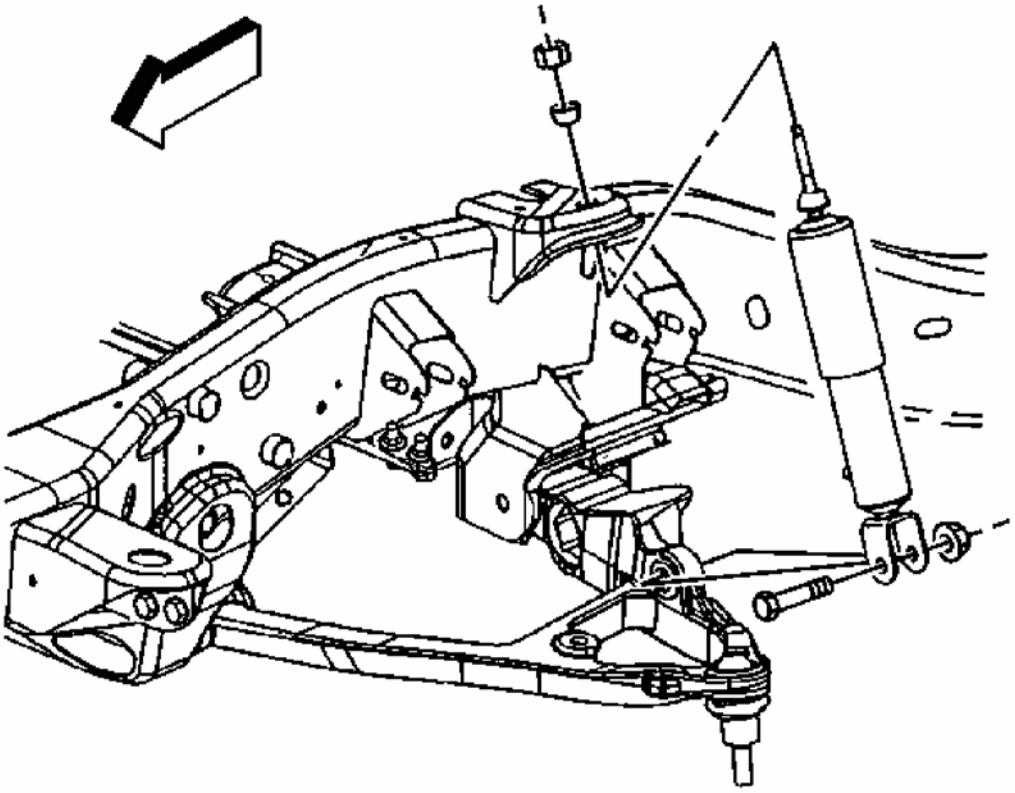

Fig. 79: Shock Absorber & Mounting Bolt (15 Series)
Courtesy of GENERAL MOTORS CORP.

9. Remove the shock absorber mounting bolt at the lower control arm, 15 Series.

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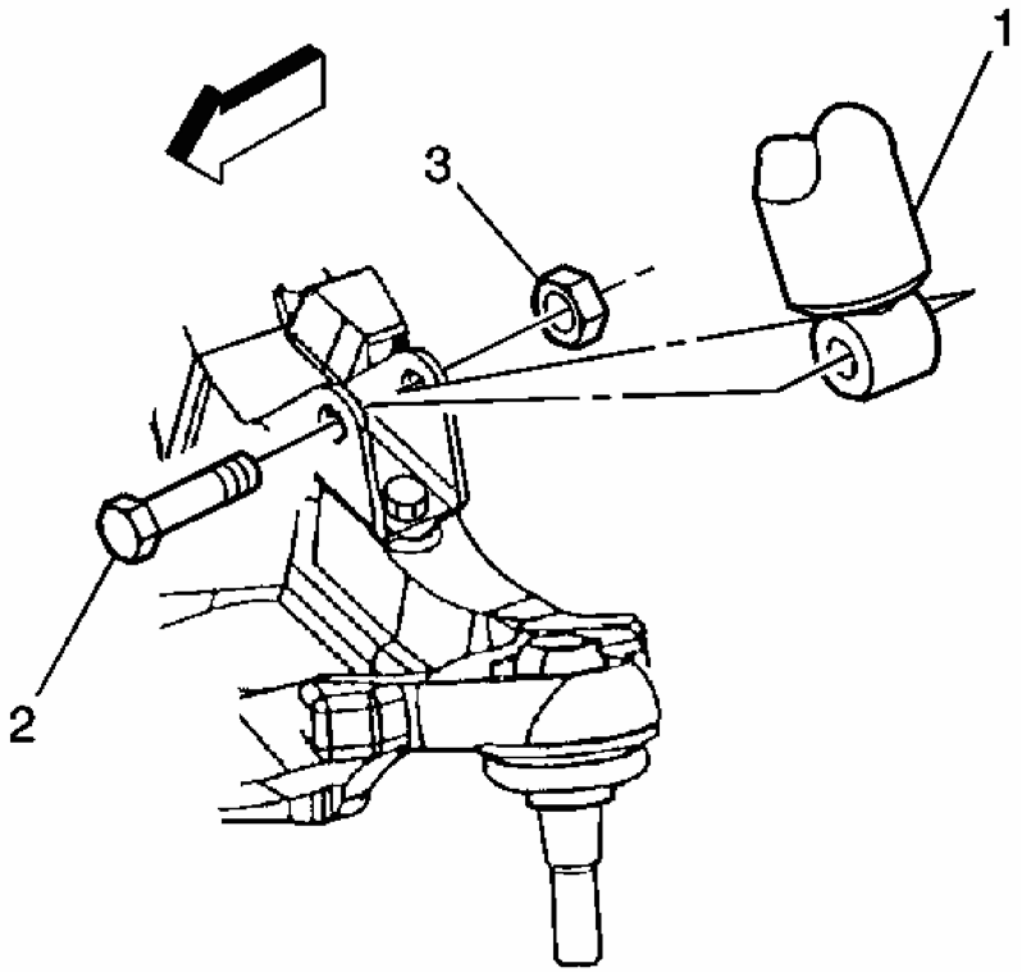

Fig. 80: Shock Absorber & Mounting Bolt (25/35 Series)
Courtesy of GENERAL MOTORS CORP.

10. Remove the shock absorber mounting bolt (2) at the lower control arm, 25/35 Series.
11. Remove the shock absorber.

Installation Procedure

1. Install the shock absorber. Insert the stem through the hole in the shock bracket on the frame.

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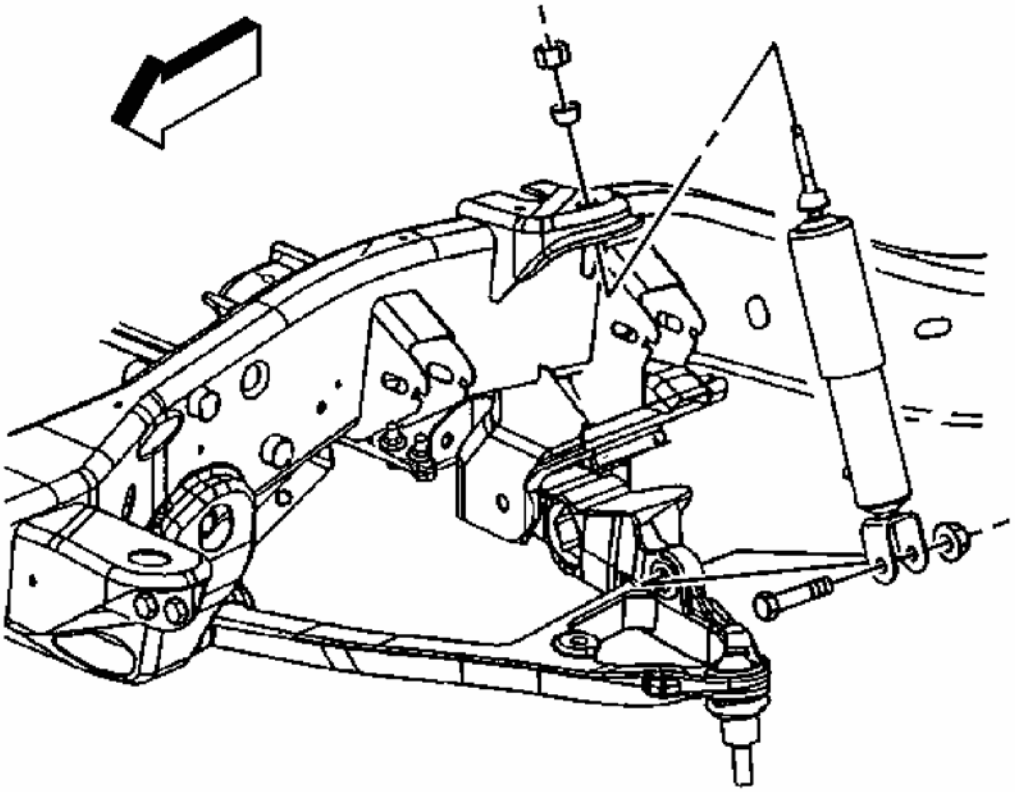

Fig. 81: Shock Absorber & Mounting Bolt (15 Series)
Courtesy of GENERAL MOTORS CORP.

2. Align the shock absorber with the mounting holes in the lower control arm, 15 Series.

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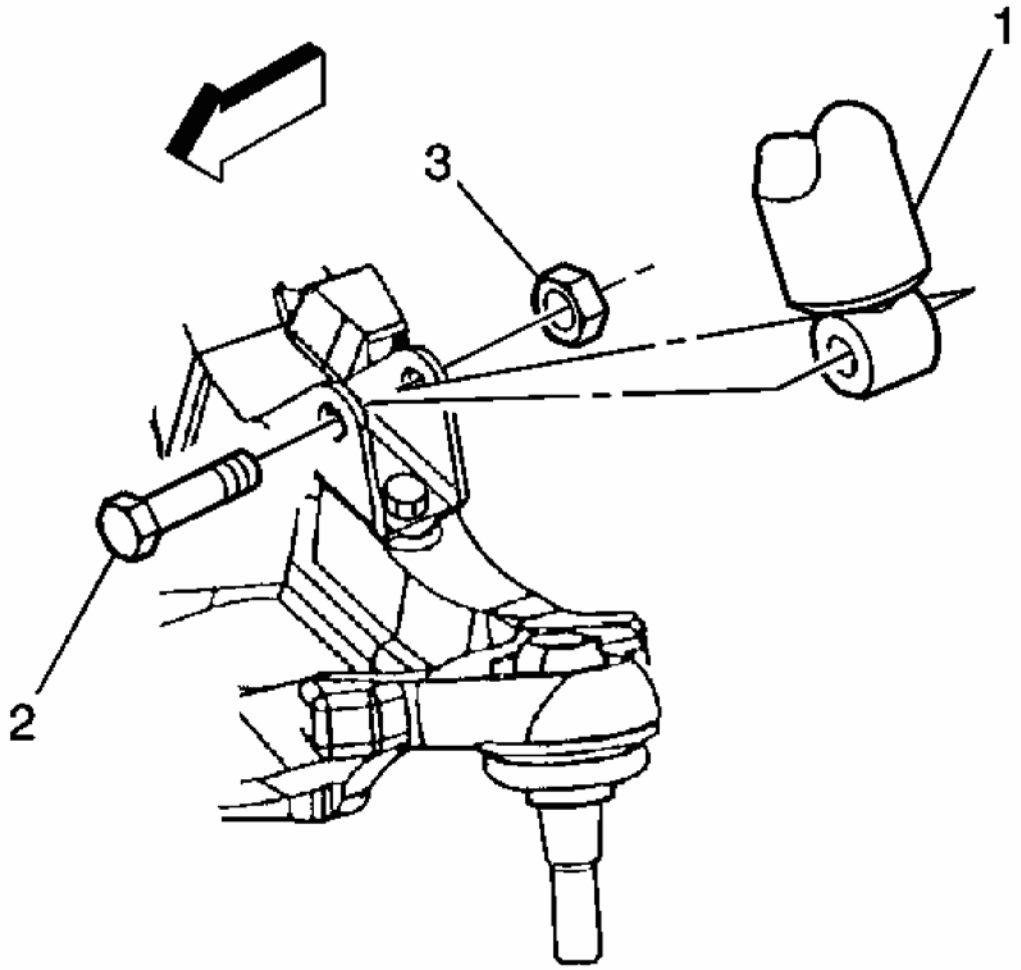

Fig. 82: Shock Absorber & Mounting Bolt (25/35 Series)
Courtesy of GENERAL MOTORS CORP.

3. Align the shock absorber with the mounting holes in the lower control arm, 25/35 Series.
4. Install the shock absorber bolt (2) to the lower control arm.

NOTE: Refer to Fastener Notice in Cautions and Notices.

5. Install the shock absorber nut (3) to the bolt.

Tighten: Tighten the nut to 80 N.m (59 lb ft).

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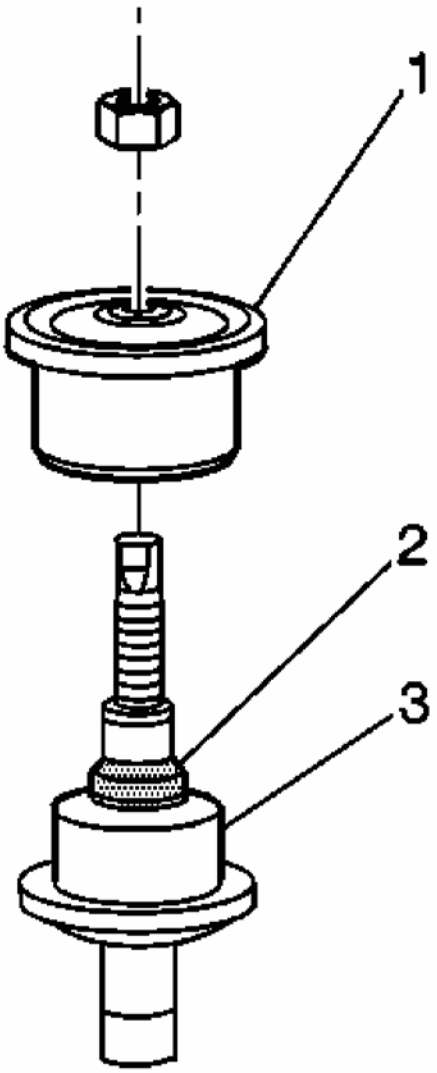

Fig. 83: Identifying Upper Insulator
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: The upper insulators are substantially larger that the lower insulators. The upper insulator (1) must be installed above the shock mounting bracket on the frame. The plastic pilot ring (2) will assist the alignment of the isolators.

6. Install the upper insulator to the shock absorber.

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7. Install the nut to the tennon end. Do not tighten the nut.
8. Connect the ESC link rod to the sensor, if equipped. Refer to **Front Position Sensor Link Assembly Replacement - Electronic Suspension** in Electronic Suspension Control.
9. Remove the safety stands.
10. Lower the vehicle.
11. Hold the tennon end with a wrench while torquing the nut.

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

12. Dispose of the shock absorber. Refer to **Shock Absorber Disposal**.

SHOCK ABSORBER DISPOSAL

CAUTION: Gas charged shock absorbers contain high pressure gas. Do not remove the snap ring from inside the top of the tube. If the snap ring is removed, the contents of the shock absorber will come out with extreme force which may result in personal injury.

CAUTION: To prevent personal injury, wear safety glasses when centerpunching and drilling the shock absorber. Use care not to puncture the shock absorber tube with the centerpunch.

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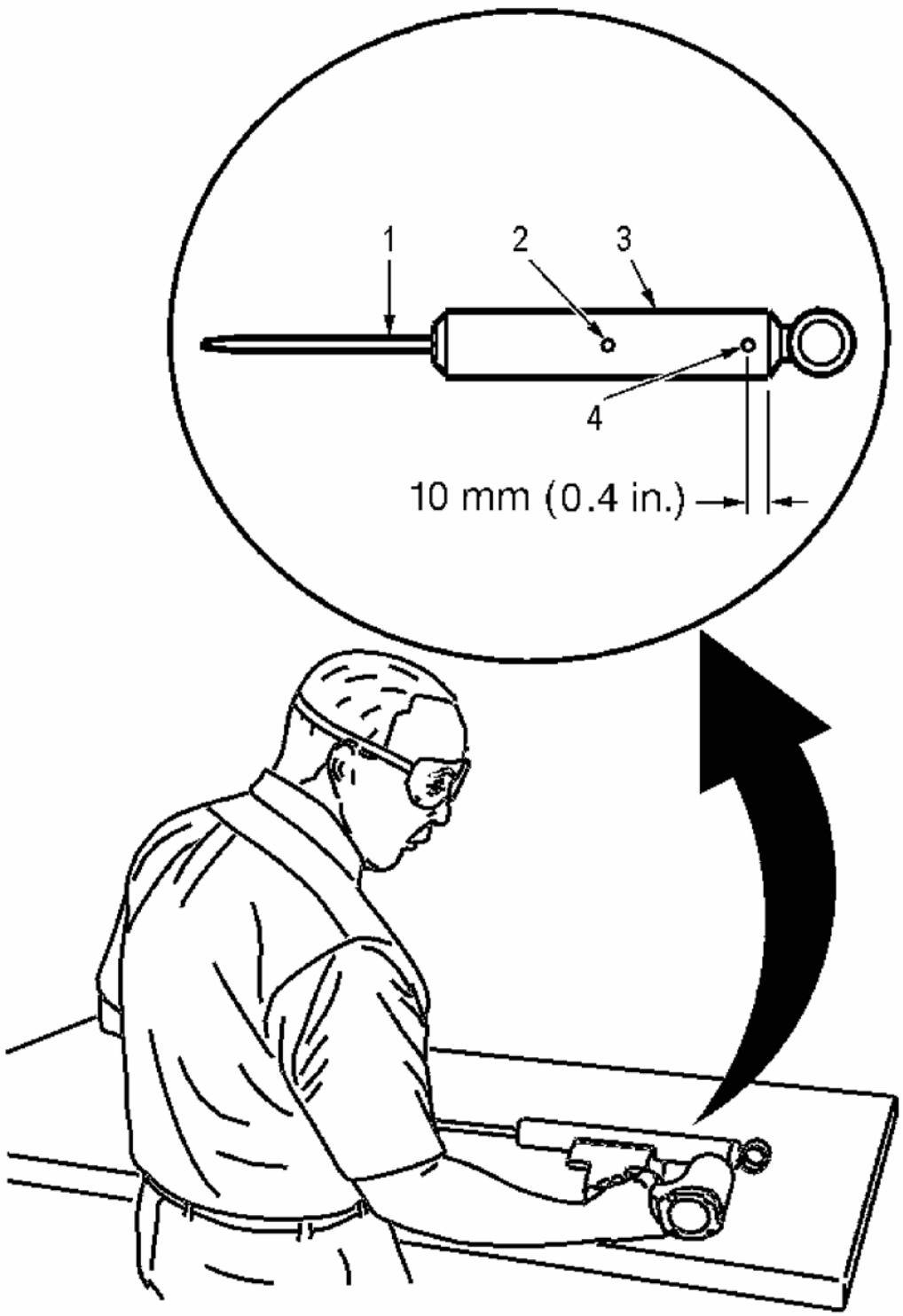

Fig. 84: Drilling Hole In Shock Absorber At Centerpunched Locations
Courtesy of GENERAL MOTORS CORP.

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1. Make an indentation 10 mm (0.4 in) from the bottom (4) of the tube (3) using a centerpunch.
2. Clamp the shock absorber in a vise horizontally with the shock absorber rod (1) completely extended.
3. Drill a hole in the shock absorber at the centerpunch (4) using a 5 mm (3/16 in) drill bit. Gas or a gas/oil mixture will exhaust when the drill bit penetrates the shock absorber. Use shop towels in order to contain the escaping oil.
4. Make an indentation in the middle (2) of the tube (3) with a centerpunch.
5. Drill a second hole in the shock absorber at the centerpunch (2) using a 5 mm (3/16 in) drill bit. Oil will exhaust when the drill bit penetrates the shock absorber. Use shop towels in order to contain the escaping oil.
6. Remove the shock absorber from the vise. Hold the shock absorber over a drain pan horizontally with the holes down. Move the rod (1) in and out of the tube (3) to completely drain the oil from the shock absorber.

DESCRIPTION AND OPERATION

GENERAL DESCRIPTION (TORSION BAR)

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 vehicle's 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 an upper and a lower control arm. 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 is attached at 2 points to the vehicle frame through semi-rigid bushings. The upper control arm attaches to the frame in the same fashion. Attached to the lower control arm is a torsion bar. Torsion bars are steel or steel composite shaft that connects from the lower control arm an adjustable mount at the torsion bar crossmember. The torsion bar functions as a spring in this suspension system. The torsion bar absorbs energy from irregular road surfaces by

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twisting force along the center axis. The torsion bar has a resistance to this twisting motion and will return to the original, at-rest position similar to that of a spring.

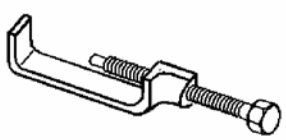
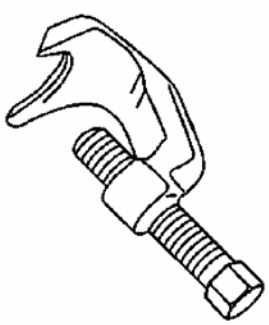
A shock absorber is used in conjunction with this system in order to dampen out the oscillations of the torsion bar. A shock absorber is a basic hydraulic cylinder. The shock is filled with oil and has a moveable shaft that connects to a piston inside the shock absorber. Valves inside the shock absorber offer resistance to oil flow and consequently offer resistance to rapid movement of the piston and shaft. Each end of the shock absorber is connected in such a fashion in order to utilize this recoil action of a torsion bar alone.

Front suspension 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 vehicle's handling characteristics on turns.

SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS

Special Tools

Illustration	Tool Number/ Description
	J 36202 Torsion Loading/Unloading Tool
	J 43631 Ball Joint Separating Tool
	J 45851

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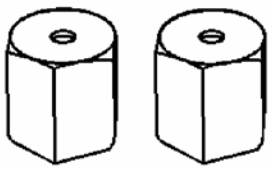
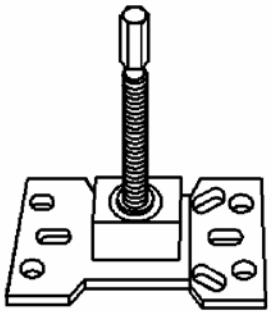
	Ball Joint Seperator Protector Adapters
	J 45859 Axle Remover

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