2010 SUSPENSION

Front Suspension - Camaro

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Application	Specification	
	Metric	English
Front Lower Control Arm Adjuster Nut	50 N.m Plus an additional 150 degrees	37 lb ft Plus an additional 150 degrees
Front Lower Front Control Arm Nut at the Steering Knuckle	40 N.m Plus an additional 90 degrees	30 lb ft Plus an additional 90 degrees
Front Lower Rear Control Arm Nut at the Steering Knuckle	40 N.m Plus an additional 90 degrees	30 lb ft Plus an additional 90 degrees
Front Lower Rear Control Arm Bolt at the Frame	50 N.m Plus an additional 120 degrees	37 lb ft Plus an additional 120 degrees
Front Stabilizer Shaft Link Nut at the Front Strut	50 N.m	36 lb ft
Front Stabilizer Shaft Link Nut at the Stabilizer Shaft	50 N.m	36 lb ft
Front Stabilizer Shaft Insulator Clamp Nuts	17 N.m	13 lb ft
Front Suspension Strut Bolts at the Steering Knuckle	80 N.m Plus an additional 180 degrees	59 lb ft Plus an additional 180 degrees
Front Suspension Strut Nut at the Front Suspension Strut Mounting Plate	70 N.m	52 lb ft
Front Suspension Strut Nut at the Front Suspension Strut Insulator	70 N.m	52 lb ft
Front Wheel Bearing/Hub Bolts	108 N.m	79 lb ft

REPAIR INSTRUCTIONS

STABILIZER SHAFT REPLACEMENT

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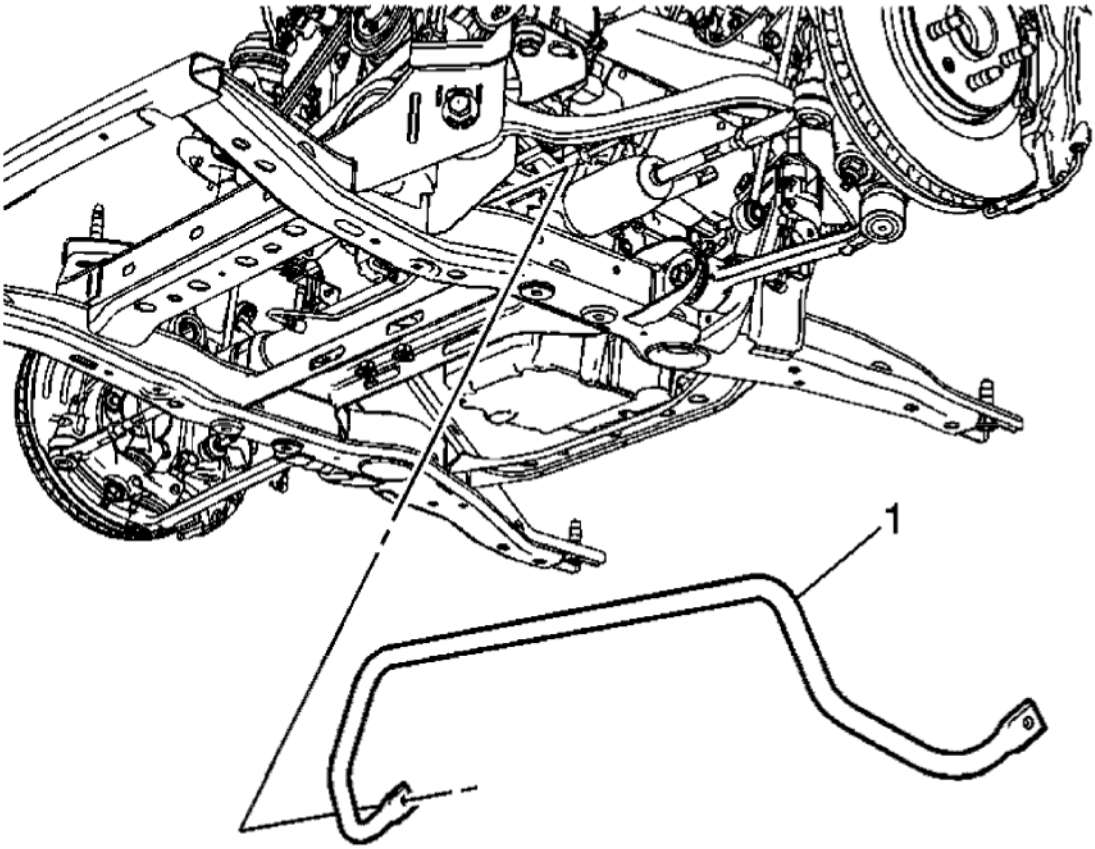


Fig. 1: Stabilizer Shaft
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedures 1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** . 2. Remove the tire and wheel assemblies. Refer to **Tire and Wheel Removal and Installation** . 3. Remove the outer tie rod from the steering knuckle. Refer to **Steering Linkage Outer Tie Rod Replacement** . 4. Remove the stabilizer shaft links from the stabilizer shaft. Refer to **Stabilizer Shaft Link Replacement**. 5. Remove the stabilizer shaft insulators. Refer to **Stabilizer Shaft Insulator Replacement**.	
1	Front Stabilizer Shaft **Tip:** It maybe necessary to maneuver the stabilizer shaft in such away to remove it from the vehicle.

STABILIZER SHAFT LINK REPLACEMENT

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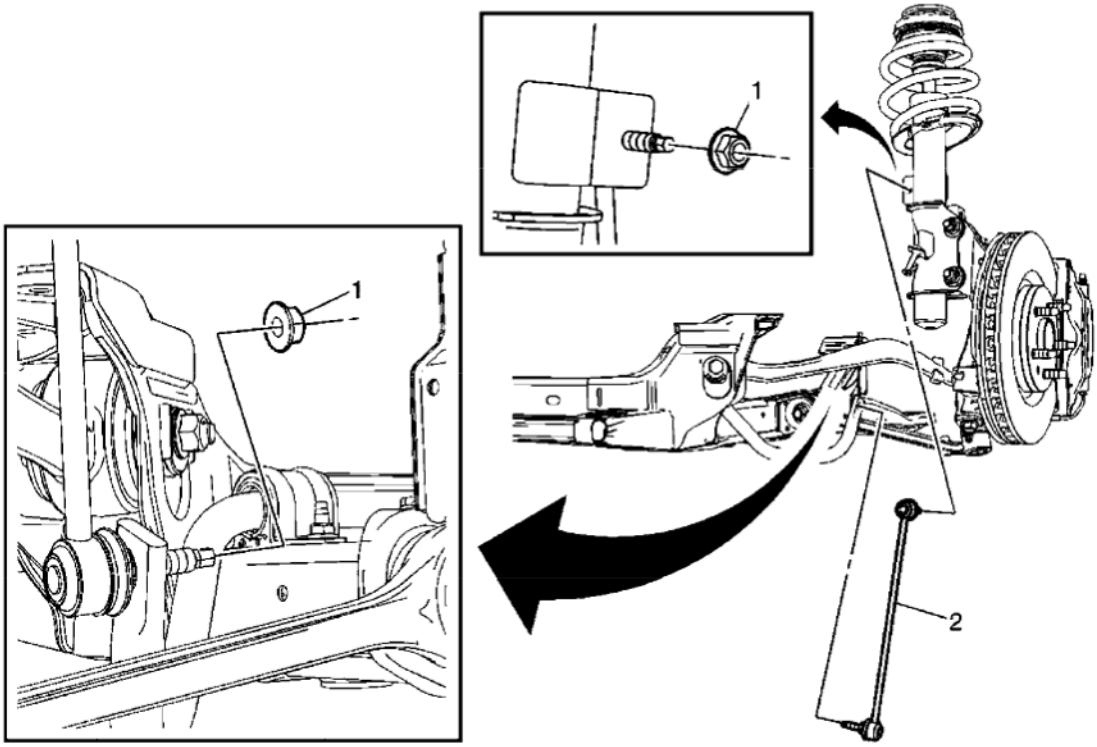


Fig. 2: Stabilizer Shaft Link
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedures 1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** . 2. Remove the tire and wheels. Refer to **Tire and Wheel Removal and Installation** .	
1	Front Stabilizer Shaft Nut (Qty: 2) **CAUTION:** **Refer to Fastener Caution .** **Tip:** • Use the appropriate size socket or wrench to hold the ball stud while removing the stabilizer shaft nut. • After the nut has been removed, discard and replace with NEW. **Tighten:** 49 N.m (36 lb ft)
2	Stabilizer Shaft Link

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STABILIZER SHAFT INSULATOR REPLACEMENT

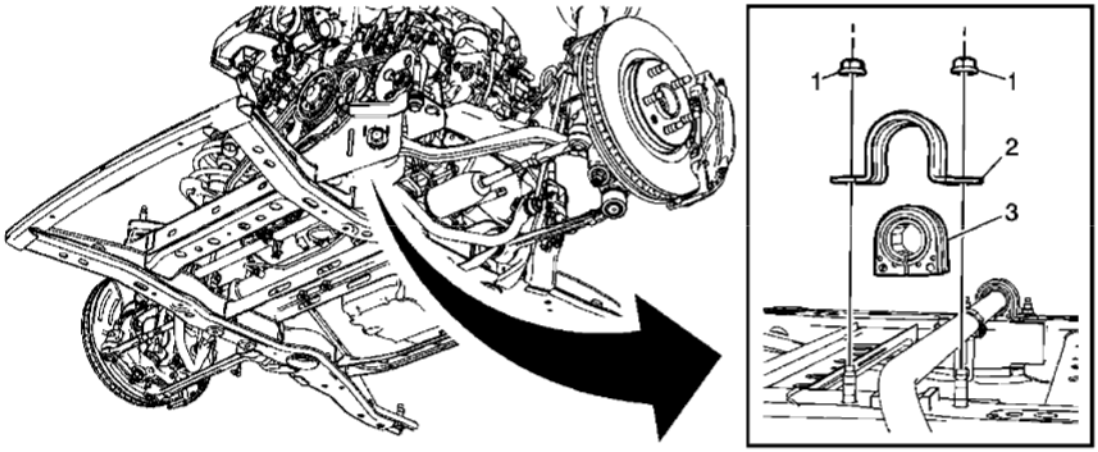


Fig. 3: Stabilizer Shaft Insulator
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedures 1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** . 2. Remove the tire and wheel. Refer to **Tire and Wheel Removal and Installation** .	
1	Front Stabilizer Shaft Clamp Nut (Qty: 2) **CAUTION:** **Refer to Fastener Caution .** **Tip:** Discard the front stabilizer shaft clamp nut and replace with NEW. **Tighten:** 17 N.m (13 lb ft)
2	Front Stabilizer Shaft Clamp
3	Front Stabilizer Shaft Insulator

FRONT WHEEL BEARING AND HUB REPLACEMENT

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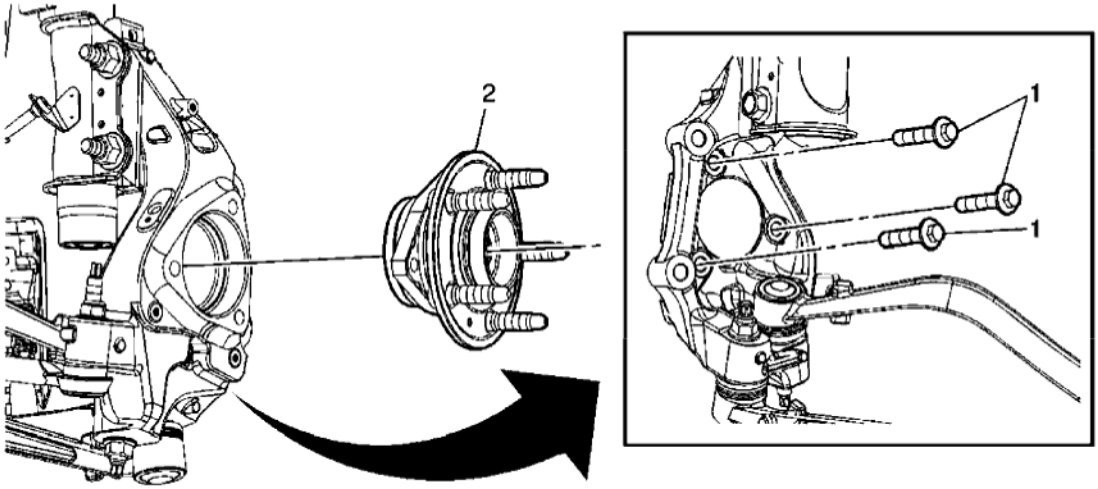


Fig. 4: Front Wheel Bearing & Hub
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedures 1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** . 2. Remove the tire and wheel. Refer to **Tire and Wheel Removal and Installation** . 3. Remove the wheel speed sensor. Refer to **Front Wheel Speed Sensor Replacement** . 4. Remove the front brake rotor. Refer to **Front Brake Rotor Replacement (LLT)** or **Front Brake Rotor Replacement (L99, LS3)** .	
1	Front Wheel bearing Bolt (Qty: 3) **CAUTION:** **Refer to Fastener Caution .** **Tip:** If needed, remove the front brake splash shield. Refer to **Front Brake Shield Replacement** to gain access to the front wheel bearing/hub bolts. **Tighten:** 108 N.m (79 lb ft)
2	Front Wheel Bearing/Hub Assembly **Tip:** Use the appropriate tool to separate the wheel bearing/hub from the wheel drive shaft.

STEERING KNUCKLE REPLACEMENT

Removal Procedure

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

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NOTE: **If removing the knuckle from the strut assembly to service other components, proceed to step 5.**

3. Remove the speed sensor from the steering knuckle. Refer to **Front Wheel Speed Sensor Replacement** .

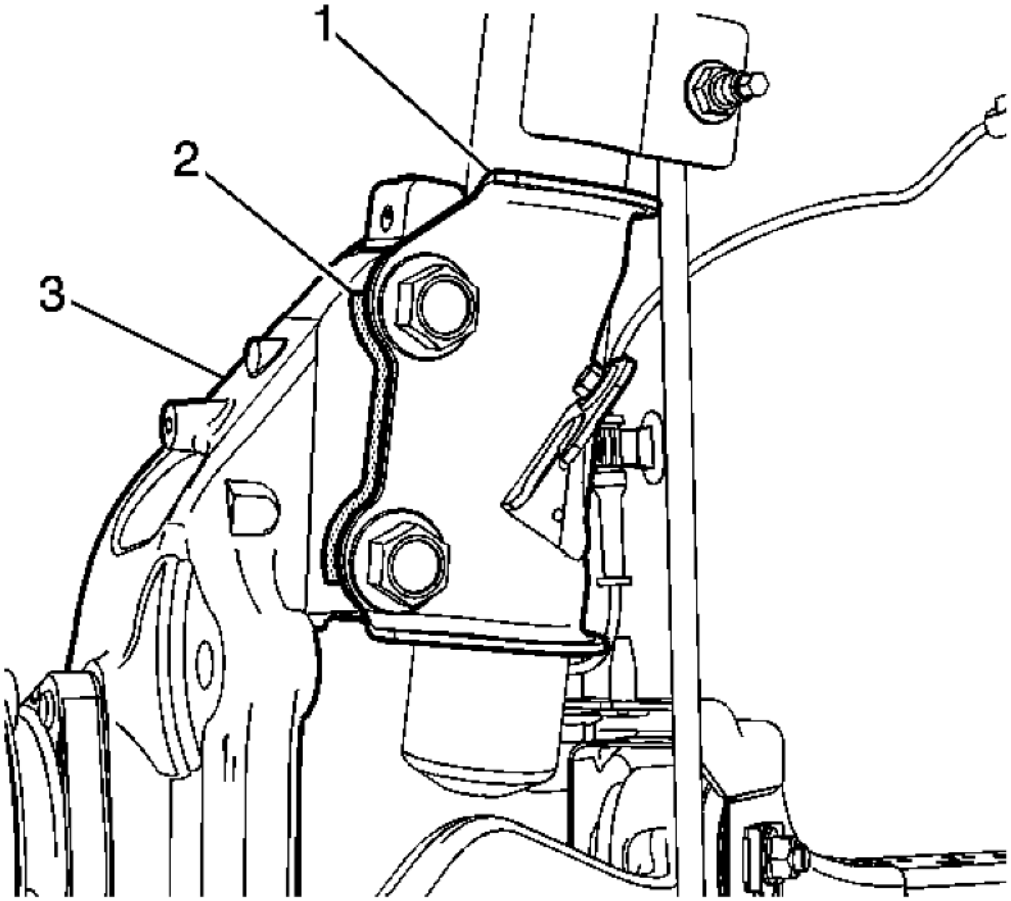


Fig. 5: Mark On Steering Knuckle & Strut Assembly
Courtesy of GENERAL MOTORS CORP.

4. Paint a mark (2) on the steering knuckle (3) and the strut assembly (1).

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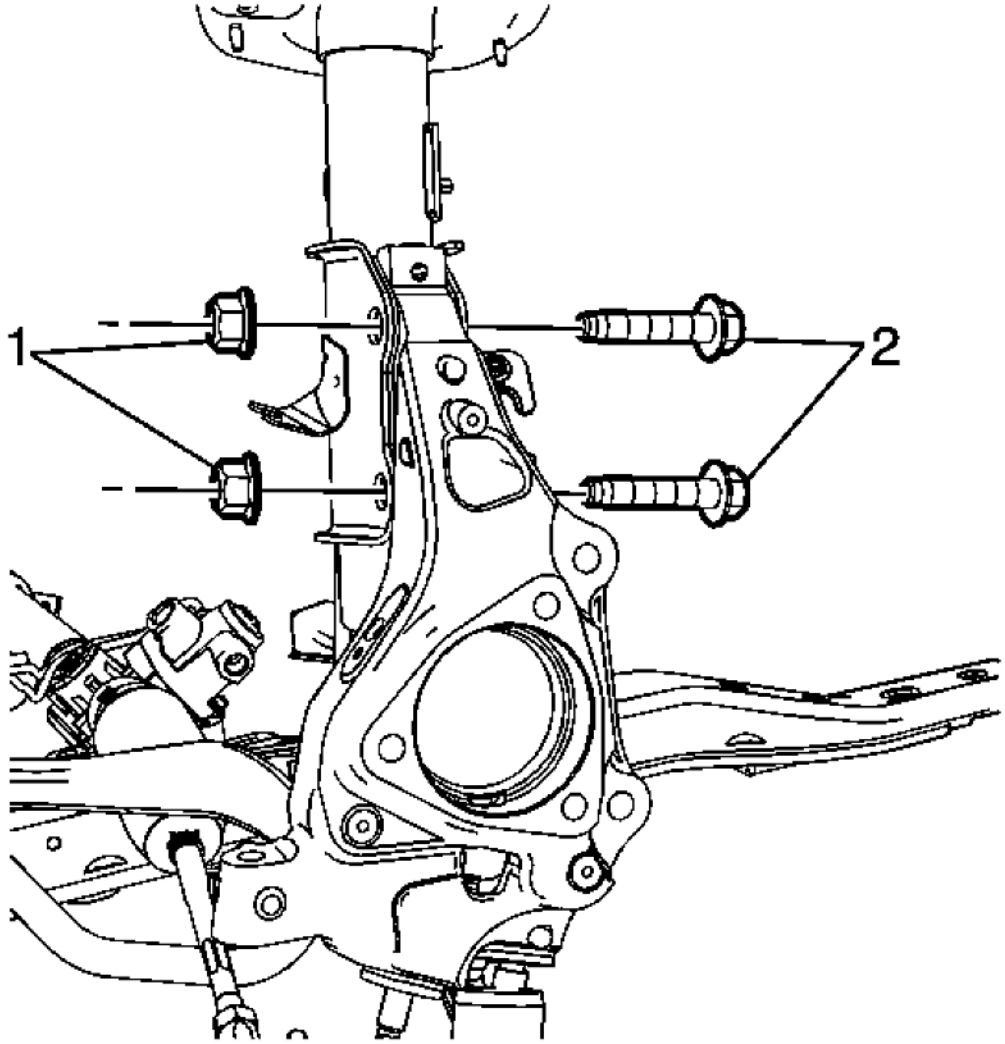


Fig. 6: Front Suspension Strut Bolts & Nuts
Courtesy of GENERAL MOTORS CORP.

5. Remove the front suspension strut bolts (2) and nuts (1) from the strut assembly.
6. Remove the wheel bearing/hub assembly from the steering knuckle. Refer to **Front Wheel Bearing and Hub Replacement**.
7. Remove the outer tie rod end from the knuckle. Refer to **Steering Linkage Outer Tie Rod Replacement** .
8. Remove the front lower control arm from the knuckle. Refer to **Front Lower Control Front Arm Replacement**.

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9. Remove the front rear lower control arm from the knuckle. Refer to **Front Lower Control Rear Arm Replacement**.

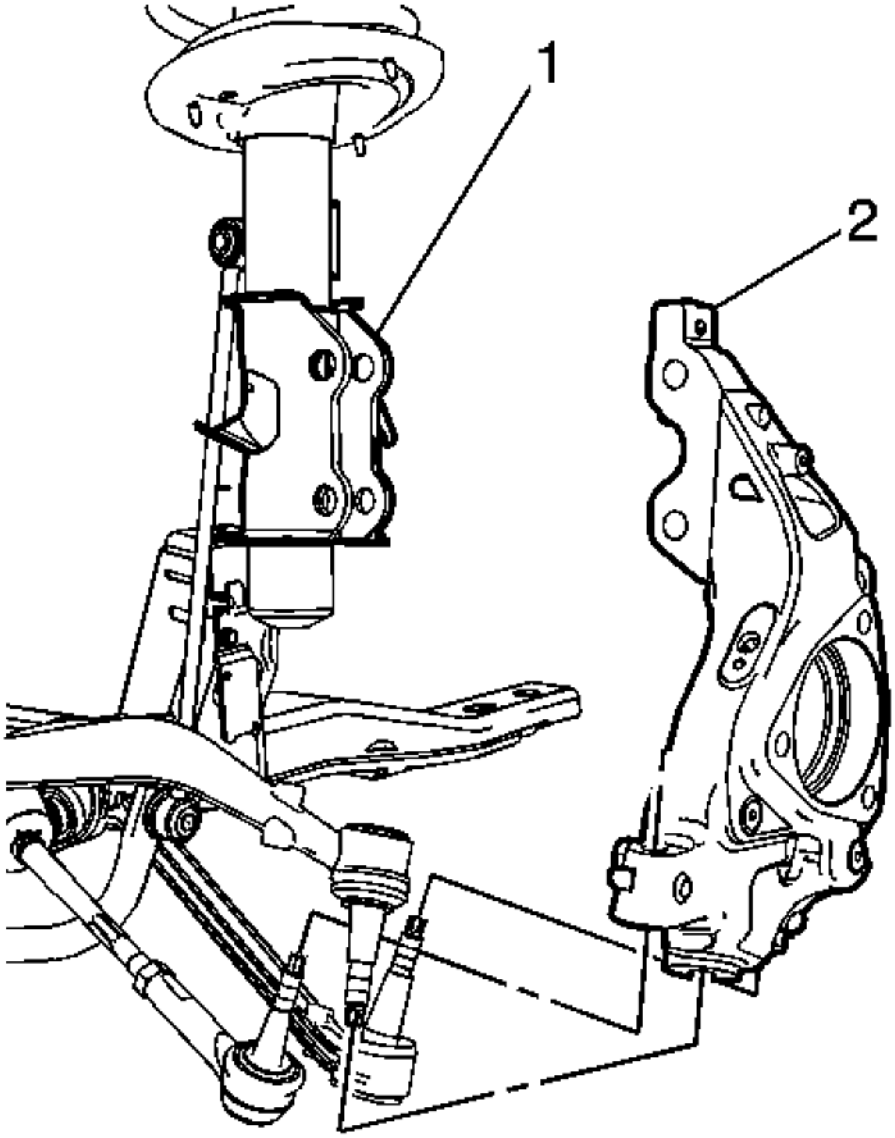


Fig. 7: Steering Knuckle Assembly
Courtesy of GENERAL MOTORS CORP.

10. Remove the steering knuckle (2) assembly.

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Installation Procedure

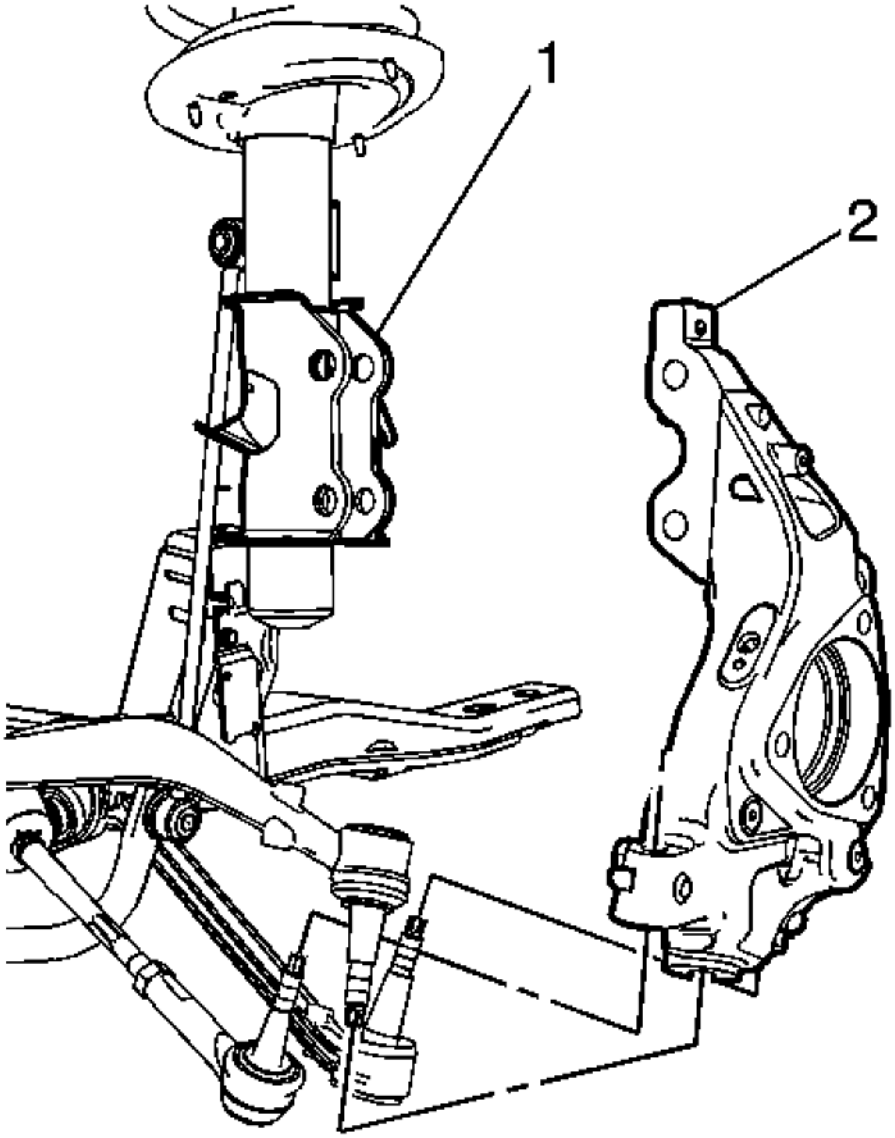


Fig. 8: Steering Knuckle Assembly
Courtesy of GENERAL MOTORS CORP.

1. Position the steering knuckle (2) in the strut (1).

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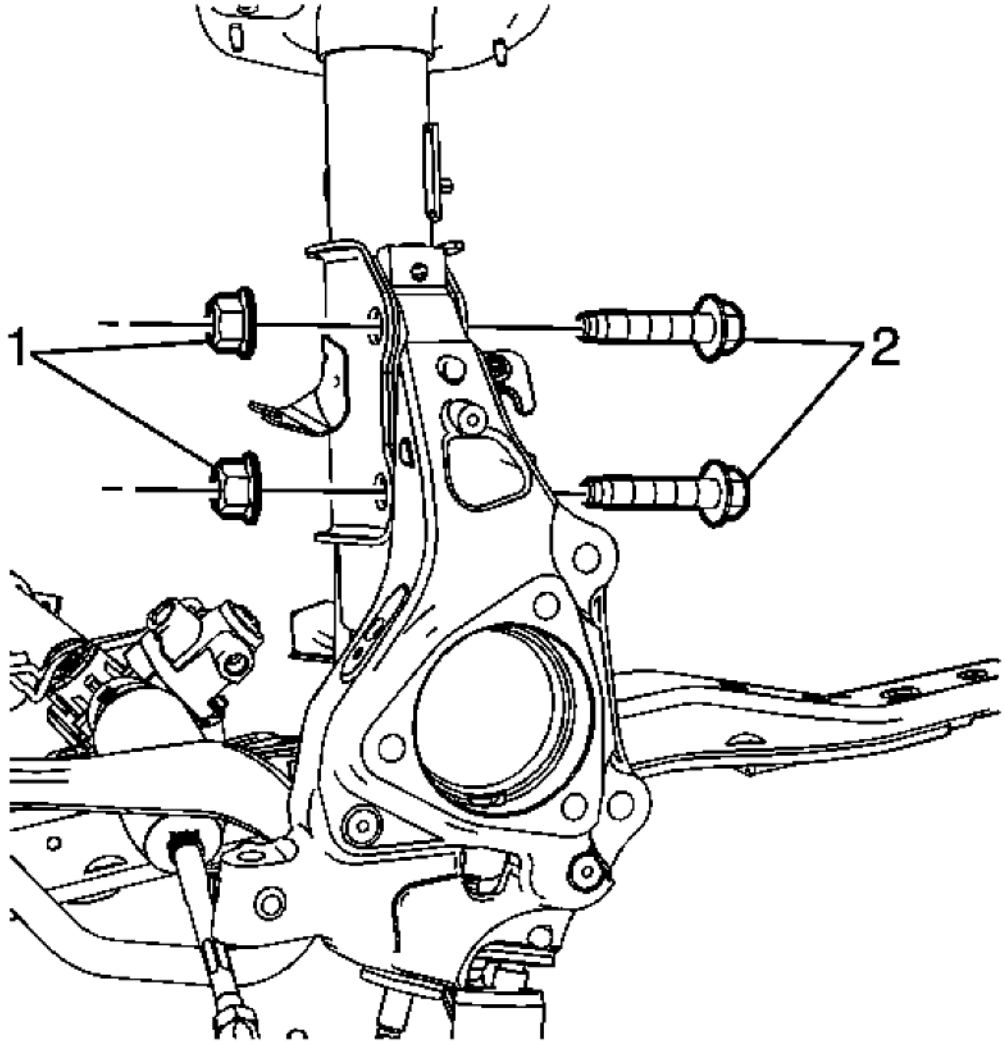


Fig. 9: Front Suspension Strut Bolts & Nuts
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2. Install the front suspension strut bolts (2) and nuts (1).

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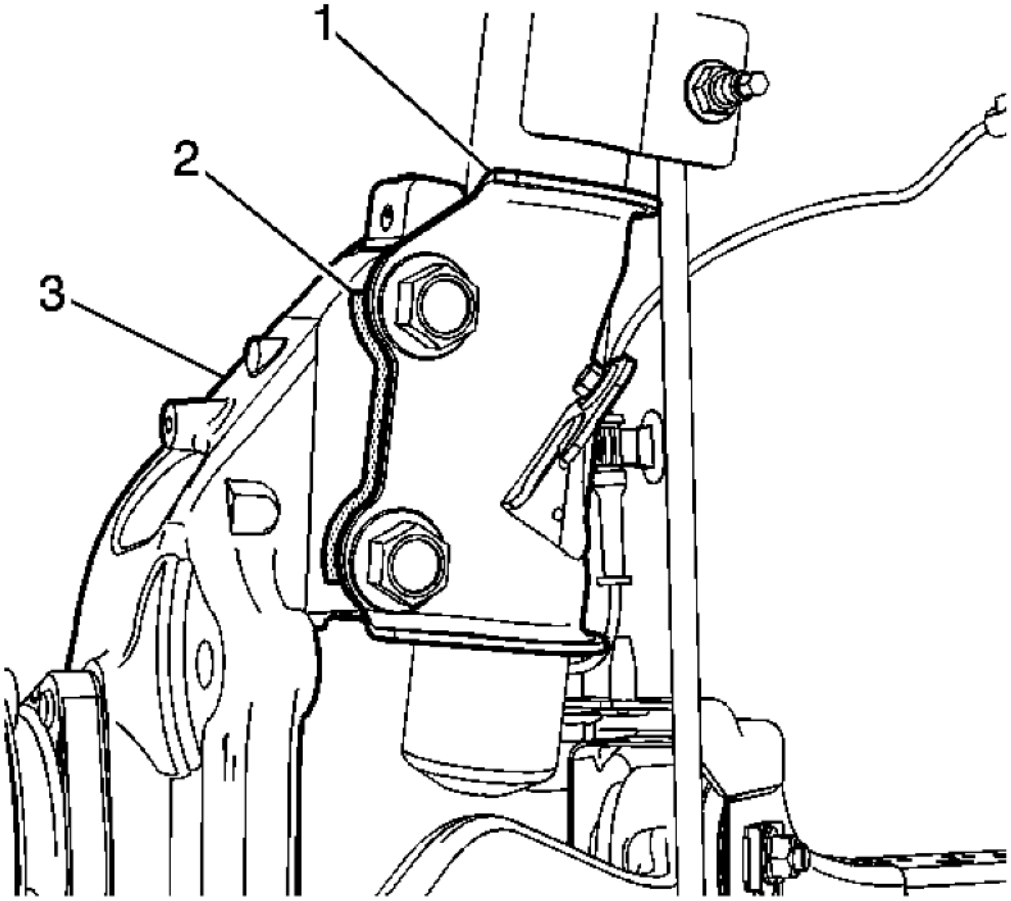


Fig. 10: Mark On Steering Knuckle & Strut Assembly
Courtesy of GENERAL MOTORS CORP.

3. Align the reference mark (2) on the steering knuckle (3) and the strut assembly (1).

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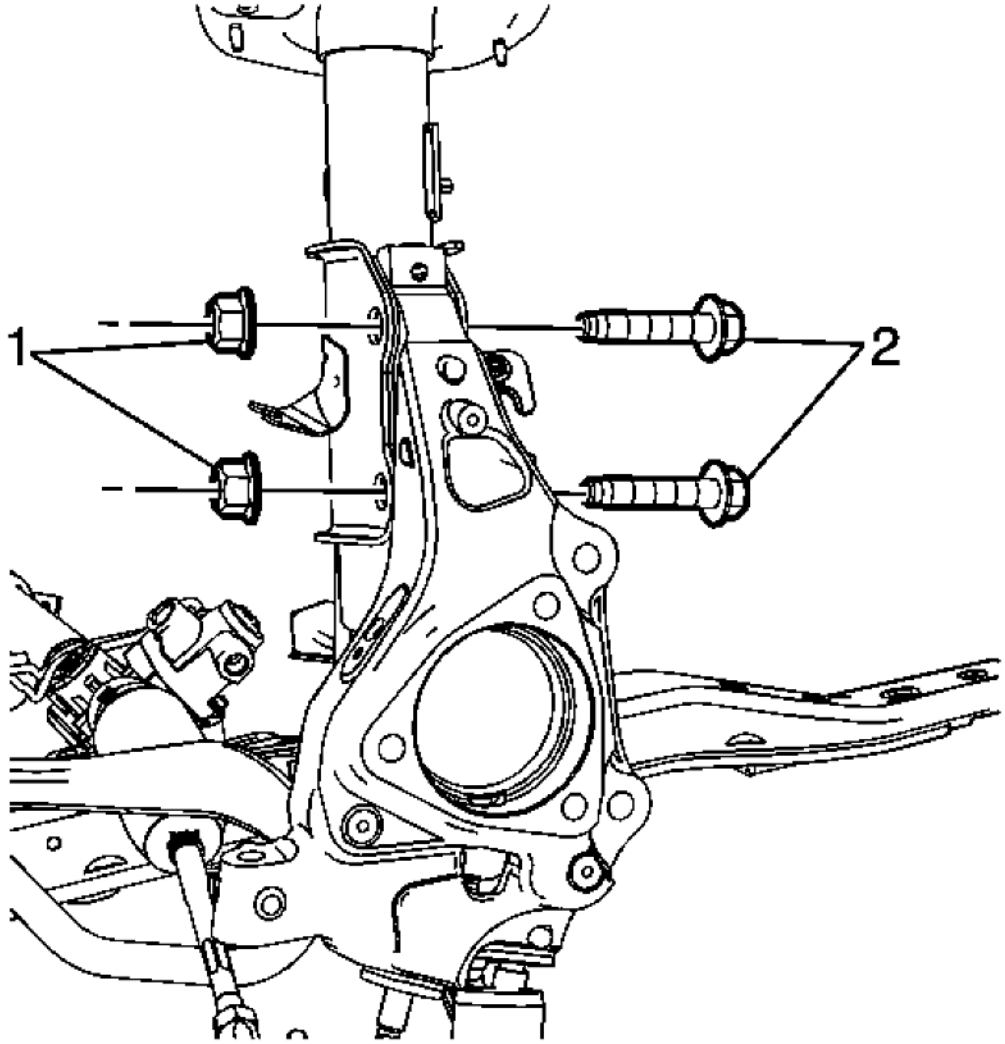


Fig. 11: Front Suspension Strut Bolts & Nuts
Courtesy of GENERAL MOTORS CORP.

CAUTION: Refer to Fastener Caution .

4. Install the front suspension strut bolts (2) and nuts (1) and tighten to 80 N.m (59 lb ft) plus an additional 180 degrees.
5. Install the front lower control arm. Refer to **Front Lower Control Front Arm Replacement**.
6. Install the front rear lower control arm. Refer to **Front Lower Control Rear Arm Replacement**.

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7. Install the outer tie rod end. Refer to **Steering Linkage Outer Tie Rod Replacement** .
8. Install the wheel bearing/hub assembly. Refer to **Front Wheel Bearing and Hub Replacement**.
9. Install the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** .
10. Install the speed sensor. Refer to **Front Wheel Speed Sensor Replacement** .
11. Install the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** .
12. Remove the support and lower the vehicle.
13. Check and adjust the front wheel alignment, if needed. Refer to **Front Camber Adjustment** .

FRONT LOWER CONTROL REAR ARM REPLACEMENT

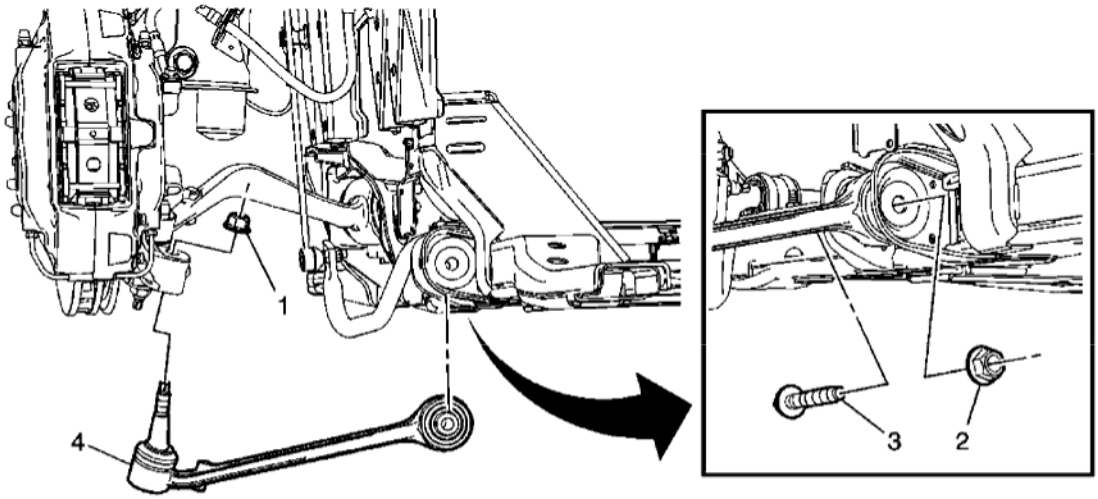


Fig. 12: Front Lower Control Rear Arm
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedures 1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** . 2. Remove the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** .	
	Front Rear Lower Control Arm Nut **CAUTION:** **Refer to Fastener Caution .** **Procedure** 1. Using the **J-38892:** separator, remove the front rear lower control arm from the knuckle. 2. Using a torque angle meter, tighten the nut.

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1	**Tip:** If servicing the steering knuckle, it is NOT necessary to completely remove the lower control arm from the vehicle. Separate the lower control arm from the steering knuckle. **Tighten:** 40 N.m (30 lb ft) plus an additional 90 degrees **Special Tools:** **J-38892:** Ball Joint Separator For equivalent regional tools, refer to **Special Tools**.
2	Front Lower Control Arm Rear Nut
3	Front Lower Control Arm Bolt **Tighten:** 50 N.m (37 lb ft) plus an additional 120 degrees
4	Front Lower Control Arm **Procedure:** Check and adjust the front wheel alignment, if needed. Refer to **Front Camber Adjustment** .

FRONT LOWER CONTROL FRONT ARM REPLACEMENT

Special Tools

J 38892-2: Ball Joint Separator

For equivalent regional tools, refer to **Special Tools**.

Removal Procedure

NOTE: If servicing the steering knuckle, it is NOT necessary to completely remove the lower control arm from the vehicle. Separate the lower control arm from the steering knuckle.

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

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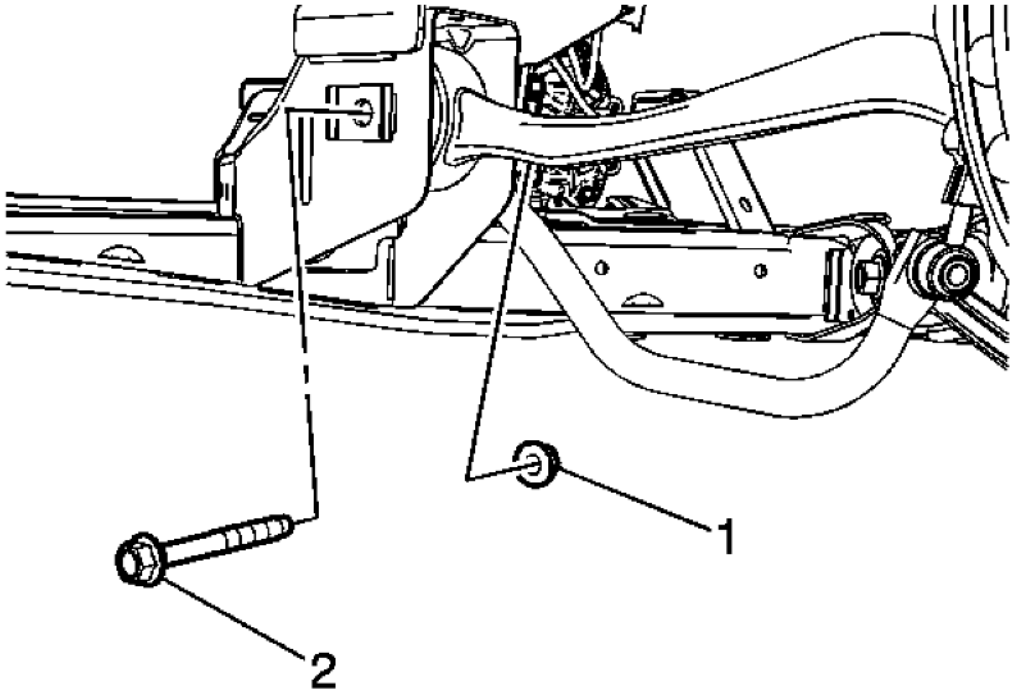


Fig. 13: Lower Control Arm Nut & Bolt
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3. Remove the lower control arm nut (1) and the bolt (2).

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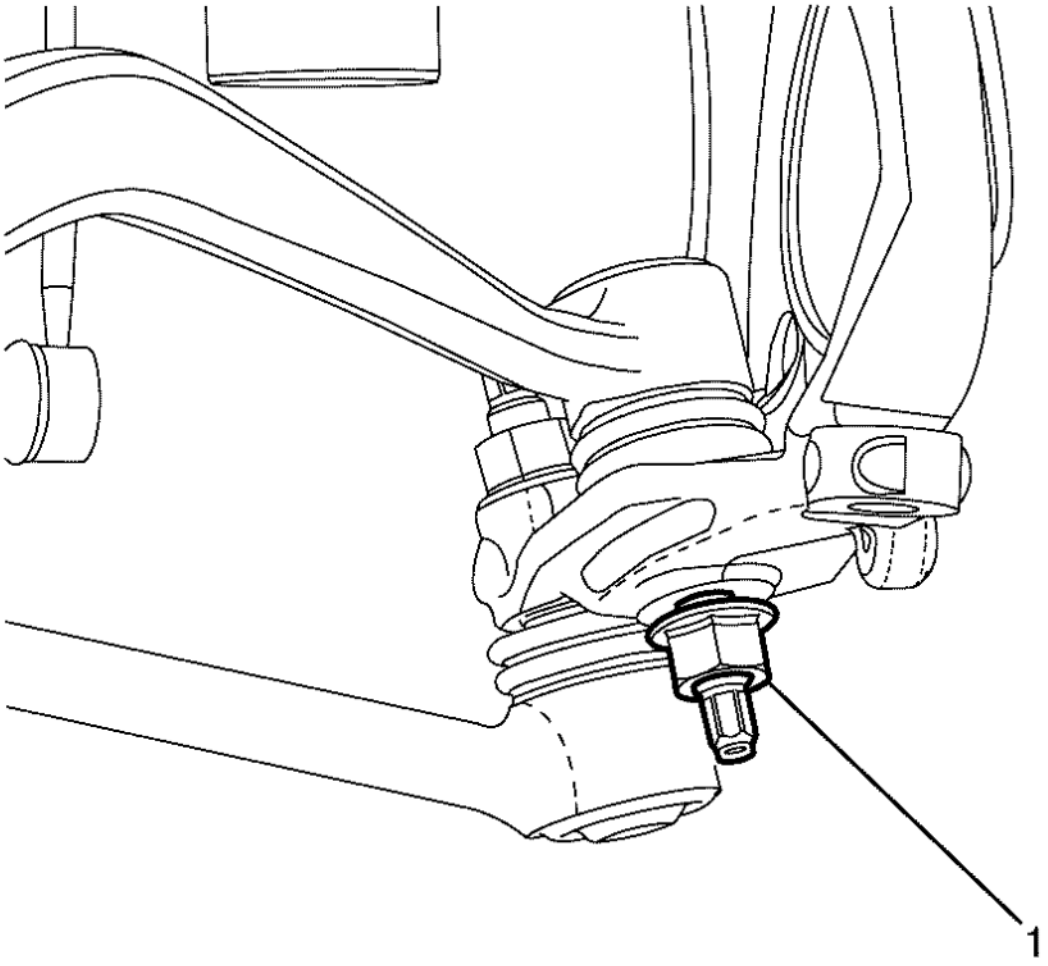


Fig. 14: Front Lower Control Arm Nut
Courtesy of GENERAL MOTORS CORP.

4. Loosen, but DO NOT remove the front lower control arm nut (1).

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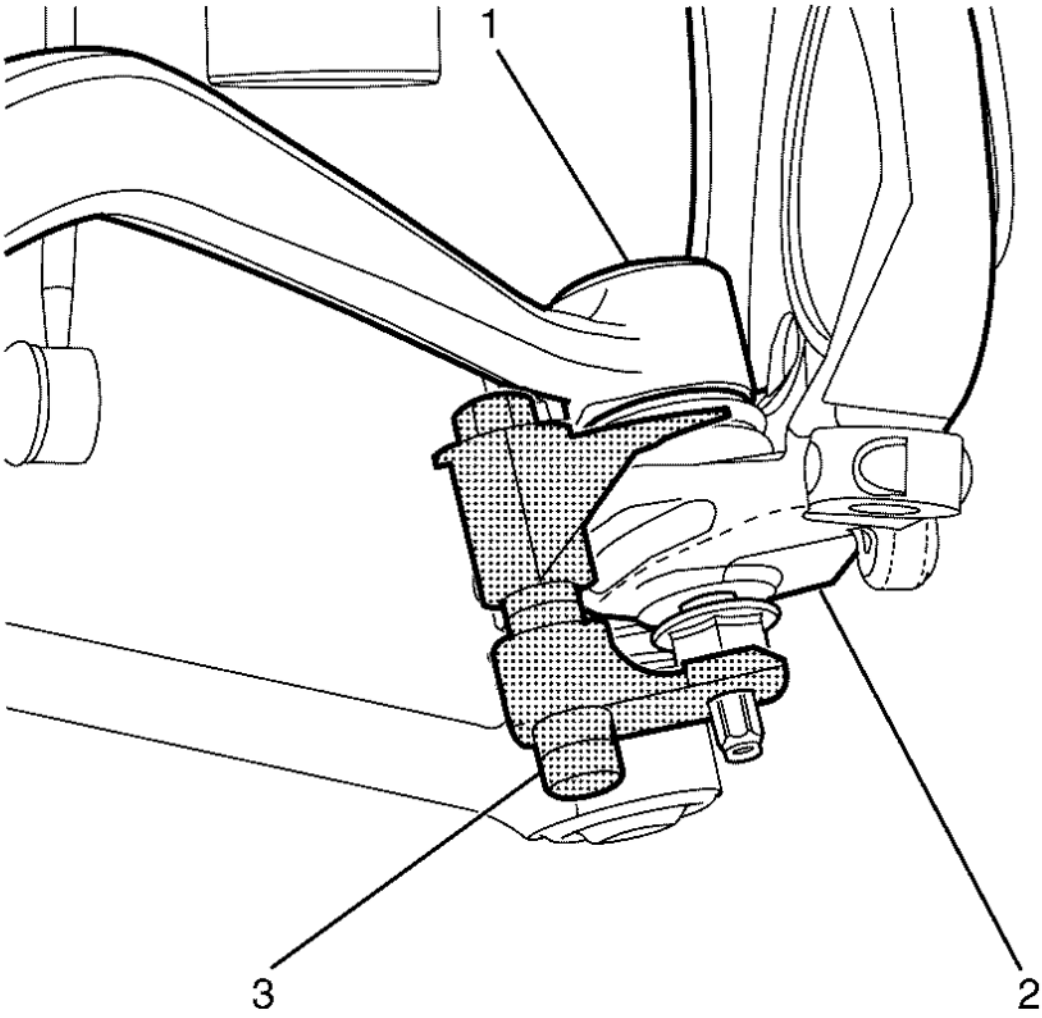


Fig. 15: Separating Front Lower Control Arm From Steering Knuckle
Courtesy of GENERAL MOTORS CORP.

5. Using the **J 38892-2:** separator (3), separate the front lower control arm from the steering knuckle (1).

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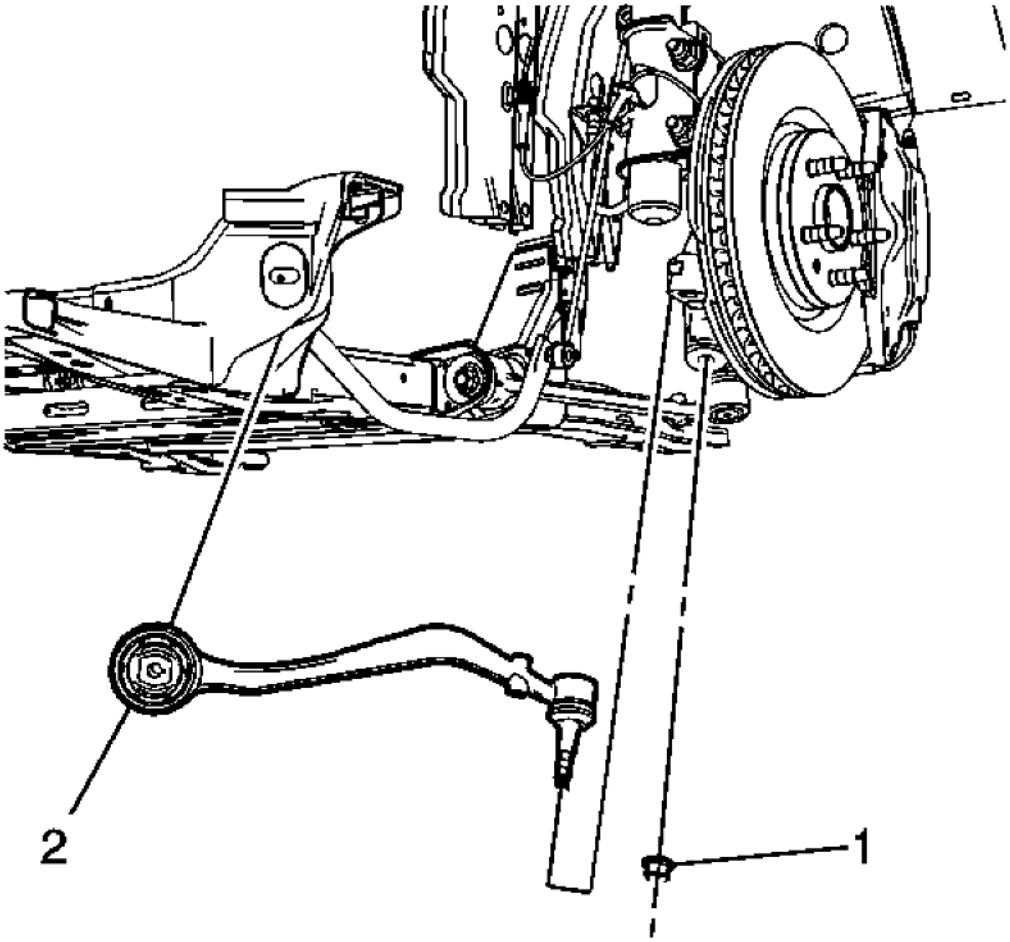


Fig. 16: Front Lower Control Nut & Control Arm
Courtesy of GENERAL MOTORS CORP.

6. Remove the front lower control nut (1) and the control arm (2) from the frame and the steering knuckle.

Installation Procedure

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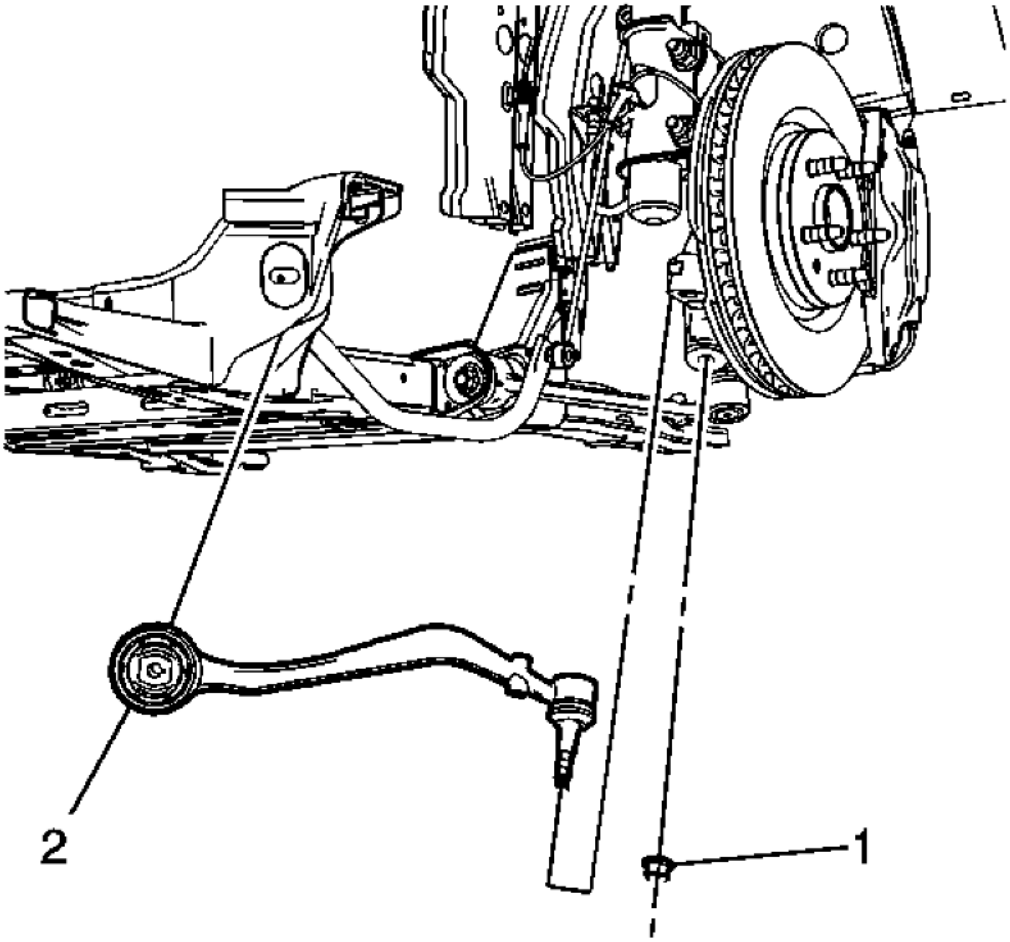


Fig. 17: Front Lower Control Nut & Control Arm
Courtesy of GENERAL MOTORS CORP.

1. Position the front lower control arm (2) in the frame and the steering knuckle.

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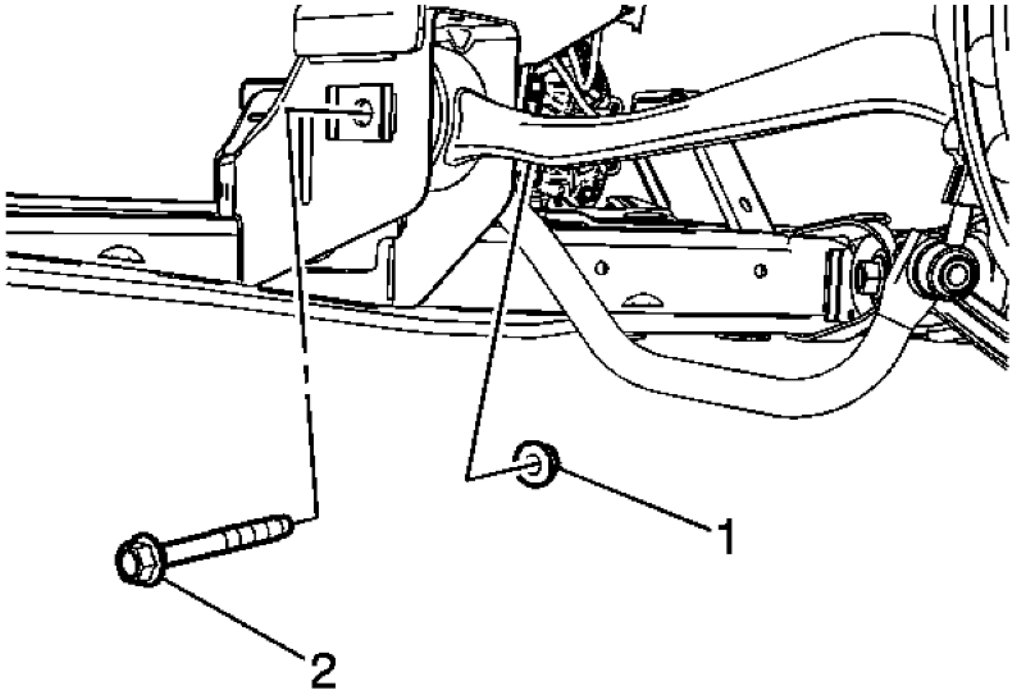


Fig. 18: Lower Control Arm Nut & Bolt
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2. Install the front lower control arm bolt (2) and the nut (1).

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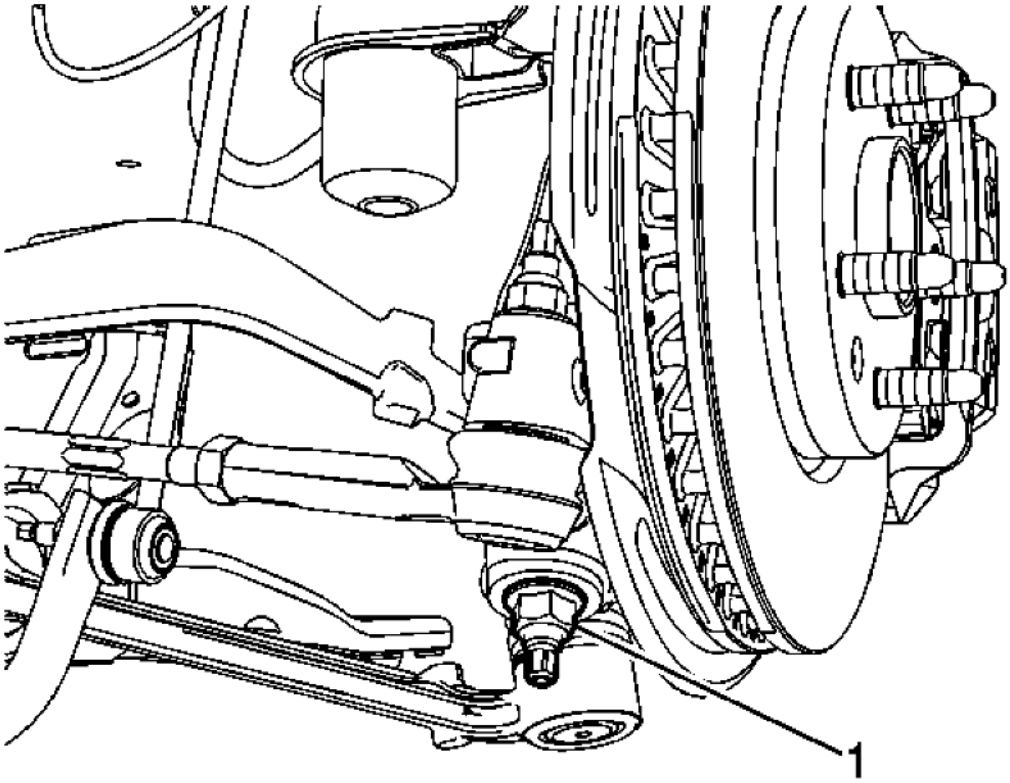


Fig. 19: Front Lower Control Arm Nut
Courtesy of GENERAL MOTORS CORP.

3. Install the front lower control arm nut (1).

CAUTION: Refer to Fastener Caution .

4. Using a torque angle meter, tighten the lower control arm nut (1) to 40 N.m (30 lb ft) plus an additional 90 degrees.

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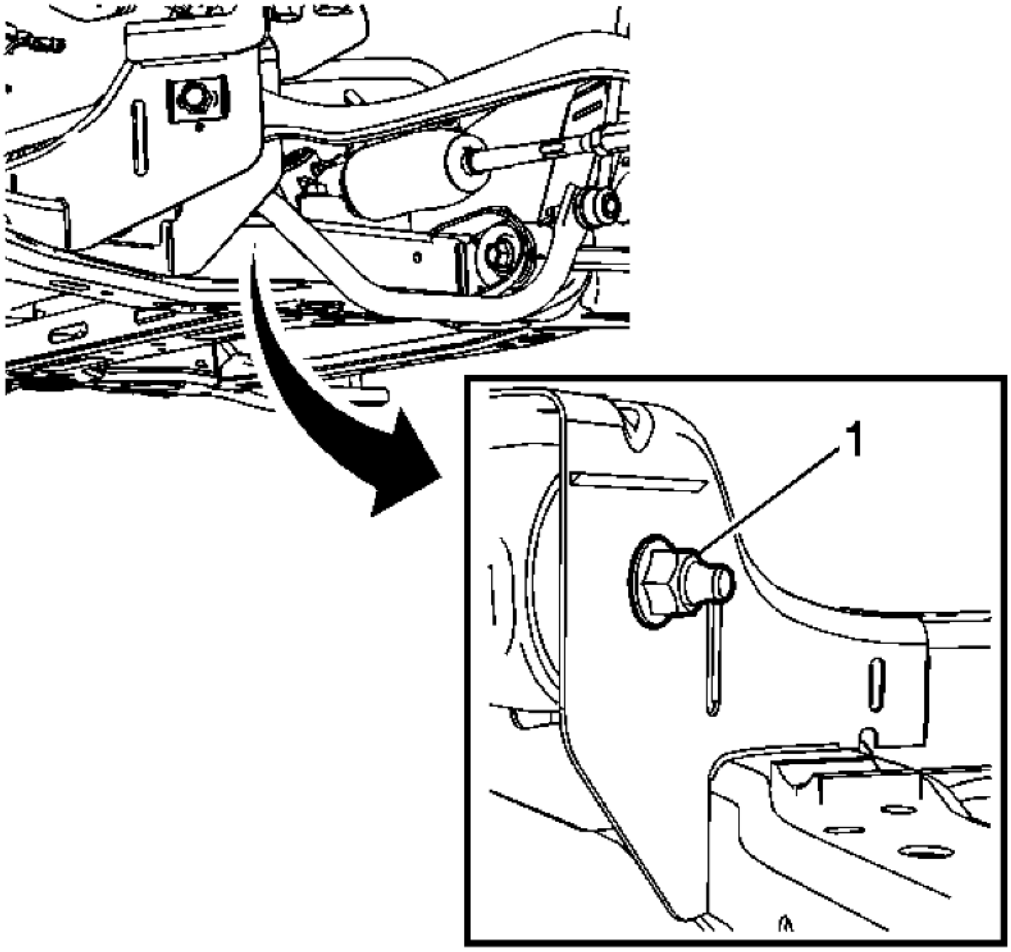


Fig. 20: Front Lower Control Arm Nut
Courtesy of GENERAL MOTORS CORP.

5. Using a torque angle meter, tighten the front lower control arm nut (1) to 50 N.m (37 lb ft) plus an additional 150 degrees.
6. Install the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** .
7. Remove the support and lower the vehicle.
8. Check and adjust the front wheel alignment, if needed. Refer to **Front Camber Adjustment** .

WHEEL STUD REPLACEMENT

Special Tools

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J 43631: Ball Joint Remover

For equivalent regional tools, refer to **Special Tools**.

Removal Procedure

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
2. Remove the tire and wheel. Refer to **Tire and Wheel Removal and Installation** .
3. Remove the brake rotor. Refer to **Front Brake Rotor Replacement (LLT)** or **Front Brake Rotor Replacement (L99, LS3)** .

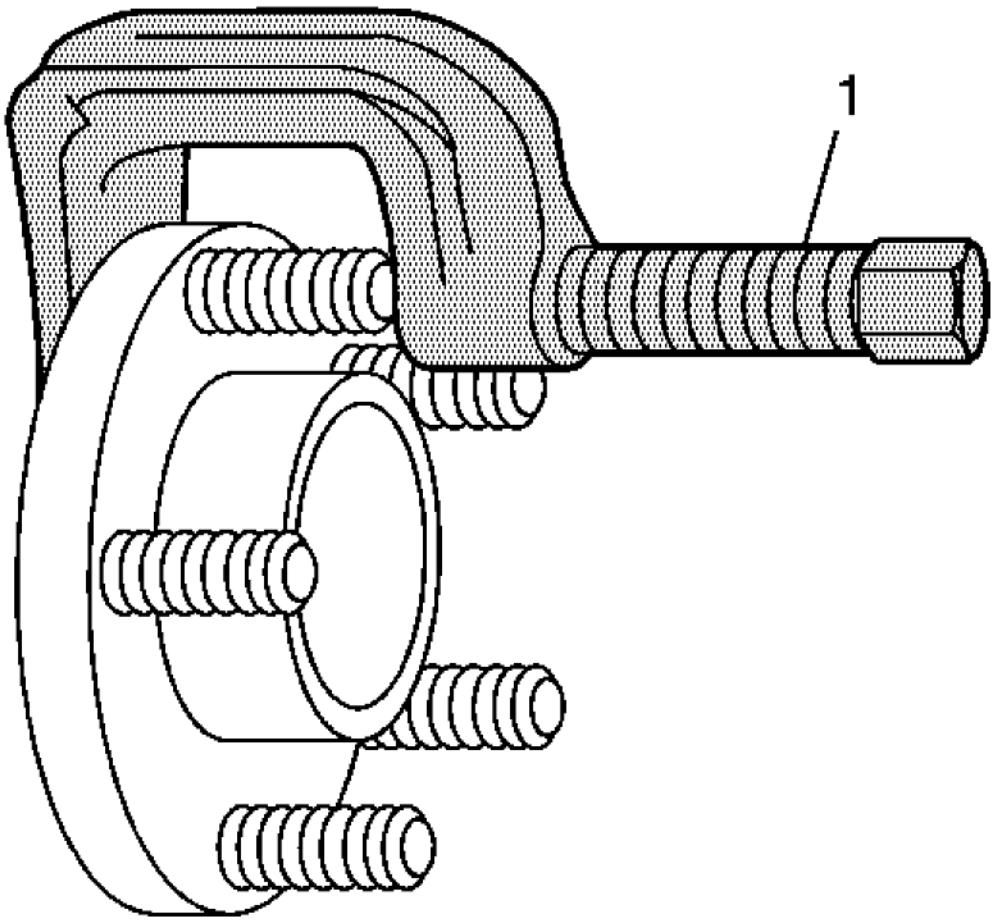


Fig. 21: Removing Wheel Stud From Wheel Bearing/Hub
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4. Using the **J 43631:** remover (1), remove the wheel stud from the wheel bearing/hub.

Installation Procedure

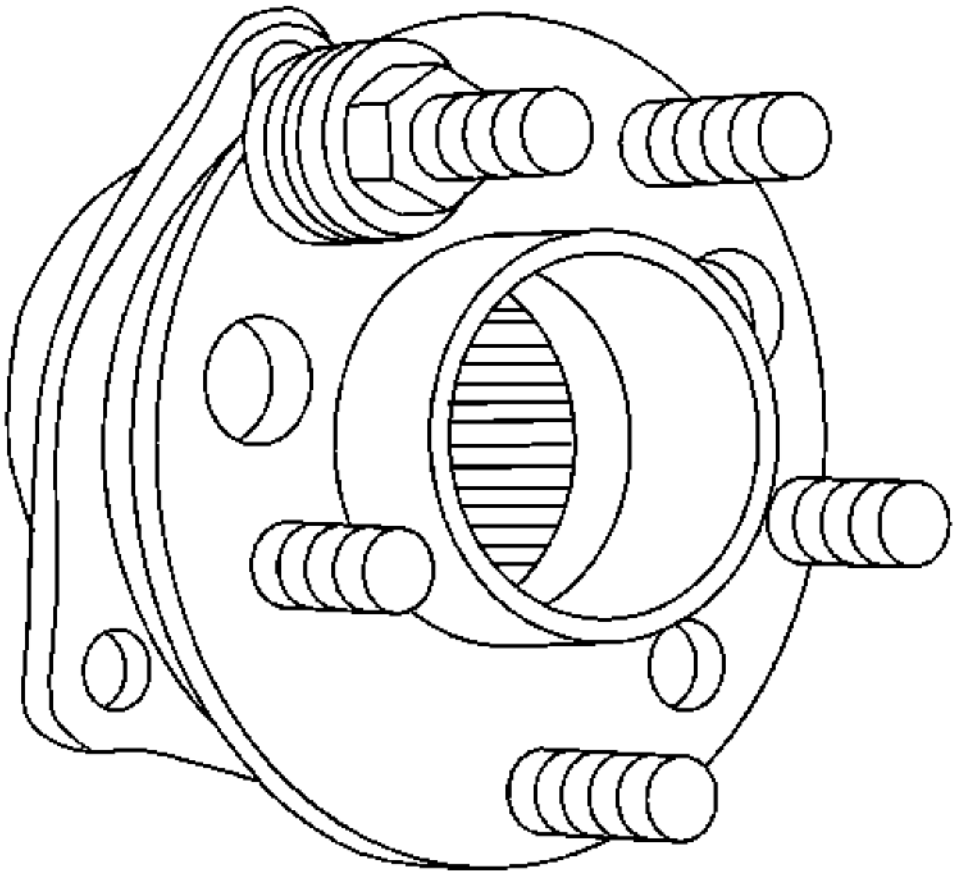


Fig. 22: Installing Wheel Stud
Courtesy of GENERAL MOTORS CORP.

1. Install the new stud from the back side of the hub.
2. Install flat washers on the wheel stud.

NOTE: Ensure that the wheel stud is fully seated against the wheel hub flange.

3. With the flat side of a wheel nut against the washers, tighten the wheel nut until the wheel stud head seats against the wheel hub flange.

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4. Install the brake rotor. Refer to **Front Brake Rotor Replacement (LLT)** or **Front Brake Rotor Replacement (L99, LS3)** .
5. Install the tire and wheel. Refer to **Tire and Wheel Removal and Installation** .
6. Lower the vehicle.

STRUT AND SHOCK ABSORBER INSPECTION (STRUT)

NOTE: The strut assembly DOES NOT have to be removed from the vehicle to perform the following inspection procedure.

NOTE: A light film of oil on the top portion of the strut is normal. DO NOT replace the strut for this condition.

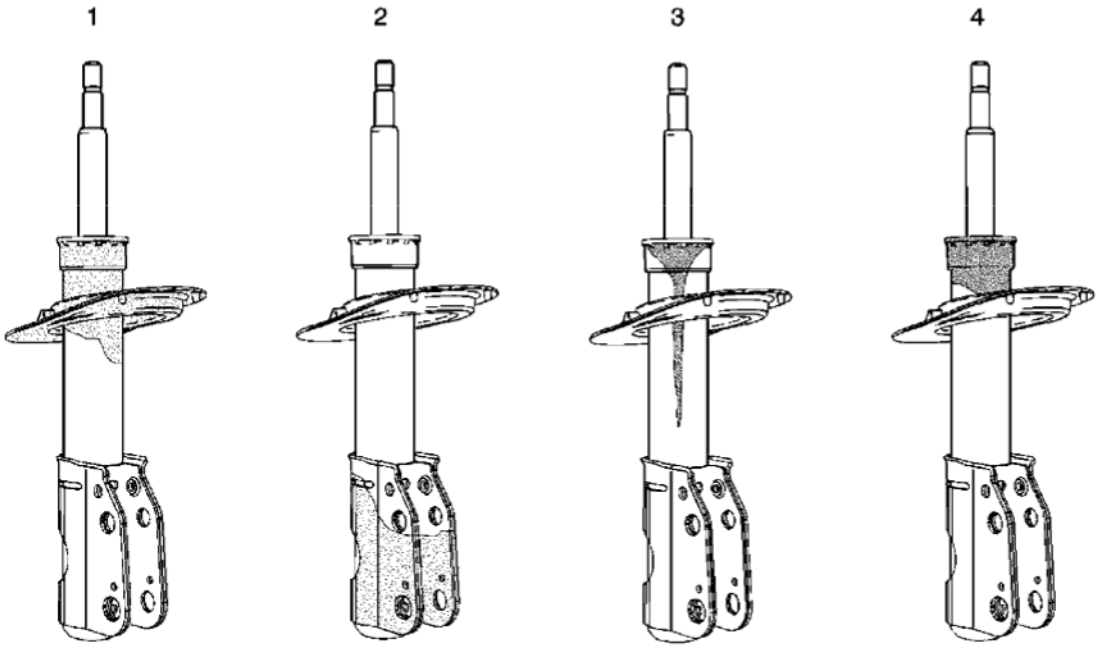


Fig. 23: Identifying Strut Conditions
Courtesy of GENERAL MOTORS CORP.

Condition 1

Oil or fluid residue only on the bottom of the strut tube or on other strut components and not originating from the shaft seal, is not a strut related problem. DO NOT replace the strut, look for other external leaks.

Condition 2

Light film/residue on the strut tube, but not on the spring seat and originating from the shaft seal, is a NORMAL condition. DO NOT replace the strut.

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Condition 3

Oil drip or trail down the strut tube and originating from the shaft seal, is an ABNORMAL condition. Replace the strut.

Condition 4

Extreme wet film of oil covering the strut tube and pooling in the spring seat and originating from the shaft seal, is an ABNORMAL condition. Replace the strut.

Inspection

1. Verify the customer's concern is present. If the concern is present, continue to the next step. If the concern is not present, then the vehicle is operating normally.

NOTE: The strut assembly DOES NOT have to be removed from the vehicle to perform the following inspection procedure.

2. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
3. Visually inspect each of the shock absorbers or struts for external fluid leaks. Refer to the following conditions 1, 2, 3, and 4 for visual inspection.
   - If conditions 1 or 2 are found, continue to step 4.
   - If conditions 3 or 4 are found, replace strut. Refer to Strut Replacement.
4. If equipped with electronic suspension control system, ensure that the system is working properly. Refer to Diagnostic Starting Point-Electronic Suspension Control.
5. Use your hands in order to lift up and push down on each corner of the vehicle 3 times. Remove your hands from the vehicle. If the corner motion exceeds 2 cycles, replace the strut. If the strut does not exceed 2 cycles, NO repair is necessary.

STRUT ASSEMBLY REPLACEMENT

Removal Procedure

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
2. Remove the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** .
3. Remove the stabilizer shaft link from the strut. Refer to **Stabilizer Shaft Link Replacement**.

NOTE: It is NOT necessary to completely remove the wheel speed sensor from the vehicle. Relocate the wheel speed sensor to the side and secure it.

4. Remove the wheel speed sensor from the strut and the steering knuckle. Refer to **Front Wheel Speed Sensor Replacement** .
5. Remove the front disc brake hose from the strut. Refer to **Front Brake Hose Replacement (LLT)** or **Front Brake Hose Replacement (LS3, L99)** .

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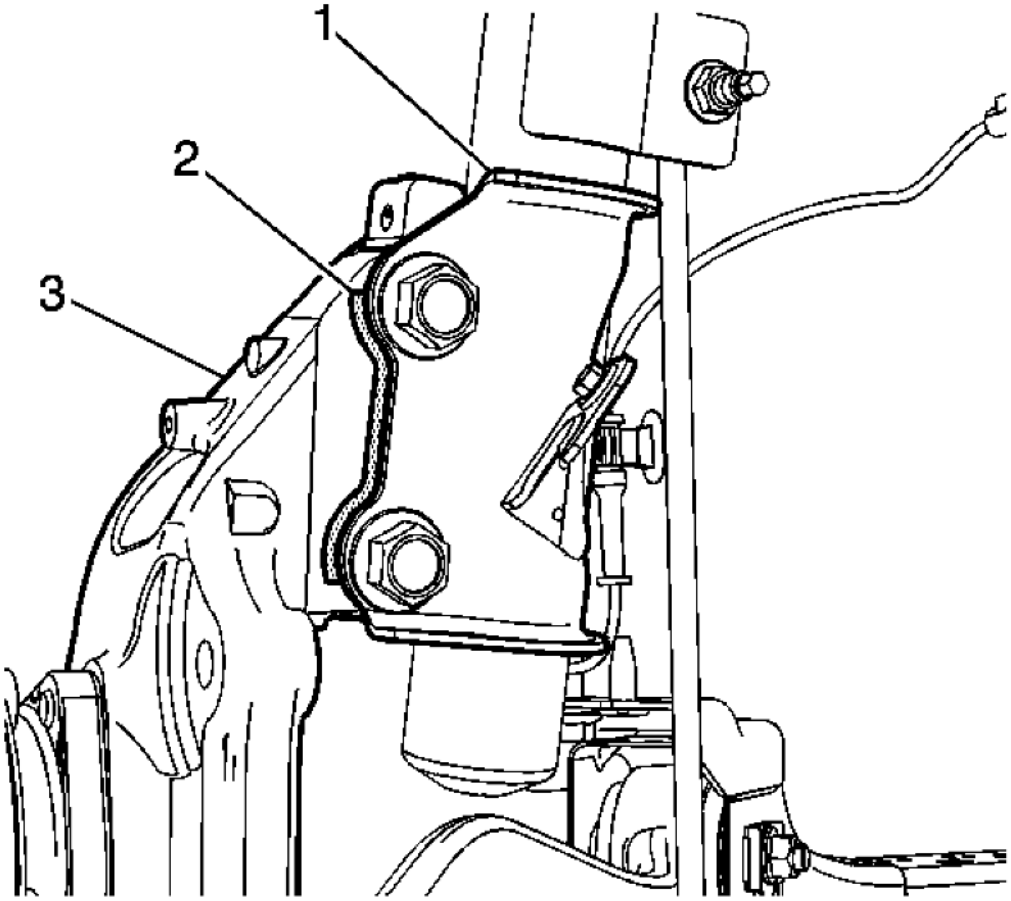


Fig. 24: Mark On Steering Knuckle & Strut Assembly
Courtesy of GENERAL MOTORS CORP.

6. Paint a reference mark (2) of the strut (1) to the steering knuckle (3).

NOTE: Adjust the hydraulic floor jack so that the front strut has a small amount of pressure on it.

7. Using an hydraulic floor jack, support the steering knuckle.
8. Remove the dust cover, if equipped.

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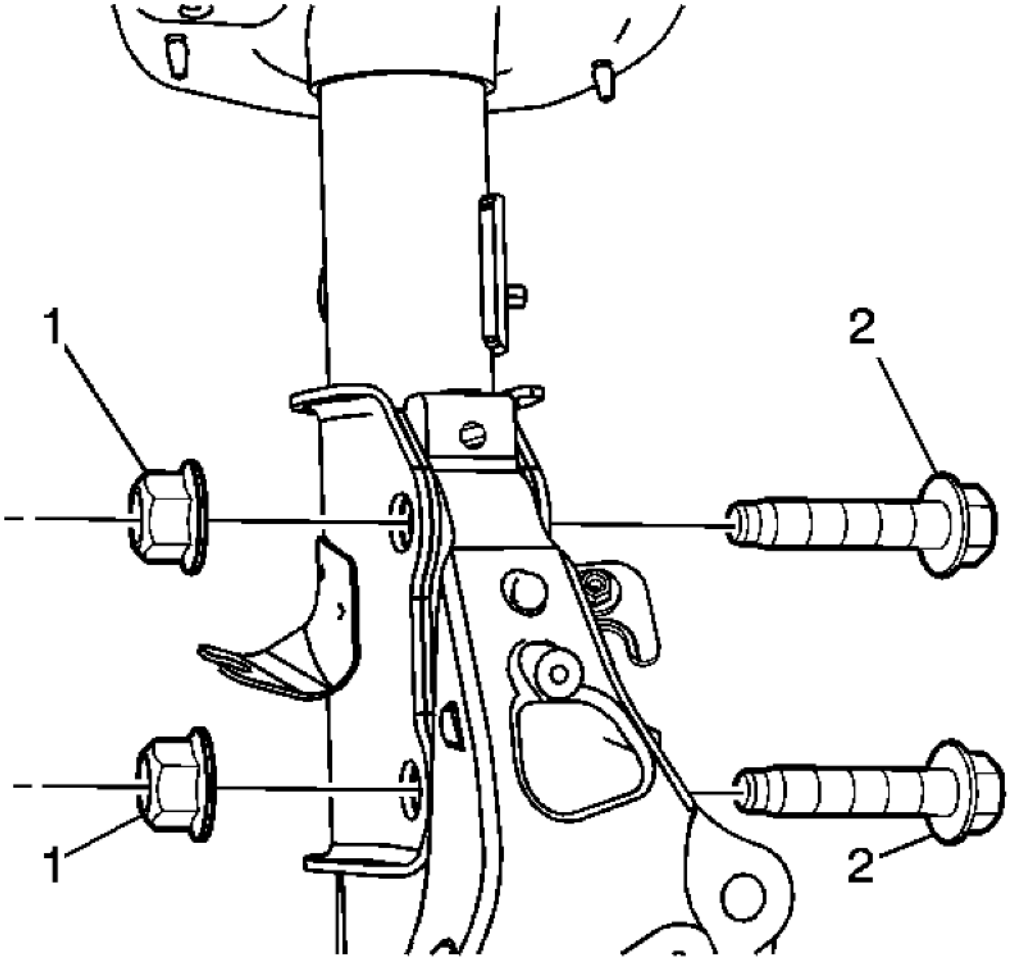


Fig. 25: Front Strut Nuts & Bolts
Courtesy of GENERAL MOTORS CORP.

9. Remove the front strut nuts (1) and the bolts (2).

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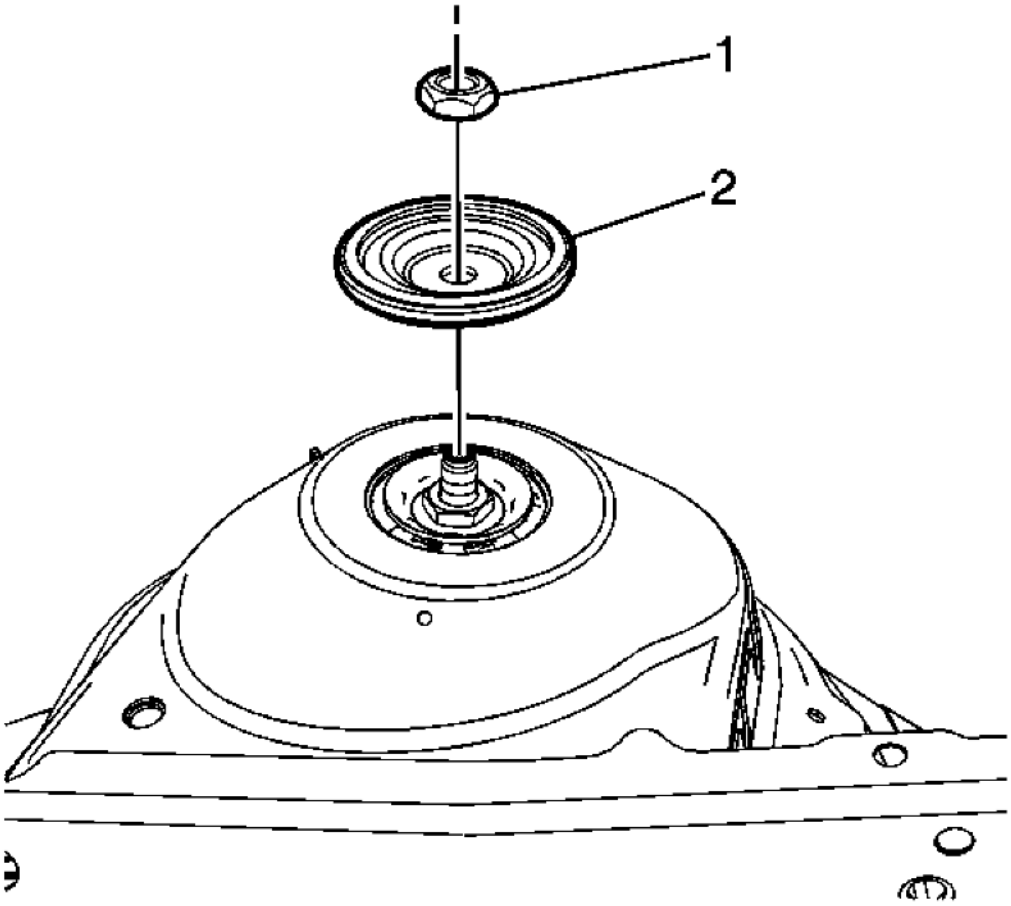


Fig. 26: Front Suspension Nut & Washer
Courtesy of GENERAL MOTORS CORP.

10. Remove the front suspension nut (1) and washer (2).

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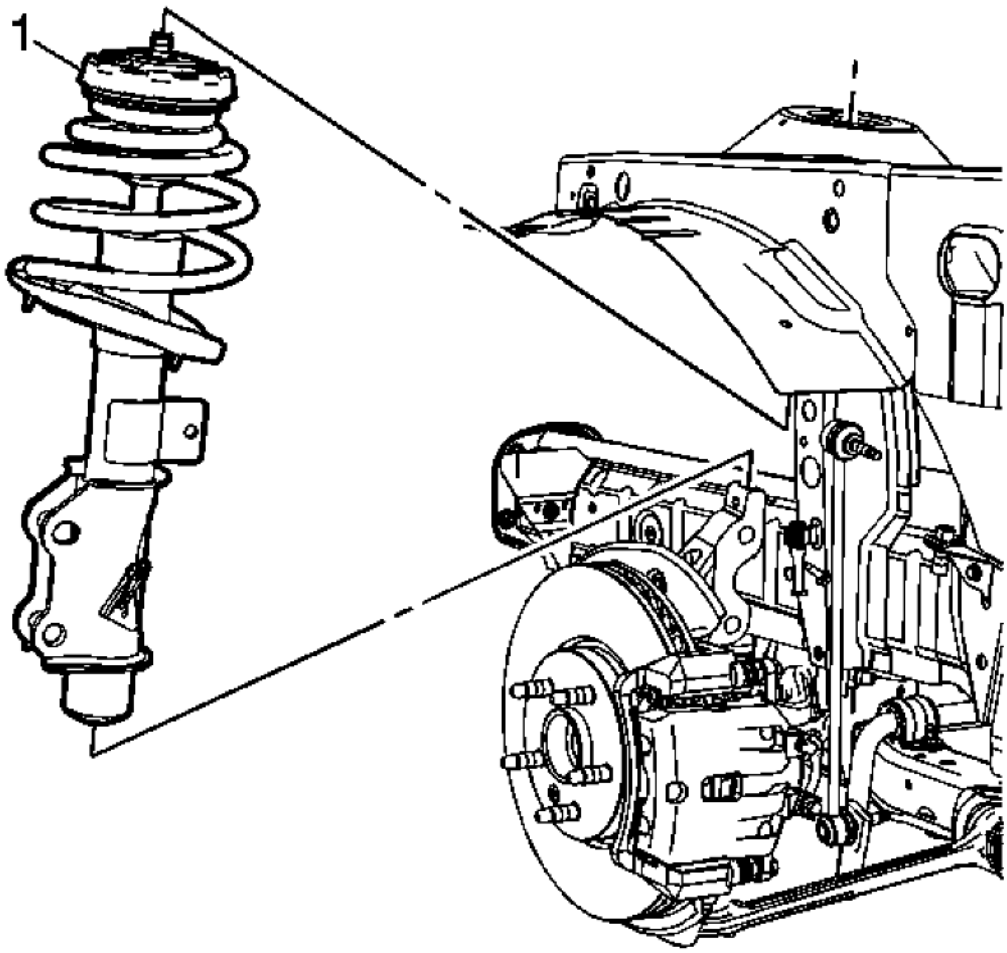


Fig. 27: Front Suspension Strut
Courtesy of GENERAL MOTORS CORP.

11. Remove the front suspension strut (1) from the vehicle.

Installation Procedure

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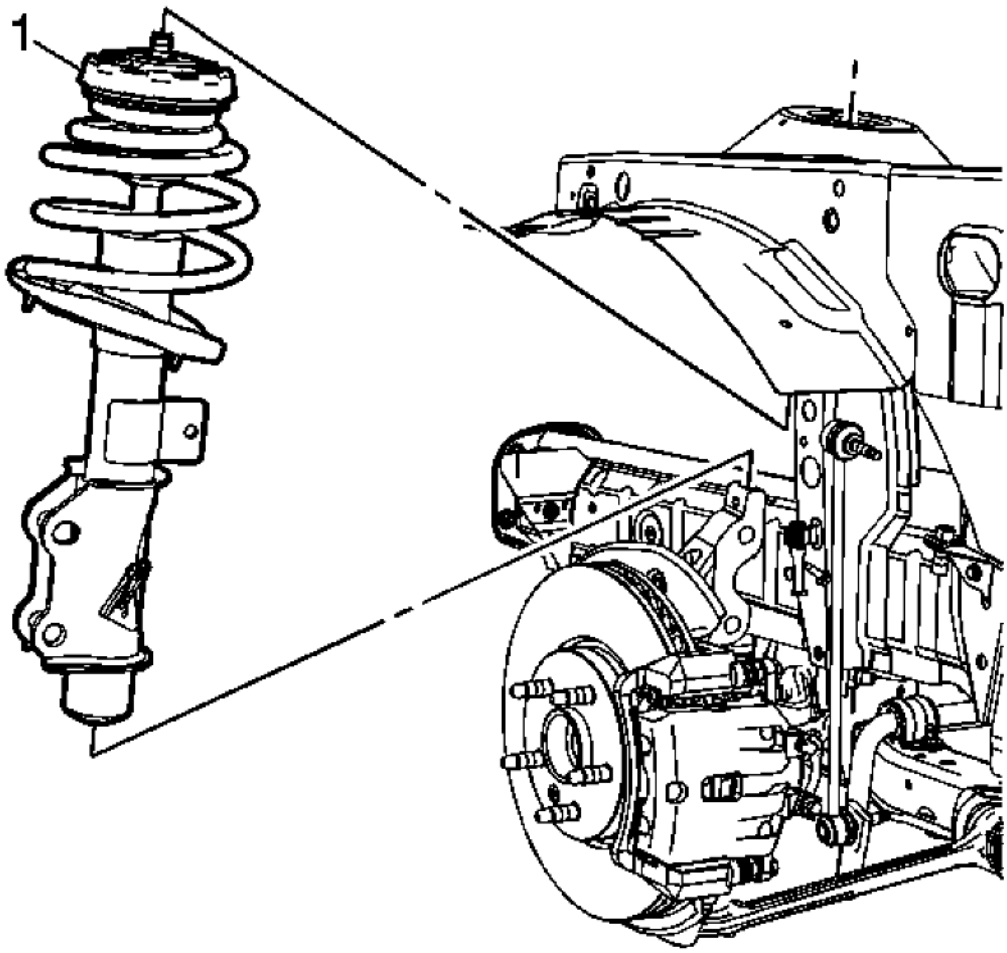


Fig. 28: Front Suspension Strut
Courtesy of GENERAL MOTORS CORP.

1. Position the front strut assembly (1) in the vehicle.

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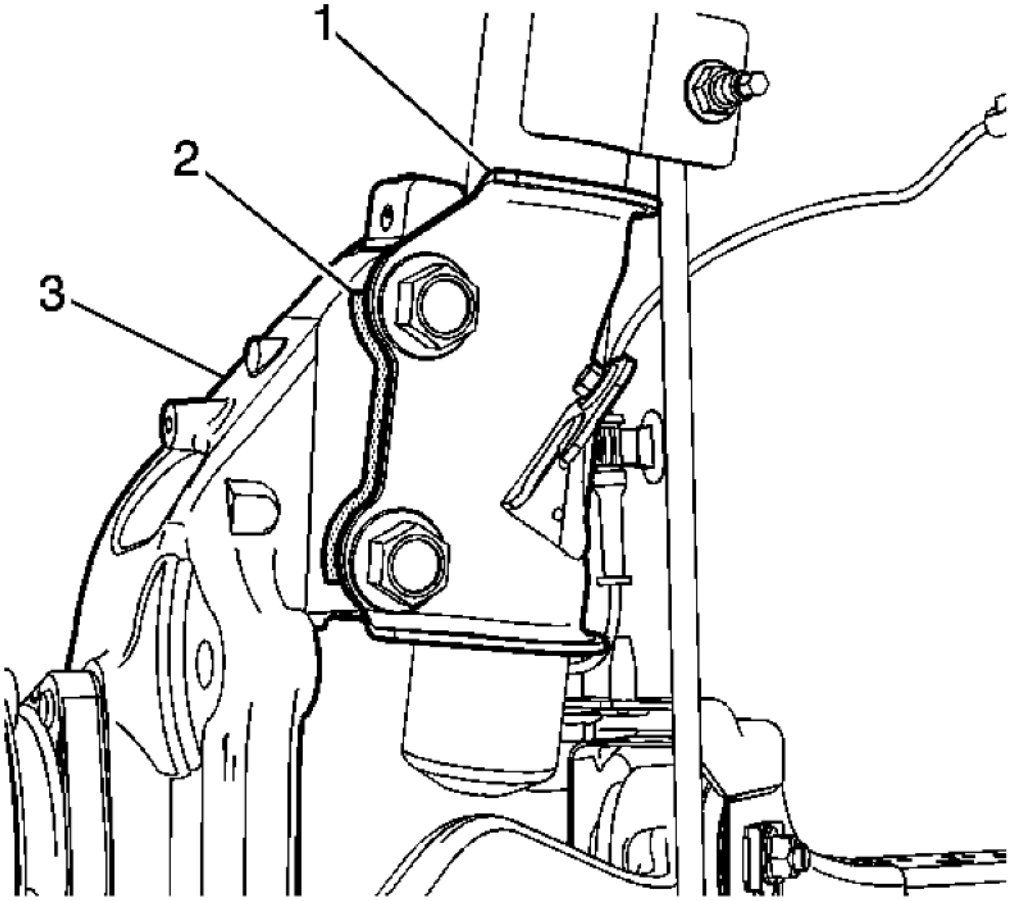


Fig. 29: Mark On Steering Knuckle & Strut Assembly
Courtesy of GENERAL MOTORS CORP.

2. Align the front strut (1) with the alignment mark (2).

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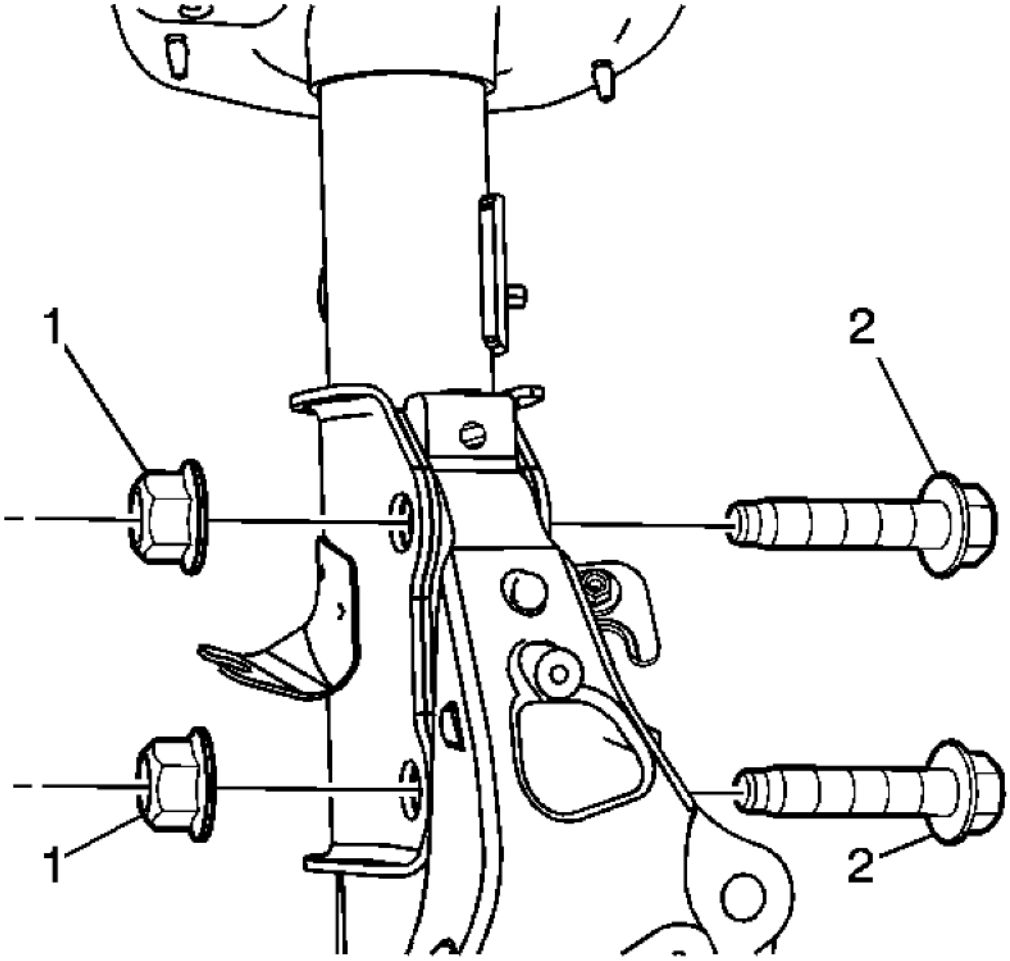


Fig. 30: Front Strut Nuts & Bolts
Courtesy of GENERAL MOTORS CORP.

3. Install the front strut bolts (2).

CAUTION: Refer to Fastener Caution .

4. Install the nuts (1) and tighten to 80 N.m (59 lb ft) plus an additional 180 degrees.

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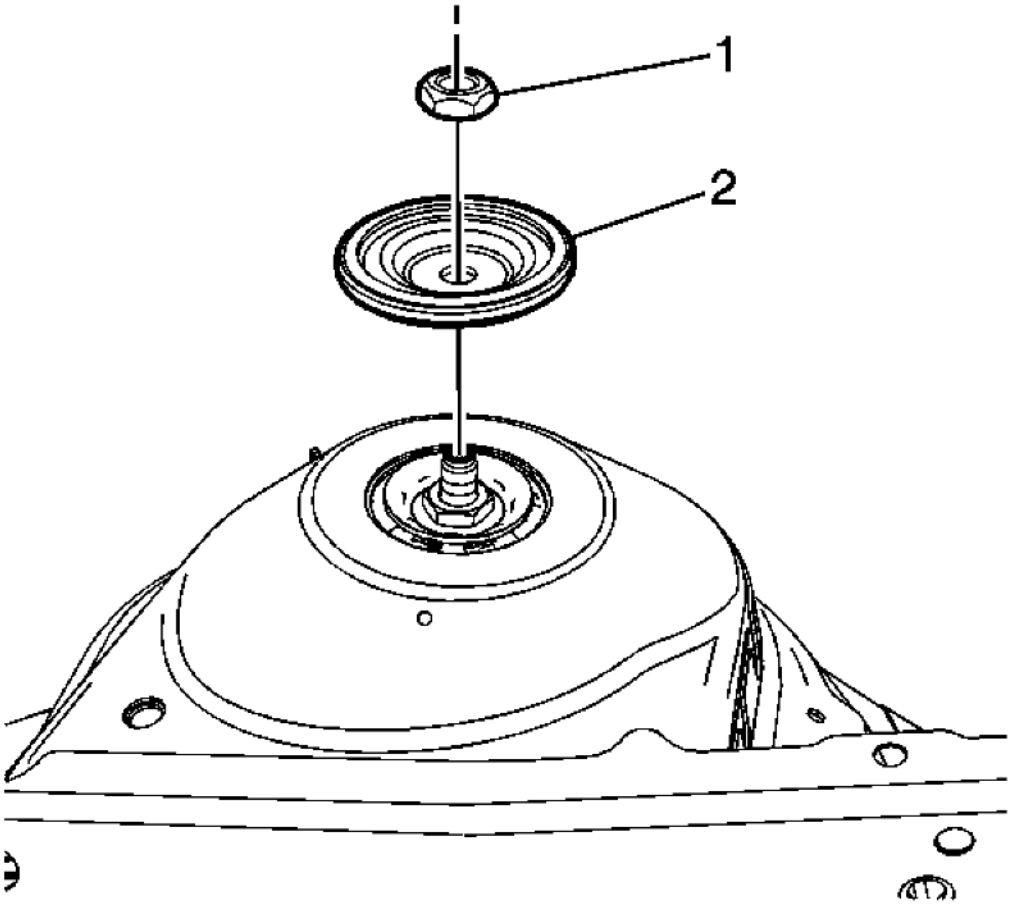


Fig. 31: Front Suspension Nut & Washer
Courtesy of GENERAL MOTORS CORP.

5. Install the front suspension strut mounting plate (2).
6. Install the front suspension strut nut (1) and tighten to 70 N.m (52 lb ft).
7. Remove the hydraulic floor jack.
8. Install the dust cover, if equipped.
9. Install the stabilizer shaft link. Refer to **Stabilizer Shaft Link Replacement**.
10. Install the wheel speed sensor. Refer to **Front Wheel Speed Sensor Replacement** .
11. Install the front brake hose. Refer to **Front Brake Hose Replacement (LLT)** or **Front Brake Hose Replacement (LS3, L99)** .
12. Install the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** .
13. Lower the vehicle.

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14. Check and adjust the front wheel alignment, if needed. Refer to **Front Camber Adjustment** .

STRUT, STRUT COMPONENT, OR SPRING REPLACEMENT

Special Tools

CH-48845: Spring Compressor

For equivalent regional tools, refer to **Special Tools**.

Removal Procedure

1. Remove the front suspension strut assembly from the vehicle. Refer to **Strut Assembly Replacement**.

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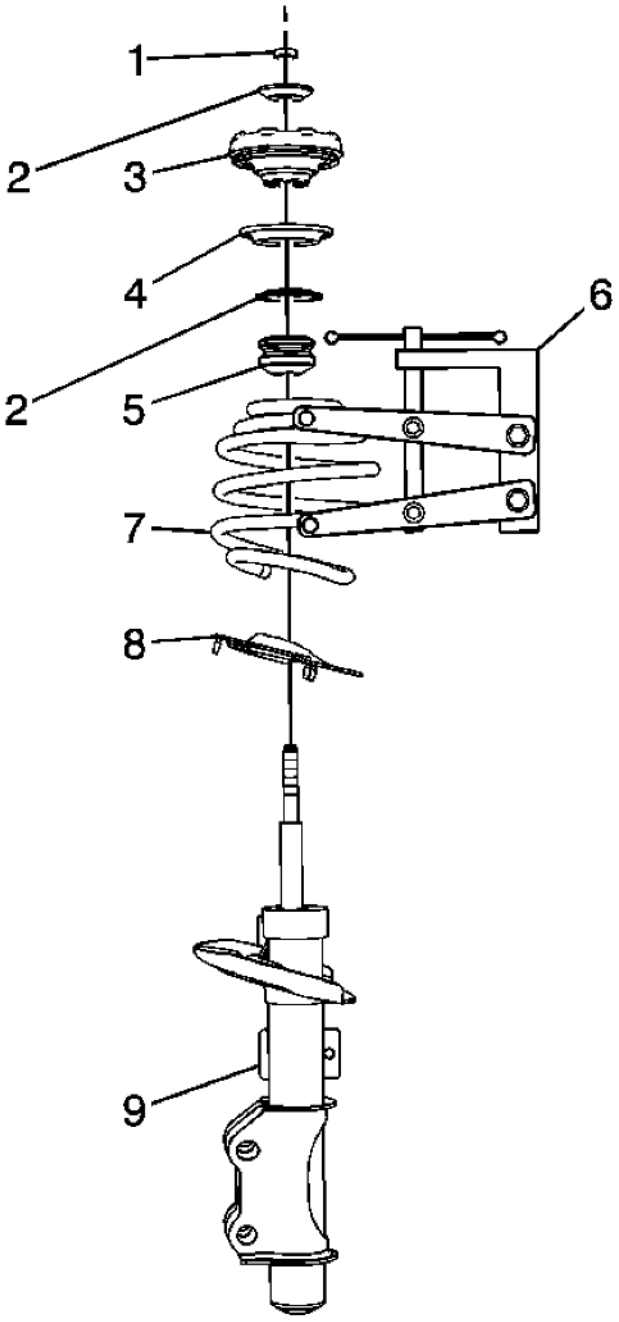


Fig. 32: Removing/Installing Front Suspension Components
Courtesy of GENERAL MOTORS CORP.

NOTE: **Ensure that the front suspension strut assembly is properly seated in the**

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CH-48845: compressor.

2. Position the front suspension strut assembly in the **CH-48845:** compressor (6)

NOTE: Use only hand tools when using the CH-48845: Spring Compressor.

3. Using the **CH-48845:** compressor (6) and hand tools, compressor the front spring until the front suspension strut moves freely.

NOTE: Have an assistant hold the front suspension strut while removing the other front suspension strut components.

4. Remove the front suspension strut nut (1), front suspension strut mount retainer (2), front suspension strut mount (3), front suspension strut insulator (4), front suspension strut mount retainer (2), front suspension strut bumper (5), front spring (7), front spring insulator (8), and the front suspension strut (9).
5. Replace any of the front suspension strut components that are found to be excessively worn or that are damaged.

Installation Procedure

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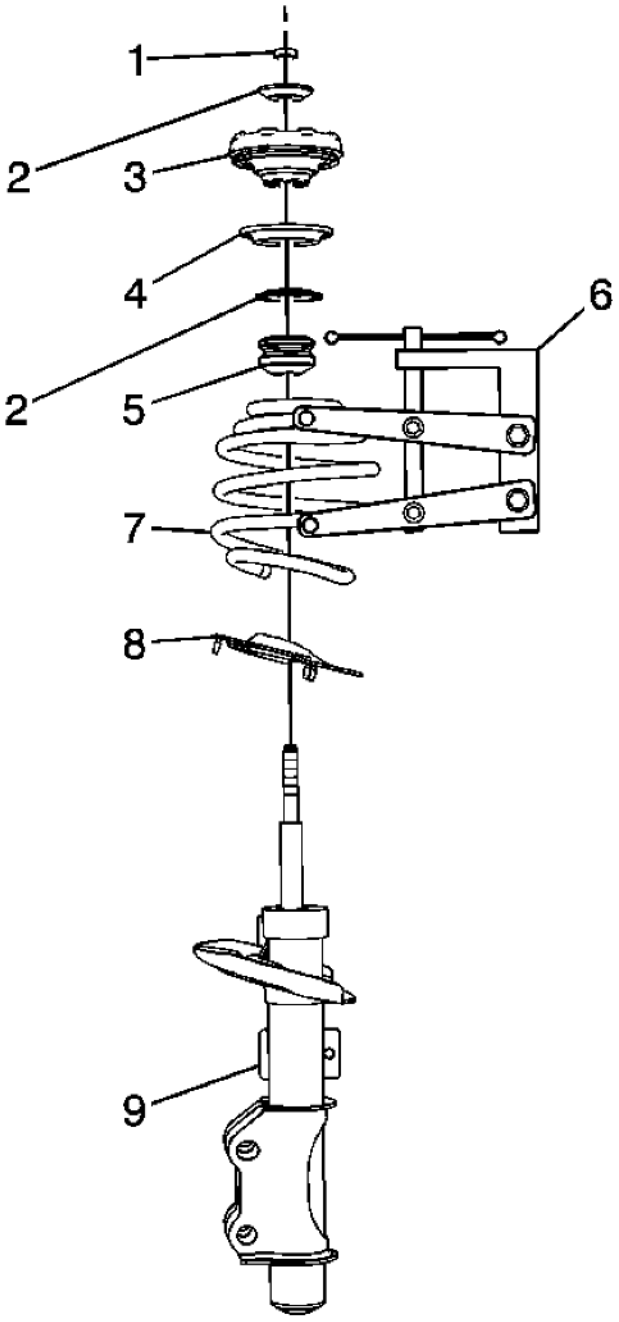


Fig. 33: Removing/Installing Front Suspension Components
Courtesy of GENERAL MOTORS CORP.

NOTE: **Have an assistant hold the front suspension strut while installing the other**

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front suspension strut components.

1. Position the front suspension strut (9) in the **CH-48845:** compressor (6).

NOTE: Install the front suspension strut nut so that there are 3 threads showing

2. Install the front spring insulator (8), front spring (7), front suspension strut bumper (5), front suspension strut insulator (4), front suspension strut mount retainer (2), front suspension strut mount (3), front suspension strut mount retainer (2), and the front suspension strut nut (1).
3. Using hand tools, slowly release the **CH-48845:** compressor until the front spring contacts the upper front suspension strut insulator (4), and the lower front spring insulator (8).

CAUTION: Refer to Fastener Caution .

4. Tighten the front suspension strut nut (1) to 70 N.m (52 lb ft).
5. Install the front suspension strut assembly in the vehicle. Refer to **Strut Assembly Replacement**.

DESCRIPTION AND OPERATION

GENERAL DESCRIPTION

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 road wheel travelling over irregular road surfaces and dissipates this energy throughout the suspension system. This process isolates the vehicle occupants from the road surface. This process isolates the vehicle occupants from the road surface. 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.

The steering knuckle is connected to two lower control arms and a strut assembly. The lower control arms attach to the steering knuckle with balls joints at the outermost point. The upper portion of the steering knuckle is attached to a strut assembly by two bolts and nuts. The upper most hole in the strut is a slot which allows for front camber adjustment.

The strut assembly contains a spring, shock absorber, a jounce bumper, boot, and a top mount. The top mount includes a bearing to allow the strut assembly and knuckle to rotate when the steering wheel is turned. The strut assembly is a coil over shock design that bolts to the lower control arm and the body structure. The spring absorbs the movement of the knuckle as the wheel travels over rough roads. The shock absorber dampens the oscillations of the coil spring.

The lower control arms are connected to the vehicle frame through two rigid bushings which allow the control

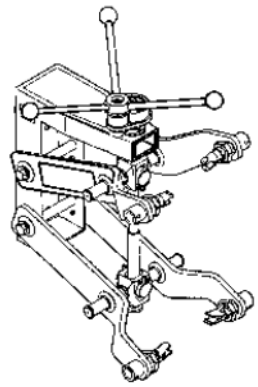
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top pivot up and down with respect to the vehicle frame and body structure. The forward most attachment points uses a bolt with a cam and slotted hole to allow for caster adjustment. A ball joint at the outermost and of the control arm allows the steering knuckle to maintain the perpendicular relationship to the road surface and to rotate as the steering wheel is turned.

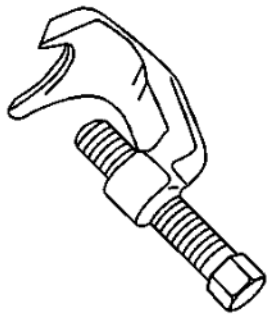
A stabilizer shaft is used to help reduce body roll when the vehicle is driven around a turn. The stabilizer shaft is mounted to the sub frame or front cradle by two clamps and insulators. A link is used to connect the ends of the stabilizer shaft to each front suspension strut assembly. Each link has a ball joint on each end.

SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS

Illustration	Tool Number/ Description
	CH 48845 Spring Compressor
	J 38892 Ball Joint Separator

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	J 43631 Ball Joint Remover

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2010 SUSPENSION

Rear Suspension - Camaro

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Application	Specification	
	Metric	English
Adjustable Link Bolt to Knuckle	140 N.m	103 lb ft
Adjustable Link Adjuster Nut	115 N.m	85 lb ft
Lower Control Arm Adjuster Nut	115 N.m	85 lb ft
Lower Control Arm to Knuckle Bolt		
• First Pass	40 N.m	30 lb ft
• Final Pass	+ 120°	
Lower Rear Shock Absorber Nut		
• First Pass	80 N.m	59 lb ft
• Final Pass	+ 120°	
Rear Shock Absorber Nut	45 N.m	33 lb ft
Rear Stabilizer Shaft Insulator Clamp Bolts	22 N.m	16 lb in
Rear Stabilizer Shaft Link Nuts	49 N.m	36 lb ft
Rear Wheel Bearing and Hub Bolts	115 N.m	85 lb ft
Trailing Arm to Frame Bolt	100 N.m	74 lb ft
Trailing Arm to Knuckle Bolts		
• First Pass	40 N.m	30 lb ft
• Final Pass	+ 120°	
Upper Control Arm to Bushing Bolt	160 N.m	118 lb ft
Upper Control Arm to Knuckle Bolts		
• First Pass	60 N.m	44 lb ft
• Final Pass	+ 90°	
Upper Control Arm to Frame Bolt		
• First Pass	80 N.m	59 lb ft
• Final Pass	+ 120°	
Upper Control Arm to Bushing to Frame Bolt		
• First Pass	50 N.m	37 lb ft
• Final Pass	+ 120°	
Upper Rear Shock Absorber Bolt	58 N.m	43 lb ft

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REPAIR INSTRUCTIONS

REAR WHEEL BEARING AND HUB REPLACEMENT

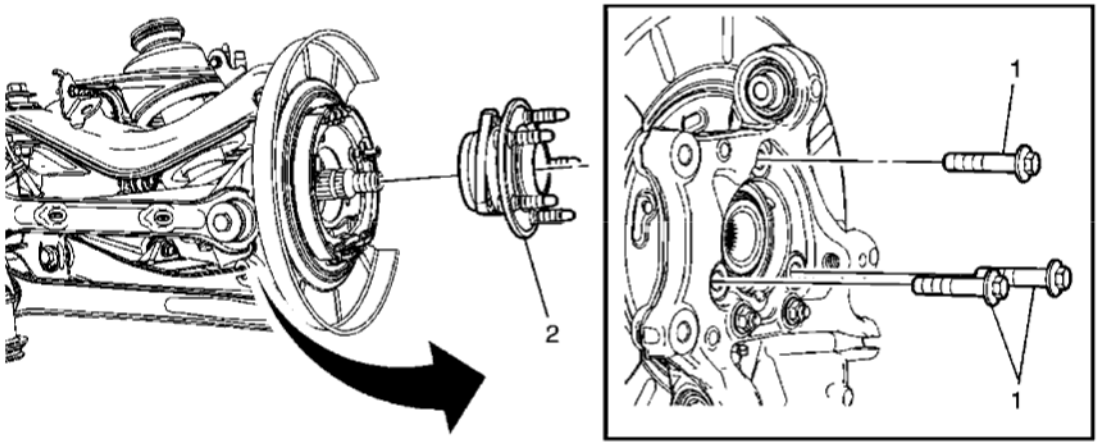


Fig. 1: Rear Wheel Bearing & Hub
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedures 1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** . 2. Remove the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** . 3. Remove the rear brake rotor. Refer to **Rear Brake Rotor Replacement (LLT)** or **Rear Brake Rotor Replacement (L99, LS3)** . 4. Remove the rear wheel speed sensor. Refer to **Rear Wheel Speed Sensor Replacement** . 5. Separate the wheel drive shaft from the wheel bearing/hub assembly.	
1	Rear Wheel Bearing and Hub Bolt (Qty: 3) **CAUTION:** **Refer to Fastener Caution .** **Tighten:** 115 N.m (85 lb ft)
2	Rear Wheel Bearing and Hub

KNUCKLE REPLACEMENT

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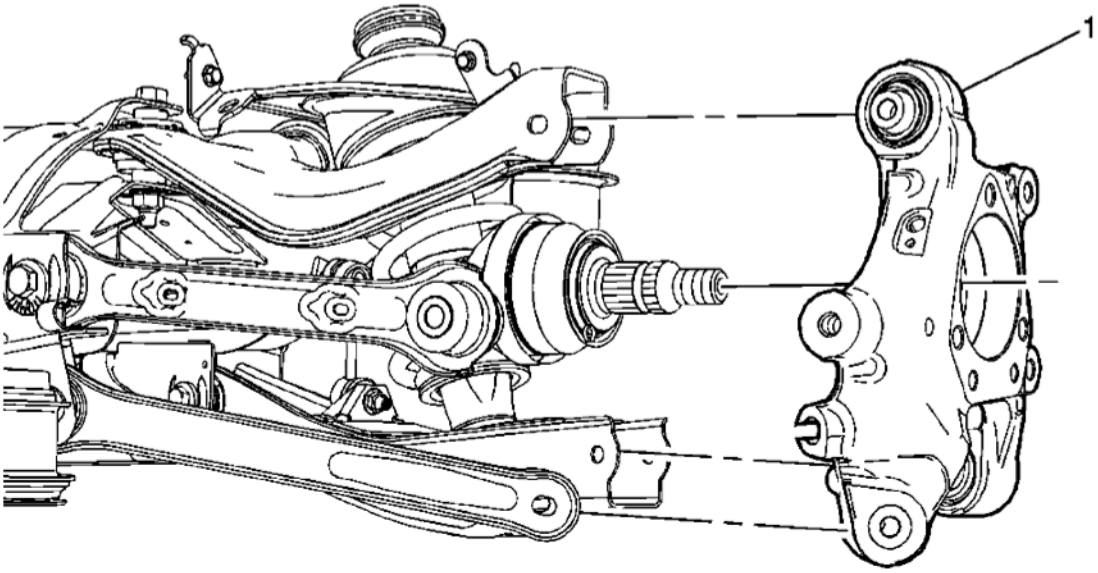


Fig. 2: Knuckle
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedures 1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** . 2. Remove the rear wheel bearing and hub assembly. Refer to **Rear Wheel Bearing and Hub Replacement**. 3. Remove the rear upper control arm bolt at the knuckle. Refer to **Upper Control Arm Replacement** 4. Remove the adjustable link bolt at the knuckle. Refer to **Adjust Link Replacement**. 5. Remove the rear trailing arm bolt and nut. Refer to **Trailing Arm Replacement**. 6. Remove the rear lower control arm bolt and nut. Refer to **Lower Control Arm Replacement**.	
1	Rear Suspension Knuckle

STABILIZER SHAFT REPLACEMENT

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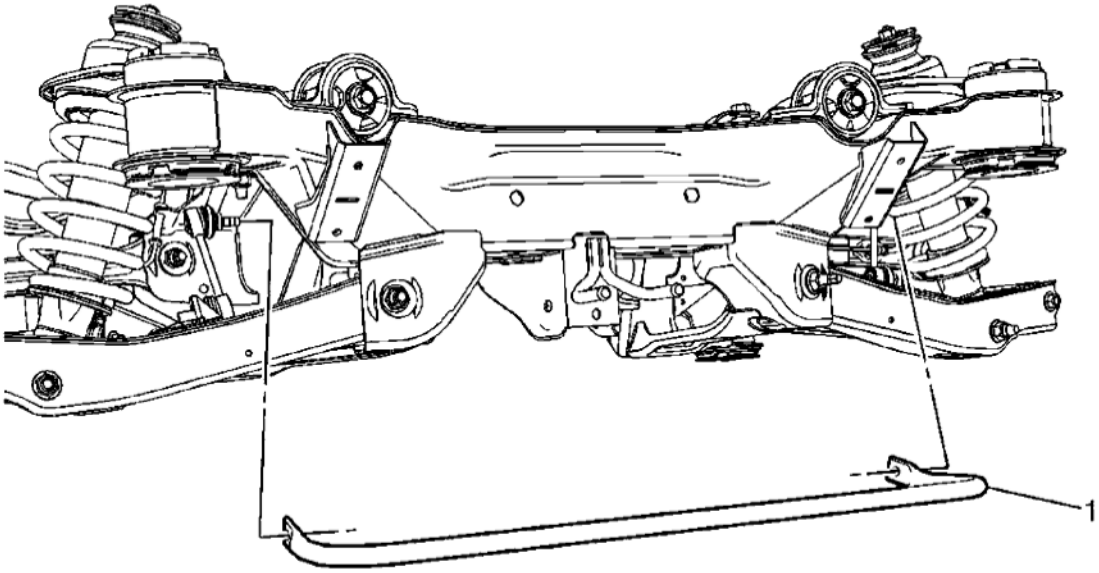


Fig. 3: Stabilizer Shaft
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedures 1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** 2. Remove the stabilizer shaft from the stabilizer shaft links. Refer to **Stabilizer Shaft Link Replacement** 3. Remove the stabilizer shaft insulators. Refer to **Stabilizer Shaft Insulator Replacement**	
1	Stabilizer Shaft **Tip:** It a maybe necessary to maneuver the stabilizer shaft in such a way to remove it from the vehicle.

STABILIZER SHAFT INSULATOR REPLACEMENT

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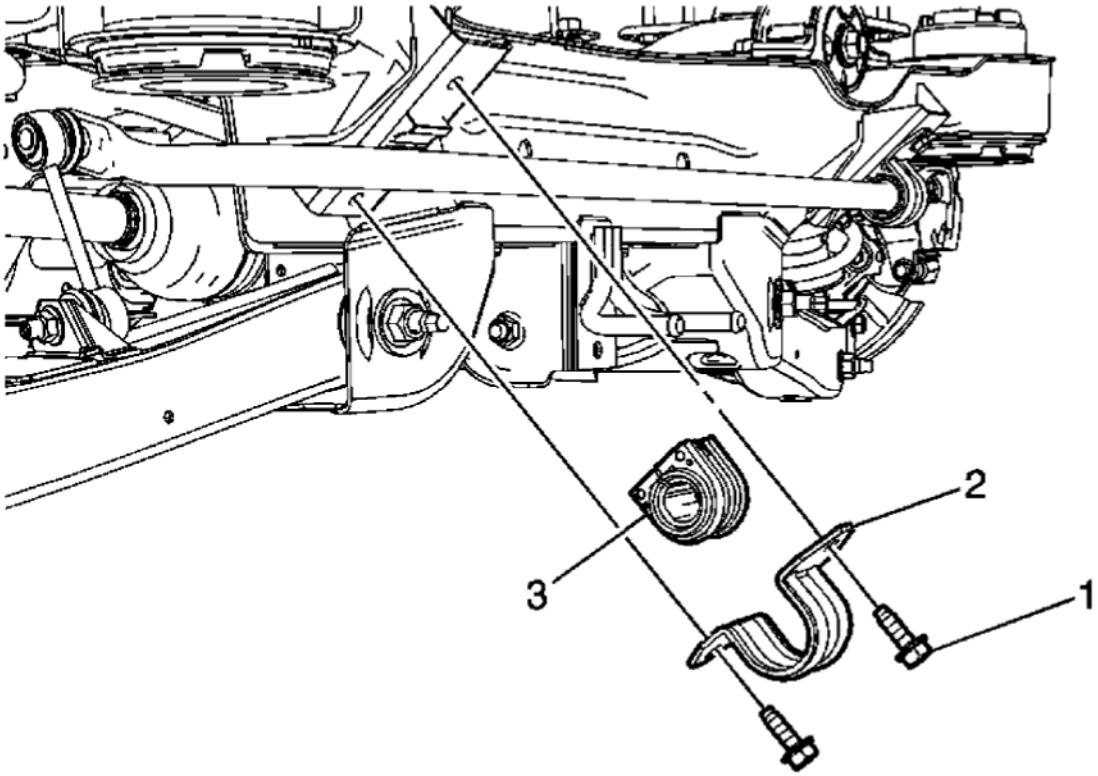


Fig. 4: Stabilizer Shaft Insulator
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedure: Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .	
1	Rear Stabilizer Shaft Clamp Bolt (Qty: 2) **CAUTION:** **Refer to Fastener Caution .** **Tighten:** 22 N.m (16 lb ft)
2	Rear Stabilizer Shaft Clamp
3	Rear Stabilizer Shaft Insulator

STABILIZER SHAFT LINK REPLACEMENT

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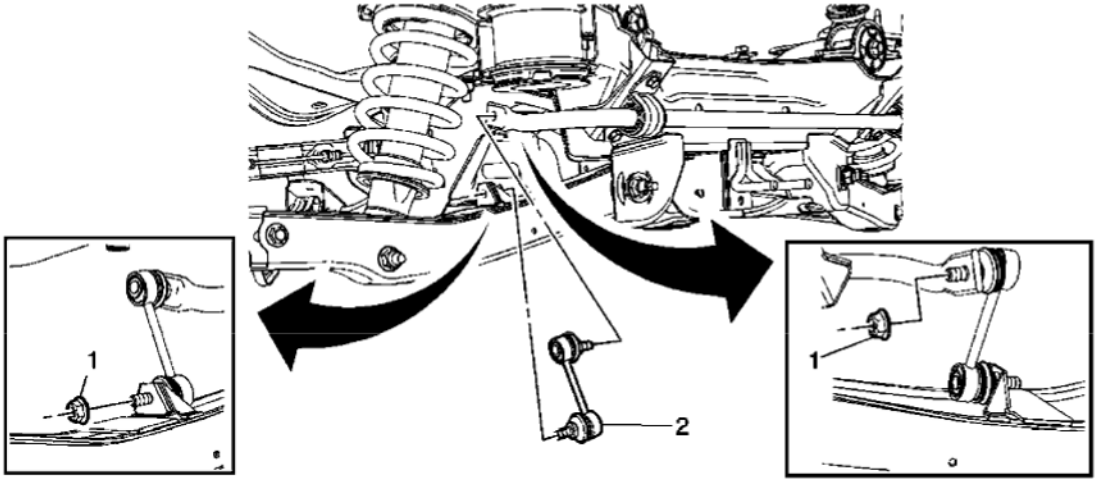


Fig. 5: Stabilizer Shaft Link
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedure: Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .	
1	Rear Stabilizer Shaft Link Nut (Qty: 2) **CAUTION:** **Refer to Fastener Caution .** **Tip:** Use the appropriate size allen/TORX™ bit wrench to keep the ball stud form rotating when removing the stabilizer shaft link nut. **Tighten:** 49 N.m (36 lb ft)
2	Rear Stabilizer Shaft Link

STRUT AND SHOCK ABSORBER INSPECTION (COIL OVER SHOCK)

NOTE: **The coil over shock assembly DOES NOT have to be removed from the vehicle to perform the following inspection procedure.**

NOTE: **A light film of oil on the top portion of the shock absorber tube is normal. DO NOT replace the shock absorber for this condition.**

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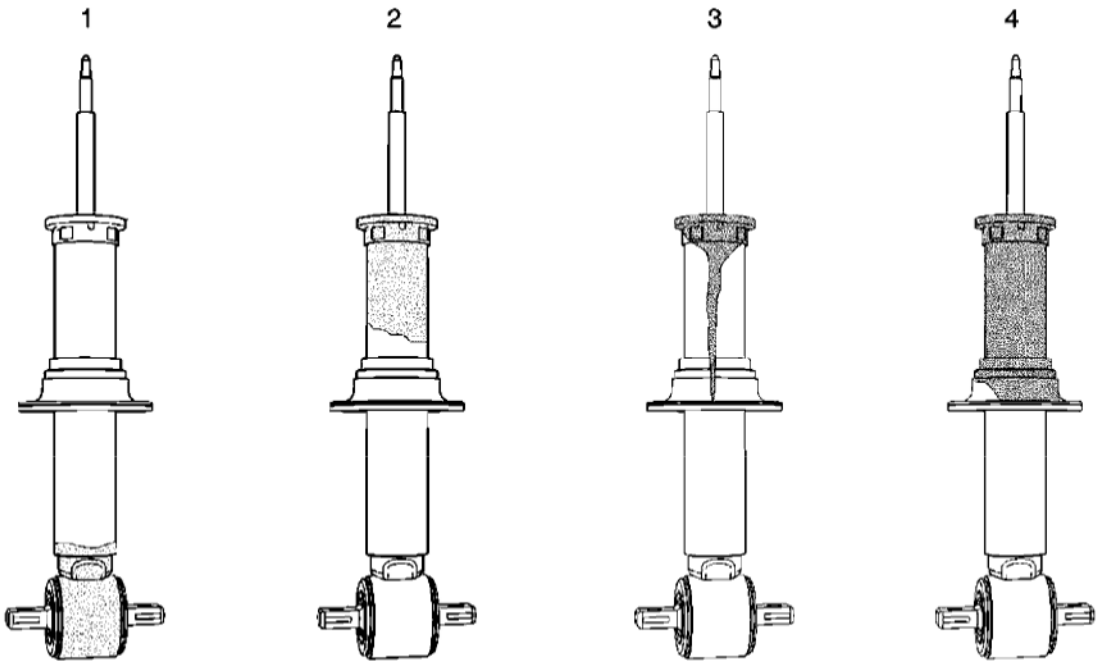


Fig. 6: Identifying Strut & Shock Absorber Conditions
Courtesy of GENERAL MOTORS CORP.

Condition 1

Oil or fluid residue only on the bottom of the lower shock absorber tube or other coil over shock absorber and originating from the shaft seal, is not a shock absorber related problem. DO NOT replace the shock absorber, look for other external leaks.

Condition 2

Light film/residue on the shock absorber tube, but not on the spring seat and originating from the shaft seal, is a NORMAL condition. DO NOT replace the shock absorber.

Condition 3

Oil drip or trail down the shock absorber tube and originating from the shaft seal, is an ABNORMAL condition. Replace the shock absorber.

Condition 4

An extreme wet film of oil covering the shock absorber tube and pooling in the spring seat and originating from the shaft seal, is an ABNORMAL condition. Replace the shock absorber.

Inspection

1. Verify the customer's concern is present. If the concern is present, continue to the next step. If the concern

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is not present, then the vehicle is operating normally.

NOTE: The shock assembly DOES NOT have to be removed from the vehicle to perform the following inspection procedure.

2. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
3. Visually inspect each of the shock absorbers for external fluid leaks. Refer to the following conditions 1, 2, 3, and 4 for visual inspection.
   - If conditions 1 or 2 are found, continue to step 4.
   - If conditions 3 or 4 are found, replace shock absorber. Refer to Shock Absorber Replacement.
4. If equipped with electronic suspension control system, ensure that the system is working properly. Refer to Diagnostic Starting Point-Electronic Suspension Control.
5. Use your hands in order to lift up and push down on each corner of the vehicle 3 times. Remove your hands from the vehicle. If the corner motion exceeds 2 cycles, replace the shock absorber. If the shock absorber does not exceed 2 cycles, NO repair is necessary.

SHOCK, SHOCK COMPONENT, AND/OR SPRING REPLACEMENT

Special Tools

CH 48845: Spring Compressor

For equivalent regional tools, refer to **Special Tools**.

Removal Procedure

1. Remove the shock absorber from the vehicle. Refer to **Shock Absorber Replacement**.

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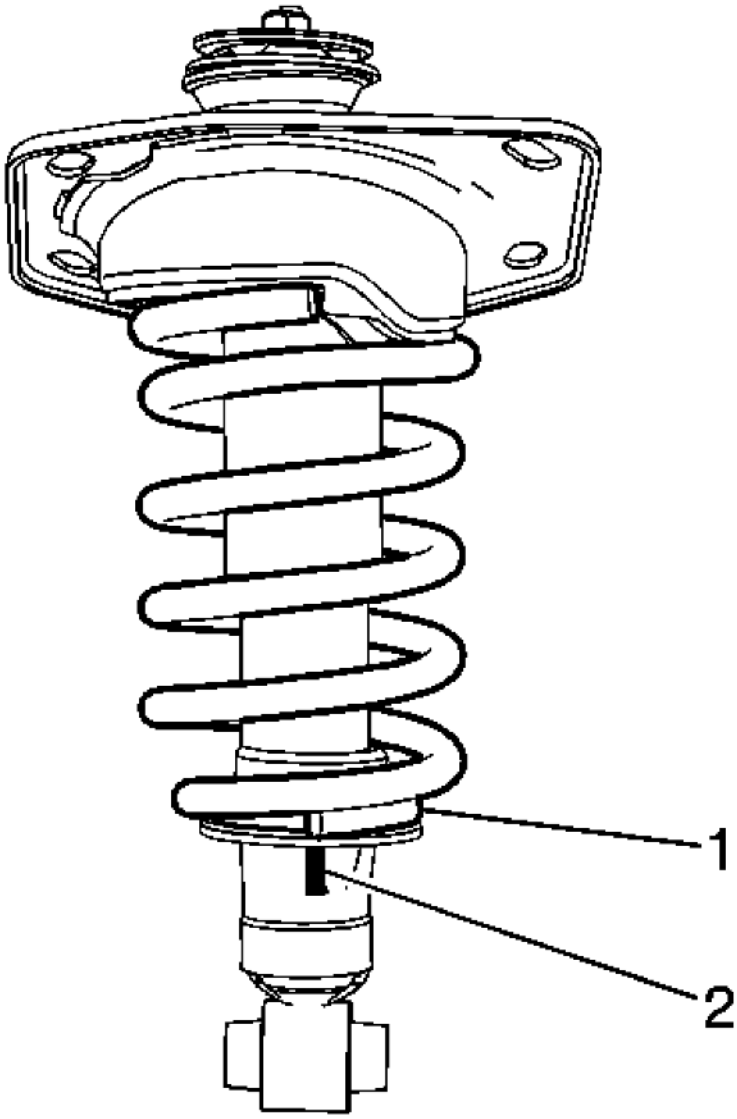


Fig. 7: Mark On Rear Spring
Courtesy of GENERAL MOTORS CORP.

NOTE: **Note the relationship of the end of the spring to the shock absorber. This will aid in the proper alignment of the spring to the shock absorber.**

2. Mark the rear spring (1) to the shock absorber (2).

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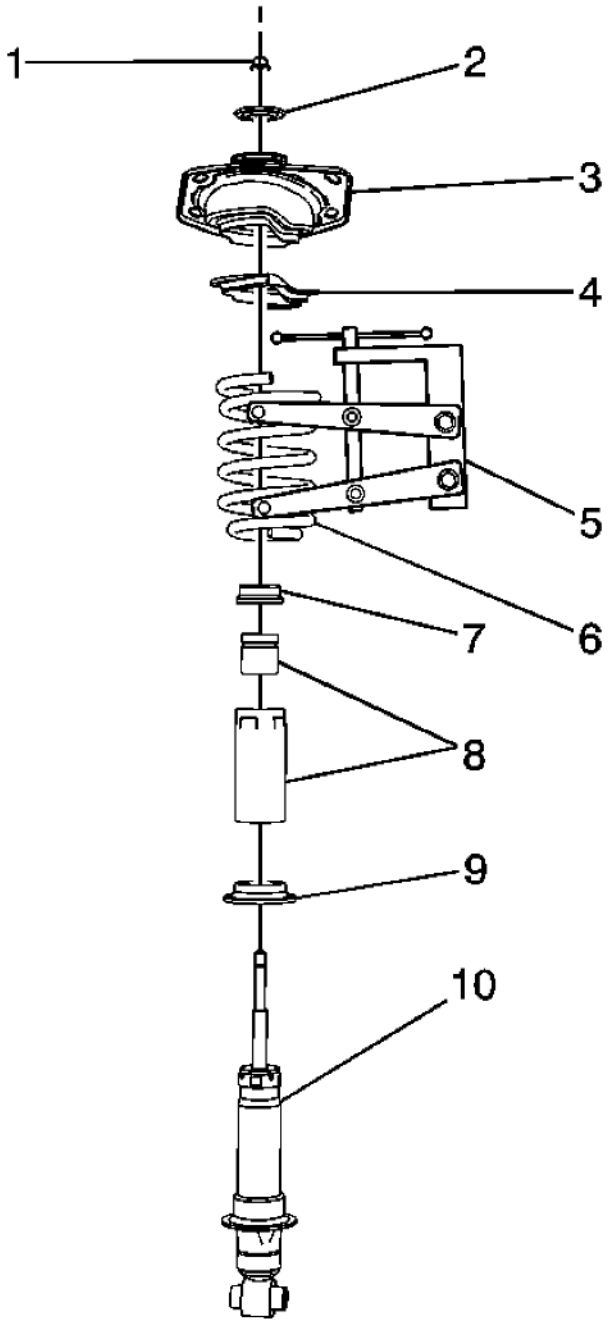


Fig. 8: Removing/Installing Rear Shock Absorber Components
Courtesy of GENERAL MOTORS CORP.

3. Using the **CH 48845:** compressor (5), remove the nut (1), retainer (2), rear shock absorber upper plate (3), rear spring upper insulator (4), spring (6), rear shock absorber bumper seat (7), rear shock absorber

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bumper and shield (8), lower insulator (9), and the rear shock absorber (10).

Installation Procedure

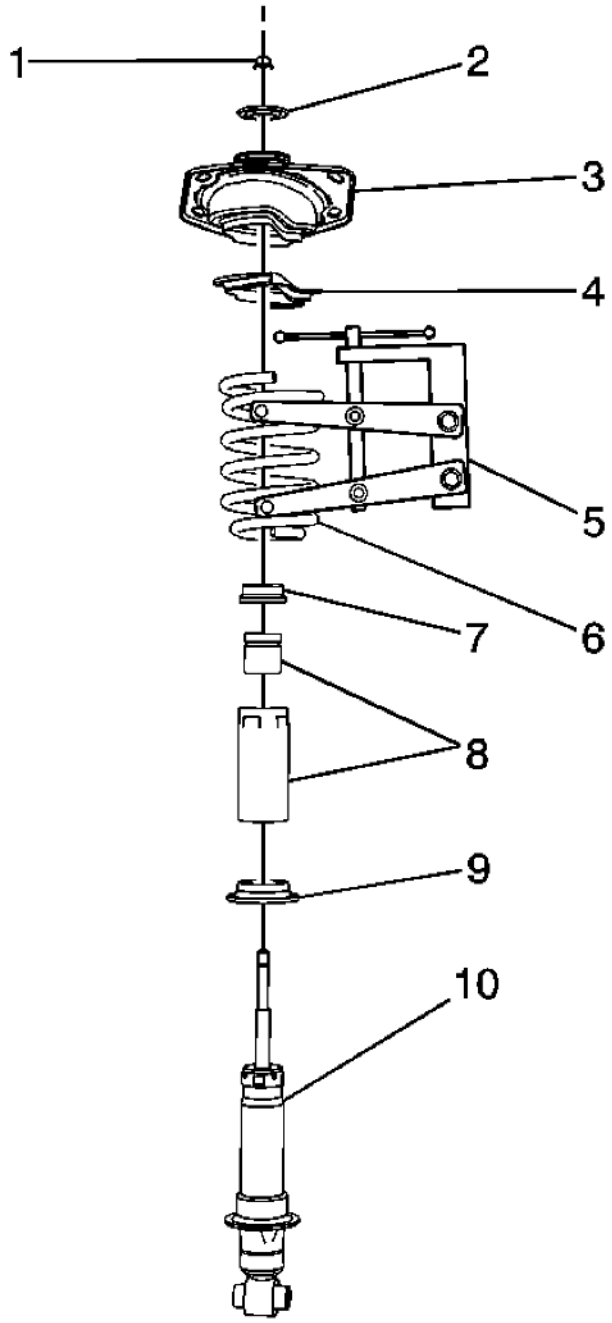


Fig. 9: Removing/Installing Rear Shock Absorber Components

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Courtesy of GENERAL MOTORS CORP.

NOTE: DO NOT tighten the nut for the rear shock absorber until the spring is properly alignment with the reference mark.

1. Using the **CH 48845:** compressor (5) install the rear shock absorber (10), lower insulator (9), shield, rear shock absorber bumper (8), rear shock absorber bumper seat (7), spring (6), rear spring upper insulator (4), rear shock absorber upper plate (3), retainer (2), and the nut (1).

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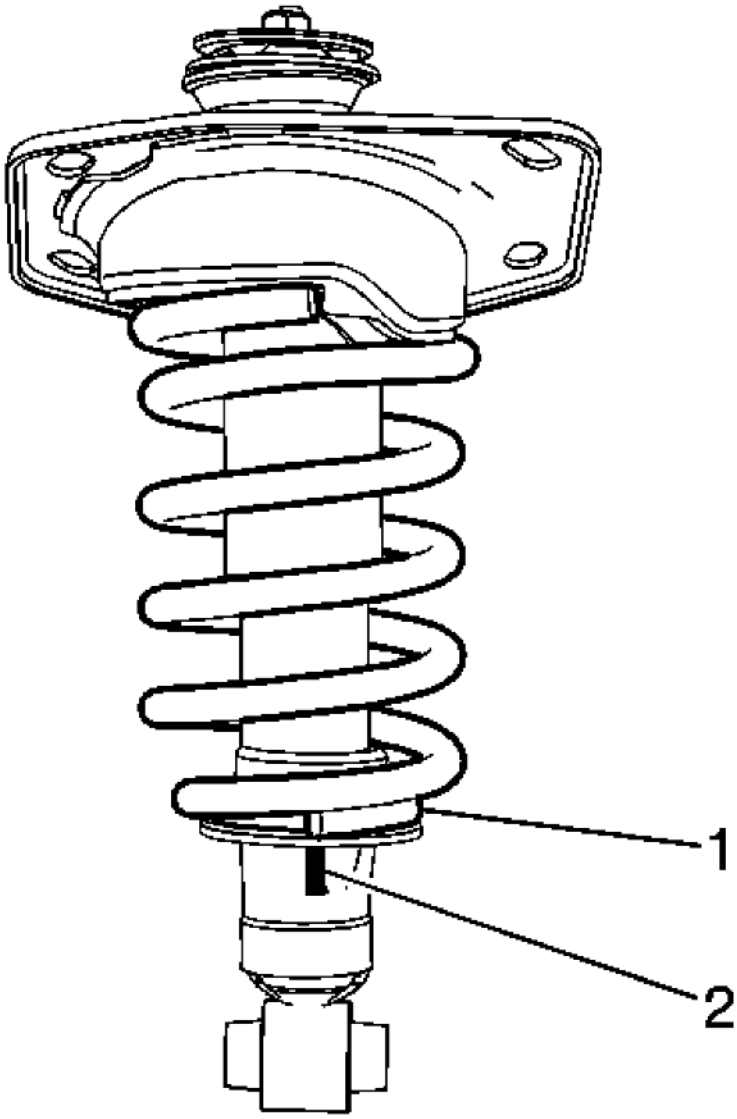


Fig. 10: Mark On Rear Spring
Courtesy of GENERAL MOTORS CORP.

2. Align the spring (1) to the reference mark on the shock absorber (2).

CAUTION: Refer to Fastener Caution .

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3. Using the appropriate tool to hold the shock absorber shaft, tighten the rear shock absorber nut to 45 N.m (33 lb ft).
4. Install the rear shock absorber in the vehicle. Refer to **Shock Absorber Replacement**.

SHOCK ABSORBER REPLACEMENT

Removal Procedure

1. Raise the vehicle. Refer to **Lifting and Jacking the Vehicle** .
2. Remove the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** .
3. Support the rear knuckle with a suitable hydraulic jack.
4. Remove the stabilizer shaft link from the lower control arm, if needed. Refer to **Stabilizer Shaft Link Replacement**.
5. Remove the lower control arm bolt from the knuckle. Refer to **Lower Control Arm Replacement**.

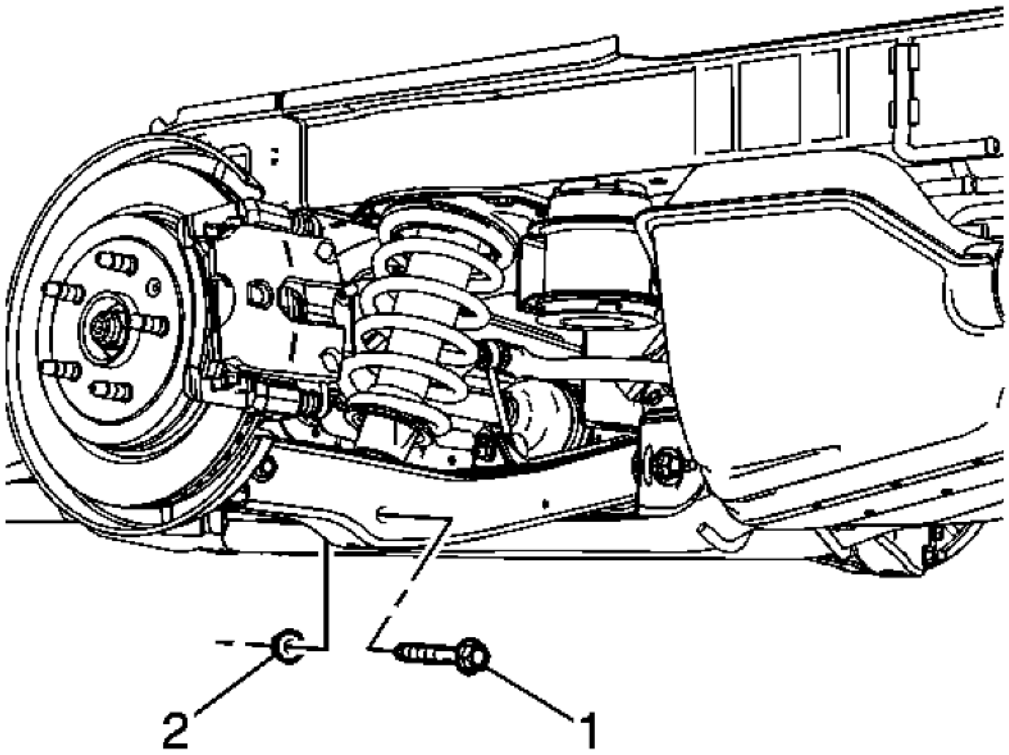


Fig. 11: Lower Rear Shock Absorber Nut & Bolt
Courtesy of GENERAL MOTORS CORP.

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6. Remove the lower rear shock absorber nut (2) and bolt (1).

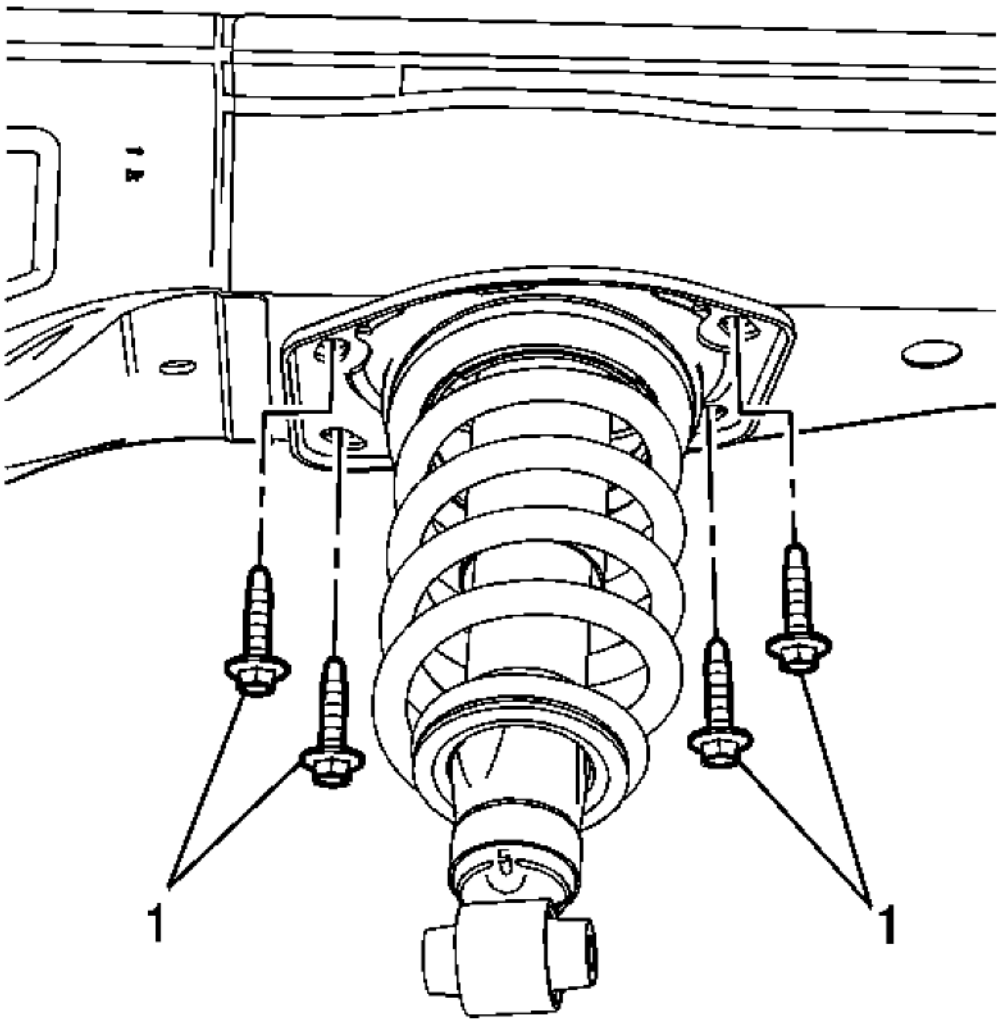


Fig. 12: Upper Shock Absorber Bolts
Courtesy of GENERAL MOTORS CORP.

7. Remove the upper shock absorber bolts (1).

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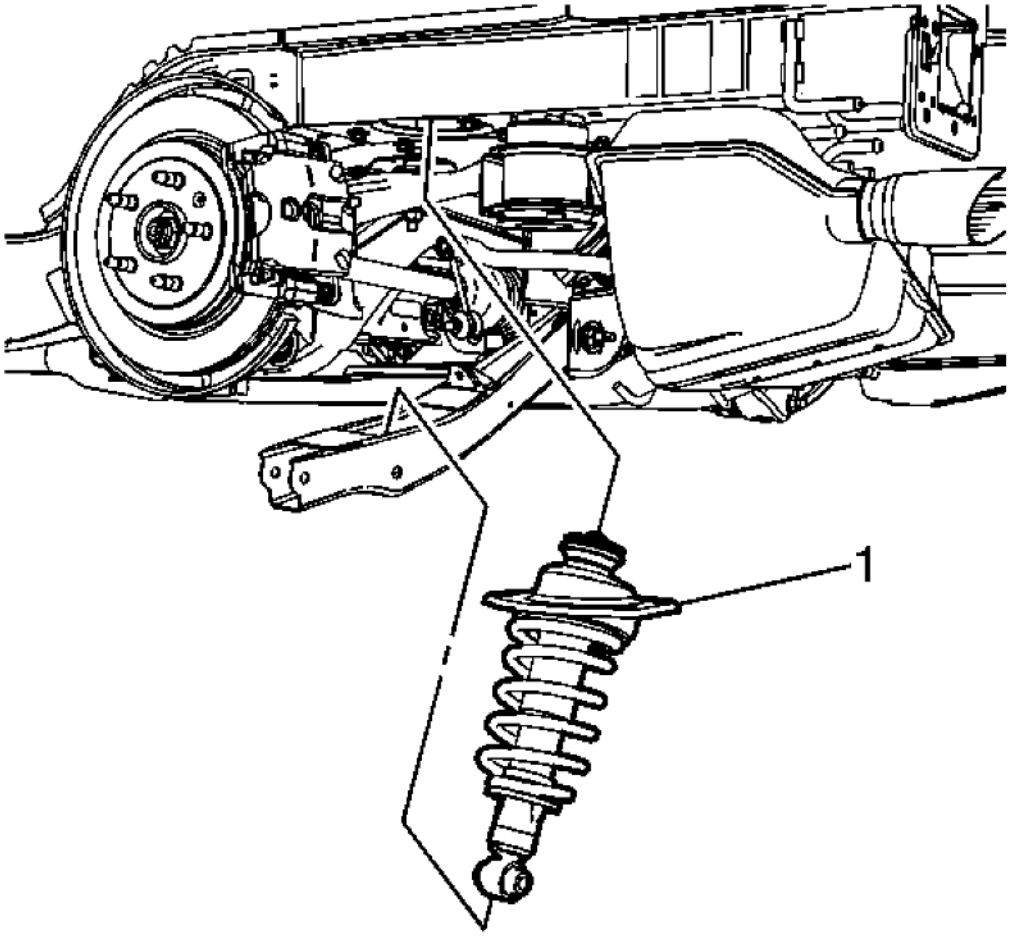


Fig. 13: Rear Shock Absorber Assembly
Courtesy of GENERAL MOTORS CORP.

8. Remove the rear shock absorber assembly (1) from the vehicle.

Installation Procedure

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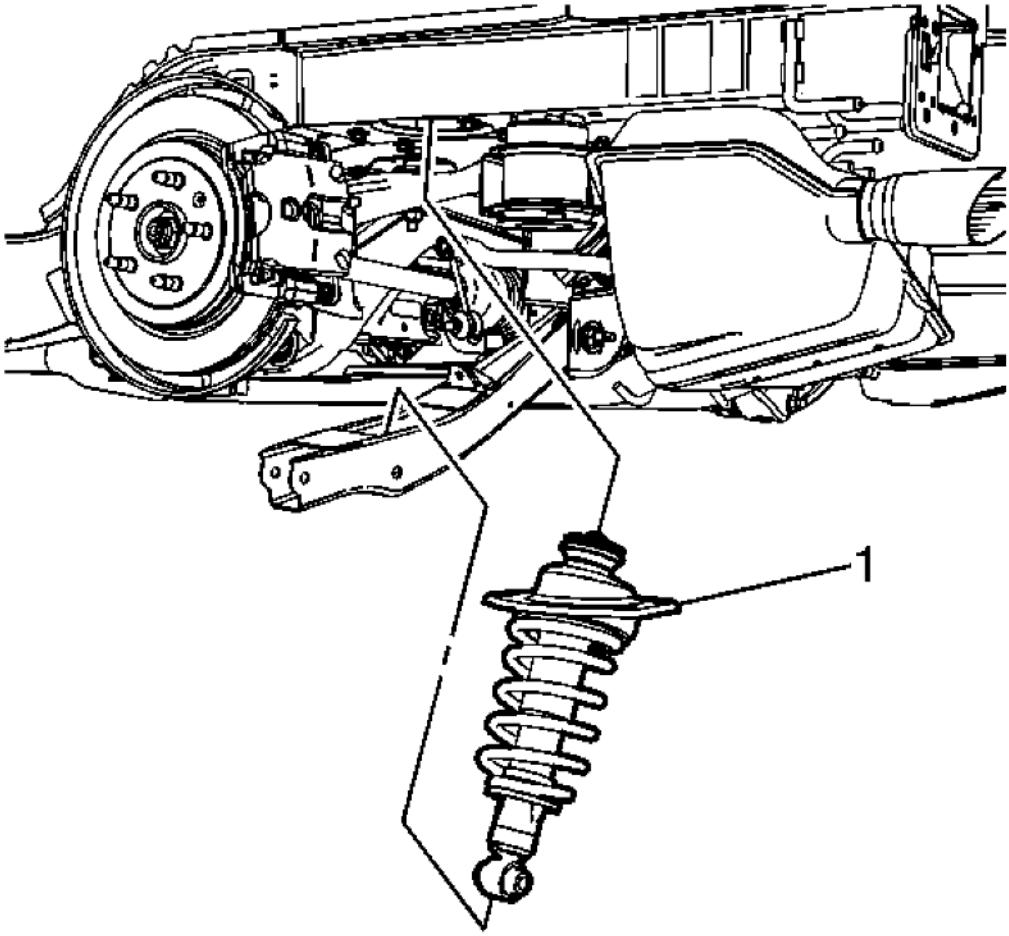


Fig. 14: Rear Shock Absorber Assembly
Courtesy of GENERAL MOTORS CORP.

1. Position the rear shock absorber assembly (1) in the vehicle.

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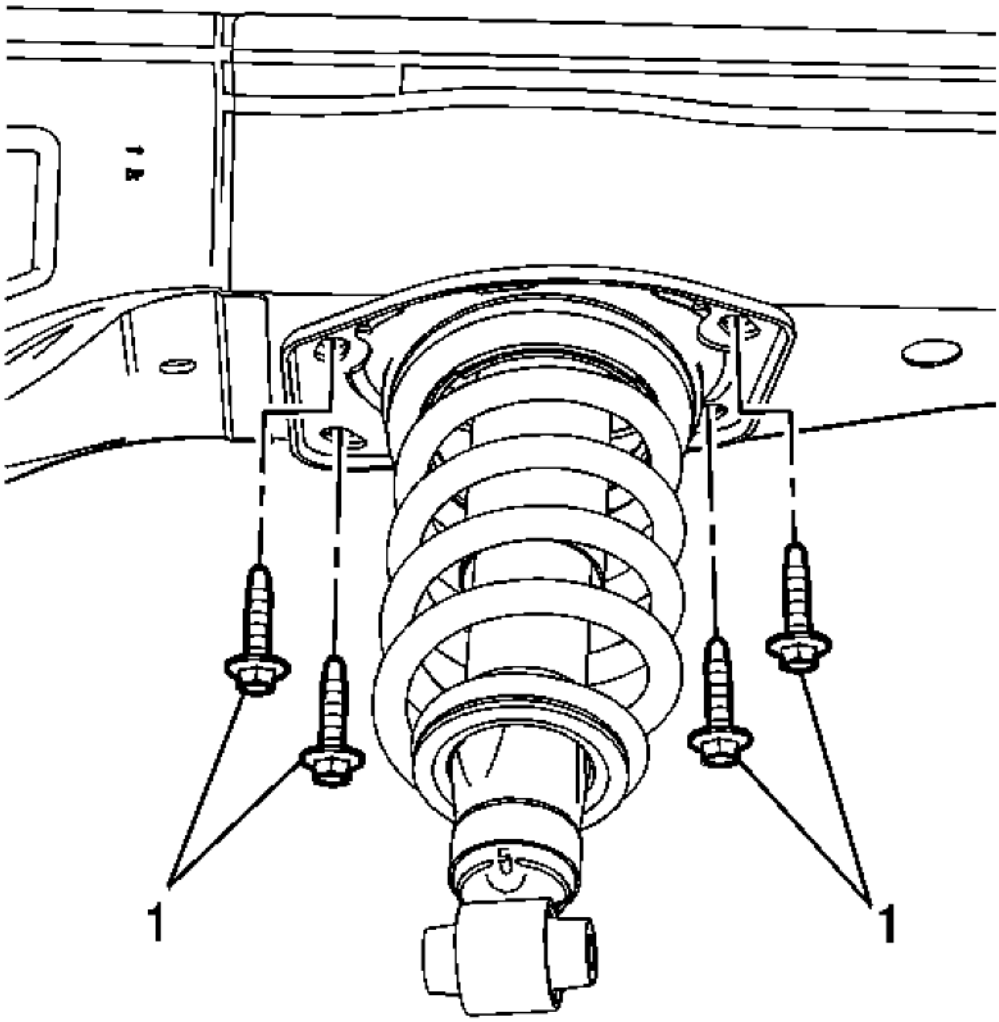


Fig. 15: Upper Shock Absorber Bolts
Courtesy of GENERAL MOTORS CORP.

CAUTION: Refer to Fastener Caution .

2. Install the upper shock absorber bolts (1) and tighten the bolts to 58 N.m (43 lb ft).
3. If needed, use the hydraulic jack to raise the lower control arm and install the lower control arm bolt. Refer to **Lower Control Arm Replacement**.

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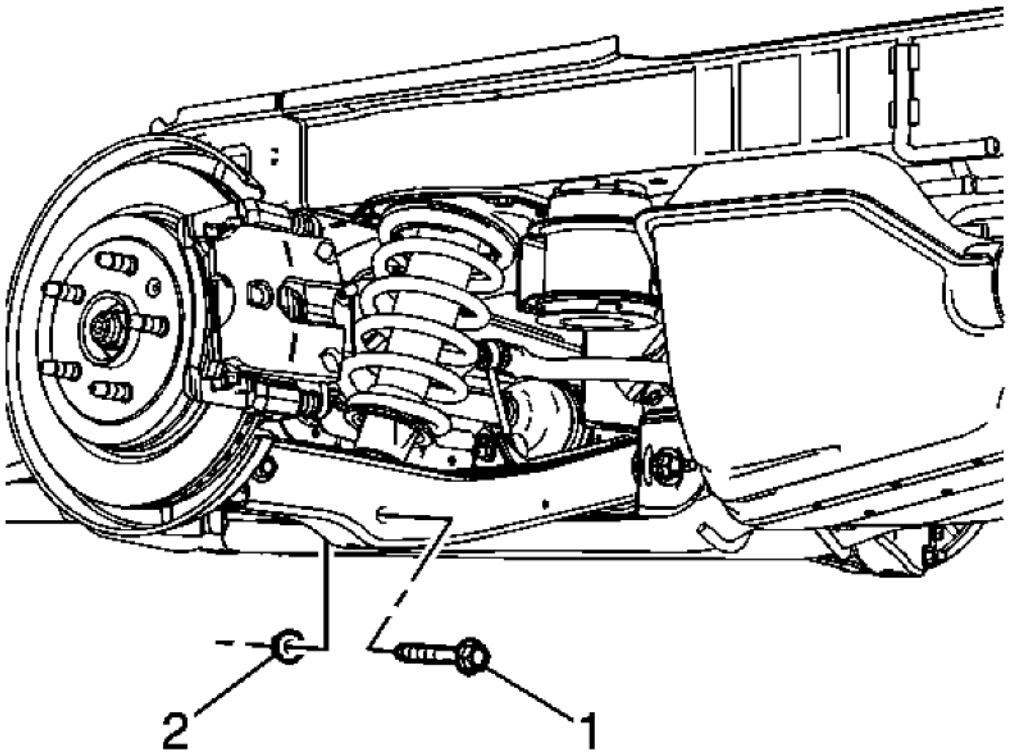


Fig. 16: Lower Rear Shock Absorber Nut & Bolt
Courtesy of GENERAL MOTORS CORP.

4. Install the lower shock absorber bolt (1) and nut (2) and tighten to 80 N.m (59 lb ft) plus an additional 120 degrees.
5. Remove the hydraulic jack.
6. Install the stabilizer shaft link from the lower control arm, if needed. Refer to **Stabilizer Shaft Link Replacement**.
7. Install the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** .
8. Lower the vehicle.

TRAILING ARM REPLACEMENT

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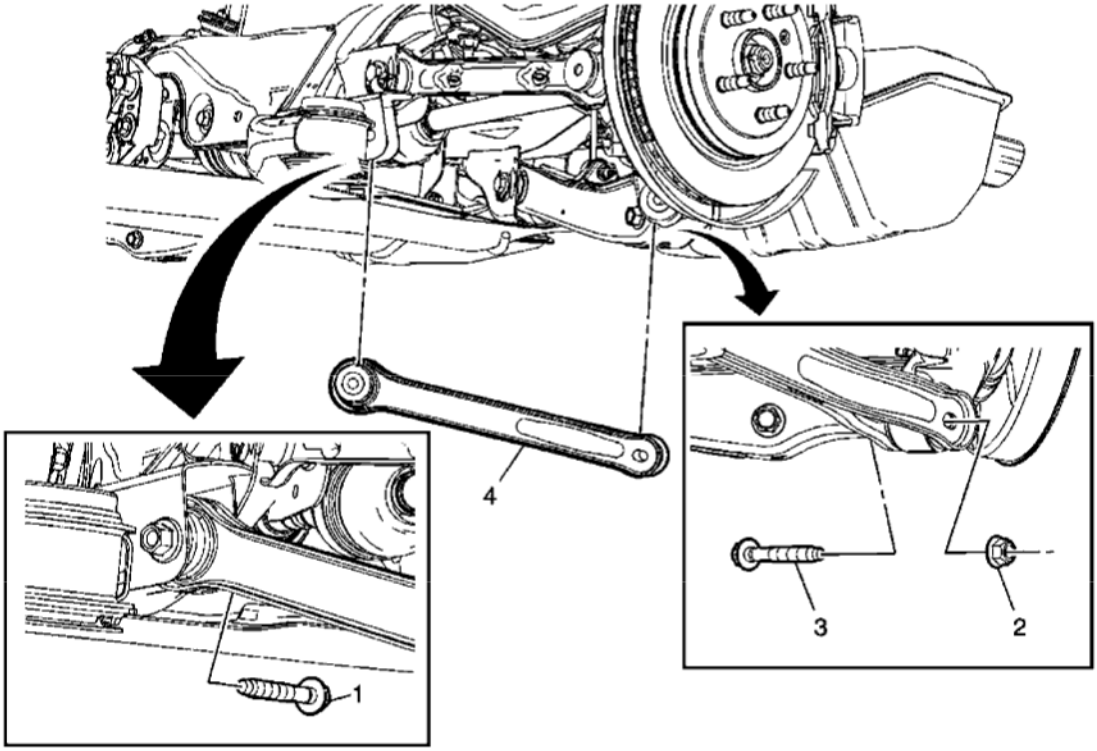


Fig. 17: Trailing Arm
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedures 1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** . 2. Remove the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** .	
1	Rear Suspension Trailing Arm Bolt **CAUTION:** **Refer to Fastener Caution .** **Tighten:** 100 N.m (74 lb ft)
2	Rear Suspension Trailing Arm Nut
3	Rear Suspension Trailing Arm Bolt **Tighten:** 40 N.m (30 lb ft) plus 120 degrees
4	Rear Suspension Trailing Arm **Procedure:** Check and adjust the rear wheel alignment, if needed. Refer to **Rear Camber Adjustment** .

ADJUST LINK REPLACEMENT

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Removal Procedure

1. Raise the vehicle. Refer to **Lifting and Jacking the Vehicle** .
2. Remove the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** .
3. Remove the wheel speed sensor wiring harness from the adjuster link. Refer to **Rear Wheel Speed Sensor Replacement** .

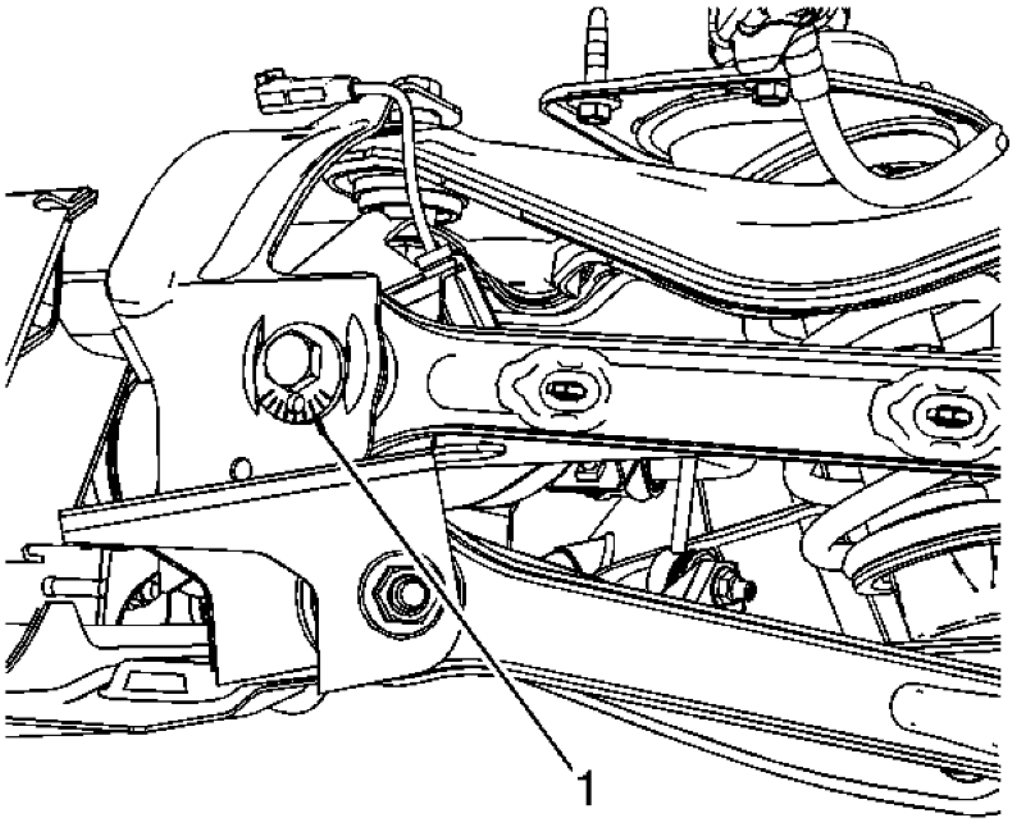


Fig. 18: Relationship Mark Of Adjuster To Frame
Courtesy of GENERAL MOTORS CORP.

4. Mark the relationship of the adjuster to the frame (1).

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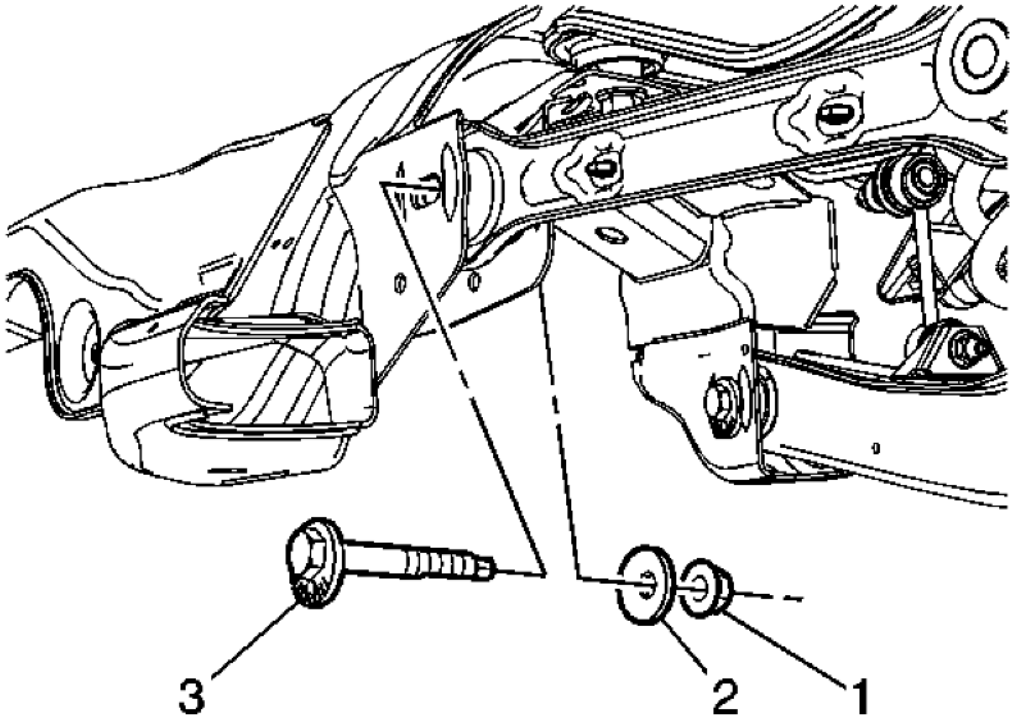


Fig. 19: Rear Suspension Adjuster Link Bolt, Nut & Washer
Courtesy of GENERAL MOTORS CORP.

5. Remove the rear suspension adjuster link bolt (3), nut (1) and the washer (2).

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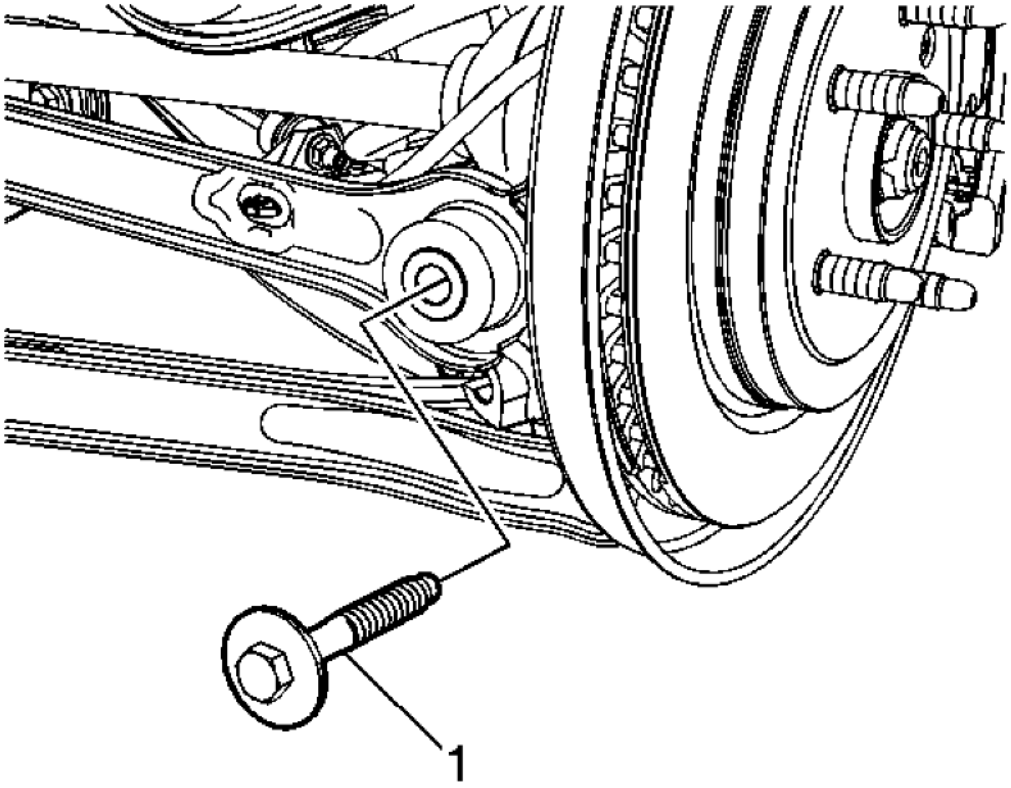


Fig. 20: Rear Suspension Adjuster Link Bolt At Knuckle
Courtesy of GENERAL MOTORS CORP.

6. Remove the rear suspension adjuster link bolt (1) at the knuckle.

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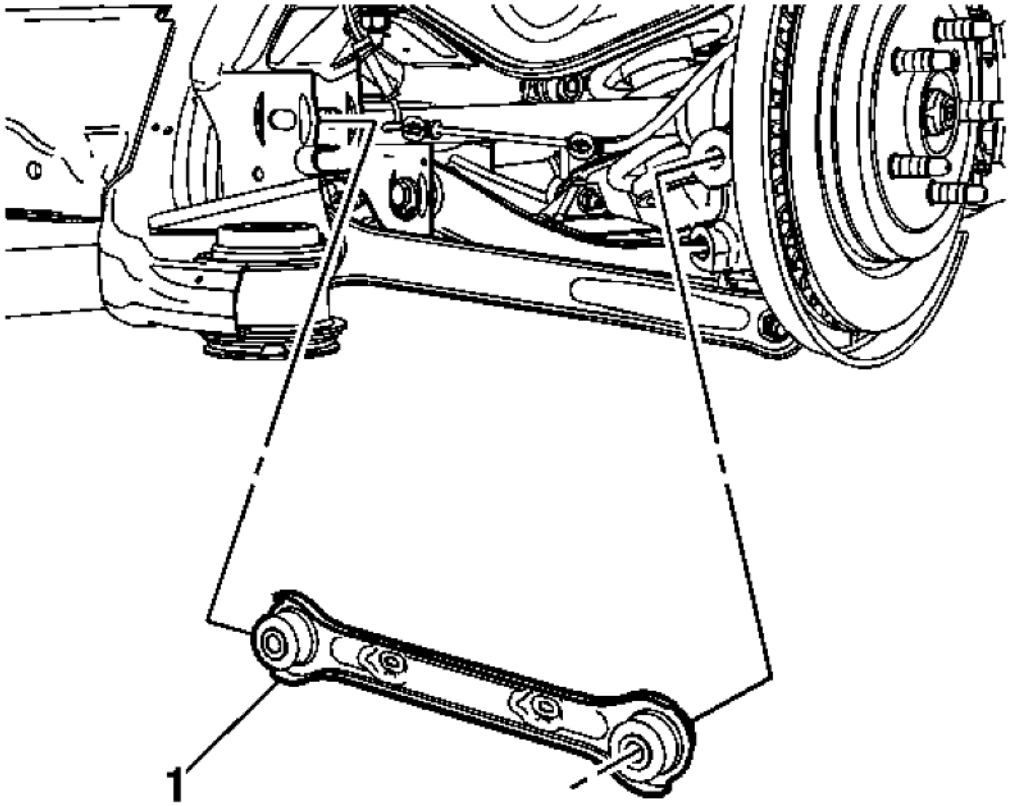


Fig. 21: Rear Suspension Adjuster Link
Courtesy of GENERAL MOTORS CORP.

NOTE: If the bushings are found to be excessively worn or are damaged, replace the adjustable link. The bushings are NOT serviced.

7. Remove the rear suspension adjuster link (1).

Installation Procedure

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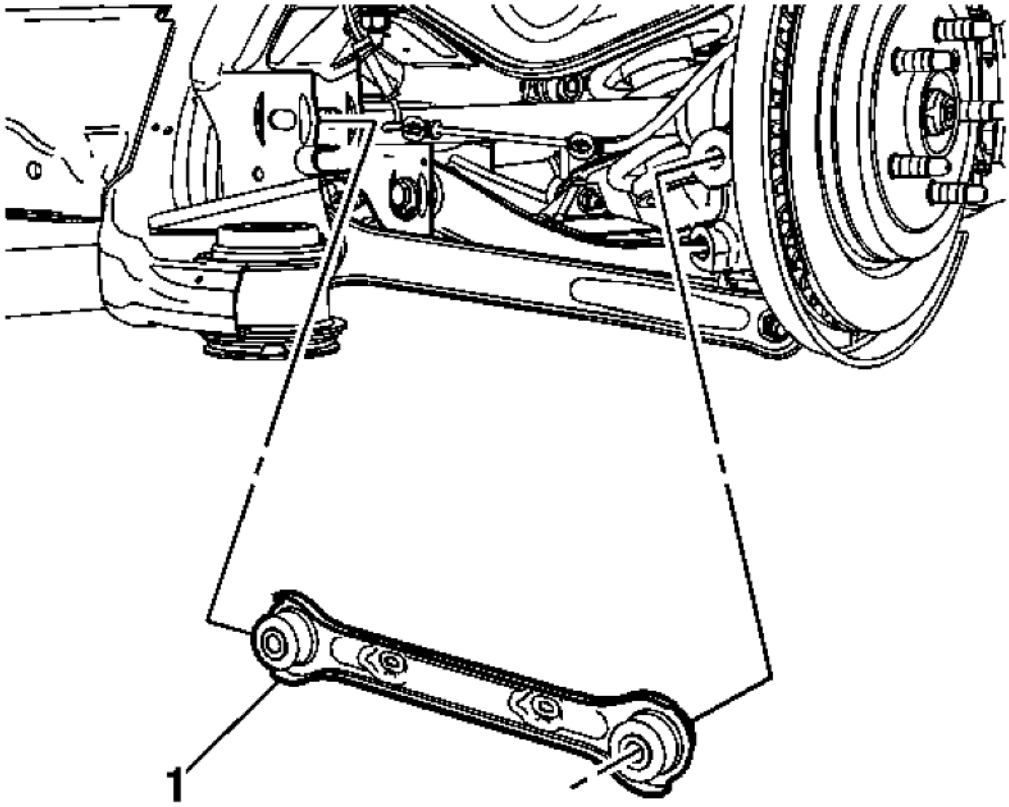


Fig. 22: Rear Suspension Adjuster Link
Courtesy of GENERAL MOTORS CORP.

1. Position the rear suspension adjuster link (1) in the vehicle.

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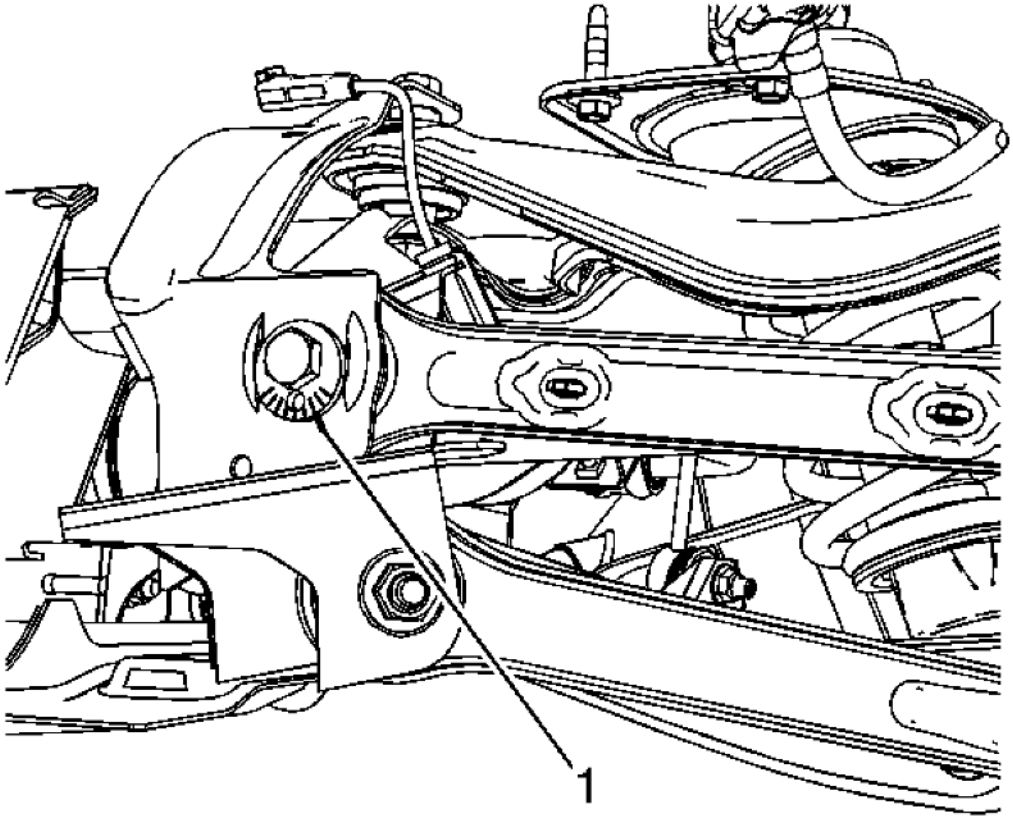


Fig. 23: Relationship Mark Of Adjuster To Frame
Courtesy of GENERAL MOTORS CORP.

2. Install the rear suspension adjuster link bolt and align the reference marks (1).

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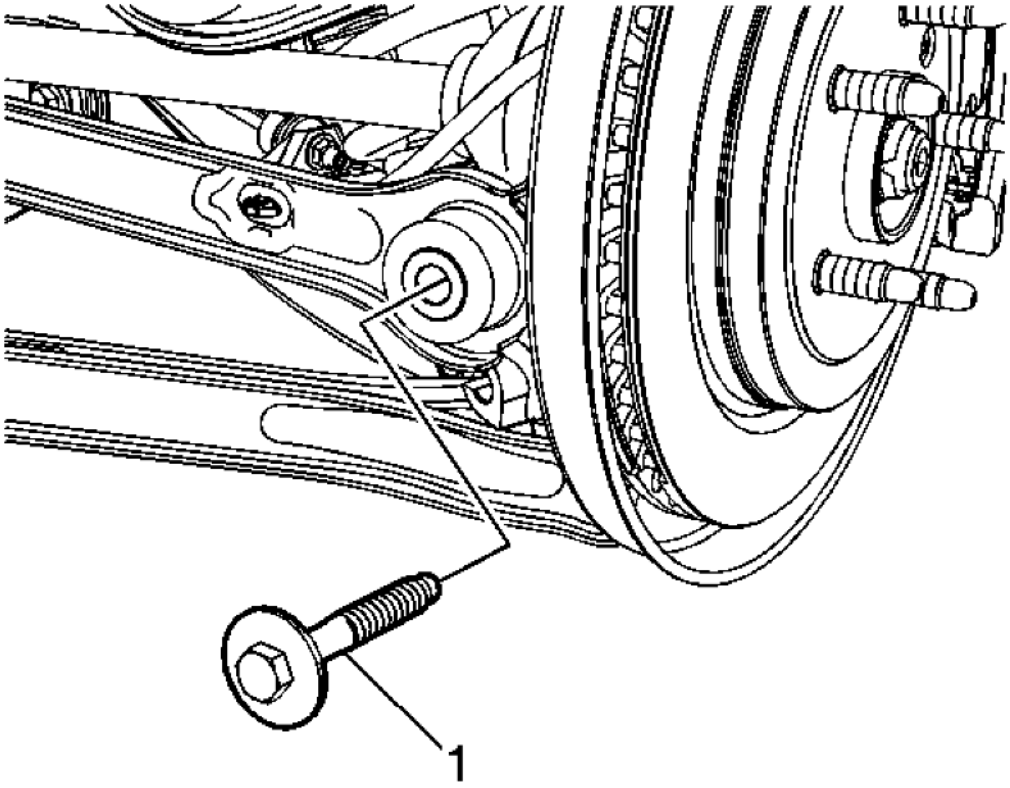


Fig. 24: Rear Suspension Adjuster Link Bolt At Knuckle
Courtesy of GENERAL MOTORS CORP.

CAUTION: Refer to Fastener Caution .

3. Install the adjuster link bolt (1) in the knuckle and tighten to 140 N.m (103 lb ft).

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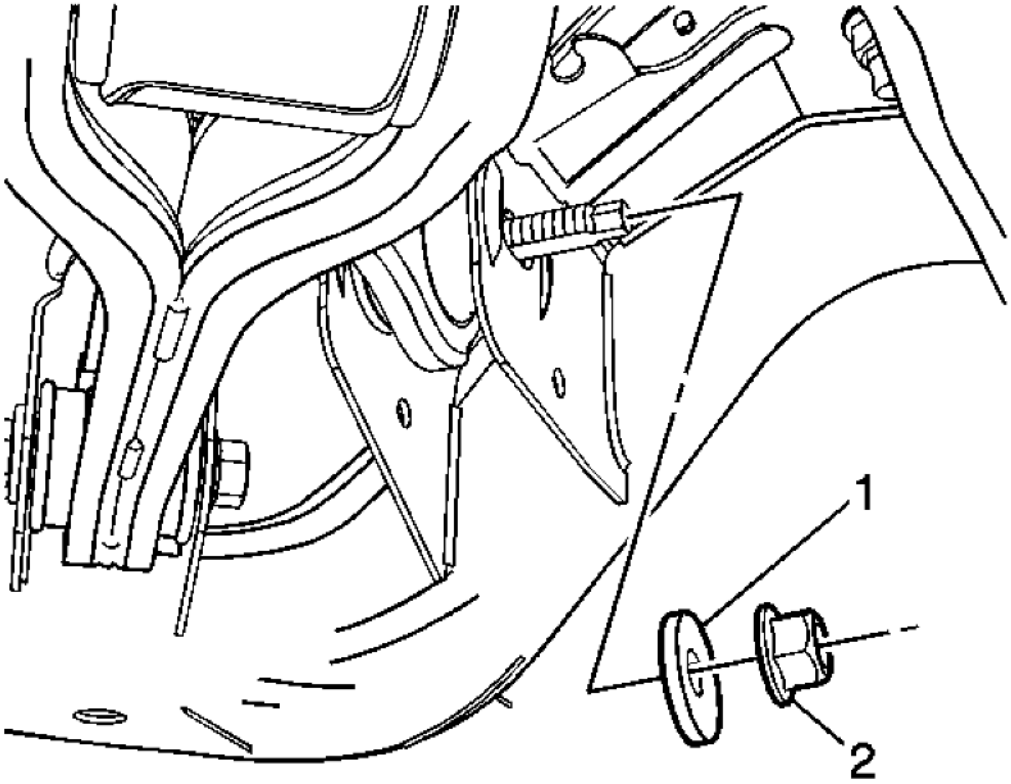


Fig. 25: Adjuster Washer & Nut
Courtesy of GENERAL MOTORS CORP.

NOTE: Ensure that the alignment marks DO NOT move when tighten the adjuster nut to specifications.

4. Install the adjuster washer (1) and the nut (2) and tighten to 115 N.m (85 lb ft).
5. Install the wheel speed sensor wiring harness on the adjuster link. Refer to **Rear Wheel Speed Sensor Replacement** .
6. Install the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** .
7. Lower the vehicle.
8. Check and adjust the rear wheel alignment, if needed. Refer to **Rear Camber Adjustment** .

REAR SUSPENSION UPPER CONTROL ARM BUSHING REPLACEMENT

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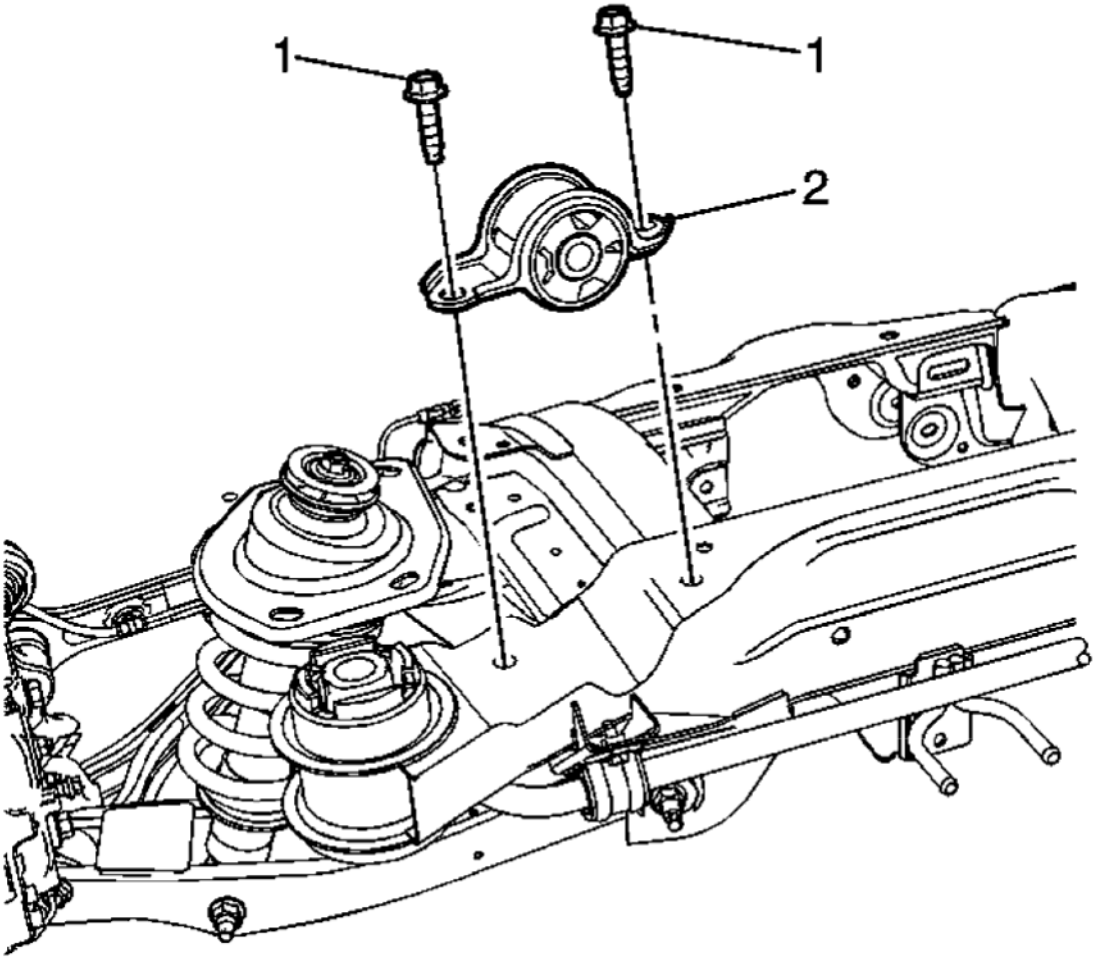


Fig. 26: Rear Suspension Upper Control Arm Bushing
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedure: Remove the rear upper control arm. Refer to **Upper Control Arm Replacement**.	
1	Rear Suspension Control Arm Bolt (Qty: 2) **CAUTION:** **Refer to Fastener Caution .** **Tighten:** 50 N.m (37 lb ft) plus an additional 120 degrees
2	Upper Control Arm Bushing **Procedure:** Check and adjust the rear wheel alignment, if needed. Refer to **Rear Camber Adjustment** .

UPPER CONTROL ARM REPLACEMENT

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Removal Procedure

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
2. Remove the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** .
3. Support the knuckle with a suitable jack stand.

NOTE: **The rear brake hose does NOT have to be completely removed from the upper control arm. Just remove the rear brake hose form the upper control arm to have enough clearance to remove the upper control arm.**

4. Remove the rear brake hose from the upper control arm. Refer to **Rear Brake Hose Replacement (LLT)** or **Rear Brake Hose Replacement (LS3, L99)** .

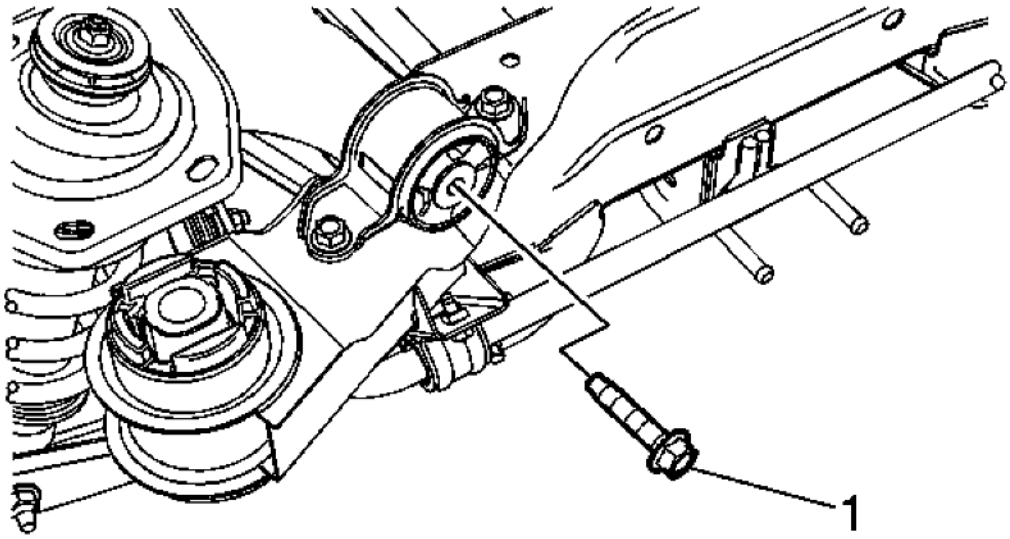


Fig. 27: Upper Rear Control Arm Bushing Bolt
Courtesy of GENERAL MOTORS CORP.

5. Remove the upper rear control arm bushing bolt (1).

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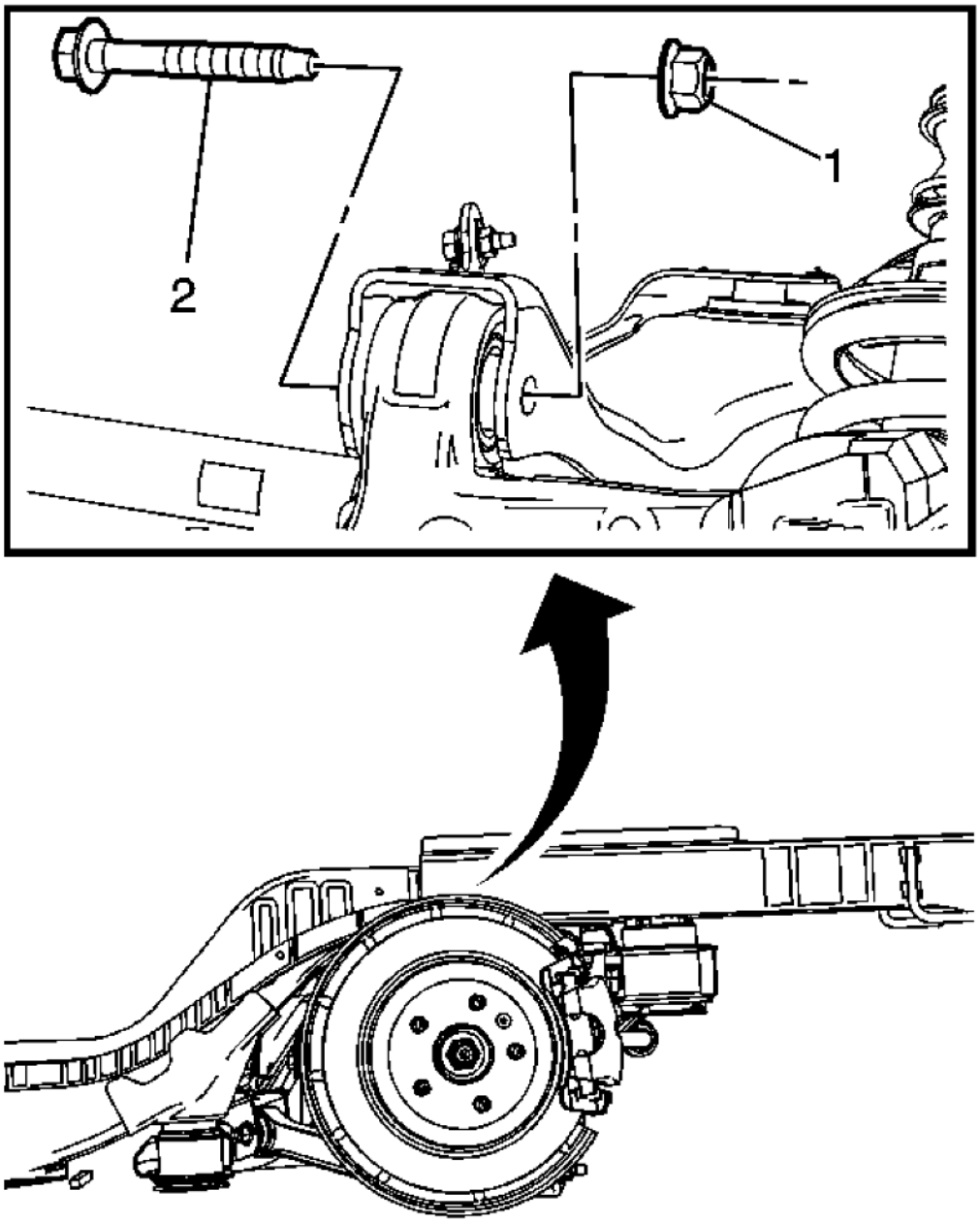


Fig. 28: Upper Control Arm Bolt & Nut From Knuckle
Courtesy of GENERAL MOTORS CORP.

6. Remove upper control arm bolt (2) and nut (1) from the knuckle.

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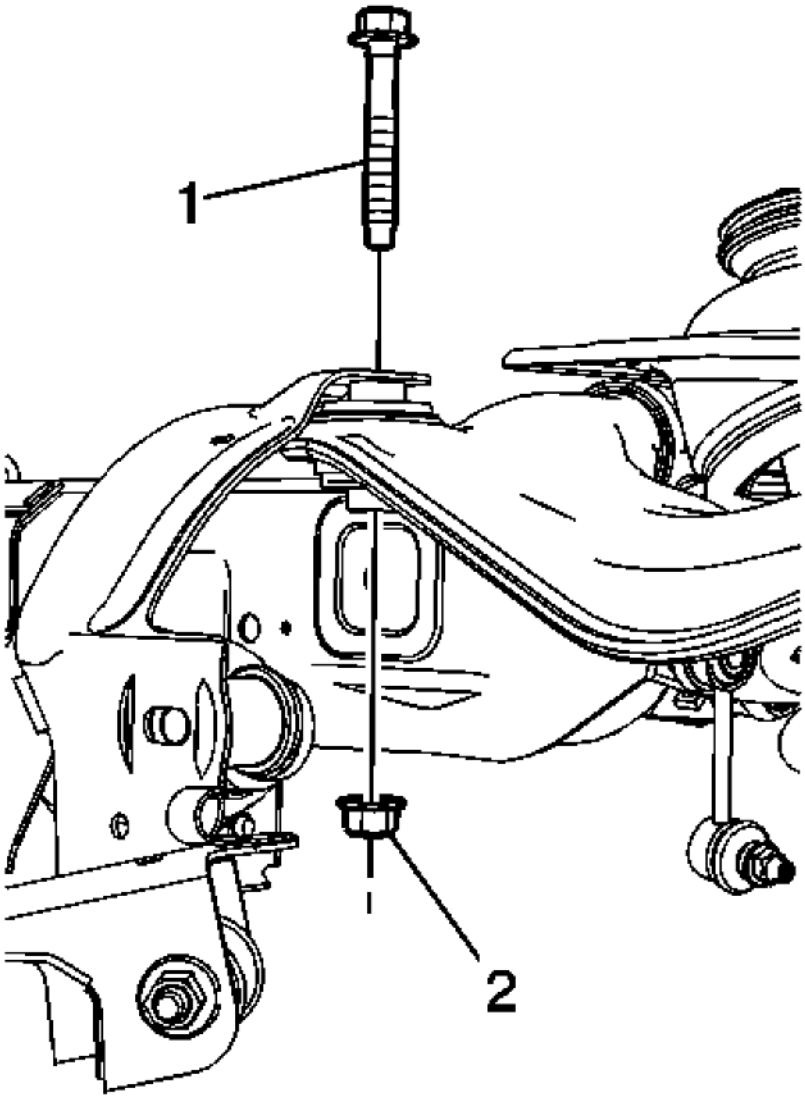


Fig. 29: Upper Control Arm Bolt & Nut From Frame
Courtesy of GENERAL MOTORS CORP.

7. Remove the upper control arm bolt (1) and the nut (2) from the frame.

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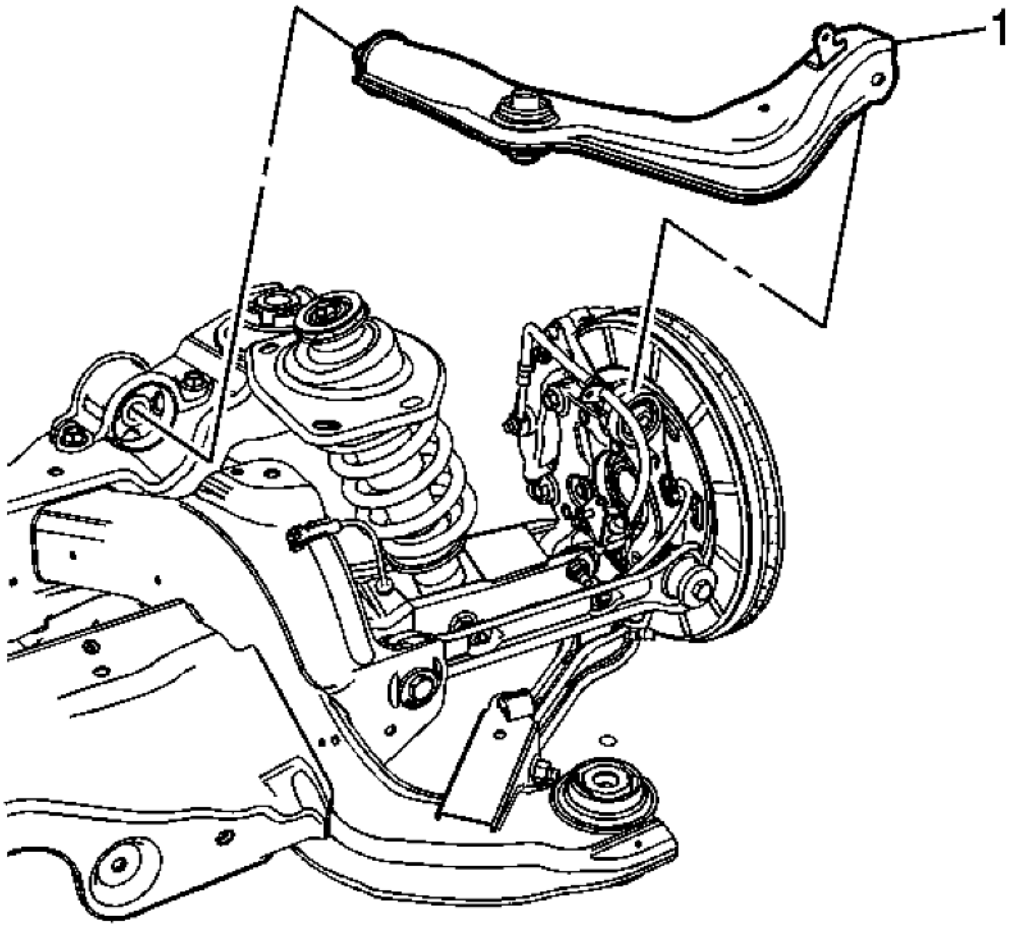


Fig. 30: Upper Control Arm
Courtesy of GENERAL MOTORS CORP.

8. Remove the upper control arm (1) from the vehicle.

Installation Procedure

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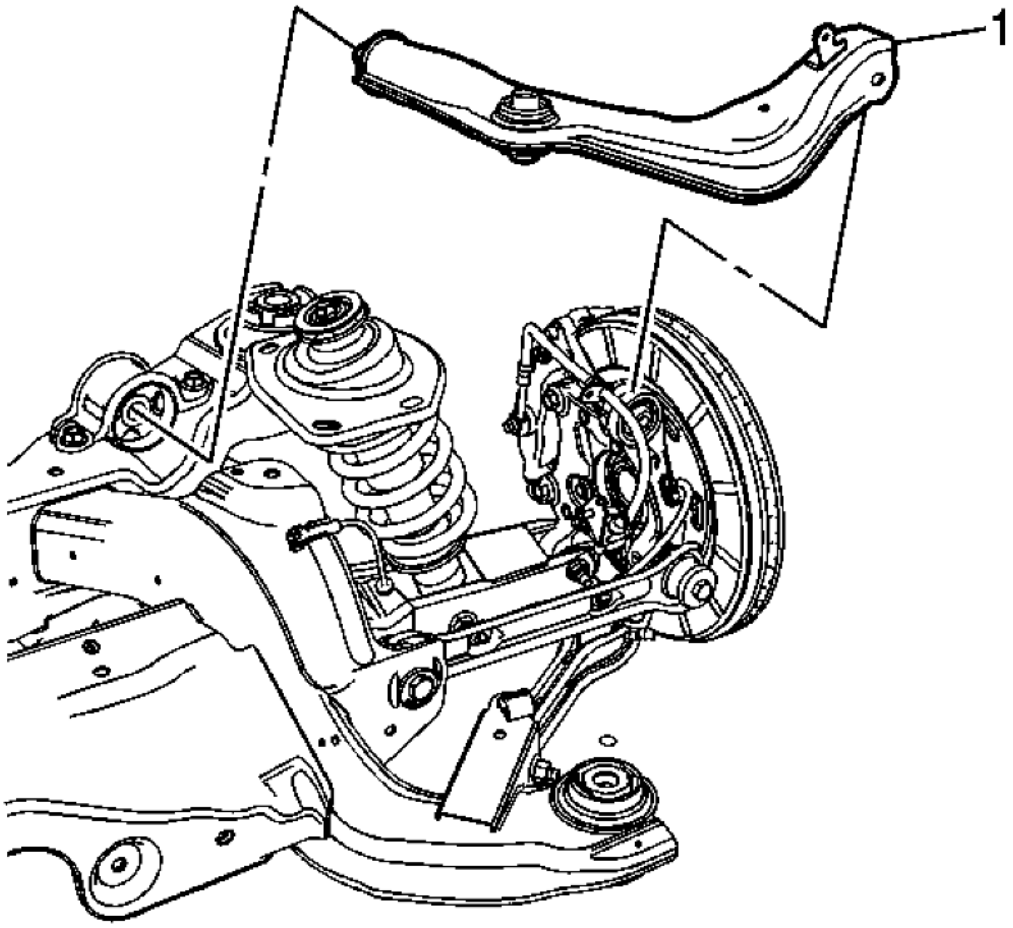


Fig. 31: Upper Control Arm
Courtesy of GENERAL MOTORS CORP.

1. Position the upper control arm (1) in the frame and on the knuckle.

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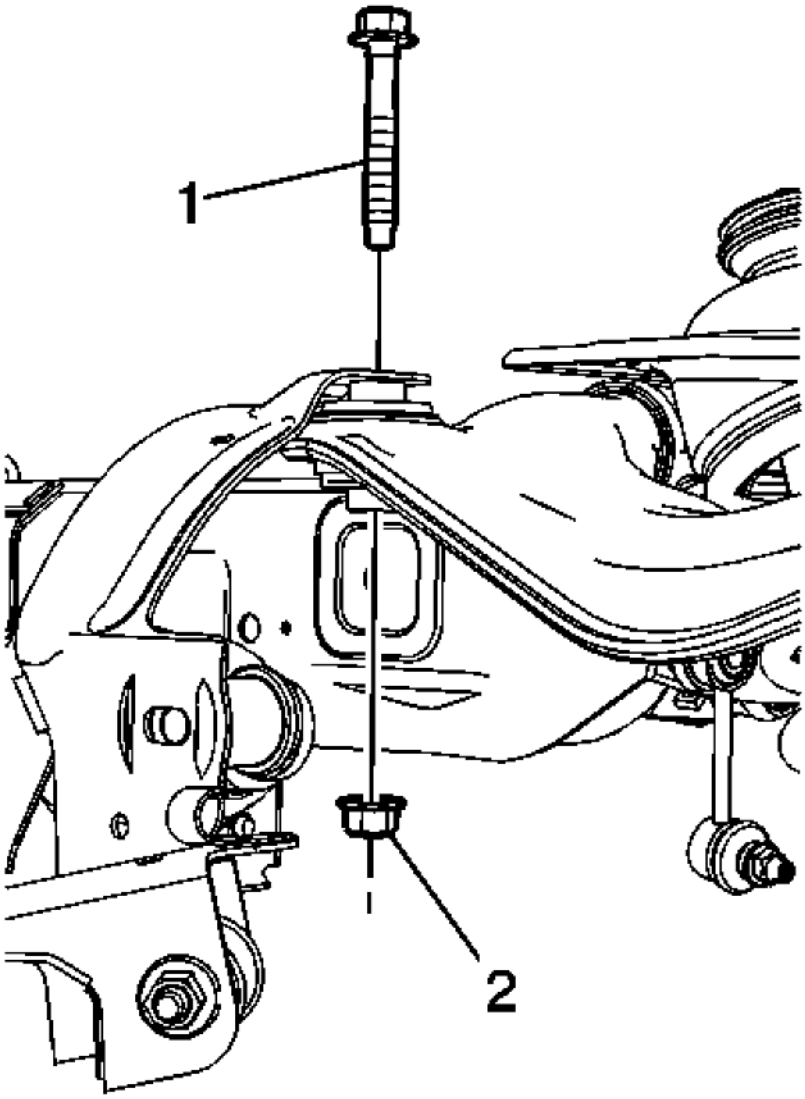


Fig. 32: Upper Control Arm Bolt & Nut From Frame
Courtesy of GENERAL MOTORS CORP.

CAUTION: Refer to Fastener Caution .

2. Install the upper control arm bolt (1) and the nut (2) and tighten to 80 N.m (59 lb ft) plus 120 degrees.

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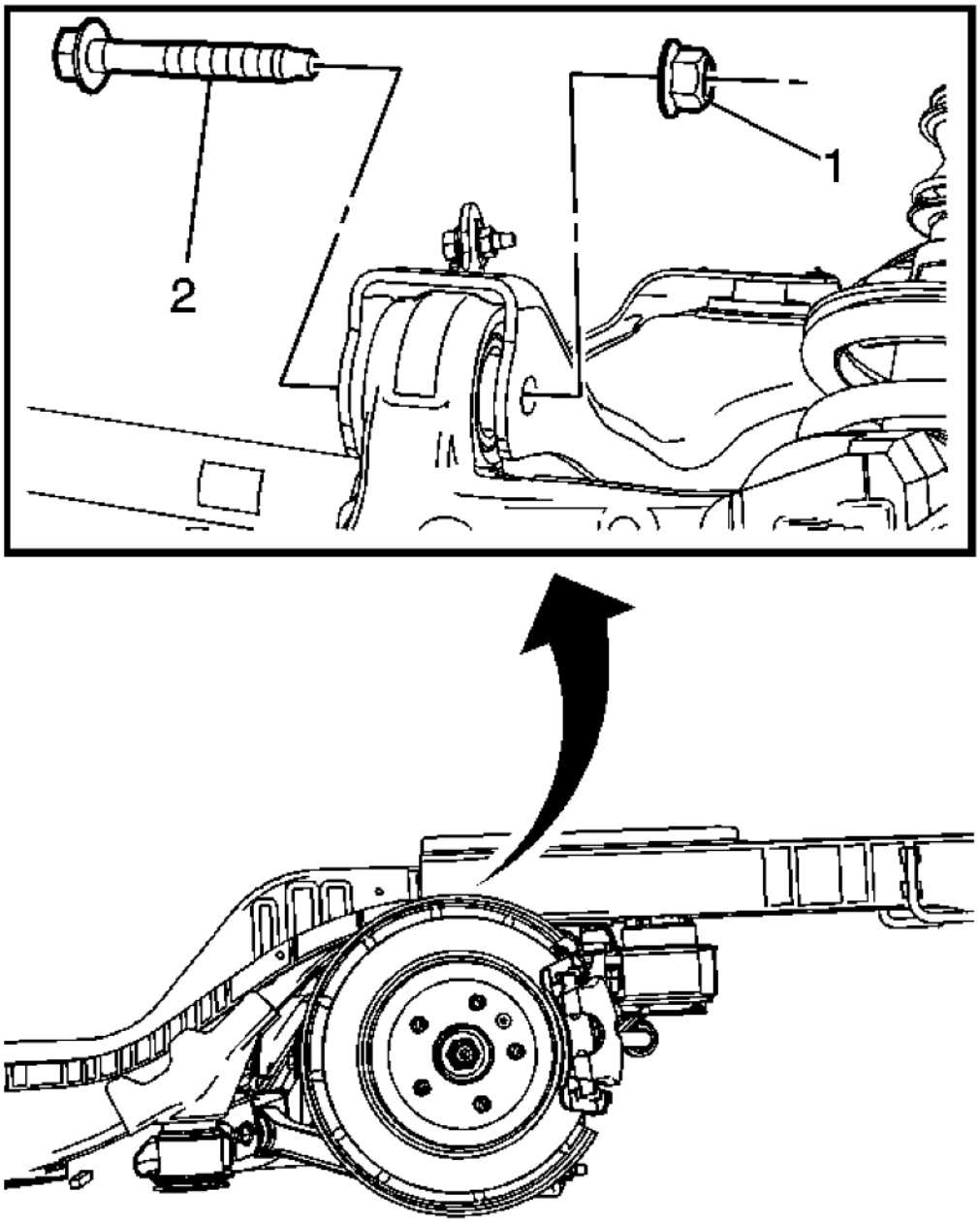


Fig. 33: Upper Control Arm Bolt & Nut From Knuckle
Courtesy of GENERAL MOTORS CORP.

3. Install the upper control arm bolt (2) and the nut (1) and tighten to 60 N.m (44 lb ft) plus 90 degrees.

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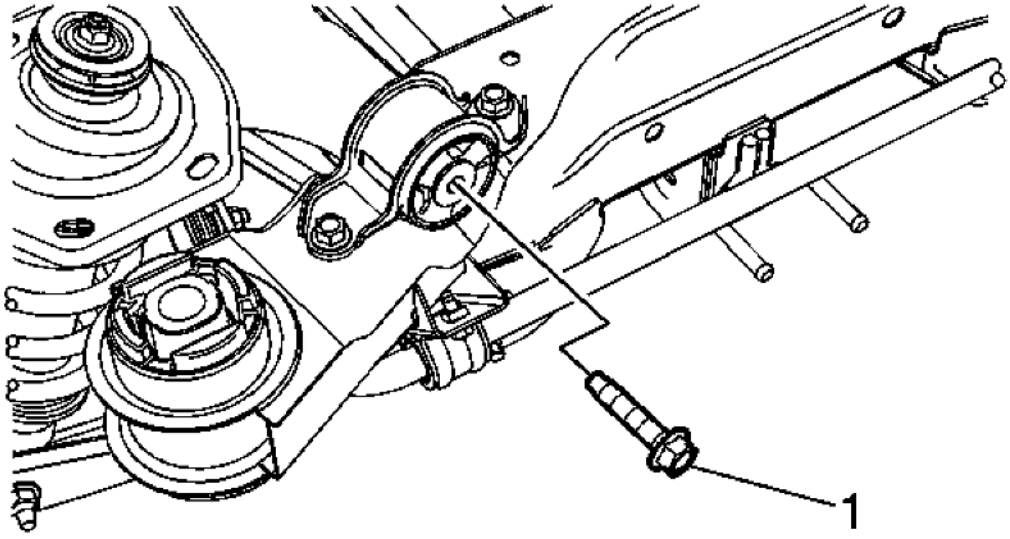


Fig. 34: Upper Rear Control Arm Bushing Bolt
Courtesy of GENERAL MOTORS CORP.

4. Install the upper control arm bushing bolt (1) and tighten to 50 N.m (37 lb ft) plus 120 degrees.
5. Install the rear brake hose on the upper control arm. Refer to **Rear Brake Hose Replacement (LLT)** or **Rear Brake Hose Replacement (LS3, L99)** .
6. Remove the support from the knuckle.
7. Install the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** .
8. Lower the vehicle.
9. Check and adjust the rear wheel alignment, if needed. Refer to **Rear Camber Adjustment** .

LOWER CONTROL ARM REPLACEMENT

Removal Procedure

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

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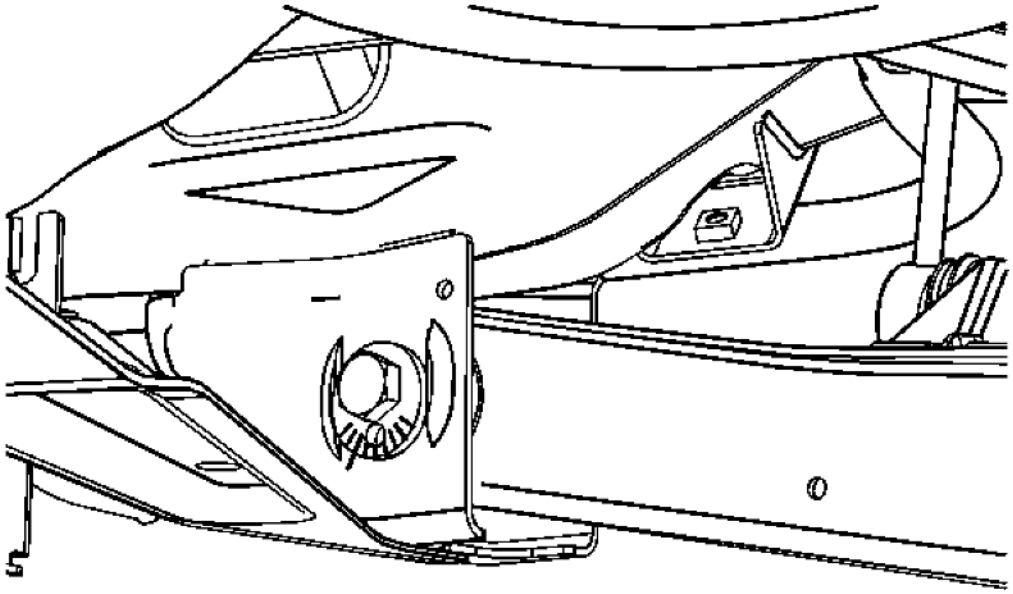


Fig. 35: Adjuster To Frame Mark
Courtesy of GENERAL MOTORS CORP.

3. Mark the relationship of the adjuster to the frame before removing the adjuster bolt.
4. Support the rear knuckle with the hydraulic transmission jack.
5. Remove the stabilizer shaft link from the lower control arm. Refer to **Stabilizer Shaft Link Replacement**.
6. Remove the lower shock absorber bolt from the lower control arm. Refer to **Shock Absorber Replacement**.

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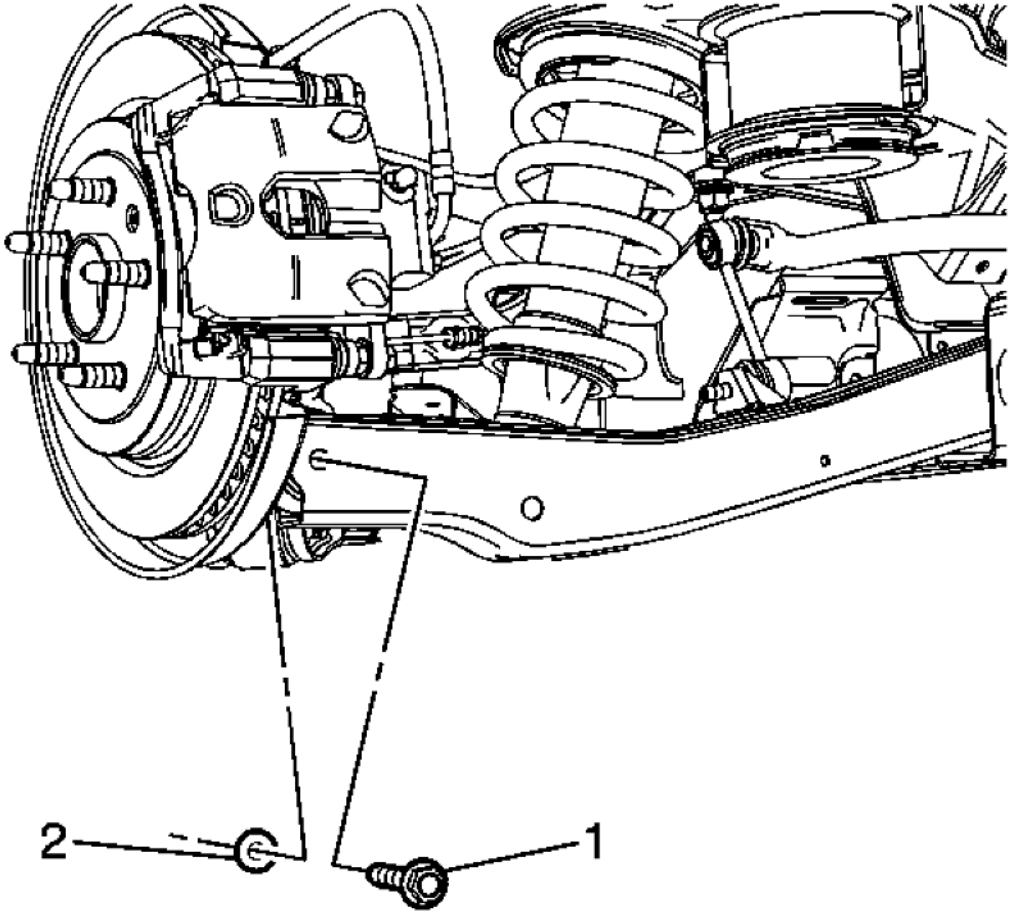


Fig. 36: Rear Lower Control Arm Bolt & Washer
Courtesy of GENERAL MOTORS CORP.

7. Remove the rear lower control arm bolt (1) and the washer (2).

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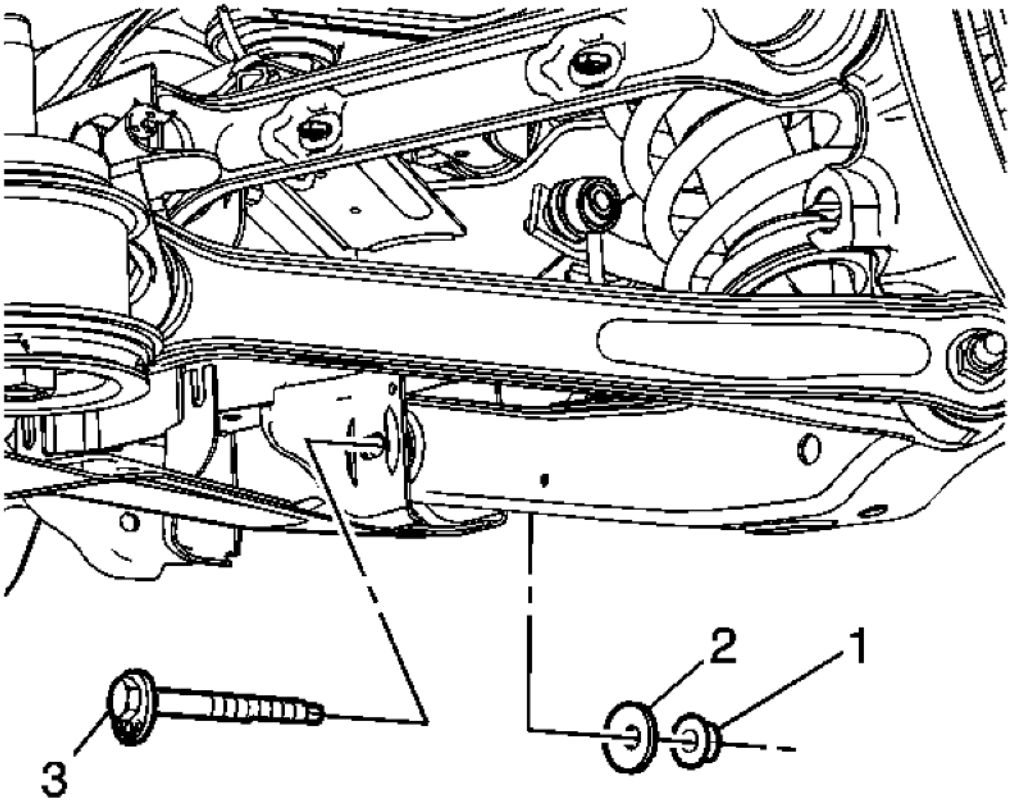


Fig. 37: Rear Lower Control Arm Adjuster Bolt, Washer & Nut
Courtesy of GENERAL MOTORS CORP.

8. Remove the rear lower control arm adjuster bolt (3), washer (2), and the nut (1).

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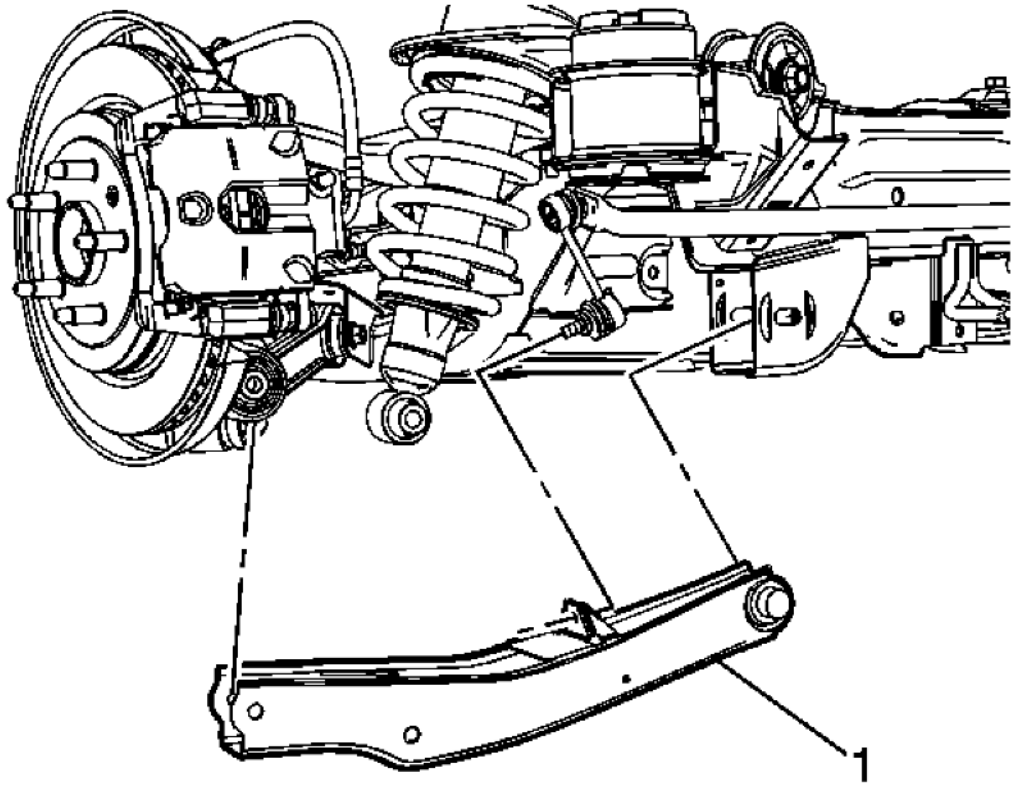


Fig. 38: Rear Lower Control Arm
Courtesy of GENERAL MOTORS CORP.

9. Remove the rear lower control arm (1).

Installation Procedure

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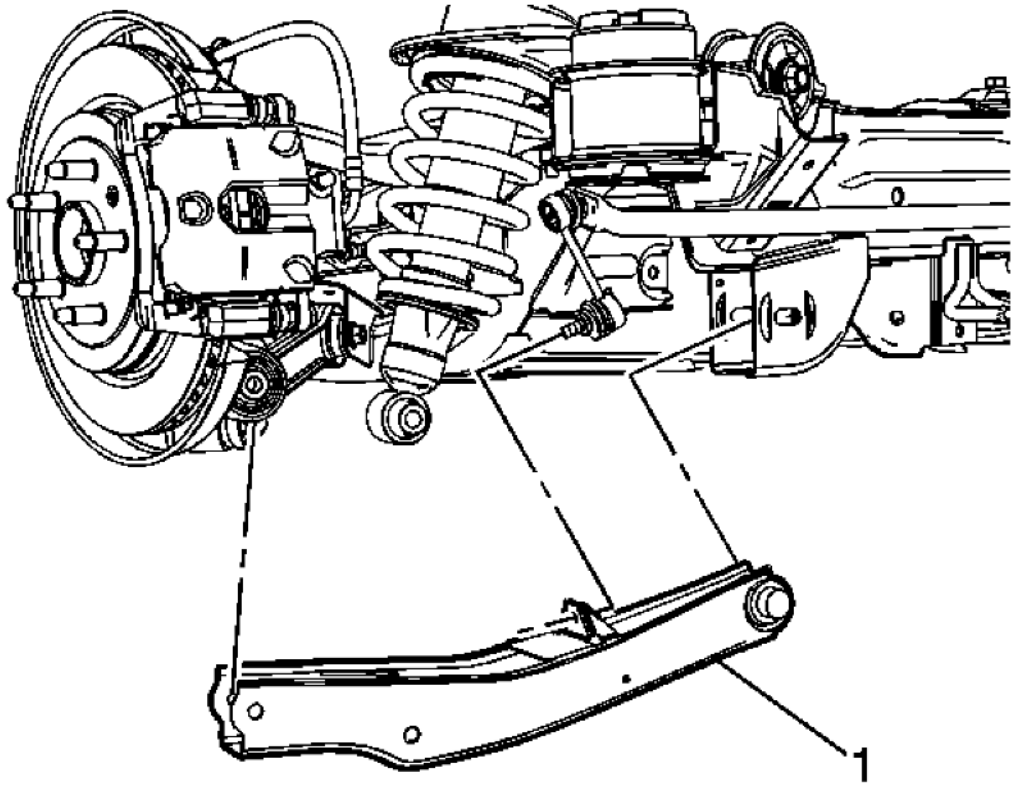


Fig. 39: Rear Lower Control Arm
Courtesy of GENERAL MOTORS CORP.

1. Position the rear lower control arm (1) in the rear cradle and knuckle.

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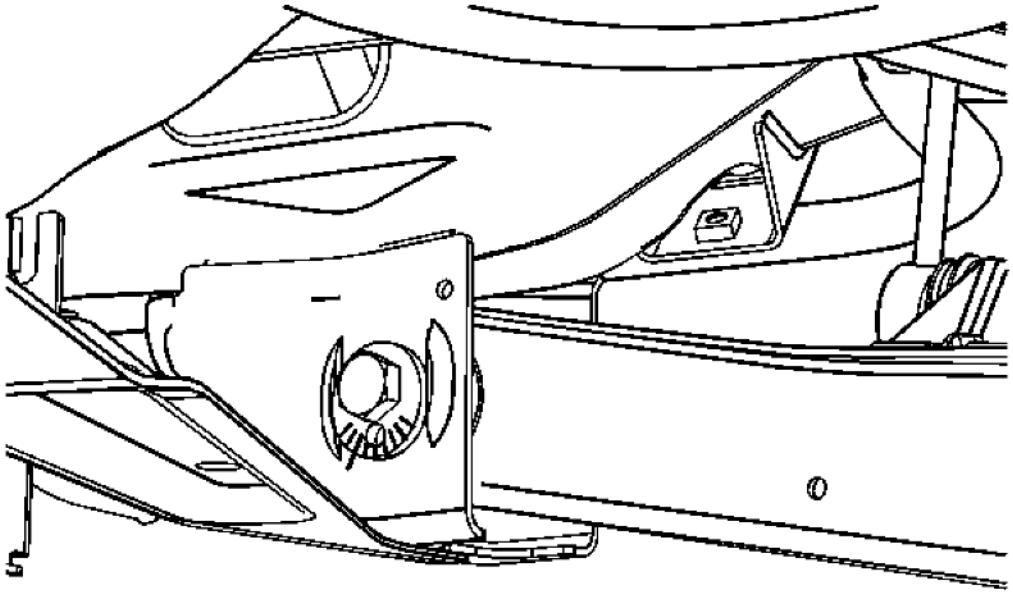


Fig. 40: Adjuster To Frame Mark
Courtesy of GENERAL MOTORS CORP.

2. Install the rear lower control arm adjuster bolt and align the reference marks.

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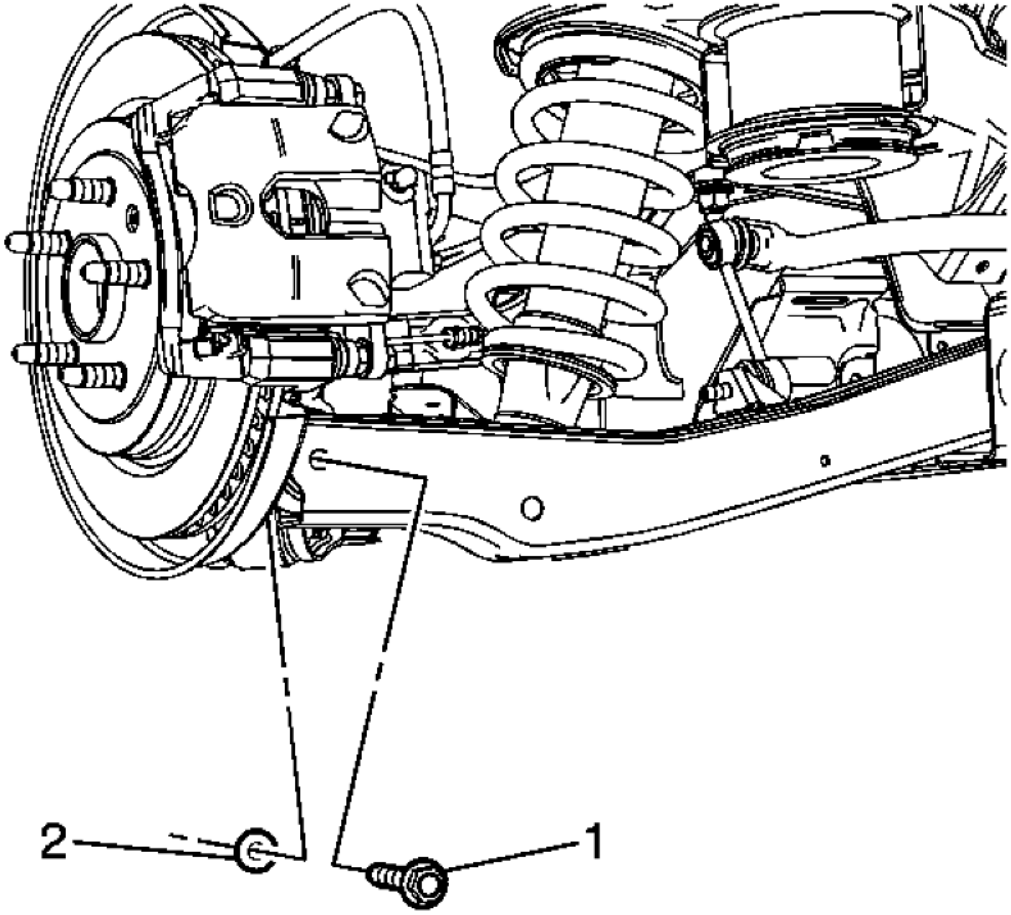


Fig. 41: Rear Lower Control Arm Bolt & Washer
Courtesy of GENERAL MOTORS CORP.

CAUTION: Refer to Fastener Caution .

3. Install the rear lower control arm bolt (1).
4. Install the rear lower control arm nut (2) and tighten to 40 N.m (30 lb ft) plus 120 degrees.

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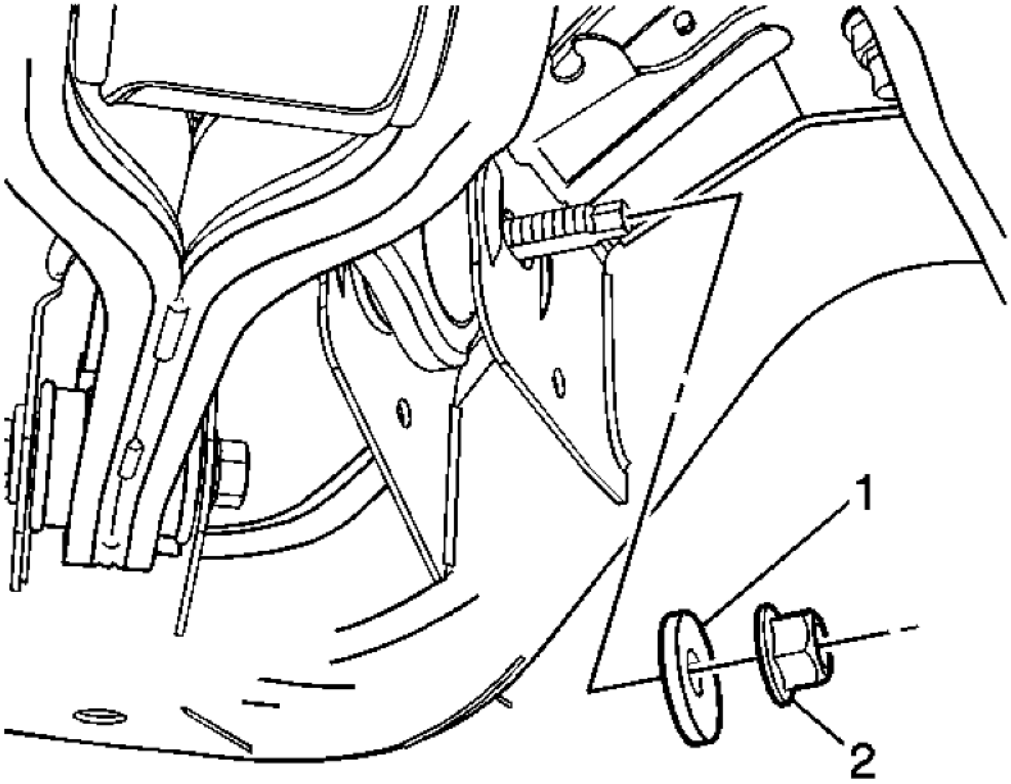


Fig. 42: Adjuster Washer & Nut
Courtesy of GENERAL MOTORS CORP.

5. Install the rear lower control arm adjuster washer (1) and nut (2), then tighten the nut (2) to 115 N.m (85 lb ft).
6. Install the lower shock absorber bolt to the lower control arm. Refer to **Shock Absorber Replacement**.
7. Install the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** .
8. Lower the vehicle.
9. Check and adjust the rear wheel alignment, if needed. Refer to **Rear Camber Adjustment** .

WHEEL STUD REPLACEMENT

Special Tools

J 43631: Ball Joint Remover

For equivalent regional tools, refer to **Special Tools**.

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Removal Procedure

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

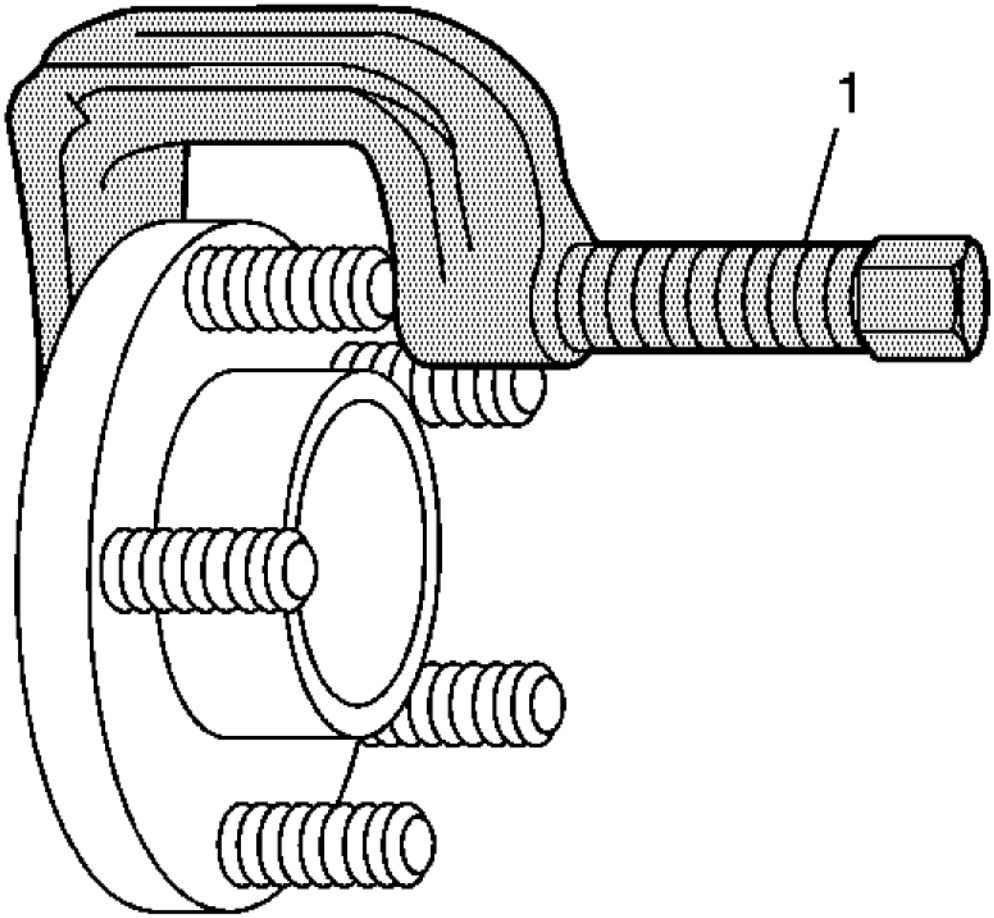


Fig. 43: Removing Wheel Stud From Wheel Bearing/Hub
Courtesy of GENERAL MOTORS CORP.

3. Remove the wheel bearing/hub assembly. Refer to **Rear Wheel Bearing and Hub Replacement**.
4. Using the **J 43631:** remover (1), remove the wheel stud from the wheel bearing.

Installation Procedure

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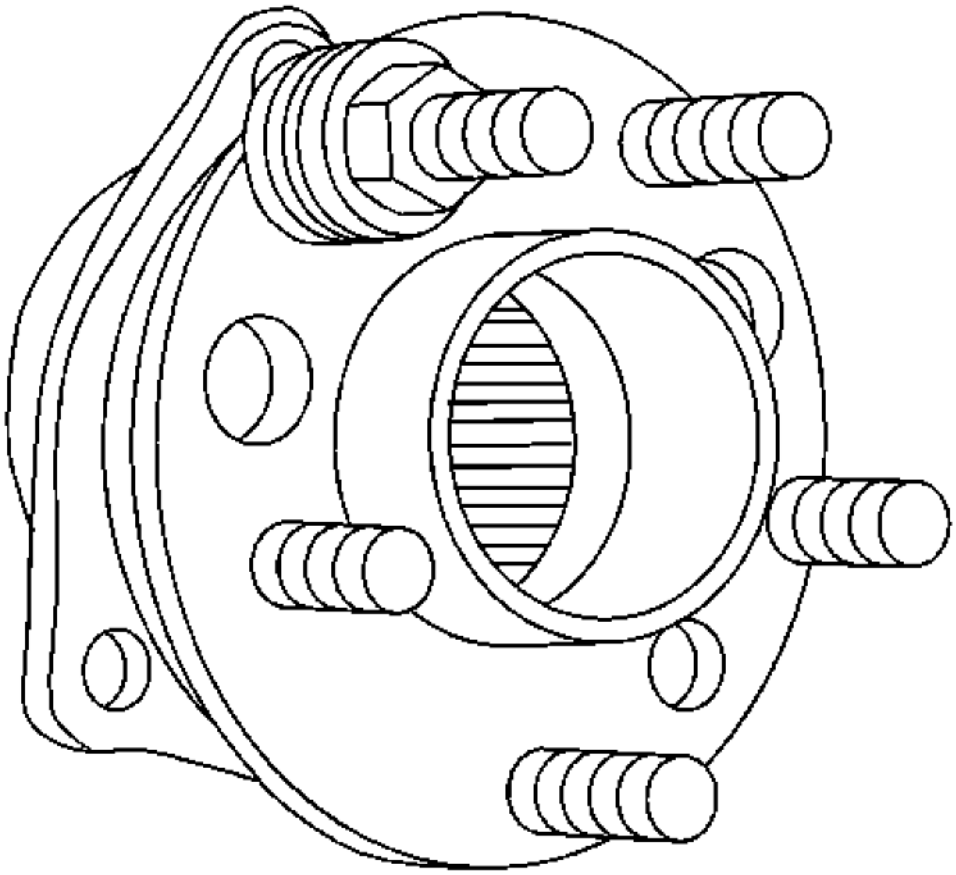


Fig. 44: Installing Wheel Stud
Courtesy of GENERAL MOTORS CORP.

1. Install the new stud from the back side of the hub.
2. Install flat washers on the wheel stud.

NOTE: Ensure that the wheel stud is fully seated against the wheel hub flange.

3. With the flat side of a wheel nut against the washers, tighten the wheel nut until the wheel stud head seats against the wheel hub flange.
4. Install the wheel bearing/hub assembly. Refer to **Rear Wheel Bearing and Hub Replacement**.
5. Install the tire and wheel. Refer to **Tire and Wheel Removal and Installation** .
6. Lower the vehicle.

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DESCRIPTION AND OPERATION

REAR SUSPENSION DESCRIPTION AND OPERATION

These vehicles are equipped with independent rear suspension and coil spring.

The shock absorber when loaded will reach its normal ride height after a few hundred yards.

The rear spring steel stabilizing bar helps minimize body roll and sway during cornering. The rear stabilizer shaft is connected to the frame through insulators and to the lower control arm through the stabilizer shaft links.

The rear suspension system on this vehicle consists of the following components:

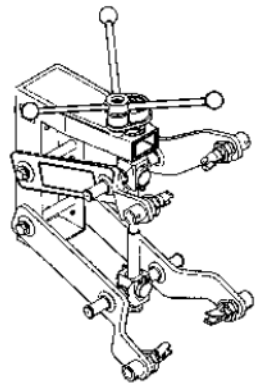
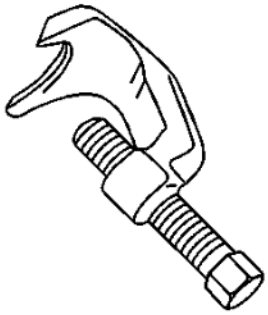
- The rear differential
- Two coil springs
- Two shock absorbers
- Two toe adjustment links
- Two upper control arms
- Two lower control arms
- Two knuckles
- The stabilizer shaft
- Two stabilizer shaft links
- Two trailing arms

SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS

Illustration	Tool Number/ Description
	CH 48845 Spring Compressor

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	J 43631 Ball Joint Remover

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2010 SUSPENSION

Suspension General Diagnosis - Camaro

SPECIFICATIONS

TRIM HEIGHT SPECIFICATIONS

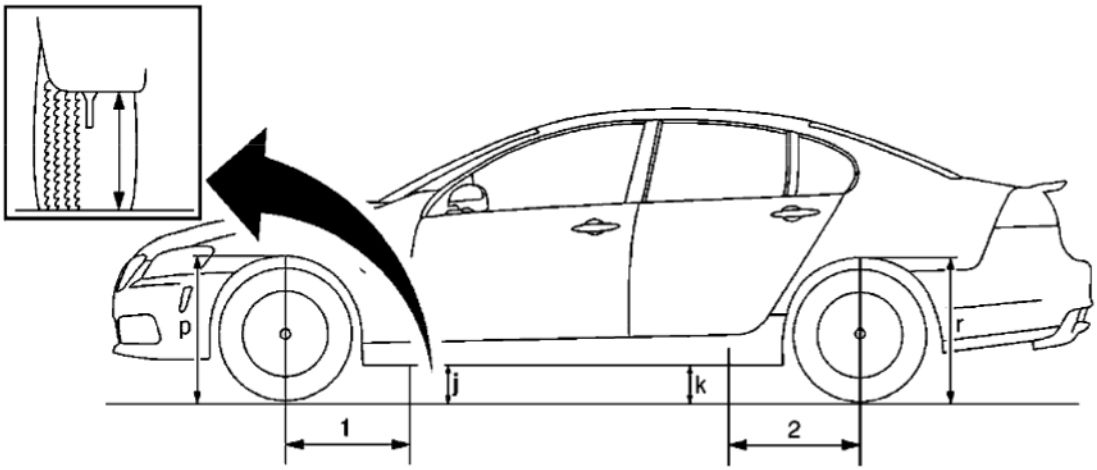


Fig. 1: Trim Height
Courtesy of GENERAL MOTORS CORP.

Model	Options	Tire Size	'P' Height	Cross 'P'	'R' Height	Cross 'R'
1EE00/1EF00	FE2 QAM	P245/55R18-P245/55R18	768 mm (30.23 in)	+/- 12 (0.47 in)	774 mm (30.47 in)	+/- 12 (0.47 in)
1EE00/1EF00	FE2 QZN	P245/50ZR19-P245/50ZR19	768 mm (30.23 in)	+/- 12 (0.47 in)	774 mm (30.47 in)	+/- 12 (0.47 in)
1EE00/1EF00	FE2 QOO	P245/45ZR20-P275/40ZR20	765 mm (30.11 in)	+/- 12 (0.47 in)	773 mm (30.43 in)	+/- 12 (0.47 in)
1ES00	FE3 QOO	245/45ZR20-275/40ZR20	753 mm (30.11 in)	+/- 12 (0.47 in)	758 mm (29.84 in)	+/- 12 (0.47 in)
All measurements are for reference only and intended to be a guide.						

Model	Options	Tire Size	'Z' Height	Cross 'Z'	'D' Height	Cross 'D'
1EE00/1EF00	FE2 QAM	P245/55R18-P245/55R18	68 mm (2.64 in)	+/- 10 (0.39 in)	31 mm (1.22 in)	+/- 10 (0.39 in)
1EE00/1EF00	FE2 QZN	P245/50ZR19-P245/50ZR19	68 mm (2.64 in)	+/- 10 (0.39 in)	31 mm (1.22 in)	+/- 10 (0.39 in)
1EE00/1EF00	FE2 QOO	P245/45ZR20-P275/40ZR20	68 mm (2.64 in)	+/- 10 (0.39 in)	31 mm (1.22 in)	+/- 10 (0.39 in)
		245/45ZR20-	55 mm (2.17	+/- 12 (0.47	16 mm (0.63	+/- 102 (0.39

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1ES00	FE3 QOO	275/40ZR20	in)	in)	in)	in)
All measurements are for reference only and intended to be a guide.						

DIAGNOSTIC INFORMATION AND PROCEDURES

SYMPTOMS - SUSPENSION GENERAL DIAGNOSIS

NOTE: The following steps must be completed before using the symptom tables.

1. Review the system description and operation in order to familiarize yourself with the system functions.
2. Refer to the appropriate description and operation:
   - **General Description** for the front suspension
   - **Rear Suspension Description and Operation** for the rear suspension
   - **General Description** for tires and wheels

Visual/Physical Inspection

- Inspect for aftermarket devices which could affect the operation of any of the Suspension subsystems.
- Inspect the easily accessible or visible system components for obvious damage or conditions which could cause the symptom.
- Inspect for proper tire size and inflation pressure. Refer to **Vehicle Certification, Tire Placard, Anti-Theft, and Service Parts ID Label** .

Symptom List

Refer to a symptom diagnostic procedure from the following list in order to diagnose the symptom:

- **Ride Diagnosis**
- **Vehicle Leads/Pulls**
- **Body Leans or Sways in Corners**
- **Suspension Bottoms**
- **Memory Steer**
- **Noise Diagnosis - Front Suspension**
- **Noise Diagnosis - Rear Suspension**
- **Lower Control Arm Ball Joint Inspection**
- **Suspension Strut and Shock Absorber Testing - On Vehicle**
- **Wheel Bearings Diagnosis**
- **Radial Tire Lead/Pull Correction**

RIDE DIAGNOSIS

Step	Action	Yes	No

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1	Did you review the General Description and perform the necessary inspections?	Go to **Step 2**	Go to **Symptoms - Suspension General Diagnosis**
2	**IMPORTANT:** **Verify the vehicle suspension package RPO.** Verify that the ride is too soft or too hard.Does the vehicle ride normally?	System OK	Go to **Step 3**
3	Check the tire inflation and adjust to specifications. Refer to **Vehicle Certification, Tire Placard, Anti-Theft, and Service Parts ID Label** . Did you adjust the tire pressure?	Go to **Step 6**	Go to **Step 4**
4	Inspect the vehicle trim height. Refer to **Trim Height Inspection**. Did you find and correct the condition?	Go to **Step 6**	Go to **Step 5**
5	Inspect the following suspension components for wear or damage: • Shock Absorbers-Refer to **Suspension Strut and Shock Absorber Testing - On Vehicle**. • Springs Did you find and correct the condition?	Go to **Step 6**	-
6	Drive the vehicle in order to verify the repair. Did you correct the condition?	System OK	Go to **Step 3**

VEHICLE LEADS/PULLS

Step	Action	Yes	No
DEFINITION: At a constant highway speed on a typical straight road, lead/pull is the amount of effort required at the steering wheel to maintain the vehicle straight path.			
1	Did you review the General Description and perform the visual/physical inspections?	Go to **Step 2**	Go to **Symptoms - Suspension General Diagnosis**
2	Road test the vehicle in order to verify the complaint. Does the vehicle operate normally?	System OK	Go to **Step 3**
3	Inspect the tire/wheel assemblies for: • Correct tire pressure-Refer to the tire placard. • Correct tire size-Refer to the tire placard. • Abnormal tire wear or damage Did you find and correct the condition?	Go to **Step 9**	Go to **Step 4**

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4	Perform the **Radial Tire Lead/Pull Correction** . Did you find and correct the condition?	Go to **Step 9**	Go to **Step 5**
5	Inspect and correct/adjust the suspension and steering systems for: • Vehicle trim height-Refer to **Trim Height Inspection**. • Excessively worn, loose, or damaged components Did you find and correct the condition?	Go to **Step 9**	Go to **Step 6**
6	Inspect the brake system for brake drag. With the vehicle suspended on a hoist, brake drag can be identified by rotating each wheel several times and observing whether more force is needed to rotate the left wheel or the right wheel. Refer to **Brake Caliper Inspection** . Did you find and correct the condition?	Go to **Step 9**	Go to **Step 7**
7	Inspect the wheel alignment and adjust as necessary. Refer to **Wheel Alignment Measurement** . Did you correct the condition?	Go to **Step 9**	Go to **Step 8**
8	Inspect the steering gear for unequal effort. The vehicle must be suspended on a hoist, the engine running, and the transmission in park or neutral. Grasp the tire assembly and manually simulate a turn from the left of center and the right of center observing whether more force is needed to turn to the left or to the right. If this condition exists, replace the steering gear. Did you correct the condition?	System OK	Go to **Step 3**
9	Operate the vehicle in order to verify the repair. Did you correct the condition?	System OK	Go to **Step 3**

BODY LEANS OR SWAYS IN CORNERS

Step	Action	Yes	No
1	Did you review the General Description and perform the necessary inspections?	Go to **Step 2**	Go to **Symptoms - Suspension General Diagnosis**.
2	Verify the vehicle leans or sways in corners. Does the vehicle operate normally?	System OK	Go to **Step 3**
3	Inspect the following components for wear or damage: • The front coil springs • The rear coil springs		

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	Are the components worn or damaged?	Go to **Step 7**	Go to **Step 4**
4	Inspect the stabilizer bar links for wear or damage. Are the stabilizer bar links worn or damaged?	Go to **Step 8**	Go to **Step 5**
5	Inspect the stabilizer bar insulators for wear or damage. Are the stabilizer bar insulators worn or damaged?	Go to **Step 9**	Go to **Step 6**
6	Inspect the stabilizer bars for wear or damage. Are the stabilizer bars worn or damaged?	Go to **Step 10**	Go to **Strategy Based Diagnosis** .
7	Replace the springs. Refer to the appropriate procedure: • **Strut, Strut Component, or Spring Replacement** for Front. • **Shock, Shock Component, and/or Spring Replacement** for Rear. Did you complete the repair?	Go to **Step 11**	-
8	Replace the stabilizer bar link(s). Refer to **Stabilizer Shaft Link Replacement** for Front or **Stabilizer Shaft Link Replacement** for Rear. Did you complete the repair?	Go to **Step 11**	-
9	Replace the stabilizer bar Insulators. Refer to **Stabilizer Shaft Insulator Replacement** for Front or **Stabilizer Shaft Insulator Replacement** for Rear. Did you complete the repair?	Go to **Step 11**	-
10	Replace the stabilizer bar. Refer to **Stabilizer Shaft Replacement** for Front or **Stabilizer Shaft Replacement** for Rear. Did you complete the repair?	Go to **Step 11**	-
11	Operate the vehicle in order to verify the repair. Did you correct the condition?	System OK	Go to **Step 3**

SUSPENSION BOTTOMS

Step	Action	Yes	No
DEFINITION: A loud bang or thump that can usually be felt and/or heard when the vehicle is driven over bumps. This condition is commonly noticed when the vehicle trim height is too low.			
1	Did you review the General Description and perform the necessary inspections?	Go to **Step 2**	Go to **Symptoms - Suspension General Diagnosis**.
2	Verify that the suspension bottoms. Does the vehicle operate normally?	System OK	Go to **Step 3**
3	Check for vehicle overloading and correct the overloading condition as necessary.		

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	Did you find and correct the condition?	Go to **Step 7**	Go to **Step 4**
4	Inspect the suspension struts. Refer to **Suspension Strut and Shock Absorber Testing - On Vehicle**. Did you find and correct the condition?	Go to **Step 7**	Go to **Step 5**
5	Inspect the suspension coil springs for wear or damage: Are the suspension coil springs worn or damaged?	Go to **Step 7**	Go to **Step 6**
6	Inspect the vehicle trim height. Refer to **Trim Height Inspection**. Did you find and correct the condition?	Go to **Step 7**	Go to **Strategy Based Diagnosis**
7	Operate the vehicle in order to verify the repair. Did you correct the condition?	System OK	Go to **Step 3**

MEMORY STEER

Step	Action	Yes	No
DEFINITION: A lead or pull in the direction the driver previously turned the vehicle. Additionally, after turning in the opposite direction, the vehicle will want to lead or pull in that direction.			
1	Did you review the General Description and perform the necessary inspections?	Go to **Step 2**	Go to **Symptoms - Suspension General Diagnosis**
2	Verify that memory steer is present. Does the system operate normally?	System OK	Go to **Step 3**
3	1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** . 2. Lubricate the tie rod ends and the ball joints if applicable. 3. Inspect the suspension system for worn or damaged components. 4. Repair as necessary. Did you find and correct the condition?	Go to **Step 7**	Go to **Step 4**
4	Inspect for binding strut bearings. 1. Disconnect the strut from the steering knuckle. 2. If the strut is abnormally difficult to rotate, repair or replace the upper bearing mount. Did you find and complete the repair?	Go to **Step 7**	Go to **Step 5**
5	Inspect for binding in the lower ball joints. If joint is binding, replace the joint. Did you find and complete the repair?	Go to **Step 7**	Go to **Step 6**
6	Inspect the wheel alignment and adjust as necessary. Refer to **Wheel Alignment Measurement** .		-

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	Did you complete the wheel alignment?	Go to **Step 7**	
7	Operate the vehicle in order to verify the repair. Did you correct the condition?	System OK	-

NOISE DIAGNOSIS - FRONT SUSPENSION

Step	Action	Yes	No
DEFINITION: Any noise emitted from the front of the vehicle that is induced by VEHICLE SPEED or DRIVING TERRAIN as related to the front suspension.			
1	Did you review the General Description and perform the necessary inspections?	Go to **Step 2**	Go to **Symptoms - Suspension General Diagnosis**
2	Attempt to duplicate the condition. Road test the vehicle. Did you duplicate the condition?	Go to **Step 3**	System OK
3	Is the noise reactive to vehicle load or speed?	Go to **Step 4**	Go to **Step 6**
4	Inspect the tires for the following condition: • Proper tire Inflation and adjust as necessary. Refer to **Vehicle Certification, Tire Placard, Anti-Theft, and Service Parts ID Label** . • Unusual tire wear. Refer to **Vibration Analysis - Tire and Wheel** . • Inspect the wheel nuts for looseness and tighten as necessary. Refer to **Fastener Tightening Specifications** . Did you find and correct the condition?	Go to **Step 13**	Go to **Step 5**
5	Inspect the front wheel bearings. Refer to **Wheel Bearings Diagnosis**. Did you find and correct the condition?	Go to **Step 13**	Go to **Step 8**
6	Bounce the front of the vehicle in order to duplicate the noise. Did you duplicate the noise?	Go to **Step 7**	Go to **Step 8**
7	1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** . 2. Inspect the front suspension components for looseness. Refer to **Fastener Tightening Specifications** . 3. Inspect the front suspension components for damage and repair as necessary. Did you find and correct the condition?	Go to **Step 13**	Go to **Step 8**

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8	1. Install the **J 39570** Chassis Ear or equivalent. 2. Bounce the front of the vehicle, using the **J 39570** or equivalent, in order to locate the source of the noise. If necessary road test the vehicle. 3. Repair or replace any damaged components as necessary. Did you find and correct the condition?	Go to **Step 13**	Go to **Step 9**
9	Inspect the ball joints and steering components for the following conditions. • Lack of lubrication where applicable. • Looseness in the ball joints. Refer to **Lower Control Arm Ball Joint Inspection**. • Looseness in the steering linkage. • Looseness in the tie rod. Refer to **Steering Linkage Outer Tie Rod Replacement** . Did you find and correct the condition?	Go to **Step 13**	Go to **Step 11**
10	Inspect for damaged shock absorbers. Refer to **Suspension Strut and Shock Absorber Testing - On Vehicle**. Did you find and correct the condition?	Go to **Step 13**	Go to **Step 11**
11	Inspect the front stabilizer shaft and stabilizer shaft links for damage and repair as necessary. Refer to **Stabilizer Shaft Replacement** or **Stabilizer Shaft Link Replacement** . Did you find and correct the condition?	Go to **Step 13**	Go to **Step 12**
12	Inspect for control arm damage and repair as necessary. Refer to **Front Lower Control Rear Arm Replacement** or **Front Lower Control Front Arm Replacement** Did you find and correct the condition?	Go to **Step 13**	-
13	Operate the system in order to verify the repair. Did you correct the condition?	System OK	Go to **Step 3**

NOISE DIAGNOSIS - REAR SUSPENSION

Step	Action	Yes	No
DEFINITION: Any noise emitted from the rear of the vehicle that is induced by VEHICLE SPEED or DRIVING TERRAIN as related to the rear suspension.			
1	Did you review the General Description and perform the necessary inspections?		Go to **Symptoms - Suspension General**

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		Go to **Step 2**	**Diagnosis**
2	Attempt to duplicate the condition. Road test the vehicle. Did you duplicate the condition?	Go to **Step 3**	System OK
3	Is the noise reactive to vehicle load or speed?	Go to **Step 4**	Go to **Step 6**
4	Perform the following Inspections: • Inspect and adjust the tire Inflation. Refer to **Vehicle Certification, Tire Placard, Anti-Theft, and Service Parts ID Label** . • Inspect for unusual tire wear. Refer to **Vibration Analysis - Tire and Wheel** . • Inspect the wheel nuts for looseness. Refer to **Fastener Tightening Specifications** . Did you find and correct the condition?	Go to **Step 10**	Go to **Step 5**
5	Inspect the rear wheel bearings. Refer to **Wheel Bearings Diagnosis**. Did you find and correct the condition?	Go to **Step 10**	Go to **Step 6**
6	Bounce the rear of the vehicle in order to duplicate the noise. Did you duplicate the noise?	Go to **Step 7**	Go to **Step 9**
7	1. Raise the vehicle. Refer to **Lifting and Jacking the Vehicle** . 2. Inspect the rear suspension components for looseness. Refer to **Fastener Tightening Specifications** . 3. Inspect the rear suspension components for damage and repair as necessary. Did you find and correct the condition?	Go to **Step 10**	Go to **Step 8**
8	Inspect the rear shock absorber. Refer to **Suspension Strut and Shock Absorber Testing - On Vehicle**. Did you find and correct the condition?	Go to **Step 10**	Go to **Step 9**
9	1. Install the **J 39570** Chassis Ear or equivalent. 2. Bounce the rear of the vehicle, using the **J 39570** or equivalent, in order to locate the source of the noise. If necessary, road test the vehicle. 3. Repair or replace any defective component as necessary. Did you find and correct the condition?	Go to **Step 10**	System OK
	Operate the system in order to verify the repair.		

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10	Did you correct the condition?	System OK	Go to **Step 3**

LOWER CONTROL ARM BALL JOINT INSPECTION

Special Tools

J 8001: Dial Indicator

For equivalent regional tools, refer to **Special Tools** .

NOTE:

- **The vehicle must rest on a level surface.**
- **The vehicle must be stable. Do not rock the vehicle on the floor stands.**

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
2. Clean and inspect the ball joint seal for cuts or tears. If the ball joint seal is damaged, replace the ball joint or the lower control arm as applicable for this vehicle.
3. Support the lower control arm with a floor stand as far outboard as possible and raise the suspension until the lower control arm moves 25 mm (1 in).

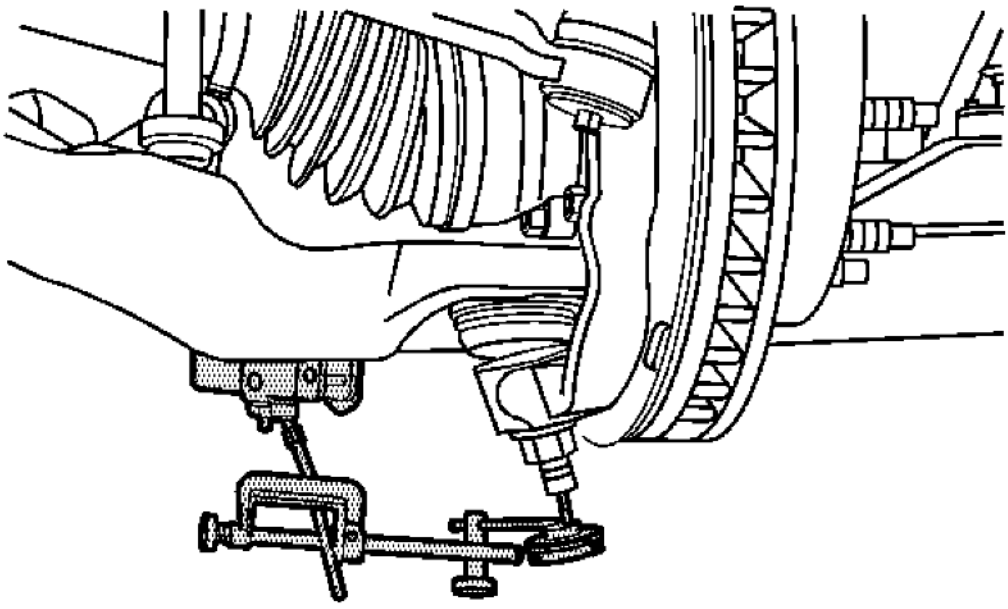


Fig. 2: Measuring Vertical Lash In Ball Joint (Lower)
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4. Install the **J 8001:** dial indicator, or suitable dial indicator, to measure the vertical lash in the ball joint.

CAUTION: Do not pry in such a way that the ball joint seal is contacted. Damage to the seal may result.

5. Lift the knuckle towards the lower control arm and record the dial indicator measurement.
6. If the dial indicator reading is more than 0.50 mm (0.020 in), replace the ball joint or the lower control arm as applicable for this vehicle.

SUSPENSION STRUT AND SHOCK ABSORBER TESTING - ON VEHICLE

Step	Action	Yes	No
1	Did you review the General Description and perform the necessary inspections?	Go to **Step 2**	Go to **Symptoms - Suspension General Diagnosis**
2	Verify that the customer's concern is present. Does the vehicle operate normally?	System OK	Go to **Step 3**
3	**NOTE:** **A light film of oil on the top portion of the shock reservoir is normal.** Inspect each strut or shock absorber for external fluid leakage.Is a strut or shock absorber leaking?	Go to **Step 5**	Go to **Step 4**
4	1. Use your hands in order to lift up and push down each corner of the vehicle 3 times. 2. Remove your hands from the vehicle. 3. Locate a shock or strut that exceeds 2 cycles. Did you locate shock or strut that exceeds 2 cycles?	Go to **Step 5**	Go to **Step 6**
5	**NOTE:** **Inspect the vehicle trim height in order to correct any possible causes of shock/strut failures. Refer to Trim Height Inspection.** Replace the strut or shock absorber. Refer to **Strut, Strut Component, or Spring Replacement** or **Shock Absorber Replacement** .Did you complete the repair?	Go to **Step 6**	-
6	Operate the vehicle in order to verify the repair. Did you correct the condition?	System OK	Go to **Step 3**

WHEEL BEARINGS DIAGNOSIS

Step	Action	Values	Yes	No	

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1	Did you review the General Description and perform the necessary inspections?	-	Go to **Step 2**	Go to **Symptoms - Suspension General Diagnosis**
2	1. Install the **J 39570** Chassis Ear. **IMPORTANT:** **A noise heard during left turns is a good indicator of a noisy right wheel bearing. A noise heard during right turns is a good indicator of a noisy left wheel bearing.** 2. Road test the vehicle to verify the location of the noise. Drive the vehicle on a smooth road at a moderate speed range. While driving, turn the wheel to the left and the right to apply loads to each wheel corner. Is the noise present at the wheel bearing?	48-72 kph (30-45 mph)	Go to **Step 7**	Go to **Step 3**
3	1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** . 2. Remove the tire and wheel. Refer to **Tire and Wheel Removal and Installation** . 3. Ensure the wheel drive shaft nut is properly tightened. Refer to **Fastener Tightening Specifications** . Are the nuts fastened to the correct specified value?	-	Go to **Step 4**	Go to **Step 8**
	IMPORTANT: **Support the vehicle by the lower control arms or the rear axle to prevent movement during wheel bearing/hub inspection.** 1. Mount and secure the **J 8001** Dial Indicator to the steering knuckle. 2. Firmly push the hub flange towards the vehicle.			

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4	3. Ensure that the dial indicator contacts the vertical surface of the hub as close as possible to the center of the flange. 4. Firmly pull the hub flange away from the vehicle in order to inspect the total travel indicator by the dial indicator. Is the measurement greater then the specified value?	0.127 mm (0.005 in)	Go to **Step 7**	Go to **Step 5**	
5	Inspect for tire or wheel damage. Refer to **Tire and Wheel Assembly Runout Measurement - On-Vehicle** . Did you find and correct the condition?	Go to **Step 9**			Go to **Step 6**
6	Inspect the front and/or rear suspension. Refer to **Noise Diagnosis - Front Suspension** or **Noise Diagnosis - Rear Suspension**. Did you find and correct the condition?	-	Go to **Step 9**	Go to **Step 2**	
7	Replace the wheel bearing. Refer to **Front Wheel Bearing and Hub Replacement** or **Rear Wheel Bearing and Hub Replacement** . Did you complete the repair?	-	Go to **Step 9**	-	
8	Remove the old wheel drive shaft nut and install a NEW wheel drive shaft nut. Tighten to the specified value. Refer to **Fastener Tightening Specifications** . Did you complete the repair?	-	Go to **Step 9**	-	
9	Road test the vehicle to verify the repair. Does the vehicle operate normally?	-	System OK	Go to **Step 3**	

TRIM HEIGHT INSPECTION

Trim Height Measurement

Trim height is a predetermined measurement relating to vehicle ride height. Incorrect trim heights can cause the vehicle to bottom out over bumps, damage to the suspension components and symptoms similar to wheel alignment problems. Check the trim heights when diagnosing suspension concerns and before checking the wheel alignment.

Perform the following before measuring the trim heights:

- Set the tire pressure to the specifications shown on the certification label. Refer to **Vehicle Certification, Tire Placard, Anti-Theft, and Service Parts ID Label** .

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NOTE: One U.S. gallon of gasoline weights approximately 6.5 lbs. One liter of gasoline weights approximately 70 kg.

- Check the fuel level. Add additional weight if necessary to simulate a full tank.
- Make sure the passenger and rear compartments are empty, except tor the spare tire.
- Make sure the vehicle is on a flat and level surface, such as an alignment rack.
- Check that all the vehicle doors are securely closed.
- Check that the vehicle hood and rear deck lids are securely closed.
- Check for installed after market accessories or modifications that could affect trim height measurement:
  - Larger or Smaller than production wheels and tires.
  - Lifting or Lowering Kits
  - Wheel Opening Flares or Ground Affects

Measuring the P and R Dimension

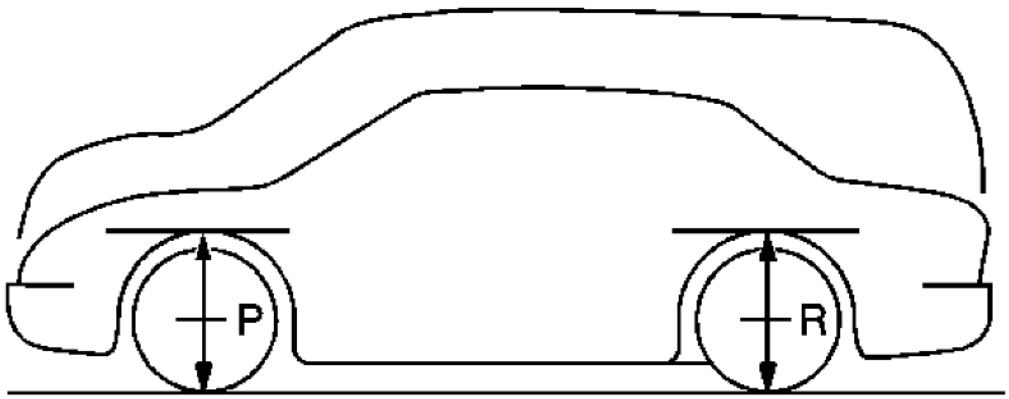


Fig. 3: P & R Dimensions
Courtesy of GENERAL MOTORS CORP.

Measurement Definitions

P Height: The vertical distance from the ground to the top of the wheel opening through the centerline of the front wheel.

R Height: The vertical distance from the ground to the top of the wheel opening through the centerline of the rear wheel.

Use the following procedures to measure the P and R dimensions:

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NOTE: **The left and right P and R height differences should be no more than 12 mm (47 in).**

1. Push the front bumper down a minimum of 25 mm (1 in), and release. Perform this step three times.
2. Measure and record the trim height per the "Measurement Definitions" above.
3. Lift the bumper up a minimum of 25 mm (1 in), and release. Perform this step three times.
4. Measure and record the trim height per the "Measurement Definitions" above.
5. The true P height measurement is the average of the measurements taken in step 2 & 4. Refer to **Trim Height Specifications**
6. Repeat the above steps at the rear of the vehicle for the R heights.
7. If the P & R heights are outside of the specifications, measure the Z & D heights.

Measuring the Z Dimension

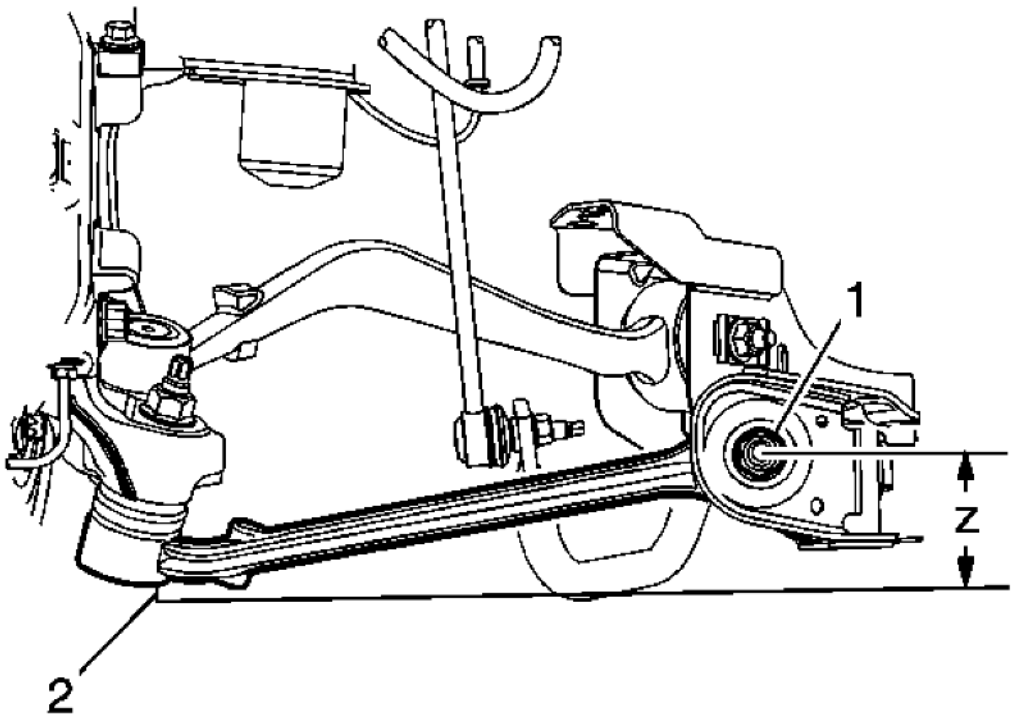


Fig. 4: Z Dimension
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Measurement Definitions

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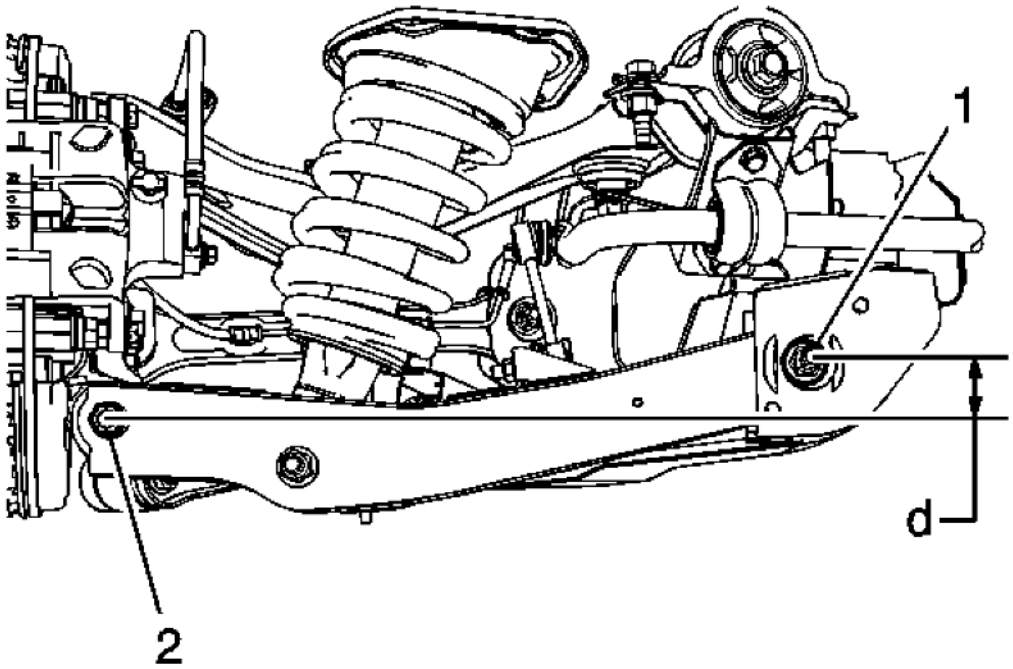
The Z Height: The vertical distance from the lowest point of the ball joint housing (2) to the center of the front lower control arm rear bolt head (1).

Use the following procedures to measure the Z dimensions:

NOTE: The left and right Z height differences should be no more than 10 mm (.39 in).

1. Push the front bumper down a minimum of 25 mm (1 in). Perform this step three times.
2. Measure and record the trim height per the "Measurement Definitions" above.
3. Lift the front bumper a minimum of 25 mm (1 in). Perform this step three times.
4. Measure and record the trim height per the "Measurement Definitions" above.
5. The true Z height dimension is the average of the measurements taken in steps 2 & 4. Refer to **Trim Height Specifications**.
6. If these measurements are out of specifications, inspect for the following conditions:
   - Worn or damaged suspension components
   - Collision damage

D Height Measurement



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Fig. 5: D Height
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Measurement Definitions

The D Height: The vertical distance from the center of the lower control arm inner bushing bolt head (1) to the center of the lower control arm outer bushing bolt head (2).

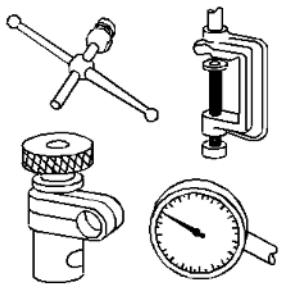
Use the following procedure to check the D dimension:

NOTE: The left and right D height difference should be no more than 10 mm (.39 in).

1. Push the rear bumper down a minimum of 25 mm (1 in). Perform this step three times.
2. Measure and record the trim height per the "Measurement Definitions" above.
3. Lift the rear bumper up a minimum of 25 mm (1 in), and release. Perform this step three times.
4. Measure and record the trim height per the "Measurement Definitions" above.
5. The true D height is the average of the measurements taken in steps 2 & 4. Refer to **Trim Height Specifications**.
6. If these measurements are out of specifications, inspect for the following conditions:
   - Worn or damaged suspension components
   - Collision damage

SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS

Illustration	Tool Number/ Description
	J 8001 Dial Indicator Set

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2010 SUSPENSION

Tire Pressure Monitoring - Camaro

DIAGNOSTIC INFORMATION AND PROCEDURES

DIAGNOSTIC CODE INDEX

DIAGNOSTIC CODE INDEX

DTC	Description
DTC C0569	C0569 00: System Configuration Malfunction
DTC C0750, C0755, C0760, or C0765	C0750 03: Left Front Tire Pressure Sensor Low Voltage C0750 29: Left Front Tire Pressure Sensor Too Few Pulses C0750 39: Left Front Tire Pressure Sensor Internal Malfunction C0755 03: Right Front Tire Pressure Sensor Low Voltage C0755 29: Right Front Tire Pressure Sensor Too Few Pulses C0755 39: Right Front Tire Pressure Sensor Internal Malfunction C0760 03: Left Rear Tire Pressure Sensor Low Voltage C0760 29: Left Rear Tire Pressure Sensor Too Few Pulses C0760 39: Left Rear Tire Pressure Sensor Internal Malfunction C0765 03: Right Rear Tire Pressure Sensor Low Voltage C0765 29: Right Rear Tire Pressure Sensor Too Few Pulses C0765 39: Right Rear Tire Pressure Sensor Internal Malfunction
DTC C0775	C0775 00: Low Tire Pressure System Sensors Malfunction

DTC C0569

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptor

DTC C0569 00

System Configuration Malfunction

Circuit/System Description

If the tire type and pressure selection information is not entered with the scan tool during the body control modue (BCM) setup, the tire pressure monitor indicator icon on the instrument panel cluster (IPC) will flash for 1 minute and then remain illuminated after the ignition switch is cycled ON and the IPC bulb check is complete. If equipped, the driver information center (DIC) will also display a service tire monitor type message. Under these circumstances, DTC C0569 will be set and the tire type and pressure information will need to be entered

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for the system to function correctly.

Conditions for Running the DTC

The ignition is ON.

Conditions for Setting the DTC

The BCM has not undergone the tire type and pressure selection setup procedure.

Action Taken When the DTC Sets

- The tire pressure monitor indicator icon on the instrument panel cluster (IPC) will flash for 1 minute and then remain illuminated after the ignition switch is cycled ON and the IPC bulb check is complete.
- If equipped, the driver information center (DIC) displays a service tire monitor type warning message.

Conditions for Clearing the DTC

A current DTC will clear when the BCM has undergone the tire type and pressure selection setup procedure and 1 ignition cycle has occurred.

Diagnostic Aids

A newly replaced BCM will set DTC C0569 on its initial ignition ON cycle if the module setup information has not been entered. The Tire Type and Tire Pressure Selection setup must be performed with the scan tool.

Reference Information

Description and Operation

Tire Pressure Monitor Description and Operation

Scan Tool Reference

Control Module References for scan tool information

Special Tools

J-46079 Tire Pressure Monitor Diagnostic Tool. See **Special Tools**.

Circuit/System Verification

Verify that the DTC C0569 is not set.

- If the DTC is set, perform the BCM tire type and pressure selection setup with the scan tool and cycle the ignition. If the DTC resets, replace the K9 BCM.

Repair Procedures

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Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

Control Module References for BCM replacement, setup and programming.

DTC C0750, C0755, C0760, OR C0765

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptor

DTC C0750 03

Left Front Tire Pressure Sensor Low Voltage

DTC C0750 29

Left Front Tire Pressure Sensor Too Few Pulses

DTC C0750 39

Left Front Tire Pressure Sensor Internal Malfunction

DTC C0755 03

Right Front Tire Pressure Sensor Low Voltage

DTC C0755 29

Right Front Tire Pressure Sensor Too Few Pulses

DTC C0755 39

Right Front Tire Pressure Sensor Internal Malfunction

DTC C0760 03

Left Rear Tire Pressure Sensor Low Voltage

DTC C0760 29

Left Rear Tire Pressure Sensor Too Few Pulses

DTC C0760 39

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Left Rear Tire Pressure Sensor Internal Malfunction

DTC C0765 03

Right Rear Tire Pressure Sensor Low Voltage

DTC C0765 29

Right Rear Tire Pressure Sensor Too Few Pulses

DTC C0765 39

Right Rear Tire Pressure Sensor Internal Malfunction

Circuit/System Description

The tire pressure monitor (TPM) system has a radio frequency (RF) transmitting pressure sensor in each wheel/tire assembly. As vehicle speed increases, centrifugal force closes the sensors internal roll switch, which puts the sensor into Rolling mode. The body control module (BCM) receives and translates the data contained in the tire pressure sensor RF transmissions into sensor presence, sensor mode, and tire pressure. Once vehicle speed is greater than 40km/h (25 mph), the BCM waits for the first sensor to go into Rolling mode, then checks if all sensors have gone into Rolling mode. If one or more sensors do not go into these modes, or do not transmit at all, the BCM will set DTC C0750, C0755, C0760, or C0765 respectively.

Conditions for Running the DTC

Vehicle speed is greater than 40 km/h (25 mph).

Conditions for Setting the DTC

- A sensor does not transmit for 18 minutes.
- A sensor low battery condition.

Action Taken When the DTC Sets

- The tire pressure monitor indicator icon on the instrument panel cluster (IPC) flashes for 1 minute and then remains illuminated after the ignition switch is cycled ON and the IPC bulb check is complete.
- If equipped, the driver information center (DIC) displays the suspect tire pressure as dashes.
- If equipped, the DIC displays a service tire monitor type message.

Conditions for Clearing the DTC

- A current DTC will clear when the malfunction is no longer present and 1 ignition cycle occurs.
- The BCM automatically clears the history DTC when a current DTC is not detected in 100 consecutive drive cycles.

Diagnostic Aids

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- Some aftermarket wheel valve stem holes are located further from the wheel rim than original equipment wheels. When using the TPM special tool to activate a sensor, ensure the tool antenna is no further than 15 cm (6 in) from the sensor and is aiming upward.
- Aftermarket wheel valve stem locations can cause a sensor to not function correctly.
- A sensor may have been damaged due to a previous wheel/tire service or flat tire event.
- The use of other than GM approved tire sealants can obstruct the sensor pressure sensing port and cause inaccurate tire pressure readings. If this condition is verified, remove the sealer from the tire and replace the sensor. Refer to **Tire Pressure Indicator Sensor Replacement**.
- Occasionally sensor transmissions are not received by the BCM due to vehicle level RF interference from items such as but not limited to aftermarket ignition systems, DVD players, CB radios, or metallic type window tinting.
- The sensor activation procedure may have to be repeated up to 3 times before determining a sensor is malfunctioning. In the event a particular sensor information is displayed on the special tool upon activation but the horn does not chirp, it may be necessary to rotate the wheel valve stem to a different position due to the RF signal is being blocked by another component.
- Occasionally sensors can become mislocated due to previous tire rotations where the sensor learn procedure was not performed or stray sensor transmissions have been received from other vehicles. Always learn the sensors to ensure the DTC set is for that actual physical corner of the vehicle. Refer to **Tire Pressure Indicator Sensor Learn**.
- A sensor low battery condition will set a sensor DTC but will not illuminate the low tire pressure indicator or display a message on the DIC, if equipped. The sensor battery condition can be verified in the scan tool BCM data list. If a sensor low battery condition is indicated on the scan tool, the sensor will need to be replaced. Refer to **Tire Pressure Indicator Sensor Replacement**.

Reference Information

Description and Operation

Tire Pressure Monitor Description and Operation

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

Scan Tool Reference

Control Module References for scan tool information

Special Tools

J-46079 Tire Pressure Monitor Diagnostic Tool. See **Special Tools**.

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Circuit/System Verification

1. Using the **J-46079** , activate each tire pressure sensor and record each sensors transmission data and physical location. See **Special Tools**. Verify **J-46079** displays the 8-digit ID number, accurate tire pressure +/- 27. See **Special Tools**.6 kPa (4 psi), Learn Mode, and at least a 1/4 graph signal strength displayed.
    - If any of the parameters listed above are not displayed, replace the suspect tire pressure sensor.
2. With the scan tool, verify tire pressure sensors ID and locations displayed on the scan tool match the IDs and locations recorded from the special tool.
    - If the IDs and locations do not match, perform the **Tire Pressure Indicator Sensor Learn**.
3. Enable the TPM learn mode. Use the **J-46079** in simulate mode to learn 4 simulated sensor transmissions into the BCM. See **Special Tools**. Verify that all 4 simulated sensor locations, IDs, and tire pressures displayed on the TPM special tool match the corresponding scan tool parameters displayed.
    - If the scan tool does not match, replace the K9 BCM.
4. Test drive the vehicle above 40 km/h (25 mph) for greater than 2 minutes. With the scan tool, observe the suspect Pressure Sensor Mode data parameter. Verify the sensor mode changes to Rolling.
    - If the Pressure Sensor Mode does not change, replace the suspect tire pressure sensor.

Repair Procedures

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

- **Tire Pressure Indicator Sensor Replacement**
- **Tire Pressure Indicator Sensor Learn**
- **Control Module References** for BCM replacement, setup and programming.

DTC C0775

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptor

DTC C0775 00

Low Tire Pressure System Sensors Malfunction

Circuit/System Description

If the tire pressure sensor learn procedure has not been performed, the tire pressure monitor indicator icon on the instrument panel cluster (IPC) will flash for 1 minute and then remain illuminated after the ignition switch is cycled ON and the IPC bulb check is complete. If equipped, the driver information center (DIC) will also

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display a service tire monitor type message. Under these circumstances, DTC C0775 will be set and the tire pressure sensor learn procedure will need to be performed for the system to function correctly.

Conditions for Running the DTC

The ignition is ON.

Conditions for Setting the DTC

The body control module (BCM) has not undergone the tire pressure sensor learn procedure.

Action Taken When the DTC Sets

- The tire pressure monitor indicator icon on the instrument panel cluster (IPC) will flash for 1 minute and then remain illuminated after the ignition switch is cycled ON and the IPC bulb check is complete.
- If equipped, the driver information center (DIC) displays a service tire monitor type warning message.

Conditions for Clearing the DTC

A current DTC will clear when the BCM has undergone the tire pressure sensor learn procedure and 1 ignition cycle has occurred.

Reference Information

Description and Operation

Tire Pressure Monitor Description and Operation

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

Scan Tool Reference

Control Module References for scan tool information

Special Tools

J-46079 Tire Pressure Monitor Diagnostic Tool. See **Special Tools**.

Circuit/System Verification

Verify that the DTC C0775 is not set.

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- If the DTC is set, perform the tire pressure sensor learn procedure. Cycle the ignition. If the DTC resets, replace the K9 BCM.

Repair Procedures

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

- **Tire Pressure Indicator Sensor Learn**
- **Control Module References** for BCM replacement, setup and programming.

SYMPTOMS - TIRE PRESSURE MONITORING

1. Perform the **Diagnostic System Check - Vehicle** , before using the Symptom Tables in order to verify that all of the following are true:
   - There are no DTCs set.
   - The control modules can communicate via the serial data link.
2. Review the system operation in order to familiarize yourself with the system functions. Refer to **Tire Pressure Monitor Description and Operation**.

Visual/Physical Inspection

- Inspect for aftermarket devices which could affect the operation of the Tire Pressure Monitoring (TPM) System. Refer to **Checking Aftermarket Accessories** .
- Inspect the easily accessible or visible system components for obvious damage or conditions which could cause the symptom.

Intermittent

Faulty electrical connections or wiring may be the cause of intermittent conditions. Refer to **Testing for Intermittent Conditions and Poor Connections** .

Symptom List

Refer to **Low Tire Pressure Indicator Malfunction** in order to diagnose the symptom.

LOW TIRE PRESSURE INDICATOR MALFUNCTION

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

Circuit/System Description

The body control module (BCM) receives a radio frequency (RF) transmission from each tire pressure sensor.

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Each sensor has its own unique identification (ID) code, which it transmits as part of each RF message, that must be learned into the BCM memory. Once all 4 IDs have been learned and vehicle speed is greater than 40 km/h (25 mph), the BCM continuously compares IDs in received transmission to its learned IDs to determine if all 4 sensors are present. If the BCM detects a low tire pressure condition or a malfunction in the system, it will send a serial data message to the instrument panel cluster (IPC) requesting the appropriate tire pressure monitor indicator illumination and also to display the appropriate data message on the driver information center (DIC), if equipped.

Diagnostic Aids

- If unsure about the condition, cycle the ignition and observe the tire pressure monitor indicator icon. If the tire pressure monitor indicator icon is continuously illuminated after the IPC bulb check is completed, a low tire pressure condition is present. Check the tires for damage or leaks and inflate to the tire placard specifications. Refer to **Vehicle Certification, Tire Placard, Anti-Theft, and Service Parts ID Label** . If the tire pressure monitor indicator icon flashes for 1 minute after the IPC bulb check is completed and then remains illuminated, a tire pressure monitor system DTC is set. Perform the **Diagnostic System Check - Vehicle** to proceed with the proper diagnosis.
- Temperature can greatly effect tire pressures. Low tire pressure on a cold morning may cause the tire pressure monitor indicator icon to turn ON. The air pressure in the tire increases as the ambient temperature rises or as the tire warms up while the vehicle is driven. The pressure may increase enough to exceed the predetermined low pressure threshold which will turn OFF the tire pressure monitor indicator icon.
- Some aftermarket wheel valve stem holes are located further from the wheel rim than original equipment wheels. When using the TPM special tool to activate a sensor, ensure the tool antenna is no further than 15 cm (6 in) from the sensor and is aiming upward.
- Aftermarket wheel value stem locations can cause a sensor to not function correctly.
- A sensor may have been damaged due to a previous wheel/tire service or flat tire event.
- The use of other than GM approved tire sealants can obstruct the sensor pressure sensing port and cause inaccurate tire pressure readings. If this condition is verified, remove the sealer from the tire and replace the sensor. Refer to **Tire Pressure Indicator Sensor Replacement**.
- Occasionally sensor transmissions are not received by the BCM due to vehicle level RF interference from items such as but not limited to aftermarket ignition systems, DVD players, CB radios, or metallic type window tinting.
- The sensor activation procedure may have to be repeated up to 3 times before determining a sensor is malfunctioning. In the event a particular sensor's information is displayed on the special tool upon activation but the horn does not chirp, it may be necessary to rotate the wheel valve stem to a different position due to the RF signal is being blocked by another component.
- Occasionally sensors can become mislocated due to previous tire rotations where the sensor learn procedure was not performed or stray sensor transmissions have been received from other vehicles. Always learn the sensors to ensure the DTC set is for that actual physical corner of the vehicle. Refer to **Tire Pressure Indicator Sensor Learn**.

Reference Information

Description and Operation

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Tire Pressure Monitor Description and Operation

Electrical Information Reference

- Circuit Testing
- Connector Repairs
- Testing for Intermittent Conditions and Poor Connections
- Wiring Repairs

Scan Tool Reference

Control Module References for scan tool information

Special Tools

J-46079 Tire Pressure Monitor Diagnostic Tool. See **Special Tools**.

Circuit/System Verification

NOTE: **Low tire pressure in one or more tires is indicated by a continuously illuminated tire pressure monitor indicator icon after the IPC bulb check is completed. If equipped with a DIC, a check tire pressure type message will also be displayed. It is not necessary to perform the Learn procedure for a low tire condition. When a TPM DTC is set, the tire pressure monitor indicator icon will flash for 1 minute after the IPC bulb check is completed and then remains illuminated. If equipped with a DIC, a service tire monitor type message will also be displayed.**

1. Verify all tires are inflated to the proper pressure ±10%. Refer to **Vehicle Certification, Tire Placard, Anti-Theft, and Service Parts ID Label** .
    - If not within the specified range, adjust all tire pressures to specification and drive the vehicle over 40 km/h (25 mph) for greater than 2 minutes. Verify the tire pressure monitor indicator icon is OFF.
2. Using the **J-46079** , activate each tire pressure sensor and record each sensor tire pressure reading. See **Special Tools**. Check the tire pressures with a known accurate hand held tire pressure gauge. Verify that the pressure readings from the special tool do not differ more than 27.6 kPa (4 psi) from the actual tire pressure readings.
    - If not within the specified range, replace the appropriate tire pressure sensor.
3. Using a scan tool, enable the TPM learn mode. Use the **J-46079** in simulate mode to learn 4 simulated sensor transmissions into the BCM. See **Special Tools**. Observe tire pressures in the scan tool data display. Verify the simulated tire pressures do not differ more than +/-27.6 kPa (4 psi) of the scan tool reading.
    - If not within the specified range, replace the K9 BCM.
4. Using a scan tool, perform the instrument panel special functions Lamp Test. Command the instrument panel warning lamps ON and OFF. Verify the tire pressure monitor indicator icon turns ON and OFF.
    - If the tire pressure monitor icon does not turn ON and OFF, replace the P16 IPC.

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5. Ignition ON, use the scan tool to setup the Tire Type/Pressure Selection in the BCM Module Setup menu. Refer to the **Vehicle Certification, Tire Placard, Anti-Theft, and Service Parts ID Label** . Drive the vehicle over 40 km/h (25 mph) for greater than 2 minutes. Verify the tire pressure monitor indicator icon is OFF.
    - If the tire pressure monitor indicator icon is ON, replace the K9 BCM.

Repair Procedures

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

- **Tire Pressure Indicator Sensor Replacement**
- **Tire Pressure Indicator Sensor Learn**
- **Control Module References** for IPC or BCM replacement, setup, and programming

REPAIR INSTRUCTIONS

TIRE PRESSURE INDICATOR SENSOR REPLACEMENT

Removal Procedure

1. Raise the vehicle on a suitable support. Refer to **Lifting and Jacking the Vehicle** .
2. Remove the tire/wheel assembly from the vehicle. Refer to **Tire and Wheel Removal and Installation** .
3. Dismount the tire from the rim. Refer to **Tire Dismounting and Mounting** .

NOTE: **When servicing the tire pressure sensor always use a new Schrader® tire pressure monitoring (TPM) sensor and a new TORX screw during installation.**

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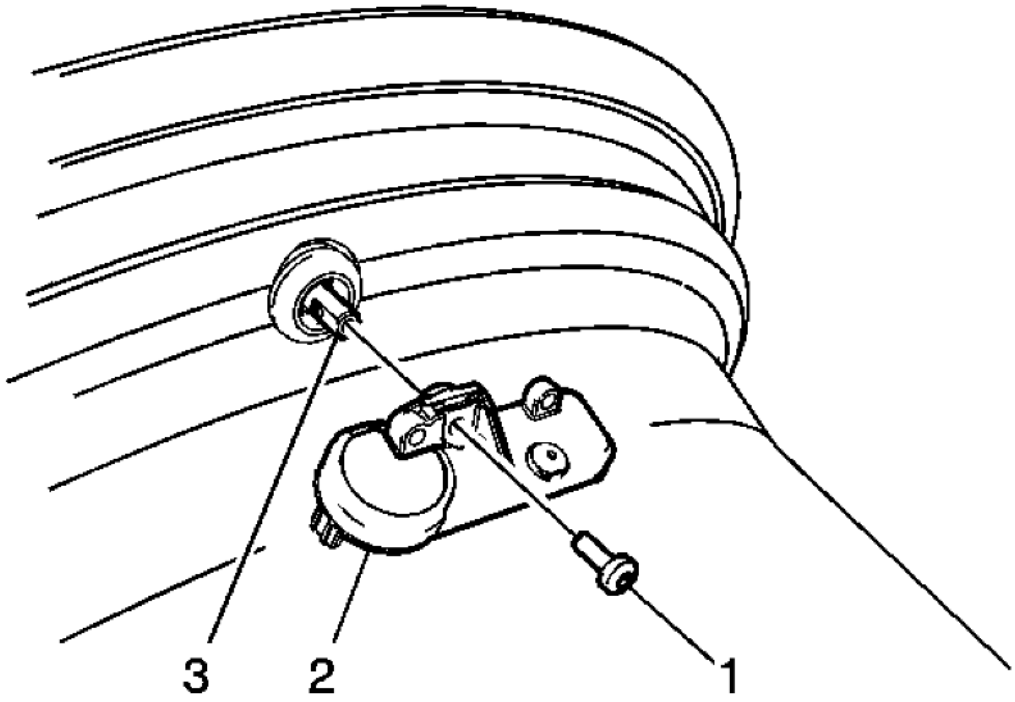


Fig. 1: Tire Pressure Sensor
Courtesy of GENERAL MOTORS CORP.

4. Remove the TORX screw (1) from the tire pressure sensor (2) and pull it straight off the tire pressure valve stem (3).

CAUTION: Do not scratch or damage the clear coating on aluminum wheels with the tire changing equipment. Scratching the clear coating could cause the aluminum wheel to corrode and the clear coating to peel from the wheel.

5. Remove the tire pressure valve stem by pulling it through the rim.

Installation Procedure

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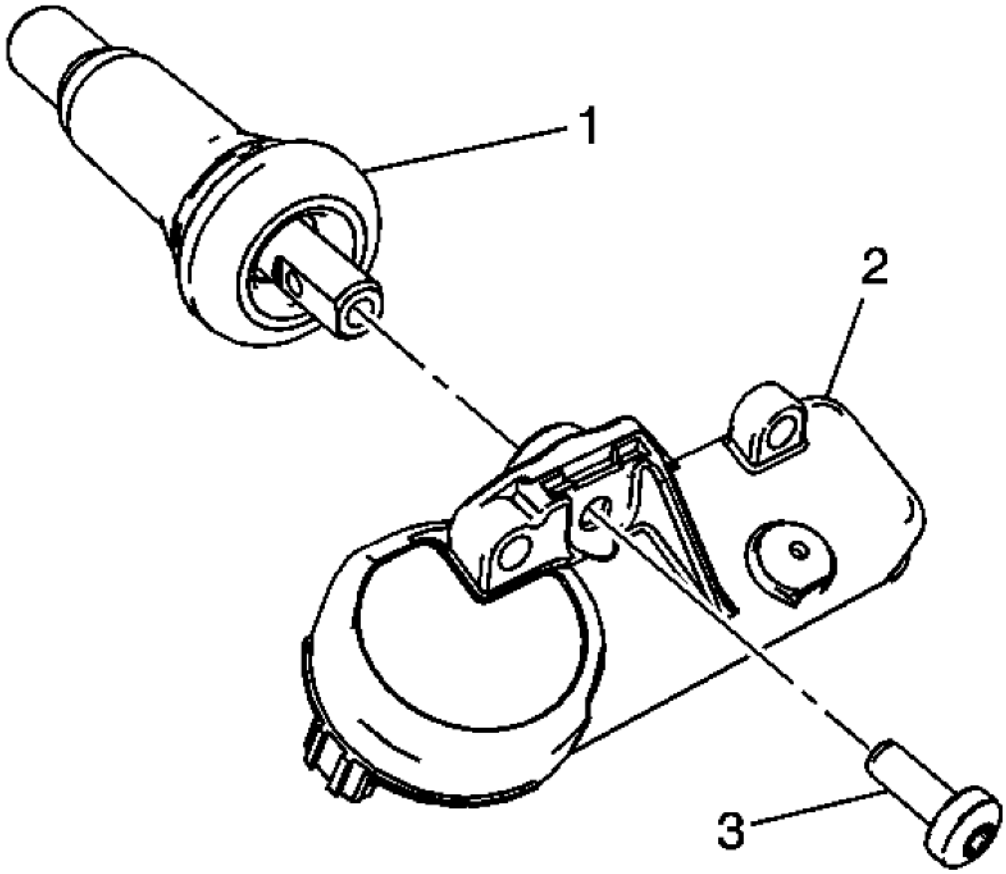


Fig. 2: Identifying Tire Pressure Sensor Components
Courtesy of GENERAL MOTORS CORP.

CAUTION: Refer to Fastener Caution .

NOTE:

- **Ensure the flat of the valve, lines up with the flats of the snap in the enclosure.**
- **TPM valves and TORX screws are single use items.**

1. Assemble the tire pressure sensor (2) to the valve stem and install the new TORX screw (3), tighten to 1.3 N.m (11.5 lb in).

NOTE: Use an approved tire mounting lubricant. DO NOT use silicon or corrosive

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base compounds to lubricate the tire bead and the wheel rim. A corrosive type compound can cause tire or rim deterioration.

2. Apply tire soap to the rubber portion of the valve stem (1).

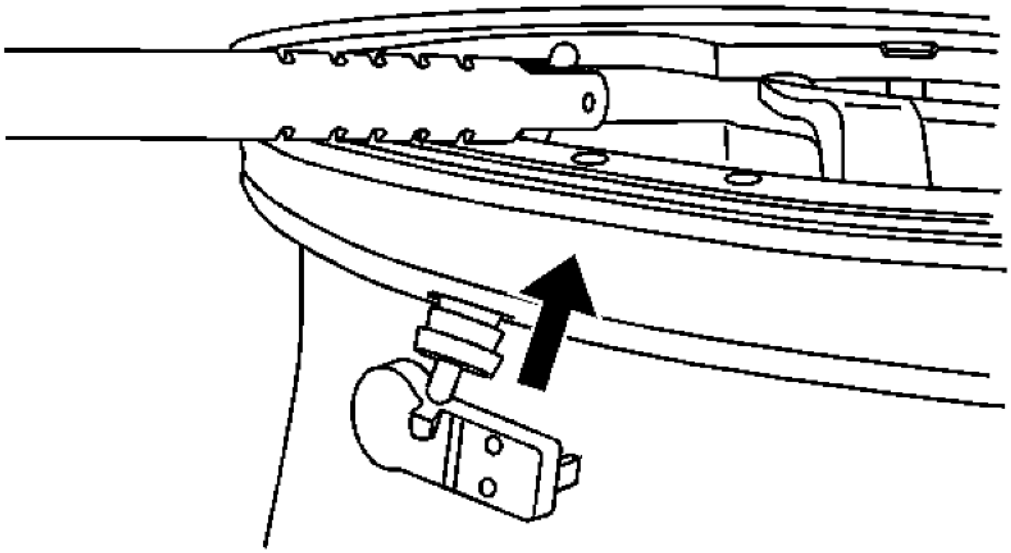


Fig. 3: View Of Tire Valve Stem Mounting Tool
Courtesy of GENERAL MOTORS CORP.

3. Using a tire valve stem mounting tool, pull the valve stem through in a direction parallel to the valve hole on the rim.

NOTE: Snap Fit TPM sensors are shipped in the OFF mode. The sensor will exit its OFF state when the tire is inflated.

4. Mount the tire to the rim. Refer to **Tire Dismounting and Mounting** .
5. Install the tire/wheel assembly on the vehicle. Refer to **Tire and Wheel Removal and Installation** .
6. Lower the vehicle.
7. Learn the tire pressure sensors. Refer to **Tire Pressure Indicator Sensor Learn**.

TIRE PRESSURE INDICATOR SENSOR LEARN

Special Tools

J-46079 Tire Pressure Monitor Diagnostic Tool. See **Special Tools**.

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Relearn Mode Description

The tire pressure monitor (TPM) system uses the instrument panel cluster (IPC), body control module (BCM), 4 radio frequency transmitting pressure sensors, and the serial data circuit to perform the TPM Relearn mode functions. The sensor Relearn procedure must be performed after every tire rotation, BCM replacement, or sensor replacement. Once the relearn mode has been enabled, each of the sensors unique identification codes can be learned into the BCM memory. When a sensor ID has been learned, the BCM sends a serial data message to the BCM to sound a horn chirp. This verifies the sensor has transmitted its ID and the BCM has received and learned it. The BCM must learn the sensor IDs in the proper sequence to determine correct sensor location. The first learned ID is assigned to the left front location, the second to right front, the third to right rear and the fourth to left rear. The turn signals will individually illuminate indicating which location is to be learned in the proper sequence.

Sensor Functions Using J-46079 or EL-46079

Each sensor has an internal low frequency coil. When the **J-46079** is used in activate mode, it produces a low frequency transmission that activates the sensor. See **Special Tools**. The sensor responds to a low frequency activation by transmitting in learn mode. When the BCM receives a learn mode transmission while in TPM learn mode, it will assign that sensors ID to the location on the vehicle relative to the order in which it was learned.

Sensor Functions Using Pressure Increase/Decrease Method

Each sensor takes a pressure measurement sample once every 30 seconds while in stationary mode. If the tire pressure increases, or decreases by more than 8.3 kPa (1.2 psi) from the last pressure measurement, another measurement will occur immediately to verify the change in pressure. If a pressure change has indeed occurred, the sensor transmits in Learn mode. When the BCM receives a Learn mode transmission while in TPM learn mode, it will assign that sensor's ID to the location on the vehicle relative to the order in which it was learned.

Relearn Mode Cancellation

The Relearn mode will cancel if the ignition is cycled to OFF or if more than 2 minutes has elapsed for any sensor that has not been learned. If the relearn mode is cancelled before the first sensor is learned, the original sensor IDs will be maintained. If the relearn mode is canceled after the first sensor is learned, the following will occur:

- All stored sensor IDs will be invalidated in the BCM memory.
- If equipped, the DIC will display dashes instead of tire pressures.
- DTC C0775 will be set.

These conditions will now require the relearn procedure to be repeated for the system to function properly.

TPM Relearn Procedure

NOTE: If using the scan tool to enable the relearn mode, the J-46079 must be used to activate the sensors. See Special Tools. When this preferred method is used, any stray sensor signals will not affect the relearn procedure. In the event a particular sensor's information is displayed on the special tool upon activation

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but the horn does not chirp, it may be necessary to rotate the wheel valve stem to a different position due to the sensor signal is being blocked by another component.
If using the DIC buttons to enable the relearn mode, the J-46079 or Pressure Increase/Decrease Method may be used. See Special Tools. Before proceeding with this method, ensure that no other learn procedure is being performed simultaneously or that tire pressures are not being adjusted on another TPM equipped vehicle within close proximity. Stray signals from other TPM equipped vehicles just driving by can be inadvertently learned. If any random horn chirps are heard from the vehicle while performing the learn procedure, most likely a stray sensor has been learned and the procedure will need to be cancelled and repeated. Under these circumstances, performing the TPM Relearn Procedure away from other vehicles would be highly recommended. In the event a particular sensor activation does not cause the horn to chirp, it may be necessary to rotate the wheel valve stem to a different position due to the sensor signal is being blocked by another component.

Preferred Scan Tool Relearn Enable Method

1. Apply park brake (manual transmission only).
2. Ignition ON, using a scan tool, initiate the Tire Pressure Sensors Learn mode. A double horn chirp will sound indicating the Relearn mode has been enabled. The left front turn signal will also be illuminated.
3. Starting with the left front tire, active the sensor by holding the antenna of the **J-46079** aimed upward against the tire sidewall close to the wheel rim at the valve stem location. See **Special Tools**. Press and release the Activate button and wait for a horn chirp. Once the horn chirp has sounded, the sensor information is learned and the turn signal in the next location to be learned will illuminate.
4. After the horn chirp has sounded and the right front turn signal is illuminated, repeat step 2 for the remaining 3 sensors in the following order:
    1. Right front
    2. Right rear
    3. Left rear
5. When the left rear sensor has been learned and a double horn chirp has sounded, the learn process is complete and the BCM exits the Relearn mode.
6. Ignition OFF, adjust all tires to the recommended pressures. Refer to **Vehicle Certification, Tire Placard, Anti-Theft, and Service Parts ID Label** .

Alternate DIC Relearn Enable Method

1. Apply park brake (manual transmission only).
2. Ignition ON, activate the Relearn mode with the driver information center (DIC) display controls. A double horn chirp sounds indicating the Relearn mode has been enabled and the left front turn signal will also be illuminated.
3. Starting with the left front tire, activate the tire pressure sensor by using one of the following methods:
    - Hold the antenna of the **J-46079** aimed upward against the tire sidewall close to the wheel rim at

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the valve stem location. See **Special Tools**. Press and release the activate button and wait for a horn chirp. Once the horn chirp has sounded, the sensor information is learned and the turn signal in the next location to be learned will illuminate.

WARNING: Over inflating tires may cause personal injury or damage to the tires and wheels. When increasing tire pressure do not exceed the maximum inflation pressure as noted on the tire sidewall.

- Increase/decrease the tire pressure for 8-10 seconds then wait for a horn chirp. The horn chirp may occur before or up to 30 seconds after the 8-10 second pressure increase/decrease time period has been reached. Once the horn chirp has sounded, the sensor information is learned and the turn signal in the next location to be learned will illuminate.

4. After the horn chirp has sounded and the right front turn signal is illuminated, repeat step 2 for the remaining 3 sensors in the following order:
    1. Right front
    2. Right rear
    3. Left rear
5. When the left rear sensor has been learned and a double horn chirp has sounded, the learn process is complete and the BCM exits the Relearn mode.
6. Ignition OFF, adjust all tires to the recommended pressures. Refer to **Vehicle Certification, Tire Placard, Anti-Theft, and Service Parts ID Label** .

DESCRIPTION AND OPERATION

TIRE PRESSURE MONITOR DESCRIPTION AND OPERATION

The tire pressure monitor (TPM) system warns the driver when a significant loss, or gain of tire pressure occurs in any of the 4 tires and allows the driver to display the individual tire pressures and their locations on the driver information center (DIC).

The system uses the body control module (BCM), driver information center (DIC), instrument panel cluster (IPC), a radio frequency (RF) transmitting pressure sensor in each wheel/tire assembly, and the serial data circuit to perform the system functions. Each sensor has an internal power supply with a 10 year service life.

When the vehicle is stationary, the sensors internal accelerometer is inactive, which puts the sensors into a stationary state. In this state the sensors sample tire pressure once every 30 seconds and do not transmit at all if the tire pressure does not change. As vehicle speed increases, centrifugal force activates the sensors internal accelerometer causing the sensors to go into rolling mode. In this mode, the sensors sample tire pressure once every 30 seconds and transmit in rolling mode once every 60 seconds. The BCM receives and translates the data contained in each sensors RF transmission into sensor presence, sensor mode, and tire pressure. The BCM sends the tire pressure and tire location data to the DIC via the serial data circuit where they are displayed.

The sensors continuously compare their last pressure sample to their current pressure sample and will transmit in re-measure mode if a 8.3 kPa (1.2 psi) change in tire pressure has been detected in either a stationary or rolling state. When the TPM system detects a significant loss, or gain of tire pressure, the tire pressure monitor indicator icon is illuminated on the IPC and if equipped, a check tire pressure type message is displayed on the

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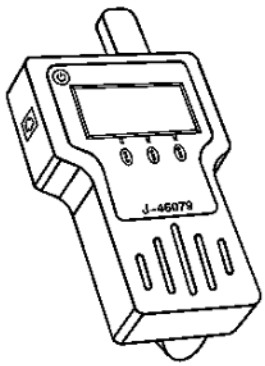
DIC. Both the indicator icon and DIC message can be cleared by adjusting the tire pressures to the recommended kPa/psi and driving the vehicle above 40 km/h (25 mph) for at least 2 minutes.

If power is disconnected from the BCM or if the vehicle battery is disconnected each TPM sensor ID is retained but all of the tire pressure information is lost. Under these circumstances the BCM cannot assume that the tire pressures were maintained over an unknown period of time. If equipped, the DIC will display all dashes and the scan tool will indicate a default tire pressure value of 1020 kPa (148 psi) for each tire. Driving the vehicle above 40 km/h (25 mph) for at least 2 minutes will activate the sensors causing the DIC to display the current tire pressures. The **J-46079** TPM special tool or the pressure increase/decrease method may also be used to activate the sensors as well. See **Special Tools**.

The BCM has the ability to detect malfunctions within the TPM system. In the event a DTC is set, the tire pressure monitor indicator icon on the IPC will flash for 1 minute and then remain illuminated after the ignition is turned ON and the IPC bulb check has been completed. Any malfunction detected will cause the DIC to display a service tire monitor system type message. For more information on other functions of the BCM, refer to **Keyless Entry System Description and Operation** .

SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS

Illustration	Tool Number/Description
	EL 46079 J 46079 Tire Pressure Monitor Diagnostic Tool

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2010 SUSPENSION

Tires and Wheels - Camaro

SPECIFICATIONS

TIRE AND WHEEL SPECIFICATIONS

Alloy Wheel Specifications

Description	Specifications
Alloy Wheels	
• Rim Width Code	8J
• Diameter Code	18, 19
• Maximum Permissible Radial runout All Models	0.4 mm
Offset	
• 18" x 8", 19" x 8"	48 mm (positive)

Inflation Pressure Specifications

Wheel	Tire Designation	Recommended Cold Inflation kPa			
		Up to 3 Passengers		Up to Max. Load	
		Front	Rear	Front	Rear
8J x 18 alloy	RPO : QFX 245/45 R18 96V	230	230	250	270
8J x 18 alloy	RPO : R1L 245/45 R18 100V	230	230	250	270
8J x 19 alloy	RPO : RP2 245/40 R19 94W	250	250	250	270
8J x 19 alloy	RPO : QWT 245/40 R19 98W	250	250	250	270
For speeds above 160 km/h		250	250	270	300

FASTENER TIGHTENING SPECIFICATIONS

Application	Specification	
	Metric	English
Wheel Nut Torque	190 N.m	140 lb ft

ADHESIVES, FLUIDS, LUBRICANTS, AND SEALERS

Application	Type of Material	GM Part Number
Wheels	Mounting Lubricant	12345884 (Canadian P/N

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		5728223)

DIAGNOSTIC INFORMATION AND PROCEDURES

TIRE DIAGNOSIS - IRREGULAR OR PREMATURE WEAR

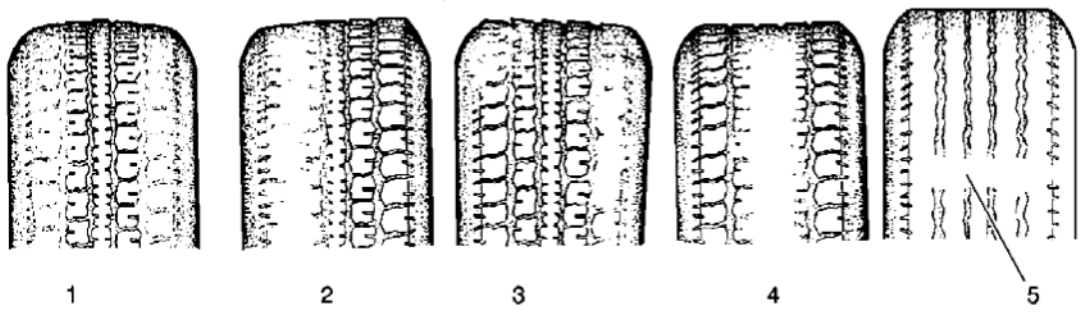


Fig. 1: Identifying Types Of Tire Wear
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Under-Inflation, Hard Cornering, Lack of Regular Rotation
2	Incorrect Wheel Alignment, Hard Cornering, Lack of Regular Rotation
3	Incorrect Wheel Alignment, Shock Absorber Failure
4	Over-Inflation, Heavy Acceleration, Lack of Regular Rotation
5	Normal Wear to wear indicator

Inspection Procedure

1. Inspect front tires for wear and damage.
2. Inspect rear tires for wear and damage.
3. Rotate the tire and wheel assembly if any of the following conditions exist:
   - The amount of time or distance since the last tire rotation matches the maintenance schedule.
   - The outer tread blocks are worn more than the middle tread blocks (1).
   - The outer tread blocks are worn more than the inner tread blocks (2).
   - The middle tread blocks are worn more than the outer tread blocks (4).
4. Measure the wheel alignment. Refer to **Wheel Alignment Measurement** . If any of the following conditions exist:
   - The tread blocks have feather edges (3).
   - The outer tread blocks are worn more than the inner tread blocks (2).
   - The inner tread blocks are worn more than the outer tread blocks (4).
5. Inspect the struts or the shock absorbers if the tire tread exhibits a cupped appearance (3).

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WHEEL MOUNTING SURFACE CHECK

Replace any wheels that are bent or dented, or have excessive lateral or radial runout. Wheels with runout greater than specified may cause objectionable vibrations.

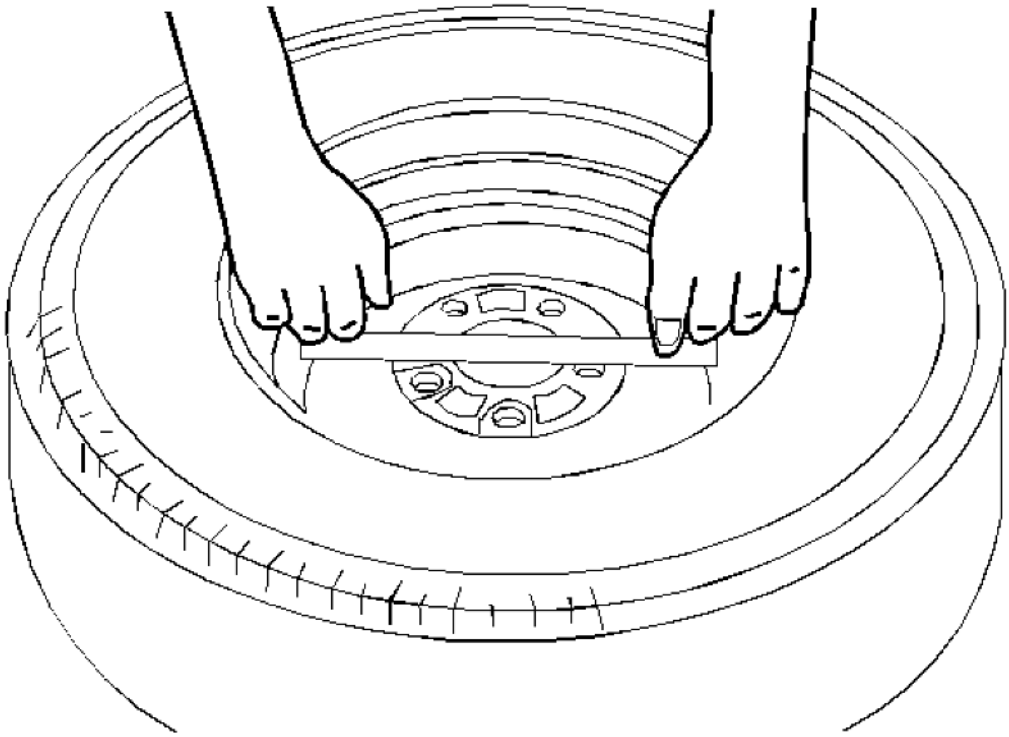


Fig. 2: Checking Wheel Mounting Surface
Courtesy of GENERAL MOTORS CORP.

1. Use a straight edge 203-229 mm (8-9 in) long. Place the straight edge on the wheel inboard mounting surface. Try to rock the straightedge up and down within the mounting surface.
2. Repeat this procedure on at least 3-4 different positions on the inboard mounting surface.
   - If you can rock the straight edge, the mounting surface is bent and you must replace the wheel.
   - Inspect the mounting wheel/nut holes for damage caused from over-torquing the wheel/nuts. Inspect for collapsed wheel/nut bosses. Inspect for cracked wheel bosses.

CAUTION: The use of non-GM original equipment wheels may cause:

- **Damage to the wheel bearing, the wheel fasteners and the wheel**

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- **Tire damage caused by the modified clearance to the adjacent vehicle components**
- **Adverse vehicle steering stability caused by the modified scrub radius**
- **Damage to the vehicle caused by the modified ground clearance**
- **Speedometer and odometer inaccuracy**

NOTE:

- **Replacement wheels must be equivalent to the original equipment wheels in the following ways:**
  - **The load capacity**
  - **The wheel diameter**
  - **The rim width**
  - **The wheel offset**
  - **The mounting configuration**
- **A wheel of the incorrect size or type may affect the following conditions:**
  - **Wheel and hub-bearing life**
  - **Brake cooling**
  - **Speedometer/odometer calibration**
  - **Vehicle ground clearance**
  - **Tire clearance to the body and the chassis**

3. Replace the wheel if the wheel is bent.
4. Replace the wheel if the wheel/nut boss area is cracked.

To identify aluminum wheels the code, the part number, and the manufacturer identification cast into the back side of the wheel.

RADIAL TIRE LEAD/PULL CORRECTION

Step	Action	Yes	No
DEFINITION: Lead/pull is the deviation of the vehicle from a straight path on a level road with no pressure on the steering wheel.			
1	Did you perform the Vehicle Leads/Pull diagnostic table?	Go to **Step 2**	Go to **Vehicle Leads/Pulls**
2	Road test the vehicle to verify the complaint. Select a smooth level surface to perform the test. Does the condition exist?	Go to **Step 3**	System OK
3	1. Cross-switch the front tire/wheel assemblies. Refer to **Tire and Wheel Removal and Installation**.		

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	2. Road test the vehicle on a smooth level surface. Does the vehicle still lead/pull?	Go to **Step 4**	System OK
4	Does the vehicle lead/pull in the opposite direction?	Go to **Step 5**	Go to **Wheel Alignment Measurement**
5	1. Cross-switch the left front tire/wheel assembly with the left rear tire/wheel assembly. Refer to **Tire and Wheel Removal and Installation**. 2. Road test the vehicle on a smooth level surface. Does the vehicle still lead/pull?	Go to **Step 6**	Go to **Step 7**
6	1. Cross-switch the right front tire/wheel assembly with the right rear tire/wheel assembly. Refer to **Tire and Wheel Removal and Installation**. 2. Road test the vehicle on a smooth level surface. Does the vehicle still lead/pull?	Go to **Wheel Alignment Measurement**	Go to **Step 8**
7	Replace the left rear tire. Refer to **Tire Dismounting and Mounting**. Is the repair complete?	Go to **Step 9**	-
8	Replace the right rear tire. Refer to **Tire Dismounting and Mounting**. Is the repair complete?	Go to **Step 9**	-
9	Verify proper vehicle operation. Does the original condition still exist?	Go to **Step 1**	System OK

REPAIR INSTRUCTIONS

ALUMINUM WHEEL REFINISHING

Aluminum Wheel Refinishing Guidelines

WARNING: To avoid personal injury when exposed to plastic media blast, hand and/or lathe sanding dust, primer, color coat, and clearcoat, you must work in a properly ventilated area, wearing an approved respirator, eye protection, earplugs and protective gloves and clothing.

Evaluating Damage

NOTE:

- **Inspect the wheel for corrosion, scrapes, gouges, etc. Damage MUST NOT be deeper than what can be sanded or polished off.**
- **Inspect the wheel for cracks. If cracks are found, discard the wheel.**

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- **ALL wheels with bent rim flanges must not be repaired or refinished.**
- **The re-machining and the re-clear coating of aluminum wheels is not recommended in the dealer environment due to concerns of repair durability.**
- **Do not use any re-machining process that removes aluminum. This could affect the dimensions and function of the wheel.**

Aluminum Wheel Refinishing General Recommendations/Options

- Painted aluminum wheels use a primer, color coat, and clearcoat procedure. If the paint is damaged, refinishing is possible. As with polished wheels, all original coatings must be removed first. Media blasting is recommended. (See option number 1).
- If the clearcoat is damaged, it is possible to refinish with clearcoat only, however, the required refinishing process cannot be performed in the dealer environment. Refer to Refinishers Responsibility (Repair option number 2).
- Re-plating of chrome-plated aluminum wheels is not recommended.

Repair Option Number 1

Material Required/Information Resources

- The Paint Manufacturer's Color Book
- Refer to the latest GM Approved Refinish Materials Booklet (GM 4901 MD-2005) for specific products for aluminum refinishing.
- To access the booklet, go to www.gmgoodwrench.com. Click on GM Collision Parts. Click on GM Technical Repair Information, select Paint Shop.
- A Color Compatibility chart is also at this site defining what colors are used on what models.

NOTE: Chemical strippers are not recommended.

- Refer to specific Paint Manufacturers for refinish procedures and process pertaining to "Aluminum Refinishing".

The procedure requires the wheel surface to be plastic media blasted to remove old paint or clearcoat.

General Color Selection

- If the wheels being painted were previously clearcoated aluminum, and a painted aluminum look is desired, using Corsican Silver WAEQ9283 for a fine "aluminum-like" look, or Sparkle Silver WA9967 for a very bright look. Body color is another option to the customer that may also be used.
- Some specific colors may be recommended on certain models.
- If painting wheels that were previously clearcoated aluminum, it is recommended that all 4 wheels and their center caps be refinished to maintain color uniformity.

General Refinishing Procedures - Removal

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1. Remove the wheels from the vehicle. The tires may remain mounted on the wheels.
2. Remove the balance weights and mark their locations on the tire.
3. Remove excess grease, etc. from the wheels with wax and grease remover.
4. Have the wheels plastic media blasted to remove the clearcoat.

NOTE: **MASK OFF ALL MOUNTING SURFACES, whenever a wheel is refinished. The mounting surface and the wheel nut contact surfaces must not be painted or clearcoated. Coating these surfaces could affect the wheel nut torque.**

5. Clean and mask and paint the wheels.

General Refinishing Procedures - Installation

1. Unmask the wheels.
2. Clean all wheel mounting surface of any corrosion, overspray, or dirt.

NOTE: **When re-balancing a tire on an aluminum wheel, coated balance weights must be used in order to reduce the chance of future cosmetic damage.**

3. Install NEW coated balance weights at marked locations.

NOTE: **Use a torque stick on an impact wrench, or a torque wrench to consistently and uniformly fasten the wheel to the specified torque for the vehicle. The star pattern must be followed.**

4. Install wheels on vehicle.

Repair Option Number 2 - Outside Companies

NOTE: **Some outside companies are offering wheel refinishing services. Such refinished wheels will be permanently marked by the refinisher and are warranted by the refinisher. Any process that re-machines or otherwise re-manufactures the wheel should not be used.**

A refinishers responsibility includes inspecting for cracks using the Zyglo system or the equivalent. Any cracked wheels must not be refinished. No welding, hammering or reforming of any kind is allowed. The wheel ID must be recorded and follow the wheel throughout the process in order to assure that the same wheel is returned. A plastic media blast may be used for clean up of the wheel. Hand and/or lathe sanding of the machined surface and the wheel window is allowed. Material removal, though, must be kept to a minimum. Re-machining of the wheel is not allowed. Paint and/or clearcoat must not be present on the nut chamfers, the wheel mounting surfaces and the wheel pilot hole. The refinisher must permanently ID stamp the wheel and warrant the painted/clearcoated surfaces for a minimum of one year or the remainder of the new vehicle warranty, whichever is longer.

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NOTE: Whenever a wheel is refinished, the mounting surface and the wheel nut contact surfaces must not be painted or clearcoated. Coating these surfaces could affect the wheel nut torque.

When re-mounting a tire on an aluminum wheel, coated balance weights must be used in order to reduce the chance of future cosmetic damage.

TIRE AND WHEEL REMOVAL AND INSTALLATION

Special Tools

- **J 41013** Rotor Resurfacing Kit
- **J 42450-A** Wheel Hub Resurfacing Kit
- **J 39544-KIT** Complete Torque Socket Set - 10 Pieces

Removal Procedure

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
2. Remove the wheel center cap, if equipped.
3. Remove the wheel center cap nuts, if equipped.
4. Remove the wheel nuts.
5. Remove the tire and wheel assembly.

CAUTION: Never use heat to loosen a tight wheel bolt or nut. This can shorten the life of wheel and damage wheel bearings.

6. If the tire and wheel assembly is difficult to remove or cannot be removed, perform the following steps:
    1. Apply a small amount of penetrating oil to the wheel nuts, and the center hub. Allow a few moments for the penetrating oil to work.
    2. Loosen each wheel nut 2 complete turns.
    3. Lower the vehicle.
    4. Rock the vehicle from side to side.
    5. Repeat the procedure if necessary.
7. If the tire and wheel assembly still does not loosen, perform the following:
    1. Start the engine.
    2. Allow the vehicle to move forward, and quickly apply the brakes. Repeat this procedure in reverse.
    3. Repeat this procedure if necessary.
8. With the tire and wheel assembly loose, raise and support the vehicle.
9. Remove the tire and wheel assembly.

CAUTION: Before installing wheels, remove any build-up of corrosion on the wheel mounting surface by scraping and wire brushing. Installing

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wheels without good metal-to-metal contact at the mounting surfaces can cause wheel bolts or nuts to loosen, which can later allow a wheel bolt or nut to come off while the vehicle is moving. Wheel bolts or nuts must be tightened in sequence and to proper torque to avoid bending the wheel, brake drum or rotor.

NOTE:

- **Wear approved safety glasses when performing the following service procedures.**
- **DO NOT use power grinders to clean any of the brake rotor or brake drum to wheel contact areas.**

10. Using a wire brush or wire wheel, clean the rotor to the wheel or brake drum to wheel hub contact area.
11. Where possible, use the **J 41013** to clean the contact areas of the wheel to brake rotor or brake drum.

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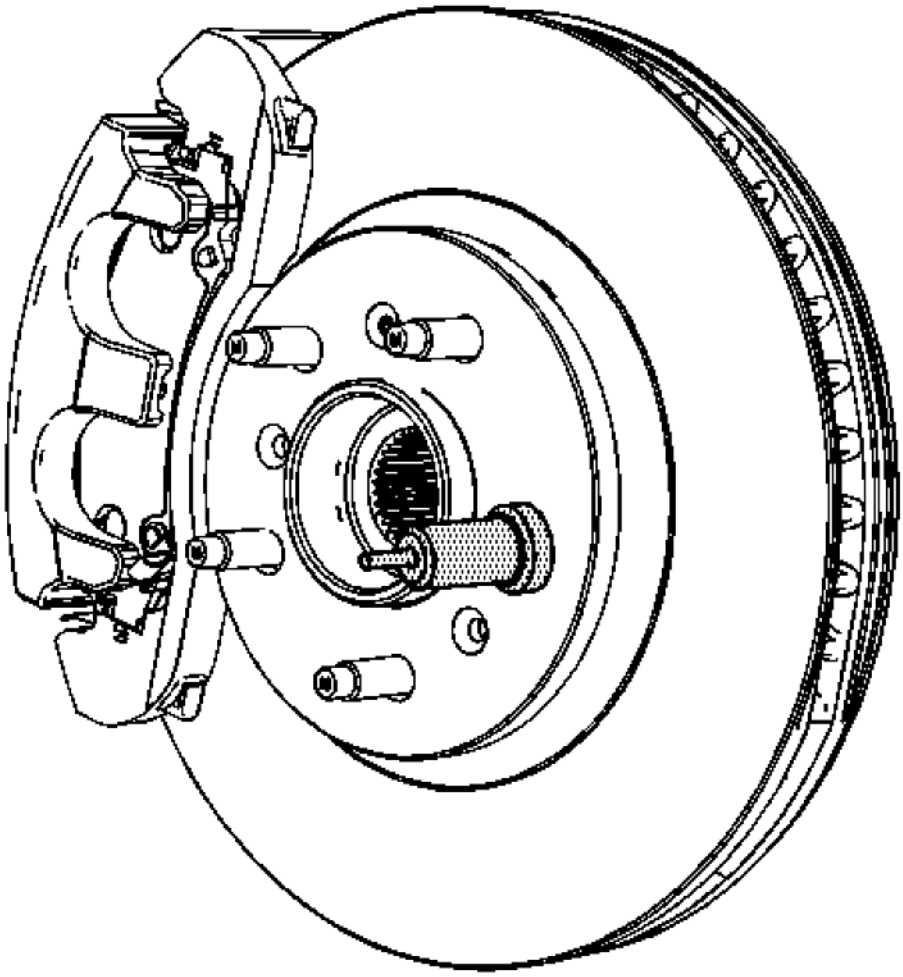


Fig. 3: Cleaning Surface Around Wheel Studs
Courtesy of GENERAL MOTORS CORP.

12. Using the **J 42450-A** , clean the surface around the wheel studs.
13. Clean the threads of the wheel studs. If the threads are damaged, replace the wheel stud.
    - For the front wheel stud replacement, refer to **Wheel Stud Replacement** .
    - For the rear wheel stud replacement, refer to **Wheel Stud Replacement** .
14. After cleaning all the contact areas, use brake clean or denatured alcohol to remove all the penetrating oil, dirt and debris from the wheel nuts, brake rotor or brake drum.
15. Inspect and clean the contact area of the wheel. Refer to **Wheel Mounting Surface Check**.

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Installation Procedure

1. Install the tire and wheel assembly.
2. Hand start the wheel nuts.

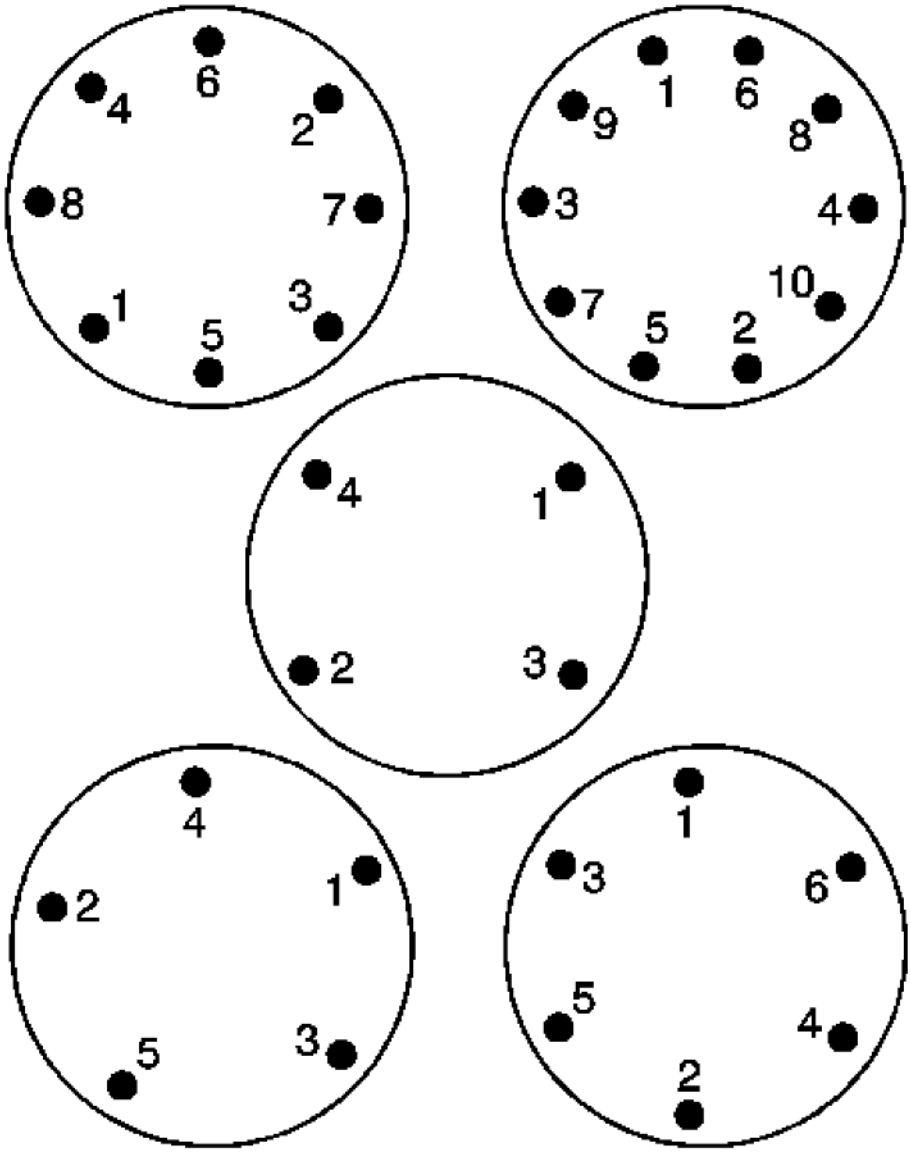


Fig. 4: Identifying Wheel Bolt/Nut Tightening Sequence
Courtesy of GENERAL MOTORS CORP.

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CAUTION: Improperly tightened wheel bolts or nuts can lead to brake pulsation and rotor damage. In order to avoid expensive brake repairs, evenly tighten the wheel bolts or nuts to the proper torque specification.

3. Using the **J 39544-KIT** (proper size torque stick), tighten the wheel nuts in the proper sequence. Refer to **Fastener Tightening Specifications**
4. Install the wheel center cap, if required.
5. Install the wheel cap nuts, if required.
6. Remove the support and lower the vehicle.

TIRE DISMOUNTING AND MOUNTING

CAUTION: Use a tire changing machine in order to dismount tires. Do not use hand tools or tire irons alone in order to remove the tire from the wheel. Damage to the tire beads or the wheel rim could result.

CAUTION: Do not scratch or damage the clear coating on aluminum wheels with the tire changing equipment. Scratching the clear coating could cause the aluminum wheel to corrode and the clear coating to peel from the wheel.

CAUTION: Damage to either the tire bead or the wheel mounting holes can result from the use of improper wheel attachment or tire mounting procedures. It takes up to 70 seconds for all of the air to completely exhaust from a large tire. Failure to follow the proper procedures could cause the tire changer to put enough force on the tire to bend the wheel at the mounting surface. Such damage may result in vibration and/or shimmy, and under severe usage lead to wheel cracking.

1. Remove the valve core from the valve stem.
2. Deflate the tire completely.

NOTE: Rim-clamp European-type tire changers are recommended.

3. Use the tire changer in order to remove the tire from the wheel. Follow steps 4-7 to remove the tire from the wheel.

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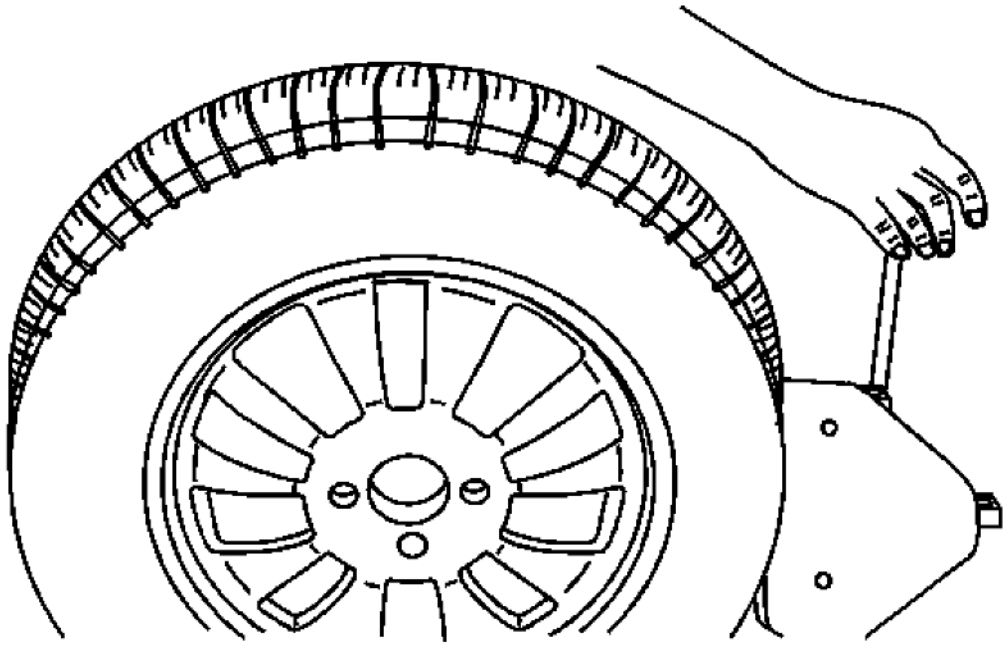


Fig. 5: Using Bead Breaking Fixture
Courtesy of GENERAL MOTORS CORP.

4. When separating the tire bead from the wheel, position the bead breaking fixture 90, 180 and 270 degrees from the valve stem.

CAUTION: Failure to position valve stem in proper position while dismounting and mounting the tire may result in the TPM sensor to become damaged.

5. Position the wheel and tire so the valve stem is at the 7 o'clock position relative to the head. The tire iron or pry bar can be inserted when prying the outer tire bead up and over the mounting/dismounting head.

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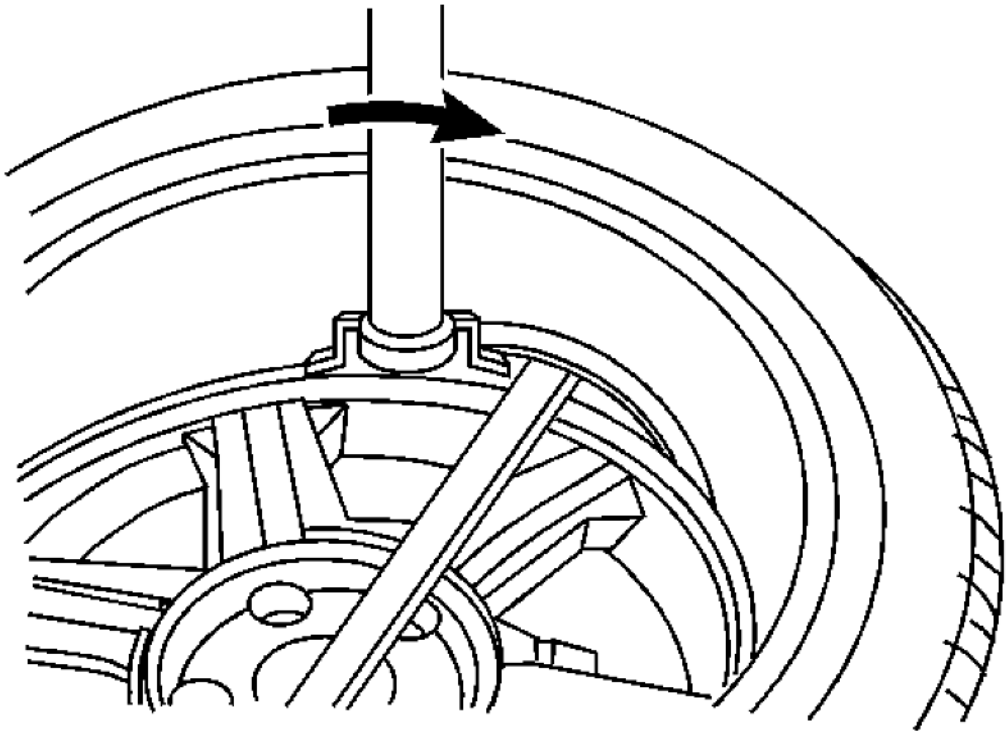


Fig. 6: Positioning Wheel
Courtesy of GENERAL MOTORS CORP.

6. Position the wheel and tire so the valve stem is again at the 7 o'clock position relative to the head. The tire iron or pry bar can be inserted when prying the inner tire bead up and over the mounting/dismounting head.
7. Remove all residual liquid sealant from the inside of the tire and wheel surfaces. If any tire sealant is noted upon tire dismounting on vehicles equipped with TPM, replace the tire pressure sensor. Refer to **Tire Pressure Indicator Sensor Replacement** .
8. Use a wire brush or coarse steel wool in order to remove any rubber, light rust or corrosion from the wheel bead seats.

CAUTION: When mounting the tires, use an approved tire mounting lubricant. DO NOT use silicon or corrosive base compounds to lubricate the tire bead and the wheel rim. A silicon base compound can cause the tire to slip on the rim. A corrosive type compound can cause tire or rim deterioration.

9. Apply mounting lubricant to the tire bead and the wheel rim. Refer to **Adhesives, Fluids, Lubricants,**

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and Sealers.

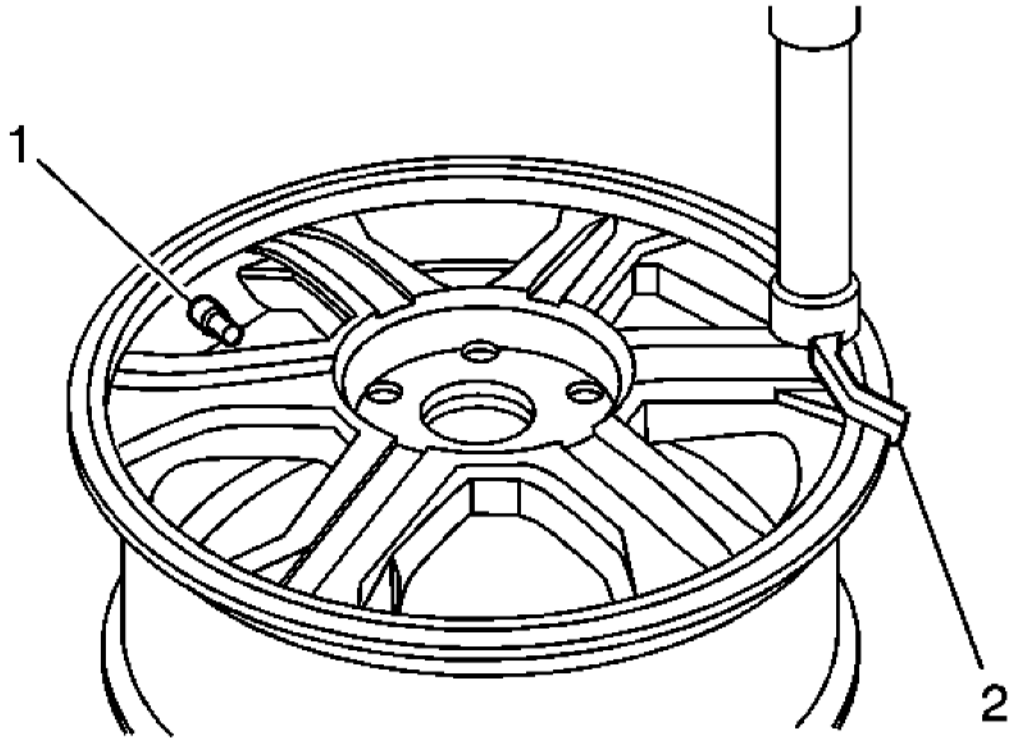


Fig. 7: Positioning Rim
Courtesy of GENERAL MOTORS CORP.

10. Position the rim so the valve stem (1) is at the 7 o'clock position relative to the head (2). This will protect the sensor when the bottom bead seats.

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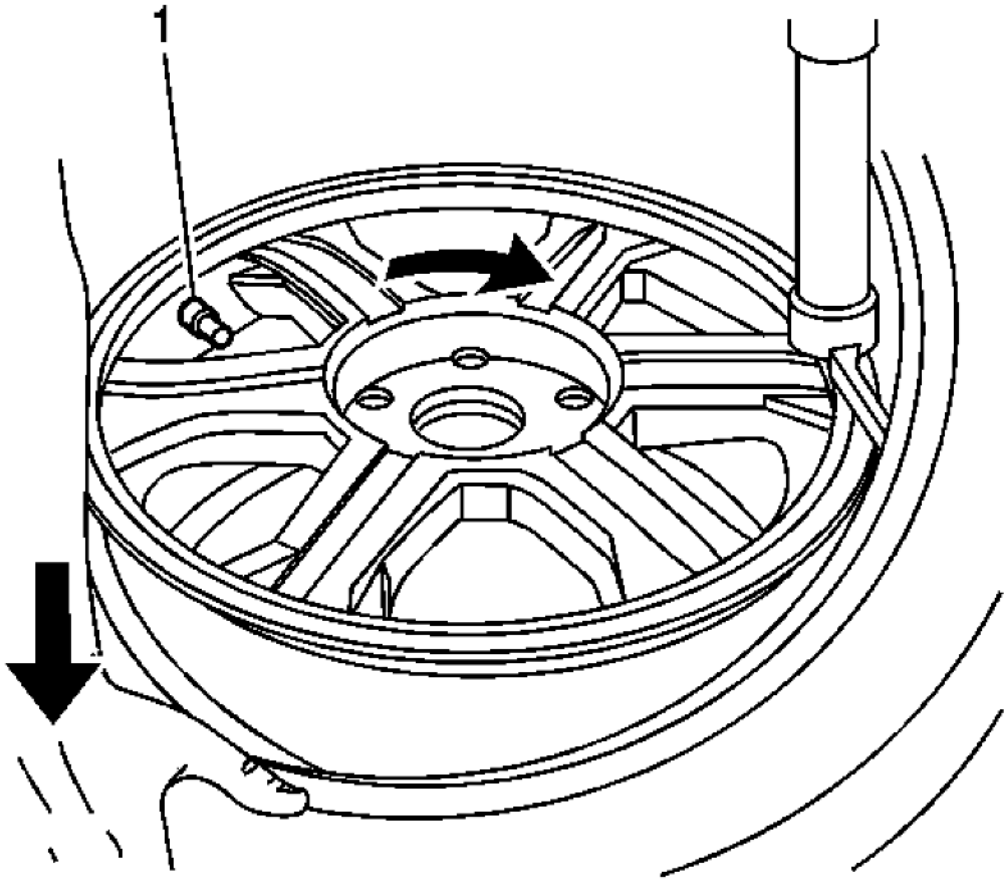


Fig. 8: Transferring Tire Bead To Inside Of Wheel Rim
Courtesy of GENERAL MOTORS CORP.

11. Using the tire machine, rotate the tire/wheel assembly clockwise when transferring the tire bead to the inside of the wheel rim. Ensure that the valve stem (1) is at the 7 o'clock position.

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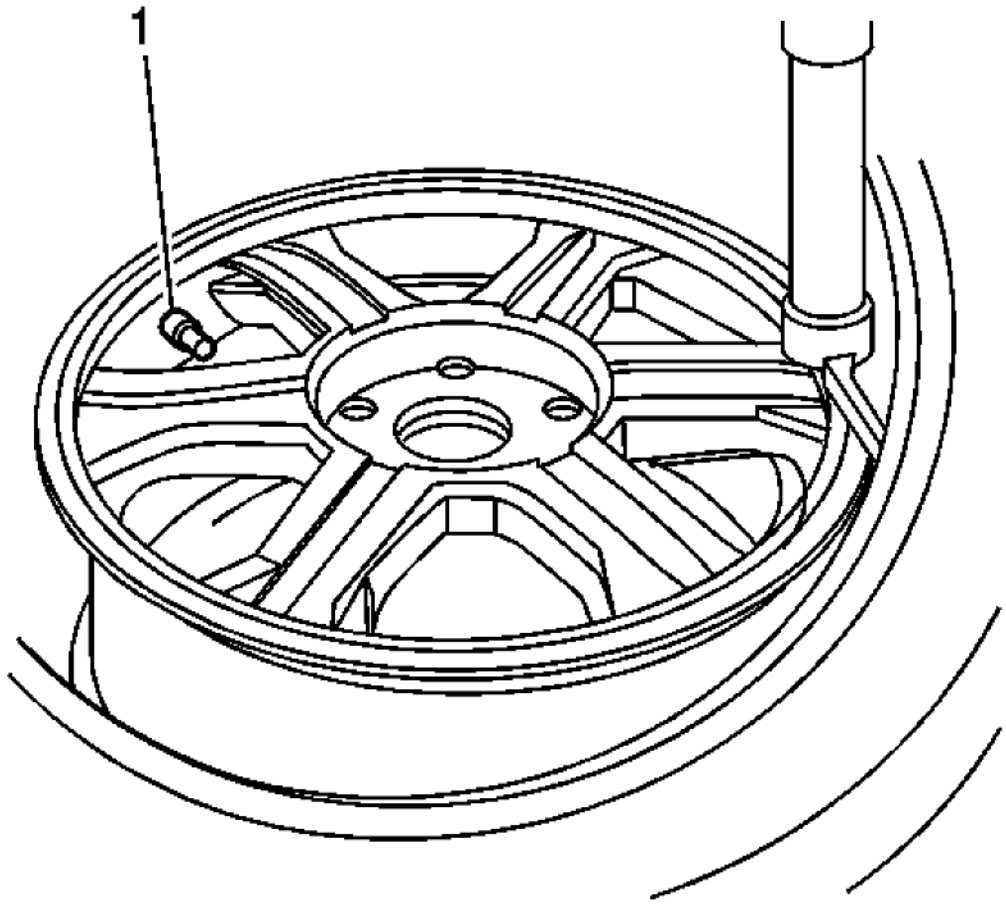


Fig. 9: Positioning Wheel & Tire
Courtesy of GENERAL MOTORS CORP.

12. After the bottom bead is on the wheel, reposition the wheel and tire so that the valve stem (1) is at the 7 o'clock position relative to the head. This will protect the sensor while mounting the tire bead to the outside of the wheel.

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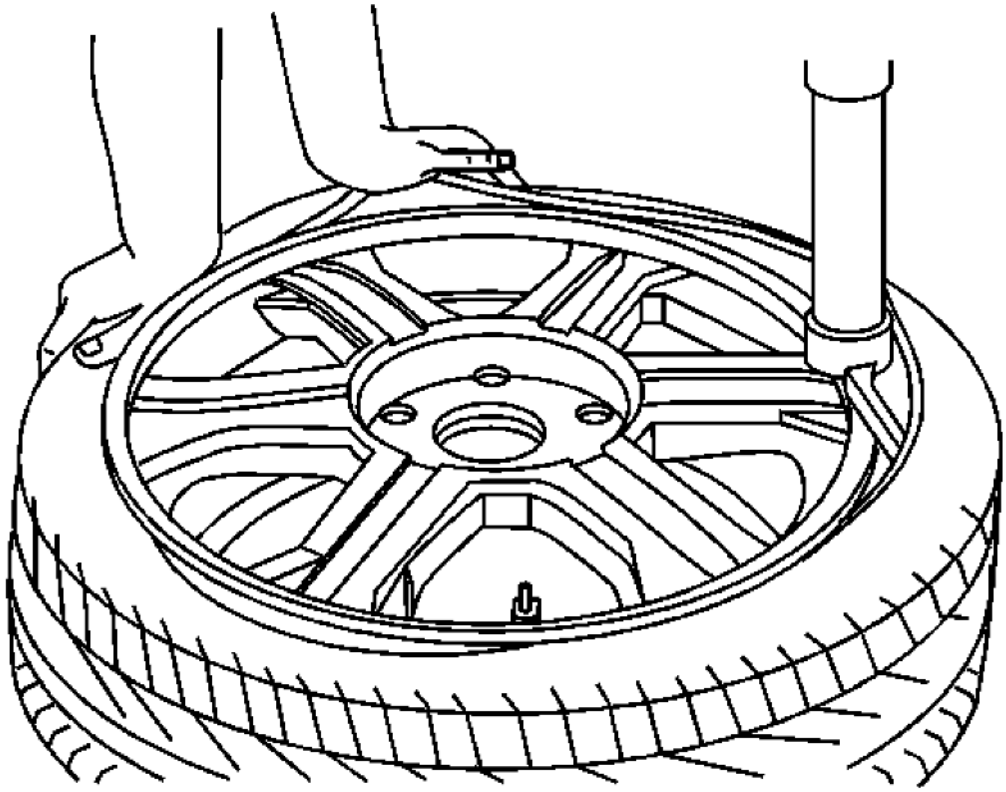


Fig. 10: Using Tire Changer
Courtesy of GENERAL MOTORS CORP.

13. Use the tire changer in order to install the tire to the wheel.

WARNING: To avoid serious personal injury, do not stand over tire when inflating. The bead may break when the bead snaps over the safety hump. Do not exceed 275 kPa (40 psi) pressure when inflating any tire if beads are not seated. If 275 kPa (40 psi) pressure will not seat the beads, deflate, relubricate the beads and reinflate. Overinflation may cause the bead to break and cause serious personal injury.

14. Inflate the tire until it passes the bead humps. Be sure that the valve core is not installed at this time.
15. Install the valve core to the valve core stem.
16. Inflate the tire to the proper air pressure.
17. Ensure that the locating rings are visible on both sides of the tire in order to verify that the tire bead is fully seated on the wheel.

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DESCRIPTION AND OPERATION

GENERAL DESCRIPTION

The factory installed tires are designed to operate satisfactorily with loads up to and including the full rated load capacity when these tires are inflated to the recommended pressures.

The following factors have an important influence on tire life:

- Correct tire pressures
- Correct wheel alignment
- Proper driving techniques
- Tire rotation

The following factors increase tire wear:

- Heavy cornering
- Excessively rapid acceleration
- Heavy braking

METRIC WHEEL NUTS AND BOLTS DESCRIPTION

Metric wheel/nuts and bolts are identified in the following way:

- The wheel/nut has the word Metric stamped on the face.
- The letter M is stamped on the end of the wheel bolt.

The thread sizes of metric wheel/nuts and the bolts are indicated by the following example: M12 x 1.5.

- M = Metric
- 12 = Diameter in millimeters
- 1.5 = Millimeters gap per thread

P-METRIC SIZED TIRES DESCRIPTION

The tire sidewall has a coded marking system, which provides information about the tire.

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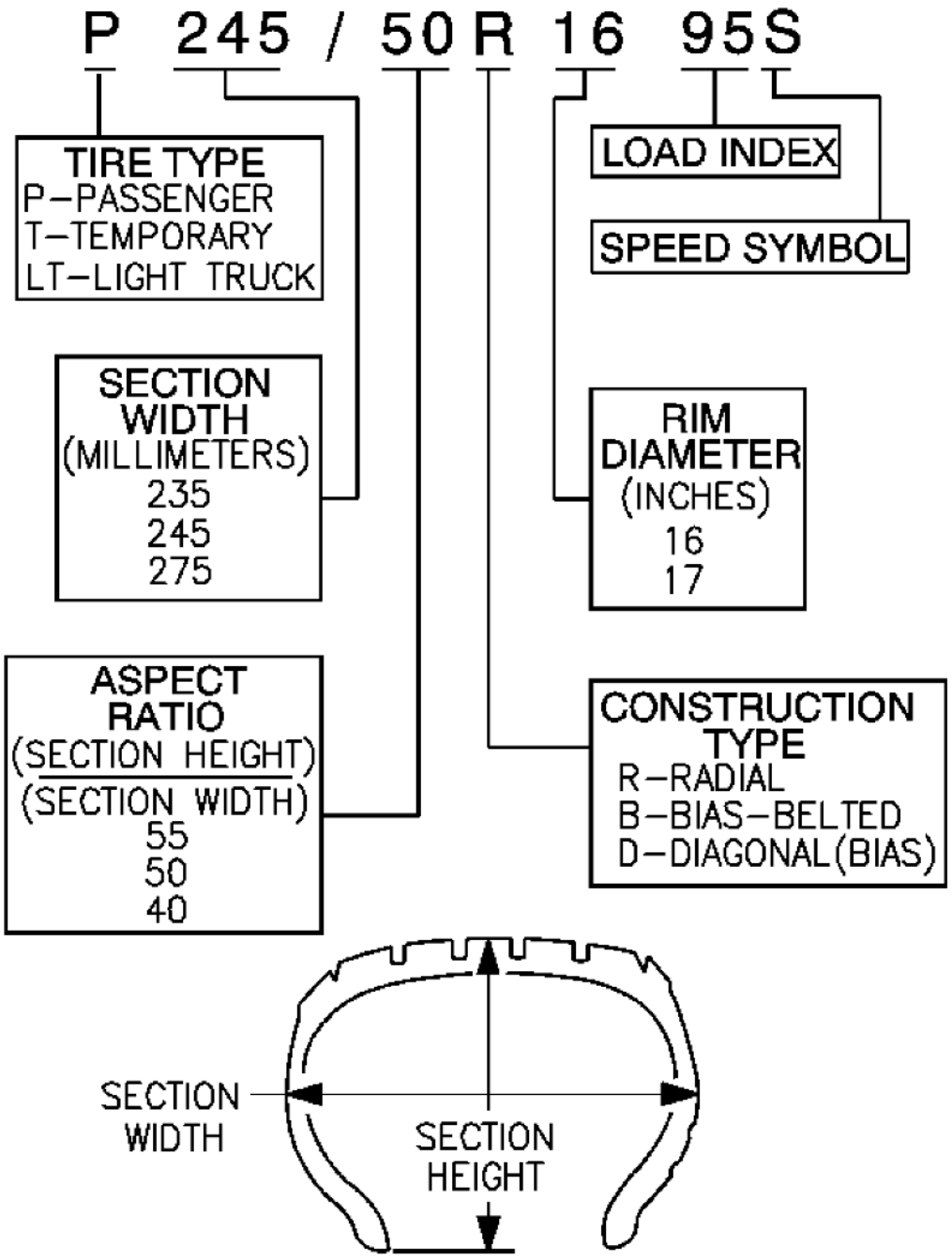


Fig. 11: Identifying P-Metric Sized Tire Marking
Courtesy of GENERAL MOTORS CORP.

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Tire Marking Example:		
P 245 50 R 16 95 S		
P	Passenger Vehicle Designation	
245	Section Width in mm (245 mm)	
50	Aspect Ratio % (Section Height to Section Width) (50 = 50%)	
R	tire Construction (R = Radial)	
16	Rim Diameter in inches (16 = 16")	
C	**NOTE:** **Some European and Japanese light truck tires use C instead of LT for the same purpose.** Service Application Code(C or LT = Light Truck or Multi-purpose Passenger Vehicle)	
95	Max Load Index	91 = 615 kg
		92 = 630 kg
		93 = 650 kg
		94 = 670 kg
		95 = 690 kg
		96 = 710 kg
		97 = 730 kg
		99 = 775 kg
		104 = 900 kg
		106 = 950 kg
S	Speed Rating	R = 170 km/h
		S = 180 km/h
		H = 210 km/h
		V = 240 km/h
		W = 270 km/h

REPLACEMENT WHEELS DESCRIPTION

Replace the wheel if any of the following conditions exist:

- The wheel exhibits excessive runout.
- The wheel is bent.
- The wheel mounting surface is bent.
- The wheel is cracked.

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Replace the wheel, the wheel hub studs and the wheel nuts, if any of the following conditions exist:

- The wheel has elongated wheel stud holes.
- The wheel nuts loosen repeatedly.

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

CAUTION: The use of non-GM original equipment wheels may cause:

- **Damage to the wheel bearing, the wheel fasteners and the wheel**
- **Tire damage caused by the modified clearance to the adjacent vehicle components**
- **Adverse vehicle steering stability caused by the modified scrub radius**
- **Damage to the vehicle caused by the modified ground clearance**
- **Speedometer and odometer inaccuracy**

NOTE:

- **Replacement wheels must be equivalent to the original equipment wheels in the following ways:**
  - **The load capacity.**
  - **The wheel diameter.**
  - **The rim width.**
  - **The wheel offset.**
  - **The mounting configuration.**
- **A wheel of the incorrect size or type may affect the following conditions:**
  - **Wheel and hub-bearing life.**
  - **Brake cooling.**
  - **Speedometer/odometer calibration.**
  - **Vehicle ground clearance.**
  - **Tire clearance to the body and the chassis.**

Aluminium wheel identification is cast into the inboard side of the wheel.

TIRE INFLATION DESCRIPTION

This vehicle has been engineered to operate up to the stated load capacity with wheel and tyre assemblies of the type, size, construction, and configuration as originally installed. Maintenance of the tyre inflation pressures is critical to the continued satisfactory performance, handling, and operating economy of the vehicle.

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Operating the vehicle with incorrectly inflated tyres can adversely affect vehicle performance and may contribute to the following:

- Reduced fuel economy
- Tyre overloading
- Reduced tyre life
- Excessive tyre wear
- Uneven tyre wear
- Vehicle handling concerns

Inspect the tyre pressures when the vehicle has not been driven for at least 3 hours or not more than 1.6 km (1 mi) and when the tyres are cool to the touch.

Replace any missing or damaged tyre valve stem extensions and/or caps to prevent the intrusion of water and contaminates.

One pound per square inch (psi) equals 6.9 kilopascals (kPa). The following table illustrates the conversion of kilopascals to pounds per square inch:

Inflation Pressure Conversion (Kilopascals to PSI)

kPa	psi	kPa	psi
140	20	215	31
145	21	220	32
155	22	230	33
160	23	235	34
165	24	240	35
170	25	250	36
180	26	275	40
185	27	310	45
190	28	345	50
200	29	380	55
205	30	415	60
Conversion: 6.9 kPa = 1 psi			

For the correct inflation pressures refer to the vehicle's tyre placard.

Tyres inflated to a higher than recommended pressure can contribute to the following conditions:

- A hard ride
- Tyre bruising
- Rapid tread wear at the center of the tyre

Tyres inflated to a lower than recommended pressure can contribute to the following conditions:

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- Tyre squeal on turns
- Hard steering
- Rapid and/or uneven wear on the outer edges of the tread
- Tyre rim bruises and tyre rim rupture
- Tyre cord breakage
- High tyre temperatures
- Sluggish vehicle handling
- Higher fuel consumption

Unequal pressure on the same axle can cause the following conditions:

- Uneven braking action
- Steering lead
- Imprecise vehicle handling

SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS

Illustration	Tool Number/ Description
	J 39544-KIT Complete Torque Socket Set-10 Pieces

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2010 SUSPENSION

Wheel Alignment - Camaro

SPECIFICATIONS

WHEEL ALIGNMENT SPECIFICATIONS

Suspension	Camber		Cross Camber (L-R)	Caster		Cross Caster (L-R)	Total Toe	Steering Wheel Angle	Thrust Angle
	Left	Right		Left	Right				
Front, RPO FE2	-0.2° ± 0.75°	-0.2° ± 0.75°	0.00° ± 0.75°	6.4° ± 0.75°	6.4° ± 0.75°	0.00° ± 0.75°	+0.20° ± 0.20°	0.00° ± 3.50°	-
Rear, RPO FE2 Without WRS	-0.75° ± 0.75°	-0.75° ± 0.75°	-	-	-	-	+0.20° ± 0.20°	-	0.00° ± 0.30°
Rear, RPO FE2 with WBS	-0.40° ± 0.75°	-0.40° ± 0.75°	-	-	-	-	+0.20° ± 0.20°	-	0.00° ± 0.30°
Front, RPO FE3	-0.8° ± 0.75°	-0.8° ± 0.75°	0.00° ± 0.75°	6.6° ± 0.75°	6.6° ± 0.75°	0.00° ± 0.75°	+0.20° ± 0.20°	0.00° ± 3.50°	-
Rear, RPO FE3	-0.4° ± 0.75°	-0.4° ± 0.75°	-	-	-	-	0.20° ± 0.20°	-	0.00° ± 0.30°

FASTENER TIGHTENING SPECIFICATIONS

Application	Specification	
	Metric	English
Front Lower Control Arm to Frame Nut	50 N.m + 150 degrees	37 lb ft + 150 degrees
Inner Tie Rod End Nut	75 N.m	55 lb ft
Rear Adjuster Link to Frame Nuts	115 N.m	85 lb ft
Rear Lower Control Arm to Frame Nuts	115 N.m	85 lb ft
Shock to Steering Knuckle	80 N.m + 180 degrees	59 lb ft + 180 degrees

DIAGNOSTIC INFORMATION AND PROCEDURES

PRELIMINARY ALIGNMENT INSPECTION

Steering and vibration complaints are not always the result of improper alignment. One possible cause is wheel and tire imbalance. Another possibility is tire lead due to worn or improperly manufactured tires. Lead/pull is defined as follows: At a constant highway speed on a typical straight road, lead/pull is the amount of effort required at the steering wheel to maintain the vehicle's straight path. Lead is the vehicle deviation from a straight path on a level road without pressure on the steering wheel. Refer to **Radial Tire Lead/Pull**

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Correction in order to determine if the vehicle has a tire lead problem.

Before performing any adjustment affecting wheel alignment, perform the following inspections in order to ensure correct alignment readings:

- Inspect for visible damage to the suspension components and replace as necessary.
- Inspect the tires for the proper inflation and irregular tire wear. Refer to **Vehicle Certification, Tire Placard, Anti-Theft, and Service Parts ID Label** and **Tire Diagnosis - Irregular or Premature Wear** .
- Inspect the runout of the wheels and the tires. Refer to **Tire and Wheel Runout Specifications** .
- Inspect the wheel bearings for backlash and excessive play. Refer to **Wheel Bearings Diagnosis** .
- Inspect the ball joints for looseness or wear.
- Inspect the tie rod ends for looseness or wear.
- Inspect the control arms and stabilizer shaft for looseness or wear.
- Inspect the steering gear for looseness at the frame. Refer to **Fastener Tightening Specifications** .
- Inspect the struts/shock absorbers for wear, leaks, and any noticeable noises. Refer to **Suspension Strut and Shock Absorber Testing - On Vehicle** .
- Inspect the vehicle trim height. Refer to **Trim Height Inspection** .
- Inspect the steering wheel for excessive drag or poor return due to stiff or rusted linkage or suspension components.
- Inspect the fuel level. The fuel tank should be full or the vehicle should have a compensating load added.

Give consideration to excess loads, such as tool boxes, sample cases, etc. If normally carried in the vehicle, these items should remain in the vehicle during alignment adjustments. Give consideration also to the condition of the equipment being used for the alignment. Follow the equipment manufacturer's instructions.

Satisfactory vehicle operation may occur over a wide range of alignment settings. However, if the setting exceeds the service allowable specifications, correct the alignment to the service preferred specifications. Refer to **Wheel Alignment Specifications**.

Perform the following steps in order to measure the front and rear alignment angles:

1. Install the alignment equipment according to the manufacturer's instructions.
2. Jounce the front and the rear bumpers 3 times prior to checking the wheel alignment.

REPAIR INSTRUCTIONS

WHEEL ALIGNMENT MEASUREMENT

Steering and vibration complaints are not always the result of improper alignment. One possible cause is wheel and tire imbalance. Another possibility is tire lead due to worn or improperly manufactured tires. Lead/pull is defined as follows: At a constant highway speed on a typical straight road, lead/pull is the amount of effort required at the steering wheel to maintain the vehicle's straight path. Lead is the vehicle deviation from a straight path on a level road without pressure on the steering wheel. Refer to **Radial Tire Lead/Pull**

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Correction in order to determine if the vehicle has a tire lead problem.

Before performing any adjustment affecting wheel alignment, perform the following inspections in order to ensure correct alignment readings:

- Inspect for visuable damage to the suspension components and replace as necessary.
- Inspect the tires for the proper inflation and irregular tire wear. Refer to **Vehicle Certification, Tire Placard, Anti-Theft, and Service Parts ID Label** and **Tire Diagnosis - Irregular or Premature Wear** .
- Inspect the runout of the wheels and the tires. Refer to **Tire and Wheel Runout Specifications** .
- Inspect the wheel bearings for backlash and excessive play. Refer to **Wheel Bearings Diagnosis** .
- Inspect the ball joints for looseness or wear.
- Inspect the tie rod ends for looseness or wear.
- Inspect the control arms and stabilizer shaft for looseness or wear.
- Inspect the steering gear for looseness at the frame. Refer to **Fastener Tightening Specifications** .
- Inspect the struts/shock absorbers for wear, leaks, and any noticeable noises. Refer to **Suspension Strut and Shock Absorber Testing - On Vehicle** .
- Inspect the vehicle trim height. Refer to **Trim Height Inspection** .
- Inspect the steering wheel for excessive drag or poor return due to stiff or rusted linkage or suspension components.
- Inspect the fuel level. The fuel tank should be full or the vehicle should have a compensating load added.

Give consideration to excess loads, such as tool boxes, sample cases, etc. If normally carried in the vehicle, these items should remain in the vehicle during alignment adjustments. Give consideration also to the condition of the equipment being used for the alignment. Follow the equipment manufacturer's instructions.

Satisfactory vehicle operation may occur over a wide range of alignment settings. However, if the setting exceeds the service allowable specifications, correct the alignment to the service preferred specifications. Refer to **Wheel Alignment Specifications**.

Perform the following steps in order to measure the front and rear alignment angles:

1. Install the alignment equipment according to the manufacturer's instructions.
2. Jounce the front and the rear bumpers 3 times prior to checking the wheel alignment.

NOTE:

- **Record the "Before" and "After" alignment measurements.**
- **When performing adjustments to vehicles requiring a 4-wheel alignment, set the rear toe adjustment first in order to obtain proper front alignment angles.**

3.

FRONT CAMBER ADJUSTMENT

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Adjustment Procedure

1. Before performing any adjustment affecting the wheel alignment, refer to **Wheel Alignment Measurement**.
2. Loosen the strut to the knuckle bolts. Refer to **Strut Assembly Replacement** .

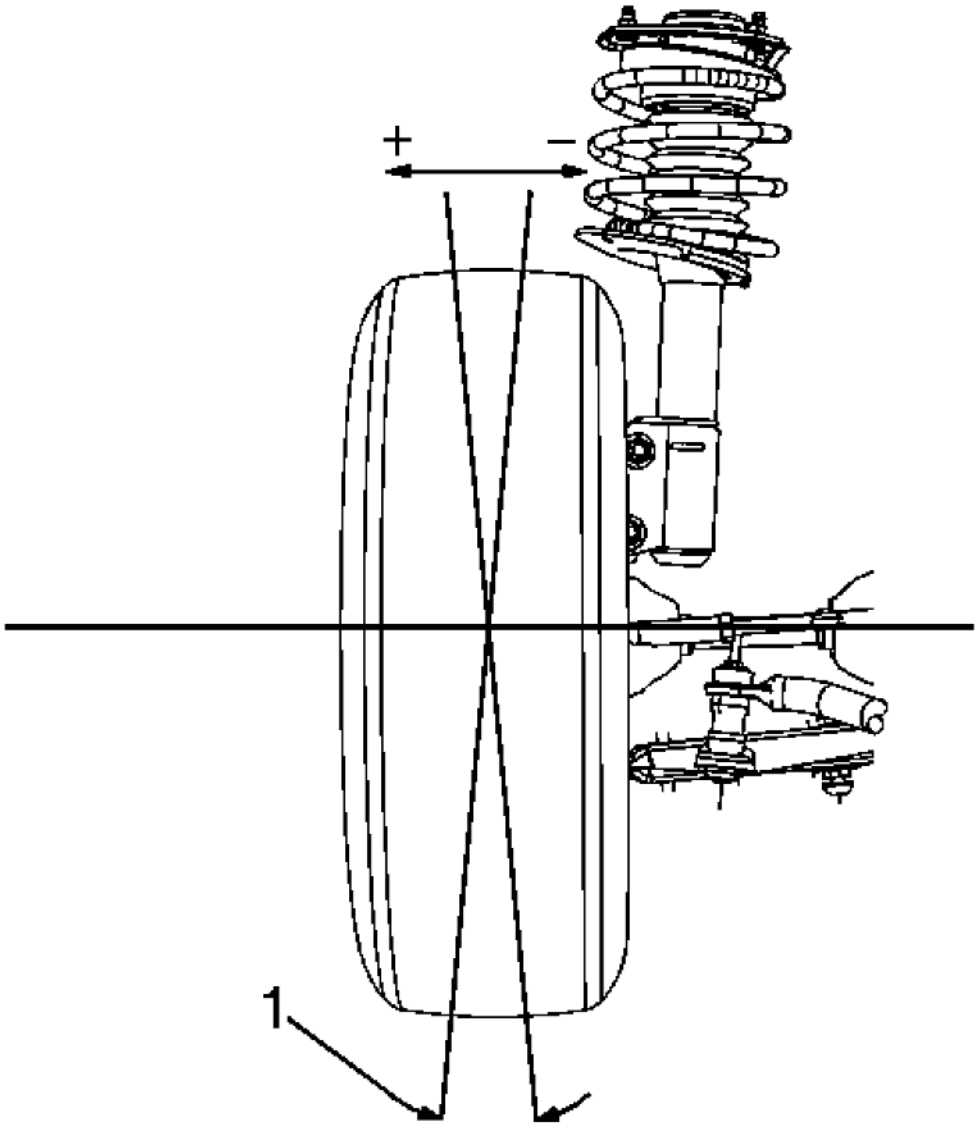


Fig. 1: Front Camber
Courtesy of GENERAL MOTORS CORP.

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CAUTION: Refer to Fastener Caution .

3. Adjust the front camber (1) and tighten the strut-to-knuckle nuts to 80 N.m (59 lb ft) plus 180 degrees.

NOTE: After adjusting the front camber, it is necessary to adjust the front toe.

4. Adjust the front toe. Refer to **Wheel Alignment - Steering Wheel Angle and/or Front Toe Adjustment**.

WHEEL ALIGNMENT - STEERING WHEEL ANGLE AND/OR FRONT TOE ADJUSTMENT

1. Before performing any adjustment affecting the wheel alignment, refer to **Wheel Alignment Measurement**.

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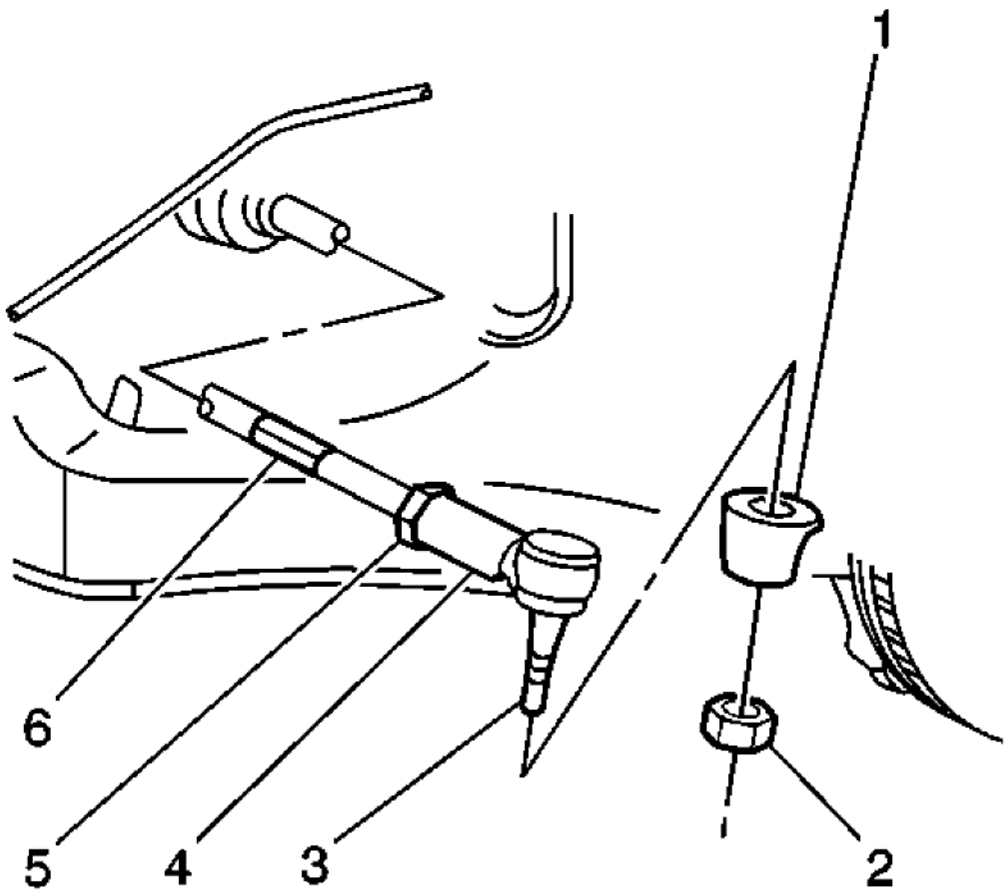


Fig. 2: View Of Tie Rod Jam Nut & Adjuster
Courtesy of GENERAL MOTORS CORP.

2. Ensure that the steering wheel is set in a straight ahead position.
3. Loosen the tie rod jam nut (5).
4. Adjust the toe to specification by turning the adjuster (6). Refer to **Wheel Alignment Specifications**.

CAUTION: Refer to Fastener Caution .

5. Install the tie rod jam nut (5) and tighten to 68 N.m(50 lb ft).

REAR CAMBER ADJUSTMENT

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WARNING: **To avoid any vehicle damage, serious personal injury or death when major components are removed from the vehicle and the vehicle is supported by a hoist, support the vehicle with jack stands at the opposite end from which the components are being removed and strap the vehicle to the hoist.**

WARNING: **Refer to Safety Glasses Warning .**

1. Before performing any adjustment affecting the wheel alignment, refer to **Wheel Alignment Measurement**.
2. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .

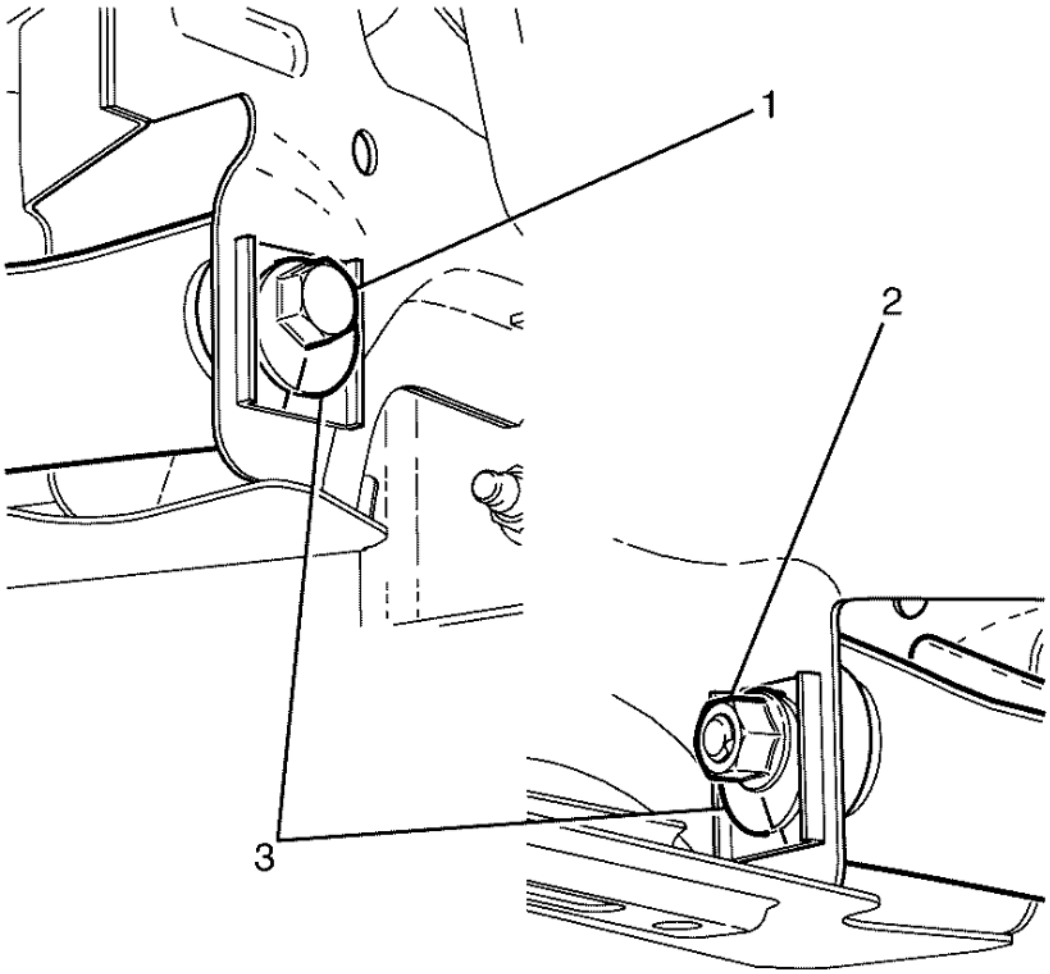


Fig. 3: Identifying Lower Control Arm To Subframe Retaining Bolt & Nut

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Courtesy of GENERAL MOTORS CORP.

NOTE:

- **The lower control arm to the subframe retaining bolt (1) and nut (2) eccentric washers (3) are used to adjust rear suspension camber.**
- **Nuts with micro-encapsulated thread sealant must be discarded after removal.**

3. Remove the lower control arm to the subframe retaining nut (2). Discard the nut.

NOTE: The lower control arm to the subframe retaining nut (2) is not to be fully tightened until after the rear suspension camber has been adjusted.

4. Install NEW lower control arm to the subframe retaining nut (2).

   Do not fully tighten at this stage.

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

NOTE: Before checking and adjusting any wheel alignment angles bounce the vehicle to settle the suspension at normal ride height.

7. Bounce the vehicle several times to settle the suspension.
8. Determine the actual rear suspension camber angle.
9. Adjust the rear suspension camber to specification by turning the lower control arm to subframe retaining bolt (1). For rear suspension camber specifications, refer to **Wheel Alignment Specifications**.

CAUTION: Refer to Fastener Caution .

NOTE:

- **The weight of the vehicle must be on a level surface such as an alignment rack and on all four wheels before fully tightening the bolts and nuts that have been partially tightened. Failure to comply with this requirement may adversely affect the ride and handling characteristics of the vehicle.**
- **Do not allow the lower control arm to subframe retaining bolt (1) to turn while tightening.**

10. Tighten the lower control arm to subframe retaining bolt (1) and nut (2) to 175 N.m (129 lb ft).
11. Verify that camber is still within specifications. Refer to **Wheel Alignment Specifications**.
12. If further adjustment is required, adjust as necessary.

REAR TOE ADJUSTMENT

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1. Before performing any adjustment affecting the wheel alignment, refer to **Wheel Alignment Measurement**.
2. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
3. Remove the safety stands.
4. Lower the vehicle to the ground.

NOTE: **Before checking and adjusting any wheel alignment angles bounce the vehicle to settle the suspension to normal ride height.**

5. Bounce the vehicle several times to settle the suspension.
6. Determine the actual rear suspension toe setting.

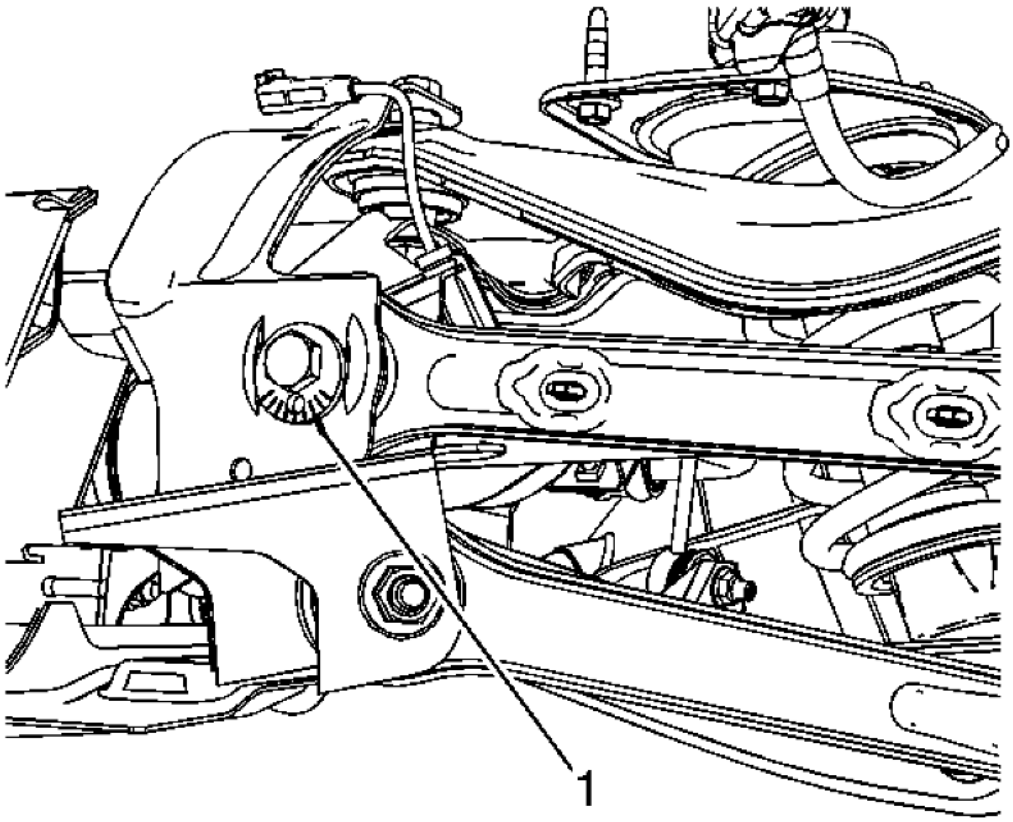


Fig. 4: Adjustment Cam
Courtesy of GENERAL MOTORS CORP.

7. Adjust the rear suspension toe to specification by turning adjustment cam (1). Refer to **Wheel Alignment**

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Specifications.

CAUTION: Refer to Fastener Caution .

NOTE: The weight of the vehicle must be on a level surface such as an alignment rack and on all four wheels before fully tightening the bolts and nuts that have been partially tightened. Failure to comply with this requirement may adversely affect the ride and handling characteristics of the vehicle.

8. Tighten the adjuster link nut to 115 N.m (85 lb ft).
9. Verify that the toe is still within specifications. Refer to **Wheel Alignment Specifications**.
10. Readjust if necessary.

DESCRIPTION AND OPERATION

CAMBER DESCRIPTION

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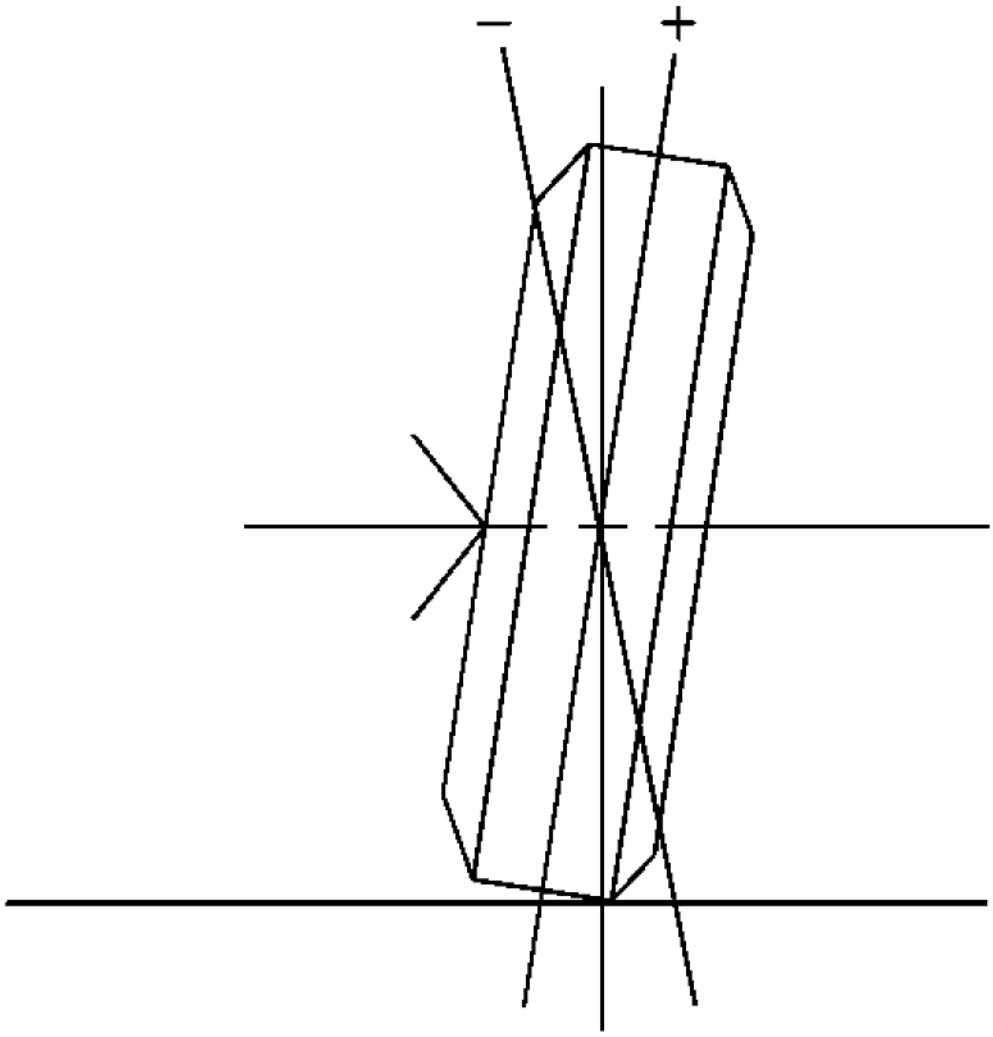


Fig. 5: Illustrating Camber Angle
Courtesy of GENERAL MOTORS CORP.

Camber is the tilting of the wheels from the vertical when viewed from the front of the vehicle. When the wheels tilt outward at the top, the camber is positive (+). When the wheel tilts inward at the top, the camber is negative (-). The amount of tilt is measured in degrees from the vertical. Camber settings influence the directional control and the tire wear.

Too much positive camber will result in premature wear on the outside of the tire and cause excessive wear on the suspension parts.

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Too much negative camber will result in premature wear on the inside of the tire and cause excessive wear on the suspension parts.

Unequal side-to-side camber of 1 degree or more will cause the vehicle to pull or lead to the side with the most positive camber.

CASTER DESCRIPTION

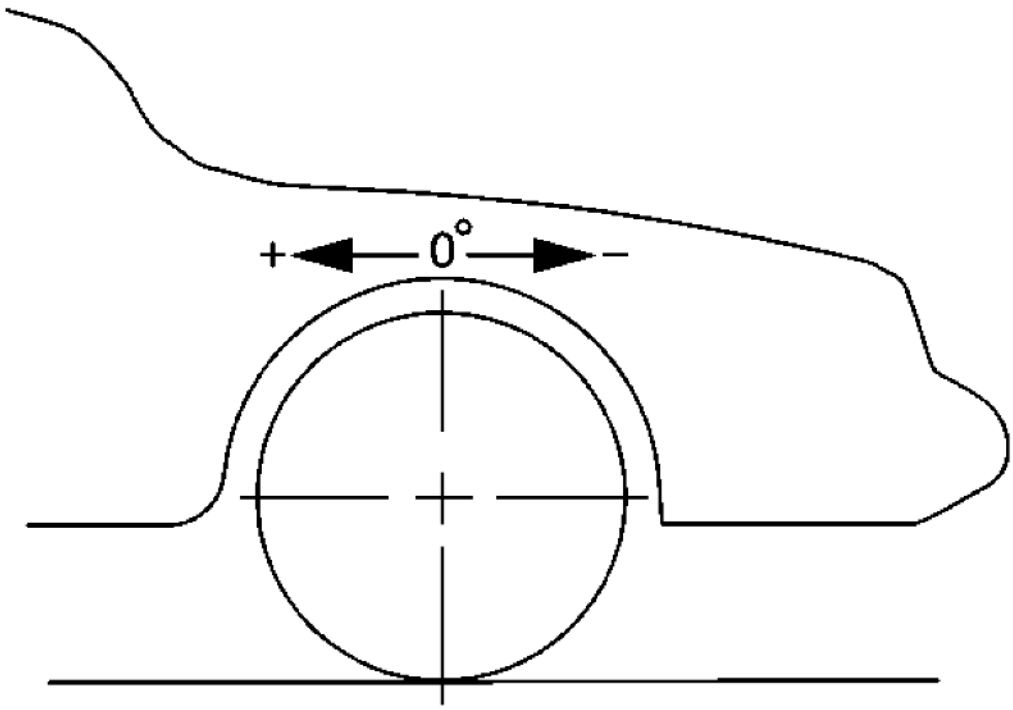


Fig. 6: Illustrating Caster Angle
Courtesy of GENERAL MOTORS CORP.

Caster is the tilting of the uppermost point of the steering axis either forward or backward, when viewed from the side of the vehicle. A backward tilt is positive (+) and a forward tilt is negative (-). Caster influences directional control of the steering but does not affect the tire wear. Caster is affected by the vehicle height, therefore it is important to keep the body at its designed height. Overloading the vehicle or a weak or sagging rear spring will affect caster. When the rear of the vehicle is lower than its designated trim height, the front suspension moves to a more positive caster. If the rear of the vehicle is higher than its designated trim height, the front suspension moves to a less positive caster.

With too little positive caster, steering may be touchy at high speed and wheel returnability may be diminished when coming out of a turn. If one wheel has more positive caster than the other, that wheel will pull toward the

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center of the vehicle. This condition will cause the vehicle to pull or lead to the side with the least amount of positive caster.

LEAD/PULL DESCRIPTION

At a constant highway speed on a typical straight road, lead/pull is the amount of effort required at the steering wheel to maintain the vehicle's straight path.

IMPORTANT: Vehicles will tend to lead/pull in the direction of the road slope as part of normal operation.

Lead/pull is usually caused by the following factors:

- Road slope
- Variability in tire construction
- Wheel alignment (front cross caster and camber)
- Unbalanced steering gear
- Electronic Power Steering (EPS) steering position and torque sensors not calibrated correctly, if equipped.

MEMORY STEER DESCRIPTION

Memory steer is when the vehicle wants to lead or pull in the direction the driver previously turned the vehicle. Additionally, after turning in the opposite direction, the vehicle will want to lead or pull in that direction.

SCRUB RADIUS DESCRIPTION

Ideally, the scrub radius is as small as possible. Normally, the SAI angle and the centerline of the tire and the wheel intersect below the road surface, causing a positive scrub radius. With struts, the SAI angle is much larger than the long arm/short arm type of suspension. This allows the SAI angle to intersect the camber angle above the road surface, forming a negative scrub radius. The smaller the scrub radius, the better the directional stability. Installing aftermarket wheels that have additional offset will dramatically increase the scrub radius. The newly installed wheels may cause the centerline of the tires to move further away from the spindle. This will increase the scrub radius.

A large amount of scrub radius can cause severe shimmy after hitting a bump. Four-wheel drive vehicles with large tires use a steering damper to compensate for an increased scrub radius. Scrub radius is not directly measurable by the conventional methods. Scrub radius is projected geometrically by engineers during the design phase of the suspension.

SETBACK DESCRIPTION

Setback applies to both the front and the rear wheels. Setback is the amount that one wheel may be aligned behind the other wheel. Setback may be the result of a road hazard or a collision. The first clue is a caster difference from side-to-side of more than 1 degree.

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THRUST ANGLES DESCRIPTION

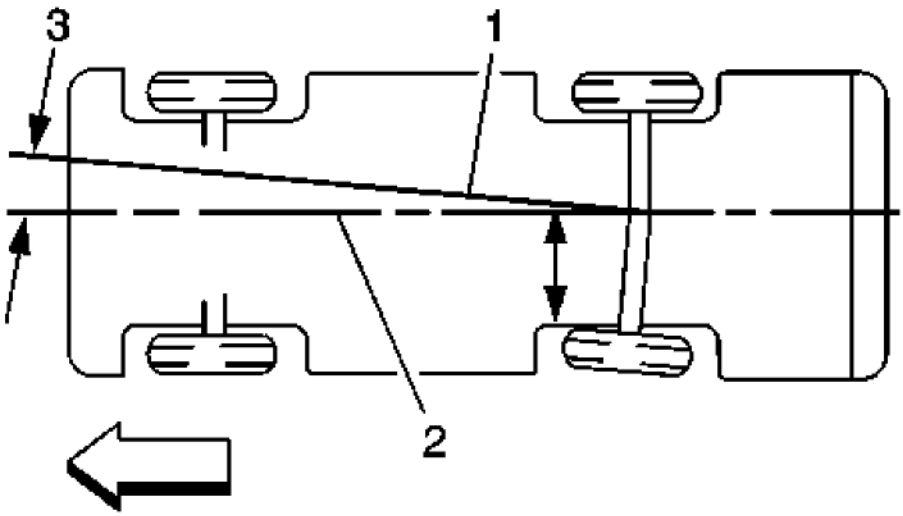


Fig. 7: Illustrating Thrust Angles
Courtesy of GENERAL MOTORS CORP.

The front wheels aim or steer the vehicle. The rear wheels control tracking. This tracking action relates to the thrust angle (3). The thrust angle is the path that the rear wheels take. Ideally, the thrust angle is geometrically aligned with the body centerline (2).

In the illustration, toe-in is shown on the left rear wheel, moving the thrust line (1) off center. The resulting deviation from the centerline is the thrust angle.

If the thrust angle is not set properly the vehicle may "dog track", the steering wheel may not be centered or it could be perceived as a bent axle. Thrust angle can be checked during a wheel alignment.

Positive thrust angle means the thrust line is pointing to the right hand side (RHS) of the vehicle.

Negative thrust angle means the thrust line is pointing to the left hand side (LHS) of the vehicle.

If the thrust angle is out of specification, moving the axle to body relationship will change the thrust angle reading.

If the vehicle is out in the Positive (+) direction-moving the RHS forward and/or LHS rearward will move the thrust angle towards zero degrees.

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If the vehicle is out in the Negative (-) direction-moving the RHS rearward and/or LHS forward will move the thrust angle towards zero degrees.

TOE DESCRIPTION

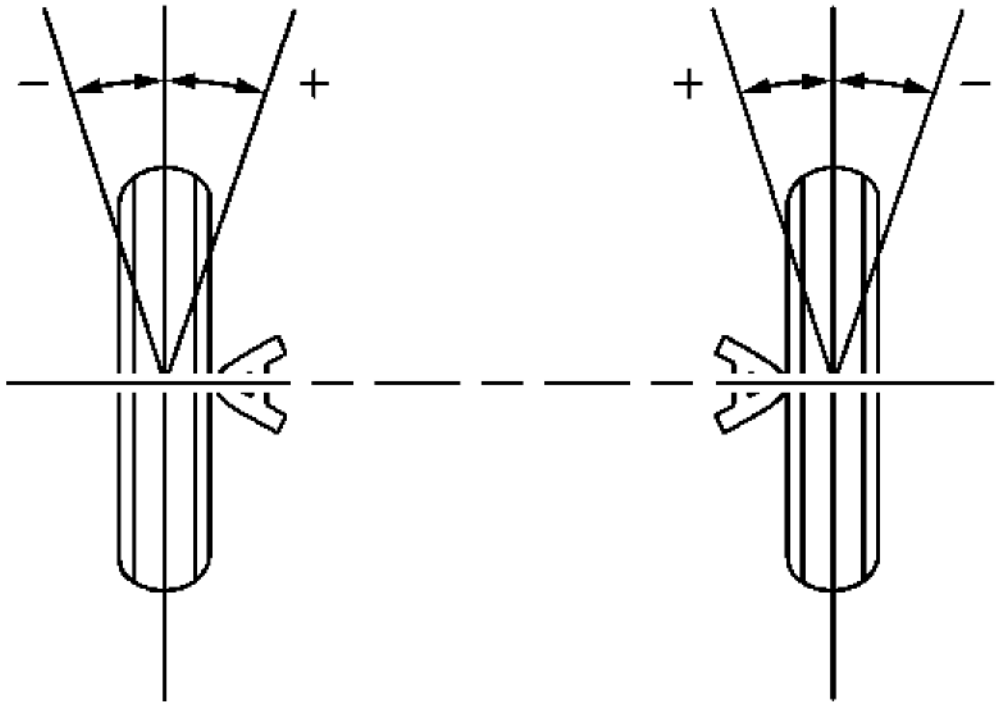


Fig. 8: Illustrating Toe Angle
Courtesy of GENERAL MOTORS CORP.

Toe is a measurement of how much the front and/or rear wheels are turned in or out from a straight-ahead position. When the wheels are turned in, toe is positive (+). When the wheels are turned out, toe is negative (-). The actual amount of toe is normally only a fraction of a degree. The purpose of toe is to ensure that the wheels roll parallel.

Toe also offsets the small deflections of the wheel support system that occur when the vehicle is rolling forward. In other words, with the vehicle standing still and the wheels set with toe-in, the wheels tend to roll parallel on the road when the vehicle is moving.

Improper toe adjustment will cause premature tire wear and cause steering instability.

TORQUE STEER DESCRIPTION

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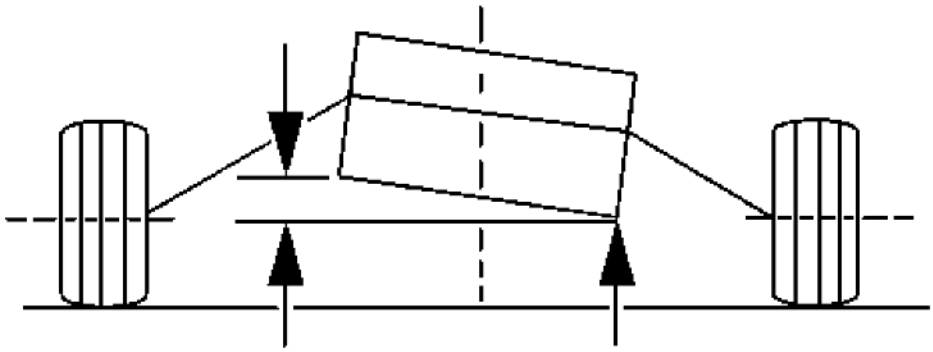


Fig. 9: Identifying Torque Steer
Courtesy of GENERAL MOTORS CORP.

A vehicle pulls or leads in one direction during hard acceleration. A vehicle pulls or leads in the other direction during deceleration.

The following factors may cause torque steer to be more apparent on a particular vehicle:

- A slightly smaller diameter tire on the right front increases a right torque lead. Inspect the front tires for differences in the brand, the construction, or the size. If the tires appear to be similar, change the front tires from side-to-side and retest the vehicle. Tire and wheel assemblies have the most significant effect on torque steer correction.
- A large difference in the right and left front tire pressure
- Left-to-right differences in the front view axle angle may cause significant steering pull in a vehicle. The pull will be to the side with the most downward sloping axle from the differential to the wheels. Axles typically slope downward from the differential. The slope of the transaxle pan to level ground may be used as an indication of bias axle angles. The side with the higher transaxle pan, shown on the left side of the illustration, has the most downward sloping axle angle.

WANDER DESCRIPTION

Wander is the undesired drifting or deviation of a vehicle to either side from a straight path with hand pressure on the steering wheel. Wander is a symptom of the vehicle's sensitivity to external disturbances, such as road crown and crosswind, and accentuated by poor on-center steering feel.

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2010 TRANSMISSION

Clutch - Camaro

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Application	Specification	
	Metric	English
Clutch Pedal Assembly to Brake Pedal Assembly Nuts	20 N.m	15 lb ft
Clutch Pedal Assembly to Cowl Nut	9 N.m	80 lb in
Clutch Pedal Assembly Bolt	20 N.m	15 lb ft
Clutch Pedal Position Switch Bolt	2.5 N.m	22 lb in
Clutch Pressure Plate Bolt	30 N.m plus 20 degrees	22 lb ft plus 20 degrees
Concentric Slave Cylinder Bolt	20 N.m	15 lb ft
Concentric Slave Cylinder Quick Connector Bolt	10 N.m	89 lb in

ADHESIVES, FLUIDS, LUBRICANTS, AND SEALERS

Application	Type of Material	GM Part Number	
		United States	Canada
Clutch Hydraulic Fluid	DOT 3 Brake Fluid	12377967	89021320

DIAGNOSTIC INFORMATION AND PROCEDURES

SYMPTOMS - CLUTCH

Strategy Based Diagnostics

Review the system operations in order to familiarize yourself with the system functions. Refer to **Clutch System Description and Operation**.

Visual/Physical Inspection

- Inspect the easily accessible or visible system components for obvious damage or conditions which could cause the symptom.
- Visually inspect the clutch master cylinder reservoir for the correct fluid level. Do not open.
- Inspect the hydraulic clutch lines for dents, kinks or other obvious damage that may affect the clutch system operations.
- Inspect the hydraulic lines for proper installation.
- Inspect the clutch system for contamination of dirt, oil, or other substances that may affect the clutch system operations.

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