

Suspension

Front Suspension - CTS Coupe & Wagon

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Lower Ball Joint to Knuckle Nut		
• First Pass	40	30 lb ft
• Final Pass	Plus 120 Degrees	
Lower Control Arm to Cradle Bolt - Front (With Rear Wheel Drive)	200	148 lb ft
Lower Control Arm to Cradle Bolt - Rear (With Rear Wheel Drive)	320	236 lb ft
Lower Control Arm to Cradle Nut- Front (With All Wheel Drive)		
• First Pass	90	66 lb ft
• Final Pass	Plus 140 Degrees	
Lower Control Arm to Cradle Nut- Rear (With All Wheel Drive)		
• First Pass	90	66 lb ft
• Final Pass	Plus 95 Degrees	
Shock Absorber Nut	25	18 lb ft
Shock Module to Body Bolt	112	83 lb ft
Shock Module to Lower Control Arm Bolt (With Rear Wheel Drive)	25	18 lb ft
Shock Module to Shock Module Yoke Bolt (With All Wheel Drive)	90	66 lb ft
Shock Module Yoke to Lower Control Arm Bolt (With All Wheel Drive)	180	133 lb ft
Stabilizer Shaft Clamp Bolt (With All Wheel Drive)	100	74 lb ft
Stabilizer Shaft Clamp Bolt (With Rear Wheel Drive)	65	48 lb ft
Stabilizer Shaft Link Nut - (AWD Upper and Lower)	125	92 lb ft
Stabilizer Shaft Link Nut - (Upper RWD)	125	92 lb ft
Stabilizer Shaft Link Nut - (Lower RWD)	100	74 lb ft
Upper Control Arm Ball Joint Nut	80	59 lb ft
Upper Control Arm To Steering Knuckle Pinch Bolt	60	44 lb ft
Wheel Bearing/Hub to Knuckle Bolt	135	100 lb ft

REPAIR INSTRUCTIONS

STABILIZER SHAFT REPLACEMENT (AWD)

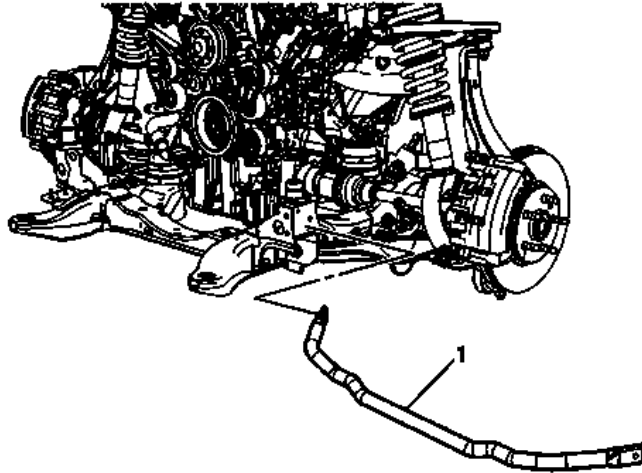


Fig. 1: Identifying Stabilizer Shaft (AWD)

Courtesy of GENERAL MOTORS COMPANY

Stabilizer Shaft Replacement (AWD)

Callout	Component Name
Preliminary Procedure	
1. Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> .	
2. Remove the tire and wheel assembly. Refer to <u>Tire and Wheel Removal and Installation</u> .	
3. Remove the stabilizer shaft insulators. Refer to <u>Stabilizer Shaft Insulator Replacement (AWD)</u> .	
1	Stabilizer Shaft TIP: It maybe necessary to maneuver the stabilizer shaft in order to remove it from the vehicle.

STABILIZER SHAFT REPLACEMENT (RWD)

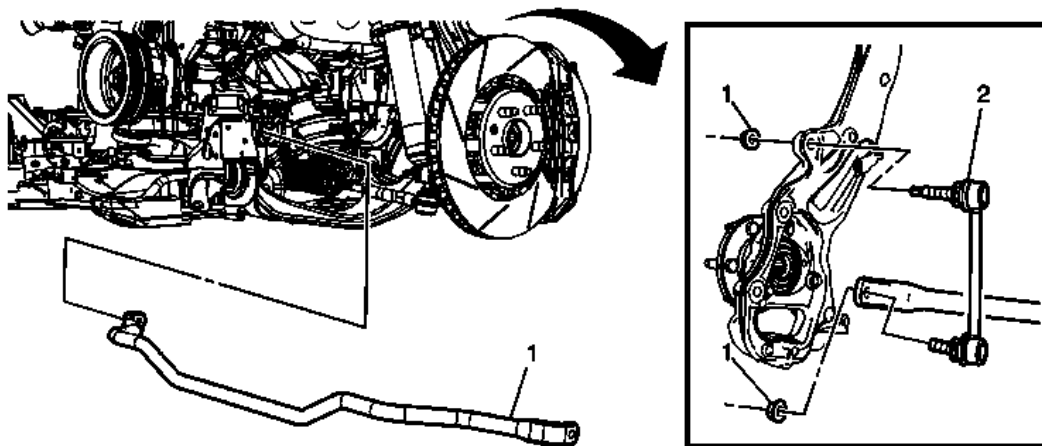


Fig. 2: Identifying Stabilizer Shaft (RWD)
Courtesy of GENERAL MOTORS COMPANY

Stabilizer Shaft Replacement (RWD)

Callout	Component Name
Preliminary Procedure 1. Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> . 2. Remove the tire and wheel assembly. Refer to <u>Tire and Wheel Removal and Installation</u> . 3. Remove the stabilizer insulators and brackets. Refer to <u>Stabilizer Shaft Insulator Replacement (RWD)</u>	
1	Stabilizer Shaft Nut (Qty: 4) CAUTION: Refer to <u>Fastener Caution</u> . Tighten • Nut to Stabilizer Shaft 100 N.m (74 lb ft) • Nut to Steering Knuckle 125 N.m (92 lb ft)
2	Stabilizer Shaft TIP: It maybe necessary to maneuver the stabilizer shaft in order to remove it from the vehicle.

STABILIZER SHAFT LINK REPLACEMENT (AWD)

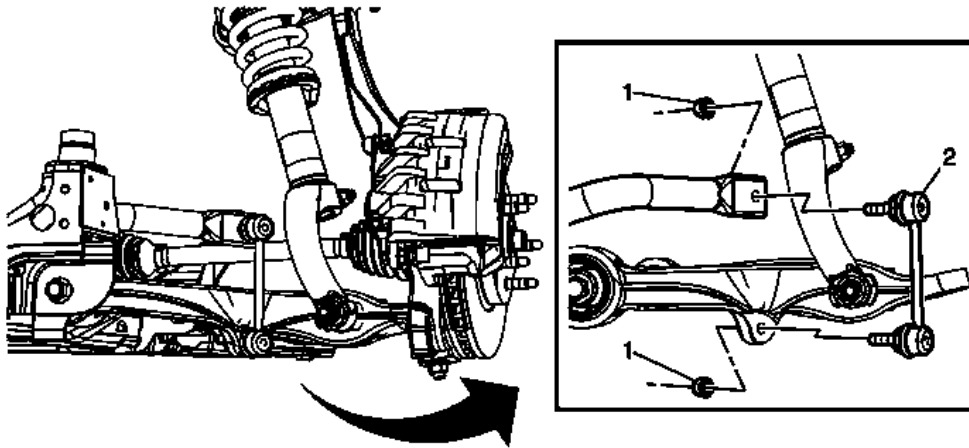


Fig. 3: Identifying Stabilizer Shaft Link (AWD)
 Courtesy of GENERAL MOTORS COMPANY

Stabilizer Shaft Link Replacement (AWD)

Callout	Component Name
Preliminary Procedure	
1. Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> . 2. Remove the tire and wheel assembly. Refer to <u>Tire and Wheel Removal and Installation</u> .	
1	Front Stabilizer Shaft Link Nut (Qty: 4) CAUTION: Refer to <u>Fastener Caution</u> . Tighten • At the stabilizer shaft end 125 N.m (92 lb ft) • At the lower control arm end 125 N.m (92 lb ft)
2	Front Stabilizer Shaft Link

STABILIZER SHAFT LINK REPLACEMENT (RWD)

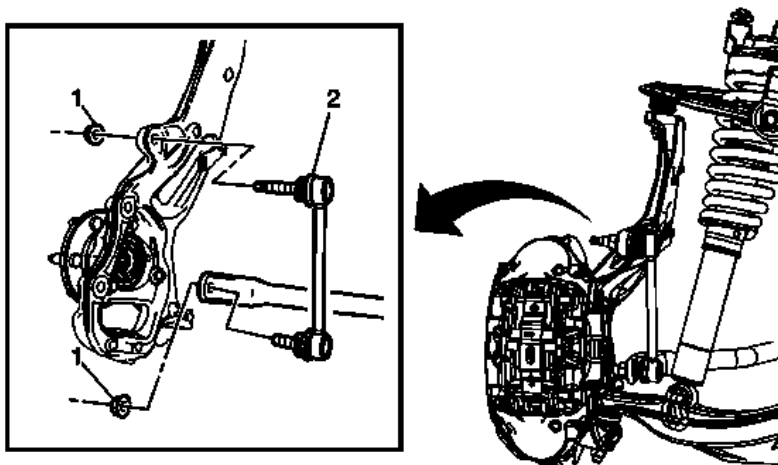


Fig. 4: Identifying Stabilizer Shaft Link (RWD)
 Courtesy of GENERAL MOTORS COMPANY

Stabilizer Shaft Link Replacement (RWD)

Callout	Component Name
Preliminary Procedure	
1. Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> 2. Remove the tire and wheel assembly. Refer to <u>Tire and Wheel Removal and Installation</u>	
1	Front Stabilizer Shaft Link Nut (Qty: 4) CAUTION: Refer to <u>Fastener Caution</u> . Tighten • At the stabilizer shaft 100 N.m (74 lb ft) • At the steering knuckle 125 N.m (92 lb ft)
2	Front Stabilizer Shaft Link

STABILIZER SHAFT INSULATOR REPLACEMENT (RWD)

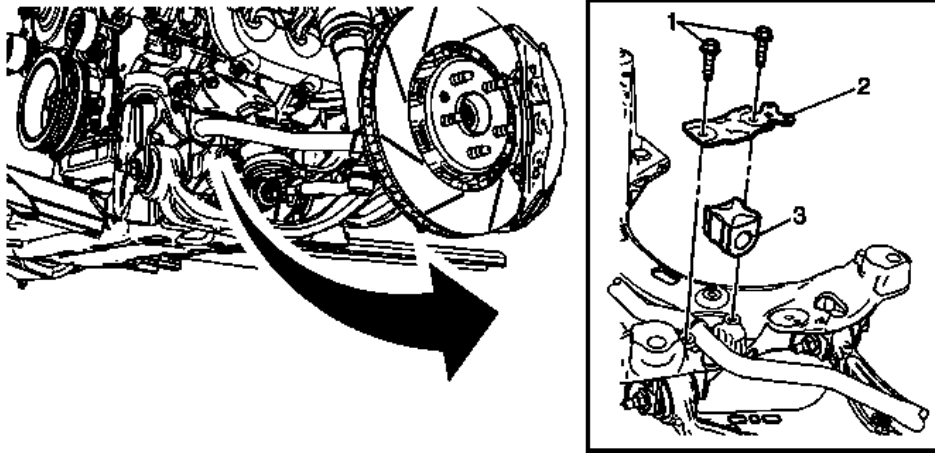


Fig. 5: Identifying Stabilizer Shaft Insulator (RWD)

Courtesy of GENERAL MOTORS COMPANY

Stabilizer Shaft Insulator Replacement (RWD)

Callout	Component Name
Preliminary Procedure 1. Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> . 2. Remove the tire and wheel assembly. Refer to <u>Tire and Wheel Removal and Installation</u> .	
1	Stabilizer Shaft Insulator Bolts (Qty: 4) CAUTION: Refer to <u>Fastener Caution</u> . Tighten 65 N.m (48 lb ft).
2	Front Stabilizer Shaft Insulator Clamp (Qty: 2)
3	Stabilizer Shaft insulator (Qty: 2) • Rotate the stabilizer shaft upward slight to remove and install the stabilizer shaft insulator. • When installing stabilizer shaft insulator, ensure that the split of the insulator is facing the rear of the vehicle.

STABILIZER SHAFT INSULATOR REPLACEMENT (AWD)

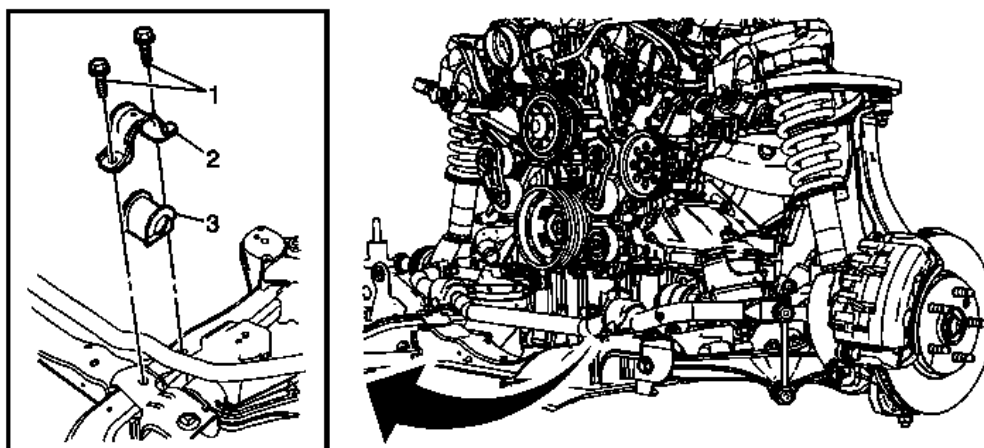


Fig. 6: Identifying Stabilizer Shaft Insulator (AWD)
Courtesy of GENERAL MOTORS COMPANY

Stabilizer Shaft Insulator Replacement (AWD)

Callout	Component Name
Preliminary Procedure	
1. Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> . 2. Remove the tire and wheel assembly. Refer to <u>Tire and Wheel Removal and Installation</u>	
1	Stabilizer Shaft Clamp Bolt (Qty: 4) CAUTION: Refer to <u>Fastener Caution</u> . Tighten 100 N.m (74 lb ft)
2	Stabilizer Shaft Clamp (Qty: 2)
3	Stabilizer Shaft Insulator (Qty: 2) • Rotate the stabilizer shaft upward to remove and install the stabilizer shaft insulator. • When installing the stabilizer shaft insulator, ensure that the split in the insulator is facing the rear of the vehicle.

FRONT WHEEL BEARING AND HUB REPLACEMENT (AWD)

Removal Procedure

1. Raise the vehicle. Refer to **Lifting and Jacking the Vehicle** .
2. Remove the tire and wheel. Refer to **Tire and Wheel Removal and Installation** .
3. Separate the wheel driveshaft from the knuckle.

- For the left side, refer to Front Wheel Drive Shaft Replacement - Left Side .
 - For the right side, refer to Front Wheel Drive Shaft Replacement - Right Side .
4. Remove the front brake rotor. Refer to Front Brake Rotor Replacement (JE5, J55 (AWD)) , Front Brake Rotor Replacement (J56) .
 5. Remove the wheel speed sensor. Refer to Front Wheel Speed Sensor Replacement (AWD) .

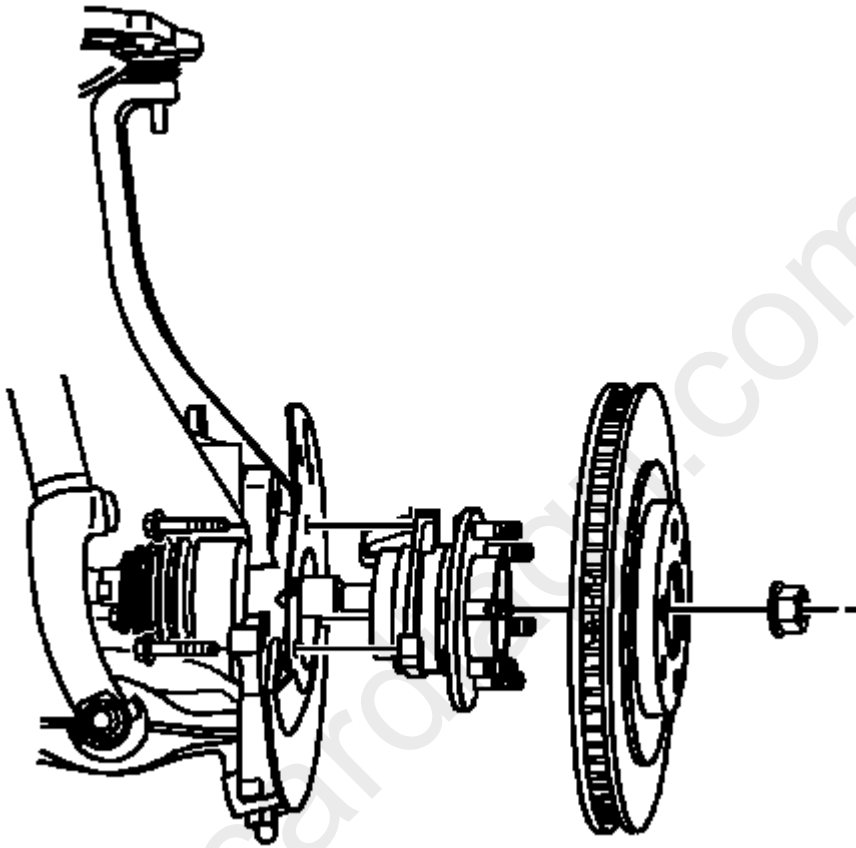


Fig. 7: View Of Wheel Bearing/Hub Mounting Bolts
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Avoid tool contact to the outer constant velocity boot when removing the wheel bearing mounting bolts. Failure to observe this caution may result in damage to the CV boot.

6. Remove the wheel bearing/hub mounting bolts.
7. Remove the wheel bearing/hub assembly.

Installation Procedure

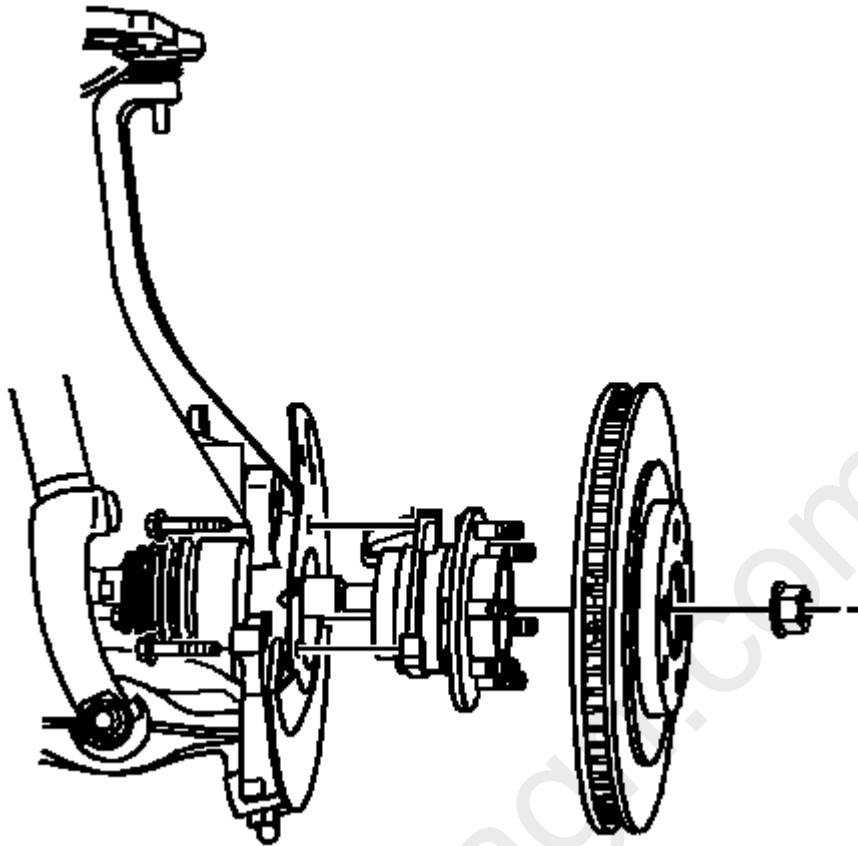


Fig. 8: View Of Wheel Bearing/Hub Mounting Bolts
 Courtesy of GENERAL MOTORS COMPANY

1. Install the wheel bearing/hub.

CAUTION: Refer to Fastener Caution .

2. Install the wheel bearing/hub mounting bolts and tighten to 135 N.m (100 lb ft).
3. Install the wheel speed sensor. Refer to **Front Wheel Speed Sensor Replacement (AWD)** .
4. Install the NEW wheel driveshaft nut and washer.
 - For the left side, refer to **Front Wheel Drive Shaft Replacement - Left Side** .
 - For the right side, refer to **Front Wheel Drive Shaft Replacement - Right Side** .
5. Install the front brake rotor. Refer to **Front Brake Rotor Replacement (JE5, J55 (AWD))** , **Front Brake Rotor Replacement (J56)** .
6. Install the tire and wheel. Refer to **Tire and Wheel Removal and Installation** .
7. Lower the vehicle.

FRONT WHEEL BEARING AND HUB REPLACEMENT (RWD)

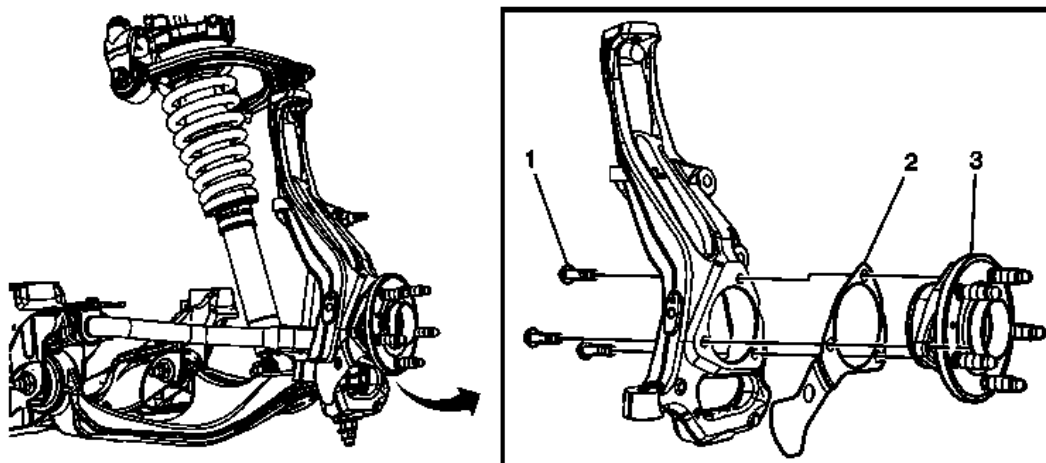


Fig. 9: Identifying Front Wheel Bearing & Hub (RWD)
 Courtesy of GENERAL MOTORS COMPANY

Front Wheel Bearing and Hub Replacement (RWD)

Callout	Component Name
Preliminary Procedure 1. Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> . 2. Remove the tire and wheel assembly. Refer to <u>Tire and Wheel Removal and Installation</u> . 3. Remove the wheel drive shaft nut and washer and separate the wheel drive shaft from the knuckle. • For the left wheel drive shaft, refer to <u>Front Wheel Drive Shaft Replacement - Left Side</u> • For the right wheel drive shaft, refer to <u>Front Wheel Drive Shaft Replacement - Right Side</u> 4. Remove the brake rotor. Refer to <u>Front Brake Rotor Replacement (JE5, J55 (RWD))</u> , <u>Front Brake Rotor Replacement (J56)</u> . 5. Remove the wheel speed sensor and bracket. Refer to <u>Front Wheel Speed Sensor Replacement (RWD)</u>	
1	Wheel Bearing/Hub Bolts (Qty: 3) CAUTION: Refer to <u>Fastener Caution</u> . Tighten 135 N.m (100 lb ft)
2	Front Brake Shield
3	Wheel Bearing/Hub Assembly

STEERING KNUCKLE REPLACEMENT (AWD)

Removal Procedure

CAUTION: The ball stud must not rotate during disassembly or reassembly. Hand tools must be used to keep the ball stud from rotating. If air tools are used and the stud is allowed to rotate, damage to the ball stud and/or stud mounting hole may occur.

CAUTION: Do not free the ball stud by using a pickle fork or a wedge-type tool. Damage to the seal or bushing may result.

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 bearing/hub. Refer to Front Wheel Bearing and Hub Replacement (AWD).
4. Remove the outer tie rod to steering knuckle. Refer to Steering Linkage Outer Tie Rod Replacement (AWD) .
5. Remove the brake hose bracket to steering knuckle retaining bolts. Refer to Front Brake Hose Replacement (AWD) .

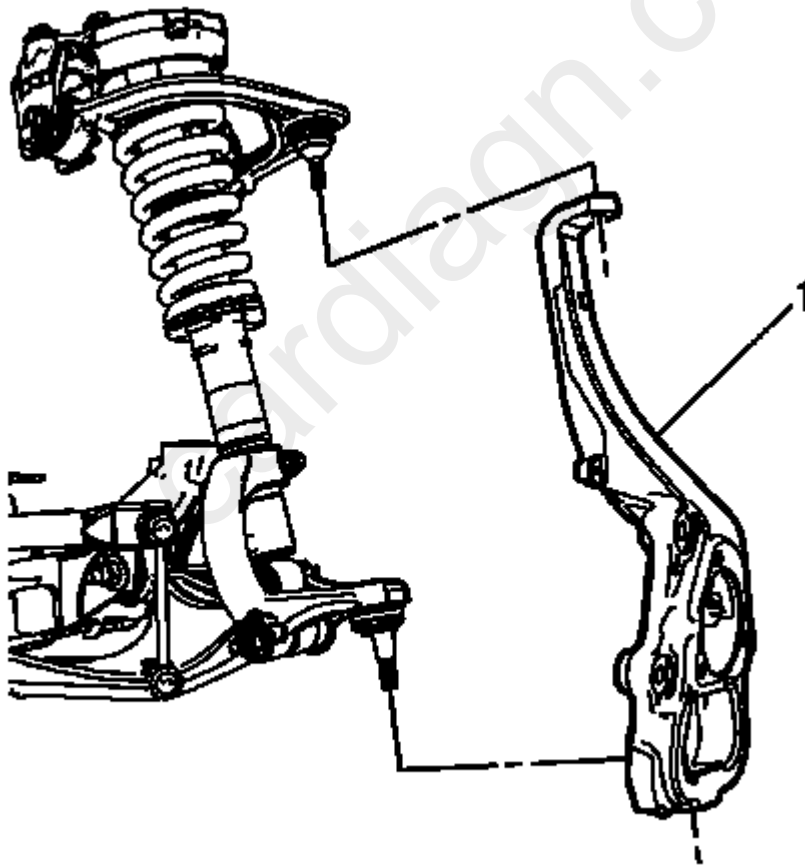


Fig. 10: View of Steering Knuckle
Courtesy of GENERAL MOTORS COMPANY

6. Remove the steering knuckle (1) from the upper control arm. Refer to Shock Absorber and Spring

Removal and Installation.

7. Remove the steering knuckle (1) lower from the control arm. Refer to **Lower Control Arm Replacement (AWD)**.

Installation Procedure

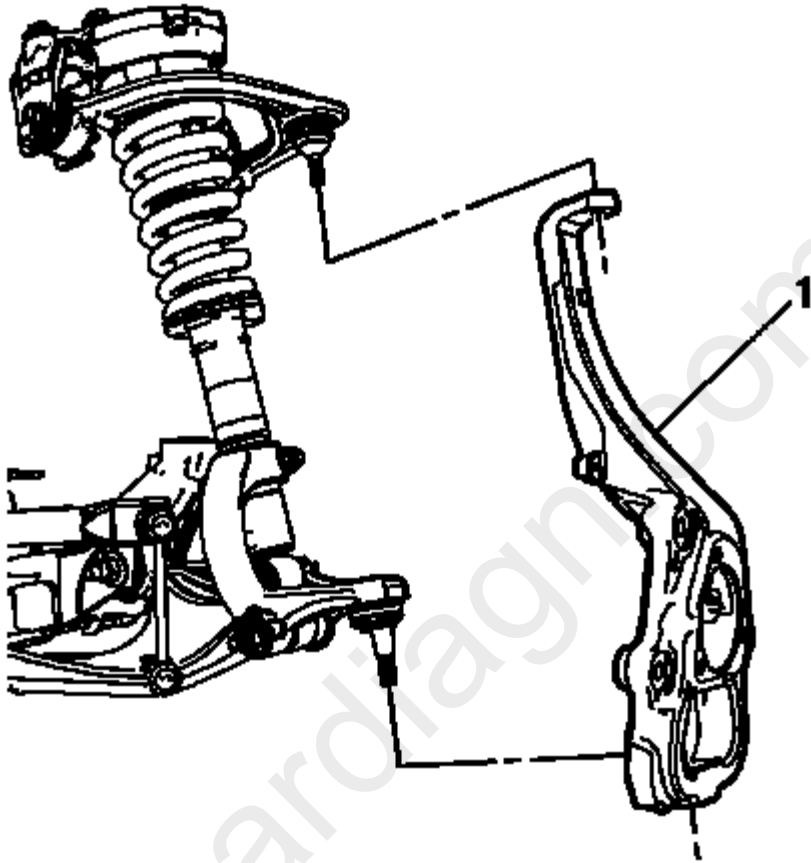


Fig. 11: View of Steering Knuckle

Courtesy of GENERAL MOTORS COMPANY

1. Install the steering knuckle (1) to the lower control arm . Refer to **Lower Control Arm Replacement (AWD)**.
2. Install the steering knuckle (1) in the upper control arm. Refer to to **Shock Absorber and Spring Removal and Installation**
3. Install the brake hose bracket to the steering knuckle retaining bolts. Refer to **Front Brake Hose Replacement (AWD)** .
4. Install the outer tie rod to the steering knuckle. Refer to **Steering Linkage Outer Tie Rod Replacement (AWD)** .
5. Install the wheel bearing/hub. Refer to **Front Wheel Bearing and Hub Replacement (AWD)**.
6. Install the tire and wheel. Refer to **Tire and Wheel Removal and Installation** .
7. Lower the vehicle.

STEERING KNUCKLE REPLACEMENT (RWD)

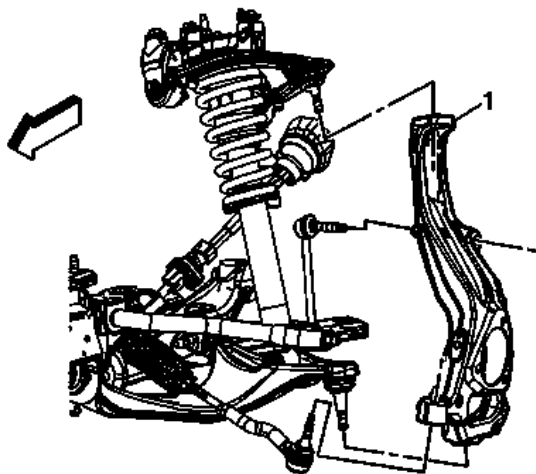


Fig. 12: Identifying Steering Knuckle (RWD)
Courtesy of GENERAL MOTORS COMPANY

Steering Knuckle Replacement (RWD)

Callout	Component Name
Preliminary procedure	
1. Raise and support the vehcile. Refer to <u>Lifting and Jacking the Vehicle</u> . 2. Remove the tire and wheel assembly. Refer to <u>Tire and Wheel Removal and Installation</u> . 3. Remove the wheel bearing/hub assembly. Refer to <u>Front Wheel Bearing and Hub Replacement (RWD)</u>.	
1	Steering Knuckle Procedure 1. Remove the outer tie rod end from the knuckle. Refer to <u>Steering Linkage Outer Tie Rod Replacement (RWD)</u> . 2. Remove the upper ball joint from the knuckle. Refer to <u>Shock Absorber and Spring Removal and Installation</u>. 3. Remove the lower ball joint from the knuckle. Refer to <u>Lower Control Arm Replacement (RWD)</u>. 4. Remove the stabilizer link from the knuckle. Refer to <u>Stabilizer Shaft Link Replacement (RWD)</u>.

LOWER CONTROL ARM REPLACEMENT (RWD)

Special Tools

J 43631 Ball Joint Remover

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 stabilizer shaft link from the lower control arm. Refer to Stabilizer Shaft Link Replacement (RWD)
4. Remove the shock assembly lower retaining bolts. Refer to Shock Absorber and Spring Removal and Installation.

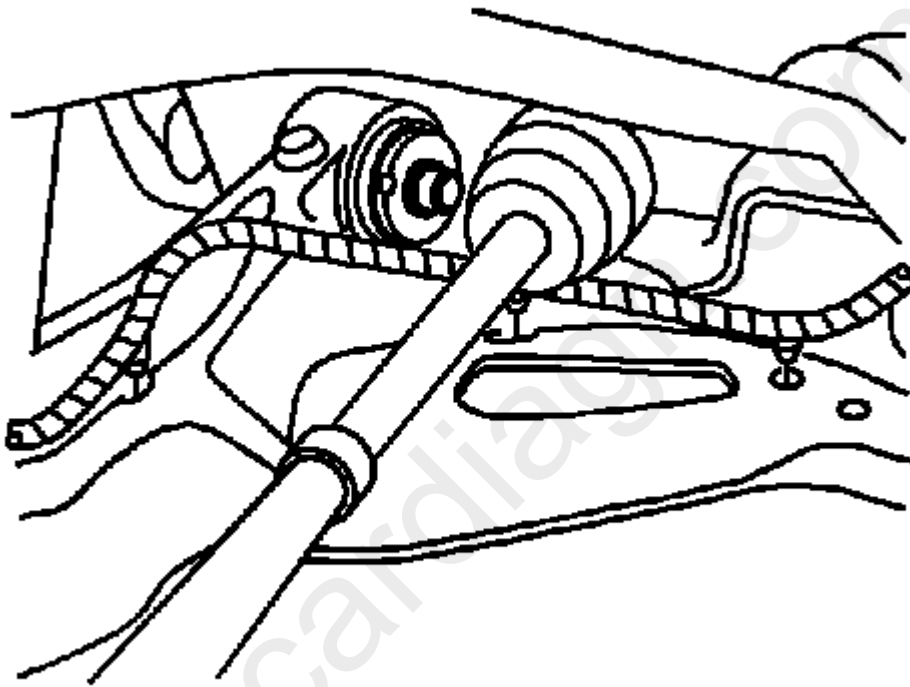


Fig. 13: Identifying Anti-Lock Brake Wiring Harness At Lower Control Arms
Courtesy of GENERAL MOTORS COMPANY

5. Remove the ABS wire harness from the lower control arm.

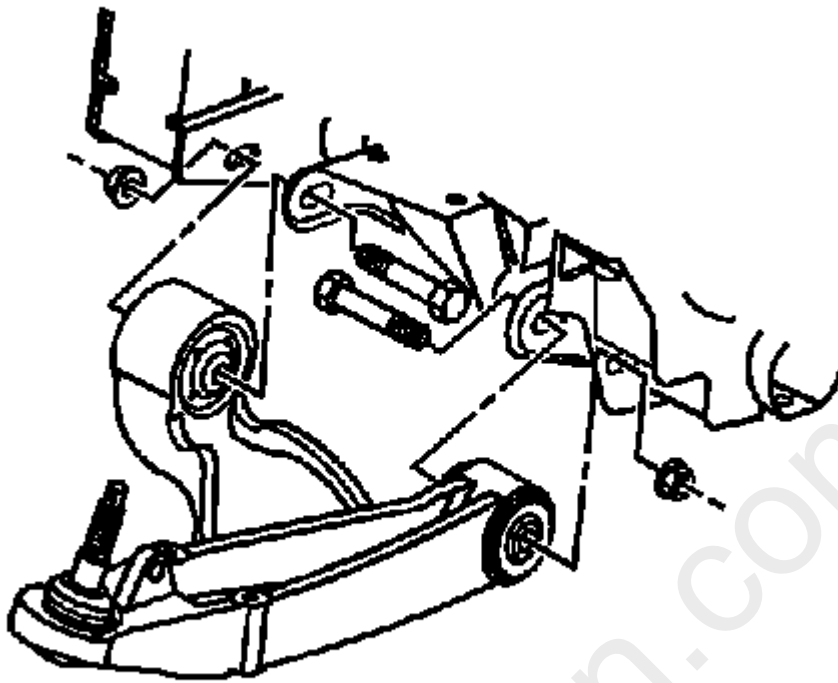


Fig. 14: Removing Lower Control Arm Mounting Nuts
Courtesy of GENERAL MOTORS COMPANY

6. Remove the front and rear lower control arm mounting nuts.
7. Remove the front and rear lower control arm mounting bolts.
8. Lower and support the lower arm control to gain access to the lower ball joint.

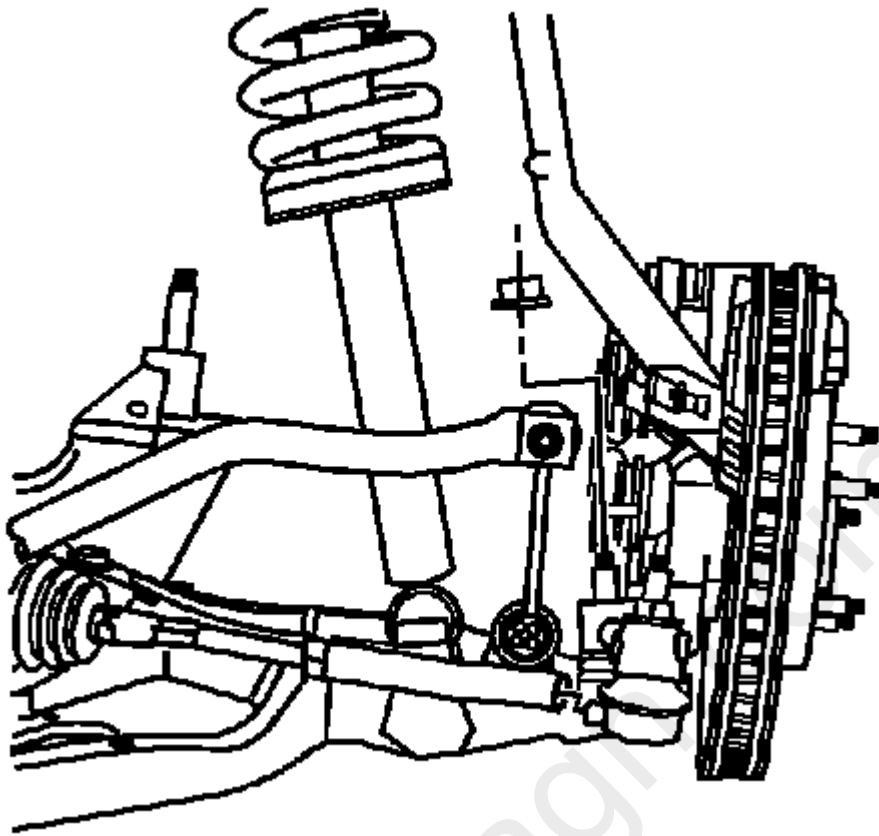


Fig. 15: Installing Steering Knuckle Ball Joint
Courtesy of GENERAL MOTORS COMPANY

9. Remove the front lower control arm front nut and discard.

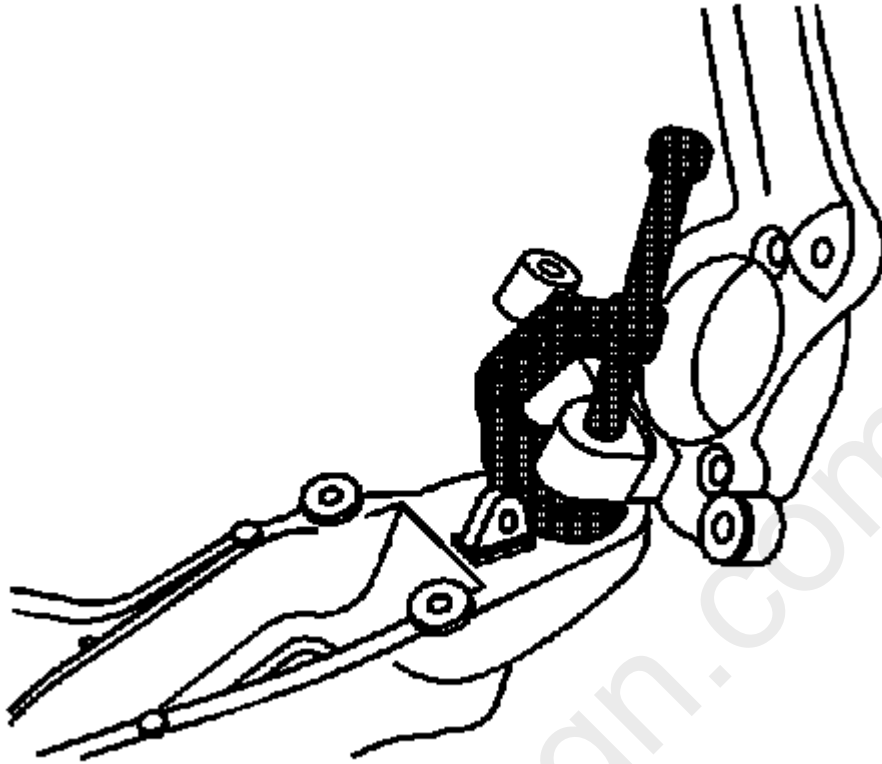


Fig. 16: Disconnecting Lower Ball Joint From Steering Knuckle
Courtesy of GENERAL MOTORS COMPANY

10. Using the **J 43631** remover , separate the lower ball joint from the steering knuckle.
11. Remove the lower control arm from the vehicle.

Installation Procedure

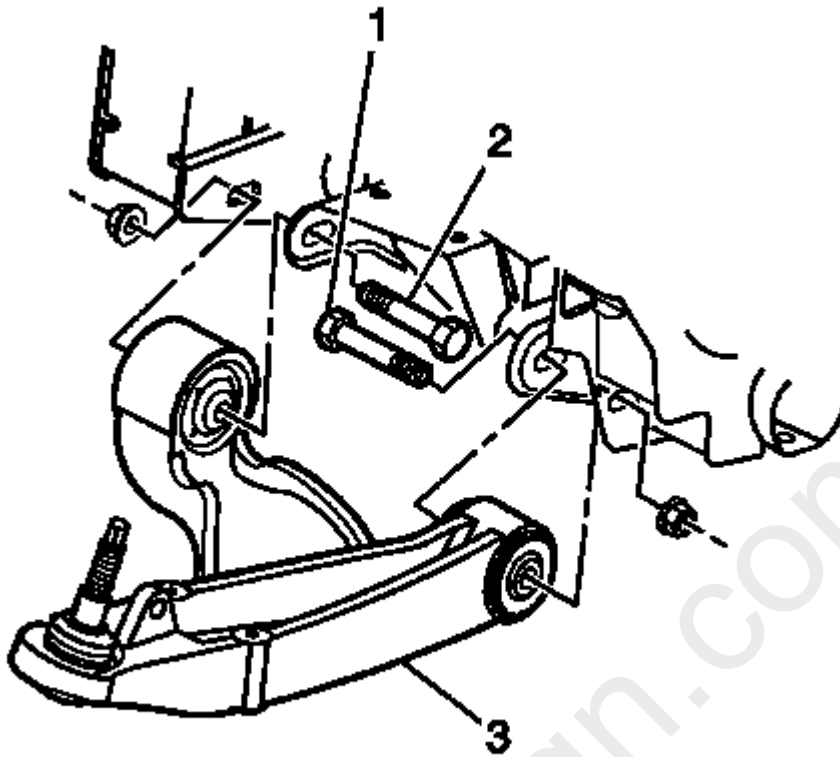


Fig. 17: Identifying Lower Control Arm Components
Courtesy of GENERAL MOTORS COMPANY

1. Position the lower control arm (3) to the vehicle.

CAUTION: Refer to Fastener Caution .

2. Install the front lower control arm mounting bolt (1) to tighten to 200 N.m (148 lb ft).
3. Install the rear lower control arm mounting bolt (2) to tighten to 320 N.m (236 lb ft).

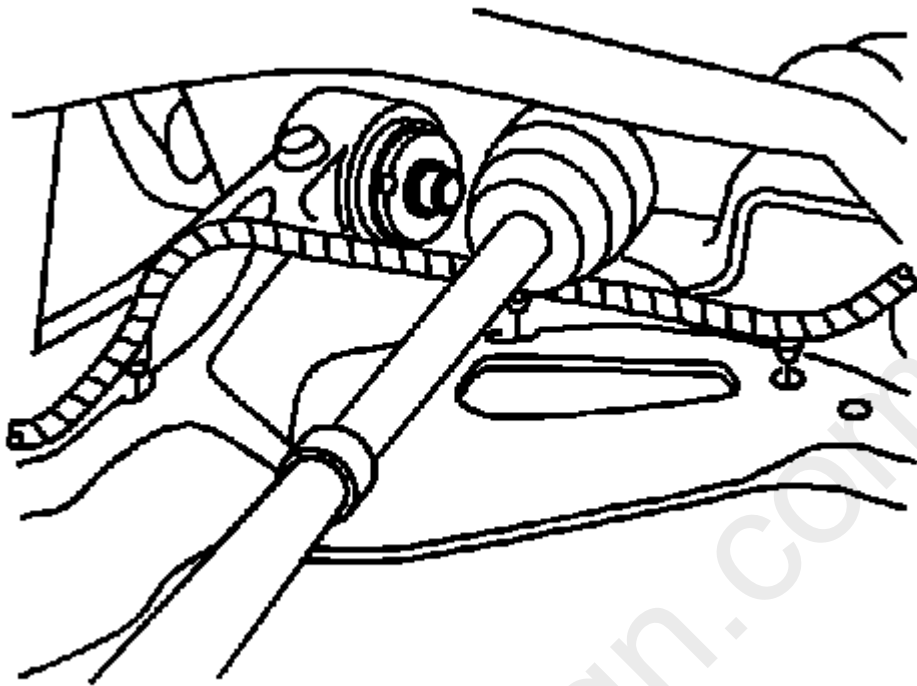


Fig. 18: Identifying Anti-Lock Brake Wiring Harness At Lower Control Arms
Courtesy of GENERAL MOTORS COMPANY

4. Install the ABS wire harness to the lower control arm.

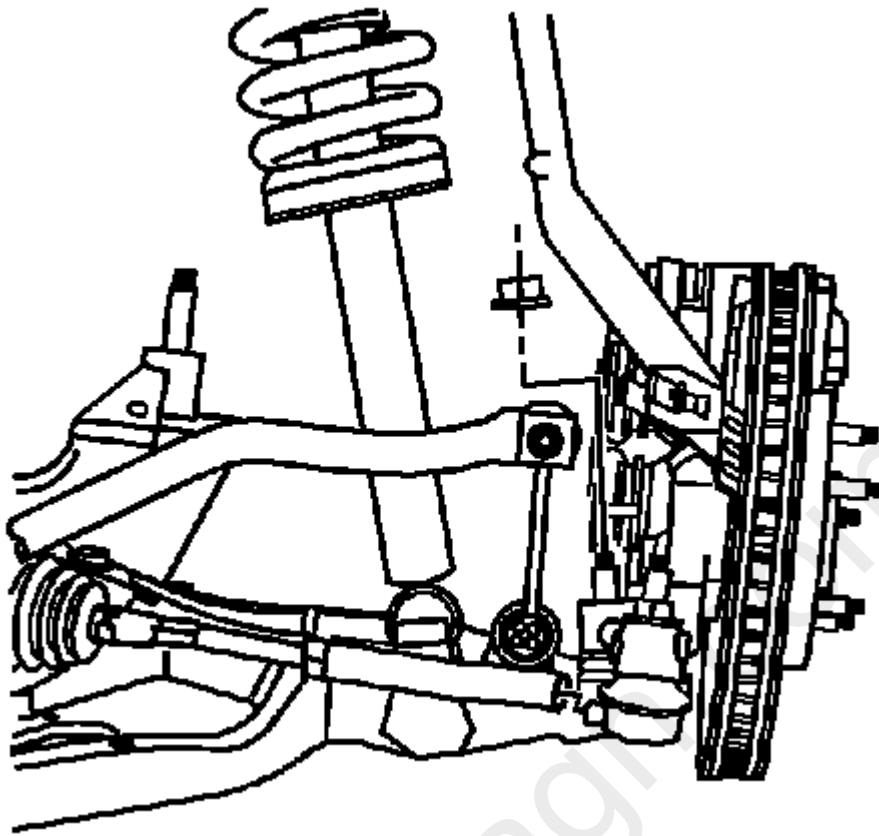


Fig. 19: Installing Steering Knuckle Ball Joint
Courtesy of GENERAL MOTORS COMPANY

5. Connect the lower ball joint to the steering knuckle.
6. Install a NEW front lower control arm front nut.
7. Tighten the lower ball joint retaining nut in the following order:
 1. Tighten the front lower control arm front nut to 40 N.m (30 lb ft).
 2. Tighten the front lower control arm front nut to an additional 120 degree turn.

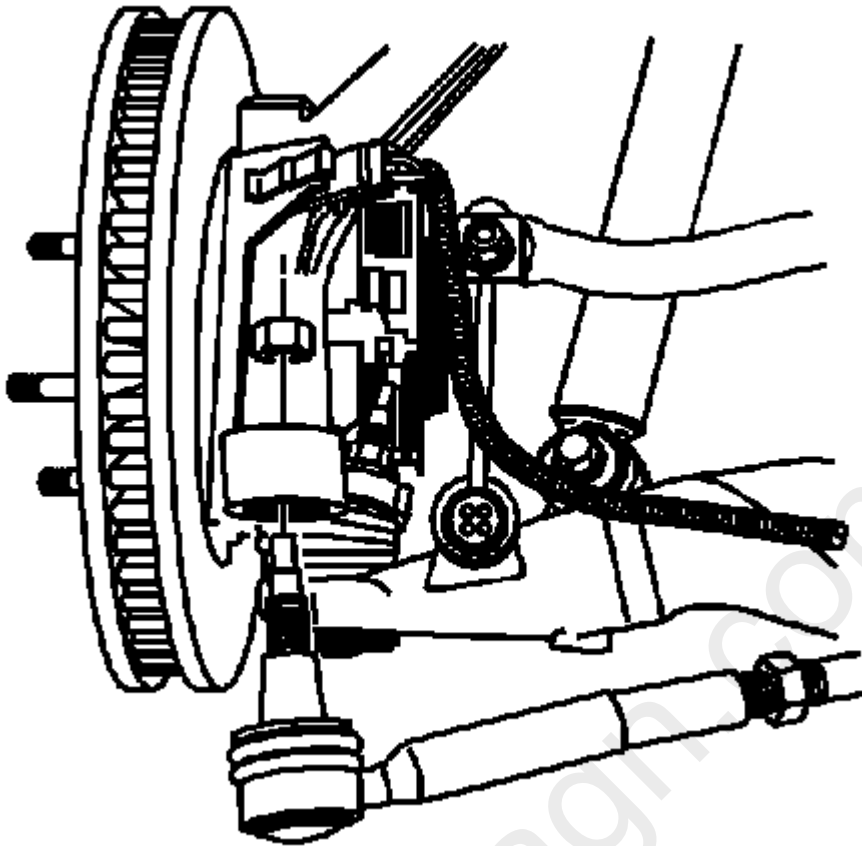


Fig. 20: View Of Outer Tie Rod & Steering Knuckle
Courtesy of GENERAL MOTORS COMPANY

8. Connect the outer tie rod to the steering knuckle.
9. Install the steering linkage outer tie rod nut. Refer to **Steering Linkage Outer Tie Rod Replacement (RWD)** .
10. Install the stabilizer shaft link to the lower control arm. Refer to **Stabilizer Shaft Link Replacement (RWD)**
11. Adjust the lower control arm to Z height. Refer to **Trim Height Specifications** .
12. Install the tire and wheel. Refer to **Tire and Wheel Removal and Installation** .
13. Lower the vehicle.
14. Align the front end. Refer to **Wheel Alignment Measurement** .

LOWER CONTROL ARM REPLACEMENT (AWD)

Special Tools

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 wheel speed sensor. Refer to Front Wheel Speed Sensor Replacement (AWD) .
4. Remove the air deflector. Refer to Front Air Deflector Replacement .
5. Remove the stabilizer shaft link from the lower control arm. Refer to Stabilizer Shaft Link Replacement (AWD).

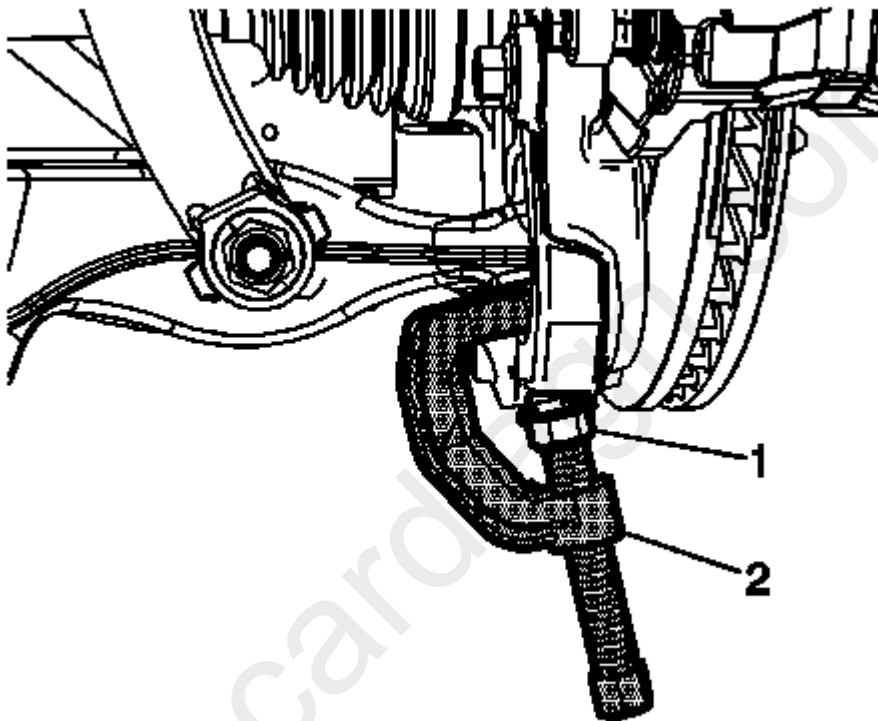


Fig. 21: Lower Ball Stud Nut & Removal Tool
Courtesy of GENERAL MOTORS COMPANY

CAUTION: The ball stud must not rotate during disassembly or reassembly. Hand tools must be used to keep the ball stud from rotating. If air tools are used and the stud is allowed to rotate, damage to the ball stud and/or stud mounting hole may occur.

6. Loosen, but DO NOT remove the lower ball stud nut (1).
7. Using the **J 43631** remover (2), separate the ball joint stud from the steering knuckle.
8. Remove the yoke from the stud on the lower control arm. Refer to Front Shock Absorber Yoke

Replacement.

NOTE: Raise the power steering gear to provide clearance when removing the rear lower control arm to frame retaining bolt.

9. Loosen the power steering gear retaining bolts and raise the power steering gear. Refer to Steering Gear Replacement (LHD With AWD) .

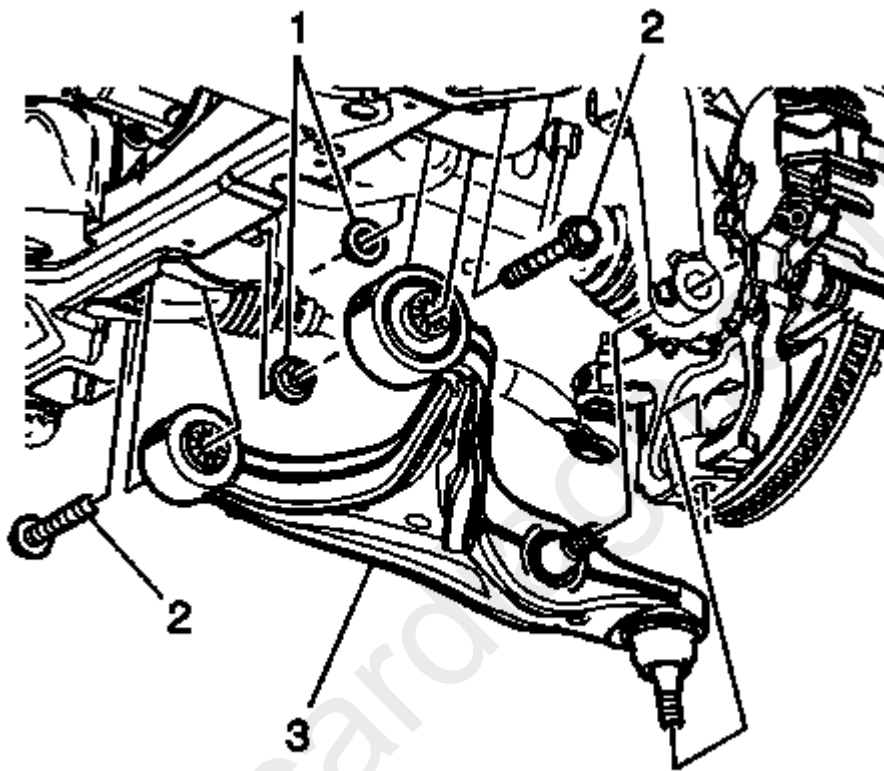


Fig. 22: Lower Control Arm Components
Courtesy of GENERAL MOTORS COMPANY

10. Remove the lower control arm to cradle nuts (1).
11. Remove the lower control arm to cradle bolts (2).
12. Remove the lower control arm (3) from the vehicle.

Installation Procedure

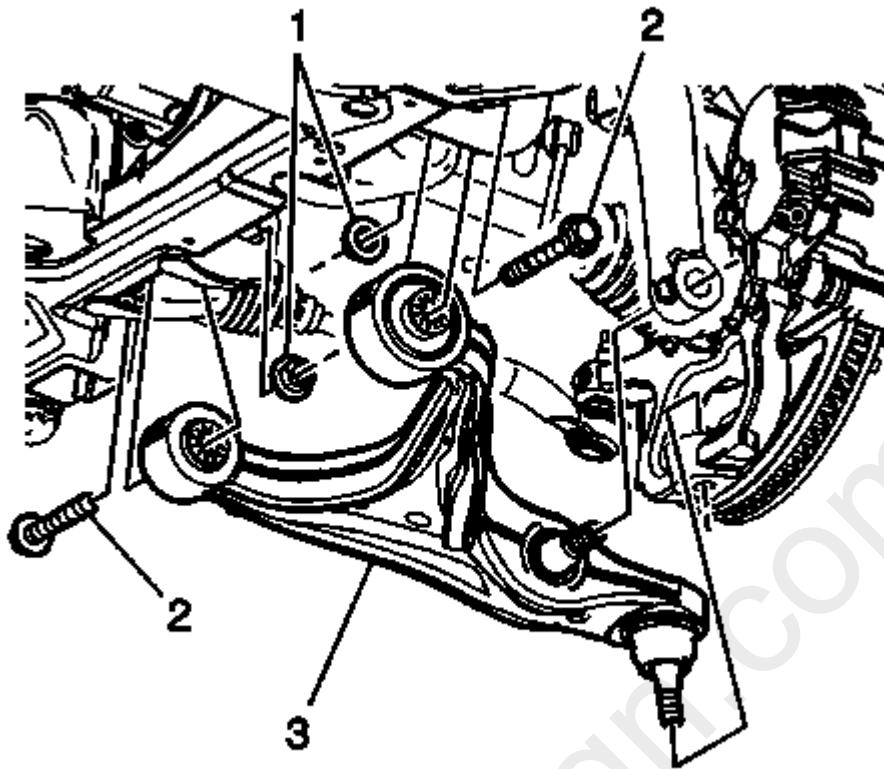


Fig. 23: Lower Control Arm Components
Courtesy of GENERAL MOTORS COMPANY

1. Position the lower control arm (3) to the vehicle.
2. Install the lower control arm to cradle bolts (2).

CAUTION: Refer to Fastener Caution .

NOTE: Tighten the lower control arm bolts and nuts with the lower control arm at normal vehicle ride height.

3. Install the lower control arm to cradle nuts (1) and tighten to:
 - Front First Pass: 90 (66 lb ft)
 - Front Final Pass: Plus 140 degrees
 - Rear First Pass: 90 (66 lb ft)
 - Rear Final Pass: Plus 95 degrees
4. Tighten the power steering gear retaining bolts. Refer to Steering Gear Replacement (LHD With AWD) .

5. Install the shock module yoke to the lower control arm nut. Refer to **Front Shock Absorber Yoke Replacement**.

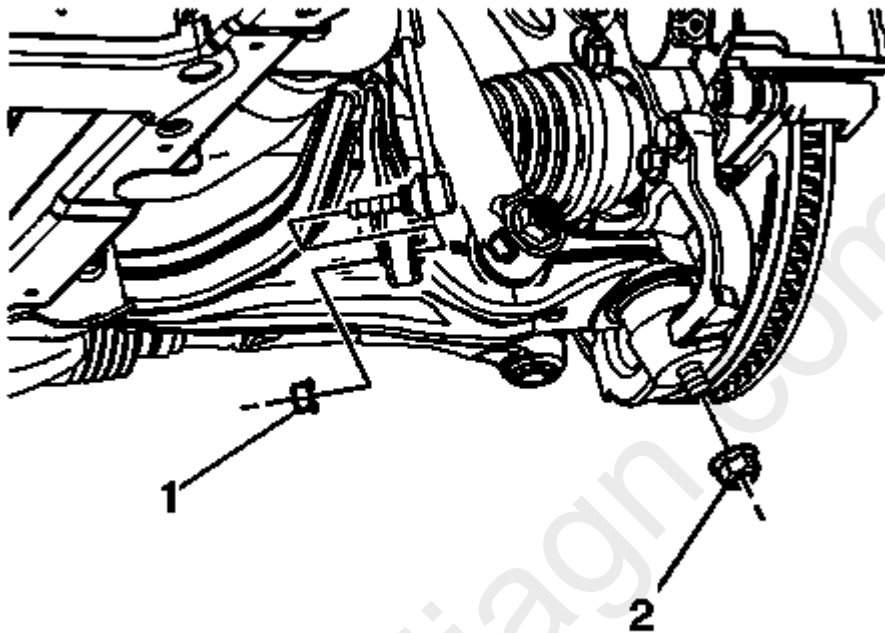


Fig. 24: Lower Control Arm Ball Joint Nut
Courtesy of GENERAL MOTORS COMPANY

CAUTION: The ball stud must not rotate during disassembly or reassembly. Hand tools must be used to keep the ball stud from rotating. If air tools are used and the stud is allowed to rotate, damage to the ball stud and/or stud mounting hole may occur.

6. Install the lower control arm ball joint nut (1) and tighten to:
 - First Pass: 40 (30 lb ft)
 - Final Pass: Plus 120 degrees
7. Install the wheel speed sensor. Refer to **Front Wheel Speed Sensor Replacement (AWD)** .
8. Install the stabilizer shaft link to the lower control arm. Refer to **Stabilizer Shaft Link Replacement (AWD)**.
9. Install the air deflector. Refer to **Front Air Deflector Replacement** .
10. Install the tire and wheel. Refer to **Tire and Wheel Removal and Installation** .

11. Lower the vehicle.
12. Check the front end alignment. Refer to Wheel Alignment Measurement .

WHEEL STUD REPLACEMENT

Tools Required

J 43631 Ball Joint Remover

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 .

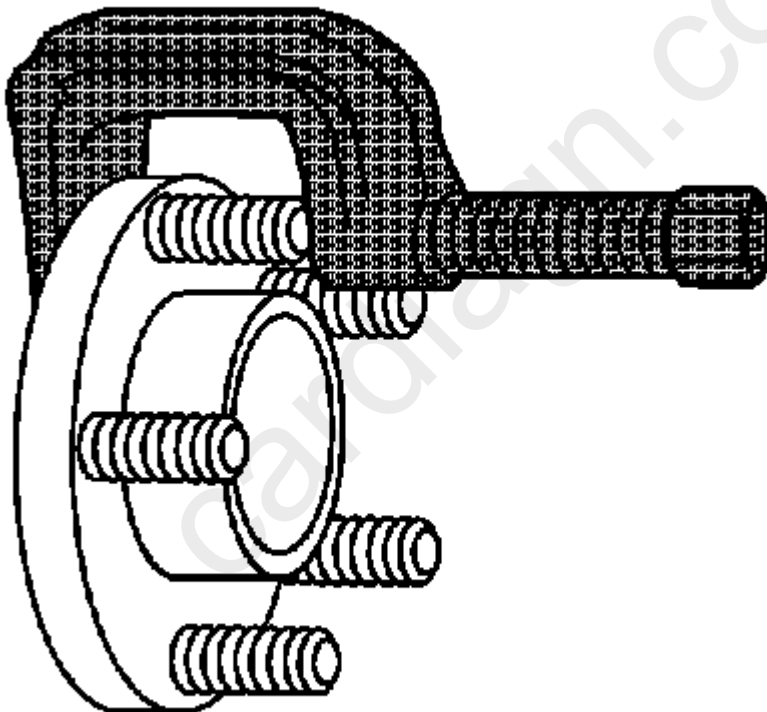


Fig. 25: Removing Wheel Stud From Axle Flange
Courtesy of GENERAL MOTORS COMPANY

3. Remove the brake rotor. Refer to Front Brake Rotor Replacement (JE5, J55 (RWD)) , Front Brake Rotor Replacement (JE5, J55 (AWD)) , Front Brake Rotor Replacement (J56) .
4. Using **J 43631** ball joint remover , remove the wheel stud at the inner most notch.

Installation Procedure

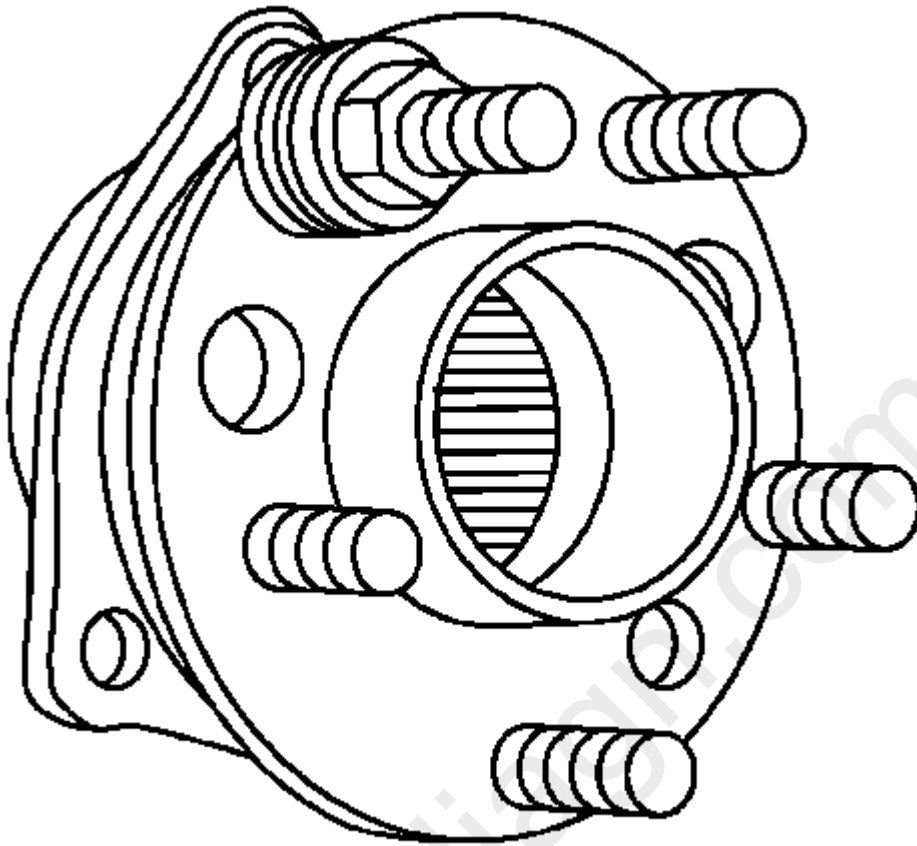


Fig. 26: Installing Wheel Stud
Courtesy of GENERAL MOTORS COMPANY

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

IMPORTANT: 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 brake rotor. Refer to **Front Brake Rotor Replacement (JE5, J55 (RWD))** , **Front Brake Rotor Replacement (JE5, J55 (AWD))** , **Front Brake Rotor Replacement (J56)** .
5. Install the tire and wheel. Refer to **Tire and Wheel Removal and Installation** .
6. Lower the vehicle.

SHOCK ABSORBER AND SPRING REMOVAL AND INSTALLATION

Special Tools

J-24319-B Steering Linkage and Tie Rod Puller

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 .

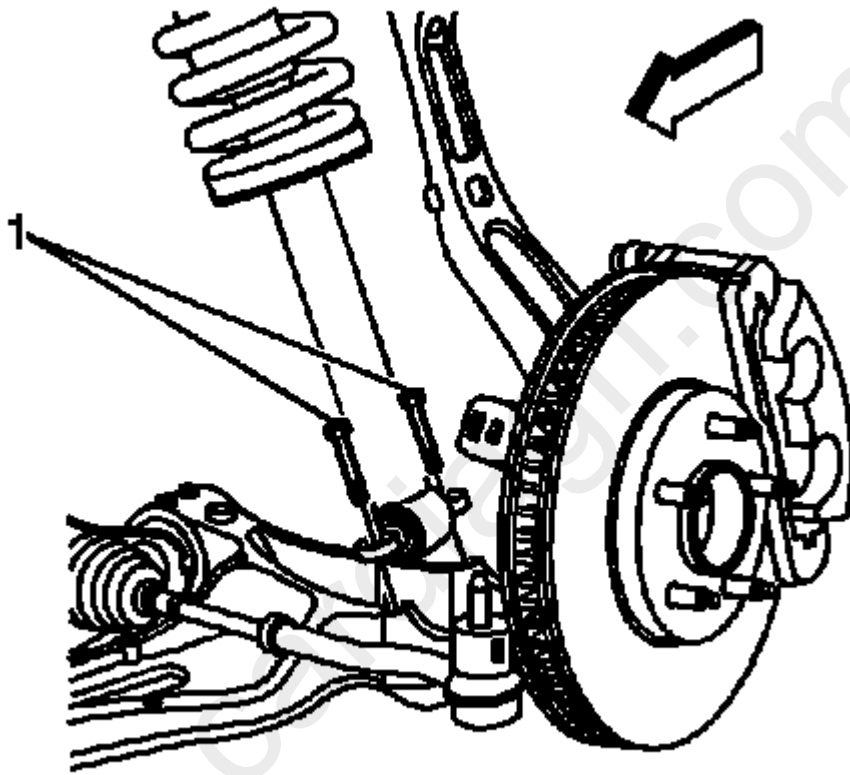


Fig. 27: View of Lower Shock Bolts
Courtesy of GENERAL MOTORS COMPANY

NOTE: Step 3 is for rear wheel drive (RWD) vehicles drive only.

3. Remove the lower mounting bolts (1) for the shock absorber.

NOTE: Step 4 is for vehicles equipped with all wheel drive (AWD) only.

4. Remove the front shock yoke. Refer to Front Shock Absorber Yoke Replacement.

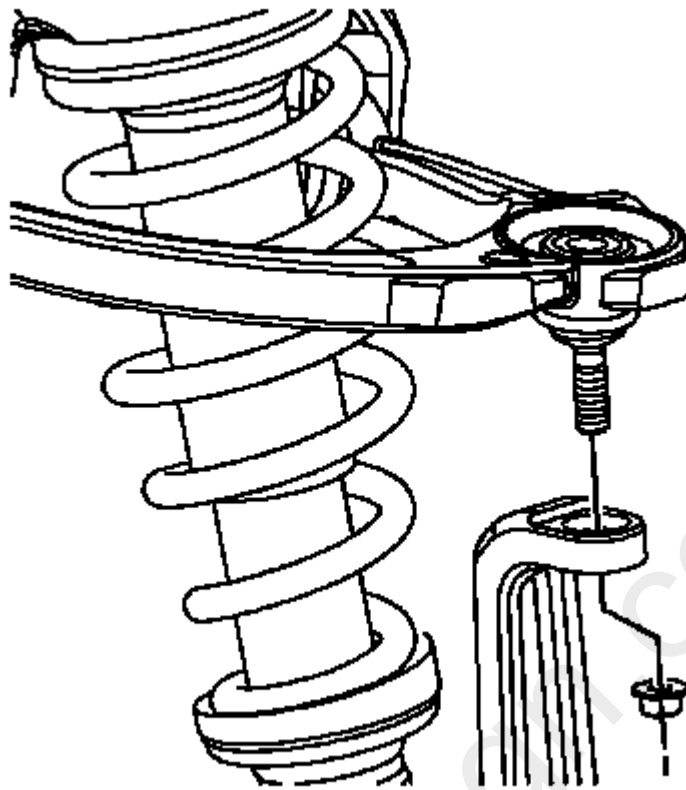


Fig. 28: View Of Upper Control Arm Ball Stud-To-Steering Knuckle Retaining Nut
Courtesy of GENERAL MOTORS COMPANY

CAUTION: The ball stud must not rotate during disassembly or reassembly. Hand tools must be used to keep the ball stud from rotating. If air tools are used and the stud is allowed to rotate, damage to the ball stud and/or stud mounting hole may occur.

NOTE: Hold the upper control arm to the steering knuckle when removing the retaining nut.

NOTE: To prevent the ball stud from slipping, insert a hex-head tool while removing the upper control arm-to-steering knuckle nut.

5. Remove the upper control arm to steering knuckle nut.
6. Using the **J-24319-B** puller , remove the upper control arm from the steering knuckle.
7. Lower the vehicle.

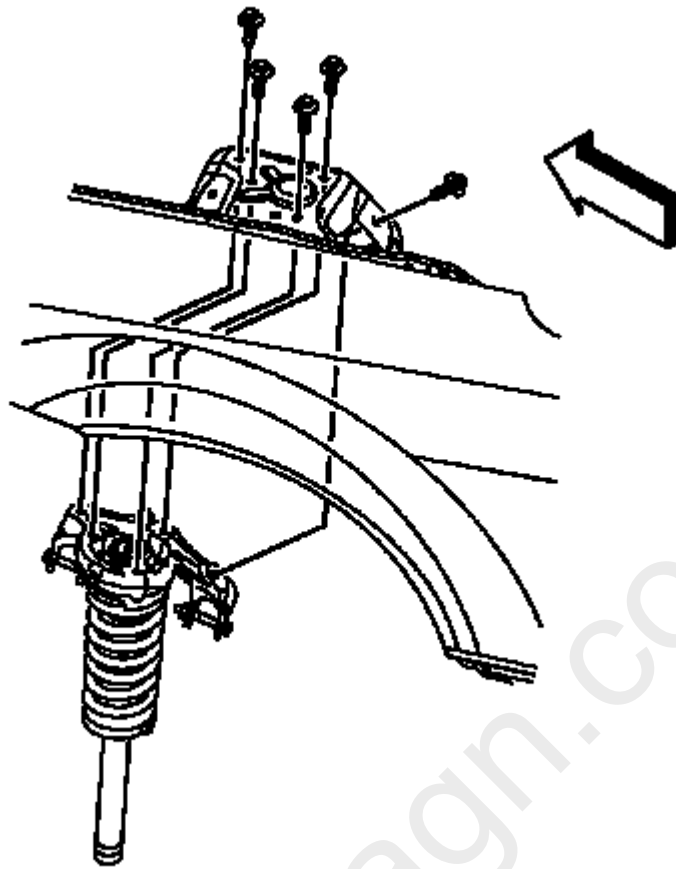


Fig. 29: View Of Shock Module

Courtesy of GENERAL MOTORS COMPANY

8. Remove the front shock absorber assembly upper mounting bolts.
9. Remove the front shock absorber assembly from the vehicle.
10. If servicing the front spring, or related parts, refer to **Shock Absorber, Shock Absorber Component, or Spring Replacement**.

Installation Procedure

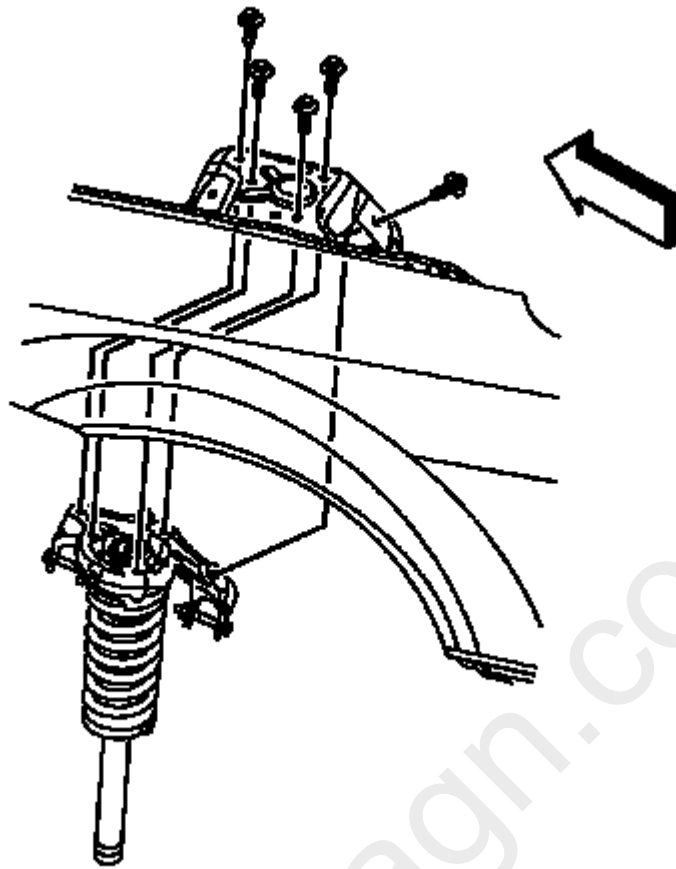


Fig. 30: View Of Shock Module
Courtesy of GENERAL MOTORS COMPANY

1. Install the front shock absorber assembly in the vehicle.

CAUTION: Refer to Fastener Caution .

2. Install the front shock assembly upper mounting bolts and tighten to 112 N.m (83 lb ft).
3. Raise the vehicle.

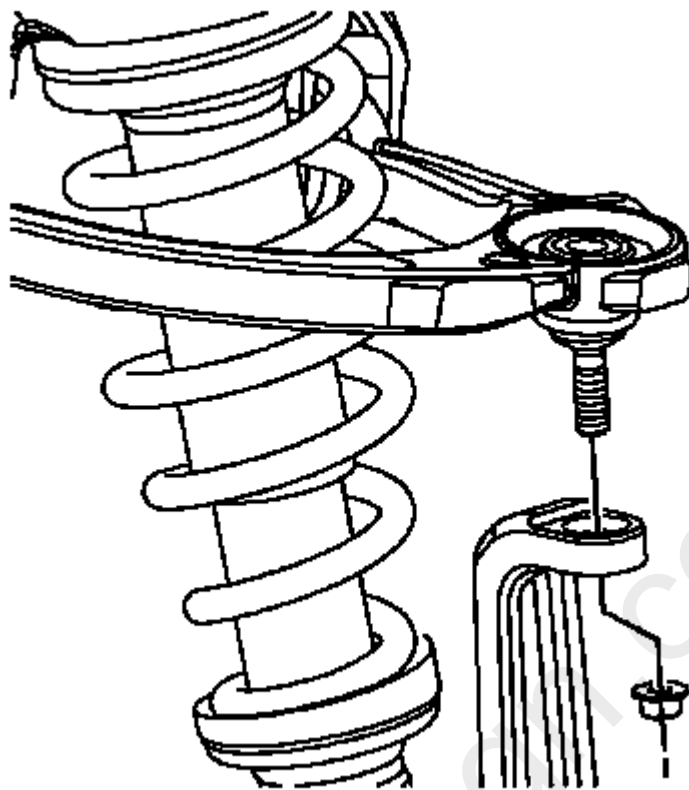


Fig. 31: View Of Upper Control Arm Ball Stud-To-Steering Knuckle Retaining Nut
Courtesy of GENERAL MOTORS COMPANY

4. Install the upper control arm to the steering knuckle.
5. Install the upper control arm to steering knuckle retaining nut and tighten to 60 N.m (44 lb ft).

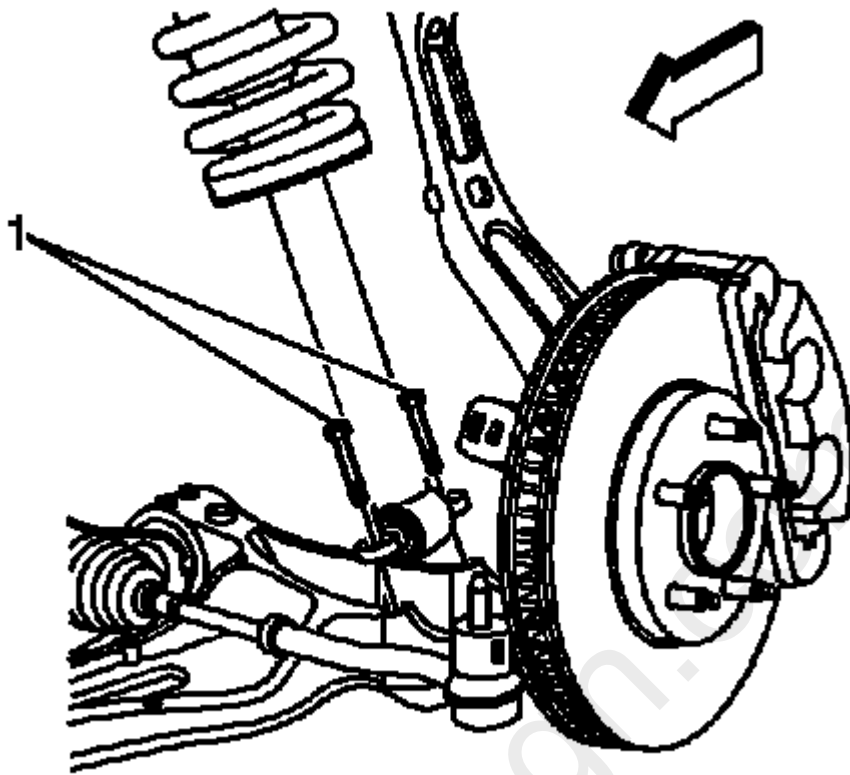


Fig. 32: View of Lower Shock Bolts
Courtesy of GENERAL MOTORS COMPANY

NOTE: Step 6 is for RWD vehicles only.

6. Install the lower mounting bolts (1) for the shock absorber and tighten to 25 N.m (18 lb ft).

NOTE: Step 7 is for AWD vehicles only.

7. Install the shock to the shock absorber yoke. Refer to **Front Shock Absorber Yoke Replacement**.
8. Install the tire and wheel. Refer to **Tire and Wheel Removal and Installation**.
9. Lower the vehicle.

SHOCK ABSORBER, SHOCK ABSORBER COMPONENT, OR SPRING REPLACEMENT

Removal Procedure

CAUTION: Use care when handling the coil springs in order to avoid chipping or scratching the coating. Damage to the coating will result in premature failure of the coil springs.

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 shock module from the vehicle. Refer to Shock Absorber and Spring Removal and Installation.

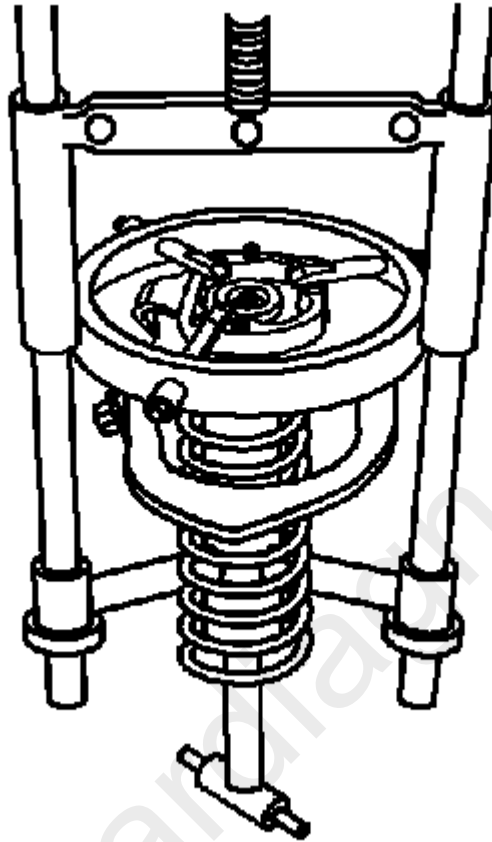


Fig. 33: View Of Spring Compressor
Courtesy of GENERAL MOTORS COMPANY

4. Install the shock module into the spring compressor.
5. Mark the upper control arm assembly and insulator for proper installation.

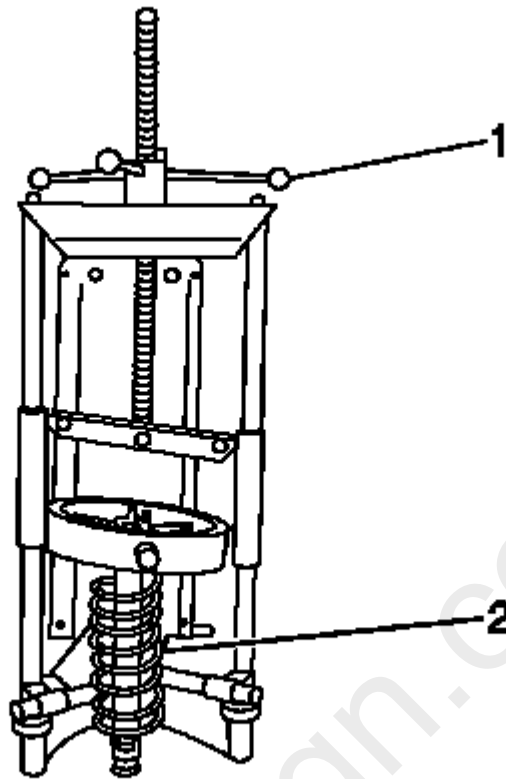


Fig. 34: View Of Compressor Forcing Screw & Coil Spring
Courtesy of GENERAL MOTORS COMPANY

NOTE: The spring is compressed when the shock absorber moves freely.

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

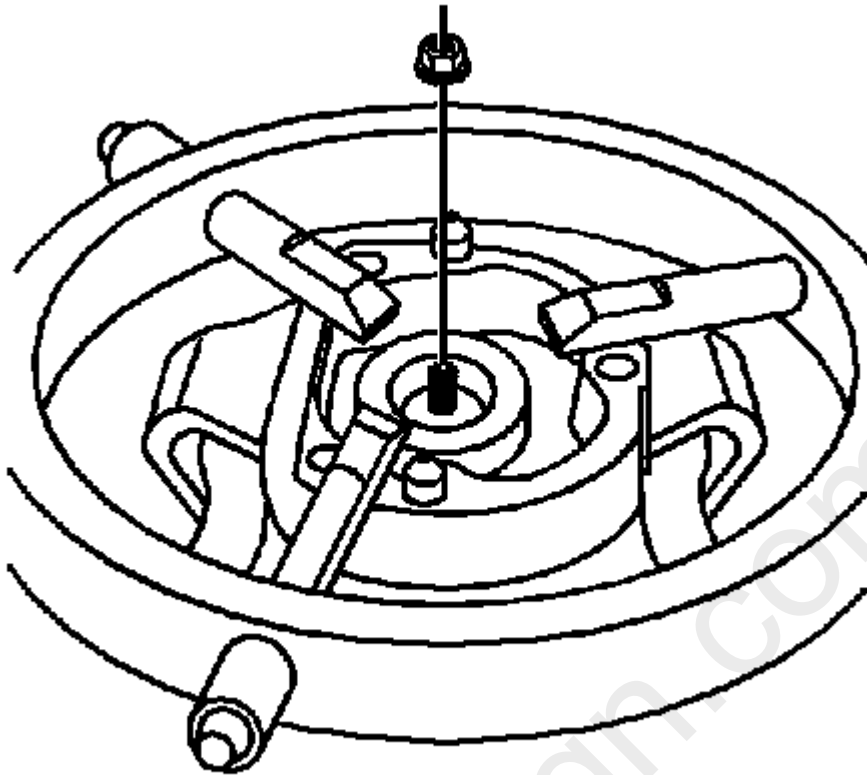


Fig. 35: View Of Shock Absorber Upper Retaining Nut
Courtesy of GENERAL MOTORS COMPANY

7. Remove the shock absorber upper retaining nut.
8. Remove the shock absorber from the shock module.
9. Loosen the compressor forcing screw until the upper mounting plate and coil spring may be removed.
10. Remove the upper control arm bracket assembly, insulator and coil spring from the spring compressor.

Installation Procedure

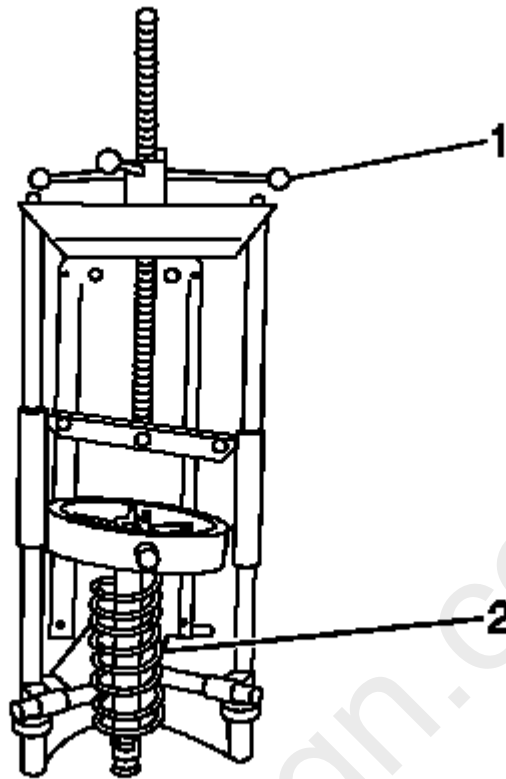


Fig. 36: View Of Compressor Forcing Screw & Coil Spring
Courtesy of GENERAL MOTORS COMPANY

NOTE: Ensure the alignment pins in the upper control arm bracket is orientated 90 degrees with the shock absorber lower mounting holes.

1. Install the coil spring, insulator, upper control arm bracket assembly, and shock absorber to the spring compressor aligning all marks.
2. Turn the spring compressor forcing screw (1) until the coil spring is compressed.

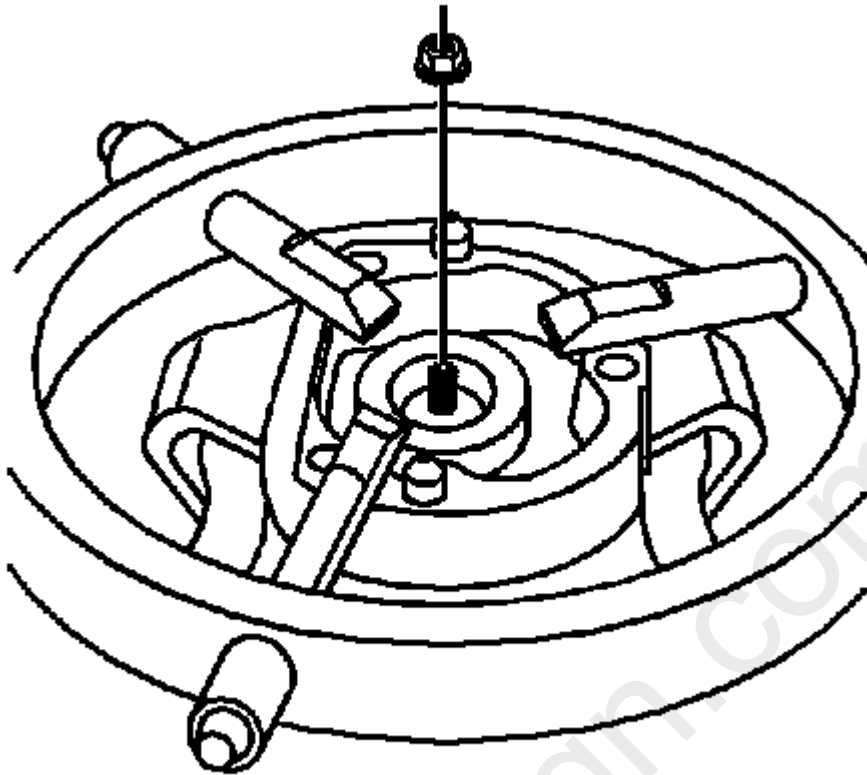


Fig. 37: View Of Shock Absorber Upper Retaining Nut
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

3. Install the shock absorber retaining nut and tighten to 25 N.m (18 lb ft).

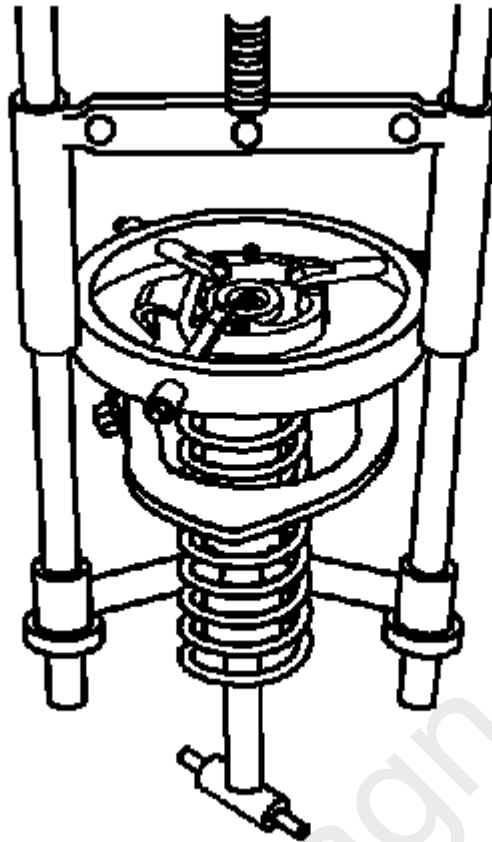


Fig. 38: View Of Spring Compressor
Courtesy of GENERAL MOTORS COMPANY

4. Remove the shock module from the spring compressor.
5. Install the shock module to the vehicle. Refer to **Shock Absorber and Spring Removal and Installation**.
6. Install the tire and wheel. Refer to **Tire and Wheel Removal and Installation** .
7. Lower the vehicle.

FRONT SHOCK ABSORBER YOKE REPLACEMENT

Special Tools

J 24319-B Steering Linkage and Tie Rod Puller

Removal Procedure

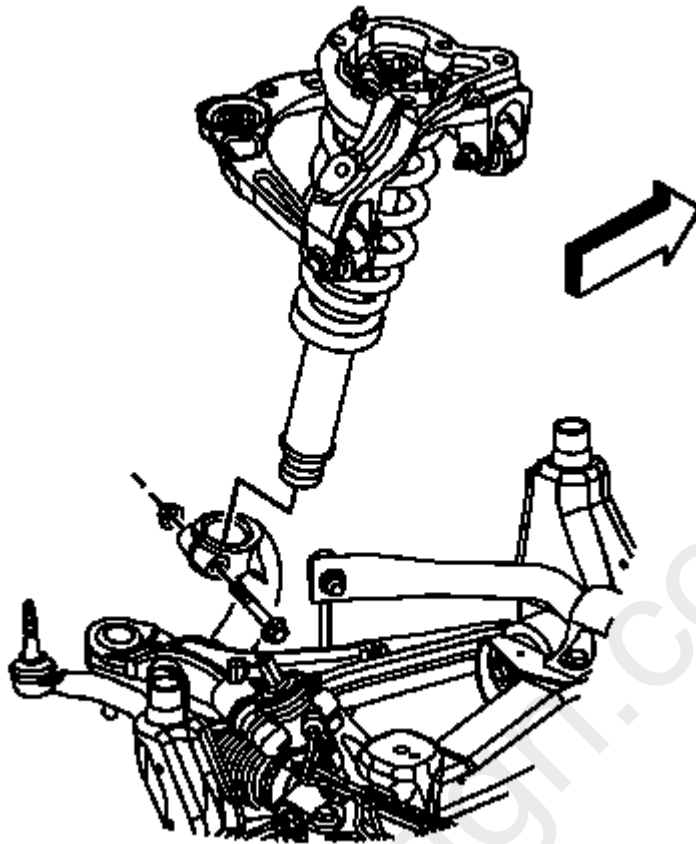


Fig. 39: View Of Shock-To-Yoke Retaining Bolt
Courtesy of GENERAL MOTORS COMPANY

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 shock to yoke retaining nut.
4. Remove the shock to yoke retaining bolt by pulling up slightly on the lower control arm to remove the pressure on the bolt.

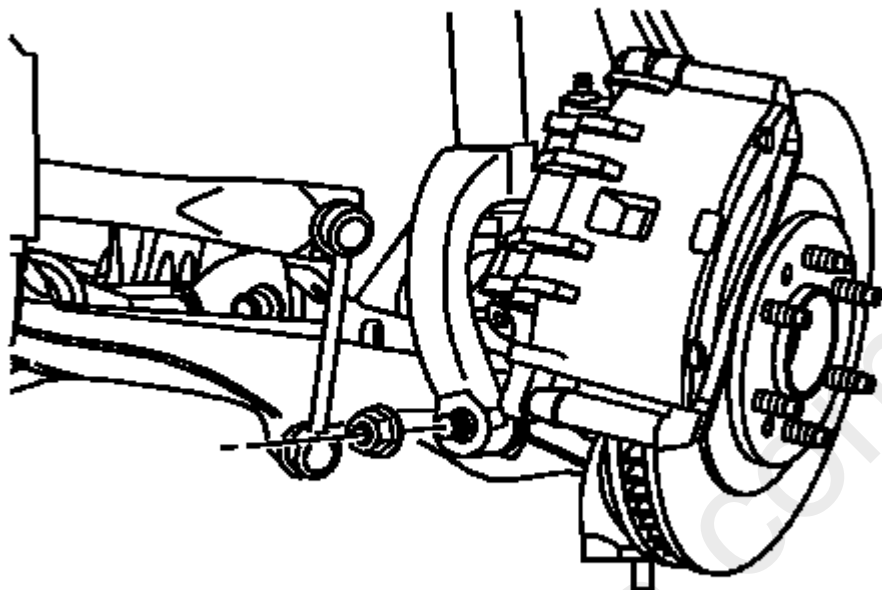


Fig. 40: View Of Yoke-To-Lower Control Arm Retaining Nut
Courtesy of GENERAL MOTORS COMPANY

5. Remove the yoke to lower control arm retaining nut.

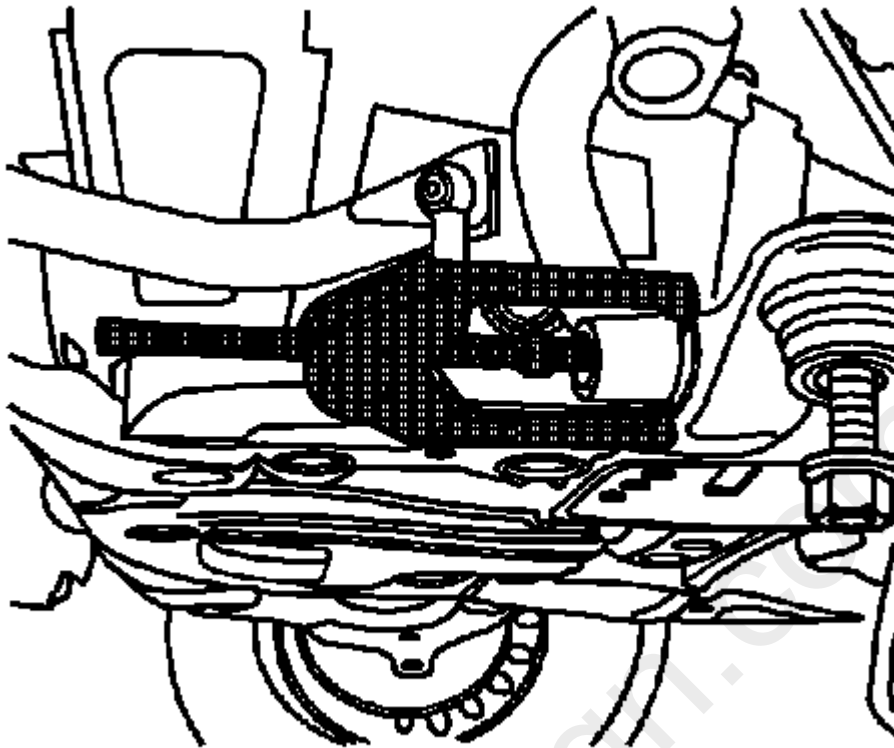


Fig. 41: Disconnecting Shock Module Yoke From Lower Control Arm
Courtesy of GENERAL MOTORS COMPANY

6. Using the J 24319-B steering linkage and tie rod puller , separate the yoke from the lower control arm.

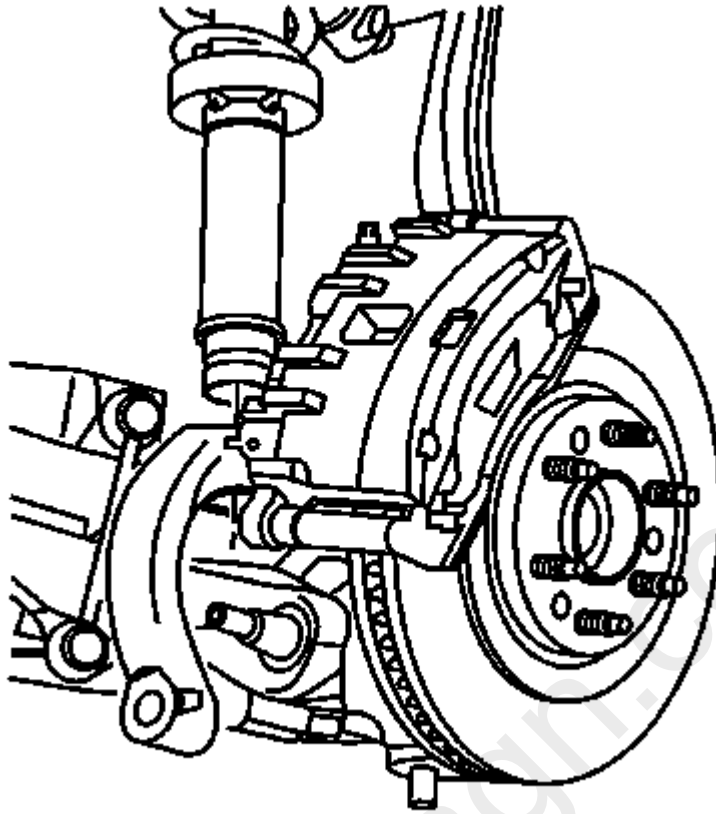


Fig. 42: View Of Yoke
Courtesy of GENERAL MOTORS COMPANY

7. Remove the yoke from the vehicle.

Installation Procedure

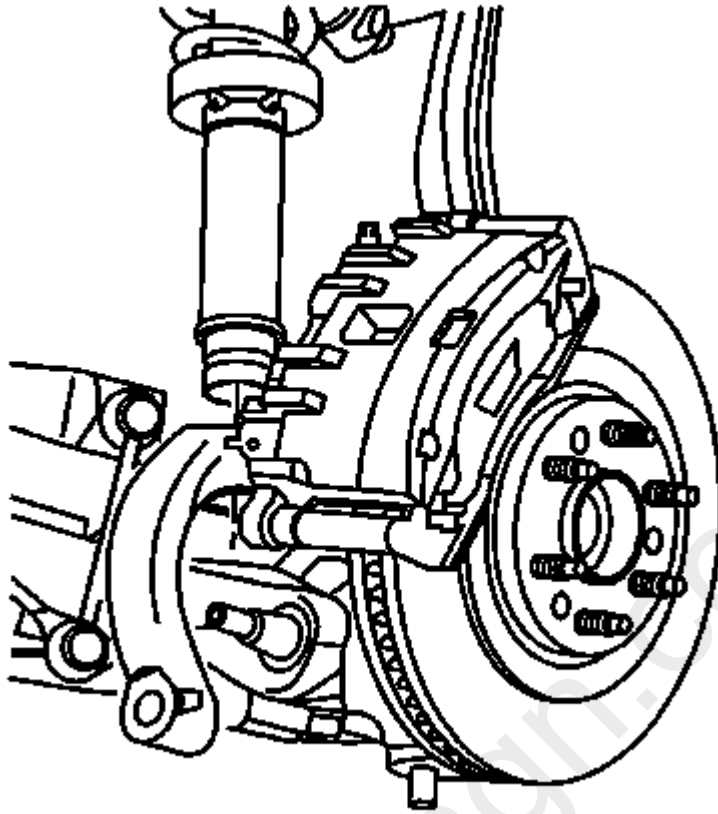


Fig. 43: View Of Yoke

Courtesy of GENERAL MOTORS COMPANY

1. Install the yoke to the vehicle.

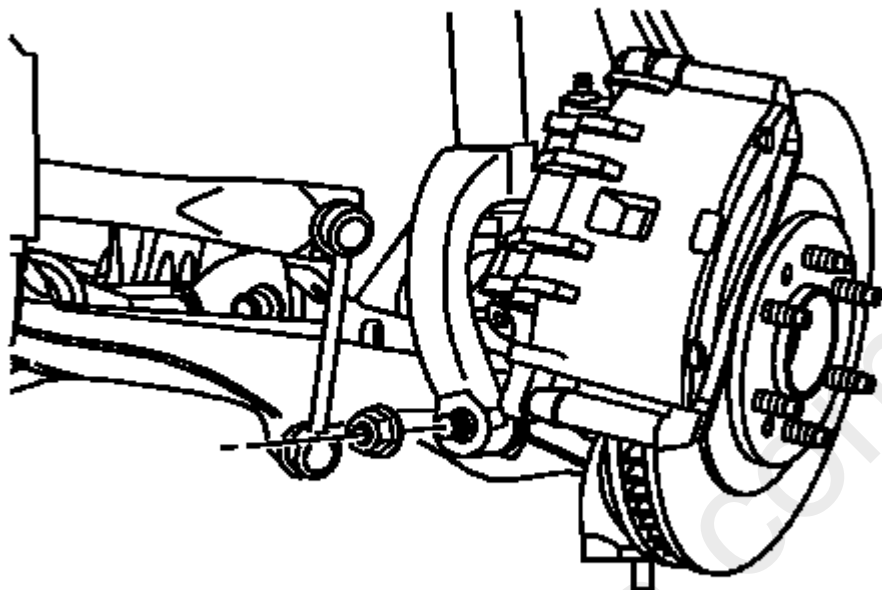


Fig. 44: View Of Yoke-To-Lower Control Arm Retaining Nut
Courtesy of GENERAL MOTORS COMPANY

NOTE: Do not tighten the nut at this time.

2. Install the yoke to lower control arm retaining nut.

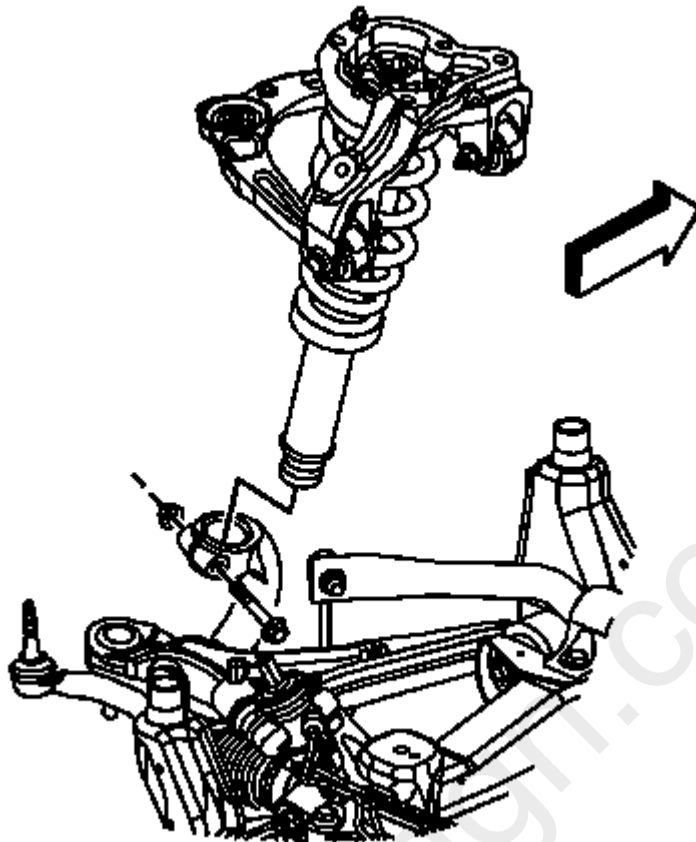


Fig. 45: View Of Shock-To-Yoke Retaining Bolt
Courtesy of GENERAL MOTORS COMPANY

3. Install the yoke to the shock.

CAUTION: Refer to Fastener Caution .

4. Install the yoke to shock retaining bolt and nut.

Tighten

- Tighten the shock to yoke nut to 90 (66 lb ft).
 - Tighten the yoke to lower control arm nut to 180 (133 lb ft).
5. Install the tire and wheel. Refer to Tire and Wheel Removal and Installation .
 6. Lower the vehicle.

SUSPENSION SHOCK/STRUT DISPOSAL

WARNING: Gas charged shock absorbers contain high pressure gas. Do not attempt

to cut the shock open before all gas pressure is released. Failure to do so may result in personal injury.

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

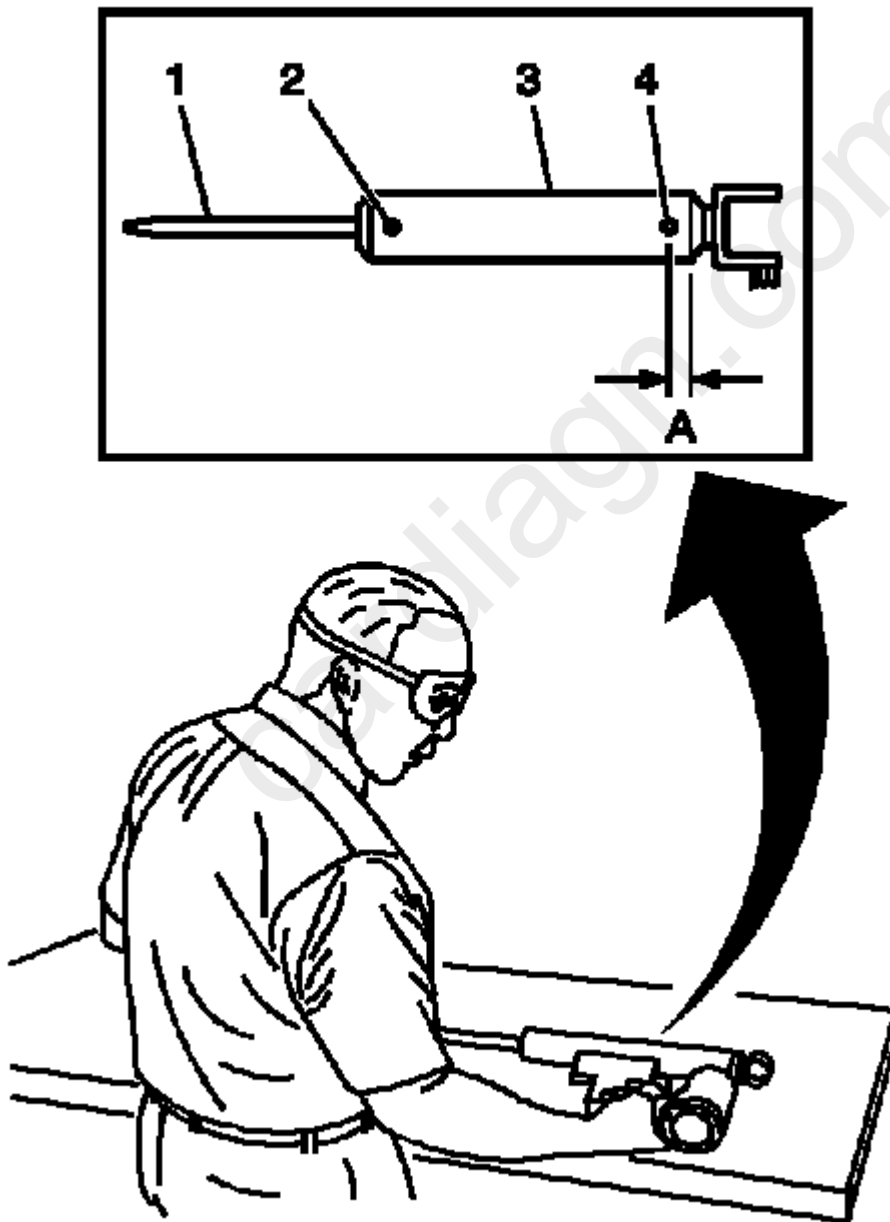


Fig. 46: Disposing Of Shock Absorber

Courtesy of GENERAL MOTORS COMPANY

1. Make an indentation 50 mm (2 in) from the top (2) of the tube using a centerpunch.
2. Make an indentation 25 mm (1.0 in) from the bottom (4) of the tube (3) using a centerpunch.
3. Clamp the shock absorber in a vise horizontally with the shock absorber rod (1) completely extended.
4. Drill a hole in the shock absorber at the centerpunch (4) using a 5 mm (3/16 in) drill bit. Gas or a gas/oil mixture will exhaust when the drill bit penetrates the shock absorber. Use shop towels in order to contain the escaping oil.
5. Drill a second hole in the shock absorber at the centerpunch (2) using a 5 mm (3/16 in) drill bit. Oil will exhaust when the drill bit penetrates the shock absorber. Use shop towels in order to contain the escaping oil.
6. Remove the shock absorber from the vise. Hold the shock absorber over a drain pan horizontally with the holes down. Move the rod (1) in and out of the tube (3) to completely drain the oil from the shock absorber.

DESCRIPTION AND OPERATION

FRONT SUSPENSION DESCRIPTION AND OPERATION

The front suspension has 2 primary purposes:

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

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

This requires that the steering knuckle be suspended between an upper and a lower control arm. The lower control arm attaches from the steering knuckle at the outermost point of the control arm. The attachment is through a ball and socket type joint. The innermost end of the control arm attached at 2 points to the vehicle frame, through semi-rigid bushings. The upper control arm attaches to the upper control arm bracket and is part of the front shock module assembly that bolts to the body. Between the upper control arm bracket assembly and the seat on the shock, isolated by insulators under compression, is a coil spring.

This up and down motion of the steering knuckle as the vehicle travels over bumps is absorbed predominantly by the coil spring. The vertical movement of the steering knuckle as the vehicle travels over irregular road surfaces will tend to compress the spring and spring tension will lead the spring to return to the original, at-rest state. This action isolates the vehicle from the road surface. The lower control arms are allowed to pivot at the vehicle frame in a vertical fashion. The upper control arms are allowed to pivot on the upper control arm bracket. The ball joint allows the steering knuckle to maintain the perpendicular relationship to the road surface.

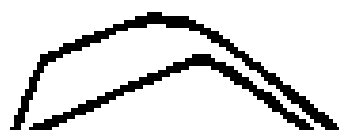
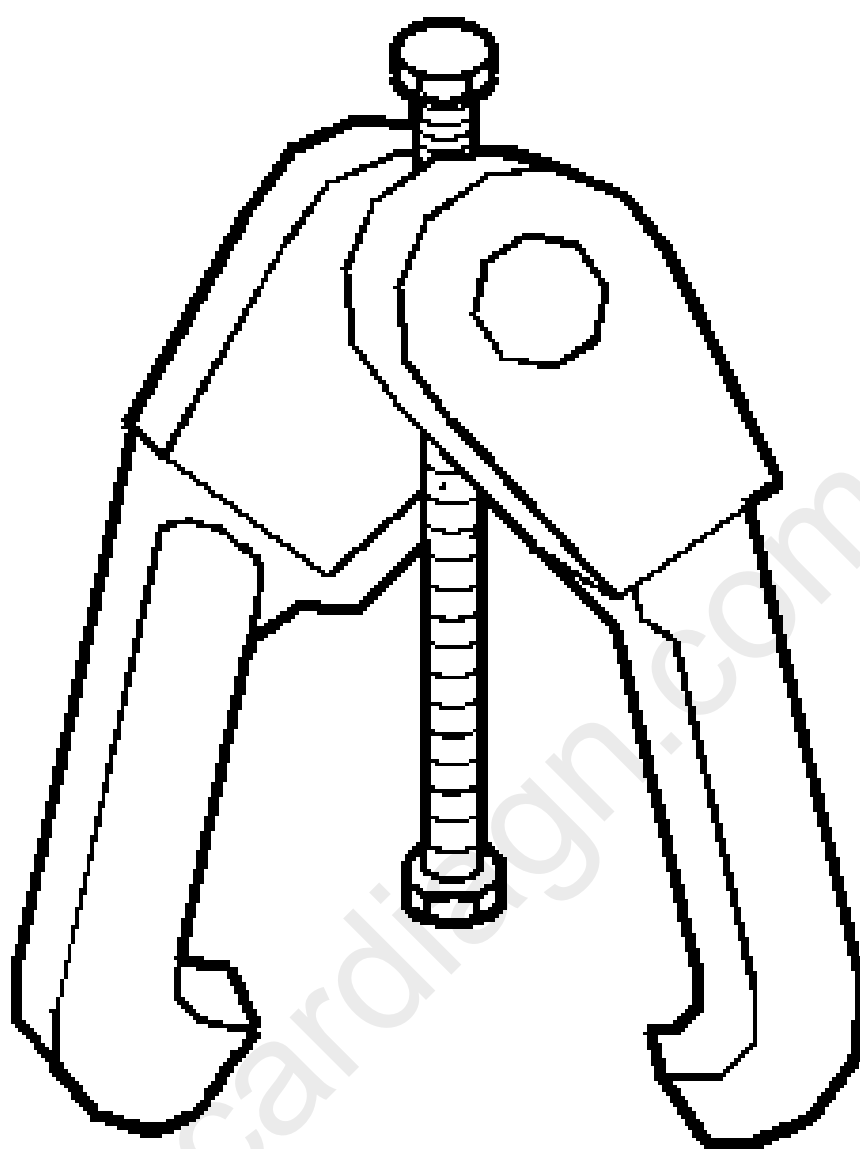
A shock absorber is used in conjunction with this system in order to dampen out the oscillations of the coil spring. A shock absorber is a basic hydraulic cylinder. The shock is filled with oil and has a moveable shaft that connects to a piston inside the shock absorber. Valves inside the shock absorber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

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

SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS

Illustration	Tool Number/ Description
	J 24319-B Universal Steering Linkage and Tie Rod Puller



J 43631
Ball Joint
Remover

cardiagn.com