

2004 SUSPENSION

Suspension General Diagnosis - Corvette

SPECIFICATIONS

TRIM HEIGHT SPECIFICATIONS

Trim Height Specifications

RPO	Service Preferred	Tolerance	
		Metric	English
Z Trim Height			
FE1(Base)	46 mm (1.81 in)	39.6-52.4 mm	1.52-2.06 in
FE2 (F55)	46 mm (1.81 in)	39.6-52.4 mm	1.52-2.06 in
FE3 (Z51)	45 mm (1.77 in)	38.6-51.4 mm	1.52-2.02 in
D Trim Height			
FE1	122 mm (4.80 in)	115.6-128.4 mm	4.55-5.05 in
FE2	122 mm (4.80 in)	115.6-128.4 mm	4.55-5.05 in
FE3	121 mm (4.76 in)	114.6-127.4 mm	4.51-5.01 in

DIAGNOSTIC INFORMATION AND PROCEDURES

DIAGNOSTIC STARTING POINT - SUSPENSION GENERAL DIAGNOSIS

Begin the system diagnosis by reviewing the system Description and Operation. Reviewing the Description and Operation information will help you determine the correct symptom diagnostic procedure when a malfunction exists. Reviewing the Description and Operation information, and the vehicle RPO, will also help you determine if the condition described by the customer is normal operation. Refer to **Symptoms - Suspension General Diagnosis** in order to identify the correct procedure for diagnosing the system and where the procedure is located.

SYMPTOMS - SUSPENSION GENERAL DIAGNOSIS

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

1. Determine whether the vehicle is equipped with an electrically assisted or active suspension system. Perform electrical diagnosis prior to beginning mechanical diagnosis. Refer to the following list in order to diagnose the system:
 - **Diagnostic Starting Point - Tire Pressure Monitoring** in Tire Pressure Monitoring
 - **Diagnostic Starting Point - Electronic Suspension Control** in Electronic Suspension Controls
2. Review the system description and operation in order to familiarize yourself with the system functions. Refer to the appropriate description and operation:
 - **General Description** in Front Suspension

- **General Description** in Rear Suspension
- **General Description** in 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 **Tire Placard** in General Information.

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**
- **Poor Directional Stability**
- **Noise Diagnosis - Front Suspension**
- **Noise Diagnosis - Rear Suspension**
- **Struts or Shock Absorbers On-Vehicle Testing**
- **Wheel Bearings Diagnosis**
- **Radial Tire Lead/Pull Correction**

RIDE DIAGNOSIS

Ride Diagnosis

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 ride is too soft or too hard. Does the vehicle ride normally?	System OK	Go to Step 3
3	Inspect the tires for the proper inflation pressure. Refer to <u>Tire Inflation Pressure Specifications (1)</u> in Maintenance and Lubrication. Is the tire inflation pressure correct?	Go to Step 5	Go to Step 4
4	Inflate the tires to the correct pressure. Did you complete the repair?	Go to Step 5	-
	1. Inspect the vehicle trim height. Refer to <u>Trim Height</u>		

5	<p><u>Inspection Procedure</u> .</p> <p>2. Repair as necessary.</p> <p>Did you complete the inspection/repair?</p>	Go to Step 6	-
6	<p>Inspect the following suspension components for wear or damage:</p> <ul style="list-style-type: none"> • Springs • Struts • Shock Absorbers <p>Refer to <u>Struts or Shock Absorbers On-Vehicle Testing</u> .</p> <p>Are any of the components the worn or damaged?</p>	Go to Step 7	Go to Step 8
7	<p>Replace all of the worn or damaged components.</p> <ul style="list-style-type: none"> • For shock absorber replacement, refer to <u>Shock Absorber Replacement (w/o F55)</u> or <u>Shock Absorber Replacement (W/F55)</u> in Front Suspension or <u>Shock Absorber Replacement (W/O F55)</u> or <u>Shock Absorber Replacement (W/F55)</u> in Rear Suspension. • For spring replacement, refer to <u>Front Transverse Spring Replacement</u> in Front Suspension or <u>Rear Transverse Spring Replacement</u> in Rear Suspension. <p>Did you complete the repair?</p>	Go to Step 8	-
8	<p>1. Inspect the electronic suspension control system. Refer to <u>Diagnostic System Check - Electronic Suspension Control</u> in Electronic Suspension Control (ESC).</p> <p>2. Repair as necessary.</p> <p>Did you complete the inspection/repair?</p>	Go to Step 9	-
9	<p>Drive the vehicle in order to verify the repair.</p> <p>Did you correct the condition?</p>	System OK	Go to Step 3

VEHICLE LEADS/PULLS

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's straight path.			
1	Did you review the General Description and perform the visual/physical inspections?	Go to	Go to Symptoms - Suspension General

		Step 2	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: <ul style="list-style-type: none"> • 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
4	Perform the Radial Tire Lead/Pull Correction in Tires and Wheels. 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: <ul style="list-style-type: none"> • Vehicle trim height-Refer to Trim Height Specifications . • 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 need to rotate the left wheel or the right wheel. Refer to Diagnostic Starting Point - Disc Brakes in Disc Brakes. 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 Measuring Wheel Alignment in Wheel Alignment. 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

Body Leans or Sways in Corners

Step	Action	Yes	No
1	Did you review the General Description and perform	Go to	Go to Symptoms - Suspension

	the necessary inspections?	Step 2	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 transverse leaf springs for wear or damage: Are the springs worn or damaged?	Go to Step 5	Go to Step 4
4	Inspect the stabilizer shaft link for wear or damage. Is the stabilizer shaft link worn or damaged?	Go to Step 6	Go to Step 2
5	Replace the springs. Refer to the appropriate procedure: <ul style="list-style-type: none"> • Rear Transverse Spring Replacement in Rear Suspension • Front Transverse Spring Replacement in Front Suspension 	Go to Step 7	-
6	Replace the stabilizer shaft link. Refer to the appropriate procedure: <ul style="list-style-type: none"> • Stabilizer Shaft Link Replacement in Front Suspension • Stabilizer Shaft Link Replacement in Rear Suspension 	Go to Step 7	-
7	Operate the vehicle in order to verify the repair. Did you correct the condition?	System OK	Go to Step 3

SUSPENSION BOTTOMS

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. Refer to Label - Vehicle Certification in General Information. Is the vehicle overloaded?	Go to Step 6	Go to Step 4

4	Inspect the vehicle trim height. Refer to <u>Trim Height Inspection Procedure</u> . Is the vehicle trim height incorrect?	Go to Step 7	Go to Step 5
5	Inspect the struts and shock absorbers. Refer to <u>Struts or Shock Absorbers On-Vehicle Testing</u> . Are the components in need of replacement?	Go to Step 8	Go to Step 9
6	Remove the excess weight from the vehicle. Did you remove the excess weight from the vehicle?	Go to Step 9	-
7	Correct the vehicle trim height. Refer to <u>Trim Height Inspection Procedure</u> . Did you complete the repair?	Go to Step 9	-
8	Replace the components as necessary. Did you complete the repair?	Go to Step 9	-
9	Operate the vehicle in order to verify the repair. Did you correct the condition?	System OK	Go to Step 3

MEMORY STEER

Memory Steer

Step	Action	Yes	No
DEFINITION: The steering wheel does not return to center after completing a turn.			
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	Ensure that all of the tires are inflated to the correct pressure. Refer to <u>Tire Inflation Pressure Specifications (1)</u> in Maintenance and Lubrication. Has the inspection/adjustment been performed?	Go to Step 4	-
4	<ol style="list-style-type: none"> 1. Lubricate the tie rod ends and the ball joints if applicable. 2. Inspect the suspension system for worn or damaged components. 3. Repair as necessary. 4. Road test the vehicle in order to verify the customer complaint. Does the vehicle still exhibit memory steer?	Go to Step 5	System OK
5	<ol style="list-style-type: none"> 1. Check for proper wheel alignment. Refer to <u>Measuring Wheel Alignment</u> in Wheel Alignment. Adjust as necessary. 2. Road test the vehicle in order to verify the customer complaint. 		

	Does the vehicle still exhibit memory steer?	Go to Step 6	System OK
6	<ol style="list-style-type: none"> 1. Raise and support the vehicle. Refer to Tire Placard in General Information. 2. Disconnect both of the outer tie rod ends from the steering knuckles. Refer to Rack and Pinion Outer Tie Rod End Replacement in Power Steering System. 3. Use your hands in order to move the tie rod ends. <p>Are either of the tie rod ends abnormally difficult to move?</p>	Go to Step 7	Go to Step 8
7	<p>Replace the outer tie rod end(s) as necessary. Refer to Rack and Pinion Outer Tie Rod End Replacement in Power Steering System.</p> <p>Did you complete the repair?</p>	Go to Step 14	-
8	<ol style="list-style-type: none"> 1. Remove the tire/wheel. 2. Disconnect the lower control arm from the steering knuckle. 3. Use your hands to rotate the ball joint stud. <p>Is the ball joint abnormally difficult to rotate?</p>	Go to Step 9	Go to Step 10
9	<p>Replace the lower control arm. Refer to Lower Control Arm Replacement in Front Suspension.</p> <p>Did you complete the repair?</p>	Go to Step 14	-
10	<ol style="list-style-type: none"> 1. Raise and support the vehicle. Refer to Tire Placard in General Information. 2. Rotate the steering wheel ONE revolution in either direction. 3. Rotate the steering wheel back to the original position. <p>Was the steering wheel abnormally difficult to rotate in either direction?</p>	Go to Step 11	Go to Step 14
11	<ol style="list-style-type: none"> 1. Disconnect the intermediate shaft. <p>IMPORTANT: Do NOT rotate the steering wheel more than one complete revolution.</p> <ol style="list-style-type: none"> 2. Note the position of the steering wheel and rotate the steering wheel ONE revolution in either direction. 3. Rotate the steering wheel back to the original position as previously noted. <p>Was the steering wheel abnormally difficult to rotate in either</p>	Go to	

	direction?	Step 12	Go to Step 13
12	<ol style="list-style-type: none"> 1. Repair the steering gear as necessary. Refer to <u>Power Steering Gear Replacement</u> in Power Steering System. 2. Road test the vehicle in order to verify the customer complaint. <p>Did you complete the repair?</p>	Go to Step 14	-
13	<p>Repair the steering column as necessary.</p> <p>Did you complete the repair?</p>	Go to Step 14	-
14	<p>Operate the vehicle in order to verify the repair.</p> <p>Did you correct the condition?</p>	System OK	Go to Step 3

POOR DIRECTIONAL STABILITY

Poor Directional Stability

Step	Action	Yes	No
DEFINITION: Driver is unable to maintain consistent, predictable vehicle driving control in any direction.			
1	Did you review the General Description and perform the necessary inspections?	Go to Step 2	Go to <u>Symptoms - Suspension General Diagnosis</u>
2	Verify that the directional stability is poor. Does the system operate normally?	System OK	Go to Step 3
3	<ol style="list-style-type: none"> 1. Inspect the stabilizer shaft, links, and insulators for wear or damage. 2. Replace as necessary. <ul style="list-style-type: none"> • Refer to <u>Stabilizer Shaft Replacement</u> in Front Suspension. • Refer to <u>Stabilizer Shaft Link Replacement</u> in Front Suspension. • Refer to <u>Stabilizer Shaft Insulator Replacement</u> in Front Suspension. <p>Does the vehicle still exhibit poor directional stability?</p>	Go to Step 4	System OK
4	<ol style="list-style-type: none"> 1. Inspect the lower control arms, ball joints and tie rods for wear or damage. 2. Repair as necessary. <ul style="list-style-type: none"> • Refer to <u>Lower Control Arm Replacement</u> in Front Suspension. • Refer to <u>Rack and Pinion Outer Tie Rod End Replacement</u> in Power Steering System. 	Go to	

	Does the vehicle still exhibit poor directional stability?	Step 5	System OK
5	Inspect the wheel bearings/hubs for looseness or excessive lateral runout. Refer to Wheel Bearings Diagnosis . Does the vehicle still exhibit poor directional stability?	Go to Step 6	System OK
6	1. Inspect the vehicle trim height. Refer to Trim Height Inspection Procedure . 2. Repair as necessary. Does the vehicle still exhibit poor directional stability?	Go to Step 7	System OK
7	Inspect and adjust the wheel alignment as necessary. Refer to Measuring Wheel Alignment in Wheel Alignment. Does the vehicle still exhibit poor directional stability?	Go to Step 8	System OK
8	1. Inspect the steering column for looseness. Refer to Looseness in Steering Column in Steering Wheel and Column. 2. Repair as necessary. Did you complete the repair?	Go to Step 9	-
9	1. Inspect the steering gear mounting bolts for looseness. Refer to Fastener Tightening Specifications in Power Steering. 2. Inspect the bearing preload adjustment. Refer to Rack and Pinion Gear Rack Bearing Preload Adjustment - Off Vehicle (MAGNASTEER) in Power Steering Systems. 3. Repair as necessary. Did you complete the repair?	Go to Step 10	-
10	Operate the vehicle in order to verify the repair. Did you correct the condition?	System OK	Go to Step 3

NOISE DIAGNOSIS - FRONT SUSPENSION

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	<p>Inspect the tires for the following condition:</p> <ul style="list-style-type: none"> • Proper tire Inflation and adjust as necessary. Refer to <u>Tire Inflation Pressure Specifications (1)</u> in Maintenance and Lubrication. • Unusual tire wear. Refer to <u>Vibration Analysis - Tire and Wheel</u> in Vibration Diagnosis and Correction. • Inspect the wheel nuts for looseness and tighten as necessary. Refer to <u>Fastener Tightening Specifications</u> in Tire and Wheels. <p>Did you find and correct the condition?</p>	Go to Step 13	Go to Step 5
5	<p>Inspect the front wheel bearings. Refer to <u>Wheel Bearings Diagnosis</u> .</p> <p>Did you find and correct the condition?</p>	Go to Step 13	Go to Step 6
6	<p>Bounce the front of the vehicle in order to duplicate the noise.</p> <p>Did you duplicate the noise?</p>	Go to Step 7	Go to Step 8
7	<ol style="list-style-type: none"> 1. Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> in General Information. 2. Inspect the front suspension components for looseness. Refer to <u>Fastener Tightening Specifications</u> in Front Suspension. 3. Inspect the front suspension components for damage and repair as necessary. <p>Did you find and correct the condition?</p>	Step 13	Step 8
8	<ol style="list-style-type: none"> 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. <p>Did you find and correct the condition?</p>	Go to Step 13	Go to Step 9
9	<p>Inspect the ball joints and steering components for the following conditions.</p> <ul style="list-style-type: none"> • Lack of lubrication where applicable • Looseness in the ball joints. Refer to <u>Ball Joint Inspection</u> . • Looseness in the steering linkage. Refer to <u>Looseness in Steering Column</u> in Steering Linkage (Non-Rack and Pinion). • Looseness in the tie rods. Refer to <u>Rack and Pinion Outer Tie Rod End Replacement</u> or <u>Tie Rod Replacement -</u> 		

	Inner (MAGNASTEER) in Power Steering System. Did you find and correct the condition?	Go to Step 13	Go to Step 10
10	Inspect for damaged shock absorbers. Refer to Struts or Shock Absorbers On-Vehicle Testing . 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 in Front Suspension. 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 Lower Control Arm Replacement Upper Control Arm Replacement in Front Suspension. 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

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 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	Perform the following inspections: <ul style="list-style-type: none"> Inspect and adjust the tire inflation. Refer to Tire Inflation Pressure Specifications (1) in Maintenance and Lubrication. Inspect for unusual tire wear. Refer to Vibration Analysis - Tire and Wheel in Vibration Diagnosis and Correction. Inspect the wheel nuts for looseness. Refer to Fastener Tightening Specifications in Tire and Wheels. 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	<ol style="list-style-type: none"> 1. Raise the vehicle. Refer to Lifting and Jacking the Vehicle in General Information. 2. Inspect the rear suspension components for looseness. Refer to Fastener Tightening Specifications in Rear Suspension. 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 Struts or Shock Absorbers On-Vehicle Testing . Did you find and correct the condition?	Go to Step 10	Go to Step 9
9	<ol style="list-style-type: none"> 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
10	Operate the system in order to verify the repair. Did you correct the condition?	System OK	Go to Step 3

BALL JOINT INSPECTION

Tools Required

J 8001 Dial Indicator

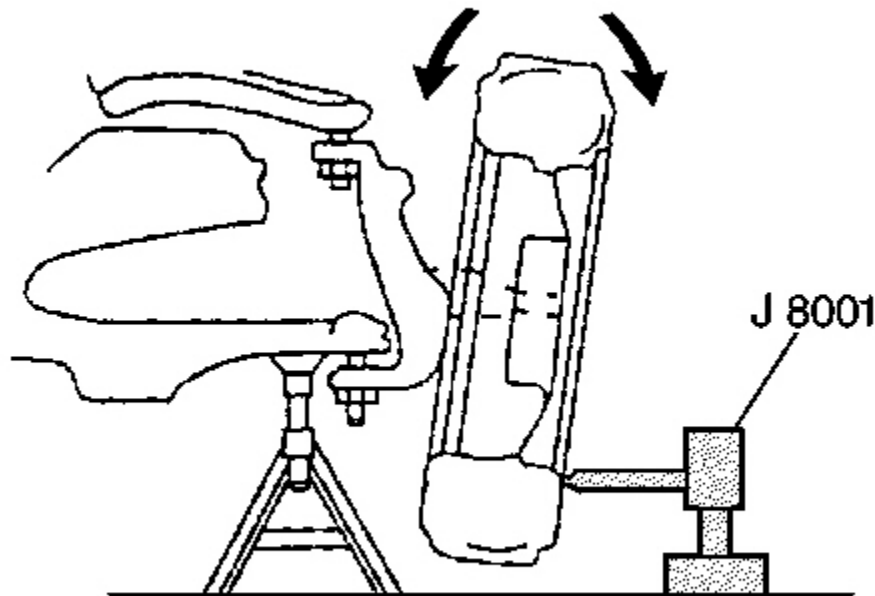


Fig. 1:
Courtesy of GENERAL MOTORS CORP.

IMPORTANT:

- The vehicle must rest on a level surface.
- The vehicle must be stable. Do not rock the vehicle on the jack stands.
- The upper control arm bumper must not contact the frame.

1. Raise and support the vehicle with safety stands. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Support the lower control arm with a jack stand, as far outboard as possible, near the lower ball joint.

IMPORTANT: If a seal is cut or torn, replace the ball joint.

3. Wipe the ball joints clean. Check the seals for cuts or tears.
4. Check the wheel bearings for looseness. If looseness in the wheel bearings is present, refer to **Wheel Bearings Diagnosis**.
5. Check the ball joints for horizontal looseness.
 1. Position the **J 8001** dial indicator against the lowest outboard point on the wheel rim.

2. Rock the wheel in and out while reading the dial indicator. This shows horizontal looseness in both joints.
3. The dial indicator reading should be no more than 3.18 mm (0.125 in). If the reading is too high, check the lower ball joints for vertical looseness.

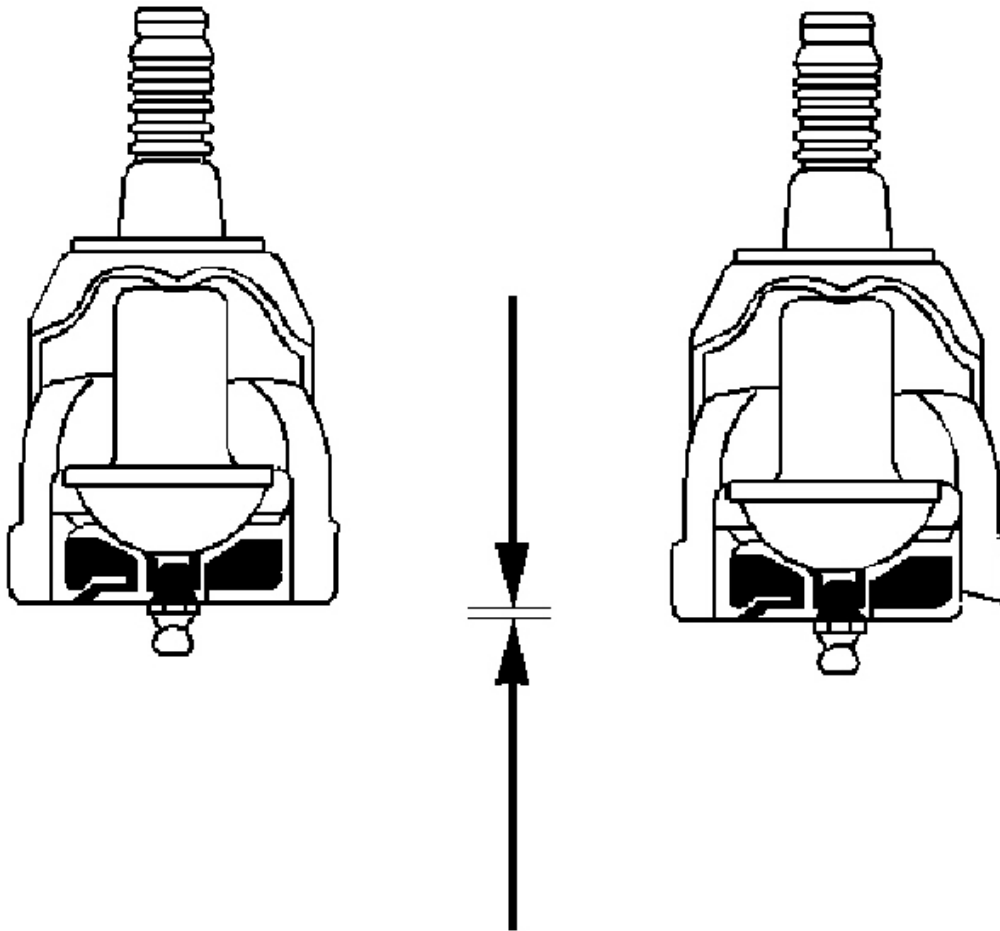


Fig. 2: Inspecting The Lower Ball Joint For Damage
Courtesy of GENERAL MOTORS CORP.

6. Check the lower ball joints for wear and for vertical looseness using the following procedure:
 1. Inspect by sight the lower ball joint for wear. The position of the housing into which the grease fitting is threaded indicates wear. This round housing projects 1.27 mm (0.050 in) beyond the surface of the lower ball joint cover on a new ball joint. Under normal wear, the surface of the lower ball joint housing retreats inward very slowly.

2. First observe, then scrape a scale, a screwdriver, or a fingernail across the cover. If the round housing is flush with or inside of the cover surface, replace the lower control arm. Refer to **Lower Control Arm Replacement** in Front Suspension.

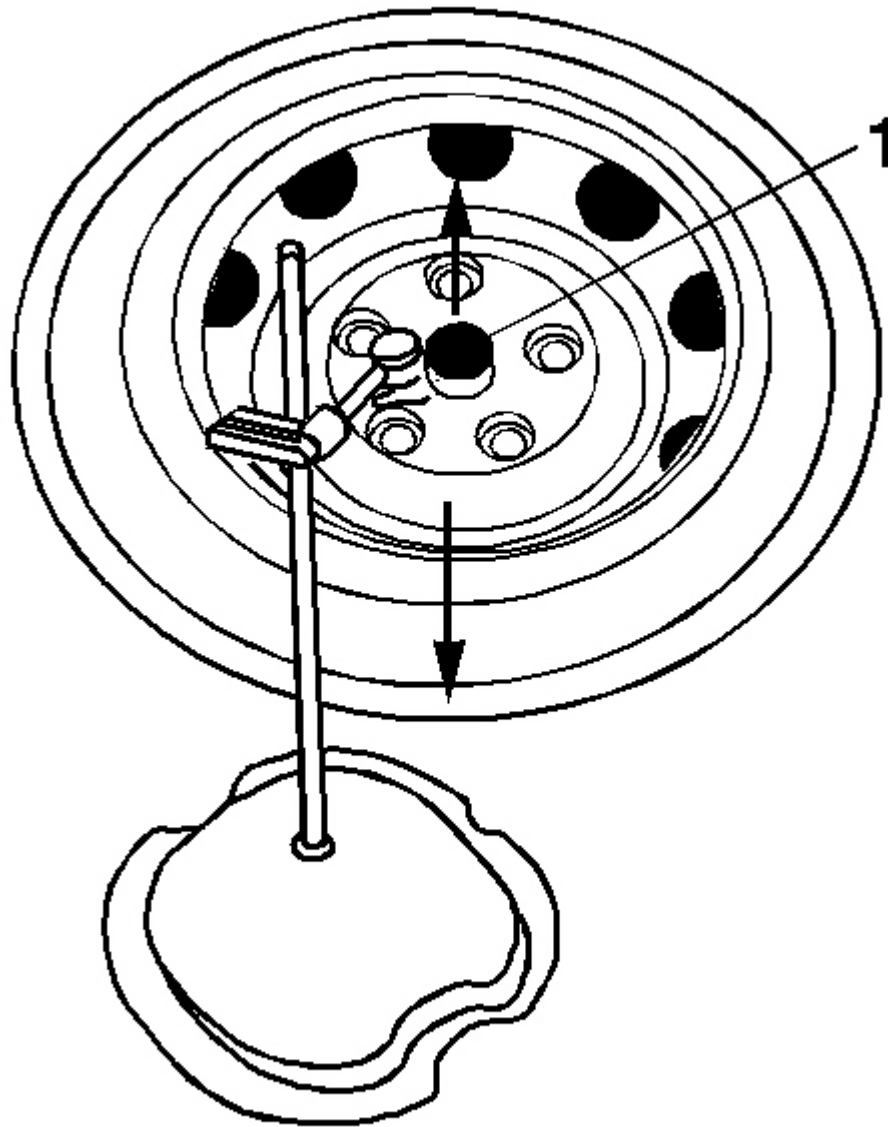


Fig. 3: Dial Indicator & Spindle
Courtesy of GENERAL MOTORS CORP.

7. Place a **J 8001** dial indicator (1) against the spindle in order to show vertical movement.

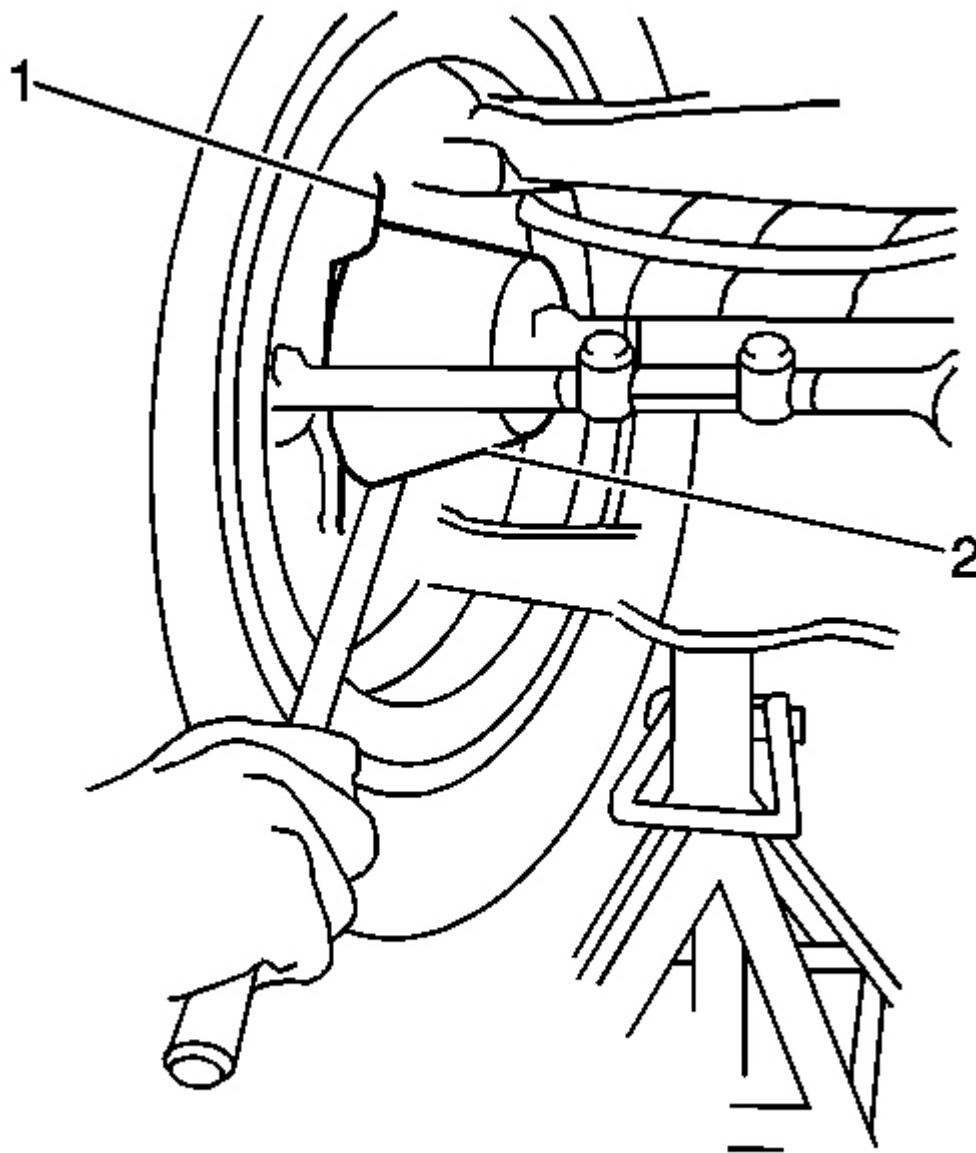


Fig. 4: Prying Between Lower Control Arm & Outer Bearing Race
Courtesy of GENERAL MOTORS CORP.

8. Pry between the lower control arm (2) and the outer bearing race (1) while reading the dial indicator. This

shows vertical looseness in the ball joints. The lower ball joint is not preloaded and may show some looseness.

9. If the dial indicator reading is more than 3.18 mm (0.125 in), replace the lower control arm. Refer to **Lower Control Arm Replacement** in Front Suspension.
10. If the lower ball joint is within specifications, and there is too much horizontal looseness, check the upper ball joint for wear.
 1. Disconnect the upper ball joint from the steering knuckle. Refer to **Upper Ball Joint Replacement** in Front Suspension.
 2. If you find any looseness or can twist the stud with your fingers, replace the upper ball joint. Refer to **Upper Ball Joint Replacement** in Front Suspension.

STRUTS OR SHOCK ABSORBERS ON-VEHICLE TESTING

Struts or Shock Absorbers On-Vehicle Testing

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 malfunction is present. Does the vehicle operate normally?	System OK	Go to Step 3
3	IMPORTANT: A light film of oil on the top portion of the reservoir is normal. Inspect each strut or shock absorber for external fluid leakage. Is the strut or shock absorber leaking?	Go to Step 7	Go to Step 4
4	Inspect the vehicle trim height. Refer to <u>Trim Height Inspection Procedure</u> . Is the vehicle trim height correct?	Go to Step 5	Go to Step 6
5	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. Does the vehicle stop bouncing after 2 cycles?	Go to Step 8	Go to Step 7
6	Replace the front spring or the rear spring. Refer to the appropriate procedure: <ul style="list-style-type: none"> • <u>Front Transverse Spring Replacement</u> in Front Suspension • <u>Rear Transverse Spring Replacement</u> in Rear Suspension Did you complete the repair?	Go to Step 8	-

7	<p>Replace the strut or shock absorber. Refer to the appropriate procedure:</p> <ul style="list-style-type: none"> • Shock Absorber Replacement (w/o F55) or Shock Absorber Replacement (W/F55) in Front Suspension • Shock Absorber Replacement (W/O F55) or Shock Absorber Replacement (W/F55) in Rear Suspension 		
	Did you complete the repair?	Go to Step 8	-
8	Operate the vehicle in order to verify the repair. Did you correct the condition?	System OK	Go to Step 3

WHEEL BEARINGS DIAGNOSIS

Wheel Bearings Diagnosis

Step	Action	Values	Yes	No
1	Did you review the General Description and perform the necessary inspections?	-	-	Go to Symptoms - Suspension General Diagnosis
2	Road test the vehicle in order to verify the customer's complaint. Does the vehicle operate normally?	-	System OK	Go to Step 3
3	<ol style="list-style-type: none"> 1. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle in General Information. 2. Inspect for tire or wheel damage. Refer to Tire and Wheel Assembly Runout Measurement - On-Vehicle in Vibration Diagnosis and Correction. <p>Did you find and correct the condition?</p>	-	Go to Step 7	Go to Step 4
4	<ol style="list-style-type: none"> 1. Install the J 39570 Chassis Ear. 2. Road test the vehicle to verify the location of the wheel bearing noise. <p>Did you locate the source of the wheel bearing noise?</p>	-	Go to Step 6	Go to Step 5
	<p>IMPORTANT:</p> <p>Support the vehicle by the lower control arms or the rear axle to prevent movement during wheel bearing/hub inspection.</p> <ol style="list-style-type: none"> 1. Mount and secure the J 8001 Dial Indicator. 			

5	<p>2. Ensure that the dial indicator contacts the vertical surface of the wheel as close as possible to the top wheel stud.</p> <p>3. Push and pull on the top of the tire in order to inspect the total travel indicated by the dial indicator.</p>	0.27 mm (0.005 in)		
	Is the measurement greater than the specified value?		Go to Step 6	System OK
6	<p>Replace the wheel bearing. Refer to Wheel Bearing/Hub Replacement - Front in Front Suspension or Wheel Bearing/Hub Replacement - Rear in Rear Suspension.</p> <p>Did you complete the repair?</p>	-	Go to Step 7	-
7	<p>Road test the vehicle to verify the repair.</p> <p>Does the vehicle operate normally?</p>	-	System OK	Go to Step 3

TRIM HEIGHT INSPECTION PROCEDURE

Tools Required

- J 42743 Trim Height Adjustment Tool
- J 42854 Trim Height Measurement Gauge

Trim Height Measurements

Trim height is a predetermined measurement relating to vehicle ride height. Incorrect trim heights can cause bottoming 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:

1. Set the tire pressures to the pressure shown on the certification label. Refer to **Label - Vehicle Certification** in General Information.
2. Check the fuel level. Add additional weight if necessary to simulate a full tank.
3. Make sure the rear compartment is empty except for the spare tire.
4. Make sure the vehicle is on a level surface, such as an alignment rack.
5. Close the doors.
6. Close the hood.
7. All dimensions are measured vertical to the ground. Trim heights should be within 13 mm (0.5 in) to be considered correct.

Z Height Measurement

IMPORTANT: The Z height dimension measurement determines the proper ride height for the front end of the vehicle.

1. Lift the front bumper of the vehicle up about 38 mm (1.5 in).
2. Gently remove your hands.
3. Allow the vehicle to settle into position.
4. Repeat this jouncing operation 2 more times for a total of 3 times.

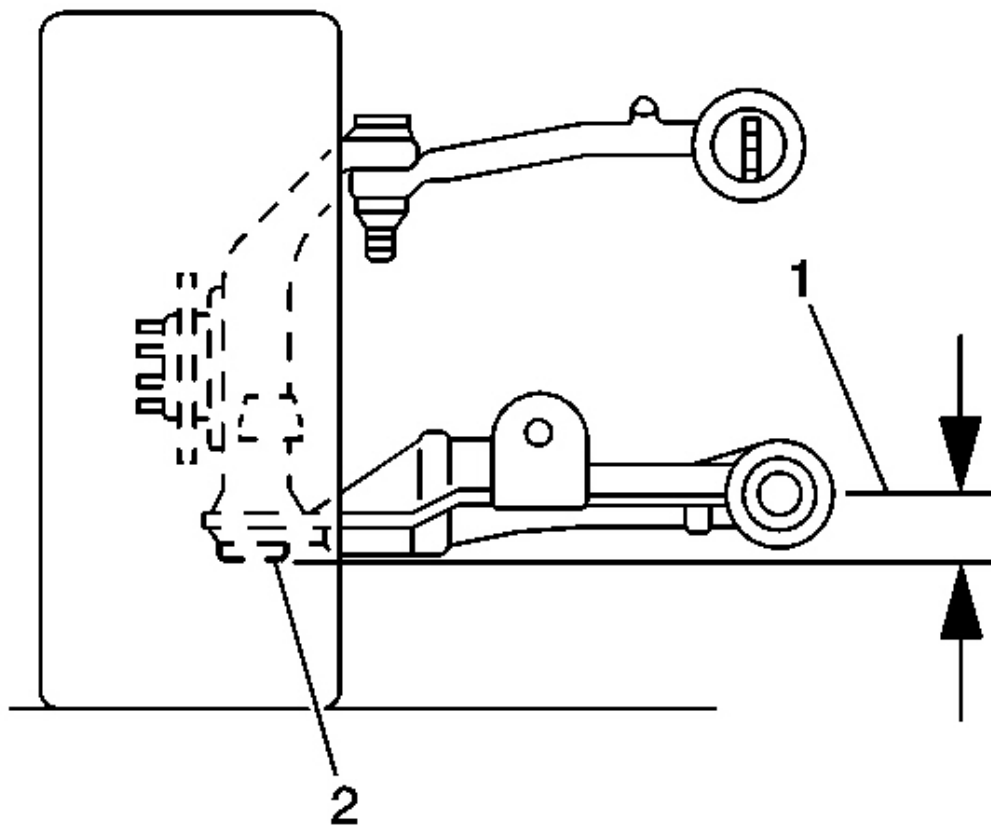


Fig. 5: Measuring The Distance Between Lowest Point Of Ball Joint & Center Of Front Side Lower Control Arm Mounting Bolt
Courtesy of GENERAL MOTORS CORP.

5. Measure the distance between the lowest point of the ball joint (2) and the center of the front side of the lower control arm mounting bolt (1), using the J 42854 .
6. Push the front bumper of the vehicle down about 38 mm (1.5 in).

7. Gently remove your hands.
8. Allow the vehicle to rise.
9. Repeat the operation for a total of 3 times.
10. Measure the Z dimension from both the right and left side.
11. The true Z height dimension number is the average of the high and the low measurements. Refer to **Trim Height Specifications** .

Z Height Adjustment

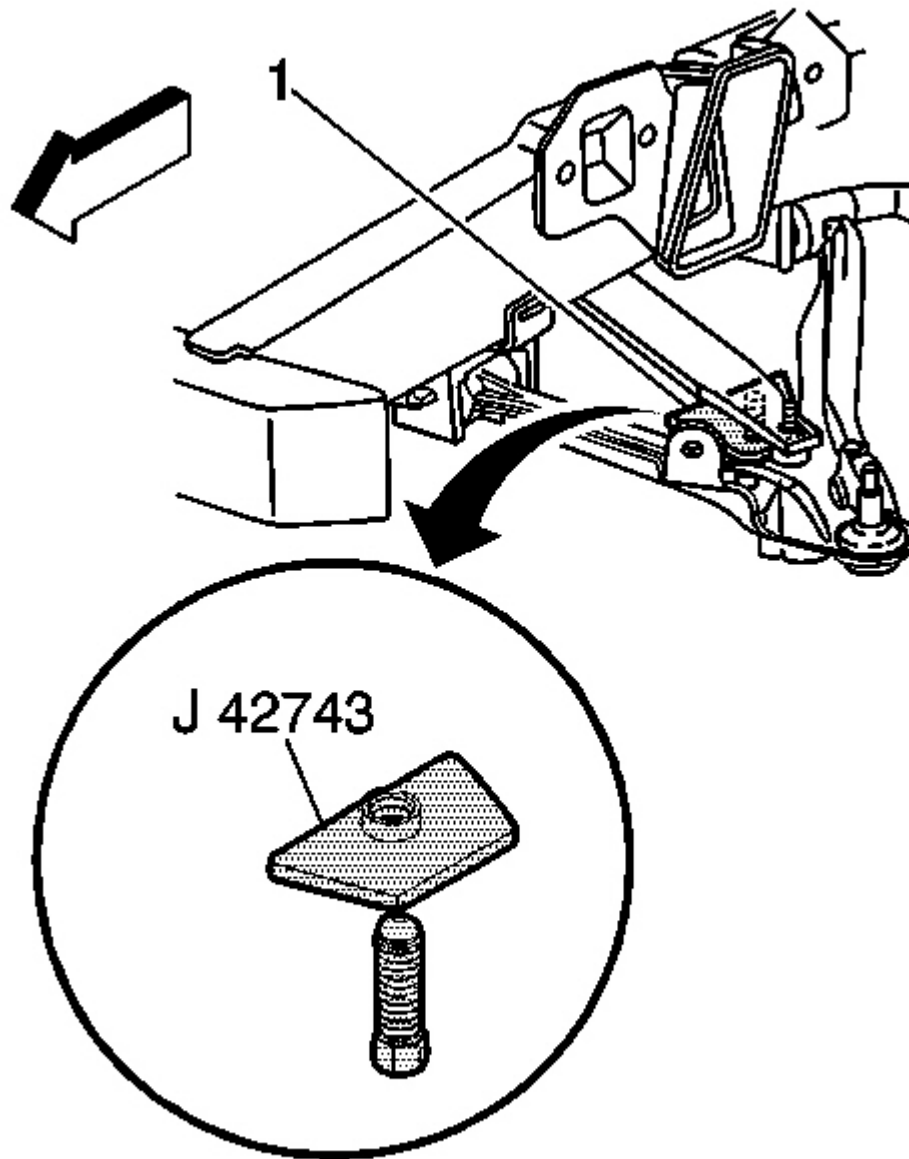


Fig. 6: J 42743 & Spring Adjuster Bolt
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: When adjusting the spring adjuster bolt, J 42743 must be used in order to prevent damage to the rubber shear pad on the end of the bolt. One complete turn of the spring adjuster bolt is equal to 2 mm (5/64 in).

1. Using J 42743 , adjust the Z trim height by turning the spring adjuster bolt.
2. Lower the transverse spring back onto the lower control arm and remove J 42743 .
3. Measure the Z trim height again.

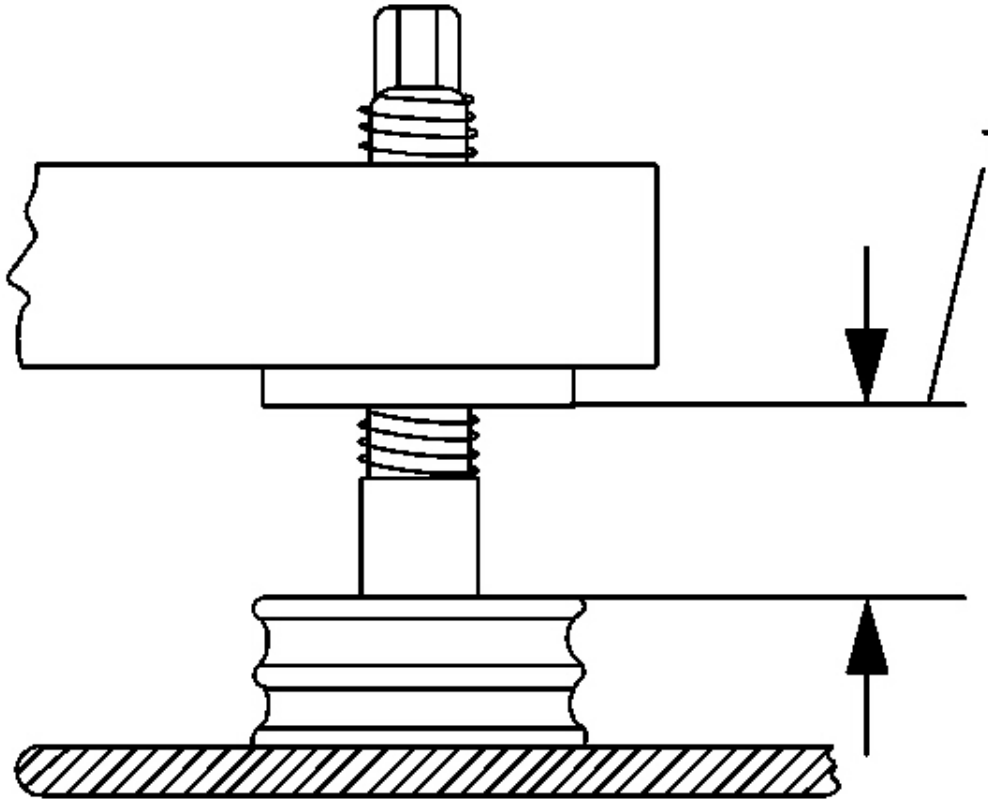


Fig. 7: Measuring & Adjusting The Front Spring Adjuster Bolt Gaps
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Do not exceed the maximum difference between the right and left spring adjuster bolt gaps.

4. Measure and adjust the front spring adjuster bolt gaps (1) to 2-24 mm (0.078-0.944 in).

D Height Measurement

The D height dimension measurement determines the proper rear end ride height.

1. With the vehicle on a flat surface, lift upward on the rear bumper 38 mm (1.5 in).
2. Gently remove your hands.

Allow the vehicle to settle into position.

3. Repeat the jouncing operation 2 more times for a total of 3 times.

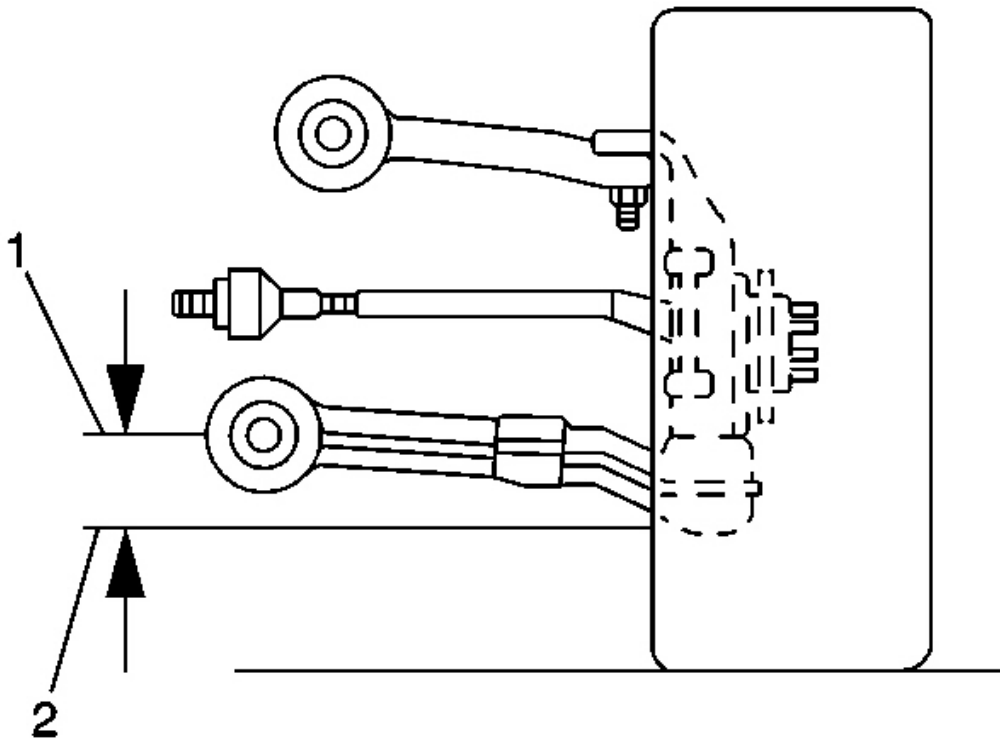


Fig. 8: Measuring The Distance Between Lowest Point Of Ball Joint & Center Front Side Of Lower Control Arm Mounting Bolt

Courtesy of GENERAL MOTORS CORP.

4. Use the J 42854 in order to measure the distance between the lowest point of the ball joint (2) and the center of the front side of the lower control arm mounting bolt (1).
5. Manually push the rear of the vehicle down approximately 38 mm (1.5 in), gently remove hands and let the vehicle settle.
6. Repeat the above step 2 more times for a total of 3 times.
7. Measure both the right and left sides of the vehicle.
8. The true D trim height is the average of the high and low measurements. Refer to **Trim Height**

Specifications in Suspension General Diagnosis.

D Height Adjustment

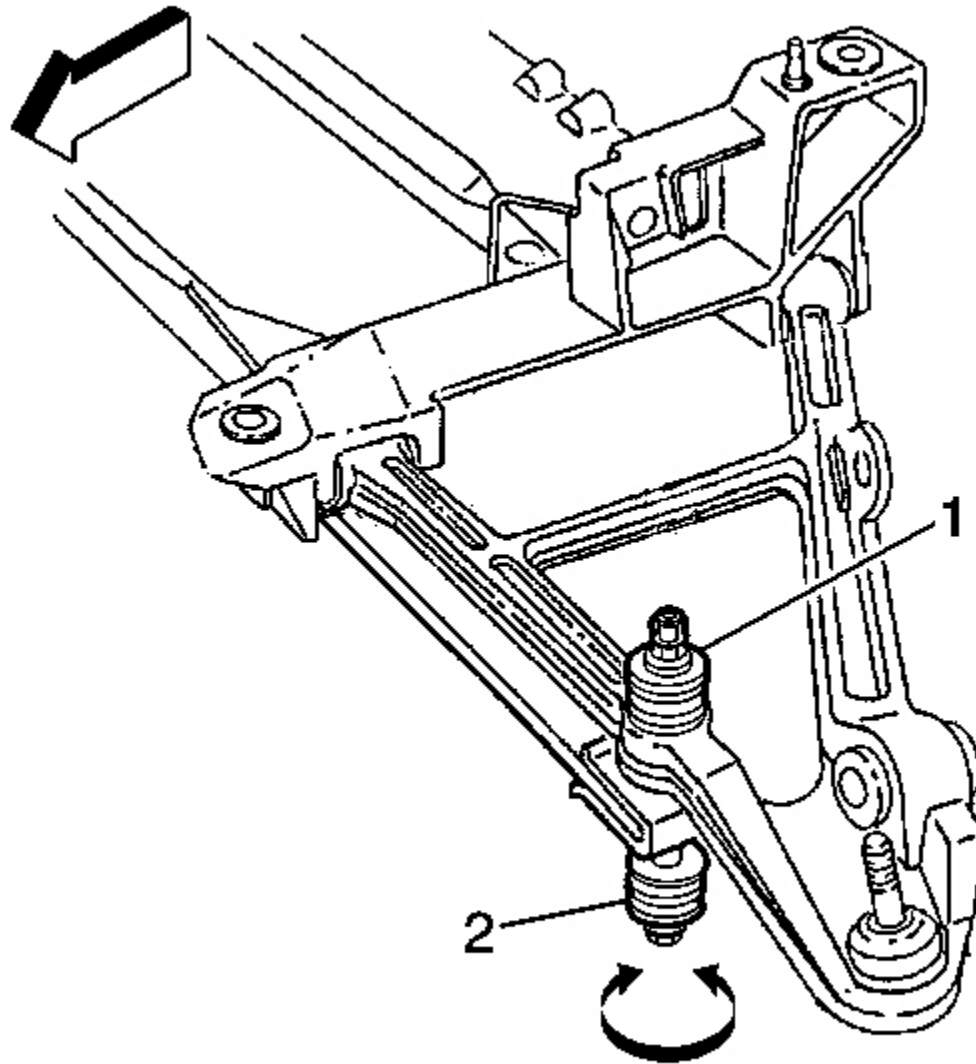


Fig. 9: Retainers & Top Of Spring Bolts
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: One complete turn of the adjustment bolt is equal to 2 mm (5/64 in).

1. Remove the retainers (1) on the top of the spring bolts (2).
2. Adjust the D trim height by turning the spring bolt.
3. Measure the D trim height again.

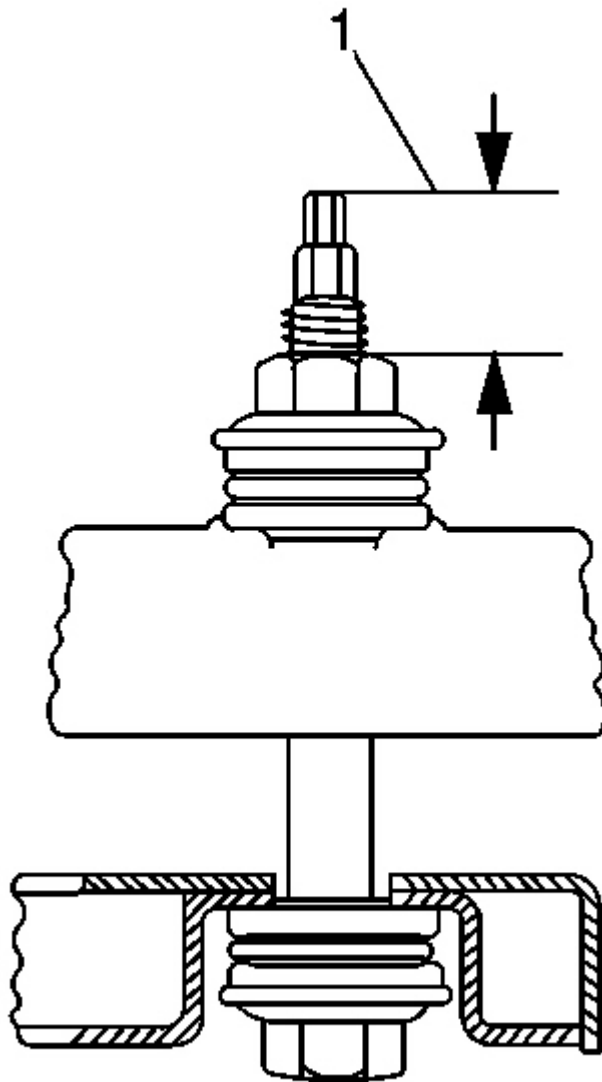


Fig. 10: Measuring The Rear Spring Stud Heights
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Do not exceed the maximum difference between the right and left rear spring stud heights.

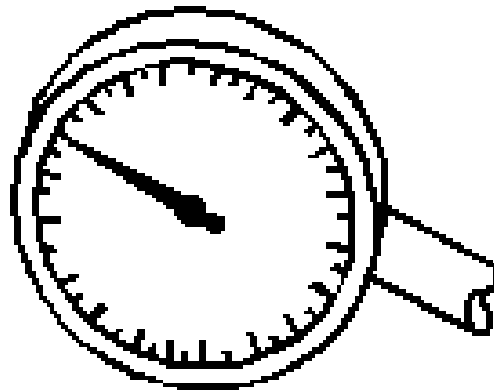
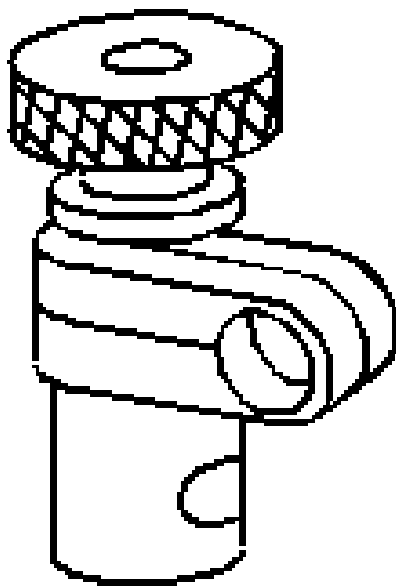
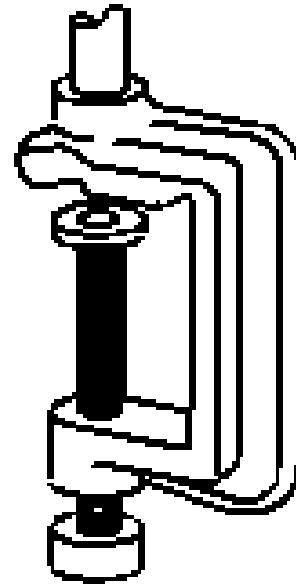
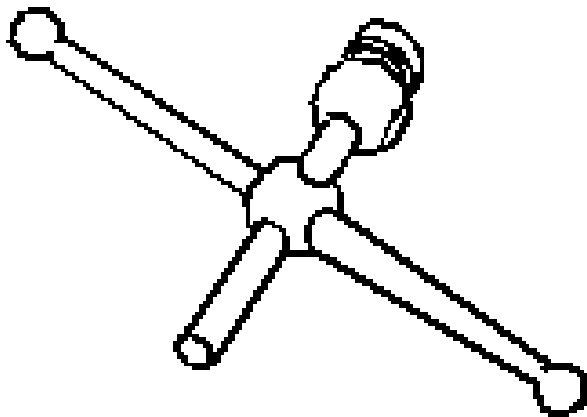
4. Measure the rear spring stud heights (1), the maximum difference should be 5 mm (0.196 in).
5. Install the retainers to the bolts.
6. Lower the vehicle.

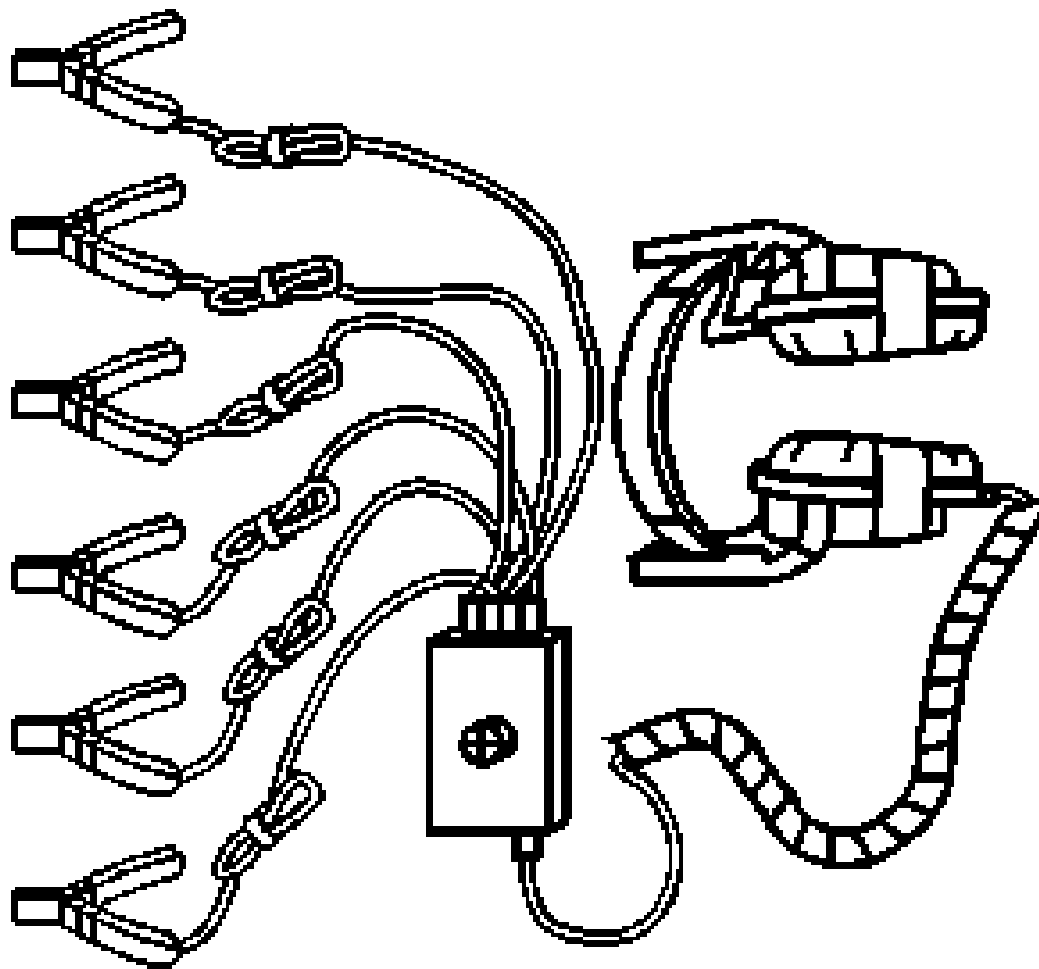
SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS

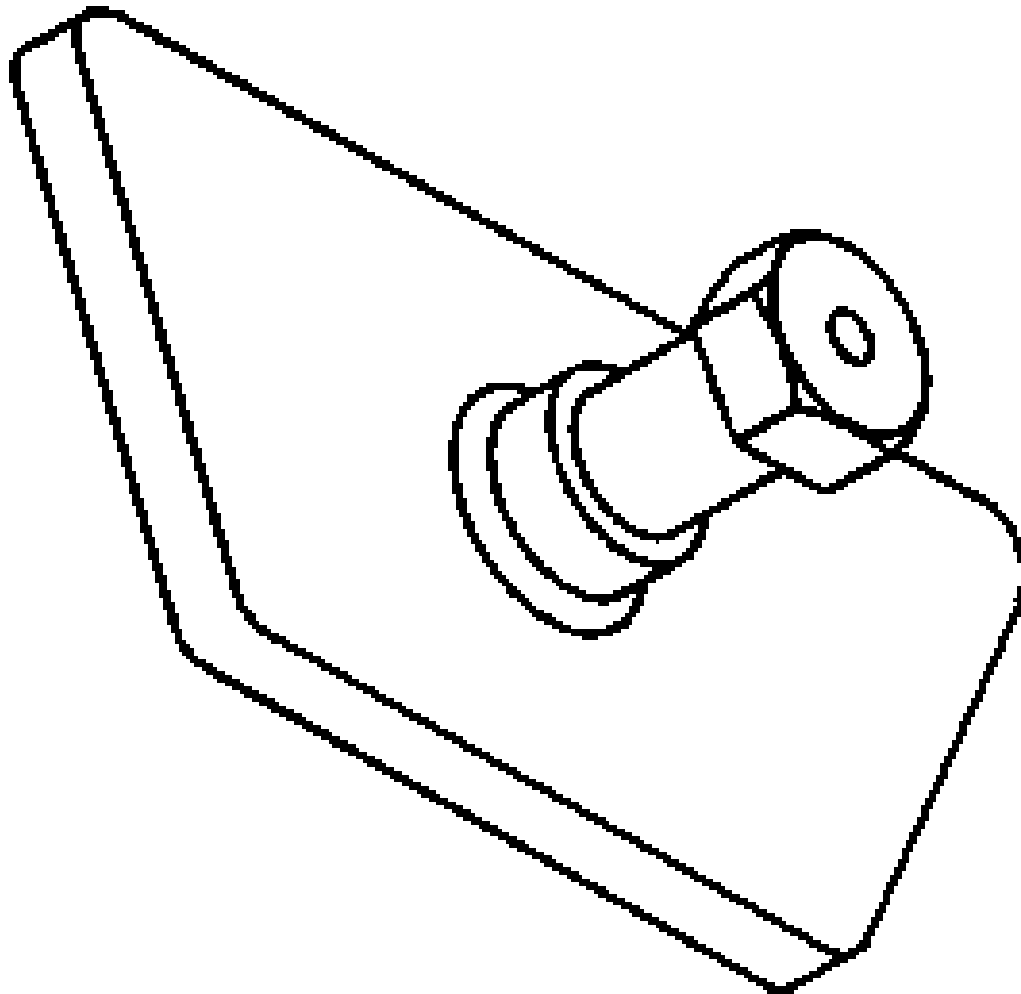
Special Tools

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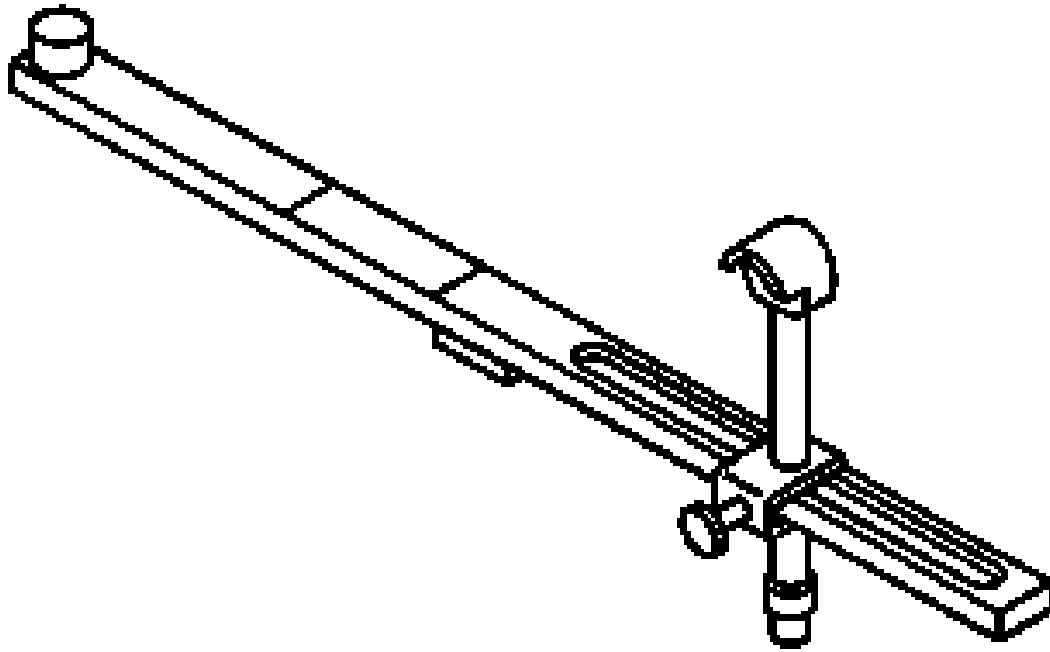




J3
Chas



J 4
Trim Hei



J 4
Trim H