

2017 SUSPENSION

Suspension General Diagnosis - Impala

SPECIFICATIONS

TRIM HEIGHT SPECIFICATIONS

Model	Option	Z	D	P	R
1GX69, 1GY69, 1GZ69	Q GK	0 mm (0.0 in)	43 mm (1.7 in)	737 mm (29.0 in)	746 mm (29.4 in)
1GX69, 1GY69, 1GZ69	Q2B, RAL	0 mm (0.0 in)	43 mm (1.7 in)	745 mm (29.3 in)	753 mm (29.7 in)

All measurements taken with a full tank of gas.
All measurements have a tolerance of +/- 10 mm (0.39 in).

DIAGNOSTIC INFORMATION AND PROCEDURES

SYMPTOMS - SUSPENSION GENERAL DIAGNOSIS

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

Review the system description and operation in order to familiarize yourself with the system functions.
Refer to the appropriate description and operation:

- [Front Suspension Description and Operation](#) for the front 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.

Symptom List

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

- [Ride Diagnosis](#)
- [Vehicle Leads/Pulls](#)
- [Suspension Bottoms](#)
- [Torque Steer](#)
- [Memory Steer](#)

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

Step	Action	Yes	No
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	Values	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	With the vehicle on a flat surface and the wheels facing straight ahead, verify that the Steering Angle Sensor is centered. If the steering wheel angle sensor is out of specification, refer to Steering Wheel Angle Sensor Centering. Did you find and correct the condition?	0°±5°	Go to Step 10	Go to Step 4
4	Inspect the tire/wheel assemblies for the following: - 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 10	Go to Step 4

Step	Action	Values	Yes	No
5	Perform the Radial Tire Lead/Pull Correction . Did you find and correct the condition?	-	Go to Step 10	Go to Step 6
6	Inspect and correct/adjust the suspension and steering systems for the following: - Vehicle trim height - Refer to Trim Height Specifications. - Excessively worn, loose, or damaged components Did you find and correct the condition?	-	Go to Step 10	Go to Step 7
7	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. Did you find and correct the condition?	-	Go to Step 10	Go to Step 8
8	Inspect the wheel alignment and adjust as necessary. Refer to Wheel Alignment Measurement . Did you correct the condition?	-	Go to Step 10	Go to Step 9
9	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 4
10	Operate the vehicle in order to verify the repair. Did you correct the condition?	-	System OK	Go to Step 4

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: - Rear coil springs - Front coil springs Are the components worn or damaged?	Go to Step 5	Go to Step 4

Step	Action	Yes	No
4	1. Inspect the stabilizer shaft link for wear or damage. 2. Repair as necessary. Did you find and correct the condition?	Go to Step 6	Go to Step 2
5	Replace the springs as necessary. 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

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	Inspect for vehicle overloading and correct the overloading condition as necessary. Refer to Vehicle Certification, Tire Placard, Anti-Theft, and Service Parts ID Label for specifications. Did you find and correct the condition?	Go to Step 6	Go to Step 4
4	Inspect the following components: - Inspect the shock absorbers. Refer to Suspension Strut and Shock Absorber Testing - On Vehicle - Inspect for damaged coil springs, torsion bar or leaf springs and replace as necessary. Did you find and correct the condition?	Go to Step 6	Go to Step 5
5	Inspect the vehicle trim height. Refer to Trim Height Inspection . Did you complete the trim height inspection procedure?	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

TORQUE STEER

Step	Action	Yes	No
DEFINITION: On a dry, smooth, flat road, the vehicle has a left or right steering force only during acceleration.			
1	Did you review the General Description and perform the necessary inspections?	Go to Step 2	Go to Symptoms - Suspension General Diagnosis

Step	Action	Yes	No
2	1. Drive the vehicle on a straight, smooth, flat road. 2. Press the accelerator and determine if any additional steering input is required to maintain a straight ahead direction. 3. Repeat this test with the vehicle traveling in the opposite direction in order to eliminate crosswind effects. Lead/pull caused by unlevel roads and crosswinds are considered normal. Does the vehicle exhibit torque steer when the accelerator is pressed?	Go to Step 3	System OK
3	1. Drive the vehicle on a straight, smooth, flat road at 64 - 97 km/h (40 - 60 mph). 2. Remove your foot from the accelerator. 3. Shift the transmission into NEUTRAL in order to allow the vehicle to coast. 4. Is any additional steering input required to maintain a straight ahead direction? 5. Repeat this test with the vehicle traveling in the opposite direction in order to eliminate crosswind effects. Lead/pull caused by unlevel roads and crosswinds are considered normal. Does the vehicle direction change when the steering wheel is momentarily released?	Go to Vehicle Leads/Pulls	Go to Step 4
4	Inspect the front suspension and powertrain mounts for worn or damaged components and repair as necessary. Did you find and correct the condition?	Go to Step 6	Go to Step 5
5	Inspect the vehicle trim height. Refer to Trim Height Inspection. Did you find and correct the condition?	Go to Step 6	-
6	Operate the vehicle in order to verify the repair. Did you correct the condition?	System OK	-

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

Step	Action	Yes	No
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 . 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 7
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 Specifications . Did you find and correct the condition?	Go to Step 14	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 14	Go to Step 6

Step	Action	Yes	No
6	Inspect for front axle or transaxle noises. Refer to Noise and Vibration Analysis . Did you find and correct the condition?	Go to Step 14	Go to Step 7
7	Bounce the front of the vehicle in order to duplicate the noise. Did you duplicate the noise?	Go to Step 8	Go to Step 9
8	1. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle . 2. Inspect the front suspension components for looseness. Refer to Fastener Specifications . 3. Inspect the front suspension components for damage and repair as necessary. Did you find and correct the condition?	Go to Step 14	Go to Step 9
9	1. Install a listening device, if existing. 2. Bounce the front of the vehicle, preferably by using a listening device, 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 14	Go to Step 10
10	Inspect the ball joints and steering components for the following conditions: • Lack of lubrication where applicable • Looseness in the ball joints - Refer to Ball Joint Inspection. • Looseness in the tie rods - Refer to Steering Linkage Outer Tie Rod Replacement . Did you find and correct the condition?	Go to Step 14	Go to Step 11
11	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 14	Go to Step 12
12	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 14	Go to Step 13
13	Inspect for control arm damage and repair as necessary. Refer to Lower Control Arm Replacement . Did you find and correct the condition?	Go to Step 14	-
14	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

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: - 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 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	- Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle . - Inspect the rear suspension components for looseness. Refer to Fastener Specifications . - 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	- Install a listening device, if existing. - Bounce the rear of the vehicle, preferably by using a listening device, in order to locate the source of the noise. If necessary, road test the vehicle. - 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

Special Tools

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 lower control arm. Refer to [Lower Control Arm Replacement](#) .

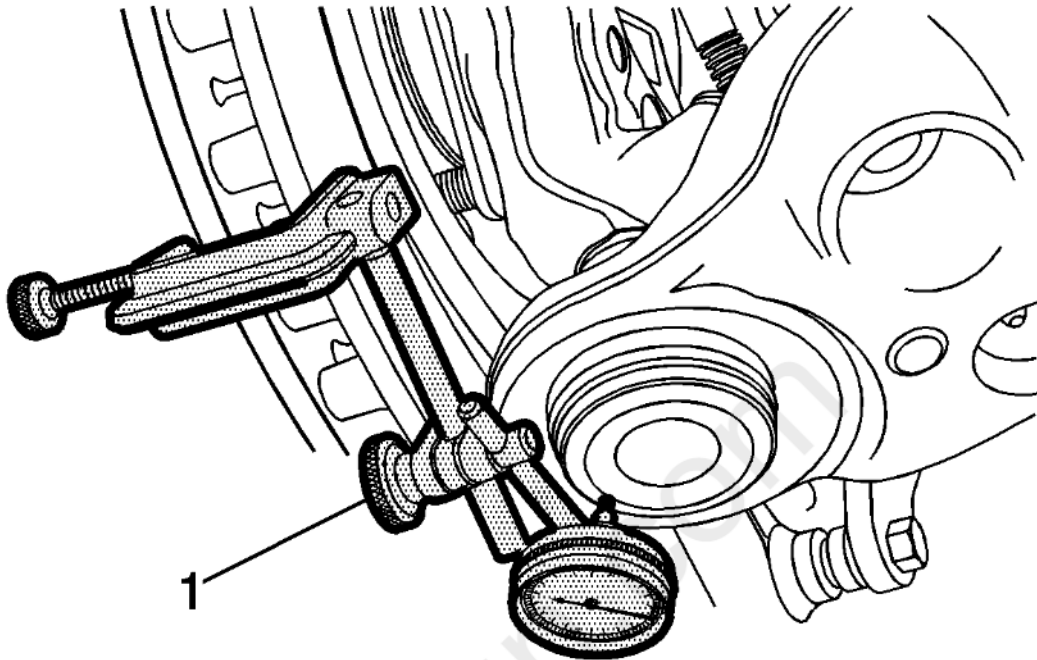


Fig. 1: Measuring Vertical Lash In Ball Joint
 Courtesy of GENERAL MOTORS COMPANY

3. Install the J 8001 set (1) in a way to measure 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.

4. Gently lift or pry the suspension to induce ball joint movement.
5. If the dial indicator indicates a reading greater than 0.5 mm (0.02 in), replace the lower control arm. Refer to [Lower Control Arm Replacement](#) .

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

Step	Action	Yes	No
3	IMPORTANT: 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	IMPORTANT: 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
1	Did you review the General Description and perform the necessary inspections?	-	Go to Step 2	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	1. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle. 2. Inspect for tire or wheel damage. Did you find and correct the condition?	-	Go to Step 6	Go to Step 4
4	Road test the vehicle to verify the location of the wheel bearing noise. Did you locate the source of the wheel bearing noise?	-	Go to Step 5	Go to Step 2
5	Replace the wheel bearing. Refer to Front Wheel Bearing and Hub Replacement, or Rear Wheel Bearing and Hub Replacement. Did this complete the repair?	-	Go to Step 6	-
6	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. **Vehicle Certification, Tire Placard, Anti-Theft, and Service Parts ID Label**
- Check the fuel level. Add additional weight if necessary to simulate a full tank.
- Make sure the passenger and rear compartments are empty, except for 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

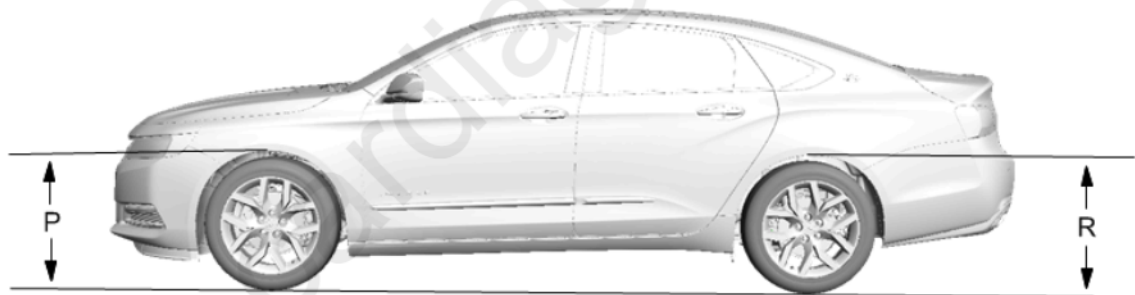


Fig. 2: P and R Dimension

Courtesy of GENERAL MOTORS COMPANY

Measurement Definitions

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

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

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

NOTE: The left and right P and R height differences should be no more than 10 mm (.39 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

Measurement Definitions

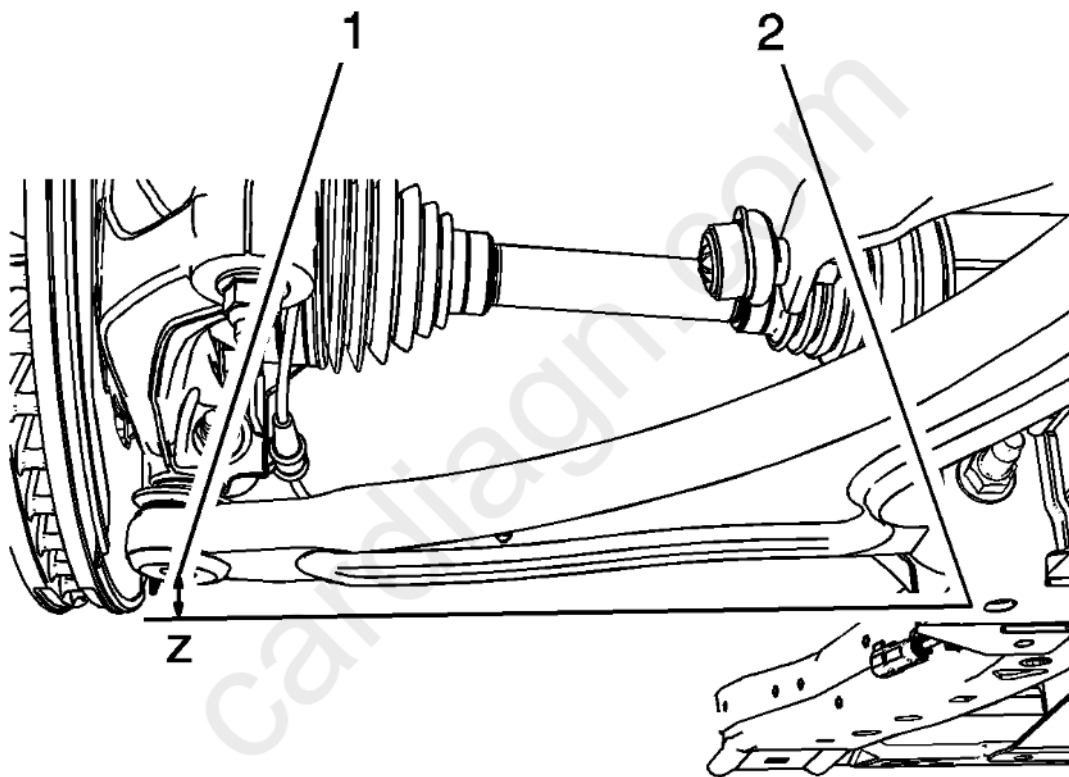


Fig. 3: Z Dimension

Courtesy of GENERAL MOTORS COMPANY

Z Height: The vertical distance between the bottom surface of the cradle bracket (2) in line with the ball joint and center point of the ball joint cup (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. **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

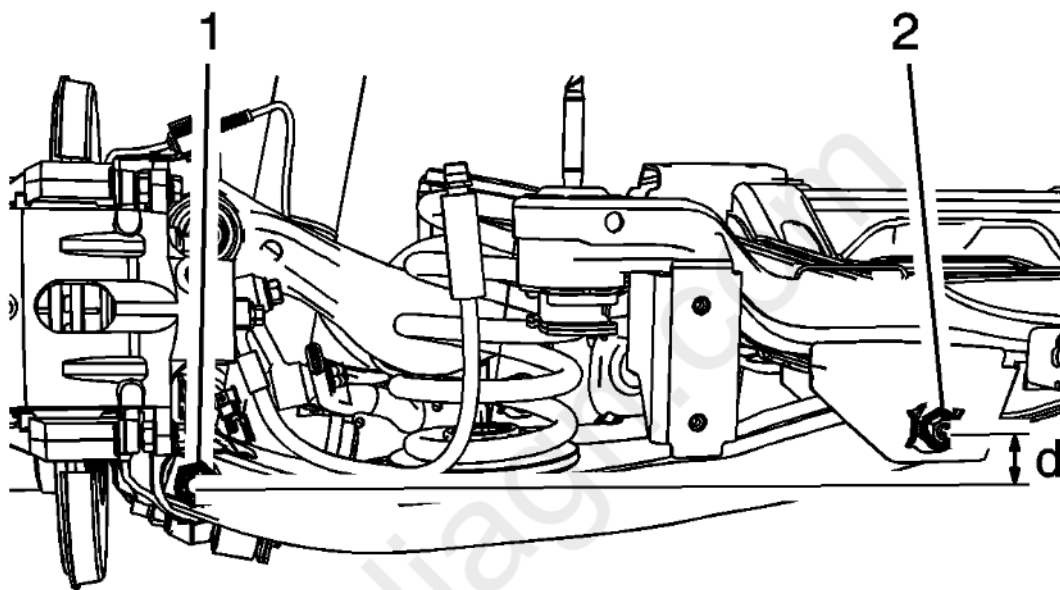


Fig. 4: D Height Measurement

Courtesy of GENERAL MOTORS COMPANY

Measurement Definitions

D Height GNC: The vertical distance between the center of the outer lower control arm bolt (1) to the center of the inner lower control arm bolt (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. Trim Height Specifications

6. If these measurements are out of specifications, inspect for the following conditions:

- Worn or damaged suspension components
 - Collision damage
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