

# SECTION 2A

## SUSPENSION DIAGNOSIS

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## DIAGNOSIS

### GENERAL DIAGNOSIS

Problems in the steering, the suspension, the tires, and the wheels involve several systems. Consider all systems when you diagnose a complaint. Some problems, such as abnormal or excessive tire wear and scuffed tires, may be the result of hard driving. Always road test

the vehicle first. If possible, do this road test with the customer.

Proceed with the following preliminary checks. Correct any substandard conditions.

### Preliminary Checks

Checks	Action
Inspect the tires for improper pressure and uneven wear.	Inflate the tires to the proper pressure.
Inspect the joint from the steering column to the steering gear for loose connections or wear.	Tighten the coupling flange pinch bolts. Replace the coupling flange as needed.
Inspect the front and the rear suspension, the steering gear, and the linkage for loose or damaged parts.	Tighten the front and the rear suspension. Tighten the steering gear mounting bracket bolts. Tighten the coupling flange pinch bolts. Replace the front and the rear suspension as needed. Replace the steering gear as needed. Replace the coupling flange as needed.
Inspect for out-of-round tires.	Perform free runout test. Match-mount the tires.
Inspect for out-of-balance tires, bent wheels, and worn or loose wheel bearings.	Balance the wheels. Replace the wheels. Replace the wheel bearings.
Check the power steering pump drive belt tension.	Tighten the power steering pump drive belt.
Inspect the power steering system for leaks. Also check the power steering fluid level.	Repair any leaks. Perform a power steering gear test. Add power steering fluid.

### Car Lead/Pull

Checks	Action
Inspect for mismatched or uneven tires.	Replace the tires.
Inspect for a broken or a sagging spring.	Replace the spring.
Inspect for a radial tire lateral force.	Check the wheel alignment. Switch the tire and wheel assemblies. Replace the tires as needed.
Check the front-wheel alignment.	Align the front wheels.
Inspect for an off-center steering gear.	Reseat the pinion valve assembly. Replace the pinion valve assembly as needed.
Inspect for front-brake dragging.	Adjust the front brakes.

## 2A - 2 SUSPENSION DIAGNOSIS

### Abnormal or Excessive Tire Wear

Checks	Action
Check the front-wheel and rear-wheel alignment.	Align the front and the rear wheels.
Inspect for excessive toe.	Adjust the toe.
Inspect for a broken or a sagging spring.	Replace the spring.
Inspect for out-of-balance tires.	Balance the tires.
Inspect for worn strut dampeners.	Replace the strut dampeners.
Check for a failure to rotate tires.	Rotate the tires. Replace the tires as needed.
Check for an overloaded vehicle.	Maintain the proper load weight.
Inspect for low tire inflation.	Inflate the tires to the proper pressure.

### Scuffed Tires

Checks	Action
Inspect for incorrect toe.	Adjust the toe.
Inspect for a twisted or a bent suspension arm.	Replace the suspension arm.

### Wheel Tramp

Checks	Action
Inspect for an out-of-balance tire or wheel.	Balance the tire or the wheel.
Inspect for improper strut dampener action.	Replace the strut dampeners.

### Shimmy, Shake, or Vibration

Checks	Action
Inspect for an out-of-balance tire or wheel.	Balance the tire or the wheel.
Inspect for excessive wheel hub runout.	Measure the hub flange runout. Replace the hub as needed.
Inspect for excessive brake drum or brake rotor imbalance.	Adjust the brakes. Replace the brake rotor or the brake drum as needed.
Inspect for worn tie rod ends.	Replace the outer tie rods.
Inspect for wheel trim imbalance.	Balance the wheel.
Inspect for a worn lower ball joint.	Replace the lower ball joint.
Inspect for excessive wheel runout.	Measure the wheel runout. Replace the wheel as needed.
Inspect for excessive loaded radial runout on the tire and wheel assembly.	Match-mount the tire and wheel assembly.

### Hard Steering (Manual)

Checks	Action
Inspect for a lack of lubrication of the ball joints, the tie rods and the steering gear.	Lubricate the ball joints, the tie rods, and the steering gear. Replace the ball joints, the tie rods, and the steering gear as needed.
Check the front-wheel alignment.	Align the front wheels.
Check the steering gear adjustment.	Adjust the steering gear.

**Hard Steering (Power)**

Checks	Action
Check the steering gear preload adjustment.	Perform a rack bearing preload on-vehicle adjustment.
Check the hydraulic system. Test the power steering system pressure with a gauge.	Replace the seals and the hoses as needed.
Inspect for binding or catching in the steering gear.	Lubricate the steering gear. Repair or replace the steering gear as needed.
Inspect for a loose steering gear mounting.	Tighten the steering gear mounting bracket nuts.

**Too Much Play in Steering**

Checks	Action
Inspect for worn or loose wheel bearings.	Tighten the drive axle nut. Replace the wheel bearings as needed.
Inspect for a loose steering gear mounting.	Tighten the steering gear mounting bracket nuts.
Inspect the joint from the column to the steering gear for loose connections or wear.	Tighten the coupling flange pinch bolts. Replace the coupling flange as needed.
Check the steering gear preload adjustment.	Perform a rack bearing preload on-vehicle adjustment.

**Poor Returnability (Manual)**

Checks	Action
Inspect for a lack of lubrication of the ball joints, the tie rods and the steering gear.	Lubricate the ball joints, the tie rods, and the steering gear. Replace the ball joints, the tie rods, and the steering gear as needed.
Inspect for binding in the ball joints.	Replace the ball joints.
Inspect for binding in the steering column.	Lubricate the steering column. Replace the steering column as needed.
Inspect for a lack of lubrication in the steering gear.	Lubricate the steering gear. Repair or replace the steering gear as needed.
Check the front-wheel alignment.	Align the front wheels.
Check the steering gear preload adjustment.	Perform a rack bearing preload on-vehicle adjustment.

**Poor Returnability (Power)**

Checks	Action
Inspect for lack of lubrication of the ball joints and the tie rod ends.	Lubricate the ball joints and the tie rod ends. Replace the ball joints and the outer tie rods as needed.
Inspect for binding in the ball joints.	Replace the ball joint.
Inspect for binding in the steering column.	Lubricate the steering column. Replace the steering column as needed.
Check the front-wheel alignment.	Align the front wheels.
Check the steering gear preload adjustment.	Perform a rack bearing preload on-vehicle adjustment.
Inspect for a sticking valve.	Lubricate the pinion valve assembly. Replace the pinion valve assembly as needed.
Inspect for binding in the coupling flange on the steering gear.	Replace the coupling flange.

## 2A - 4 SUSPENSION DIAGNOSIS

### Abnormal Noise, Front Suspension

Checks	Action
Inspect for a lack of lubrication of the ball joints and the tie rod ends.	Lubricate the ball joints and the tie rod ends. Replace the ball joints and the outer tie rods as needed.
Inspect for damaged suspension components.	Replace the damaged suspension components.
Inspect for worn control arm bushings or tie rod ends.	Replace the control arm bushings or the tie rods.
Inspect for a loose stabilizer shaft link.	Tighten the stabilizer shaft link.
Inspect for loose wheel bolts.	Tighten the wheel bolts.
Inspect for loose suspension bolts or nuts.	Tighten the suspension bolts or the nuts.
Inspect for loose wheel covers.	Tighten the wheel covers.
Inspect for worn strut dampeners or strut mountings.	Replace the strut dampeners. Tighten the strut mounting bolts.
Inspect for an improperly positioned strut spring.	Adjust the strut spring to the proper position.

### Wander or Poor Steering Ability

Checks	Action
Inspect for mismatched or uneven tires.	Replace the tires.
Inspect for lack of lubrication of the ball joints and the tie rod ends.	Lubricate the ball joints and the tie rod ends. Replace the ball joints and the outer tie rods as needed.
Inspect for worn strut dampeners.	Replace the strut dampeners.
Inspect for a loose stabilizer shaft link.	Tighten the stabilizer shaft link.
Inspect for a broken or a sagging spring.	Replace the spring.
Check the steering gear preload adjustment.	Perform a rack bearing preload on-vehicle adjustment.
Check the front-wheel and the rear-wheel alignment.	Align the front and the rear end wheels.

### Erratic Steering when Braking

Checks	Action
Inspect for worn or loose wheel bearings.	Replace the wheel bearings.
Inspect for a broken or a sagging spring.	Replace the spring.
Inspect for a leaking wheel cylinder or caliper.	Replace the wheel cylinder or the caliper.
Inspect for warped rotors.	Replace the rotors.
Inspect for an incorrect or an uneven caster.	If the caster is beyond specifications, check the frame and repair it as needed.

### Low or Uneven Trim Height

Checks	Action
Inspect for a broken or a sagging spring.	Replace the spring.
Check for an overloaded vehicle.	Maintain the proper load weight.
Inspect for an incorrect or weak spring.	Replace the spring.

### Ride Too Soft

Checks	Action
Inspect for worn strut dampeners.	Replace the strut dampeners.
Inspect for a broken or a sagging spring.	Replace the spring.

**Ride Too Harsh**

Checks	Action
Inspect for incorrect strut dampeners.	Replace the strut dampeners.
Inspect for an incorrect spring.	Replace the spring.

**Body Leans or Sways in Corners**

Checks	Action
Inspect for a loose stabilizer shaft link.	Tighten the stabilizer shaft link.
Inspect for worn strut dampeners or strut mountings.	Replace the strut dampeners. Tighten the strut assembly mounting bolts.
Check for an overloaded vehicle.	Maintain the proper load weight.
Inspect for a broken or a sagging spring.	Replace the spring.

**Suspension Bottoms**

Checks	Action
Inspect for worn strut dampeners.	Replace the strut dampeners.
Check for an overloaded vehicle.	Maintain the proper load weight.
Inspect for a broken or a sagging spring.	Replace the spring.

**Steering Wheel Kickback (Power)**

Checks	Action
Inspect for air in the power steering system.	Purge the power steering system of air.
Inspect for a loose steering gear mounting.	Tighten the steering gear mounting bracket nuts.
Inspect the joint from the column to the steering gear for loose connections or wear.	Tighten the coupling flange pinch bolts. Replace the coupling flange as needed.
Inspect for loose tie rod ends.	Tighten the tie rod ends. Replace the outer tie rods as needed.
Inspect for loose or worn wheel bearings.	Tighten the drive axle nut. Replace the wheel bearings as needed.

**Steering Wheel Surges or Jerks (Power)**

Checks	Action
Check the hydraulic system. Test the power steering system pressure with a gauge.	Replace the seals and the hoses as needed.
Inspect for a sluggish steering gear valve.	Clean the pinion valve assembly. Replace the pinion valve assembly as needed.
Inspect for a loose power steering pump drive belt.	Adjust the power steering pump drive belt.

**Cupped Tires**

Checks	Action
Check the front-wheel and the rear-wheel alignment.	Align the front and the rear wheels.
Inspect for worn strut dampeners.	Replace the strut dampeners.
Inspect for worn or loose wheel bearings.	Tighten the drive axle nut. Replace the wheel bearings as needed.
Inspect for excessive tire or wheel runout.	Match-mount the tires. Replace the tires as needed. Replace the wheels as needed.
Inspect for a worn ball joint.	Replace the ball joint.
Check the steering gear preload adjustment.	Perform a rack bearing preload on-vehicle adjustment.

### TORQUE STEER

A degree of torque steer to the right may normally be experienced during the use of heavy throttle on some front-wheel drive cars with drive axles of unequal length. This torque steer to the right results from the right drive axle being longer than the left drive axle, which creates a difference in the drive axle angle. Cars with intermediate shaft assemblies have axles of almost equal length.

A difference in the drive axle lengths results in more torque toe-in in the left front wheel. You will notice the torque toe-in when the vehicle accelerates from a standing start or at lower speeds.

#### Inspection Procedure

1. Place a small piece of tape at the top center of the steering wheel.
2. Note the inches of steering wheel deflection required to keep the vehicle straight during heavy acceleration.
3. Compare this finding with similar cars.

Factors that may cause torque steer to be more apparent on a particular vehicle include:

- Variations in the tire and wheel assemblies. This has the most significant effect on torque steer. A slightly smaller diameter on the right front tire will increase a right torque lead.
- Large differences in the right and the left front tire pressure.
- Looseness in the control arm bushings, the tie rod assemblies, or the steering gear mounting. This looseness permits a front wheel to pull forward and toe-in under a torque greater than the wheel on the opposite side. A loose suspension component may result in an opposite lead upon deceleration.
- A high front trim height. This height would increase the drive axle angle and could cause wobble at speeds between 24 to 48 km/h (15 to 30 mph).
- Binding or a tight drive axle joint. A tight drive axle joint or a high front trim height may also cause a wobble at speeds between 24 to 48 km/h (15 to 30 mph).
- Incorrect, worn, or loose engine mounts causing adverse drive angles.

Refer to "General Diagnosis" in this section for actions to remedy these problems.

Conditions that may produce an effect similar to torque steer include:

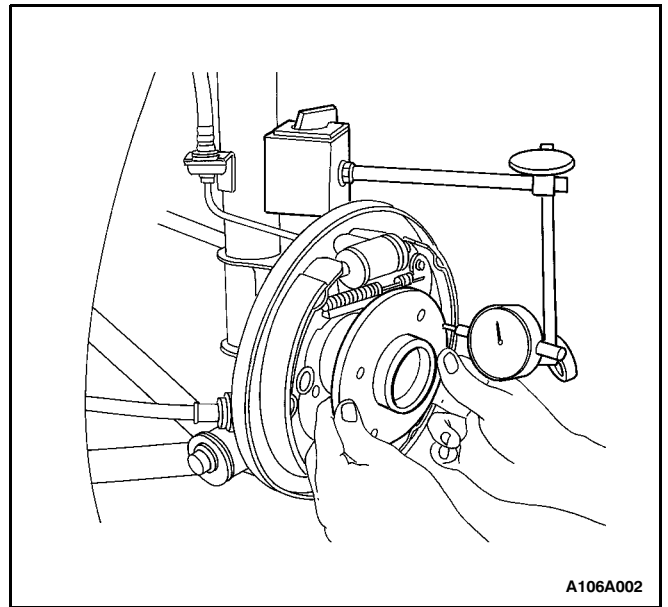
- Incorrect front or rear alignment.
- Frame misalignment or defect.
- Front suspension damage.
- Incorrectly mounted rear crossmember.

### TAPERED ROLLER BEARING

Perform the following test to check for looseness in the bearing cartridge assembly:

1. Raise and suitably support the vehicle.
2. Remove the rear wheel. Refer to Section 2E, Tires and Wheels.
3. Remove the brake drum detent screw and the brake drum. Refer to Section 4E, Rear Drum Brakes.

4. Mount a dial indicator set with a magnetic base to a control arm or any other stationary part of the vehicle.
5. Push and pull the wheel hub by hand. If the wheel hub movement exceeds 0.05 mm (0.002 inch), replace the wheel bearing. Refer to Section 2D, Rear Suspension.
6. Install the rear brake drum. Refer to Section 4E, Rear Drum Brakes.
7. Install the rear wheel. Refer to Section 2E, Tires and Wheels.
8. Lower the vehicle.



### SEALED WHEEL BEARING DIAGNOSIS

Vehicles with antilock braking systems have sealed, non-serviceable cartridge bearings in the rear wheels. If any fault is found with a wheel bearing, it must be replaced.

#### Wheel Bearing Noise

A road test usually reveals excessive wheel bearing noise. Sealed wheel bearings emit a howling sound when loose or damaged. Wheel bearing noise is present only when the vehicle is moving. It is constant and un-wavering and increases with the speed of the vehicle. If the wheel bearing noise cannot be positively diagnosed, or if the origin of the noise cannot be determined, perform the following test:

1. Raise and suitably support the vehicle.
2. Spin the wheels using your hand. Check for out-of-round or out-of-balance tires, bent rims, or loose wheel bearings.
3. Spin the rear wheels using a commercial wheel spinner.
4. If a noise can be heard from the passenger compartment, replace the noisy wheel bearing cartridge. Refer to Section 4D, Rear Suspension.
5. Lower the vehicle.