

# SECTION 2A

## SUSPENSION DIAGNOSIS

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## DIAGNOSTIC INFORMATION AND PROCEDURES

### 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.

Application	Checks	Correction
Preliminary Checks	<ul style="list-style-type: none"> <li>● Inspect the tires for improper pressure and uneven wear.</li> </ul>	<ul style="list-style-type: none"> <li>● Inflate the tires to the proper pressure.</li> </ul>
	<ul style="list-style-type: none"> <li>● Inspect the joint from the steering column to the intermediate shaft for loose connections or wear.</li> <li>● Inspect the joint from the intermediate shaft to the steering gear for loose connections or wear.</li> </ul>	<ul style="list-style-type: none"> <li>● Tighten the coupling flange pinch bolts.</li> <li>● Replace the intermediate shaft as needed.</li> </ul>
	<ul style="list-style-type: none"> <li>● Inspect the front and the rear suspension, the steering gear, and the linkage for loose or damaged parts.</li> </ul>	<ul style="list-style-type: none"> <li>● Tighten the front and the rear suspension.</li> <li>● Tighten the steering gear mounting bracket bolts.</li> <li>● Replace the front and the rear suspension as needed.</li> <li>● Replace the steering gear as needed.</li> <li>● Replace the coupling flange as needed.</li> </ul>
	<ul style="list-style-type: none"> <li>● Inspect for out-of-round tires.</li> </ul>	<ul style="list-style-type: none"> <li>● Perform free runout test.</li> <li>● Match-mount the tires.</li> </ul>
	<ul style="list-style-type: none"> <li>● Inspect for out-of-balance tires, bent wheels, and worn or loose wheel bearings.</li> </ul>	<ul style="list-style-type: none"> <li>● Balance the wheels.</li> <li>● Replace the wheels.</li> <li>● Replace the wheel bearings.</li> </ul>
	<ul style="list-style-type: none"> <li>● Check the power steering pump drive belt tension.</li> </ul>	<ul style="list-style-type: none"> <li>● Tighten the power steering pump drive belt.</li> </ul>
	<ul style="list-style-type: none"> <li>● Inspect the power steering system. Also, check the power steering fluid level.</li> </ul>	<ul style="list-style-type: none"> <li>● Repair any leaks.</li> <li>● Perform a power steering gear test.</li> <li>● Add power steering fluid.</li> </ul>

## 2A-2 SUSPENSION DIAGNOSIS

Condition	Probable Cause	Correction
Car Lead/Pull	<ul style="list-style-type: none"> <li>● Mismatched or uneven tires.</li> </ul>	<ul style="list-style-type: none"> <li>● Replace the tires.</li> </ul>
	<ul style="list-style-type: none"> <li>● A broken or a sagging coil spring.</li> </ul>	<ul style="list-style-type: none"> <li>● Replace the coil spring.</li> </ul>
	<ul style="list-style-type: none"> <li>● A improperly radial tire lateral force.</li> </ul>	<ul style="list-style-type: none"> <li>● Check the wheel alignment.</li> <li>● Switch the tire and wheel assemblies.</li> <li>● Replace the tires as needed.</li> </ul>
	<ul style="list-style-type: none"> <li>● The front-wheel alignment is out-of-align.</li> </ul>	<ul style="list-style-type: none"> <li>● Align the front wheels.</li> </ul>
	<ul style="list-style-type: none"> <li>● Off-center steering gear.</li> </ul>	<ul style="list-style-type: none"> <li>● Reseat the pinion valve assembly.</li> <li>● Replace the pinion valve assembly as needed.</li> </ul>
	<ul style="list-style-type: none"> <li>● Front-brake dragging.</li> </ul>	<ul style="list-style-type: none"> <li>● Adjust the front brakes.</li> </ul>
Abnormal or Excessive Tire Wear	<ul style="list-style-type: none"> <li>● The front-wheel and rear-wheel alignment is out-of-align.</li> </ul>	<ul style="list-style-type: none"> <li>● Align the front and the rear wheels.</li> </ul>
	<ul style="list-style-type: none"> <li>● Excessive toe.</li> </ul>	<ul style="list-style-type: none"> <li>● Adjust the toe.</li> </ul>
	<ul style="list-style-type: none"> <li>● A broken or a sagging coil spring.</li> </ul>	<ul style="list-style-type: none"> <li>● Replace the coil spring.</li> </ul>
	<ul style="list-style-type: none"> <li>● Out-of-balance tires.</li> </ul>	<ul style="list-style-type: none"> <li>● Balance the tires.</li> </ul>
	<ul style="list-style-type: none"> <li>● Worn strut dampeners.</li> </ul>	<ul style="list-style-type: none"> <li>● Replace the strut dampeners.</li> </ul>
	<ul style="list-style-type: none"> <li>● A failure to rotate tires.</li> </ul>	<ul style="list-style-type: none"> <li>● Rotate the tires.</li> <li>● Replace the tires as needed.</li> </ul>
	<ul style="list-style-type: none"> <li>● Overloaded vehicle.</li> </ul>	<ul style="list-style-type: none"> <li>● Maintain the proper load weight.</li> </ul>
	<ul style="list-style-type: none"> <li>● Low tire inflation.</li> </ul>	<ul style="list-style-type: none"> <li>● Inflate the tires to the proper pressure.</li> </ul>
Scuffed Tires	<ul style="list-style-type: none"> <li>● Incorrect toe.</li> </ul>	<ul style="list-style-type: none"> <li>● Adjust the toe.</li> </ul>
	<ul style="list-style-type: none"> <li>● A twisted or a bent suspension arm.</li> </ul>	<ul style="list-style-type: none"> <li>● Replace the suspension arm.</li> </ul>
Wheel Tramp	<ul style="list-style-type: none"> <li>● An out-of-balance tire or wheel.</li> </ul>	<ul style="list-style-type: none"> <li>● Balance the tire or the wheel.</li> </ul>
	<ul style="list-style-type: none"> <li>● Improper strut dampener action.</li> </ul>	<ul style="list-style-type: none"> <li>● Replace the strut dampeners.</li> </ul>
Shimmy, Shake, or Vibration	<ul style="list-style-type: none"> <li>● An out-of-balance tire or wheel.</li> </ul>	<ul style="list-style-type: none"> <li>● Balance the tire or the wheel.</li> </ul>
	<ul style="list-style-type: none"> <li>● Excessive wheel hub runout.</li> </ul>	<ul style="list-style-type: none"> <li>● Measure the hub flange runout.</li> <li>● Replace the hub as needed.</li> </ul>
	<ul style="list-style-type: none"> <li>● Excessive brake drum or brake rotor imbalance.</li> </ul>	<ul style="list-style-type: none"> <li>● Adjust the brakes.</li> <li>● Replace the brake rotor or the brake drum as needed.</li> </ul>
	<ul style="list-style-type: none"> <li>● Worn tie rod ends.</li> </ul>	<ul style="list-style-type: none"> <li>● Replace the tie rod ends.</li> </ul>
	<ul style="list-style-type: none"> <li>● Wheel trim imbalance.</li> </ul>	<ul style="list-style-type: none"> <li>● Balance the wheel.</li> </ul>
	<ul style="list-style-type: none"> <li>● A worn ball joint.</li> </ul>	<ul style="list-style-type: none"> <li>● Replace the control arm and ball joint assembly.</li> </ul>
	<ul style="list-style-type: none"> <li>● Excessive wheel runout.</li> </ul>	<ul style="list-style-type: none"> <li>● Measure the wheel runout.</li> <li>● Replace the wheel as needed.</li> </ul>
	<ul style="list-style-type: none"> <li>● Excessive loaded radial runout on the tire and wheel assembly.</li> </ul>	<ul style="list-style-type: none"> <li>● Match-mount the tire and wheel assembly.</li> </ul>

Condition	Probable Cause	Correction
Hard Steering (Manual)	<ul style="list-style-type: none"> <li>● A lack of lubrication of the ball joints, the tie rods and the steering gear.</li> </ul>	<ul style="list-style-type: none"> <li>● Lubricate the ball joints, the tie rods, and the steering gear.</li> <li>● Replace the control arm and ball joint assembly, the tie rods, and the steering gear as needed.</li> </ul>
	<ul style="list-style-type: none"> <li>● The front-wheel alignment is out-of-align.</li> </ul>	<ul style="list-style-type: none"> <li>● Align the front wheels.</li> </ul>
	<ul style="list-style-type: none"> <li>● Steering gear adjustment is out-of-adjustment.</li> </ul>	<ul style="list-style-type: none"> <li>● Adjust the steering gear.</li> </ul>
Hard Steering (Power)	<ul style="list-style-type: none"> <li>● The steering preload adjustment is out-of-adjustment.</li> </ul>	<ul style="list-style-type: none"> <li>● Perform a rack bearing preload on-vehicle adjustment.</li> </ul>
	<ul style="list-style-type: none"> <li>● The leaked hydraulic system.</li> </ul>	<ul style="list-style-type: none"> <li>● Test the power steering system pressure with a gauge.</li> <li>● Replace the seals and the hoses as needed.</li> </ul>
	<ul style="list-style-type: none"> <li>● A loose steering gear mounting.</li> </ul>	<ul style="list-style-type: none"> <li>● Tighten the steering gear mounting bracket bolts.</li> </ul>
Too Much Play in Steering.	<ul style="list-style-type: none"> <li>● Worn or loose wheel bearings.</li> </ul>	<ul style="list-style-type: none"> <li>● Tighten the drive axle nut.</li> <li>● Replace the wheel bearing as needed.</li> </ul>
	<ul style="list-style-type: none"> <li>● A loose steering gear mounting.</li> </ul>	<ul style="list-style-type: none"> <li>● Tighten the steering gear mounting bracket bolts.</li> </ul>
	<ul style="list-style-type: none"> <li>● The steering preload adjustment is out-of-adjustment.</li> </ul>	<ul style="list-style-type: none"> <li>● Perform a rack bearing preload on-vehicle adjustment.</li> </ul>
	<ul style="list-style-type: none"> <li>● Loose connections or wear of the joint from the steering column to the intermediate shaft.</li> <li>● Loose connections or wear of the joint from the intermediate shaft to the steering gear.</li> </ul>	<ul style="list-style-type: none"> <li>● Tighten the coupling pinch bolts.</li> <li>● Replace the intermediate shaft as needed.</li> </ul>
Poor Returnability	<ul style="list-style-type: none"> <li>● Binding in the ball joints.</li> </ul>	<ul style="list-style-type: none"> <li>● Replace the control arm and ball joint assembly.</li> </ul>
	<ul style="list-style-type: none"> <li>● Binding in the steering column.</li> </ul>	<ul style="list-style-type: none"> <li>● Lubricate the steering column.</li> <li>● Replace the steering column as needed.</li> </ul>
	<ul style="list-style-type: none"> <li>● The front-wheel alignment is out-of-align.</li> </ul>	<ul style="list-style-type: none"> <li>● Align the front wheels.</li> </ul>
	<ul style="list-style-type: none"> <li>● The steering preload adjustment is out-of-adjustment.</li> </ul>	<ul style="list-style-type: none"> <li>● Perform a rack bearing preload on-vehicle adjustment.</li> </ul>
	<ul style="list-style-type: none"> <li>● A sticking valve.</li> </ul>	<ul style="list-style-type: none"> <li>● Lubricate the pinion valve assembly.</li> <li>● Replace the pinion valve assembly as needed.</li> </ul>
	<ul style="list-style-type: none"> <li>● Binding in the coupling on the intermediate shaft.</li> </ul>	<ul style="list-style-type: none"> <li>● Replace the intermediate shaft.</li> </ul>
Abnormal Noise, Front Suspension	<ul style="list-style-type: none"> <li>● Damaged suspension components.</li> </ul>	<ul style="list-style-type: none"> <li>● Replace the damaged suspension components.</li> </ul>
	<ul style="list-style-type: none"> <li>● Worn control arm bushings or tie rod ends.</li> </ul>	<ul style="list-style-type: none"> <li>● Replace the control arm bushings or the tie rods.</li> </ul>

## 2A-4 SUSPENSION DIAGNOSIS

Condition	Probable Cause	Correction
Abnormal Noise, Front Suspension	● A loose stabilizer shaft link.	● Tighten the stabilizer shaft link.
	● Loose wheel nuts.	● Tighten the wheel nuts.
	● Loose suspension bolts or nuts.	● Tighten the suspension bolts or the nuts.
	● Loose wheel covers.	● Tighten the wheel covers.
	● Worn strut dampeners or strut mountings.	● Replace the strut dampeners. ● Tighten the strut mounting nuts.
	● An improperly positioned strut spring.	● Adjust the strut spring to the proper position.
Wander or Poor Steering Ability	● Mismatched or uneven tires.	● Replace the tires.
	● Worn strut dampeners.	● Replace the strut dampeners.
	● A loose stabilizer shaft link.	● Tighten the stabilizer shaft link.
	● A broken or a sagging coil spring.	● Replace the coil spring.
	● The steering preload adjustment is out-of-adjustment.	● Perform a rack bearing preload on-vehicle adjustment.
	● The front-wheel and the rear-wheel alignment are out-of-align.	● Align the front and the rear end wheels.
Erratic Steering when Braking	● Worn or loose wheel bearings.	● Replace the wheel bearings.
	● A broken or a sagging coil spring.	● Replace the coil spring.
	● A leaking caliper.	● Replace the caliper.
	● Warped rotors.	● Replace the rotors.
	● 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	● A broken or a sagging coil spring.	● Replace the coil spring.
	● An overloaded vehicle.	● Maintain the proper load weight.
	● An incorrect or weak coil spring.	● Replace the coil spring.
Ride Too Soft	● Worn strut dampeners.	● Replace the strut dampeners.
	● A broken or a sagging coil spring.	● Replace the coil spring.
Ride Too Harsh	● Incorrect strut dampeners.	● Replace the strut dampeners.
	● An incorrect coil spring.	● Replace the coil spring.
Body Leans or Sways in Corners	● A loose stabilizer shaft link.	● Tighten the stabilizer shaft link.
	● Worn strut dampeners or strut mountings.	● Replace the strut dampeners. ● Tighten the strut assembly mounting nuts.
	● an overloaded vehicle.	● Maintain the proper load weight.
	● A broken or a sagging coil spring.	● Replace the coil spring.
Suspension Bottoms	● Worn strut dampeners.	● Replace the strut dampeners.
	● An overloaded vehicle.	● Maintain the proper load weight.
	● A broken or a sagging coil spring.	● Replace the coil spring.

Condition	Probable Cause	Correction
Steering Wheel Kickback (Power)	<ul style="list-style-type: none"> <li>● Air in the power steering system.</li> </ul>	<ul style="list-style-type: none"> <li>● Bleed the power steering system.</li> </ul>
	<ul style="list-style-type: none"> <li>● A loose steering gear mounting.</li> </ul>	<ul style="list-style-type: none"> <li>● Tighten the steering gear mounting bracket bolts.</li> </ul>
	<ul style="list-style-type: none"> <li>● Loose connections or wear of the joint from the steering column to the intermediate shaft.</li> <li>● Loose connections or wear of the joint from the intermediate shaft to the steering gear.</li> </ul>	<ul style="list-style-type: none"> <li>● Tighten the coupling pinch bolts.</li> <li>● Replace the intermediate shaft as needed.</li> </ul>
	<ul style="list-style-type: none"> <li>● Loose tie rod ends.</li> </ul>	<ul style="list-style-type: none"> <li>● Tighten the tie rod ends.</li> <li>● Replace the tie rods as needed.</li> </ul>
	<ul style="list-style-type: none"> <li>● Loose or worn wheel bearings.</li> </ul>	<ul style="list-style-type: none"> <li>● Tighten the drive axle nut.</li> <li>● Replace the wheel bearing as needed.</li> </ul>
Steering Wheel Surges or Jerks (Power)	<ul style="list-style-type: none"> <li>● Low pressure in the power steering system.</li> </ul>	<ul style="list-style-type: none"> <li>● Replace the seals and the hoses as needed.</li> </ul>
	<ul style="list-style-type: none"> <li>● A sluggish steering gear valve.</li> </ul>	<ul style="list-style-type: none"> <li>● Clean the pinion valve assembly.</li> <li>● Replace the pinion valve assembly as needed.</li> </ul>
	<ul style="list-style-type: none"> <li>● A loose power steering pump drive belt.</li> </ul>	<ul style="list-style-type: none"> <li>● Adjust the power steering pump drive belt.</li> </ul>
Cupped Tires	<ul style="list-style-type: none"> <li>● The front-wheel and the rear-wheel alignment are out-of-align.</li> </ul>	<ul style="list-style-type: none"> <li>● Align the front and the rear wheels.</li> </ul>
	<ul style="list-style-type: none"> <li>● Worn strut dampeners.</li> </ul>	<ul style="list-style-type: none"> <li>● Replace the strut dampeners.</li> </ul>
	<ul style="list-style-type: none"> <li>● Worn or loose wheel bearing.</li> </ul>	<ul style="list-style-type: none"> <li>● Tighten the drive axle nut.</li> <li>● Replace the wheel bearings as needed.</li> </ul>
	<ul style="list-style-type: none"> <li>● Excessive tire or wheel runout.</li> </ul>	<ul style="list-style-type: none"> <li>● Match-mount the tires.</li> <li>● Replace the tires as needed.</li> <li>● Replace the wheels as needed.</li> </ul>
	<ul style="list-style-type: none"> <li>● A worn ball joints.</li> </ul>	<ul style="list-style-type: none"> <li>● Replace the control arm and ball joint assembly.</li> </ul>
	<ul style="list-style-type: none"> <li>● The steering gear preload adjustment is out-of-adjustment.</li> </ul>	<ul style="list-style-type: none"> <li>● Perform a rack bearing preload on-vehicle adjustment.</li> </ul>

### **WHEEL BEARING DIAGNOSIS**

This vehicle with non-serviceable 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. 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 unwavering 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 bearings. Refer to *Section 2D, Rear Suspension*.
5. Lower the vehicle.