Modern Automotive Technology
Chapter 62
Differential and Rear Drive Axle Diagnosis and Repair
Objectives

- Diagnose common differential and rear drive axle problems.
- Explain the basic service and repair of a differential assembly.
- Remove and replace axles, axle bearings, and seals.
- Describe limited-slip differential testing and service.
- Adjust ring and pinion gears.
- Check and replace rear axle lubricant.
- Cite safety rules and practice safe work habits.
Common Rear Axle Problems

- Bent or damaged axle housing
- Clogged housing vent
- Leaking filler drain plug
- Loose axle retainer fasteners
- Broken axle
- Incorrect axle shim
- Bent axle

- Flange not true
- Carrier damaged
- Leaking pinion seal
- Leaking gasket or RTV sealer
- Worn carrier bearings
- Loose carrier bolts
- Leaking axle seal
- Bad axle bearing
Differential Inspection

- Differential bearings
- Ring and pinion gear
- Spider gears
- Differential case
- Pinion shaft
- Splines
- Companion flange
- Bearing cups
- Threaded bolt holes
- Axle housing machined surfaces
- Welds
1. A REAR AXLE LUBRICANT LEAK will show up as a darkened, oily, dirty area below the pinion gear, carrier, or on the inside of the wheel and brake assembly.

2. A RING and PINION PROBLEM will usually show up as a howl or whining noise that changes when going from acceleration to deceleration.
Rear Axle Leaks

- Lubricant leaks can occur at the pinion gear seal, carrier or inspection cover gaskets, or the two axle seals
- Make sure that a possible axle seal leak is not a brake fluid leak
  - touch and smell the wet area to determine the type of leak
Axle and Carrier Bearing Problems

Pinion gear or case bearing failure

Axle bearing failure
Rear Axle Seal Service

Using a slide hammer puller for removal
Rear Axle Seal Service

Using a seal driver for installation
Ring and Pinion Problems

Tooth damage

Scoring of teeth from lack of lubricant
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3. A RETAINING PLATE TYPE AXLE is a method of holding an axle in its housing that commonly is used with a removable carrier.

4. INSUFFICIENT AXLE END-PLAY can result in axle bearing, retainer, or differential side gear failure.
Axle Removal
(with a Retainer Plate)

Using a slide hammer puller
Measuring Axle Endplay

- Excessive axle end play can cause a clunking sound as the vehicle corners.
- To measure, mount a dial indicator so that the stem is parallel with the axle centerline.
- Pull the axle in and out while watching the indicator.
- Compare the reading to specs.
Measuring Axle Endplay

- Special tool
- Read dial indicator
- Pull in and out on axle
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5. BREAK-AWAY TORQUE is the amount of torque needed to make one axle or differential side gear rotate the limited-slip differential clutches.

6. RING and PINION BACKLASH refers to the amount of space between the meshing teeth of the gears.
Brake-Away Torque

Amount of torque needed to make one axle or differential side gear rotate the limited-slip differential clutches
Diagnosing Break-Away Torque

Compare the “break-away torque” to specs.
Ring and Pinion Backlash

Diagram showing a mechanical setup with a dial indicator, stem on tooth, case bearing nut, spanner wrench, and instructions to move back and forth.
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7. A STETHOSCOPE can often be used to isolate the source of a differential or rear axle bearing problem.

8. A CLUNKING SOUND can be produced by the gears if the backlash between the ring and pinion is too great.
Gear Tooth Terminology

Note the names of the areas on the ring gear teeth.
Checking gear contact pattern
Contact Patterns

Shift drive pinion away from ring gear

Low flank contact

Bring drive pinion closer to ring gear

Heel contact

Toe contact

Shift drive pinion away from ring gear

High face contact

Bring drive pinion closer to ring gear
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9. The PINION GEAR PRELOAD is frequently adjusted by torquing the pinion nut to compress a collapsible spacer.

10. DIFFRENTIAL CASE TROUBLES frequently show up when rounding a corner as an abnormal sound (knocking or grinding) from the rear of the vehicle.
Pinion Gear Spacer

If the pinion gear has a collapsible spacer, always replace it.
Pinion Bearing Preload

Measure preload with a torque wrench. Compare the measurement to specs.
Ring Gear Runout

If runout is excessive, check ring gear mounting and case runout.
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