

Automotive Technology 6th Edition

Chapter 130 – Drive Axles and Differentials

Lesson Plan



CHAPTER SUMMARY:

1. Drive axles, parts of a differential, differential gear ratios, and open differentials
 2. Limited slip differentials, differential components, and differential axle bearings
 3. Differential identification and determining the axle ratio of a differential
 4. Rear end noise diagnosis, differential inspection, and tooth contact pattern test
 5. Differential disassembly, pinion shaft replacement, drive pinion depth, and pinion gear preload
 6. Checking and correcting backlash and setting side bearing preload
 7. Reassembly of the differential assembly and differential lubrication
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OBJECTIVES:

1. Describe the operation of a differential and the gear ratios set types.
 2. Compare the operation of a standard open differential and a limited slip differential.
 3. Describe the components of a differential and the types of bearings used in drive axles.
 4. Explain how to identify, determine the axle ratio, diagnose, inspect, and disassemble a differential.
 5. Explain how to set the drive pinion depth and replace the pinion shaft bearing.
 6. Describe the procedure to check backlash and set the preload for pinion gears and side bearings.
 7. Discuss differential lubricants.
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RESOURCES: (All resources may be found at <http://www.jameshalderman.com>)

1. **Task Sheet ASE (A3-A-2) P-1, (A3-E-1.3) P-1:** Differential Fluid Check
 2. **Task Sheet ASE (A3-E-1.4) P-2:** Differential Noise Diagnosis
 3. **Task Sheet ASE (A3-E-1.1) P-1:** Drive Axle Fluid Leaks
 4. **Task Sheet ASE (A3-E-1.5) P-2:** Pinion Seal Replacement
 5. **Task Sheet ASE (A3-E-1.6) P-3:** Ring Gear Runout
 6. **Task Sheet ASE (A3-E-1.7) P-3:** Differential Assembly Inspection
 7. **Task Sheet ASE (A3-E-1.8) P-3:** Drive Pinion Depth
 8. **Task Sheet ASE (A3-E-1.9) P-3:** Drive Pinion Bearing Preload
 9. **Task Sheet ASE (A3-E-1.10) P-3:** Differential Side Bearing Preload
 10. **Task Sheet ASE (A3-E-1.11) P-3:** Ring and Pinion Tooth Pattern
 11. **Task Sheet ASE (A3-E-1.12) P-3:** Differential Pinion Gears and Case
 12. **Task Sheet ASE (A3-E-1.13) P-3:** Differential Case Assembly
 13. **Task Sheet ASE (A3-E-2.1) P-3:** Limited Slip Differential Diagnosis
 14. **Task Sheet ASE (A3-E-2.2) P-3:** Limited Slip Differential Rotating Torque
 15. Chapter PowerPoint
 16. Chapter Crossword Puzzle and Word Search
 17. Animations: See list at the end of the lesson plan.
 18. Videos: See list at the end of the lesson plan.
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DEMO

ACTIVITIES:

1. Task Sheet ASE (A3-A-2) P-1, (A3-E-1.3) P-1: Have students complete Differential Fluid Check Task Sheet.
 2. Task Sheet ASE (A3-E-1.4) P-2: Have students complete Differential Noise Diagnosis Task Sheet.
 3. Task Sheet ASE (A3-E-1.1) P-1: Have students complete Drive Axle Fluid Leaks Task Sheet.
 4. Task Sheet ASE (A3-E-1.5) P-2: Have students complete Pinion Seal Replacement Task Sheet.
 5. Task Sheet ASE (A3-E-1.6) P-3: Have students complete Ring Gear Runout Task Sheet.
 6. Task Sheet ASE (A3-E-1.7) P-3: Have students complete Differential Assembly Inspection Task Sheet.
 7. Task Sheet ASE (A3-E-1.8) P-3: Have students complete Drive Pinion Depth Task Sheet.
 8. Task Sheet ASE (A3-E-1.9) P-3: Have students complete Drive Pinion Bearing Preload Task Sheet.
 9. Task Sheet ASE (A3-E-1.10) P-3: Have students complete Differential Side Bearing Preload Task Sheet.
 10. Task Sheet ASE (A3-E-1.11) P-3: Have students complete Ring and Pinion Tooth Pattern Task Sheet.
 11. Task Sheet ASE (A3-E-1.12) P-3: Have students complete Differential Pinion Gears and Case Task Sheet.
 12. Task Sheet ASE (A3-E-1.13) P-3: Have students complete Differential Case Assembly Task Sheet.
 13. Task Sheet ASE (A3-E-2.1) P-3: Have students complete Limited Slip Differential Diagnosis Task Sheet.
 14. Task Sheet ASE (A3-E-2.2) P-3: Have students complete Limited Slip Differential Rotating Torque Task Sheet.
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ASSIGNMENTS:

1. Chapter crossword and word search puzzles.
 2. Complete end of chapter 10 question quiz.
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CLASS DISCUSSION:

1. Review and group discussion chapter [Frequently Asked Questions](#) and [Tech Tips](#) sections.
 2. Review and group discussion of the five (5) chapter [Review Questions](#).
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NOTES AND EVALUATION:



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Animations: (at <http://www.jameshalderman.com>)

2WD Differentials
4WD Drivetrain, FWD Based
4WD Drivetrain, RWD Based
Adjust Carrier
Assemble Carrier
Differential Action
Differential End Play
Hypoid Ring & Pinion Gear Set
Measure Ring Gear Runout
Remove and Replace Axle Shaft, Bearing Retained
Remove and Replace Axle Shaft, C-Lock

Videos: (at <http://www.jameshalderman.com>)

Axle ID (time 1:21)	Differential Leaks (time 1:03)
Eaton mechanical locking differential (time 4:37)	Rear axle fluid change (time 7:24)
Differential (time 0:13)	Rear axle fluid change (time 2:03)
Differential (time 1:39)	Ford 8:8" rear end Traction-Lok setup (time 5:44)
Differential (time 4:44)	Ford 8:8" ring and pinion swap (time 4:42)
Differential animation (time 0:30)	Locking differential part 1 (time 7:46)
Differential animation (time 0:23)	Locking differential part 2 (time 7:18)
Axle seal replacement (time 8:27)	Rear differential noise diagnosis (time 4:34)
Front pinion bearings (time 14:22)	Ring gear runout (time 3:28)
Differential side gear backlash (time 2:21)	Limited slip noise (time 0:50)
Ring and Pinion setup (time 29:24)	Wheel stud replacement (time 5:12)
Setting pinion bearing preload (time 2:56)	Axle shaft runout (time 15:48)
How to install a ring gear and pinion (time 14:08)	Axle boot inspection (time 0:55)
Pinion seal replacement (time 6:27)	Pressed on axle bearing (time 6:46)
Broken Gov Loc axle (time 1:09)	Rear wheel bearing (time 6:44)
Pinion seal replacement (time 6:51)	Axle bearing and seal (time 8:11)
Front axle seal (time 11:28)	Front axle u joint (time 7:48)
Front axle seals (time 3:50)	Front axle seal (time 11:29)
Rear axle inspection (time 5:14)	How to install a Detroit Locker Truetrac -
Rear axle fluid change (time 4:59)	limited slip differential carrier (time 38:59)