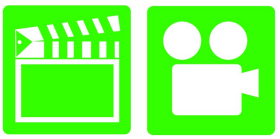
Manual Drive Train and Axles 1st Edition

Chapter 13 Drive Axles and Differentials Service

Opening Your Class

KEY ELEMENT	EXAMPLES
Introduce Content	This course or class covers operation and service of **Manual Drive Trains and Axles.** It correlates material to task lists specified by ASE and NATEF.
Motivate Learners	Explain how the knowledge of how something works translates into the ability to use that knowledge to figure why the engine does not work correctly and how this saves diagnosis time, which translates into more money.
State the learning objectives for the chapter or course you are about to cover and explain this is what they should be able to do as a result of attending this session or class.	Explain the chapter learning objectives to the students. 1. Prepare to take the ASE certification test for content area "E" (Rear-Wheel-Drive Axle Diagnosis and Repair). 2. Perform the maintenance needed to keep a drive axle operating properly. 3. Describe the steps involved in drive axle service. 4. Discuss drive axle lubrication. 5. Discuss drive axle diagnosis. 6. Discuss the procedures for in-the-shop inspections. 7. Explain the on-vehicle service operations. 8. Explain the procedure for differential carrier service and differential assembly service. 9. Explain pinion depth shim selection and drive pinion bearing preload adjustment. 10. Explain the steps to adjust backlash and carrier bearing preload.
Establish the Mood or Climate	Provide a *WELCOME,* Avoid put downs and bad jokes.
Complete Essentials	Restrooms, breaks, registration, tests, etc.
Clarify and Establish Knowledge Base	Do a round robin of the class by going around the room and having each student give their backgrounds, years of experience, family, hobbies, career goals, or anything they want to share.

ICONS	Ch12 Drive Axles and Differentials Service
	**1. SLIDE 1 DRIVE AXLES & DIFFERENTIALS SERVICE** **2. SLIDES 2-4 EXPLAIN OBJECTIVES** **Check for ADDITIONAL VIDEOS & ANIMATIONS @ http://www.jameshalderman.com/** **WEB SITE IS CONSTANTLY UPDATED** **Drive Axle (41 Links)** **Drive Shaft (27 Links)**
	
	
	**5. SLIDES 5-6 EXPLAIN** Drive Axle Service **7. SLIDE 7 EXPLAIN Figure 13–2** service parts identification sticker includes the codes for major components parts & includes drive axle ratio & other information needed to get correct parts.
	**8. SLIDE 8 EXPLAIN** Drive Axle Lubrication **9. SLIDE 9 EXPLAIN Figure 13–4** In most axles the gear oil level is at the bottom of the filler opening. When the axle operates, the ring gear will produce a dynamic oil flow to lubricate all the parts.
	**NATEF TASK CLEAN & INSPECT DIFFERENTIAL HOUSING; CHECK FOR LEAKS; INSPECT HOUSING VENT.**
	**NATEF TASK CHECK AND ADJUST DIFFERENTIAL HOUSING FLUID LEVEL.**
	**NATEF TASK DRAIN AND REFILL DIFFERENTIAL HOUSING.**
	**10. SLIDE 10 EXPLAIN** Drive Axle Diagnosis **11. SLIDE 11 EXPLAIN** Procedures for In-The-Shop Inspections **12. SLIDE 12 EXPLAIN Figure 13–7** drive axle can be checked for excessive play in the differential by blocking one drive wheel and driveshaft.
	**13. SLIDE 13 EXPLAIN** On-Vehicle Service Operations **14. SLIDE 14 EXPLAIN Figure 13–15a** differential pinion shaft removed to allow C-lock & axle to be removed.

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	15. **SLIDE 15 EXPLAIN Figure 13–15b** differential pinion shaft must be removed to allow C-lock and axle to be removed. 16. **SLIDE 16 EXPLAIN Figure 13–15c** differential pinion shaft must be removed to allow C-lock and axle to be removed. 17. **SLIDE 17 EXPLAIN Figure 13–15d** differential pinion shaft must be removed to allow C-lock and axle to be removed. 18. **SLIDE 18 EXPLAIN Figure 13–16** The retainer nuts/bolts are removed before sliding the bearing-retained axle from the housing.
	**DEMONSTRATION: SHOW EXAMPLES OF AXLE SHAFTS WITH TAPERED ROLLER BEARINGS, BALL BEARINGS, AND STRAIGHT ROLLER BEARINGS**
	19. **SLIDES 19-21 EXPLAIN** Procedure for Differential Carrier Services and Assembly Service 22. **SLIDE 22 EXPLAIN** Pinion Depth Shim Selection and Drive Pinion Bearing Preload Adjustment
	**DEMONSTRATION: SHOW RING AND PINION AND DEMONSTRATE THE IMPORTANCE OF PROPER DEPTH PLACEMENT OF THE PINION GEAR INTO RING GEAR.**
	**HYPOID RING & PINION GEAR SET**
	**DEMONSTRATION: SHOW THREADED AND SHIMMED ADJUSTMENT FOR PRELOAD ON SIDE BEARINGS**
	**WHEN INSTALLING SHIMS, A COATING OF GREASE WILL HELP HOLD THEM IN PLACE.**
	**Adjust Carrier, Threaded Adjusters** **Adjust Carrier** **Assemble Carrier**
	**DISCUSSION: HOLD A DISCUSSION ON THE ADVANTAGES OR DISADVANTAGES OF THREADED OR SHIMMED PRELOAD ADJUSTMENT**

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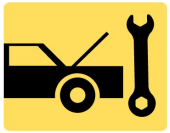
	**DEMONSTRATION:** SHOW HOW TO DO A TOOTH CONTACT PATTERN TEST ON A DIFFERENTIAL BY USING EITHER IRON OXIDE COMPOUND OR WHITE LITHIUM GREASE.
	WHITE LITHIUM GREASE WORKS WELL ON GEAR TOOTH CONTACT PATTERN TEST
	23. **SLIDES 23-24 EXPLAIN** Adjusting Backlash and Carrier Bearing Preload 25. **SLIDE 25 EXPLAIN Figure 13–42a** Backlash is determined by mounting a dial indicator to the differential housing and placing the button of the gauge against a tooth of the ring gear. Moving the ring gear back and forth will indicate on the dial indicator the amount of backlash. 26. **SLIDE 26 EXPLAIN Figure 13–42b** Backlash is clearance between drive pinion and ring gear teeth.
	**DEMONSTRATION:** SHOW SETUP PROCEDURE FOR CHECKING RING GEAR BACKLASH. EXPLAIN IMPORTANCE OF THIS READING
	**DISCUSSION:** HOLD A DISCUSSION ON CHECKING RING GEAR BACKLASH AND WHAT IT MEANS
	**DEMONSTRATION:** SHOW SET-UP AND PROCEDURE FOR CHECKING RING GEAR RUNOUT.
	**HANDS-ON-TASK:** HAVE THE STUDENTS SET UP AND TAKE RING GEAR AND BACKLASH READINGS ON SEVERAL DIFFERENTIALS.
	**NATEF TASK** REPLACE PINION SEAL; MEASURE COMPANION FLANGE RUNOUT.
	**NATEF TASK** MEASURE RING GEAR RUNOUT; DETERMINE NECESSARY ACTION

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	**NATEF TASK REMOVE, INSPECT, AND REINSTALL RING GEAR, DRIVE PINION, AND BEARINGS**
	**NATEF TASK MEASURE AND ADJUST DRIVE PINION DEPTH**
	**NATEF TASK MEASURE AND ADJUST DRIVE PINION PRELOAD.**
	**NATEF TASK MEASURE AND ADJUST SIDE BEARING PRELOAD.**
	**NATEF TASK ASSEMBLE AND INSTALL DIFFERENTIAL CASE ASSEMBLY AND MEASURE RUNOUT; DETERMINE NECESSARY ACTION.**
	27. **SLIDES 27-28 EXPLAIN** Summary