

Automatic Transmissions and Transaxles, 7e

Chapter 17 Transmission/Transaxle Assembly and Installation

Opening Your Class

KEY ELEMENT	EXAMPLES
Introduce Content	This course or class covers Automatic Transmissions and Transaxles 7th Edition. It correlates material to task lists specified by ASE and ASE Education (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 for ASE Automatic Transmissions (A2) certification test content area "A" (General Transmission and Transaxle Diagnosis). 2. Identify the different methods of component cleaning. 3. Explain bushing, bearing, and thrust washer service. 4. Discuss friction material service. 5. Explain internal seal and ring service. 6. Describe the procedure for performing case and pump service. 7. Explain the procedure for clutch assembly and disassembly. 8. Discuss gear set service and air testing. 9. Explain the procedure to perform a final transmission assembly. 10. List the steps involved in installing a transmission/transaxle.
Establish the Mood or Climate	Provide a <i>WELCOME</i> , 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.

NOTE: This lesson plan is based on automatic Transmissions & Transaxle 7th Edition Chapter Images found on Jim's web site @ www.jameshalderman.com
DOWNLOAD CHP 17: Chapter Images

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         	1. SLIDE 1 Transmission/Transaxle Removal and Disassembly Check for ADDITIONAL VIDEOS & ANIMATIONS @ http://www.jameshalderman.com/ WEB SITE IS CONSTANTLY UPDATED <u>Off Vehicle Repair - Automatic Transmission (85 Links)</u> At the beginning of this class, you can download the crossword puzzle & Word Search from http://www.jameshalderman.com/books_a2.html to familiarize your class with the terms in this chapter & then discuss them DOWNLOAD Crossword Puzzle DOWNLOAD Word Search Puzzle 2. SLIDE 2 EXPLAIN FIGURE 17–1 A pressure jet washer is similar to a large industrial-sized dishwasher. This type of cleaning unit can be used for most automotive components including engines and transmissions. Each part is then rinsed with water to remove chemicals or debris that may remain there while it is still in the tank. 3. SLIDE 3 EXPLAIN FIGURE 17–2 Transmission parts being cleaned in a water-based solvent cleaning tank. EXPLAIN WARNING: The petroleum solvent–air mixture from drying parts is highly flammable. Never use cleaning solvent around an open flame, spark, or source of ignition. 4. SLIDE 4 EXPLAIN FIGURE 17–3 A microbial cleaning tank uses microbes to clean grease and oil from parts. 5. SLIDE 5 EXPLAIN FIGURE 17–4 A Torrington bearing used to absorb thrust loads on a planetary gear set. 6. SLIDE 6 EXPLAIN FIGURE 17–5 Worn pump bushings can be removed using a hydraulic press and a tool that applies force only to the bushing. 7. SLIDE 7 EXPLAIN FIGURE 17–6 The cup, rollers,

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	and cone of a tapered roller bearing are machined at an angle as shown. This allows them to resist a thrust in the direction indicated by the P arrows. The bearing is preloaded in this direction; any clearance at the sides of the bearing (C arrows) is called free play.
	8. SLIDE 8 EXPLAIN FIGURE 17-7 The selective spacer used at the final drive on a Chrysler 41TE. This unit uses two tapered roller bearings facing each other to support the final drive. 9. SLIDE 9 EXPLAIN FIGURE 17-8 All lined friction material should be submerged in a shallow pan of ATF and allowed to soak before being installed in the automatic transmission/transaxle. 10. SLIDE 10 EXPLAIN FIGURE 17-9 Steel plates can usually be reused if no faults are found during a visual inspection
	EXPLAIN TECH TIP: A Stack of Plates Test
	11. SLIDE 11 EXPLAIN FIGURE 17-10 A badly chipped and pitted band. This band requires replacement. 12. SLIDE 12 EXPLAIN FIGURE 17-11a Piston seals as supplied in an overhaul (OH) kit. b These seals are being lubricated in ATF before installation. c Installing a lip seal.
	13. SLIDE 13 EXPLAIN FIGURE 17-12 A round flat plastic ring is often included in overhaul kits and makes seal installation easier. 14. SLIDE 14 EXPLAIN FIGURE 17-13 A dial indicator is set up to measure clutch pack clearance and then it is air checked to verify proper operation.
	15. SLIDE 15 EXPLAIN FIGURE 17-14 A metal sealing ring has been hooked and placed into its bore. It should enter with a slight pressure and make full contact with the bore. There should be a slight gap at the ends of the ring as shown. 16. SLIDE 16 EXPLAIN FIGURE 17-15 (a) Side clearance of a metal sealing ring is checked by placing the ring into the groove and measuring the clearance using a feeler gauge. (b) While making this check, look for damage to the seal groove. 17. SLIDE 17 EXPLAIN FIGURE 17-16 Four styles of Teflon rings; the uncut, continuous ring requires special

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   	tools for installation. The other styles are placed into the groove with overlapping ends positioned properly. 18. SLIDE 18 EXPLAIN FIGURE 17–17a Using a seal installation tool allows the seal to slide down over the shaft without harming the seal. b After the seal has been placed in the groove, use a sizing tool to reduce the size of the seal. c The seal after it has been sized. 19. SLIDE 19 EXPLAIN FIGURE 17–18 Using water that has been heated in a microwave to help soften a Teflon sealing ring before installing it on the shaft. EXPLAIN TECH TIP, Figure 17-18: Sealing Ring Tip 20. SLIDE 20 EXPLAIN FIGURE 17–19 Filling the passage with ATF and then seeing how long it takes for the fluid to leak down to point A. A test tool instead of the component can be used to check for leakage around a bore if available. 21. SLIDE 21 EXPLAIN FIGURE 17–20 A pump assembly after the cover has been removed. 22. SLIDE 22 EXPLAIN FIGURE 17–21 The pump housing should be inspected for wear and replaced if grooved or damaged. 23. SLIDE 23 EXPLAIN FIGURE 17–22 Clearance checks of the pump gears include (a) end clearance, (b) gear-to-housing clearance, and (c) gear-tooth clearance. 24. SLIDE 24 EXPLAIN FIGURE 17–23 An exploded view of a vane-type pump. Wear checks include the rotor, vanes, slide, pump body, and pump cover. 25. SLIDE 25 EXPLAIN FIGURE 17–24 A new front seal is being installed using a seal driver which is a special service tool (SST). 26. SLIDE 26 EXPLAIN FIGURE 17–25 Using an alignment band to assemble both pump halves to ensure proper alignment. Many experts recommend lightly tapping the outer edges of the pump while tightening the clamp. 27. SLIDE 27 EXPLAIN FIGURE 17–26 A compressor tool is usually necessary to compress the springs of the clutch piston to remove the snap ring.

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      	28. SLIDE 28 EXPLAIN FIGURE 17–27a large snap ring can usually be removed using a screwdriver or seal pick. b Then the pressure plate and clutch plates can be removed. EXPLAIN WARNING: Be careful when compressing the spring(s), removing retainer, and allowing the spring(s) to extend. Some springs store quite a bit of energy and if they fly loose, can cause personal injury. 29. SLIDE 29 EXPLAIN FIGURE 17–28 The check ball should be free to move inside its cage. It should also seal low-pressure airflow in one direction (left) and leak in the other (right). EXPLAIN CASE STUDY: The Case of the Abused Minivan 30. SLIDE 30 EXPLAIN FIGURE 17–29 All new friction plates should be soaked in ATF for at least 20 minutes or until bubbles no longer rise to the surface of the shallow pan of ATF. 31. SLIDE 31 EXPLAIN FIGURE 17–30 All clutch packs should be checked for proper clearance. Here, a feeler (thickness) gauge is used to check the clearance to make sure it is within factory specifications. 32. SLIDE 32 EXPLAIN FIGURE 17–31 (a) and (b) Clutch clearance can be reduced by adding an extra unlined plate, or (c) lined plate. If two lined plates are next to each other as in (c), clearance can be increased by shaving the lining off one or both adjacent sides of the two lined plates. <u>Remove and Reinstall Clutch Plates (View) (Download)</u> <u>Replace Clutch Plates (View) (Download)</u> <u>Air Check Clutch (View) (Download)</u> <u>Air Test Transmission (View) (Download)</u> <u>Air Test Transmission No Test Plate (View) (Download)</u> <u>Measure Clutch Plate Clearance - Dial Indicator (View) (Download)</u> <u>Measure Clutch Plate Clearance - Feeler Gauge</u>

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       	(View) (Download) Remove and Reinstall Clutch Pistons (View) (Download) Replace Clutch Plates (View) (Download) 33. SLIDE 33 EXPLAIN FIGURE 17–32 Service information states that this one-way roller clutch should be installed as shown. Check by holding the outer race so that the inner race is free to rotate counterclockwise as shown. 34. SLIDE 34 EXPLAIN FIGURE 17–33 This planetary gear set is excessively worn and wear metal from this failure has likely contaminated many other parts in the transmission. 35. SLIDE 35 EXPLAIN FIGURE 17–34 Using a feeler gauge to measure the pinion gear side clearance. Check Carrier End Play (View) (Download) Check Pinion End Play (View) (Download) DIFFERENTIAL END PLAY (VIEW) (DOWNLOAD) 36. SLIDE 36 EXPLAIN FIGURE 17–35 Air testing a clutch pack before installing it into an automatic transmission or transaxle. 37. SLIDE 37 EXPLAIN FIGURE 17–36 Using a rubber-tipped air nozzle in a passage to check the operation of a clutch or band. Air Check Clutch (View) (Download) Air Test Transmission (View) (Download) Air Test Transmission No Test Plate (View) (Download) EXPLAIN WARNING: Always wear eye protection when making air tests. Always adjust the air pressure to the level specified in service information. EXPLAIN TECH TIP• SEE FIGURE 17–37 38. SLIDE 38 EXPLAIN FIGURE 17–37a An eraser with a hole drilled through it used to seal passages during an air test. b Using an air nozzle and the eraser to test hydraulic circuits at the valve body.

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      	39. SLIDE 39 EXPLAIN FIGURE 17–38 Using an electronic torque wrench to tighten the pump retaining bolts to factory specifications. 40. SLIDE 40 EXPLAIN FIGURE 17–39 A dial indicator being used to measure the end play of an input shaft. If the end play is not within factory specifications, the unit may not have been assembled correctly. 41. SLIDE 41 EXPLAIN FIGURE 17–40 Checking gear clearance using a dial indicator on a final drive assembly on a Chrysler 41TE transaxle. <u>Gerotor - Type Oil Pump (View) (Download)</u> <u>TRANSMISSION END PLAY CHECKS(VIEW) (DOWNLOAD)</u> EXPLAIN TECH TIP Avoid Using Red Assembly Lube, Figure 17-41 42. SLIDE 42 EXPLAIN FIGURE 17–41 Blue assembly lube. 43. SLIDE 43 EXPLAIN FIGURE 17–42a The valve body retaining bolts being torqued to factory specifications. b After the valve body has been installed, the interior wiring harness and case connector are installed. This unit is ready for the filter and pan to be installed. EXPLAIN CASE STUDY: The Case of the Broken Flex Plate 44. SLIDE 44 EXPLAIN FIGURE 17–43 Installing an output speed sensor that has been equipped with a new O-ring seal. 45. SLIDE 45 EXPLAIN FIGURE 17–44 An electric motor-driven dynamometer being used to check the operation of a 41TE transaxle. 46. SLIDE 46 EXPLAIN FIGURE 17–45 A gasoline-powered dynamometer being used to test a rear-wheel-drive automatic transmission. 47. SLIDE 47 EXPLAIN FIGURE 17–46 Check the linkage for proper adjustment so that the shift interlock works correctly and the PRNDL is aligned with the transmission range switch.

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    Education Foundation   QUESTION   QUESTION   	48. SLIDE 48 EXPLAIN FIGURE 17–47 A screen shot on a Snap-on Solus scan tool showing where to clear the adaptive prior to test driving the vehicle after an overhaul. Assemble Valve Body (Download) Gerotor - Type Oil Pump (View) (Download) Transmission End Play Checks(View) (Download) VACUUM TEST VALVE BODY (VIEW) (DOWNLOAD) 49. SLIDES 49-60 EXPLAIN SLIDE SHOW Assembling a 4T65-E transaxle ASEEducation TASK: ASSEMBLE TRANSMISSION/TRANSAXLE. DISCUSSION: HAVE THE STUDENTS DISCUSS BEST METHODS FOR CLEANING VARIOUS TRANSMISSION PARTS. WHAT WILL HAPPEN IF WATER IS ALLOWED TO REMAIN IN AN AUTOMATIC TRANSMISSION OR TRANSAXLE? DISCUSSION: HAVE THE STUDENTS TALK ABOUT INSPECTING VALVE BODY. CAN A WORN VALVE BODY BE REPAIRED? CAN PROBLEMS THAT WERE ENGINEERED INTO THE VALVE BODY BE CORRECTED? DEMONSTRATION: DISASSEMBLING TRANSMISSION HANDS-ON TASK: HAVE THE STUDENTS DISASSEMBLE CLUTCH PACKS OF UNIT THEY ARE WORKING ON. HAVE THEM NOTE CONDITION OF CLUTCH DISCS AND WHETHER THEY NEED TO BE REPLACED. CAN STEELS BE REUSED? HANDS-ON TASK: HANDS-ON TASK: HAVE STUDENTS REMOVE CLUTCH PISTON, USING SPECIAL TOOLS IF NEEDED. POINT OUT THAT COMPRESSED AIR CAN BE USED TO REMOVE PISTON ONCE SNAP RING IS REMOVED, BUT HANDS AND FINGERS NEED TO BE KEPT CLEAR TO

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   ASE Education Foundation   ASE Education Foundation   ASE Education Foundation   ASE Education Foundation    ASE Education Foundation 	AVOID INJURY. HANDS-ON TASK: INSPECT PISTON RETURN SPRINGS, PISTONS, AND SEALS. ASK THEM TO NOTE ANY PROBLEMS THEY SEE. THEN HAVE STUDENTS INSPECT HARD PARTS SUCH AS DRUMS, HUBS, SHELLS, AND PLANETARY ASSEMBLIES. REMIND THEM TO USE FACTORY SPECIFICATIONS TO MEASURE AND INSPECT PARTS. ASEEducation TASK: INSPECT SERVO PISTON BORE, PISTON AND SEALS; DETERMINE NECESSARY ACTION. ASEEducation TASK: INSPECT OIL DELIVERY CIRCUITS, INCLUDING SEAL RINGS, RING GROOVES, & SEALING SURFACE AREAS, FEED PIPES, ORIFICES, & AND CHECK VALVES/BALLS. ASEEducation TASK: INSPECT BUSHINGS; DETERMINE NECESSARY ACTION ASEEducation TASK: INSPECT CASE BORES, PASSAGES, BUSHINGS, VENTS, AND MATING SURFACES; DETERMINE NECESSARY ACTION. HANDS-ON TASK: DISASSEMBLE FRONT PUMP ASSEMBLY. HAVE THEM MEASURE PUMP FOR WEAR AND COMPARE THESE MEASUREMENTS TO SPECIFICATION. IS THE PUMP GOOD? ASEEducation TASK: INSPECT, MEASURE, AND RESEAL OIL PUMP ASSEMBLY AND COMPONENTS. ASEEducation TASK: INSPECT CLUTCH DRUM, PISTON, CHECK-BALLS, SPRINGS, RETAINERS, SEALS, & FRICTION, PRESSURE PLATES, BANDS & DRUMS; DETERMINE NECESSARY ACTION.

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 ASE Education Foundation 	<u>ASE Education TASK:</u> MEASURE CLUTCH PACK CLEARANCE; DETERMINE NECESSARY ACTION.
 ASE Education Foundation 	<u>ASE Education TASK:</u> AIR TEST OPERATION OF CLUTCH AND SERVO ASSEMBLIES.
 ASE Education Foundation 	<u>ASE Education TASK:</u> MEASURE TRANSMISSION/TRANSAXLE END PLAY OR PRELOAD; DETERMINE NECESSARY ACTION.
 ASE Education Foundation 	<u>ASE Education TASK:</u> INSPECT, MEASURE, AND REPLACE THRUST WASHERS AND BEARINGS.
 ASE Education Foundation 	<u>ASE Education TASK:</u> INSPECT ROLLER AND SPRAG CLUTCH, RACES, ROLLERS, SPRAGS, SPRINGS, CAGES, RETAINERS; DETERMINE NECESSARY ACTION.
 ASE Education Foundation 	<u>ASE Education TASK:</u> INSPECT AND MEASURE PLANETARY GEAR ASSEMBLY COMPONENTS; DETERMINE NECESSARY ACTION.
 ASE Education Foundation 	<u>ASE Education TASK:</u> DIAGNOSE AND INSPECT TRANSAXLE DRIVE, LINK CHAINS, SPROCKETS, GEARS, BEARINGS, AND BUSHINGS; PERFORM NECESSARY ACTION
 ASE Education Foundation 	<u>ASE Education TASK:</u> INSPECT, MEASURE, REPAIR, ADJUST OR REPLACE TRANSAXLE FINAL DRIVE COMPONENTS.

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