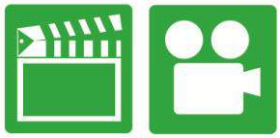
Advanced Engine Performance Diagnosis 6/E

Chapter 27 Electronic Transmission Controls

Opening Your Class

KEY ELEMENT	EXAMPLES
Introduce Content	This course or class covers operation and service of **ADVANCED Automotive Engine Performance Diagnosis 6/E.** 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 for ASE Automatic Transmissions (L1) certification test content area A (General Powertrain Diagnosis). 2. Explain how the automatic transmissions/ transaxles are controlled electronically. 3. Explain the function of sensors and switches for electronic control of transmission. 4. Identify the types of transmission solenoids. 5. Discuss adaptive strategies and controls for electronically controlled automatic transmissions/transaxles.
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.

NOTE: This lesson plan is based on Advanced Engine Performance Diagnosis 6/E Chapter Images found on Jim's web site @ www.jameshalderman.com
LINK CHP 27: Chapter Images

ICONS	Ch27 Electronic Transmission Controls
	1. **SLIDE 1 CH27 Electronic Transmission Controls**
	**Check for ADDITIONAL VIDEOS & ANIMATIONS @ http://www.jameshalderman.com/** **WEB SITE REGULARLY UPDATED** **Engine Controls (284 Links)** **Videos**
	**Transmission Fluid Exchange (View) (Download)**
	
	**At the beginning of this class, you can download the crossword puzzle & Word Search from the links below to familiarize your class with the terms in this chapter & then discuss them** **Crossword Puzzle (Microsoft Word) (PDF)** **Word Search Puzzle (Microsoft Word) (PDF)**
	
	2. **SLIDE 2 EXPLAIN FIGURE 27–1A** This control solenoid assembly contains four transmission fluid pressure (TFP) switches, a line pressure control (PC) solenoid, four pressure control (PC) solenoids, two shift solenoids (SS), a torque converter clutch (TCC) solenoid, a transmission fluid temperature (TFT) sensor, and the transmission control module (TCM). 3. **SLIDE 3 EXPLAIN Figure 27.1B** simplified view is also shown.
	**DEMONSTRATION: DEMONSTRATE HOW A SCAN TOOL CAN BE USED TO COMMAND SHIFTS IN AN ELECTRONICALLY CONTROLLED TRANSMISSION.**
	**DISCUSSION: AFTER DEMONSTRATING HOW TO COMMAND TRANSMISSION TO SHIFT WITH A SCAN TOOL, HAVE STUDENTS DISCUSS RESULTS OF TEST. DID TRANSMISSION SHIFT AS EXPECTED? IF NOT, WHAT SYSTEM OF THE**

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	**TRANSMISSION IS NOT WORKING CORRECTLY?** 4. **SLIDE 4 EXPLAIN Figure 27.2** The transmission range switch is usually located on the case where the shifter cable attaches to the manual valve lever. 5. **SLIDE 5 EXPLAIN Figure 27.3** Moving the shift lever to the M (manual) position (a) activates the up/down, +/− switches that will cause an upshift or downshift.
	**HANDS-ON TASK: HAVE THE STUDENTS HOOK UP A SCAN TOOL TO A 1996, OR NEWER, VEHICLE SCAN FOR ENGINE/TRANSMISSION DTCS. NOTE ANY CODES PRESENT. TALK ABOUT DTCS. JUST BECAUSE A CODE IS SET DOES NOT MEAN THAT COMPONENT IS BAD. CORRECT DIAGNOSIS AFTER A CODE IS SET IS IMPORTANT.**
	6. **SLIDE 6 EXPLAIN Figure 27.4** Speed sensors are used by the powertrain control module (PCM) or the transmission control module (TCM) to control shifts and detect faults such as slippage when the two speeds do not match the predetermined ratio for each gear commanded. 7. **SLIDE 7 EXPLAIN Figure 27.5A** The speed sensor switch will close as the magnet moves past it. 8. **SLIDE 8 EXPLAIN Figure 27.5B** It will generate a sine wave signal, which is converted inside the PCM/TCM to a digital signal. The frequency of the signal is used to measure the speed. 9. **SLIDE 9 EXPLAIN Figure 27.6** The pressure switch manifold (PSM) used in a GM 4L60-E consists of diaphragm switches with seals around each one that are bolted to the valve body over holes for each clutch circuit. 10. **SLIDE 10 EXPLAIN Figure 27.7** Some switches are electrically normally open (N.O.) and others are normally closed (N.C.) and are used to provide gear selection information to the PCM/TCM. 11. **SLIDE 11 EXPLAIN Figure 27.8A** transmission fluid temperature sensor can be checked by connecting an ohmmeter to the harness connector terminals. 12. **SLIDE 12 EXPLAIN Figure 27.8B** The resistance should change as the temperature changes. 13. **SLIDE 13 EXPLAIN Figure 27.9** The brake (stop light) switch is mounted at the brake pedal.

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	14. **SLIDE 14 EXPLAIN Figure 27.10A** The normally closed solenoid blocks fluid flow when it is off while opening the exhaust; and when it is on, it opens the valve. 15. **SLIDE 15 EXPLAIN Figure 27.10B** The normally open solenoid allows fluid flow when it is off; and when it is on, it closes the valve while opening the exhaust.
	**DISCUSSION: DISCUSS DIAGNOSTICS USED WITH ELECTRONICAL CONTROLLED TRANS AS COMPARED TO THOSE FOR A HYDRAULICALLY CONTROLLED TRANSMISSION. IS ONE TYPE OF TRANSMISSION EASIER TO DIAGNOSE THAN THE OTHER?**
	16. **SLIDE 16 EXPLAIN Figure 27.11** The signal from the TCM can cause the EPC solenoid to change the pressure regulator valve to adjust line pressure. 17. **SLIDE 17 EXPLAIN Figure 27.12** Line pressure increases as the duty cycle of EPC solenoid decreases. 18. **SLIDE 18 EXPLAIN Figure 27.13** Solenoid control occurs when the PCM/ TCM completes the circuit to ground (top) or switches on B+ (bottom). The ground connection is also B−
	**PRESSURE TESTING** **TRANSMISSION PRESSURE TEST (VIEW) (DOWNLOAD)**
	19. **SLIDE 19 EXPLAIN Figure 27.14** When the transmission control module (TCM) is ready to begin an upshift, it signals the powertrain control module (PCM) to reduce engine torque. 20. **SLIDE 20 EXPLAIN Figure 27.15** Using data from the various sensors, the TCM can apply or release the clutches. 21. **SLIDE 21 EXPLAIN Figure 27.16** A diagram showing the relationship between the electronic and hydraulic controls.
	**HANDS-ON TASK: HAVE STUDENTS HOOK UP A SCAN TOOL TO A 1996, OR NEWER, VEHICLE AND WATCH TRANSMISSION DATA. DO ANY CHANGES OCCUR WHEN SHIFTER IS CHANGED THROUGH THE GEARS?**

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	22. **SLIDE 22 EXPLAIN Figure 27.17** A scan tool display showing the adaptive (TAP) pressure changes at various throttle positions. 23. **SLIDE 23 EXPLAIN Figure 27.18** The fuzzy logic part of the TMC receives input signals
	**ON-VEHICLE NATEF TASK PERFORM ACTIVE TESTS USING A SCAN TOOL**
	**ON-VEHICLE NATEF TASK RETRIEVE AND RECORD STORED OBD II DIAGNOSTIC TROUBLE CODES; CLEAR CODES.**