

Automatic Transmissions and Transaxles, 7e










Chapter 9 Electronic Transmission Controls

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.	<p>Explain the chapter learning objectives to the students.</p> <ol style="list-style-type: none">1. Prepare for ASE Automatic Transmissions (A2) certification test content area "A" (General Transmission and Transaxle Diagnosis).2. Explain the procedure for monitoring engine load and vehicle speed for the proper functioning of hydraulically controlled transmission/ transaxles.3. Explain how the automatic transmissions/ transaxles are controlled electronically.4. Explain the function of sensors and switches for electronic control of transmission.5. Identify the types of transmission solenoids.6. Discuss adaptive strategies and controls for electronically controlled automatic transmissions/transaxles.
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 9: Chapter Images

ICONS	Ch9 Electronic Transmission Controls
         OLD INFO	<p>1. SLIDE 1 Electronic Transmission Controls</p> <p>Check for ADDITIONAL VIDEOS & ANIMATIONS @ http://www.jameshalderman.com/ WEB SITE IS CONSTANTLY UPDATED</p> <p><u>Videos</u></p> <p>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</p> <p>DOWNLOAD Crossword Puzzle</p> <p>DOWNLOAD Word Search Puzzle</p> <p>2. SLIDE 2 EXPLAIN FIGURE 9–1 a) 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). It also has a vehicle harness connector with connections to the shift position switch and the input and output speed sensors. (b) A simplified view is also shown.</p> <p>3. SLIDE 3 EXPLAIN FIGURE 9–2 The transmission range switch is usually located on the case where the shifter cable attaches to the manual valve lever. The switch also includes the switch for the backup lights and the park/neutral switch, which is used to prevent the start being engaged unless the shifter is in park or neutral.</p> <p><u>Vacuum Modulator Valve (View) (Download)</u></p>

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<div data-bbox="212 247 337 380"></div> <div data-bbox="354 352 527 388">OLD INFO</div> <div data-bbox="212 407 363 520"></div> <div data-bbox="212 558 363 672"></div> <div data-bbox="212 743 337 875"></div> <div data-bbox="212 892 363 1005"></div> <div data-bbox="212 1457 337 1589"></div> <div data-bbox="212 1602 337 1734"></div> <div data-bbox="354 1612 456 1734"></div>	<div data-bbox="586 247 1146 279"><u>Governor Operation (View) (Download)</u></div> <div data-bbox="586 285 1365 317"><u>Hydraulic Controlled Manual Shifts (View) (Download)</u></div> <div data-bbox="586 323 1192 354"><u>Hydraulic Shift Control (View) (Download)</u></div> <div data-bbox="623 401 1414 737"> <p>4. SLIDE 4 EXPLAIN FIGURE 9–3 Moving the shift lever to the M (manual) position (a) activates the up/down, +/- switches that will cause an upshift or downshift.</p> <p>5. SLIDE 5 EXPLAIN FIGURE 9–4 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.</p> </div> <div data-bbox="586 743 1349 774"><u>Electronic/Hydraulic Shift Control (View) (Download)</u></div> <div data-bbox="586 781 1321 812"><u>Electronic Transmission Control (View)(Download)</u></div> <div data-bbox="623 888 1414 1451"> <p>6. SLIDE 6 EXPLAIN FIGURE 9–5 (a) The speed sensor switch will close as the magnet moves past it. (b) 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.</p> <p>7. SLIDE 7 EXPLAIN FIGURE 9–6 Input and output speed sensors are often mounted so that the notches in the rotating assembly are used to measure speed (RPM), which is used by the PCM/TCM for shift control and diagnostic information.</p> <p>8. SLIDE 8 EXPLAIN FIGURE 9–7 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.</p> </div> <div data-bbox="586 1457 1414 1535">DEMONSTRATION: CONNECT A DSO OR GMM TO ONE OF THE TRANSMISSION SPEED SENSOR</div> <div data-bbox="586 1602 1328 1717">DISCUSSION: DISCUSS SHIFT MODES THAT MOST AUTOMATIC TRANSMISSIONS & TRANSAXLES INCLUDE.</div>

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        	<p><u>MANUAL LEVER POSITION SWITCH (MLPS) (VIEW) (DOWNLOAD)</u></p> <p>DISCUSSION: DISCUSS IMPORTANCE OF OPERATING A VEHICLE IN THE PROPER SHIFT MODE AT THE PROPER TIME. WHICH GEARS ARE USED ON GENTLE, LONG, OR STEEP GRADES?</p> <p>9. SLIDE 9 EXPLAIN FIGURE 9–8 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.</p> <p>EXPLAIN FREQUENTLY ASKED QUESTION: What Is Pressure Logic?</p> <p>10. SLIDE 10 EXPLAIN FIGURE 9–9a A transmission fluid temperature sensor can be checked by connecting an ohmmeter to the harness connector terminals. (b) The resistance should change as the temperature changes.</p> <p><u>Transmission Fluid Temperature Sensor (View) (Download)</u></p> <p>11. SLIDE 11 EXPLAIN FIGURE 9–10 The brake (stop light) switch is mounted at the brake pedal. It provides a brake-apply signal to the TCM.</p> <p>12. SLIDE 12 EXPLAIN FIGURE 9–11 (a) The normally closed solenoid blocks fluid flow when it is off while opening the exhaust; and when it is on, it opens the valve. (b) The normally open solenoid allows fluid flow when it is off; and when it is on, it closes the valve while opening the exhaust.</p> <p>13. SLIDE 13 EXPLAIN FIGURE 9–12 The signal from the TCM can cause the EPC solenoid to change the pressure regulator valve to adjust line pressure.</p> <p>14. SLIDE 14 EXPLAIN FIGURE 9–13 Line pressure increases as the duty cycle of EPC solenoid decreases.</p> <p><u>EPC Solenoid (View) (Download)</u></p>

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	<p>HANDS-ON TASK: PULSE WIDTH IS MEASURED IN HERTZ. HERTZ ARE OFTEN DISPLAYED IN MILLISECONDS. HOW MANY MILLISECONDS IN A SECOND? HAVE STUDENTS DETERMINE SPEED OF ELECTRICITY. UNDERSTANDING SPEED OF ELECTRICITY HELPS UNDERSTAND HOW ELECTRONICS CAN OPERATE SO FAST.</p>
	<ol style="list-style-type: none"> 15. SLIDE 15 EXPLAIN FIGURE 9–14 Solenoid control occurs when the PCM/TCM completes the circuit to ground (top) or switches on B+ (bottom). The ground connection is also B- 16. SLIDE 16 EXPLAIN FIGURE 9–15 Using data from the various sensors, the TCM can apply or release the clutches. During an upshift, solenoid 1 can control how fast clutch 1 releases as solenoid 2 controls how fast clutch 2 applies to keep the shift time at the proper speed 17. SLIDE 17 EXPLAIN FIGURE 9–16 A diagram showing the relationship between the electronic and hydraulic controls. 18. SLIDE 18 EXPLAIN FIGURE 9–17 When the transmission control module (TCM) is ready to begin an upshift, it signals the powertrain control module (PCM) to reduce engine torque. This produces a smoother shift with less wear in the transmission.
	<p>EXPLAIN CHART 9-1</p>
	<p>EXPLAIN FREQUENTLY ASKED QUESTION: What Is Torque Control?</p>
	<ol style="list-style-type: none"> 19. SLIDE 19 EXPLAIN FIGURE 9–18 A scan tool display showing the adaptive (TAP) pressure changes at various throttle positions.
	<p>DEMONSTRATION: CONNECT A SCAN TOOL TO A LAB VEHICLE AND SHOW STUDENTS HOW TO DISPLAY THE ADAPTIVE (TAP) PRESSURE CHANGES AT VARIOUS THROTTLE POSITIONS</p>
	<p>HANDS-ON TASK: CONNECT A SCAN TOOL TO A LAB VEHICLE AND DISPLAY ADAPTIVE (TAP) PRESSURE CHANGES AT VARIOUS THROTTLE</p>

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     	<p>POSITIONS:</p> <p>20. SLIDE 20 EXPLAIN FIGURE 9–19 The fuzzy logic part of the TMC receives input signals, compares what the driver is doing with the throttle and what the vehicle is doing with normal operation, and adapts shift timing</p> <p>EXPLAIN CHARTS 9-2 & 9-3</p> <p>28. SLIDE 28 EXPLAIN FIGURE 9–19 A diagram showing the relationship between the electronic and hydraulic controls.</p> <p><u>Electronic Clutch Control (View) (Download)</u> <u>Electronic/Hydraulic Shift Control (View) (Download)</u> <u>Electronic Transmission Control (View) (Download)</u> <u>Simple Electronic Controlled Shifts (View) (Download)</u></p> <p>DEMONSTRATION: SHOW HOW TO USE A SCAN TOOL TO CHECK & DIAGNOSE A TCC</p> <p>HANDS-ON TASK: BASED ON DEMO HAVE STUDENTS USE A SCAN TOOL TO CHECK & DIAGNOSE A TCC</p>