

# Automotive Fuel and Emissions Control Systems 4/E


## Chapter 14 TP SENSORS



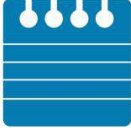





### Opening Your Class

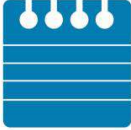

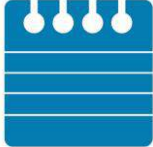
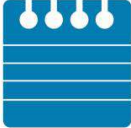



KEY ELEMENT	EXAMPLES
Introduce Content	This course or class covers operation and service of <b>Automotive Fuel and Emissions Control Systems</b> . It correlates material to task lists specified by ASE and NATEF.
Motivate Learners	Explain how the knowledge of how something works translates into the ability 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. <ol style="list-style-type: none"><li>1. Discuss the purpose and function of throttle position (TP) sensors.</li><li>2. Describe the powertrain control module (PCM) uses for the TP sensor.</li><li>3. Describe how to test the TP sensor and interpret the TP sensor diagnostic trouble codes.</li></ol>
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 Fuel & Emission Control 4<sup>th</sup> Edition Chapter Images found on Jim's web site @ [www.jameshalderman.com](http://www.jameshalderman.com)**

**LINK CHP 14: [Chapter Images](#)**

ICONS	Ch14 TP SENSORS
	<p><b>1. SLIDE 1 CH14 TP SENSORS</b></p> <p>Check for <b>ADDITIONAL VIDEOS &amp; ANIMATIONS</b>  @ <a href="http://www.jameshalderman.com/">http://www.jameshalderman.com/</a>  <b>WEB SITE REGULARLY UPDATED</b></p> <p><b><u>VIDEOS</u></b></p> <p>At the beginning of this class, you can download the crossword puzzle &amp; Word Search from the links below to familiarize your class with the terms in this chapter &amp; then discuss them</p> <p><b>Crossword Puzzle (<a href="#">Microsoft Word</a>) (<a href="#">PDF</a>)</b>  <b>Word Search Puzzle (<a href="#">Microsoft Word</a>) (<a href="#">PDF</a>)</b></p> <p>2. <b>SLIDE 2 EXPLAIN</b> Throttle Position Sensor  Construction &amp; <b>EXPLAIN Figure 14-1</b> typical TP sensor mounted on the throttle plate of this port-injected engine.</p> <p><b><u>DISCUSSION: PROVIDE THE STUDENTS WITH A WIRING DIAGRAM OF A TP CIRCUIT TO STUDY AND DISCUSS. WHAT IS THE FUNCTION OF EACH WIRE CONNECTED TO SENSOR?</u></b></p> <p><b><u>HANDS-ON TASK: HAVE STUDENTS LOCATE AND VISUALLY INSPECT A TP SENSOR FOR PROPER CONNECTION, ATTACHMENT, AND CONDITION.</u></b></p> <p><b>SOME TP SENSORS HAVE 4 WIRES. THE FOURTH WIRE IS COMMONLY A SWITCH CIRCUIT USED TO PROVIDE A SIGNAL THAT VEHICLE IS AT IDLE.</b></p> <p><b>SOME TP SENSORS GO BAD IN ONLY ONE SPOT—VEHICLES THAT ARE DRIVEN AT CONSTANT SPEEDS TEND TO WEAR THE TP IN ONE SPOT.</b></p> <p><b><u>POTENTIOMETER (VIEW) (DOWNLOAD)</u></b>  <b><u>THROTTLE POSITION SENSOR (VIEW) (DOWNLOAD)</u></b></p>

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	<p>3. <b>SLIDE 3 EXPLAIN Figure 14-2</b> The signal voltage from a throttle position increases as the throttle is opened because the wiper arm is closer to the 5-volt reference. At idle, the resistance of the sensor winding effectively reduces the signal voltage output to the computer.</p>
	<p><b><u>DISCUSSION: HAVE STUDENTS DISCUSS HOW TP SENSORS AFFECT AUTOMATIC TRANSMISSION FUNCTION. HOW COULD VARIOUS TP MALFUNCTIONS CAUSE ABNORMAL AUTOMATIC TRANSMISSION OPERATION? IF YOU FIND THAT TP SENSOR IS MISSING ITS VREF SIGNAL, CHECK OTHER SENSORS THAT OPERATE ON SAME VREF SIGNAL. IF OTHER SENSORS ARE ALSO MISSING THEIR VREF SIGNAL, THE PROBLEM MAY BE INSIDE THE COMPUTER.</u></b></p>
	<p>4. <b>SLIDE 4 EXPLAIN Figure 14-3</b> A meter lead connected to a T-pin that was gently pushed along the signal wire of the TP sensor until the point of the pin touched the metal terminal inside the plastic connector.</p>
	<p>5. <b>SLIDE 5 EXPLAIN Figure 14-4</b> typical waveform of a TP sensor signal as recorded on a DSO when the accelerator pedal was depressed with the ignition switch on (engine off). Clean transitions and the lack of any glitches in this waveform indicate a good sensor</p>
	<p><b>EXPLAIN TECH TIP</b></p>
	<p><b><u>THROTTLE POSITION VOLT CHECK REF SIGNAL (VIEW) (DOWNLOAD)</u></b>  <b><u>THROTTLE POSITION GROUND CHECK (VIEW) (DOWNLOAD)</u></b></p>
	<p>6. <b>SLIDE 6 EXPLAIN FIGURE 14-5</b> Checking the 5-volt reference from the computer being applied to the TP sensor with the ignition switch on (engine off)</p> <p>7. <b>SLIDE 7 EXPLAIN FIGURE 14-6</b> Checking the voltage drop between TP sensor ground and a good engine ground with the ignition on (engine off). A reading of greater than 0.2 volt (200 mV) represents a bad computer ground.</p>
	<p><b><u>DEMONSTRATION: SHOW THE STUDENTS HOW TO USE A DIGITAL VOLTMETER TO TEST TP SENSOR FOR PROPER OPERATION. BE SURE TO DEMONSTRATE PROPER TECHNIQUES THAT SHOULD BE USED TO PREVENT WIRE, TERMINAL,</u></b></p>

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	<p><b>AND CONNECTOR DAMAGE DURING TESTING.</b></p> <p><b><u>FIGURE 14-5</u></b></p> <p>WHEN USING A DIGITAL VOLTMETER, BE SURE METER IS NOT AUTORANGING; OTHERWISE, WHEN THE METER SWITCHES RANGES, IT CAN EASILY BE MISTAKEN AS A GLITCH IN SENSOR.</p>
	<p><b><u>DEMONSTRATION: SHOW PROPER METHOD FOR ADJUSTING A TP SENSOR USING A VOLTMETER, DSO, OR SCAN TOOL</u></b></p>
	<p><b>ONLY EARLY MODEL TP SENSORS ARE ADJUSTABLE. CURRENT TP SENSORS ARE NOT ADJUSTABLE</b></p>
	<p>ON SOME OLDER VEHICLES, BASE IGNITION TIMING CANNOT BE SET UNLESS COMPUTER SEES AN IDLE SIGNAL FROM THE TP SENSOR. IT MAY BE NECESSARY TO ADJUST TP SENSOR AND/OR THROTTLE CABLE IN ORDER TO SET TIMING.</p>
	<p><b><u>HANDS-ON TASK: HAVE STUDENTS TEST A TP SENSOR FOR PROPER OPERATION USING A SCAN TOOL.</u></b></p>
	<p><b><u>ON-VEHICLE NATEF TASK INSPECT AND TEST THROTTLE POSITION SENSOR USING A GMM)/(DSO); PERFORM NECESSARY ACTION</u></b></p>
	<p><b><u>ON-VEHICLE NATEF TASK INSPECT &amp; TEST PCM/ECM, ACTUATORS, &amp; CIRCUITS USING GMM/DSO; PERFORM NECESSARY ACTION</u></b></p>