Automotive Technology 6th Edition
Chapter 75 THROTTLE POSITION (TP) SENSORS
Opening Your Class

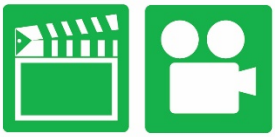
KEY ELEMENT	EXAMPLES
Introduce Content	This Automotive Technology 6th text provides complete coverage of automotive components, operation, design, and troubleshooting. It correlates material to task lists specified by ASE and ASEEducation (NATEF) and emphasizes a problem-solving approach. Chapter features include Tech Tips, Frequently Asked Questions, Case Studies, Videos, Animations, and ASEEducation (NATEF) Task Sheets.
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 learning objectives to students as listed BELOW: 1. Discuss how throttle position sensors work. 2. Describe how the operation of the TP sensor affects vehicle operation. 3. Describe how to test the TP sensor and interpret the TP sensor diagnostic trouble codes. 4. This chapter will help prepare for Engine Repair (A8) ASE certification test content area "E" (Computerized Engine Controls Diagnosis and Repair).
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: Lesson plan is based on 6th Edition Chapter Images found on Jim's web site @ www.jameshalderman.com

DOWNLOAD Chapter 75 Chapter Images: From

http://www.jameshalderman.com/automotive_principles.html

NOTE: You can use Chapter Images or possibly Power Point files:

ICONS	Chapter 75 Throttle Position Sensors
	**1. SLIDE 1 Chapter 75 Throttle Position Sensors**
	**Check for ADDITIONAL VIDEOS & ANIMATIONS @ http://www.jameshalderman.com/** **WEB SITE IS CONSTANTLY UPDATED** **http://www.jameshalderman.com/automotive_principles.html** **DOWNLOAD** **Crossword Puzzle (Microsoft Word) (PDF)** **Word Search Puzzle (Microsoft Word) (PDF**
	**Videos**
	**2. SLIDE 2 EXPLAIN Figure 75-1** A typical TP sensor mounted on the throttle plate of this port-injected engine.
	**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?**
	**HANDS-ON TASK: Have students locate and visually inspect a TP SENSOR for proper connection, attachment, and condition.**
	**Some TP sensors have 4 wires. The fourth wire is commonly a switch circuit used to provide a signal that vehicle is at idle.**
	**Some TP sensors go bad in only one spot—vehicles that are driven at constant speeds tend to wear the TP in one spot.**
	**Potentiometer (View) (Download)**
	**Throttle Position Sensor (View) (Download)**
	Throttle Position Volt Check Ref Signal (View) (Download)
	Throttle Postion Ground Check (View) (Download)

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	3. **SLIDE 3 EXPLAIN Figure 75-2** 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.
	**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.**
	4. **SLIDE 4 EXPLAIN Figure 75-3** 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. 5. **SLIDE 5 EXPLAIN Figure 75-4** 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 6. **SLIDE 6 EXPLAIN FIGURE 75-5** Checking the 5-volt reference from the computer being applied to the TP sensor with the ignition switch on (engine off). 7. **SLIDE 7 EXPLAIN FIGURE 75-6** Checking the voltage drop between the TP sensor ground and a good engine ground with the ignition on (engine off).
	**EXPLAIN TECH TIP: *Check Power and Ground Before Condemning a Bad Sensor:* Most engine sensors use a 5-volt reference and a ground. If 5 volts to the sensor is too high (shorted to voltage) or too low (high resistance), then the sensor output is skewed or out of range. Before replacing sensor that did not read correctly, measure both 5-volt reference and ground. To measure ground, simply turn ignition on (engine off) and touch one testlead of a DMM set to read DC volts to sensor ground and other to negative terminal of battery. Any**

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	reading higher than 0.2 volt (200 mV) represents a poor ground. • SEE FIGURES 75–5 AND 75–6.
DEMO	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, and connector damage during testing.
	FIGURE 75-5
	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.
DEMO	DEMONSTRATION: Show proper method for adjusting a TP sensor using a voltmeter, DSO, or scan tool
	Only early model TP sensors are adjustable. Current TP sensors are NOT adjustable
	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.
	HANDS-ON TASK: Have students test a TP sensor for proper operation using a scan tool.
	ON-VEHICLE TASK: Inspect and test THROTTLE POSITION Sensor using a GMM)/(DSO); perform necessary action.
	ON-VEHICLE ASEEDUCATION TASK: Inspect & test PCM/ECM, ACTUATORS, & circuits using GMM/DSO; perform necessary action

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 	**ON-VEHICLE ASEEDUCATION TASK E7.** **Interpret diagnostic trouble codes (DTCs) and scan tool data related to the emissions control systems; determine needed action.**