# Automotive Electrical & Engine Performance 8/E

# Chapter 32 THROTTLE POSITION (TP) SENSORS

## Opening Your Class

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| **KEY ELEMENT** | **EXAMPLES** |
| **Introduce Content** | This Automotive Electrical & Engine Performance 8th edition provides complete coverage of automotive areas pertaining vehicle electrical systems and engine performance. 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, and Animations that are listed in this Lesson Plan. This Lesson Plan also references ASEEducation (NATEF) Task Sheets available from Jim’s web site. |
| **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 to test the TP sensor using a scan tool. 3. Describe how the operation of the TP sensor affects vehicle operation. 4. Discuss the PCM uses for the TP sensor.   **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: This lesson plan is based on Automotive Electrical & Engine Performance 8th Edition Chapter Images found on Jim’s web site @** [**www.jameshalderman.com**](http://www.jameshalderman.com)

**DOWNLOAD Chapter 32 Chapter Images: From**

[**http://www.jameshalderman.com/books\_a8.html#anchor2**](http://www.jameshalderman.com/books_a8.html#anchor2)

| ICONS | **Ch32 THROTTLE POSITION (TP) SENSORS** |
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| Explain | 1. SLIDE 1 CH32 THROTTLE POSITION (TP) SENSORS |
| AnimationVideo | **Check for ADDITIONAL VIDEOS & ANIMATIONS @** [**http://www.jameshalderman.com/**](http://www.jameshalderman.com/)  **WEB SITE IS CONSTANTLY UPDATED** |
| Video | [Videos](http://www.jameshalderman.com/links/book_master/vid/ch73/video_frame.html) |
| InstructorNotesDiscussion | At the beginning of this class, you can download the crossword puzzle & Word Search from Jim’s web site to familiarize your class with terms in this chapter & then discuss them, see below: |
| AssessmentIcon | <http://www.jameshalderman.com/books_a8.html#anchor2>  **DOWNLOAD**  **Crossword Puzzle (Microsoft Word) (PDF)**  **Word Search Puzzle (Microsoft Word) (PDF** |
| Explain | **2. SLIDE 2 EXPLAIN Figure 32-1** A typical TP sensor mounted on the throttle plate of this port-injected engine. |
| DiscussionAnswerQuestionIcon | 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? |
| Repair Vehicle | HANDS-ON TASK: Have students locate and visually inspect a TP SENSOR for proper connection, attachment, and condition. |
| InstructorNotes | Some TP sensors have 4 wires. The fourth wire is commonly a switch circuit used to provide a signal that vehicle is at idle. |
| InstructorNotes | Some TP sensors go bad in only one spot—vehicles that are driven at constant speeds tend to wear the TP in one spot. |
| Animation | |  | | --- | | [**Potentiometer (View)**](http://jameshalderman.com/links/a8/html5/Potentiometer_A6_Chapter_39_and_A8-Chapter_73.html) [**(Download)**](http://jameshalderman.com/links/a8/flash/Potentiometer_A6_Chapter_39_and_A8-Chapter_73.swf) | | [**Throttle Position Sensor (View)**](http://jameshalderman.com/links/a8/html5/throttle_position_sensor_ch73.html) [**(Download)**](http://jameshalderman.com/links/a8/flash/throttle_position_sensor_ch73.swf) | | [**Throttle Position Volt Check Ref Signal (View)**](http://jameshalderman.com/links/a8/html5/throttle_position_volt_check_ref_signal_ch73.html) [**(Download)**](http://jameshalderman.com/links/a8/flash/throttle_position_volt_check_ref_signal_ch73.swf) | | [**Throttle Postion Ground Check (View)**](http://jameshalderman.com/links/a8/html5/tp_sensor_ground_check_ch73.html) [**(Download)**](http://jameshalderman.com/links/a8/flash/tp_sensor_ground_check_ch73.swf) | |
| Explain | **3. SLIDE 3 EXPLAIN Figure 32-2** 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. |
| DiscussionAnswerQuestionIcon | DISCUSSION: Have students discuss how TP sensors affect automatic transmission function. How could various TP malfunctions cause abnormal automatic transmission operation? |
| InstructorNotes | 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. |
| Explain | **4. SLIDE 4 EXPLAIN Figure 32-3** 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 32-4** 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 |
| Tech Tip | 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  reading higher than 0.2 volt (200 mV) represents a poor ground. ● SEE FIGURES 32–5 AND 32–6. |
|  | **6. SLIDE 6 EXPLAIN FIGURE 32-5** 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 32-6** Checking the voltage drop between the TP sensor ground and a good engine ground with the ignition on (engine off). |
| DemoRepair Vehicle | 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 32-5 |
| InstructorNotes | When using a digital voltmeter, be sure meter is not autoranging; otherwise, when meter switches ranges, it can easily be mistaken as a glitch in sensor. |
| DemoRepair Vehicle | DEMONSTRATION: Show proper method for adjusting a TP sensor using a voltmeter, DSO, or scan tool |
| InstructorNotes | Only early model TP sensors are adjustable. Current TP sensors are NOT adjustable |
| InstructorNotes | 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. |
| Repair Vehicle | HANDS-ON TASK: Have students test a TP sensor for proper operation using a scan tool. |
| Repair Vehicle | ON-VEHICLE TASK: Inspect and test THROTTLE POSITION Sensor using a GMM)/(DSO); perform necessary action. |
| Repair Vehicle | ON-VEHICLE ASEEDUCATION TASK: Inspect & test PCM/ECM, ACTUATORS, & circuits using GMM/DSO; perform necessary action |
| ASE-Education-Foundation-Horizontal | ON-VEHICLE ASEEDUCATION TASK E7. Interpret diagnostic trouble codes (DTCs) and scan tool data related to the emissions control systems; determine needed action. |