

# Automotive Technology 5<sup>th</sup> Edition

## Chapter 80 Electronic Throttle Control System

### Opening Your Class

KEY ELEMENT	EXAMPLES
<b>Introduce Content</b>	This course or class provides complete coverage of the components, operation, design, and troubleshooting. It correlates material to task lists specified by ASE and NATEF and emphasizes a problem-solving approach. Chapter features include Tech Tips, Frequently Asked Questions, Real World Fixes, Videos, Animations, and NATEF Task Sheet references.
<b>Motivate Learners</b>	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.
<b>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.</b>	Explain learning objectives to students as listed below: <ol style="list-style-type: none"> <li>1. Describe electronic throttle control systems and explain how the position of the accelerator pedal is detected.</li> <li>2. Discuss throttle body assembly and throttle position sensors.</li> <li>3. Describe how to diagnose faults in an electronic throttle control system.</li> <li>4. Explain how to service an electronic throttle system.</li> </ol>
<b>Establish the Mood or Climate</b>	Provide a <b>WELCOME</b> , Avoid put downs and bad jokes.
<b>Complete Essentials</b>	Restrooms, breaks, registration, tests, etc.
<b>Clarify and Establish Knowledge Base</b>	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 the 5<sup>th</sup> Edition Chapter Images found on Jim's web site @**

**[www.jameshalderman.com](http://www.jameshalderman.com)**

**LINK CHP 80: [ATE5 Chapter Images](#)**

## ICONS



## CH80 ELECTRONIC THROTTLE CONTROL SYSTEM

### 1. SLIDE 1 CH80 ELECTRONIC THROTTLE CONTROL SYSTEM

Check for ADDITIONAL VIDEOS & ANIMATIONS @  
<http://www.jameshalderman.com/>  
WEB SITE IS CONSTANTLY UPDATED

### Videos

[Electronic Throttle Control \(View\)](#)  
[\(Download\)](#)

[ON-VEHICLE NATEF TASK: ELECTRONIC THROTTLE CONTROL Identification: Research service information, such as engine management system operation, vehicle service history, and TSBs. Page 249](#)

2. SLIDE 2 EXPLAIN Figure 80-1 throttle pedal is connected to the accelerator pedal position (APP) sensor. The electronic throttle body includes a throttle position sensor to provide throttle angle feedback to the vehicle computer. Some systems use a Throttle Actuator Control (TAC) module to operate the throttle blade (plate)

**DEMONSTRATION: Show the students vehicle with an electronic throttle control system FIGURE 80-1. Point out its components and the lack of a throttle cable or linkage.**

3. SLIDE 3 EXPLAIN Figure 80-2 opening of throttle plate can be delayed as long as 30 milliseconds (0.030 sec.) to allow time for amount of fuel needed to catch up to opening of throttle plate

**DISCUSSION: Have students discuss electronic throttle control systems. What are components of an electronic throttle control system? How is accelerator pedal position sensor similar to throttle position sensor? FIGURE 80-2**

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4. **SLIDE 4 EXPLAIN Figure 80-3** A typical accelerator pedal position (APP) sensor, showing two different output voltage signals that are used by the PCM to determine accelerator pedal position. Two (or three in some applications) are used as a double check because this is a safety-related sensor

**DISCUSSION:** Ask the students to discuss the normal operation of electronic throttle control system. How could the lack of rapid response give some drivers a negative opinion of ETC system?

**DISCUSSION:** Have the students discuss the practice of using 2 or 3 accelerator position sensors. What might happen if one sensor fails?

5. **SLIDE 5 EXPLAIN Figure 80-4** default position for the throttle plate is in slightly open position. The servomotor then is used to close it for idle and open it during acceleration

**DISCUSSION:** Ask the students to discuss the throttle body assembly FIGURE 80-4 for an electronic throttle control system. How is it same as & how does it differ from conventional system?

**HANDS-ON TASK:** Show the students a throttle body from an ETC system, if available. Let them inspect throttle body, feel spring tension, and see size of DC actuator motor.

6. **SLIDE 6 EXPLAIN Figure 80-5 (a)** An H-bridge circuit is used to control the direction of the DC electric motor of the electronic throttle control unit

7. **SLIDE 7 EXPLAIN Figure 80-5 (b)** To reverse the direction of operation, the polarity of the current through the motor is reversed.

8. **SLIDE 8 EXPLAIN Figure 80-6** Schematic of a typical electronic throttle control (ETC) system. Note that terminal #5 is always pulse-width modulated and that terminal #3 is always constant, but both power and ground are switched to change the direction of the motor

**DISCUSSION:** Have the students discuss how PCM drives throttle blade open or closed from default position. Why is a default position needed? Have the students talk about the use of 2 throttle position sensors in the throttle body. What happens

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if one fails? Ask students to discuss **H-bridge** circuit used to actuate throttle. Can they think of other motors (e.g., window motor, seat motor) that operate on same principle? **FIGURES 80-5 & 6**

9. **SLIDE 9 EXPLAIN Figure 80-7** The two TP sensors used on the throttle body of an electronic throttle body assembly produce opposite voltage signals as the throttle is opened. The total voltage of both combined at any throttle plate position is 5 volts

**DISCUSSION:** Have the students discuss need to **calibrate a replacement accelerator pedal position sensor**. Why do they think calibration should be done? **FIGURE 80-7**

10. **SLIDE 10 EXPLAIN Figure 80-8 (a)** A “reduced power” warning light indicates a fault with the electronic throttle control system on some General Motors vehicles.
11. **SLIDE 11 EXPLAIN Figure 80-8 (b)** A symbol showing an engine with an arrow pointing down is used on some General Motors vehicles to indicate a fault with the electronic throttle control system.

**DISCUSSION:** Have the students talk about the “**limp home**” or **limp-in mode situation**. Why is **limp home mode** also called **fail-safe system**?

**DISCUSSION:** Have the students talk about the differences among OEMS in symbols or warning lamps they use to indicate a problem with electronic throttle control system. Do these differences cause problems? **FIGURE 80-8**

12. **SLIDE 12 EXPLAIN Figure 80-9** wrench symbol warning lamp on Ford. Symbol can also be green.
13. **SLIDE 13 EXPLAIN Figure 80-10** symbol used on a Chrysler vehicle indicating fault with electronic throttle control.

**DISCUSSION:** Have the students talk about the **wrench & lightning bolt symbols** used by Ford & Chrysler. Do they think these symbols get more attention from the driver than a check engine lamp does? **FIGURES 80-9 & 10**

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**DISCUSSION:** Have students discuss vacuum leaks and how they affect an engine. Can ETC compensate for leaks at any other engine speed besides idle?

14. **SLIDE 14 EXPLAIN FIGURE 80-11** throttle plate stayed where it was moved, which indicates that there is a problem with electronic throttle body control assembly.
15. **SLIDE 15 EXPLAIN FIGURE 80-12** A corroded electronic throttle control assembly shown with the cover removed.
16. **SLIDE 16 EXPLAIN FIGURE 80-13** Notice the small motor gear on the left drives a larger plastic gear (black), which then drives the small gear in mesh with the section of a gear attached to the throttle plate.

**DISCUSSION:** Have the students discuss the procedure for cleaning an electronic throttle control system throttle body. Is this a new procedure? Then have students talk about procedure for a throttle body with a warning label that says "Do not clean." What would they do if this throttle body were dirty? **FIGURE 80-11**

**DISCUSSION:** Ask the students to discuss the reason for removing the key when servicing an electronic throttle body. Why should they not spray cleaner into the throttle body assembly?

**SAFETY** Explain to the students that DC motor is strong enough to severely cut or even amputate a finger if inserted into a throttle body when actuated. **Key should be removed before any service is attempted.**

**[Crossword Puzzle \(Microsoft Word\) \(PDF\)](#)**  
**[Word Search Puzzle \(Microsoft Word\) \(PDF\)](#)**