Automotive Technology 5th Edition
Chapter 74 MAP/BARO SENSORS
Opening Your Class

KEY ELEMENT	EXAMPLES
Introduce Content	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.
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 the variations in pressure that can occur within an engine. 2. Discuss how MAP sensors work. 3. Describe how the BARO sensor is used to test altitude. 4. List the methods that can be used to test MAP sensors. 5. Describe the symptoms of a failed MAP sensor.
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 the 5th Edition Chapter Images found on Jim's web site @ www.jameshalderman.com

LINK CHP 74: ATE5 Chapter Images

ICONS	Chapter 74 MAP/BARO Sensors
	**1. SLIDE 1 Chapter 74 MAP/BARO Sensors**
	**Check for ADDITIONAL VIDEOS & ANIMATIONS @ http://www.jameshalderman.com/ WEB SITE IS CONSTANTLY UPDATED**
	**Videos**
	**2. SLIDE 2 EXPLAIN Figure 74-1** (a) As an engine is accelerated under a load, the engine vacuum drops. This drop in vacuum is actually an increase in absolute pressure in the intake manifold. A MAP sensor senses all pressures greater than that of a perfect vacuum. (b) The relationship between absolute pressure, vacuum, and gauge pressure.
	**DISCUSSION: Have the students discuss intake manifold pressure. How and why does throttle angle affect intake manifold vacuum? Discuss the difference between PSIG & PSIA. How is a perfect vacuum indicated in gauge pressure? How is atmospheric pressure, or barometric pressure, indicated in absolute pressure? FIGURE 74-1**
	**DISCUSSION: Have the students discuss the difference between MAP, BARO, & BMAP sensors. Is there any advantage to using separate MAP & BARO sensors?**
	**3. SLIDE 3 EXPLAIN Figure 74-2** A clear plastic MAP sensor used for training purposes showing the electronic circuit board and electrical connections.
	**DEMONSTRATION: Show what a MAP sensor looks like and discuss where it can be found on most vehicles. FIGURE 74-2**
	**DISCUSSION: Have the students compare and contrast different types of pressure sensors (silicon diaphragm, capacitor capsule, & ceramic disc). Which is most commonly used design for a MAP sensor?**

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	4. **SLIDE 4 EXPLAIN Figure 74-3** MAP sensors use three wires: 1. 5-volt reference from the PCM 2. Sensor signal (output signal) 3. Ground. A DMM set to test a MAP sensor. (1) Connect the red meter lead to the V meter terminal and the black meter lead to the COM meter terminal. (2) Select DC volts. (3) Connect the test leads to the sensor signal wire and the ground wire. (4) Select hertz (Hz) if testing a MAP sensor whose output is a varying frequency; otherwise keep it on DC volts. (5) Read the change of voltage (frequency) as the vacuum is applied to the sensor. Compare the vacuum reading and the frequency (or voltage) reading to the specifications.
	**DISCUSSION: Have the students discuss frequency. What is frequency? How is it measured?**
	**HANDS-ON TASK: Have the students use a DMM to monitor MAP sensor frequency.** **FIGURE 74-3**
	5. **SLIDE 5 EXPLAIN Figure 74-4** A waveform of a typical digital MAP sensor.
	**DEMONSTRATION: Show the students how to use a DSO to monitor MAP sensor frequency. Show them how frequency changes with changes in engine load. FIGURE 74-4**
	6. **SLIDE 6 EXPLAIN Figure 74-5** Shown is the electronic circuit inside a ceramic disc MAP sensor used on many Chrysler engines. The black areas are carbon resistors that are applied to the ceramic, and lasers are used to cut lines into these resistors during testing to achieve the proper operating calibration.
	**DISCUSSION: Have students discuss EGR system operation. How could a leaking EGR pintle affect MAP sensor readings?**
	7. **SLIDE 7 EXPLAIN Figure 74-6** Altitude affects the MAP sensor voltage.

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	**DISCUSSION:** Have the students discuss how **intake manifold vacuum leaks** affect MAP sensor readings. How might this problem impact fuel economy and emissions?
	**Older GM products that used MAP & BARO sensors used different color connectors to help technicians tell one sensor from other.**
	**DISCUSSION:** Have the students discuss what a **BARO sensor detects**. How does a reduction in barometric pressure affect engine operation?
	**HANDS-ON TASK:** Have the students use a scan tool to monitor MAP sensor operation.
	8. **SLIDE 8 EXPLAIN** Figure 74-7 hand-operated vacuum pump
	**DEMONSTRATION:** Use a vacuum pump hooked up to MAP sensor & scan tool to show students how changes in engine load (manifold vacuum) affect pulse width (air-fuel mixture). **FIGURE 74-7**
	**DISCUSSION:** Have the students discuss how increases and decreases in fuel rail pressure affect injector pulse width. Why does this happen?
	**ON-VEHICLE NATEF TASK:** Inspect and test **MAP Sensor** using a GMM)/(DSO); perform necessary action. **Page 240**
	**Crossword Puzzle (Microsoft Word) (PDF)** **Word Search Puzzle (Microsoft Word) (PDF)**