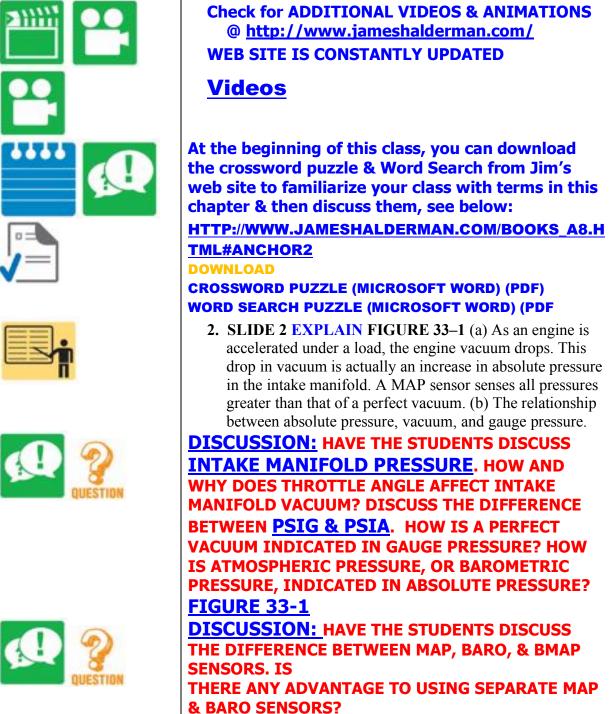
Automotive Electrical & Engine Performance 8/E Chapter 33 MAP/BARO SENSORS Opening Your Class

<u>Opening Your Class</u>			
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	Explain learning objectives to students as listed below:		
objectives for the chapter	1. Discuss the variations in pressure that can occur within an engine.		
or course you are about to cover and explain this is	2. Discuss how MAP sensors work.		
what they should be able	3. List the methods that can be used to test MAP sensors.		
to do as a result of	4. Describe the symptoms of a failed MAP sensor.		
attending this session or	5. Describe how the BARO sensor is used to test altitude.		
class.	This chapter will help you prepare for Engine Repair (A8) ASE		
	certification test content area "E" (Computerized Engine Controls		
	Diagnosis and Repair).		
Establish the Mood or	Provide a WELCOME, Avoid put downs and bad jokes.		
Climate			
Complete Essentials	Restrooms, breaks, registration, tests, etc.		
Clarify and Establish	Do a round robin of the class by going around the room and having		
Knowledge Base	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 **DOWNLOAD Chapter 33 Chapter Images: From**

http://www.jameshalderman.com/books_a8.html#anchor2

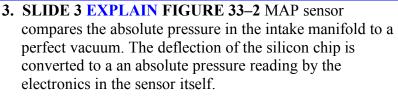
Ch 33 MAP/BARO SENSORS **ICONS**



1. SLIDE 1 CH33 MAP/BARO SENSORS

Ch 33 MAP/BARO SENSORS







DEMONSTRATION: SHOW WHAT A MAP SENSOR LOOKS LIKE AND DISCUSS WHERE IT CAN BE FOUND ON MOST VEHICLES.





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?



4. SLIDE 4 EXPLAIN FIGURE 33–3 A typical MAP sensor installed in the intake manifold.





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 33-3**



5. SLIDE 5 EXPLAIN FIGURE 33–4 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 proper operating calibration.



DUSCUSS CHARTS 33-1 & 33-2

EXPLAIN TECH TIP: If It's Green, It's a Signal Wire Ford-built vehicles usually use a green wire as the signal wire back to computer from sensors. It may not be a solid green, but if there is green somewhere on the wire, then it is signal wire. The other wires are the power and ground wires to the 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.

6. SLIDE 6 EXPLAIN FIGURE 33–5 Altitude affects the MAP sensor voltage.

EXPLAIN TECH TIP: Use the MAP Sensor as a

Vacuum Gauge: MAP sensor measures pressure inside intake manifold compared with absolute zero (perfect vacuum). For example, an idling engine that has 20 inches of mercury (inch Hg) of vacuum has a lower pressure inside intake manifold than when engine is under a load and vacuum is at 10 inch Hg. A decrease in engine vacuum results in an increase in manifold pressure. A normal engine should produce between 17 and 21 inch Hg at idle. Comparing vacuum reading with voltage reading output of MAP sensor indicates that reading should be between 1.62 and 0.88 volt. Therefore, a DMM, scan tool, or scope can be used to measure MAP sensor voltage and be used instead of a vacuum gauge.

NOTE: This chart was developed by testing a MAP sensor at a location about 600 feet above sea level. For best results, a chart based on your altitude should be made by applying a known vacuum, and reading the voltage of a known-good MAP sensor. Vacuum usually drops about 1 inch per 1,000 feet of altitude.

DISCUSSION: HAVE STUDENTS DISCUSS **EGR SYSTEM OPERATION**. HOW COULD A LEAKING EGR PINTLE AFFECT MAP SENSOR READINGS? **DUSCUSS CHARTS 33-3 & 33-4**



7. SLIDE 7 EXPLAIN FIGURE 33–6 When checking a MAP sensor, first verify that sensor is receiving a 5-volt reference voltage then check for output (signal) voltage.



Ch 33 MAP/BARO SENSORS





DISCUSS CASE STUDY: CASE OF NO START LEXUS

The owner of a Lexus is 250 had the car towed to a shop as a no-start. Technician discovered that "check engine" light would not come on even with key on, engine off (KOEO). A scan tool would not communicate either. Checking the resources on www.iatn.net, technician read of a similar case where fuel pressure sensor was shorted which disabled all serial data communications. The technician disconnected fuel pressure sensor located on the backside of engine and communications were restored and engine started. Fuel pressure senor is similar in construction to a MAP/BARO sensor where it uses a five volt reference voltage from PCM and a signal plus a ground. It was apparently five volt reference that was shorted to ground that caused fault to occur. The fuel pressure sensor was replaced the returned to happy owner.

SUMMARY:

- COMPLAINT—VEHICLE OWNER STATED THAT THE ENGINE WOULD NOT START.
- CAUSE—SHORTED FUEL PRESSURE SENSOR WAS FOUND AS PER A PREVIOUS SIMILAR CASE.
- CORRECTION—FUEL PRESSURE SENSOR WAS REPLACED AND THIS CORRECTED THE SERIAL DATA FAULT THAT CAUSED NO-START CONDITION





DISCUSSION: HAVE THE STUDENTS DISCUSS HOW INTAKE MANIFOLD VACUUM LEAKS AFFECT MAP SENSOR READINGS. HOW MIGHT THIS PROBLEM IMPACT FUEL ECONOMY AND EMISSIONS?

Ch 33 MAP/BARO SENSORS

OPERATION.



















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

8. SLIDE 8 EXPLAIN Figure 33-7 hand-operated vacuum pump

EXPLAIN TECH TIP: Visual Check of the MAP Sensor TROUBLE CODES A defective vacuum hose to a MAP sensor can cause a variety of driveability problems, including poor fuel economy, hesitation, stalling, and rough idle. A small air leak (vacuum leak) around the sensor can cause these symptoms and often sets a trouble code in vehicle computer. When checking MAP sensor, if anything comes out of sensor itself, it should be replaced. This includes water, gasoline, or any other substance.

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 (AIRFUEL MIXTURE). FIGURE 33-7

DISCUSSION: HAVE THE STUDENTS DISCUSS HOW INCREASES AND DECREASES IN FUEL RAIL PRESSURE AFFECT INJECTOR PULSE WIDTH. WHY DOES THIS HAPPEN?

ON-VEHICLE TASK: INSPECT AND TEST MAP SENSOR USING A GMM)/(DSO); PERFORM NECESSARY ACTION.