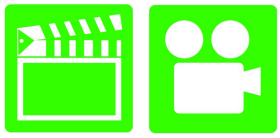
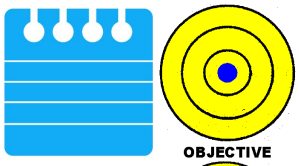
A8 Engine Performance 4th Edition

Chapter 23 MASS AIR FLOW SENSORS

Opening Your Class

KEY ELEMENT	EXAMPLES
Introduce Content	This course or class covers operation and service of **Automotive Engine Performance.** It correlates material to task lists specified by ASE and NATEF.
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 the chapter learning objectives to the students. 1. Prepare for Engine repair (A1) ASE certification test content area "D" (Lubrication and Cooling Systems Diagnosis and Repair). 2. Describe how coolant flows through an engine. 3. Discuss the operation of the thermostat. 4. Explain the purpose and function of the radiator pressure cap. 5. Describe the various types of antifreeze and how to recycle and discard used coolant. 6. Discuss how to diagnose cooling system problems.
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.

ICONS	Ch23 MASS AIR FLOW SENSORS
	1. SLIDE 1 CH23 MASS AIR FLOW SENSORS
	Check for ADDITIONAL VIDEOS & ANIMATIONS @ http://www.jameshalderman.com/ WEB SITE REGULARLY UPDATED
	POWER POINTS DONE BY INDIVIDUAL LEARNING OBJECTIVES, SO THERE IS POWER POINT FILE FOR EACH LEARNING OBJECTIVE
	2. SLIDE 2 EXPLAIN OBJECTIVE CH23 AEP_LO1 3. SLIDE 3 EXPLAIN Figure 23-1 vane air flow (VAF) sensor.
	4. SLIDES 4-5 EXPLAIN Airflow Sensors
	6. SLIDE 6 EXPLAIN Figure 23-2 typical air vane sensor with the cover removed. The movable arm contacts a carbon resistance path as the vane opens. Many air vane sensors also have contacts that close to supply voltage to the electric fuel pump as air vane starts to open when the engine is being cranked and air is being drawn into engine
	DEMONSTRATION: SHOW STUDENTS A VANE AIRFLOW SENSOR. POINT OUT VANE, &, IF COVER IS REMOVED, LINK TO POTENTIOMETER
	DISCUSSION: DISCUSS VANE AIRFLOW SENSOR AND HOW IT WORKS. WHAT MIGHT HAPPEN IF THE SENSOR DIDN'T HAVE A DAMPENING CHAMBER DESIGNED INTO IT? FIGURE 23-1 & 2
	7. SLIDE 7 EXPLAIN Figure 23-3 5-wire mass air flow sensor consists of a metal foil sensing unit, an intake air temperature (IAT) sensor, & electronic module
	8. SLIDE 8 EXPLAIN Figure 23-4 The sensing wire in a typical hot wire mass air flow sensor.

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	**DEMONSTRATION:** SHOW EXAMPLES OF HOT-FILM SENSORS. DISCUSS HOW THERMISTOR IS USED TO MEASURE AIR TEMPERATURE. THEN SHOW STUDENTS A HOT-WIRE SENSOR. DISCUSS PURPOSE OF BURN-OFF CIRCUIT. FIG 23-3 & 4
	**DISCUSSION:** TALK ABOUT TYPES OF MASS AIRFLOW SENSORS. HOW ARE HOT-FILM AND HOT-WIRE SENSORS SIMILAR? ARE THERE DIFFERENCES? FIGURES 23-3 & 4
	**DISCUSSION:** DISCUSS RESISTANCE OF THE HOT WIRE. DOES IT STAY THE SAME OR CHANGE AS AIR MOVES OVER IT? FIGURE 23-4
	9. SLIDE 9 EXPLAIN Karman Vortex Sensors 10. SLIDE 10 EXPLAIN **Figure 23-5** Karman Vortex air flow sensor uses a triangle-shaped rod to create vortexes as the air flows through the sensor. The electronics in the sensor itself converts these vortexes to a digital square wave signal 11. SLIDES 11-12 EXPLAIN PCM Uses for Airflow Sensors
	**DISCUSSION:** HAVE THE STUDENTS TALK ABOUT KARMAN VORTEX SENSORS. WHAT IS DESIGN FACTOR THAT MAKES THEM OPERATE? DISCUSS ULTRASONIC AND THE PRESSURE-TYPE KARMAN VORTEX SENSORS. WHAT IS THE DIFFERENCE IN THEIR OPERATION? WHAT IS SIMILAR IN THEIR OPERATION? FIGURE 23-5
	**ELECTRONIC PARTS, SENSOR WIRES, & THERMISTORS ARE VERY SENSITIVE TO IMPACT AND PROBING. BE CAREFUL NOT TO DROP THESE PARTS OR PROBE THEM WITH SCREWDRIVERS**
	**DISCUSSION:** HAVE STUDENTS DISCUSS HIGH-AUTHORITY & LOW-AUTHORITY SENSORS. CAN SAME SENSOR BE BOTH HIGH AND LOW? HAVE STUDENTS EXPLAIN THEIR RESPONSES.
	2. SLIDE 2 EXPLAIN **OBJECTIVE CH23 AEP_LO2** 3. SLIDE 3 EXPLAIN Testing Mass Airflow Sensors

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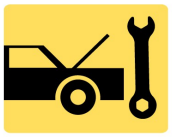
	4. SLIDE 4 EXPLAIN FIGURE 14–6 Carefully check the hose between the MAF sensor and the throttle plate for cracks or splits that could create extra (false) air into the engine that is not measured by the MAF sensor.
	**CRACKED OR LOOSE AIR INLET TUBE, OR SNORKEL, CAN ADMIT UNMETERED (FALSE) AIR & CAUSE DRIVEABILITY PROBLEMS. PCM CALCULATES FUEL INJECTOR PULSE WIDTH BASED ON MASS AIR FLOW READING. ANY LEAKS WILL GIVE FALSE READINGS. FIGURE 23-6**
	2. SLIDE 2 EXPLAIN **OBJECTIVE CH23 AEP_LO3** 3. SLIDES 3-4 EXPLAIN MAF Sensor Contamination
	**DISCUSSION: HAVE THE STUDENTS TALK ABOUT THE DIFFERENCE IN VOLTAGE READINGS AND GRAMS PER SECOND. WHY SHOULD OEM SPECIFICATIONS ALWAYS BE USED IN DIAGNOSING MASS AIR FLOW SENSORS?**
	**DISCUSSION: HAVE THE STUDENTS TALK ABOUT DIFFERENT WAYS OF TESTING MAFS. IS A TAP TEST RESULT ALWAYS ACCURATE?**
	**DISCUSSION: HAVE THE STUDENTS DISCUSS MAF SENSOR CONTAMINATION. IS IT POSSIBLE TO CLEAN A CONTAMINATED MAF SENSOR?**
	**DEMONSTRATION: SHOW DATA STREAM READINGS ON A PROPERLY OPERATING MAF SENSOR.**
	**HANDS-ON TASK: USING A SCAN TOOL HAVE THE STUDENTS ACCESS THE MAF SENSOR DATA STREAM.**
	**ON-VEHICLE NATEF TASK INSPECT AND TEST MAF SENSOR USING A GMM)/(DSO); PERFORM NECESSARY ACTION**