Introduction to Automotive Service
Chapter 29 Computers and Sensors
Opening Your Class

KEY ELEMENT	EXAMPLES
Introduce Content	This course or class serves as an introduction to the world of automotive service. 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 learning objectives to students. 1. Prepare for ASE Electrical/Electronic Systems (A6) certification test content area "A" (General Electrical/Electronic Systems Diagnosis). 2. Explain the purpose and function of onboard computers. 3. List input sensors. 4. List output devices (actuators) controlled by the computer. 5. Explain the purpose and function of ECT, IAT, MAP, MAF, and Oxygen Sensors
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	Chapter 29 Computers and Sensors
	1. SLIDE 1 Chapter 29 Computers and Sensors
	Check for ADDITIONAL VIDEOS & ANIMATIONS @ http://www.jameshalderman.com/ WEB SITE IS UPDATED REGULARLY
	2. SLIDES 2-4 EXPLAIN PCM 5. SLIDE 5 EXPLAIN **Figure 29-1** All computer systems perform four basic functions: input, processing, storage, and output.
	Show ANIMATION: COMPUTER OPERATION www.myautomotivelab.com http://media.pearsoncmg.com/ph/chet/chet_myautomotivelab_2/animations/A6_Animation/Chapter15_Fig_15_1/index.htm
	DISCUSSION: Have the students discuss the importance of SAE J1930 standardization. How has this standardization changed automotive industry?
	DEMONSTRATION: Show how to use an antistatic device to reduce the risk of damage to the PCM during service
	DISCUSSION: Have the students discuss the Differences between analog & digital signals. What does an AD converter circuit do?
	DISCUSSION: Have the students discuss the two types of computer memory. What type of information is stored on each type?
	6. SLIDE 6 EXPLAIN **Figure 29-2** Many electronic components are used to construct a typical vehicle computer including chips, resistors, and capacitors. 7. SLIDE 7 EXPLAIN PCM
	SAFETY Have the students discuss how computers are being used to make cars safer. What systems have been developed as a result of

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computer integration into the auto industry?

DISCUSSION: Have students talk about pros and cons of reprogramming computer using an aftermarket performance programmer.

8. **SLIDE 8 EXPLAIN Figure 29-3** This powertrain control module (PCM) is located under the hood on this Chevrolet pickup truck.

DISCUSSION: Have the students discuss the factors that affect computer placement in vehicle. How does placement in the vehicle affect computer construction requirements?

HANDS-ON TASK: Have the students use online service information to locate various computers and/or control modules for inspection

9. **SLIDES 9 EXPLAIN ENGINE Sensors**

Show ANIMATION: COMPUTER OUTPUTS (Ch71) www.myautomotivelab.com

http://media.pearsoncmg.com/ph/chet/chet_myautomotivelab_2/animations/A6_Animation/Chapter15_Fig_15_9/index.htm

HANDS-ON TASK: Have the students use an electronic component locator FOUND in ONLINE SERVICE INFORMATION to locate and identify various computer input sensors.

10. **SLIDES 10 EXPLAIN FIGURE 29-4** typical engine coolant temperature (ECT) sensor. ECT sensors are located near the thermostat housing on most engines
11. **SLIDES 11 EXPLAIN FIGURE 29-5** The IAT sensor on this General Motors 3800 V-6 engine is in the air passage duct between the air cleaner housing and the throttle body
12. **SLIDES 12 EXPLAIN ENGINE Sensors**
13. **SLIDES 13 EXPLAIN FIGURE 29-6** A typical TP sensor mounted on the throttle shaft on this port-injected engine
14. **SLIDES 14 EXPLAIN FIGURE 29-7** The MAP sensor uses three wires and is located on the intake manifold of the engine in most vehicles

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	15. **SLIDES 15 EXPLAIN FIGURE 29-8** mass airflow (MAF) sensor is located between the air filter housing and the engine, where it can measure all of the air entering the engine 16. **SLIDES 16 EXPLAIN FIGURE 29-9** oxygen sensor is mounted on the exhaust manifold, which is hidden behind a heat shield 17. **SLIDES 17 EXPLAIN FIGURE 29-10** The OBD-II catalytic converter monitor compares the signals of the upstream and downstream oxygen sensor to determine converter efficiency 17. **SLIDES 17-20 EXPLAIN OUTPUT CONTROLS** 21. **SLIDES 21 EXPLAIN FIGURE 29-11** dash display showing that one of the computers has detected a fault in an electrical circuit. The service technician will then follow the specified test procedures to pinpoint the cause and to correct the fault
	**DISCUSSION: Have the students discuss the different methods the computer uses to provide output controls. Before sending signals or commands, what does the computer have to do?**
	**DEMONSTRATION: Show the students how to use a DSO to measure the pulse width of a fuel injector. Show students how pulse width changes with engine speed and load.**
	**Homework: complete Ch29 crossword puzzle: http://www.jameshalderman.com/links/book_intro/cw/crossword_ch_29.pdf**