

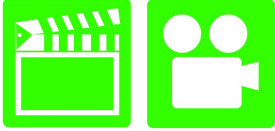
# Advanced Automotive Electricity & Electronics

## Chapter 14 Computer Fundamentals

### Opening Your Class

KEY ELEMENT	EXAMPLES
<b>Introduce Content</b>	This course or class covers operation and service of <b>Advanced Automotive Electricity and Electronics Systems</b> . It correlates material to task lists specified by ASE and NATEF.
<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 the chapter learning objectives to the students. <ol style="list-style-type: none"><li>1. List the various parts of onboard computers.</li><li>2. Explain the purpose and function of onboard computers.</li><li>3. List input sensors to an automotive computer and output devices (actuators) controlled by the computer.</li></ol> <b>This chapter will help you prepare for the ASE Electrical/Electronic Systems (A6) certification test content area "A" (General Electrical/Electronic System Diagnosis).</b>
<b>Establish the Mood or Climate</b>	Provide a <i>WELCOME</i> , 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.

## ICONS



## Ch14 COMPUTER FUNDAMENTALS

### 1. SLIDE 1 CH14 COMPUTER FUNDAMENTALS

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

2. SLIDE 2 **EXPLAIN** Computer Fundamentals

3. SLIDE 3 **EXPLAIN** Computer Functions

4. SLIDE 4 **EXPLAIN** Figure 14-1 All computer systems perform 4 basic functions: input/processing/storage/output.

### **ANIMATION: COMPUTER OPERATION** **WWW.MYAUTOMOTIVELAB.COM**

[HTTP://MEDIA.PEARSONCMG.COM/PH/CHET/CHET\\_MYAUTOMOTIVELAB\\_2/ANIMATIONS/A6\\_ANIMATION/CHAPTER15\\_FIG\\_15\\_1/INDEX.HTM](http://media.pearsoncmg.com/ph/chet/chet_myautomotivelab_2/animations/a6_animation/chapter15_fig_15_1/index.htm)

### **DEMONSTRATION: SHOW HOW TO USE AN ANTISTATIC DEVICE TO REDUCE THE RISK OF DAMAGE TO THE PCM DURING SERVICE**

**DISCUSSION: DISCUSS DIFFERENCES BETWEEN ANALOG & DIGITAL SIGNALS. WHAT DOES AN AD CONVERTER CIRCUIT DO?**

**DISCUSSION: DISCUSS THE TWO TYPES OF COMPUTER MEMORY. WHAT TYPE OF INFORMATION IS STORED ON EACH TYPE?**

5. SLIDE 5 **EXPLAIN** Computer Functions

6. SLIDE 6 **EXPLAIN** Figure 14-2 potentiometer uses a movable contact to vary resistance and send an analog voltage right to the PCM.

7. SLIDE 7 **EXPLAIN** Figure 14-3 AD converter changes analog (variable) voltage signals into digital signals that the PCM can process.

8. SLIDE 8 **EXPLAIN** Digital Computers

9. SLIDE 9 **EXPLAIN** Figure 14-4 Many electronic components are used to construct a typical vehicle computer including chips, resistors, and capacitors.

10. SLIDE 10 **EXPLAIN** Figure 14-5 Typical engine map developed from testing and used by the vehicle computer to provide the optimum ignition timing for all engine speeds and load combinations.

**ICONS****Ch14 COMPUTER FUNDAMENTALS****QUESTION****QUESTION****QUESTION**

**SAFETY DISCUSS HOW COMPUTERS ARE BEING USED TO MAKE CARS SAFER. WHAT SYSTEMS HAVE BEEN DEVELOPED AS A RESULT OF COMPUTER INTEGRATION INTO THE AUTO INDUSTRY?**

**DISCUSSION: DISCUSS IMPORTANCE OF SAE J1930 STANDARDIZATION. HOW HAS THIS CHANGED THE AUTOMOTIVE INDUSTRY?**

**DISCUSSION: TALK ABOUT PROS AND CONS OF REPROGRAMMING COMPUTER USING AN AFTERMARKET PERFORMANCE PROGRAMMER.**

11. SLIDE 11 **EXPLAIN** Figure 14-6 The clock generator produces a series of pulses that are used by the microprocessor and other components to stay in step with each other at a steady rate.
12. SLIDE 12 **EXPLAIN** Digital Computers
13. SLIDE 13 **EXPLAIN NOTE**
14. SLIDE 14 **EXPLAIN** Digital Computers
15. SLIDE 15 **EXPLAIN** Figure 14-7 This powertrain control module (PCM) is located under the hood on this Chevrolet pickup truck.
16. SLIDE 16 **EXPLAIN** Figure 14-8 This PCM on a Chrysler vehicle can only be seen by hoisting the vehicle, because it is located next to the radiator and in airflow to help keep it cool.
17. SLIDE 17 **EXPLAIN** FREQUENTLY ASKED QUESTION & NOTE

**DISCUSSION: DISCUSS HZ (HERTZ) & MHZ (MEGAHERTZ). WHAT DO THESE UNITS REPRESENT? HOW DO THEY AFFECT COMPUTER OPERATION? WHAT TYPE OF EQUIPMENT IS NEEDED TO MEASURE IT?**

## ICONS

## Ch14 COMPUTER FUNDAMENTALS



**DISCUSSION: DISCUSS FACTORS THAT AFFECT COMPUTER PLACEMENT IN VEHICLE. HOW DOES PLACEMENT IN THE VEHICLE AFFECT COMPUTER CONSTRUCTION REQUIREMENTS? FIGURES 14-7 & 8**

**HANDS-ON TASK: HAVE THE STUDENTS USE ONLINE SERVICE INFORMATION TO LOCATE VARIOUS COMPUTERS AND/OR CONTROL MODULES FOR INSPECTION. FIGURES 14-7 & 8**

18. SLIDES 18-19 **EXPLAIN** Computer Input Sensors

20. SLIDES 20-21 **EXPLAIN** Computer Outputs

22. SLIDE 22 **EXPLAIN** Figure 14-9 A typical output driver. In this case, the PCM applies voltage to the fuel pump relay coil to energize the fuel pump

23. SLIDE 23 **EXPLAIN** Figure 14-10 A typical low-side driver (LSD) which uses a control module to control the ground side of the relay coil.



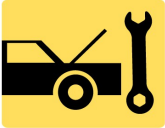


24. SLIDE 24 **EXPLAIN** Figure 14-11 A typical module-controlled high-side driver (HSD) where the module itself supplies the electrical power to the device. The logic circuit inside the module can detect circuit faults including continuity of the circuit and if there is a short-to-ground in the circuit being controlled.

**SHOW ANIMATION: COMPUTER OUTPUTS**  
**WWW.MYAUTOMOTIVELAB.COM**

[HTTP://MEDIA.PEARSONCMG.COM/PH/CHET/CHET\\_MYAUTOMOTIVELAB\\_2/ANIMATIONS/A6\\_ANIMATION/CHAPTER15\\_FIG\\_15\\_9/INDEX.HTM](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.**

25. SLIDE 25 **EXPLAIN** Figure 14-12 Both the top and bottom pattern have the same frequency. However, the amount of on-time varies. Duty cycle is the percentage of the time during a cycle that the signal is turned on.

ICONS	Ch14 COMPUTER FUNDAMENTALS
	<p><b>HANDS-ON TASK:</b> BREAK STUDENTS INTO GROUPS. USING A BINARY-CODE-TO-ALPHABET CONVERSION TABLE, HAVE HALF CLASS MAKE LABELS FOR COMMON AUTOMOTIVE COMPONENTS, WHILE OTHER HALF DECODES LABELS AND CORRECTLY PLACES THEM ON COMPONENTS <u>IN A LAB VEHICLE</u></p>
 <p>QUESTION</p>	<p><b>DISCUSSION:</b> 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?</p>
	<p><b>HANDS-ON TASK: ON ATECH TRAINER:</b> HAVE THE STUDENTS BUILD A SIMPLE ELECTRONIC CIRCUIT THAT USES A TRANSISTOR TO CONTROL BULB OPERATION.</p>
	<p><b>IF AN OUTPUT ACTUATOR DRIVER IS FOUND TO BE FAULTY, MAKE SURE YOU CHECK COMPONENT &amp; CIRCUIT THAT IT CONTROLS. LOW RESISTANCE IN CIRCUIT CAUSES AN INCREASE IN AMPERAGE, WHICH WILL CAUSE DRIVER TO FAIL</b></p>
 <p>DEMO</p>	<p><b>DEMONSTRATION:</b> SHOW THE STUDENTS HOW TO USE A <u>DSO</u> TO MEASURE THE <u>PULSE WIDTH</u> OF A FUEL INJECTOR. SHOW STUDENTS HOW PULSE WIDTH CHANGES WITH ENGINE SPEED AND LOAD.</p>