# A8 Engine Performance 4th Edition

## Chapter 18 Computer and Network Fundamentals

## 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.<br>1. Prepare for Engine repair (A1) ASE certification test content area "D" (Lubrication and Cooling Systems Diagnosis and Repair).<br>2. Describe how coolant flows through an engine.<br>3. Discuss the operation of the thermostat.<br>4. Explain the purpose and function of the radiator pressure cap.<br>5. Describe the various types of antifreeze and how to recycle and discard used coolant.<br>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 | Ch18 Computer and Network Fundamentals |
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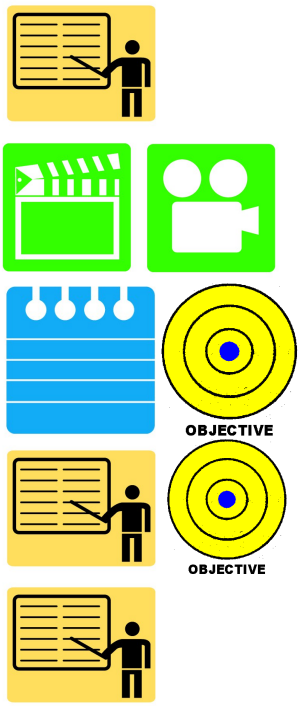
|  | **1. SLIDE 1 CH18 Computer and Network Fundamentals**<br><br>**Check for ADDITIONAL VIDEOS & ANIMATIONS @ http://www.jameshalderman.com/**<br>**WEB SITE REGULARLY UPDATED**<br>**POWER POINTS DONE BY INDIVIDUAL LEARNING OBJECTIVES, SO THERE IS POWER POINT FILE FOR EACH LEARNING OBJECTIVE**<br><br>**2. SLIDE 2 EXPLAIN OBJECTIVE CH18 AEP_LO1**<br>**3. SLIDES 3-4 EXPLAIN COMPUTER CONTROL**<br><br>**5. SLIDE 5 EXPLAIN The Four Basic Computer Functions**<br>**6. SLIDE 6 EXPLAIN FIGURE 18–1** All computer systems perform four basic functions: input, processing, storage, and output<br>**7. SLIDE 7 EXPLAIN FIGURE 18–2** potentiometer uses a movable contact to vary resistance and send an analog voltage to the PCM.<br>**8. SLIDE 8 EXPLAIN FIGURE 18–3** replaceable PROM used in an older General Motors computer. Notice that the sealed access panel has been removed to gain access.<br>**9. SLIDE 9 EXPLAIN FIGURE 18–4** typical output driver. In this case, the PCM applies voltage to the fuel pump relay coil to energize the fuel pump<br>**10. SLIDE 10 EXPLAIN Four Basic Computer Functions**<br>**11. SLIDE 11 EXPLAIN FIGURE 18–5** typical low-side driver (LSD) which uses a control module to control the ground side of the relay coil.<br>**12. SLIDE 12 EXPLAIN FIGURE 18–6** 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. |

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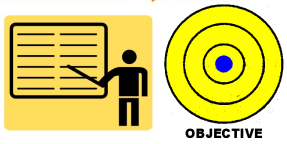
|  | 13. **SLIDE 13 EXPLAIN FIGURE 18–7** Both the top and bottom patterns have the same frequency. However, the amount of on-time varies. Duty cycle is the percentage of the time during a cycle that the signal is turned on |
|  | **ANIMATION: COMPUTER OPERATION 4 SECTIONS WWW.MYAUTOMOTIVELAB.COM** HTTP://MEDIA.PEARSONCMG.COM/PH/CHET/CHET_MYAUTOMOTIVELAB_2/ANIMATIONS/A6_ANIMATION/CHAPTER15_FIG_15_1/INDEX.HTM |
|   | **DISCUSSION: DISCUSS 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 STOCKED ON EACH TYPE?** |
|   | 2. **SLIDE 2 EXPLAIN OBJECTIVE CH18 AEP_LO2**<br>3. **SLIDES 3-5 EXPLAIN** Digital Computers |
|  | 6. **SLIDE 6 EXPLAIN Figure 18-8** Many electronic components are used to construct a typical vehicle computer including chips, resistors, and capacitors.<br>7. **SLIDE 7 EXPLAIN** Digital Computers<br>8. **SLIDE 8 EXPLAIN Figure 18-9** 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. |
|  | **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: HAVE STUDENTS TALK ABOUT PROS AND CONS OF REPROGRAMMING COMPUTER USING AN AFTERMARKET PERFORMANCE** |

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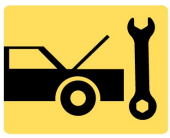
|  | **PROGRAMMER.**<br>9. **SLIDE 9 EXPLAIN FIGURE 18–10** The calibration module on many Ford computers contains a system PROM.<br>10. **SLIDE 10 EXPLAIN Figure 18-11** clock generator produces a series of pulses that are used by the microprocessor and other components to stay in step with each other at a steady rate. |
|  | 11. **SLIDE 11 EXPLAIN Figure 18-12** This powertrain control module (PCM) is located under the hood on this Chevrolet pickup truck.<br>12. **SLIDE 12 EXPLAIN Figure 18-13** This PCM on a Chrysler vehicle can only be seen by hoisting the vehicle, because it is located next to the radiator and in the airflow to help keep it cool. |
|  | **DISCUSSION: HAVE STUDENTS 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?** |
|  | **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.** |
|  | 2. SLIDE 2 EXPLAIN **OBJECTIVE CH18 AEP_LO3**<br>3. **SLIDES 3-4 EXPLAIN** Computer Input Sensors |
|  | 5. **SLIDES 5-6 EXPLAIN Computer Outputs** |
|  | **SHOW ANIMATION: COMPUTER OUTPUTS WWW.MYAUTOMOTIVELAB.COM**<br>HTTP://MEDIA.PEARSONCMG.COM/PH/CHET/CHET_MYAUTOMOTIVELAB_2/ANIMATIONS/A6_ANIMATION/CHAPTER15_FIG_15_9/INDEX.HTM |

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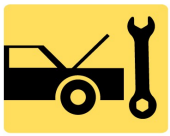
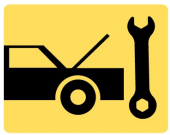
|  | **HANDS-ON TASK: HAVE STUDENTS USE AN ELECTRONIC COMPONENT LOCATOR FOUND IN ONLINE SERVICE INFORMATION TO LOCATE AND IDENTIFY VARIOUS COMPUTER INPUT SENSORS.** |
|  | 2. SLIDE 2 EXPLAIN **OBJECTIVE CH18 AEP_LO4**<br>3. **SLIDES 3-4 EXPLAIN** Module Communication Diagnosis<br>5. **SLIDE 5 EXPLAIN FIGURE 18–18** Checking the terminating resistors using an ohmmeter at the DLC<br>6. **SLIDE 6 EXPLAIN FIGURE 18–19** Sixteen-pin OBD II DLC with terminals identified. Scan tools use the power pin (16) ground pin (4) for power so that a separate cigarette lighter plug is not necessary on OBD II vehicles |
|  | **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?** |
|  | **HANDS-ON TASK: ON ATECH TRAINER: HAVE THE STUDENTS BUILD A SIMPLE ELECTRONIC CIRCUIT THAT USES A TRANSISTOR TO CONTROL BULB OPERATION.** |
|  | **IF AN OUTPUT ACTUATOR DRIVER IS FOUND TO BE FAULTY, MAKE SURE YOU CHECK COMPONENT & CIRCUIT THAT IT CONTROLS. LOW RESISTANCE IN CIRCUIT CAUSES AN INCREASE IN AMPERAGE, WHICH WILL CAUSE DRIVER TO FAIL** |
|  | **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.** |