Automotive Technology 5th Edition  
Chapter 57 Driver Information & Navigation Systems  
Opening Your Class

<table>
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<th>KEY ELEMENT</th>
<th>EXAMPLES</th>
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<td>Introduce Content</td>
<td>This course or class provides complete coverage of the components, operation, design, and troubleshooting. It correlates material to task lists specified by ASE and NATEF and emphasizes a problem-solving approach. Chapter features include Tech Tips, Frequently Asked Questions, Real World Fixes, Videos, Animations, and NATEF Task Sheet references.</td>
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<tr>
<td>Motivate Learners</td>
<td>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.</td>
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| 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 as listed below:  
1. Identify the meaning of dash warning symbols.  
2. Discuss the diagnosis of oil pressure lamp, temperature lamp, brake warning lamp, and other analog dash instruments.  
3. Discuss the operation of head-up display, night vision, and digital electronic displays.  
4. Explain the operation of electronic speedometers and electronic odometers.  
5. Describe how a navigation system works.  
6. Explain the operation and diagnosis of OnStar, backup camera, backup sensor, and lane departure warning system.  
7. Describe how to troubleshoot malfunctioning dash instruments |
| 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. |

NOTE: This lesson plan is based on the 5th Edition Chapter Images found on Jim’s web site @ www.jameshalderman.com  
LINK CHP 57: ATE5 Chapter Images
1. SLIDE 1 CH57 DRIVER INFORMATION & NAVIGATION SYSTEMS

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

Videos

Parking Brake Warning Light (View) (Download)

2. SLIDE 2 EXPLAIN Figure 57-1 Engine coolant temperature is too high.

3. SLIDE 3 EXPLAIN Figure 57-2 Engine oil pressure too low.

4. SLIDE 4 EXPLAIN Figure 57-3 Water detected in fuel. Notice to drain the water from the fuel filter assembly on a vehicle equipped with a diesel engine.

5. SLIDE 5 EXPLAIN Figure 57-4 Maintenance required. This usually means that the engine oil is scheduled to be changed or other routine service items replaced or checked.

6. SLIDE 6 EXPLAIN Figure 57-5 Malfunction indicator lamp (MIL), also called a check engine light. The light means the engine control computer has detected a fault.

7. SLIDE 7 EXPLAIN Figure 57-6 Charging system fault detected.

8. SLIDE 8 EXPLAIN Figure 57-7 Fasten safety belt warning light.

9. SLIDE 9 EXPLAIN Figure 57-8 Fault detected in the supplemental restraint (airbag) system.

10. SLIDE 10 EXPLAIN Figure 57-9 Fault detected in base brake system.

11. SLIDE 11 EXPLAIN Figure 57-10 Brake light bulb failure detected.

12. SLIDE 12 EXPLAIN Figure 57-11 Exterior light bulb failure detected.
| SLIDE 13 | EXPLAIN Figure 57-12 | Worn brake pads or linings detected. |
| SLIDE 14 | EXPLAIN Figure 57-13 | Fault detected in antilock brake system. |
| SLIDE 15 | EXPLAIN Figure 57-14 | Low tire pressure detected. |
| SLIDE 16 | EXPLAIN Figure 57-15 | Door open or ajar. |
| SLIDE 17 | EXPLAIN Figure 57-16 | Windshield washer fluid low. |
| SLIDE 18 | EXPLAIN Figure 57-17 | Low fuel level. |
| SLIDE 19 | EXPLAIN Figure 57-18 | Headlights on. |
| SLIDE 20 | EXPLAIN Figure 57-19 | Low traction detected. Traction control system is functioning to restore traction (usually flashes when actively working to restore traction). |
| SLIDE 21 | EXPLAIN Figure 57-20 | Vehicle stability control system either off or working if flashing. |
| SLIDE 22 | EXPLAIN Figure 57-21 | Traction control system has been turned off. |
| SLIDE 23 | EXPLAIN Figure 57-22 | Indicates that cruise control is on and able to maintain vehicle speed if set. Some vehicles use a symbol that looks like a small speedometer to indicate that the cruise control is on. |

**DISCUSSION:** Have students discuss importance of indicator, or warning, lights. What is purpose of dash warning light?  

**HANDS-ON TASK:** Provide students with common warning symbols used on vehicle dashboard cluster assemblies. Have them identify meaning of each symbol and label it on lab vehicle. Grade students on their ability to identify symbols & systems associated with them.  

| SLIDE 24 | EXPLAIN Figure 57-23 | A typical oil pressure sending unit provides a varying amount of resistance as engine oil pressure changes. The output from the sensor is a variable voltage. |

**DISCUSSION:** Discuss operation of an oil pressure gauge and sending unit. What is the voltage of output from the sensor?
25. SLIDE 25 EXPLAIN Figure 57-24  A temperature
gauge showing normal operating temperature between
180° F and 215° F, depending on the specific vehicle
and engine.

26. SLIDE 26 EXPLAIN Figure 57-25  Typical brake
warning light switch located on or near the master brake
cylinder.

27. SLIDE 27 EXPLAIN Figure 57-26 red brake warning
lamp can be turned on if the brake fluid level is low.

28. SLIDE 28 EXPLAIN Figure 57-27  Electromagnetic
fuel gauge wiring. If the sensor wire is unplugged and
grounded, the needle should point to “E” (empty). If the
sensor wire is unplugged and held away from ground, the
needle should point to “F” (full)

**DEMONSTRATION:** Show students how to use a
variable resistance potentiometer like a 90 ohm
gas gauge tank sender to test gauges for proper
operation.

29. SLIDE 29 EXPLAIN Figure 57-28  A typical
instrument display uses data from the sensors over serial
data lines to the individual gauges.

30. SLIDE 30 EXPLAIN Figure 57-29  Most stepper
motors use four wires which are pulsed by the computer
to rotate the armature in steps.

31. SLIDE 31 EXPLAIN Figure 57-30  The ground for
the “check oil” indicator lamp is controlled by the
electronic low-oil buffer. Even though this buffer is
connected to an oil level sensor, the buffer also takes into
consideration the amount of time the engine

32. SLIDE 32 EXPLAIN Figure 57-31  typical head-up
display showing zero miles per hour, which is actually
projected on the windshield from the head-up display in
the dash.

33. SLIDE 33 EXPLAIN Figure 57-32  dash-mounted
control for the head-up display on this Cadillac allows
the driver to move the image up and down on the
windshield for best viewing.

34. SLIDE 34 EXPLAIN Figure 57-33  typical head-up
display (HUD) unit.
DISCUSSION: Have students discuss advantages of head-up display. Where is HUD unit installed?

35. SLIDE 35 EXPLAIN Figure 57-34 A night vision camera behind the grille of a Cadillac.

36. SLIDE 36 EXPLAIN Figure 57-35a Symbol and line drawing of a typical light emitting diode (LED).

37. SLIDE 37 EXPLAIN Figure 57-35b Grouped in 7 segments, this array is called a 7-segment LED display with a common anode (positive connection). Dash computer toggles cathode (negative) side of each individual segment to display numbers and letters.

38. SLIDE 38 EXPLAIN Figure 57-35c When all segments turned on, #8 displayed.

39. SLIDE 39 EXPLAIN Figure 57-36 typical navigation system. This Honda/Acura system uses some of climate control functions as well as trip information on display. This particular unit uses a DVD unit in the trunk along with a global positioning satellite (GPS) to display a map and your exact location for the entire country.

40. SLIDE 40 EXPLAIN Figure 57-37 (a) View of the vehicle dash with the instrument cluster removed. Sometimes the dash instruments can be serviced by removing the padded dash cover (crash pad) to gain access to the rear of the dash.

41. SLIDE 41 EXPLAIN Figure 57-37 (b) The front view of the electronic analog dash display.

42. SLIDE 42 EXPLAIN Figure 57-37 (c) The rear view of the dash display showing that there are a few bulbs that can be serviced, but otherwise the unit is serviced as an assembly.

DISCUSSION: discuss difference between analog and digital gauges. How is stepper motor used in analog dash displays?

DISCUSSION: discuss diagnosis of dash electronic circuits. Why aren’t dash electronic circuits shown on a wiring diagram? How would a short-to-ground in sending unit wire affect operation?
DEMONSTRATION: Show students how to use an ohmmeter to check sending unit wires for opens and shorts.

Show ANIMATION: Input Discreet Signals

43. SLIDE 43 EXPLAIN Figure 57-38 Typical ignition switch positions

44. SLIDE 44 EXPLAIN Figure 57-39 Many newer vehicles place the ignition switch on the dash and incorporate antitheft controls

45. SLIDE 45 EXPLAIN Figure 57-40 A vehicle speed sensor located in the extension housing of the transmission. Some vehicles use the wheel speed sensors for vehicle speed information.

HANDS-ON TASK: Have students use DMM to test sensors/switches. Have students inspect & test gauge fuses to check power supply to gauge circuitry. Use scan tool to retrieve data that could help diagnose speedometer problems.

46. SLIDE 46 EXPLAIN Figure 57-41 (a) Some odometers are mechanical and are operated by a stepper motor.

47. SLIDE 47 EXPLAIN Figure 57-41 (b) Many vehicles are equipped with an electronic odometer.

DISCUSSION: discuss electronic speedometers. What advantages does using a speed sensor have over a speedometer gear-and-cable arrangement?

Vehicles equipped with electronic odometers or tripometers must be in correct mode to reset maintenance light

DEMONSTRATION: Show how to test VSS (PM generator type) using soldering gun

DISCUSSION: discuss how information from VSS is used by other electronic circuits. Why could a malfunction in VSS affect transmission shifting?
DEMONSTRATION: Show how to remove instrument cluster & how to remove trim pieces without breaking retention clips.

HANDS-ON TASK: Have students use DMM to test a vehicle speed sensor circuit.

48. SLIDE 48 EXPLAIN Figure 57-42 A fuel tank module assembly that contains the fuel pump and fuel level sensor in one assembly.

DISCUSSION: Have students discuss operation of VOICE ACTIVATED SYSTEMS. Can you name any of the specific OEM systems? What the term Bluetooth mean?

49. SLIDE 49 EXPLAIN Figure 57-43 Global positioning systems use 24 satellites in high earth orbit whose signals are picked up by navigation systems. The navigation system computer then calculates the location based on the position of the satellite overhead.

50. SLIDE 50 EXPLAIN Figure 57-44 A typical GPS display screen showing the location of the vehicle.

51. SLIDE 51 EXPLAIN Figure 57-45 A typical navigation display showing various options. Some systems do not allow access to these functions if the vehicle is in gear and/or moving.

52. SLIDE 52 EXPLAIN Figure 57-46 A screen display of a navigation system that is unable to acquire usable signals from GPS satellites.

DISCUSSION: discuss different components that compose a navigation system. What is the input device for users on most navigation systems?

53. SLIDE 53 EXPLAIN Figure 57-47 The three-button OnStar control is located on the inside rearview mirror. The left button (telephone handset icon) is pushed if a hands-free cellular call is to be made. The center button is depressed to contact an OnStar advisor and the right emergency button is used to request that help be sent to the vehicle’s location.
ON-VEHICLE NATEF TASK (A6-F-1) Inspect and test gauges and gauge sending units; determine necessary action (P-1) Page 172

54. SLIDE 54 EXPLAIN Figure 57-48 typical view displayed on the navigation screen from the backup camera.

55. SLIDE 55 EXPLAIN Figure 57-49 typical fisheye-type backup camera usually located near the center on the rear of the vehicle near the license plate.

56. SLIDE 56 EXPLAIN Figure 57-50 A typical backup sensor display located above the rear window inside the vehicle. The warning lights are visible in the inside rearview mirror.

57. SLIDE 57 EXPLAIN Figure 57-51 The small round buttons in the rear bumper are ultrasonic sensors used to sense distance to an object.

DEMONSTRATION: Show students how to locate and identify backup sensors.

58. SLIDE 58 EXPLAIN Figure 57-52 A lane departure warning system often uses cameras to sense the road lines and warns the driver if the vehicle is not staying within the lane, unless the turn signal is

DISCUSSION: discuss how lane departure warning systems operate. How does system detect whether a vehicle is changing lanes on purpose or accidentally?

DEMONSTRATION: Show methods used by various OEMs to reset maintenance reminder lights

59. SLIDES 59-70 FUEL GAUGE DIAGNOSIS OPTIONAL

ON-VEHICLE NATEF TASK Inspect and test connectors, wires, and printed circuit boards of gauge circuits; determine necessary action. (P-3) Page 173
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