

Automotive Chassis Systems 7th Edition

Chapter 1 Service Information, Tools, & Safety












Opening Your Class







KEY ELEMENT	EXAMPLES
Introduce Content	This course or class covers operation and service of Automotive Chassis Systems . 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.	<p>Explain the chapter learning objectives to the students.</p> <ol style="list-style-type: none">1. Locate and interpret vehicle and part identification numbers and labels.2. Locate vehicle service information from a variety of sources.3. Identify the strength and grades of various threaded fasteners.4. Identify the various kinds of hand tools and their uses.5. Identify the various kinds of automotive tools and their uses.6. Describe personal protective equipment and safety precautions to be used when working on automobiles. <p>This chapter will help you understand the ASE content knowledge for vehicle identification and the proper use of tools and shop equipment.</p>
Establish the Mood or Climate	Provide a <i>WELCOME</i> , 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 Automotive Chassis Systems 7th Edition Chapter Images found on Jim's web site








@ www.jameshalderman.com

LINK CHP 1: [Chapter Images](#)

ICONS	Ch01 Service Information, Tools, & Safety
          	<p>1. SLIDE 1 CH1 SERVICE INFORMATION, TOOLS, & SAFETY</p> <p>Check for ADDITIONAL VIDEOS & ANIMATIONS @ http://www.jameshalderman.com/ WEB SITE IS CONSTANTLY UPDATED</p> <p><u>Videos</u></p> <p>At the beginning of this class, you can download the crossword puzzle & Word Search from the links below to familiarize your class with the terms in this chapter & then discuss them</p> <p><u>Crossword Puzzle (Microsoft Word) (PDF)</u> <u>Word Search Puzzle (Microsoft Word) (PDF)</u></p> <p>2. SLIDE 2 EXPLAIN FIGURE 1.1 The vehicle identification number (VIN) is visible through the base of the windshield and on a decal inside the driver's door.</p> <p><u>DEMONSTRATION: SHOW STUDENTS AN EXAMPLE OF A VEHICLE IDENTIFICATION NUMBER (VIN) AND HAVE STUDENTS DECIPHER ITS MEANING BASED ON INFORMATION PROVIDED IN TEXT</u> Before 1980, there was no universally accepted equivalent to a VIN, so OEMs used their own formats.</p> <p>3. SLIDE 3 EXPLAIN FIGURE 1.2 vehicle emissions control information (VECI) sticker is placed under hood.</p> <p>4. SLIDE 4 EXPLAIN FIGURE 1.3 A typical calibration code sticker on the case of a controller. The information on the sticker is often needed when ordering parts or a replacement controller.</p> <p>5. SLIDE 5 EXPLAIN FIGURE 1.4 Casting numbers on major components can be either cast or stamped</p>

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	<u>DEMONSTRATE:</u> EXAMPLE OF VEHICLE SAFETY CERTIFICATION LABEL. ASK THEM TO DECIPHER INFORMATION PROVIDED ON LABEL AND EXPLAIN WHAT IT SIGNIFIES.
	<u>DEMONSTRATE:</u> LOCATION OF VEHICLE EMISSIONS CONTROL INFORMATION (VECI) LABEL UNDER HOOD OF VEHICLE
	<p>6. SLIDE 6 EXPLAIN FIGURE 1.5 Electronic service information is available from aftermarket sources such as ALLDATA and Mitchell On Demand, as well as on websites hosted by vehicle manufacturers.</p>
	<p>7. SLIDE 7 EXPLAIN FIGURE 1.6 Technical service bulletins (TSBs) are issued by vehicle manufacturers when a fault occurs that affects many vehicles with the same problem. The TSB then provides the fix for the problem including any parts needed and detailed instructions.</p>
	<u>DISCUSSION:</u> ASK STUDENTS TO REVIEW SAMPLES OF VEHICLE OWNER'S MANUALS. ASK STUDENTS TO SPECULATE ABOUT WHY SO FEW OWNERS READ THESE MANUALS
	<u>DISCUSSION:</u> We all have our own service history, as documented in our medical records. How do physicians use medical histories to help patients? How is this similar to an automotive technician diagnosing a problem with an automobile? Use this analogy as basis for class discussion. Use one column on flip chart to show elements of medical history. Use another column for corresponding elements of an automotive service history.
	<p>8. SLIDE 8 EXPLAIN FIGURE 1.7 The dimensions of a typical bolt showing where sizes are measured.</p>
	<p>9. SLIDE 9 EXPLAIN FIGURE 1.8 Thread pitch gauge used to measure the pitch of the thread. This bolt has 13 threads to the inch.</p>
	<p>10. SLIDE 10 EXPLAIN FIGURE 1.9 Bolts and screws have many different heads which determine what tool is needed.</p>
	<p>11. SLIDE 11 EXPLAIN FIGURE 1.10 The metric system specifies fasteners by diameter, length, and pitch</p>

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	<p>DISCUSSION: talk about differences between unified national coarse (UNC) & unified national fine (UNF) threads. Where might each be found in use on an automobile? Ask students which they think would have better holding power.</p>
	<p>DEMONSTRATION: SHOW EXAMPLES OF A VARIETY OF GENERAL BOLTS & SCREWS. DISCUSS WHAT TYPE OF TOOL MUST BE USED WITH EACH. STUDENTS GUESS WHY EXAMPLES ARE, OR ARE NOT USED ON CARS.</p>
	<p>12. SLIDE 12 EXPLAIN FIGURE 1.11 Stronger threads are created by cold-rolling a heat-treated bolt blank instead of cutting the threads, using a die.</p>
	<p>13. SLIDE 13 EXPLAIN FIGURE 1.12 Metric bolt (cap screw) grade markings and approximate tensile strength.</p>
	<p>14. SLIDES 14-19 EXPLAIN SAE BOLT CODING Bolt Threads (View) (Download)</p>
	<p>20. SLIDE 20 EXPLAIN FIGURE 1.13 Nuts come in a variety of styles, including locking (prevailing torque) types, such as distorted thread and nylon insert type.</p>
	<p>21. SLIDE 21 EXPLAIN FIGURE 1.14 Washers come in a variety of styles, including flat and serrated used to help prevent a fastener from loosening</p>
	<p>DEMONSTRATION: SHOW & DEMONSTRATE BOTH AN ENGLISH & METRIC THREAD PITCH GAUGE</p>
	<p>22. SLIDE 22 EXPLAIN FIGURE 1.15 A wrench after it has been forged but before the flashing, extra material around the wrench, has been removed.</p> <p>23. SLIDE 23 EXPLAIN FIGURE 1.16 A typical open-end wrench. The size is different on each end and notice that head is angled 15 degrees at the end.</p> <p>24. SLIDE 24 EXPLAIN FIGURE 1.17 The end of a box-end wrench is angled 15 degrees to allow clearance for nearby objects or other fasteners.</p> <p>25. SLIDE 25 EXPLAIN FIGURE 1.18 A combination wrench has an open end at one end and a box end at the other end</p>

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	<u>DEMONSTRATION:</u> AN OPEN-END WRENCH IS ONE OF THE MOST BASIC TOOLS. SHOW STUDENTS WHEN AND WHERE OPEN END WRENCHES ARE USED IN AUTOMOTIVE SERVICE AND REPAIR
	<u>DEMONSTRATION:</u> SHOW BOX-END, ADJUSTABLE, & LINE WRENCHES, AND DISCUSS WHERE EACH IS USED IN AUTOMOTIVE APPLICATIONS. REMIND STUDENTS OF THE SAFETY PROCEDURES WHEN USING WRENCHES.
	26. SLIDE 26 EXPLAIN FIGURE 1.19 adjustable wrench. Adjustable wrenches are sized by overall length of the wrench and not by how far jaws open. Common sizes of adjustable wrenches include 8, 10, and 12 inch.
	27. SLIDE 27 EXPLAIN FIGURE 1.20 end of a typical line wrench, which shows that it is capable of grasping most of the head of the fitting.
	28. SLIDE 28 EXPLAIN FIGURE 1.21 A typical ratchet used to rotate a socket. A ratchet makes a ratcheting noise when it is being rotated in the opposite direction from loosening or tightening. A knob or lever on the ratchet allows the user to switch directions.
	29. SLIDE 29 EXPLAIN FIGURE 1.22 A typical flex handle used to rotate a socket, also called a breaker bar because it usually has longer handle than a ratchet &, therefore, can be used to apply more torque to a fastener
	<u>DEMONSTRATION:</u> SHOW STUDENTS HOW TO USE A RATCHET AND SOCKET SET, AND IDENTIFY AUTOMOTIVE APPLICATIONS WHERE SOCKET WRENCHES ARE BEST USED. EXPLAIN RELEVANCE OF THE DRIVE SIZE TO THE APPLICATION
	<u>BOLT SIZE (VIEW) (DOWNLOAD)</u>
	<u>BOLT THREADS (VIEW) (DOWNLOAD)</u>
	<u>6 AND 12 POINT (VIEW) (DOWNLOAD)</u> <u>OPEN END WRENCH (VIEW) (DOWNLOAD)</u>
	30. SLIDE 30 EXPLAIN FIGURE 1.23 most used socket drive sizes include 1/4, 3/8, and 1/2 inch drive.
	31. SLIDE 31 EXPLAIN FIGURE 1.24 6 point socket fits head of a bolt or nut on all sides. 12 point socket can round off head of a bolt or nut if a lot of force is applied.

ICONS

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32. **SLIDE 32 EXPLAIN FIGURE 1.25** Allows access to nut that has stud plus other locations needing great depth, such as spark plugs.
33. **SLIDE 33 EXPLAIN FIGURE 1.26** Using clicker-type torque wrench to tighten connecting rod nuts
34. **SLIDE 34 EXPLAIN FIGURE 1.27** A beam-type torque wrench that displays the torque reading on the face of the dial. The beam display is read as the beam deflects, which is in proportion to the amount of torque applied to the fastener.
35. **SLIDE 35 EXPLAIN FIGURE 1.28** Torque wrench calibration checker

DEMONSTRATION: SHOW CLICKER TYPE & BEAM-TYPE TORQUE WRENCHES & DEMO HOW TO USE THEM PROPERLY. STRESS IMPORTANCE OF RESETTING TORQUE WRENCHES TO LOWEST SETTING (LOWEST SETTING IS NOT ALWAYS "0")

SAFETY WARN STUDENTS TO BE CAREFUL NOT TO OVERTIGHTEN BOLTS AND NUTS BY USING A CHEATER BAR. EXPLAIN THAT THEY MIGHT BREAK THE WRENCH OR CAUSE THEMSELVES HARM.

36. **SLIDE 36 EXPLAIN FIGURE 1.29** flat-tip (straight-blade) screwdriver. Width of blade should match width of slot in fastener being loosened or tightened.
37. **SLIDE 37 EXPLAIN FIGURE 1.30** Two stubby screwdrivers that are used to access screws that have limited space above. A straight blade is on top and a #2 Phillips screwdriver is on the bottom.
38. **SLIDE 38 EXPLAIN FIGURE 1.31** offset screwdriver is used to install or remove fasteners that do not have enough space above to use conventional screwdriver.
39. **SLIDE 39 EXPLAIN FIGURE 1.32** Impact screwdriver used to remove slotted or Phillips head fasteners that cannot be broken loose using screwdriver

DEMONSTRATION: SHOW STUDENTS A VARIETY OF FLAT-TIP AND PHILLIPS SCREWDRIVERS. ASK THEM WHICH TYPE IS USED MORE ON AUTOMOBILES AND WHY. SHOW STUDENTS HOW TO USE OFFSET AND IMPACT SCREWDRIVERS. FOR WHAT TYPE OF APPLICATION IS EACH USED?



40. **SLIDE 40 EXPLAIN FIGURE 1.33** ball-peen hammer.
41. **SLIDE 41 EXPLAIN FIGURE 1.34** rubber mallet used to deliver a force to an object without harming surface.
42. **SLIDE 42 EXPLAIN FIGURE 1.35** dead-blow hammer that was left outside in freezing weather. Plastic covering was damaged, which destroyed this hammer. The lead shot is encased in the metal housing and then covered.

DEMONSTRATION: SHOW EXAMPLES OF HAMMERS & MALLETS. DISCUSS THE FEATURES OF EACH HAMMER OR Mallet & DESCRIBE WHERE IT IS USED.

43. **SLIDE 43 EXPLAIN FIGURE 1.36** Typical slip-joint pliers is a common household pliers. The slip joint allows the jaws to be opened to two different settings.
44. **SLIDE 44 EXPLAIN FIGURE 1.37** Multigroove adjustable pliers is known by many names, including the trade name “Channel Locks®.”
45. **SLIDE 45 EXPLAIN FIGURE 1.38** Linesman’s pliers are very useful because it can help perform many automotive service jobs.
46. **SLIDE 46 EXPLAIN FIGURE 1.39** Diagonal-cut pliers is another common tool that has many names.

[Channel Lock Pliers \(View\) \(Download\)](#)

[Dikes View\) \(Download\)](#)

[LINEMANS PLIERS \(VIEW\) \(DOWNLOAD\)](#)

DEMONSTRATION: SHOW EXAMPLES OF SLIP-JOINT & MULTIGROOVE ADJUSTABLE PLIERS AND DISCUSS HOW EACH IS USED.

47. **SLIDE 47 EXPLAIN FIGURE 1.40** Needle-nose pliers are used where there is limited access to a wire or pin that needs to be installed or removed.
48. **SLIDE 48 EXPLAIN FIGURE 1.41** Locking pliers are best known by their trade name ViseGrips®.
49. **SLIDE 49 EXPLAIN FIGURE 1.42** Snap-ring pliers are also called lock ring pliers and most are designed to remove internal and external snap rings (lock rings).
50. **SLIDE 50 EXPLAIN FIGURE 1.43** Files come in many different shapes and sizes. Never use a file without a handle.
51. **SLIDE 51 EXPLAIN FIGURE 1.44** Tin snips are used to cut thin sheets of metal or carpet.



52. **SLIDE 52 EXPLAIN FIGURE 1.45** utility knife uses replaceable blades & used to cut carpet & other materials
53. **SLIDE 53 EXPLAIN FIGURE 1.46** Punch used to drive pins from assembled components. This type of punch is also called a pin punch.
54. **SLIDE 54 EXPLAIN FIGURE 1.47** Warning stamped on side of punch warning that goggles should be worn when using this tool. Always follow safety warnings

DEMONSTRATION: SHOW EXAMPLES OF PUNCHES & CHISELS. DESCRIBE INTENDED PURPOSE OF EACH.

55. **SLIDE 55 EXPLAIN FIGURE 1.48** Use grinder or a file to remove mushroom material on end of punch
56. **SLIDE 56 EXPLAIN FIGURE 1.49** A typical hacksaw that is used to cut metal. If cutting sheet metal or thin objects, a blade with more teeth should be used
57. **SLIDE 57 EXPLAIN FIGURE 1.50** typical beginning technician tool set that includes basic tools to get started.
58. **SLIDE 58 EXPLAIN FIGURE 1.51** A typical large tool box, showing just one of many drawers.
59. **SLIDE 59 EXPLAIN FIGURE 1.52** 12 volt test light.
60. **SLIDE 60 EXPLAIN FIGURE 1.53** Electric and butane-powered soldering guns used to make electrical repairs. Soldering guns are sold by the wattage rating. The higher the wattage, the greater amount of heat created. Most solder guns used for automotive electrical work usually fall within the 60 to 160 watt range.
61. **SLIDE 61 EXPLAIN FIGURE 1.54** A fluorescent trouble light operates cooler and is safer to use in the shop because it is protected against accidental breakage where gasoline or other flammable liquids would happen to come in contact with the light.
62. **SLIDE 62 EXPLAIN FIGURE 1.55** A typical 1/2 inch drive air impact wrench. The direction of rotation can be changed to loosen or tighten a fastener.
63. **SLIDE 63 EXPLAIN FIGURE 1.56** A typical battery-powered 3/8 inch drive impact wrench
64. **SLIDE 64 EXPLAIN FIGURE 1.57** black impact socket. Always use an impact-type socket whenever using an impact wrench to avoid shattering socket, which could cause personal injury.
65. **SLIDE 65 EXPLAIN FIGURE 1.58** An air ratchet is a very useful tool that allows fast removal and installation



of fasteners, especially in areas that are difficult to reach or do not have room enough to move a hand ratchet

DEMONSTRATION: SHOW SHOP'S AIR COMPRESSOR & DISCUSS HOW IT WORKS. WHAT TYPES OF POWER TOOLS CAN BE USED WITH THE AIR COMPRESSOR? WHAT ARE SOME OTHER APPLICATIONS?

SAFETY REVIEW SAFETY PROCEDURES FOR USING AN AIR COMPRESSOR & POWER TOOLS ASSOCIATED WITH IT. AIR TOOLS ARE POWERFUL & CAN CAUSE INJURY IF NOT USED PROPERLY

SAFETY NEVER POINT AN AIR BLOW GUN AT YOURSELF OR ANYONE ELSE.

NEVER USE COMPRESSED AIR TO SPIN A BEARING OR A GEAR TO MAKE A WHISTLING SOUND

SAFETY REMIND STUDENTS THEY SHOULD ALWAYS WEAR EYE PROTECTION WHEN USING POWER TOOLS AND OTHER SHOP EQUIPMENT.

66. **SLIDE 66 EXPLAIN FIGURE 1.59** This typical die grinder surface preparation kit includes the air-operated die grinder as well as a variety of sanding disks for smoothing surfaces or removing rust.
67. **SLIDE 67 EXPLAIN FIGURE 1.60** A typical pedestal grinder with a wire wheel on left side and a stone wheel on the right side. Even though this machine is equipped with guards, safety glasses or a face shield should always be worn whenever using a grinder or wire wheel.
68. **SLIDE 68 EXPLAIN FIGURE 1.61** **Safety glasses** should be worn at all times when working on or around any vehicle or servicing any components



69. SLIDE 69 **EXPLAIN** FIGURE 1.62 **Steel-toed shoes** are a worthwhile investment to help prevent foot injury due to falling objects. Even these well-worn shoes can protect the feet of this service technician.

70. SLIDE 70 **EXPLAIN** FIGURE 1.63 One version of a **bump cap** is molded plastic insert worn inside a regular cloth cap.

71. SLIDE 71 **EXPLAIN** FIGURE 1.64 Protective gloves are available in several sizes and materials

HOLD DISCUSSION ON PPE ASK STUDENTS TO TALK ABOUT THE MAJOR TYPES OF PPE THEY SHOULD WEAR IN SHOP

RESEARCH INTERNET FOR OSHA: HAVE STUDENTS RESEARCH & REPORT ON HISTORY OF OSHA & WHAT THEY DO TODAY.

72. SLIDE 72 **EXPLAIN** FIGURE 1.65 Remove all Jewelry before performing service work on any vehicle

DISCUSSION ON LONG HAIR IN SHOP: ASK STUDENTS ABOUT SAFETY HAZARD OF HAVING LONG HAIR AND HOW TO DEAL WITH IT

DEMONSTRATE: HOOKING UP EXHAUST HOSE: DEMONSTRATE HOW TO CONNECT AN EXHAUST HOSE TO A VEHICLE. THEN HAVE YOUR STUDENTS PERFORM THIS TASK

73. SLIDE 73 **EXPLAIN** FIGURE 1.66 Always connect an exhaust hose to the tailpipe of a vehicle to be run inside a building.

74. SLIDE 74 **EXPLAIN** FIGURE 1.67 A binder clip being used to keep a fender cover from falling off.

75. SLIDE 75 **EXPLAIN** FIGURE 1.68 Covering the interior as soon as the vehicle comes in for service helps improve customer satisfaction.

STUDENTS COMPLETE SHOP SAFETY CHECKLIST FOUND ON WWW.JAMESHALDERMAN.COM

76. SLIDE 76 **EXPLAIN** FIGURE 1.69 All oily shop cloths should be stored in a metal container equipped with a lid to help prevent spontaneous combustion



77. **SLIDE 77 EXPLAIN FIGURE 1.70** Most newer vehicles have a triangle symbol indicating the **recommended hoisting lift location**
78. **SLIDE 78 EXPLAIN FIGURE 1.71 (a) Tall safety stands** can be used to provide additional support for the vehicle while on the hoist.
79. **SLIDE 79 EXPLAIN FIGURE 1.71 (b)** A block of wood should be used to avoid the possibility of doing damage to components supported by the stand.
80. **SLIDE 80 EXPLAIN FIGURE 1.72** This training vehicle fell from the hoist because the pads were not set correctly. No one was hurt but the vehicle was damaged.
81. **SLIDE 81 EXPLAIN FIGURE 1.73 (a)** An assortment of hoist pad adapters that are often needed to safely hoist many pickup trucks, vans, and sport utility vehicles (SUVs).
82. **SLIDE 82 EXPLAIN FIGURE 1.73 (b)** view from underneath Chevrolet truck showing how pad extensions are used to attach hoist lifting pad to contact frame
83. **SLIDE 83 EXPLAIN FIGURE 1.74 (a)** pad arm is just contacting rocker panel of the vehicle.
84. **SLIDE 84 EXPLAIN FIGURE 1.74 (b)** The pad arm has dented the rocker panel on this vehicle because the pad was set too far inward underneath the vehicle.

Floor Jack (View) (Download)

85. **SLIDE 85 EXPLAIN FIGURE 1.75 (a)** hydraulic hand-operated floor jack.
86. **SLIDE 86 EXPLAIN FIGURE 1.75 (b)** Whenever a vehicle is raised off the ground, a safety stand should be placed under the frame, axle, or body to support the weight of the vehicle.

HOLD DISCUSSION ON SETTING UP LIFT

DEMO



DEMO



DEMONSTRATE HOW TO SET LIFT PADS

87. **SLIDE 87 EXPLAIN FIGURE 1.76** Drive-on-type ramps are dangerous to use. The wheels on the ground level must be chocked (blocked) to prevent accidental movement down the ramp.
88. **SLIDE 88 EXPLAIN FIGURE 1.77** Jumper cable usage guide. Follow the same connections if using a portable jump box.
89. **SLIDE 89 EXPLAIN FIGURE 1.78** The air pressure going to the nozzle should be reduced to 30 psi or less to help prevent personal injury.

HAVE STUDENTS COMPLETE LIFTING VEHICLE TASK SHEET

90. **SLIDE 90 EXPLAIN FIGURE 1.79** typical **fire extinguisher** designed to be used on type A, B, or C fires.
91. **SLIDE 91 EXPLAIN FIGURE 1.80** CO₂ fire extinguisher being used on a fire set in an open drum during a demonstration at a fire training center.
92. **SLIDE 92 EXPLAIN FIGURE 1.81** A treated wool blanket is kept in an easy-to-open wall-mounted holder and should be placed in a central location in the shop

DEMONSTRATE FIRE EXTINGUISHER ALONG WITH LOCATION OF FIRE BLANKET

HAVE STUDENTS COMPLETE FIRE EXTINGUISHER TASK SHEET

93. **SLIDE 93 EXPLAIN FIGURE 1.82** A first aid box should be centrally located in the shop and kept stocked with the recommended supplies.
94. **SLIDE 94 EXPLAIN FIGURE 1.83** A typical eye wash station. Often a thorough flushing of the eyes with water is the first and often the best treatment in the event of eye contamination

DEMO



DEMONSTRATE USE OF EYE WASH STATION SHOW LOCATION OF FIRST AID & EYE WASH STATIONS.
DEMO EYE WASH STATION

95. **SLIDE 95 EXPLAIN FIGURE 1.84** A warning label on a **Honda HYBRID** warns that a person can be killed due to the high-voltage circuits under the cover.
96. **SLIDE 96 EXPLAIN FIGURE 1.85** high-voltage disconnect switch in trunk on Prius. Rubber lineman's gloves **MUST** be worn when removing this plug.
97. **SLIDE 97 EXPLAIN FIGURE 1.86** The high-voltage shut-off switch on a Ford Escape hybrid. The switch is located under the carpet at the rear of the vehicle.
98. **SLIDE 98 EXPLAIN FIGURE 1.87** shut-off switch on a GM parallel hybrid truck is green because this system uses 42 volts instead of higher, and possibly fatal, voltages used in other hybrid vehicles
99. **SLIDES 99-110 EXPLAIN LIFTING VEHICLE SLIDE SHOW**