

Automotive Electrical & Engine Performance 8/E










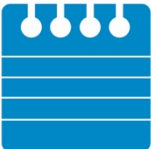

Chapter 1 Service Information, Tools, & Safety







Opening Your Class

KEY ELEMENT	EXAMPLES
Introduce Content	This Automotive Electrical & Engine Performance 8 th edition provides complete coverage of automotive areas pertaining vehicle electrical systems and engine performance. It correlates material to task lists specified by ASE and ASEEducation (NATEF) and emphasizes a problem-solving approach. Chapter features include Tech Tips, Frequently Asked Questions, Case Studies, Videos, and Animations that are listed in this Lesson Plan. This Lesson Plan also references ASEEducation (NATEF) Task Sheets available from Jim’s web site.
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 major component identification numbers. 2. Identify the strength ratings of threaded fasteners. 3. Explain the difference between the brand name (trade name) and the proper name for tools. 4. Describe what tool is the best to use for each job. 5. Explain how to maintain hand tools. 6. Identify the personal protective equipment (PPE) that all service technicians should wear. 7. Discuss how to safely use hand tools. 8. Describe how to safely hoist a vehicle.
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 Electrical & Engine Performance 8th Edition** Chapter Images found on Jim’s web site @ www.jameshalderman.com

DOWNLOAD Chapter 1 Chapter Images: From
http://www.jameshalderman.com/books_a8.html#anchor2

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>http://www.youtube.com/watch?v=q5yhKPA-eQk</p>
 	<p>At the beginning of this class, you can download the crossword puzzle & Word Search from Jim's web site to familiarize your class with terms in this chapter & then discuss them, see below:</p>
	<p>HTTP://WWW.JAMESHALDERMAN.COM/BOOKS_A8.H TML#ANCHOR2</p>
	<p>DOWNLOAD CROSSWORD PUZZLE (MICROSOFT WORD) (PDF) WORD SEARCH PUZZLE (MICROSOFT WORD) (PDF)</p>
	<p>2. SLIDE 2 EXPLAIN FIGURE 1.1 Typical vehicle identification number (VIN) as viewed through the windshield</p>
	<p>DEMONSTRATION: SHOW STUDENTS AN EXAMPLE OF A VEHICLE IDENTIFICATION NUMBER (VIN) AND HAVE STUDENTS DECIPHER ITS MEANING:DISCUSS CHARTS 1-1 & 1-2 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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	<p><u>DEMONSTRATE:</u> EXAMPLE OF VEHICLE SAFETY CERTIFICATION LABEL. ASK THEM TO DECIPHER INFORMATION PROVIDED ON LABEL</p>
	<p><u>DEMONSTRATE:</u> LOCATION OF VEHICLE EMISSIONS CONTROL INFORMATION (VECI) LABEL UNDER HOOD OF VEHICLE</p>
	<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 same problem. TSB then provides fix for problem including any parts needed and detailed instructions.</p>
	<p>DISCUSS FREQUENTLY ASKED QUESTION: <i>What should be included on a work order?</i></p>
	<p>A work order is a legal document that should include following information:</p>
	<ol style="list-style-type: none"> 1. Customer information 2. Identification of vehicle including VIN 3. Related service history information 4. The “three Cs”: <ul style="list-style-type: none"> • Customer concern (complaint) • Cause of the concern • Correction or repairs required to return vehicle to proper operation
	<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</p>
	<p><u>HOST DISCUSSION:</u> SERVICE HISTORY</p>
	<p>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</p>

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history. Use another column for corresponding elements of an automotive service history.

- 8. SLIDE 8 **EXPLAIN** FIGURE 1.7 The dimensions of a typical bolt showing where sizes are measured.
- 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.





DISCUSS FREQUENTLY ASKED QUESTION: How *Many Types of Screw Heads Are Used in Automotive Applications?* There are many, including Torx, hex (also called Allen), plus many others used in custom vans and MOTOR HOMES. ● SEE FIGURE 1-9.





- 10. SLIDE 10 **EXPLAIN** FIGURE 1-9 Bolts & screws have many different heads which determine tool needed.
- 11. SLIDE 11 **EXPLAIN** FIGURE 1.10 The metric system specifies fasteners by diameter, length, and pitch







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.

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.

- 12. SLIDES 12-17 **EXPLAIN** different marks on bolt heads to identify the type of bolts
- 18. SLIDE 18 **EXPLAIN** FIGURE 1.11 Stronger threads are created by cold-rolling a heat-treated bolt blank instead of cutting the threads, using a die.
- 19. SLIDE 19 **EXPLAIN** FIGURE 1.12 Metric bolt (cap screw) grade markings and approximate tensile strength.
- 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.
- 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

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  	<p>DEMONSTRATION: SHOW & DEMONSTRATE BOTH AN ENGLISH & METRIC THREAD PITCH GAUGE: REVIEW CHART 1-3 AMERICAN STANDARD IS ONE METHOD OF SIZING FASTENERS & CHART 1-4 TENSILE STRENGTH SAE RATING SYSTEM.</p> <p>EXPLAIN TECH TIP: <i>1/2 Inch Wrench Does Not Fit a 1/2 Inch Bolt.</i> A common mistake made by persons new to automotive field is to think that size of a bolt or nut is size of head. The size of bolt or nut (outside diameter of threads) is usually smaller than size of wrench or socket that fits head of the bolt or nut. Examples given in following table:</p> <table border="1"> <thead> <tr> <th>Wrench Size</th> <th>Thread Size</th> </tr> </thead> <tbody> <tr> <td>7/16 inch</td> <td>1/4 inch</td> </tr> <tr> <td>1/2 inch</td> <td>5/16 inch</td> </tr> <tr> <td>9/16 inch</td> <td>3/8 inch</td> </tr> <tr> <td>5/8 inch</td> <td>7/16 inch</td> </tr> <tr> <td>3/4 inch</td> <td>1/2 inch</td> </tr> <tr> <td>10 mm</td> <td>6 mm</td> </tr> <tr> <td>12 or 13 mm*</td> <td>8 mm</td> </tr> <tr> <td>14 or 17 mm*</td> <td>10 mm</td> </tr> </tbody> </table> <p>EXPLAIN TECH TIP: <i>It Just Takes a Second</i> Whenever removing any automotive component, it is wise to screw the bolts back into the holes a couple of threads by hand. This ensures that right bolt will be used in its original location when component or part is put back on vehicle. Often, same diameter of fastener is used on a component, but length of bolt may vary. Spending just couple of seconds to put the bolts and nuts back where they belong when the part is removed can save a lot of time when the part is being reinstalled. Besides making certain that right fastener is being installed in the right place, this method helps prevent bolts and nuts from getting lost or kicked away. How much time have you wasted looking for that lost bolt or nut?</p>	Wrench Size	Thread Size	7/16 inch	1/4 inch	1/2 inch	5/16 inch	9/16 inch	3/8 inch	5/8 inch	7/16 inch	3/4 inch	1/2 inch	10 mm	6 mm	12 or 13 mm*	8 mm	14 or 17 mm*	10 mm
Wrench Size	Thread Size																		
7/16 inch	1/4 inch																		
1/2 inch	5/16 inch																		
9/16 inch	3/8 inch																		
5/8 inch	7/16 inch																		
3/4 inch	1/2 inch																		
10 mm	6 mm																		
12 or 13 mm*	8 mm																		
14 or 17 mm*	10 mm																		
	<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>																		

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   	<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° at the end.</p> <p>24. SLIDE 24 EXPLAIN FIGURE 1.17 The end of a box-end wrench is angled 15° to allow clearance for nearby objects or other fasteners.</p> <p>25. SLIDE 25 EXPLAIN FIGURE 1.18 combination wrench has open end at one end & box end at other end</p> <p><u>EXPLAIN TECH TIP: Hide Those from the Boss</u> An apprentice technician started working for a shop and put his top tool box on a workbench. Another technician observed that, along with a complete set of good-quality tools, box contained several adjustable wrenches. The more experienced technician said, “Hide those from the boss.” The boss does not want any service technician to use adjustable wrenches. If any adjustable wrench is used on a bolt or nut, movable jaw often moves or loosens and starts to round the head of the fastener. If head of bolt or nut becomes rounded, it becomes that much more difficult to remove.</p> <p><u>DEMONSTRATION: 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></p> <p><u>DEMONSTRATION: SHOW STUDENTS EXAMPLES OF BOX-END, ADJUSTABLE, & LINE WRENCHES, AND DISCUSS WHERE EACH IS USED IN AUTOMOTIVE APPLICATIONS. REMIND STUDENTS OF THE SAFETY PROCEDURES THEY SHOULD FOLLOW WHEN USING ALL TYPES OF WRENCHES.</u></p> <p>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.</p> <p>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.</p>

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	<p>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.</p> <p>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</p>
	<p><u>DEMONSTRATION: 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></p>
	<p><u>EXPLAIN TECH TIP: Right to Tighten</u> It is sometimes confusing which way to rotate a wrench or screwdriver, especially when the head of the fastener is pointing away from you. To help visualize while looking at fastener, say “righty tighty, lefty loosey.”</p>
	<p><u>BOLT SIZE (VIEW) (DOWNLOAD)</u> <u>BOLT THREADS (VIEW) (DOWNLOAD)</u></p>
	<p><u>6 AND 12 POINT (VIEW) (DOWNLOAD)</u> <u>OPEN END WRENCH (VIEW) (DOWNLOAD)</u></p>
	<p>30. SLIDE 30 EXPLAIN FIGURE 1.23 most used socket drive sizes include 1/4, 3/8, and 1/2 inch drive.</p> <p>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.</p> <p>32. SLIDE 32 EXPLAIN FIGURE 1.25 Allows access to nut that has stud plus other locations needing great depth, such as spark plugs.</p> <p>33. SLIDE 33 EXPLAIN FIGURE 1.26 Using clicker-type torque wrench to tighten connecting rod nuts</p> <p>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</p>

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deflects, which is in proportion to the amount of torque applied to the fastener.

EXPLAIN TECH TIP: *Check Torque Wrench Calibration Regularly.* Torque wrenches should be checked regularly. For example, Honda has a torque wrench calibration setup at each of their training centers. It is expected that a torque wrench be checked for accuracy before every use. Most experts recommend that torque wrenches be checked and adjusted as needed at least every year, more often, if possible. • SEE FIGURE 1-28.

35. SLIDE 35 **EXPLAIN FIGURE 1-28** Torque wrench calibration checker

DEMONSTRATION: SHOW CLICKER TYPE AND BEAM-TYPE TORQUE WRENCHES & DEMONSTRATE HOW TO USE THEM PROPERLY. STRESS IMPORTANCE OF RESETTING TORQUE WRENCHES TO THE 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. TORQUE TO ANGLE (VIEW) (DOWNLOAD)

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

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EXPLAIN TECH TIP: Use Socket Adapters with Caution. Socket adapters are available and can be used for different drive size sockets on a ratchet. Combinations include:

- 1/4 inch drive—3/8 inch sockets
- 3/8 inch drive—1/4 inch sockets
- 3/8 inch drive—1/2 inch sockets
- 1/2 inch drive—3/8 inch sockets

Using a larger drive ratchet or breaker bar on a smaller size socket can cause the application of too much force to the socket, which could crack or shatter. Using a smaller size drive tool on a larger socket will usually not cause any harm, but would greatly reduce the amount of torque that can be applied to the bolt or nut.



EXPLAIN TECH TIP: Avoid Using “Cheater Bars” Whenever a fastener is difficult to remove, some technicians will insert handle of a ratchet or a breaker bar into a length of steel pipe. The extra length of pipe allows the technician to exert more torque than can be applied using drive handle alone. However, the extra torque can easily overload socket and ratchet, causing them to break or shatter, which could cause personal injury.











DEMONSTRATION: SHOW 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?



[SCREWDRIVER SELECTION \(VIEW\) \(DOWNLOAD\)](#)



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.

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	<p><u>DEMONSTRATION: SHOW EXAMPLES OF HAMMERS AND MALLET. DISCUSS THE FEATURES OF EACH HAMMER OR MALLET AND DESCRIBE WHERE IT IS USED.</u></p>
	<p><u>EXPLAIN TECH TIP: <i>Pound with Something Softer</i></u> If you must pound on something, be sure to use a tool that is softer than what you are about to pound on to avoid damage.</p>
	<p>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.</p>
	<p>44. SLIDE 44 EXPLAIN FIGURE 1.37 Multigroove adjustable pliers is known by many names, including the trade name “Channel Locks®.”</p>
	<p>45. SLIDE 45 EXPLAIN FIGURE 1.38 Linesman’s pliers are very useful because it can help perform many automotive service jobs.</p>
	<p>46. SLIDE 46 EXPLAIN FIGURE 1.39 Diagonal-cut pliers is another common tool that has many names.</p>
	<p><u>CHANNEL LOCK PLIERS (VIEW) (DOWNLOAD)</u> <u>DIKES (VIEW) (DOWNLOAD)</u> <u>LINEMANS PLIERS (VIEW) (DOWNLOAD)</u> <u>SNAP RING PLIERS (VIEW) (DOWNLOAD)</u> <u>SLIP JOINT PLIERS (VIEW) (DOWNLOAD)</u> <u>WISE GRIPS (VIEW) (DOWNLOAD)</u></p>
	<p><u>DEMONSTRATION: SHOW EXAMPLES OF SLIP-JOINT & MULTIGROOVE ADJUSTABLE PLIERS AND DISCUSS HOW EACH IS USED.</u></p>
	<p>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.</p> <p>48. SLIDE 48 EXPLAIN FIGURE 1.41 Locking pliers are best known by their trade name Vise Grips®.</p> <p>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).</p> <p>50. SLIDE 50 EXPLAIN FIGURE 1.43 Files come in different shapes & sizes. Never use file W/O handle.</p> <p>51. SLIDE 51 EXPLAIN FIGURE 1.44 Tin snips are used to cut thin sheets of metal or carpet.</p>

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52. SLIDE 52 **EXPLAIN** FIGURE 1.45 utility knife uses replaceable blades & used to cut carpet & other materials

EXPLAIN TECH TIP: Brand Name Versus Proper Term: Technicians often use slang or brand names of tools rather than the proper term. This results in some confusion for new technicians. Some examples are given in the following table.

Brand Name	Proper Term	Slang Name
Crescent wrench	Adjustable wrench	Monkey wrench

Vise Grip Locking pliers-Channel Locks-Water pump pliers or multigroove adjustable pliers Pump pliers

Diagonal cutting pliers Dikes or side cuts

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.








EXPLAIN TECH TIP: Need to Borrow a Tool More Than Twice? Buy It! Most service technicians agree that it is okay for a beginning technician to borrow a tool occasionally. However, if a tool has to be borrowed more than twice, then be sure to purchase it as soon as possible. Also, whenever a tool is borrowed, be sure that you clean the

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	<p>tool and let the technician you borrowed the tool from know that you are returning the tool. These actions will help in any future dealings with other technicians.</p>
	<p>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.</p>
	<p>WARNING: DO NOT USE INCANDESCENT TROUBLE LIGHTS AROUND GASOLINE OR OTHER FLAMMABLE LIQUIDS. THE LIQUIDS CAN CAUSE BULB TO BREAK AND HOT FILAMENT CAN IGNITE THE FLAMMABLE LIQUID, WHICH CAN CAUSE PERSONAL INJURY OR EVEN DEATH.</p> <p>DISCUSS FREQUENTLY ASKED QUESTION? WHAT IS AN “SST”? Vehicle manufacturers often specify a special service tool (SST) to properly disassemble and assemble components, such as transmissions and other components. These tools are also called special tools and are available from the vehicle manufacturer or their tool supplier, such as Kent-Moore And Miller Tools. Many service technicians do not have access to special service tools so they use generic versions available from aftermarket sources.</p>
	<p>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.</p>
	<p>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.</p> <p>63. SLIDE 63 EXPLAIN FIGURE 1.56 A typical battery-powered 3/8 inch drive impact wrench</p>

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	<p><u>WARNING:</u> ALWAYS USE IMPACT SOCKETS WITH IMPACT WRENCHES, ALWAYS WEAR EYE PROTECTION IN CASE SOCKET/FASTENER SHATTERS. IMPACT SOCKETS ARE THICKER WALLED AND CONSTRUCTED WITH PREMIUM ALLOY STEEL. THEY ARE HARDENED WITH A BLACK OXIDE FINISH TO HELP PREVENT CORROSION AND DISTINGUISH THEM FROM REGULAR SOCKETS. • SEE FIGURE 1–57.</p>
	<p>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.</p> <p>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</p>
	<p><u>DEMONSTRATION:</u> 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?</p>
	<p><u>SAFETY</u> REVIEW SAFETY PROCEDURES FOR USING AN AIR COMPRESSOR & POWER TOOLS ASSOCIATED WITH IT. AIR TOOLS ARE POWERFUL & CAN CAUSE INJURY IF NOT USED PROPERLY</p>
	<p><u>SAFETY</u> NEVER POINT AN AIR BLOW GUN AT YOURSELF OR ANYONE ELSE.</p>
	<p><u>NEVER USE COMPRESSED AIR TO SPIN A BEARING OR A GEAR TO MAKE A WHISTLING SOUND</u></p>
	<p><u>SAFETY</u> REMIND STUDENTS THEY SHOULD ALWAYS WEAR EYE PROTECTION WHEN USING POWER TOOLS AND OTHER SHOP EQUIPMENT.</p>
	<p>66. SLIDE 66 EXPLAIN FIGURE 1.59 This typical die grinder surface preparation kit includes the air-operated</p>

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     	<p>die grinder as well as a variety of sanding disks for smoothing surfaces or removing rust.</p> <p>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</p> <p>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</p> <p>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.</p> <p>70. SLIDE 70 EXPLAIN FIGURE 1.63 bump cap is molded plastic insert worn inside a regular cloth cap.</p> <p>71. SLIDE 71 EXPLAIN FIGURE 1.64 Protective gloves are available in several sizes and materials</p> <p><u>WARNING:</u> ALWAYS WEAR A FACE SHIELD WHEN USING A WIRE WHEEL OR A GRINDER.</p> <p><u>HOLD DISCUSSION</u> ON PPE ASK STUDENTS TO TALK ABOUT THE MAJOR TYPES OF PPE THEY SHOULD WEAR IN SHOP</p> <p><u>RESEARCH INTERNET FOR OSHA:</u> HAVE STUDENTS RESEARCH & REPORT ON HISTORY OF OSHA & WHAT THEY DO TODAY.</p> <p>72. SLIDE 72 EXPLAIN FIGURE 1.65 Remove all Jewelry before performing service work on any vehicle</p> <p><u>DISCUSSION</u> ON LONG HAIR IN SHOP: ASK STUDENTS ABOUT SAFETY HAZARD OF HAVING LONG HAIR AND HOW TO DEAL WITH IT</p>

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      	<p><u>DEMONSTRATE: HOOKING UP EXHAUST HOSE:</u> DEMONSTRATE HOW TO CONNECT AN EXHAUST HOSE TO A VEHICLE. THEN HAVE YOUR STUDENTS PERFORM THIS TASK</p> <p>73. SLIDE 73 EXPLAIN FIGURE 1.66 Always connect an exhaust hose to the tailpipe of a vehicle to be run inside a building.</p> <p>74. SLIDE 74 EXPLAIN FIGURE 1.67 A binder clip being used to keep a fender cover from falling off.</p> <p>75. SLIDE 75 EXPLAIN FIGURE 1.68 Covering the interior as soon as the vehicle comes in for service helps improve customer satisfaction.</p> <p><u>SAFETY SHOP CLOTH DISPOSAL</u> ALWAYS DISPOSE OF OILY SHOP CLOTHS IN AN ENCLOSED CONTAINER TO PREVENT A FIRE. WHENEVER OILY CLOTHS ARE THROWN TOGETHER ON THE FLOOR OR WORKBENCH, A CHEMICAL REACTION CAN OCCUR, WHICH CAN IGNITE THE CLOTH EVEN WITHOUT AN OPEN FLAME. THIS PROCESS OF IGNITION WITHOUT AN OPEN FLAME IS CALLED SPONTANEOUS COMBUSTION. SEE FIGURE 1-69 TASK: STUDENTS COMPLETE SHOP SAFETY CHECKLIST</p> <p>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</p> <p>77. SLIDE 77 EXPLAIN FIGURE 1.70 Most newer vehicles have a triangle symbol indicating the recommended hoisting lift location</p> <p>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. (b) A block of wood should be used to avoid the possibility of doing damage to components supported by the stand. Tall safety stands can be used to provide additional support for the vehicle while on the hoist.</p>

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	<p>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.</p> <p>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.</p> <p>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 SUVs.</p> <p>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</p> <p>83. SLIDE 83 EXPLAIN FIGURE 1.74 (a) pad arm is just contacting the rocker panel of the vehicle. (b) The pad arm has dented the rocker panel on this vehicle because the pad was set too far inward underneath the vehicle. Pad arm is just contacting the rocker panel of the vehicle.</p> <p>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.</p>
	<p><u>FLOOR JACK (VIEW) (DOWNLOAD)</u> <u>VEHICLE LIFTING (VIEW) (DOWNLOAD)</u></p>
	<p>85. SLIDE 85 EXPLAIN FIGURE 1.75 (a) hydraulic hand-operated floor jack. (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.</p>
	<p>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.</p>
	<p><u>HOLD DISCUSSION ON SETTING UP LIFT</u></p>
	<p><u>DEMONSTRATE HOW TO SET LIFT PADS</u></p>
	<p>87. SLIDE 87 EXPLAIN FIGURE 1.76 Drive-on-type ramps are dangerous to use. The wheels on the ground</p>

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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.

SAFETY . COMPRESSED AIR SAFETY
IMPROPER USE OF AN AIR NOZZLE CAN CAUSE BLINDNESS OR DEAFNESS. COMPRESSED AIR MUST BE REDUCED TO LESS THAN 30 PSI (206 KPA). • SEE FIGURE 1–78. IF AN AIR NOZZLE IS USED TO DRY AND CLEAN PARTS, MAKE SURE AIR STREAM IS DIRECTED AWAY FROM ANYONE ELSE IN THE IMMEDIATE AREA. ALWAYS USE AN OSHA-APPROVED NOZZLE WITH SIDE SLITS THAT LIMIT MAXIMUM PRESSURE AT NOZZLE TO 30 PSI. COIL, STORE AIR HOSES WHEN NOT IN USE.

- 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 2

- 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.

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    	<p>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</p> <p>DEMONSTRATE USE OF EYE WASH STATION SHOW LOCATION OF FIRST AID & EYE WASH STATIONS. DEMO EYE WASH STATION</p> <p><u>SAFETY . INFECTION CONTROL</u></p> <p>PRECAUTIONS: WORKING ON A VEHICLE CAN RESULT IN PERSONAL INJURY, INCLUDING POSSIBILITY OF BEING CUT OR HURT ENOUGH TO CAUSE BLEEDING. SOME INFECTIONS, SUCH AS HEPATITIS B, HIV (WHICH CAN CAUSE ACQUIRED IMMUNODEFICIENCY SYNDROME, OR AIDS), AND HEPATITIS C, ARE TRANSMITTED THROUGH BLOOD. THESE INFECTIONS ARE COMMONLY CALLED BLOOD-BORNE PATHOGENS. REPORT TO YOUR SUPERVISOR ANY INJURY THAT INVOLVES BLOOD, TAKE NECESSARY PRECAUTIONS TO AVOID COMING INTO CONTACT WITH BLOOD FROM ANOTHER PERSON.</p> <p>95. SLIDE 95 EXPLAIN FIGURE 1.84 warning label on a Honda HYBRID warns that a person can be killed due to the high-voltage circuits under the cover.</p> <p>96. SLIDE 96 EXPLAIN FIGURE 1.85 high-voltage disconnect switch on Prius. Rubber lineman’s gloves MUST be worn when removing this plug.</p> <p>97. SLIDE 97 EXPLAIN FIGURE 1.86 high-voltage shut-off switch on a Ford Escape hybrid. The switch is located under the carpet at the rear of the vehicle.</p> <p>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</p> <p>WARNING: SOME OEMS SPECIFY THAT INSULATED RUBBER LINEMAN’S GLOVES BE USED WHENEVER WORKING AROUND HIGH-VOLTAGE CIRCUITS TO PREVENT DANGER OF ELECTRICAL SHOCK.</p>

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 	<p><u>WARNING:</u> DO NOT TOUCH ANY ORANGE WIRING OR THE COMPONENTS WITHOUT FOLLOWING VEHICLE MANUFACTURER'S PROCEDURES AND WEARING SPECIFIED PERSONAL PROTECTIVE EQUIPMENT.</p> <p>99. SLIDES 99-110 EXPLAIN LIFTING VEHICLE SLIDE SHOW</p>