





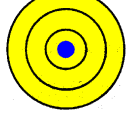


















# A8 Engine Performance 4<sup>th</sup> Edition










## Chapter 26 Fuel Pumps, Lines, and Filters









### Opening Your Class









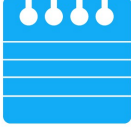



KEY ELEMENT	EXAMPLES
Introduce Content	This course or class covers operation and service of <b>Automotive Engine Performance</b> . It correlates material to task lists specified by ASE and NATEF.
Motivate Learners	Explain how the knowledge of how something works translates into the ability to use that 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. <ol style="list-style-type: none"><li>1. Prepare for ASE Engine Performance (A8) certification test content area "C" (Fuel, Air Induction, and exhaust System diagnosis and repair).</li><li>2. Describe how to check an electric fuel pump for proper pressure and volume delivery.</li><li>3. Explain how to check a fuel-pressure regulator.</li><li>4. Describe how to test fuel injectors.</li><li>5. Explain how to diagnose electronic fuel-injection problems.</li></ol>
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.










ICONS	Ch26 Fuel Pumps, Lines, and Filters
	<p><b>1. SLIDE 1 CH26 Fuel Pumps, Lines, and Filters</b></p>
 	<p>Check for <b>ADDITIONAL VIDEOS &amp; ANIMATIONS</b>  @ <a href="http://www.jameshalderman.com/">http://www.jameshalderman.com/</a>  <b>WEB SITE REGULARLY UPDATED</b></p>
  <p>OBJECTIVE</p>	<p><b>POWER POINTS DONE BY INDIVIDUAL LEARNING OBJECTIVES, SO THERE IS POWER POINT FILE FOR EACH LEARNING OBJECTIVE</b></p>
  <p>OBJECTIVE</p>	<p><b>2. SLIDE 2 EXPLAIN OBJECTIVE CH26 AEP_LO1</b>  <b>3. SLIDES 3-5 EXPLAIN Fuel Delivery System</b></p>
  <p>QUESTION</p>	<p><b><u>DISCUSSION:</u> HAVE THE STUDENTS TALK ABOUT THE VARIOUS COMPONENTS USED IN FUEL DELIVERY SYSTEM. WHAT IS THE <u>PURPOSE OF FUEL DELIVERY SYSTEMS?</u></b></p>
  <p>QUESTION</p>	<p><b><u>DISCUSSION:</u> HAVE THE STUDENTS DISCUSS THE USE OF <u>BAFFLES IN FUEL TANKS.</u> ASK THEM IF THEY HAVE EVER HEARD FUEL SLOSHING IN A FUEL TANK</b></p>
  <p>QUESTION</p>	<p><b><u>DISCUSSION:</u> HAVE THE STUDENTS TALK ABOUT ONBOARD FUELING VAPOR RECOVERY SYSTEMS. HOW IS THIS SYSTEM DIFFERENT FROM THE RECOVERY SYSTEM USED ON GASOLINE PUMPS?_</b></p>
	<p><b><u>DEMONSTRATION:</u> SHOW EXAMPLES OF <u>METAL &amp; PLASTIC FUEL TANKS.</u> DISCUSS WHETHER THERE ARE ADVANTAGES TO USING TANKS MADE FROM EITHER OF THESE MATERIALS</b></p>
	<p><b><u>DEMONSTRATION:</u> SHOW <u>FUEL PUMP/PICKUP TUBE ASSEMBLY.</u> POINT OUT FILTER SOCK &amp; FUEL RETURN LINE.</b></p>
	<p><b><u>DEMONSTRATION:</u> SHOW THE STUDENTS <u>CHARCOAL CANISTER STORAGE DEVICE FOR FUEL VAPORS</u></b></p>

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 <p>QUESTION</p>	<p><b>DISCUSSION: HAVE THE STUDENTS DISCUSS THE COMPONENTS OF AN <u>EVAPORATIVE EMISSION CONTROL SYSTEM</u>. HOW ARE FUEL VAPORS VENTED?</b></p>
	<p><b>HANDS-ON TASK: HAVE STUDENTS LOCATE &amp; IDENTIFY FUEL SYSTEM COMPONENTS ON LAB VEHICLE. GRADE THEM ON ACCURACY IN IDENTIFYING COMPONENTS AND THEIR UNDERSTANDING OF THE FUEL SYSTEM.</b></p>
 <p>OBJECTIVE</p>	<p>2. SLIDE 2 EXPLAIN <b>OBJECTIVE CH26 AEP_LO2</b>  3. SLIDES 3-5 EXPLAIN Fuel-Pump Testing</p>
 <p>QUESTION</p>	<p><b>DISCUSSION: HAVE THE STUDENTS DISCUSS <u>FUEL PUMP TEST PROCEDURES</u>. WHAT DRIVABILITY PROBLEMS WOULD WARRANT A FUEL PUMP TEST?</b></p>
	<p><b>DEMONSTRATION: SHOW HOW TO JAR A STALLED FUEL PUMP INTO OPERATION BY STRIKING THE FUEL TANK. WHY SHOULD A RUBBER Mallet BE USED FOR THIS PROCEDURE? THEN, SHOW STUDENTS HOW TO <u>LISTEN FOR FUEL PUMP OPERATION BY REMOVING FUEL CAP &amp; INSERTING A FUNNEL INTO FILLER NECK</u>. <b>FIGURE 26-21</b></b></p>
	<p>6. SLIDE 6 EXPLAIN <b>FIGURE 26-21</b> (a) A funnel helps in hearing if the electric fuel pump inside the gas tank is working. (b) If the pump is not running, check the wiring and current flow before going through the process of dropping the fuel tank to remove the pump</p> <p>7. SLIDE 7 EXPLAIN <b>Figure 26-22</b> The Schrader valve on this General Motors 3800 V-6 is located next to the fuel-pressure regulator</p> <p>8. SLIDE 8 EXPLAIN <b>Figure 26-23</b> fuel system should hold pressure if the system is leak free</p>
 <p>QUESTION</p>	<p><b>DISCUSSION: DISCUSS <u>PRESSURE-TESTING FUEL PUMP</u>. IF PRESSURE IS CORRECT AT IDLE, WILL IT ALSO BE CORRECT UNDER LOAD? DISCUSS <u>REST PRESSURE TEST</u>. WHAT COULD HAPPEN IF PRESSURE LEAKS DOWN RAPIDLY?</b></p>

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	<p><b>DISCUSS DYNAMIC PRESSURE TEST. IF PRESSURE DOESN'T CHANGE WHEN THROTTLE IS CYCLED, WHAT PROBLEMS MIGHT EXIST?</b></p> <p>9. SLIDE 9 EXPLAIN Figure 26-24 If vacuum hose is removed from fuel pressure regulator when the engine is running, fuel pressure should increase. If it does not increase, then fuel pump is not capable of supplying adequate pressure or fuel-pressure regulator is defective. If gasoline is visible in the vacuum hose, the regulator is leaking and should be replaced</p>
	<p><b>PRESENCE OF FUEL IN VACUUM LINE TO REGULATOR CAN MEAN ONLY ONE THING—DIAPHRAGM IS LEAKING. THIS CAN CAUSE MULTIPLE DRIVABILITY PROBLEMS AND DTCS: FIGURE 26-24 &amp; 25</b></p>
	<p><b>HANDS-ON TASK: GIVE STUDENTS LIST OF VEHICLES. HAVE THEM LOCATE FUEL PRESSURE SPECIFICATIONS &amp; TEST PROCEDURE FOR EACH VEHICLE.</b></p>
	<p>10. SLIDE 10 EXPLAIN FIGURE 26-25 Fuel should be heard returning to the fuel tank at the fuel return line if the fuel pump and fuel-pressure regulator are functioning correctly.</p>
	<p>11. SLIDE 11 EXPLAIN FIGURE 26-26 A fuel-pressure reading does not confirm that there is enough fuel volume for the engine to operate correctly.</p>
	<p><b>DISCUSSION: HAVE THE STUDENTS TALK ABOUT THE NEED FOR PROPER VOLUME OF FUEL FIGURE 26-26. WHAT ARE SOME INDICATORS OF A CLOGGED FUEL FILTER?</b></p>
	<p>12. SLIDES 12 EXPLAIN FIGURE 26-27 Fuel should be heard returning to fuel tank at fuel return line if fuel pump &amp; fuel-pressure regulator are functioning correctly.</p>
	<p><b>DEMONSTRATION: DEMONSTRATE QUICK &amp; EASY FUEL PUMP VOLUME TEST. IS THIS TEST 100% ACCURATE? FIGURE 26-26 &amp; 27</b></p>
	<p>13. SLIDE 13 EXPLAIN FIGURE 26-28 Removing the bed from a pickup truck makes gaining access to the fuel pump a lot easier</p> <p>14. SLIDE 14 EXPLAIN FIGURE 26-29 Hookup for</p>

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	<p>testing fuel-pump current draw on any vehicle equipped with a fuel-pump relay</p> <p>15. SLIDES 15-16 EXPLAIN FUEL-PUMP REPLACEMENT</p> <p><b>DISCUSSION: HAVE STUDENTS DISCUSS WHETHER REMOVING BED FROM A PICK-UP TRUCK MIGHT MAKE IT EASIER TO REPLACE A FUEL PUMP. IF TANK WAS COMPLETELY FULL OF FUEL, WOULD THIS PROCEDURE HELP? FIGURE 26–28</b></p>
	<p><b>SAFETY EXTREME CAUTION ADVISED WHEN WORKING AROUND ANY COMPONENT OF THE FUEL SYSTEM, ESPECIALLY WHEN THE ENGINE IS HOT.</b></p>
	<p><b>ON-VEHICLE NATEF TASK INSPECT AND TEST FUEL PUMPS &amp; PUMP CONTROL SYSTEMS FOR PRESSURE, REGULATION, AND VOLUME; PERFORM NECESSARY ACTION.</b></p>
	<p>2. SLIDE 2 EXPLAIN <b>OBJECTIVE CH26 AEP_LO3</b></p> <p>3. SLIDES 3 EXPLAIN The Fuel-Pressure Stethoscope Test</p>
	<p>4. SLIDE 4 EXPLAIN FIGURE 26–24 If the vacuum hose is removed from the fuel-pressure regulator when the engine is running, the fuel pressure should increase. If it does not increase, then the fuel pump is not capable of supplying adequate pressure or the fuel-pressure regulator is defective. If gasoline is visible in the vacuum hose, the regulator is leaking and should be replaced</p>
	<p>2. SLIDE 2 EXPLAIN <b>OBJECTIVE CH26 AEP_LO4</b></p> <p>3. SLIDES 3 EXPLAIN Fuel Filters</p>
	<p>4. SLIDE 4 EXPLAIN FIGURE 26-19 Inline fuel filters are usually attached to the fuel line with screw clamps or threaded connections. Fuel filter must be installed in the proper direction or a restricted fuel flow can result.</p> <p>5. SLIDE 5 EXPLAIN FIGURE 26–20 The final filter, also called a <b>filter basket</b>, is the last filter in the fuel system</p>
	<p><b>DEMONSTRATION: SHOW LOCATION OF FUEL FILTERS ON VEHICLES. ARE ALL FILTERS LOCATED IN COMMON AREAS? FIGURE 26–19</b></p>

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	<p><b><u>DEMONSTRATION:</u> SHOW EXAMPLES OF FUEL FILTERS. SHOW SOME FILTERS FROM CARBURETED ERA &amp; HIGH PRESSURE FILTERS USED IN FUEL-INJECTED VEHICLES. POINT OUT THAT VEHICLE WITH RETURNLESS-TYPE FUEL SYSTEM WILL MOST LIKELY HAVE FUEL FILTER INSIDE FUEL TANK. <u>FIGURE 26-19</u></b></p>
  <p>QUESTION</p>	<p><b><u>DISCUSSION:</u> HAVE THE STUDENTS DISCUSS NEED TO FILTER FUEL BEFORE IT GOES THROUGH ANY FUEL METERING DEVICE, SUCH AS A CARBURETOR OR FUEL INJECTOR. WHAT DO FUEL FILTERS REMOVE? <u>FIGURE 26-19 &amp; 20</u></b></p>
 	<p><b><u>ON-VEHICLE NATEF TASK REPLACE FUEL FILTERS</u></b></p>
  <p>QUESTION</p>	<p><b><u>DISCUSSION:</u> HAVE THE STUDENTS DISCUSS DIFFERENT TYPES OF FUEL LINES. WHAT ARE ADVANTAGES &amp; DISADVANTAGES OF DIFFERENT MATERIALS?</b></p>
	<p><b><u>DEMONSTRATION:</u> SHOW FORD INERTIA SWITCH USED TO TURN OFF FUEL PUMP IN EVENT OF AN ACCIDENT. IF FORD VEHICLE IS AVAILABLE, TRIP SWITCH BY TAPPING ON IT TO SHOW STUDENTS HOW IT WORKS</b></p>
	<p><b><u>SOME FORD VEHICLES, MAINLY TRUCKS, HAVE FUEL PUMP INERTIA SWITCH LOCATED INSIDE CAB ON EITHER FIREWALL OR COWL SIDE PANEL.</u></b></p>
	<p><b><u>DEMONSTRATION:</u> SHOW EXAMPLES OF <u>RIGID &amp; FLEXIBLE FUEL LINES USED ON A VEHICLE.</u> DISCUSS MATERIAL, ROUTING, &amp; RETENTION METHODS USED. <u>FIGURE 18-8</u></b></p>
 	<p><b><u>SAFETY</u> EXPLAIN THE DANGERS INVOLVED WHEN WORKING WITH FUEL SYSTEMS. SOME OF THESE SYSTEMS CAN OPERATE AT <u>PRESSURES OF 80 TO 100 PSI.</u> ANY TIME A FUEL LINE NEEDS TO BE DISCONNECTED, <u>FUEL PRESSURE MUST BE RELEASED USING OEM RECOMMENDED METHOD.</u></b></p>

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	<p><b>DISCUSSION:</b> HAVE THE STUDENTS DISCUSS NEWER FUEL SUPPLY SYSTEMS THAT DO NOT UTILIZE A RETURN LINE. WHAT COMPONENTS HAD TO BE MODIFIED OR CHANGED FOR THIS SYSTEM TO OPERATE PROPERLY?</p>
	<p><b>DEMONSTRATION:</b> SHOW EXAMPLES OF <u>FUEL LINE SPRING-LOCK FITTINGS</u>. SHOW SPECIAL TOOLS NEEDED TO DISCONNECT THESE FITTINGS.</p>
	<p><b>HANDS-ON TASK:</b> HAVE STUDENTS DISASSEMBLE AND REASSEMBLE FUEL LINE CONNECTIONS, INCLUDING SPRING-LOCK FITTINGS.</p>
	<p><b>DEMONSTRATION:</b> SHOW EXAMPLE OF A <u>MODULAR FUEL SENDER ASSEMBLY</u> USED IN MODERN VEHICLES. POINT OUT THE PUMP, CONVOLUTED TUBE, &amp; FLOAT ASSEMBLY.</p>
	<p><b>DISCUSSION:</b> DISCUSS REASON <u>FUEL PUMP MODULES ARE SPRING-LOADED</u>. DOES FUEL TANK MATERIAL MAKE A DIFFERENCE?</p>
	<p><b>DISCUSSION:</b> HAVE THE STUDENTS TALK ABOUT <u>ELECTRIC FUEL PUMP CONTROL CIRCUITS</u>. WHY ARE RELAYS CONTROLLED BY THE PCM?</p>
	<p><b>DEMONSTRATION:</b> EXPLAIN HOW A <u>CURRENT DRAW TEST</u> CAN INDICATE A WORN FUEL PUMP. USE FUEL PUMP CURRENT DRAW TABLE TO SHOW THAT PUMP CAN DRAW MORE OR LESS CURRENT THAN SPECIFICATIONS. SHOW HOW TO PERFORM <u>FUEL PUMP CURRENT DRAW TEST</u>.</p>
	<p><b>ON-VEHICLE NATEF TASK</b> <u>FUEL PUMP CURRENT DRAW TEST</u></p>
	<p><b>ON-VEHICLE NATEF TASK</b> <u>PERFORM ACTIVE TESTS OF ACTUATORS USING A SCAN TOOL; DETERMINE NECESSARY ACTION</u></p>

FIGURE