

# Automotive Technology 6<sup>th</sup> Edition

## Chapter 27 IN-VEHICLE ENGINE SERVICE

### Opening Your Class

KEY ELEMENT	EXAMPLES
<b>Introduce Content</b>	This Automotive Technology 6th text provides complete coverage of automotive components, operation, design, and troubleshooting. 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, Animations, and ASEEducation (NATEF) Task Sheets.
<b>Motivate Learners</b>	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.
<b>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.</b>	Explain the chapter learning objectives to the students as listed on the second SLIDE. <ol style="list-style-type: none"> <li>1. Explain thermostat replacement and water pump replacement in engines.</li> <li>2. Discuss intake manifold gasket inspection and replacement.</li> <li>3. Describe the steps involved in timing belt replacement.</li> <li>4. Discuss hybrid engine precautions.</li> </ol>
<b>Establish the Mood or Climate</b>	Provide a <i>WELCOME</i> , Avoid put downs and bad jokes.
<b>Complete Essentials</b>	Restrooms, breaks, registration, tests, etc.
<b>Clarify and Establish Knowledge Base</b>	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 6<sup>th</sup> Edition Chapter Images found on Jim's web site @**

**[www.jameshalderman.com](http://www.jameshalderman.com)**

**DOWNLOAD Chapter 27 Chapter Images: From**

**<http://www.jameshalderman.com/>**

**[automotive principles.html](#)NOTE: You can use Chapter Images or possibly Power Point files:**

## ICONS



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### 1. SLIDE CH27 IN-VEHICLE ENGINE SERVICE

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

[http://www.jameshalderman.com/  
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**Crossword Puzzle (Microsoft Word) (PDF)**

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#### **IN-VEHICLE SERVICE**

#### **Videos**

2. SLIDE 2 **EXPLAIN** Figure 27-1 If the thermostat has a jiggle valve, it should be placed toward the top to allow air to escape. If a thermostat were to become stuck open or open too soon, this can set a DTC P0128 (coolant temperature below thermostat regulating temperature).

**Running an engine without a thermostat could cause overheating. Coolant flows too fast to allow radiator time to remove heat.**

**HANDS-ON TASK: Have students bench test a thermostat**

**DEMONSTRATION: Show students how to burp (purge) the air from a cooling system.**

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3. **SLIDE 3 EXPLAIN** Figure 27-2 Use caution if using a steel scraper to remove a gasket from aluminum parts. It is best to use a wood or plastic scraper.

**Water pump weep hole leaks will sometimes leak only hot or cold**

**ON-VEHICLE HANDS-ON TASK: Have students inspect water pump. Inspections should include: bearings, leaks, flow.**

**After water pump replacement, cooling system should be filled and pressured as soon as possible. This will enable you to find any leaks before job is completed.**

4. **SLIDE 4 EXPLAIN** Figure 27-3 An intake manifold gasket that failed and allowed coolant to be drawn into the cylinder(s).
5. **SLIDE 5 EXPLAIN** Figure 27-4 The lower intake manifold attaches to the cylinder heads.
6. **SLIDE 6 EXPLAIN** Figure 27-5 The upper intake manifold, often called a plenum, attaches to the lower intake manifold.
7. **SLIDE 7 EXPLAIN FIGURE 27-6** Some plastic intake manifolds are equipped with a pressure relief valve that would open in the event of a backfire condition to prevent the higher internal pressures from causing damage to the manifold.

**DEMONSTRATION: Show students how to use torque wrench to tighten an intake manifold.**

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	<p><b><u>ON-VEHICLE HANDS-ON TASK:</u></b> Have students R&amp;R an intake manifold gasket, using the correct procedure.</p>
	<p>Most overhead cam (OHC) engines used today are not <u>Free Running</u>. This means that engine damage can occur if timing belt breaks. This damage could be bent valves, damaged valve seats, holed pistons, etc.</p>
	<p>Always rotate an engine by hand to verify timing. If any binding is felt, stop! This could mean that valves are hitting pistons.</p>
	<p><b><u>ON-VEHICLE ASE EDUCATION TASK</u></b> Inspect and replace camshaft and drive belt/chain (P-1)</p>
	
	<p>Digital photographs taken before disassembly for valve adjustment can save time when reassembling</p>
	<p>8. SLIDE 8 EXPLAIN Figure 27-7 single overhead camshaft engine with timing belt that also rotates the water pump.</p>

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### **DISCUSS CASE STUDY: Case of the Shaking**

**Chrysler:** The owner of a Chrysler Pacifica complained that vehicle would shake and a loud knock sound was heard when decelerating, but everything seemed to be normal if vehicle was accelerated slowly. Everything seemed to be fine when driven in reverse. Technician was able to confirm situation and felt that an engine mount had failed. A visual inspection confirmed that mount was torn. Replacing engine mount solved vibration problem. • **SEE FIGURE 27-8.**

#### **Summary:**

**Complaint**—Owner complained that vehicle would shake during rapid acceleration and a loud knock sound was heard during deceleration.

**Cause**—engine mount was found to be defective due to fluid leaking from mount.

**Correction**—engine mount was replaced and this corrected the customer concern.

9. **SLIDE 9 EXPLAIN FIGURE 27-8** (a) The old front engine mount contained hydraulic fluid. The oil was leaking from a split in the mount. (b) The new original equipment (OE) mount is ready to be installed.

10. **SLIDE 10 EXPLAIN FIGURE 27-9** A Toyota/Lexus hybrid electric vehicle has a ready light. If the ready light is on, the engine can start at anytime without warning.

11. **SLIDE 11 EXPLAIN Figure 27-10** Always use viscosity of oil as specified on oil fill cap.

12. **SLIDE 12 EXPLAIN FIGURE 27-11** There may become a driveability issue because the gasoline direct-injection injector is exposed to combustion carbon and fuel residue.

**DISCUSSION:** Ask students why it is important to use correct torque sequence and torque values.

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13. SLIDES 13-35 **EXPLAIN VALVE ADJUSTMENT PROCEDURE TO WALK THROUGH TASK SHEET COMPLETION**

**ON-VEHICLE ASE EDUCATION TASK Adjust valves (mechanical or hydraulic lifters) (P1)**

**SEARCH INTERNET: Have students use Internet to find information on interference (non-free-running) engines. Have students make a chart of all the students' cars. (If they don't have a car, have them pick one from lab vehicles.) The chart should show which engines are free-running.**