

Advanced Engine Performance

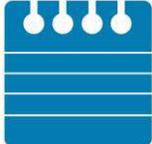
Chapter 21 FUEL TRIM DIAGNOSIS

Opening Your Class

KEY ELEMENT	EXAMPLES
Introduce Content	This course or class covers operation and service of ADVANCED Automotive Engine Performance Diagnosis 6/E . 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">1. Explain the purpose and function of fuel trim.2. Discuss the difference between speed density and mass air flow fuel control.3. Describe how knowing the volumetric efficiency of the engine can help diagnose engine performance concerns.4. Explain how to tell if a volumetric efficiency concern in an engine is due to a mechanical or an airflow measurement problem.
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 Advanced Engine Performance Diagnosis 6/E Chapter Images found on Jim's web site @ www.jameshalderman.com

LINK CHP 21: Chapter Images

ICONS	Ch21 FUEL TRIM DIAGNOSIS
       	<p>1. SLIDE 1 CH21 FUEL TRIM DIAGNOSIS</p> <p>Check for ADDITIONAL VIDEOS & ANIMATIONS @ http://www.jameshalderman.com/ WEB SITE REGULARLY UPDATED</p> <p><u>Engine Controls (284 Links)</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 FUEL TRIM FIGURE 21–1 The catalytic converter is most efficient when the exhaust ratio is closest to 14.7:1</p> <p>3. SLIDE 3 EXPLAIN FUEL TRIM FIGURE 21–2 Shown is lambda. The equivalence ratio is opposite lambda.</p>
      	<p>DISCUSS 3 FREQUENTLY ASKED QUESTIONS PAGE 280</p> <p>EXPLAIN TECH-TIP PAGE 281</p> <p>4. SLIDE 4 EXPLAIN FIGURE 21–3 Scan tool display, showing both long-term and short-term fuel trim. Both LTFT and STFT should be < 10%.</p> <p>DISCUSS REAL WORLD FIX The Red S-10 Pickup Truck Story</p> <p>EXPLAIN TECH-TIP Think of a Small Faucet and a Large Faucet</p>

ICONS**Ch21 FUEL TRIM DIAGNOSIS****EXPLAIN TECH-TIP** Movie Mode Diagnosis

5. **SLIDES 5 EXPLAIN FIGURE 17-4** Any fault in the air cleaner assembly can disrupt the airflow through the MAF sensor.

DISCUSS REAL WORLD FIX PAGE 284

6. **SLIDE 6 EXPLAIN FIGURE 21-5** This properly operating engine is drawing in 48 grams per second of air for all eight cylinders. This indicates that each cylinder will be receiving 6 grams per second (GPS).
7. **SLIDE 7 EXPLAIN FIGURE 21-6** If exhaust system on the left bank (bank #1) were to become restricted, total airflow through MAF sensor would also decrease. The cylinders on right bank (bank #2) would draw the same 6 GPS as before and the cylinders on bank #1, which have a restricted exhaust, would draw just 4 GPS.
8. **SLIDE 8 EXPLAIN FIGURE 21-7** If all cylinders were equal and showed the 40 grams per second, then each cylinder will be drawing 5 grams per second (5×8 cylinders = 40 GPS). Bank 1 is being supplied $4/5$ ths of the air needed whereas bank 2 is being supplied $6/5$ ths of the air needed causing bank 1 to operate too rich and bank 2 to operate too lean.
9. **SLIDE 9 EXPLAIN FIGURE 21-8** As a result of the restricted exhaust on bank #1, the restricted bank will operate too rich and bank #2 will operate too lean. The long-term fuel trim will be negative for bank #1 and positive for bank #2

EXPLAIN TECH-TIP MAF Sensor or Airflow Problem?
Possible Restricted Exhaust? Check the IAT