

Light Vehicle Diesel Engines

Chapter 19 OBD II

Opening Your Class

KEY ELEMENT	EXAMPLES
Introduce Content	This Light Vehicle Diesel Engines 1st text provides complete coverage of light duty diesel engine components, operation, and diagnosis. It correlates material to task lists specified by ASE and NATEF and emphasizes a problem-solving approach. Chapter features include Tech Tips, Frequently Asked Questions, and Real World Fixes: www.jameshalderman.com contains Videos, Animations, and Task Sheets for use in the lab and classroom.
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 learning objectives to students as listed below: <ol style="list-style-type: none"> 1. Explain the purpose and function of on-board diagnostics generation-II (OBD-II) systems. 2. List the various continuous and non-continuous monitors. 3. Explain the information that can be obtained from an on-board diagnostics monitor and the criteria to enable an OBD monitor. 4. Explain the numbering designation of OBD-II diagnostic trouble codes.
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 the 1st Edition Chapter Images found on Jim's web site @ www.jameshalderman.com

LINK CHP 19 Chapter Images USE BELOW LINK

http://www.jameshalderman.com/books_a9.html

NOTE: You can use Chapter Images or Power Point files: Though out Power Point Presentations, you will find questions and answers on slides that can be used for discussion.

ICONS



Chapter 19 ONBOARD DIAGNOSIS (OBDII)

1. SLIDE 1 CH19 ON-BOARD DIAGNOSIS II

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

Light Diesel (111 Links)

http://www.jameshalderman.com/books_a9.html

Crossword Puzzle (Microsoft Word) (PDF)

Word Search Puzzle (Microsoft Word) (PDF)

SAFETY Always be very careful when working on a Diesel engine that is running with air intake removed. Because most diesel **ENGINES DO NOT USE** a throttle plate, objects can very easily be sucked into engine, causing serious engine damage. **MOST OEMs offer intake covers.**

2. **SLIDE 2 EXPLAIN** Figure 19-1 typical malfunction indicator lamp (MIL) often labeled “check engine” or “service engine soon” (SES).

DISCUSSION: Have students talk about purpose of onboard diagnostic systems. How did computer control systems function prior to OBD-I? Have the students discuss OBD-I. What were some of shortcomings/problems of OBD-I?

HANDS-ON TASK: Have the students locate the **diagnostic link connector (DLC)** on several OBD-I vehicles using component locators. Ask students to compare various locations to standardized locations on an OBD-II vehicle

ON-VEHICLE TASK: Locate and interpret vehicle and major component identification numbers: Diagnose causes of emissions or driveability concerns with stored or active DTCS; obtain, graph, & interpret scan tool data: Describe importance of running all **OBDII Monitors** for repair

ICONS



QUESTION



QUESTION



QUESTION



QUESTION

Chapter 19 ONBOARD DIAGNOSIS (OBDII)

DISCUSSION: Have the students discuss examples of OBD-II monitors and how they operate. What is a monitor?

DEMONSTRATION: Connect a scan tool to OBD-II vehicle & show students how to access monitor status. Then demonstrate Comprehensive Component Monitor operation by disconnecting a sensor such as engine coolant temperature with the key on. Show illuminated MIL & stored DTC. **FIGURE 87-1**

Certain 1996 & 1997 OBD-II vehicles could set a misfire DTC from operation on rough roads. Misfire Monitor was very sensitive on these vehicles & could misinterpret slight crankshaft speed variations caused by rough roads as ignition misfires

DEMONSTRATION: Demonstrate operation of misfire monitor by closing electrode gap on spark plug and operating the engine. Once misfire has been detected, connect scan tool & show DTC Depending on PCM's determination of misfire's severity, misfire monitor may set pending code until ignition is cycled OFF & engine is operated 2nd time. After 2nd failure, matured DTC sets, with MIL on

DISCUSSION: Discuss DIESEL enabling criteria and why they are important. What are conditions that must be met for each monitor to run?

DISCUSSION: Discuss CALIFORNIA ON=BD II & criteria for a TRIP and why they are important for OBD-II. What is a trip?

DISCUSSION: Have the students talk about DRIVE CYCLES. What is a drive cycle and how does it differ from a trip?

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DISCUSSION: Discuss numbering of DTCs. What are major categories of OBD-II designated DTCs? Explain numbering for OBD-II DTCs & give some examples & explanations (e.g., P0301-cylinder #1 misfire detected)

3. **SLIDE 3 EXPLAIN FIGURE 19-2** OBD-II diagnostic link connector (DLC) is located under the dash on most diesel vehicles. The pins are also standardized for most, but not all of the pin locations..

DISCUSS FREQUENTLY ASKED QUESTION: What About the Emission Requirements for Heavy-Duty Diesel Engines?

DISCUSSION: Have the students discuss **OBD II MONIOTORS & THEIR IMPORTANCE**

ON-VEHICLE TASK: Retrieve and record diagnostic trouble codes, OBD monitor status, freeze frame data; clear codes when applicable

4. **SLIDE 4 EXPLAIN FIGURE 19-4** OBD-II DTC identification format
5. **SLIDE 5 EXPLAIN FIGURE 19-3** scan tool screen capture showing warm-up cycles and distance travelled since diagnostic trouble code (DTC) was cleared

DTC (View) (Download)

Retrieving Trouble Codes, Code Reader (View)

ON-VEHICLE TASK: Diagnose emissions or driveability concerns W/O stored diagnostic trouble codes; determine necessary action.

6. **SLIDE 6 EXPLAIN FIGURE 19-5** global OBD II can be accessed from the main menu on all factory-level aftermarket and some original equipment scan tools.

DISCUSSION: GLOBAL OBD II MODES & CHART 19-1

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DISCUSSION: DISCUSS MODE SIX INFORMATION. What is mode six data, and how can it be useful for diagnosis?

DEMONSTRATION: Create a one-trip failure of a two-trip code; for example, create a type B misfire by closing spark plug electrodes & operating engine one time. Show students how to find pending DTCs with scan tool

DISCUSS FREQUENTLY ASKED QUESTION: How Can You Tell Generic from Factory Information?

DISCUSSION: Have the students discuss PENDING CODES. What are pending codes and where are they stored?

HANDS-ON TASK: Have the students create pending DTCs on LAB VEHICLES their own cars. Have them retrieve the pending codes and freeze-frame data.

DISCUSSION: Have the students discuss PCM tests. What is rationality testing? What is functionality testing?

DEMONSTRATION: ON OBD-II Vehicle Disconnect a sensor, such as a coolant temperature sensor, to show students how PCM tests functionality. Show students DTC and create an opposing DTC by shorting connector terminals together.

HANDS-ON TASK: Have the students connect an enhanced scan tool to a LAB VEHICLE or their own vehicles. Have them access OEM data & list available parameters. Have them access generic OBD-II data and create similar list for comparison.