

Automotive Technology 5th Edition

Chapter 84 Exhaust Gas Recirculation Systems

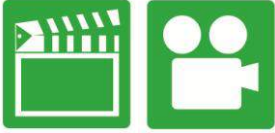
Opening Your Class

KEY ELEMENT	EXAMPLES
Introduce Content	This course or class provides complete coverage of the components, operation, design, and troubleshooting. 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, Real World Fixes, Videos, Animations, and NATEF Task Sheet references.
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 on NEXT SLIDE. 1. Discuss the purpose and function of exhaust gas recirculation (EGR) systems. 2. Explain the strategies to monitor onboard diagnostics generation II (OBD-II) exhaust gas recirculation (EGR) systems. 3. Explain how to diagnose a defective EGR system and interpret EGR -related OBD-II trouble codes.
Establish the Mood or Climate	Provide a WELCOME , 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 5th Edition Chapter Images found on Jim's web site @ www.jameshalderman.com

LINK CHP 84: [ATE5 Chapter Images](#)

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1. SLIDE 1 CH84 EXHAUST GAS RECIRCULATION SYSTEMS

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

Videos

Exhaust Gas Recirculation, EGR (View) (Download)

2. SLIDE 2 EXPLAIN Figure 84-1 Nitrogen oxides (NO_x) create a red-brown haze that often hangs over major cities

DISCUSSION: discuss how EGR systems are designed to recirculate exhaust into the combustion chamber. What conditions must be present to allow proper engine operation while exhaust is recirculated? **FIGURE 84-1**

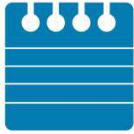
3. SLIDE 3 EXPLAIN Figure 84-2 When the EGR valve opens, the exhaust gases flow through the valve and into passages in the intake manifold

DEMONSTRATION: While applying vacuum using a hand-held pump, open & close a standard EGR valve so students can see diaphragm & valve operation. **FIGURE 84-2**

DEMONSTRATION: Pass around various EGR valves to the students. Point out positive and negative **FIGURE 84-2** backpressure styles and how they vary.

4. SLIDE 4 EXPLAIN Figure 84-3 Back pressure in the exhaust system is used to close the control valve, allowing engine vacuum to open the EGR valve.
5. SLIDE 5 EXPLAIN Figure 84-4 Typical vacuum-operated EGR valve. The operation of the valve is controlled by the PCM by pulsing the EGR control

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solenoid on and off.

EGR valves can be tested for leakage by inverting and spraying carburetor cleaner into the pintle valve. If the carburetor cleaner leaks past pintle, valve is defective.

6. **SLIDE 6 EXPLAIN** Figure 84-5 An EGR valve position sensor on top of an EGR valve

DEMONSTRATION: Pass around both digital and linear EGR valves for the students to see. **FIGURES 84-3, 4, & 5**

DEMONSTRATION: Pass around various types of EGR valve position sensors for the students to see. **FIGURES 84-3, 4, & 5**

7. **SLIDE 7 EXPLAIN** Figure 84-6 Digital EGR valve as used on some older General Motors engines.
8. **SLIDE 8 EXPLAIN** Figure 84-7 GM linear EGR valve.
9. **SLIDE 9 EXPLAIN** Figure 84-8 EGR valve pintle is pulse-width modulated and a three-wire potentiometer provides pintle-position information back to the PC

HANDS-ON TASK: Have the students gradually open an EGR valve with a hand operated vacuum pump. Have them use an ohmmeter to check valve position sensor resistance at various valve openings.

DISCUSSION: Discuss the difference between linear and Digital EGR valves. What is the difference? **FIGURES 84-6, 7, & 8**

DISCUSSION: Ask students to discuss & list possible symptoms of a malfunctioning EGR system. What driveability issues could be caused by too much, or incorrect, EGR flow or timing? What problems can be caused by no, too little, EGR flow?

10. **SLIDE 10 EXPLAIN** Figure 84-9 typical Ford DPFE sensor and related components.
11. **SLIDE 11 EXPLAIN** Figure 84-10 OBD-II active test. The PCM opens the EGR valve and then monitors the MAP sensor and/or engine speed (RPM) to verify that it meets acceptable values

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DISCUSSION: Have the students discuss malfunctioning EGR systems. What problems can be associated with control side of EGR system? What problems can be associated with functional side of the EGR system?

DISCUSSION: discuss various types of warning lights that OEMS use & significance of the amber color. What is **MIL** & what is its color?

DISCUSSION: Discuss **OBD II EGR MONITORS, SEE FIGURES 84-9 & 10.** How are they used in diagnosis?

HANDS-ON TASK: Have students disconnect EGR vacuum hose on a car and drive it until it meets enabling criteria for **EGR Monitor** to run. Connect a scan tool & retrieve DTC. If monitor runs only once, DTC will be stored as a pending code. If the monitor runs twice and fails, a matured DTC will set, and the MIL will be illuminated.

DISCUSSION: discuss **detonation**. What is detonation and how is it caused? What are its effects? What kind of mechanical damage can detonation cause to the engine?

HANDS-ON TASK: Have the students look up **OEM procedures for testing EGR system** on their own vehicles.

Speed-density fuel system measures intake MAP (vacuum) can be fooled by a stuck open EGR valve. Open EGR valve admits exhaust pressure into intake manifold, which PCM misinterprets as an increase in engine load, driving fuel system very rich. Additional fuel will keep engine running, although poorly due to excess exhaust. Black exhaust smoke caused by this overly rich condition can cause technician to mistakenly look for fuel system problem

DEMONSTRATION: On a running engine, apply vacuum incrementally to the EGR valve using a hand-held vacuum pump. Show effect of increased vacuum on engine operation as EGR valve opens up. Apply enough vacuum to stall the engine.

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DEMONSTRATION: On a vehicle with either a **digital or linear EGR valve**, open the valve incrementally with a bidirectional **scan tool** to show students its effects

ON-VEHICLE NATEF TASK Inspect, test, service and replace components of **EGR** system, exhaust passages, vacuum/pressure controls, filters and hoses; perform necessary action. **Page 261**

ON-VEHICLE NATEF TASK: Inspect and test electrical/electronic sensors, controls, and wiring of exhaust gas recirculation (EGR) systems; perform necessary action. **Page 262**

Crossword Puzzle (Microsoft Word) (PDF)

Word Search Puzzle (Microsoft Word) (PDF)