

Automotive Electrical & Engine Performance 8/E

Chapter 25 Immobilizer Systems

Opening Your Class

KEY ELEMENT	EXAMPLES
Introduce Content	This Automotive Electrical & Engine Performance 8th edition provides complete coverage of automotive areas pertaining vehicle electrical systems and engine performance. It correlates material to task lists specified by ASE and ASEducation (NATEF) and emphasizes a problem-solving approach. Chapter features include Tech Tips, Frequently Asked Questions, Case Studies, Videos, and Animations that are listed in this Lesson Plan. This Lesson Plan also references ASEducation (NATEF) Task Sheets available from Jim's web site.
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. 1. Describe the purpose and function of a security system. 2. Explain how an immobilizer system works. 3. List the engine-related faults that can be caused by the immobilizer system when it malfunctions. 4. Identify the major components that could be involved with an immobilizer system. 5. Explain how to diagnose a fault with an immobilizer system. Prepare for ASE Engine Performance (A8) certification test content area "A" (General Diagnosis).
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 **Automotive Electrical & Engine Performance 8th Edition** Chapter Images found on Jim's web site @ www.jameshalderman.com

DOWNLOAD Chapter 25 Chapter Images: From
http://www.jameshalderman.com/books_a8.html#anchor2

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1. SLIDE 1 CHAPTER 25 IMMOBILIZER SYSTEMS

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

At the beginning of this class, you can download the crossword puzzle & Word Search from Jim's web site to familiarize your class with terms in this chapter & then discuss them, see below:

http://www.jameshalderman.com/books_a8.html#anchor2

DOWNLOAD

Crossword Puzzle (Microsoft Word) (PDF)

Word Search Puzzle (Microsoft Word) (PDF)

<http://www.jameshalderman.com/videos.html#a6>

DISCUSS FREQUENTLY ASKED QUESTION:

What Is Content Thief Protection? Content Thief protection is a security system that includes sensors that detect glass breakage or entry into the vehicle and sounds an alarm when these occur. Purpose of content theft system is to prevent theft of objects inside vehicle and sound an alarm when someone enters the vehicle without using proper remote or key. Most systems use a motion detector for content theft protection, as well as switches in doorjamb, trunk, and hood that provide an input signal to the control module. Some antitheft systems are more complex and also have electronic sensors that trigger alarm if glass is broken or a change in battery current draw occurs. These sensors also provide an input signal to the control module, which may

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be a separate antitheft unit, or may be incorporated into the PCM or BCM.

- **SEE FIGURE 25-1.**

2. **SLIDE 2 EXPLAIN FIGURE 25-1** A shock sensor used in alarm and **antitheft systems**. If the vehicle is moved, the magnet moves relative to the coil, inducing a small voltage that triggers the alarm.

[Antitheft System \(View\) \(Download\)](#)

3. **SLIDE 3 EXPLAIN FIGURE 25-2** The security system symbol used on a Ford. The symbol varies by make, model, and year, so check service information to determine what symbol is used on the vehicle being diagnosed.
4. **SLIDE 4 EXPLAIN FIGURE 25-3** A typical key with the cover removed showing the battery used to power the door lock and the antenna used for the immobilizer system.
5. **SLIDE 5 EXPLAIN FIGURE 25-4** remote keyless entry is used to unlock the doors as well as create the signals to the powertrain control module (PCM) used to control the starter motor and/ or fuel system and the warning lamp on the instrument panel cluster (IPC).

[Antitheft System \(View\) \(Download\)](#)

6. **SLIDE 6 EXPLAIN FIGURE 25-5** A typical immobilizer circuit showing communication between key and the transceiver. Transceiver then communicates with immobilizer module over data lines.
7. **SLIDE 7 EXPLAIN FIGURE 25-6** The communication between the components and modules of the security system use a combination of hard wired and data bus messages

EXPLAIN TECH TIP: Do Not Have Other Keys Near
Whenever diagnosing an immobilizer system, keep other key fobs away from the area. If another key fob were close, it could be transmitting a signal that is not recognized by the vehicle and the

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security system could prevent proper vehicle operation. Even having other metal objects near the key can affect the strength of the electromagnetic pulses and could interfere with the immobilizer system and prevent it from working as designed. • **SEE FIGURE 25–7.**

8. **SLIDE 8 EXPLAIN** FIGURE 25–7 (a) Avoid using a key where the key ring is over the top of the key, which can interfere with the operation of the immobilizer system. (b) Do not angle another key upward from the key being used to help prevent interference with the magnetic field used to energize the key. (c) Do not have the keys from another vehicle near the key being used.

DISCUSS FREQUENTLY ASKED QUESTION:

What Is a Passive Keyless Entry System?

A passive system uses the key fob as a transmitter, which communicates with the vehicle as it comes close. The key is identified using one of several antennas around body of vehicle and a radio pulse generator in the key housing. Depending on system, vehicle is automatically unlocked when a button or sensor on the door handle or trunk release is depressed. Vehicles with a passive (smart) key system can also have a mechanical backup, usually in the form of a key blade built into the key fob. Vehicles with a smart key system can be started without inserting a key in ignition, provided driver has key fob inside vehicle. On most vehicles, this is done most often by pressing a start button. When leaving vehicle equipped with a smart key system, vehicle is locked, depending on make, model, and year of manufacture of vehicle, by:

- Pressing a button on one of door handles,
- Touching a capacitive area on a door handle, or

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        	• Simply walking away from vehicle and will lock doors when key fob is further away than 15 feet (5m). <u>ASE EDUCATION TASK G2:</u> Diagnose operation of security/anti-theft systems and related circuits (such as: theft deterrent, door locks, remote keyless entry, remote start, and starter/fuel disable); determine needed repairs. <u>DEMONSTRATION:</u> Obtain several remote <u>keyless entry fobs or transmitters</u> to show to your students. Separate the cases of the fobs to let students see the internal components, especially keypad touch areas on circuit board. Discuss range of remote keyless entry key fobs. What is meant by "line of sight"? <u>DISCUSSION:</u> Have students talk about <u>ROLLING CODE TRANSMITTERS</u>. What other component uses rolling code technology? 9. SLIDE 9 <u>EXPLAIN</u> FIGURE 25–8 Check service information for the exact wiring diagram (schematic) for the vehicle being tested. Highlighting the wires and noting their color helps when following the specified testing procedures. <u>ON-VEHICLE TASK:</u> Have student download the exact wiring diagram (schematic) for the vehicle being tested. Highlighting the wiring to be tested 10. SLIDE 10 <u>EXPLAIN</u> FIGURE 25–9 A special tool is needed to diagnose a General Motors VATS security system and special keys that contain a resistor pellet. 11. SLIDE 11 <u>EXPLAIN</u> FIGURE 25–10 Passlock series of General Motors security systems uses a conventional key. The magnet is located in ignition lock cylinder and triggers Hall-effect sensors. <u>DEMONSTRATION:</u> If available, show YOUR students an example of <u>GM Passkey</u> with exposed resistor. Demonstrate how to measure resistance of resistor

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DISCUSSION: Discuss GM Passlock antitheft system. How does this lock cylinder send a signal to instrument cluster OR BCM?

DISCUSSION: Have students talk about the use of special keys for antitheft systems. What happens if an unprogrammed key is used?

DISCUSSION: Discuss diagnostic steps used for troubleshooting antitheft system. Why is it important to have accurate service data before troubleshooting any electronic system?

EXPLAIN TECH TIP: Look for DTCs in “Body” and “Chassis” Whenever diagnosing a customer concern with the immobilizer system, check for diagnostic trouble codes (DTCs) under chassis and body systems. A global or generic scan tool that can read only “P” codes is not suitable for diagnosing many faults with the immobilizer system. Engine or emission control-type codes are “P” codes, whereas module communications are “U” codes. These are most often found when looking for DTCs under chassis or body systems. Chassis-related codes are labeled “C” and body system-related codes are labeled “B” codes and these can cause an immobilizer issue if they affect sensor that is used by system. • **SEE FIGURE 25-10.**

12. SLIDE 12 **EXPLAIN** FIGURE 25-11 Scan tools, such as this factory tool being used on a BMW, are capable of many diagnostic functions that can help the technician zero in on the root cause of a problem.
13. SLIDE 13 **EXPLAIN** FIGURE 25-12 After checking for stored diagnostic trouble codes (DTCs), the wise technician checks service information for any technical service bulletins (TSBs) that may relate to the vehicle being serviced.

DISCUSS CHART 25-1 Sample diagnostic trouble codes for an immobilizer system. These codes vary by make, model, and year of manufacture, so check service information for the exact vehicle being diagnosed.

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EXPLAIN TECH TIP: *Use an Antenna Coil Tester to Save Time:* The procedure for testing the antenna coil using an antenna tester includes:

- Insert the ignition key into ignition lock cylinder. On some vehicles, inserting the key causes the transceiver to activate. On some vehicles, the key must be rotated to the ON position.
- Use a handheld tester to check that transceiver is able to transmit a signal. A coil detector is used to check immobilizer coil that surrounds lock cylinder. The coil is working normally if LED lights up as key is inserted into lock cylinder. If coil is defective, this can save technician a lot of time troubleshooting system. The coil can be replaced without the need to reprogram keys.
 - **SEE FIGURE 25-12.**

14. SLIDE 14 **EXPLAIN** FIGURE 25-13 Immobilizer coil detectors can be found online by searching for immobilizer transponder coil detector.

Most antitheft keys now have a transponder chip embedded in plastic head of key