

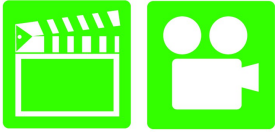
Advanced Automotive Electricity & Electronics

Chapter 21 Air Bags & Pretensioners

Opening Your Class

KEY ELEMENT	EXAMPLES
Introduce Content	This course or class covers operation and service of Advanced Automotive Electricity and Electronics Systems . 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. Diagnose and repair faulty safety belts and retractors.2. Explain the operation of front airbags.3. Describe the procedures to diagnose and repair common faults in airbag systems.4. Disarm and enable the airbag system for vehicle service.5. Explain how the passenger presence system works. This chapter will help you prepare for the ASE Electrical/Electronic Systems (A6) certification test content area "A" (General Electrical/Electronic System Diagnosis).
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.

ICONS



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1. SLIDE 1 CH21 Air Bags & Pretensioners

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DEMONSTRATION: SHOW STUDENTS DIFFERENT TYPES OF SEAT BELT LOCKING MECHANISMS & AND HOW THEY WORK.

2. SLIDE 2 **EXPLAIN** Safety Belts and Retractors
3. SLIDE 3 **EXPLAIN** 21-1 (a) Safety belts are the primary restraint system. (b) During a collision the stretching of the safety belt slows the impact to help reduce bodily injury

DISCUSSION: DISCUSS DIFFERENT TYPES OF RETRACTORS USED IN AUTOMOBILES. WHAT TYPES OF RETRACTORS ARE USED FOR SAFETY BELTS?

4. SLIDE 4 **EXPLAIN** Figure 21-2 Most safety belts have an inertia-type mechanism that locks the belt in the event of rapid movement
5. SLIDE 5 **EXPLAIN** Figure 21-3 A typical safety belt warning light
6. SLIDE 6 **EXPLAIN** Figure 21-4 A small explosive charge in the pretensioner forces the end of the seat belt down the tube, which removes any slack in the seat belt

DISCUSSION: DISCUSS ADVANTAGES & AND DISADVANTAGES OF CAR WITH PRETENSIONERS. WHAT SAFETY CONCERNS ARE ASSOCIATED WITH PRETENSIONERS? DISCUSS THE DANGERS ASSOCIATED WITH WORKING AROUND SEAT BELT PRETENSIONERS.

ANIMATION: SEAT BELT INERTIA LOCK
[WWW.MYAUTOMOTIVELAB.COM](http://www.myautomotivelab.com)

[HTTP://MEDIA.PEARSONCMG.COM/PH/CHET/CHET_MYAUTOMOTIVELAB_2/ANIMATIONS/A7_ANIMATION/CHAPTER46 FIG_46_2/INDEX.HTM](http://media.pearsoncmg.com/ph/chet/chet_myautomotivelab_2/animations/a7_animation/chapter46_fig_46_2/index.htm)

7. SLIDE 7 **EXPLAIN** Safety Belts and Retractors
8. SLIDE 8 **EXPLAIN CAUTION**
9. SLIDE 9 **EXPLAIN** FRONT AIR BAGS

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10. **SLIDE 10 EXPLAIN Figure 21-5** A typical airbag system showing many of the components. The SDM is the “sensing and diagnostic module” and includes the arming sensor as well as the electronics that keep checking the circuits for continuity and the capacitors that are discharged to deploy the air bags.
11. **SLIDE 11 EXPLAIN Figure 21-6** A simplified airbag deployment circuit. Note that both the arming sensor and at least one of the discriminating sensors must be activated at the same time. The arming sensor provides the power, and either one of the discriminating sensors can provide the ground for the circuit.

AIRBAG, SUPPLEMENTAL RESTRAINT SYSTEM

DISCUSSION: DISCUSS WHY AIRBAGS ARE CONSIDERED SUPPLEMENTAL. WHAT SAFETY FEATURE DO THEY SUPPLEMENT?

DEMONSTRATION: SHOW STUDENTS DIFFERENT TYPES OF AIRBAG INFLATION SYSTEMS. DEMONSTRATE & EXPLAIN HOW TO DIFFERENTIATE BETWEEN SYSTEMS

12. **SLIDES 12-13 EXPLAIN** Front Airbags
14. **SLIDE 14 EXPLAIN Figure 21-7** The inflator module is being removed from the airbag housing. The squib, inside the inflator module, is the heating element that ignites the pyrotechnic gas generator that rapidly produces nitrogen gas to fill the airbag.
15. **SLIDE 15 EXPLAIN Figure 21-8** This shows a deployed side curtain airbag on a training vehicle.
16. **SLIDE 16 EXPLAIN Figure 21-9** airbag magnetic sensor.
17. **SLIDE 17 EXPLAIN Figure 21-10** Some vehicles use a ribbon-type crash sensor

DISCUSSION: DISCUSS HOW AIRBAGS AFFECT DRIVING HABITS. E.G. HOW DO AIRBAGS CHANGE HAND POSITION ON STEERING WHEEL?

DISCUSSION: TALK ABOUT USING MORE THAN ONE IMPACT SENSOR IN AIRBAG CIRCUITS. WHAT IS THE SQUIB?

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QUESTION

18. **SLIDE 18 EXPLAIN** Figure 21-11 A sensing and diagnostic module that includes an accelerometer.
19. **SLIDE 19 EXPLAIN** Figure 21-12 driver's side airbag showing two inflator connectors. One is for the lower force inflator and the other is for the higher force inflator. Either can be ignited or both at the same time if the deceleration sensor detects a severe impact.
20. **SLIDE 20 EXPLAIN** Front Airbags
21. **SLIDE 21 EXPLAIN SAFETY TIP**

22. SLIDE 22 EXPLAIN TECH TIP

23. **SLIDE 23 EXPLAIN** Figure 21-13 airbag control module is linked to PCM & BCM on this Chrysler system. Notice the airbag wire connecting the module to the airbag through the clockspring. Both power, labeled "driver airbag high" and ground, labeled "driver airbag low" are conducted through the clockspring.

DEMONSTRATION: SHOW STUDENTS DIFFERENT TYPES OF SENSORS & EXPLAIN THEIR OPERATION









**ANIMATION: AIR BAG IMPACT SENSOR
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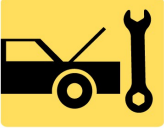







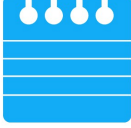


[HTTP://MEDIA.PEARSONCMG.COM/PH/CHET/CHET_MYAUTOMOTIVELAB_2/ANIMATIONS/A7_ANIMATION/CHAPTER46_FIG_46_9/INDEX.HTM](http://media.pearsoncmg.com/ph/chet/chet_myautomotivelab_2/animations/a7_animation/chapter46_fig_46_9/index.htm)

HANDS-ON TASK: ON A LAB VEHICLE, HAVE THE STUDENTS LOCATE AIR BAG SENSORS AND LABEL THEM WITH MASKING TAPE

24. **SLIDES 24 EXPLAIN** Airbag Diagnosis Tools and Equipment
25. **SLIDE 25 EXPLAIN** Figure 21-14 An airbag diagnostic tester. Included in the plastic box are electrical connectors and a load tool that substitutes for the inflator module during troubleshooting.
26. **SLIDE 26 EXPLAIN FREQUENTLY ASKED QUESTION**

DISCUSSION: DISCUSS WHY GOLD IS USED IN CONNECTORS FOUND IN AIRBAG CIRCUITS. WHY IS IT IMPORTANT FOR AIRBAG CONNECTORS TO RESIST CORROSION? HAVE STUDENTS EXPLAIN

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	<p>WHY AIRBAG CIRCUITS MUST NOT BE SERVICED UNTIL A SET PERIOD OF TIME AFTER DISCONNECTING THE BATTERY.</p> <p>DEMONSTRATION: SHOW STUDENTS PROPER PROCEDURES TO SAFELY DISARM AIRBAGS</p>
	<p>DEMONSTRATION: SHOW STUDENTS HOW TO PROPERLY HANDLE & STORE NON-DEPLOYED AIRBAGS.</p>
	<p>MANY AIRBAG CONNECTORS HAVE REDUNDANT LOCKING MECHANISMS. MAKE SURE TO DISABLE BOTH LOCKS BEFORE ATTEMPTING TO SEPARATE CONNECTOR.</p>
	<p>27. SLIDE 27 EXPLAIN Airbag Diagnosis Tools and Equipment</p> <p>28. SLIDE 28 EXPLAIN CAUTION</p> <p>29. SLIDE 29 EXPLAIN AIR BAG SYSTEM SERVICE</p> <p>30. SLIDE 30 EXPLAIN FREQUENTLY ASKED QUESTION</p>
	<p>DISCUSSION: DISCUSS HOW AIRBAG CONTROL MODULE PERFORMS SELF-TEST ON ITS CIRCUITRY. WHAT IS PURPOSE OF THIS SELF-TEST?</p>
	<p>31 SLIDE 31 EXPLAIN Driver Side Airbag Module Replacement</p> <p>32. SLIDE 32 EXPLAIN Figure 21-15 After disconnecting battery and yellow connector at base of the steering column, the airbag inflator module can be removed from the steering wheel and the yellow airbag electrical connector at the inflator module disconnected</p>
	<p>DISCUSSION: DISCUSS PURPOSE OF SHORTING BARS. HOW DO THESE DEVICES HELP PREVENT ACCIDENTAL DEPLOYMENT OF AIRBAGS?</p>
	<p>33. SLIDE 33 EXPLAIN Figure 21-16 Shorting bars are used in most airbag connectors. These spring-loaded clips short across both terminals of an airbag connector when it is disconnected to help prevent accidental deployment of the airbag. If electrical power was applied to the terminals, the shorting bars would simply provide a low-resistance path to the other terminal and not allow</p>

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	<p>current to flow past the connector. The mating part of the connector has a tapered piece that spreads apart the shorting bars when the connector is reconnected</p> <p>34. SLIDE 34 EXPLAIN Figure 21-17 An airbag clockspring showing the flat conductor wire. It must be properly positioned to ensure proper operation.</p>
 	<p><u>DEMONSTRATION: DEMONSTRATE HOW TO ACCESS STEERING COLUMN COMPONENTS TO REMOVE AIR BAG</u></p>
	<p>SHOW VIDEO: 1 MINUTE AIRBAG REMOVAL <u>WWW.MYAUTOMOTIVELAB.COM</u> <small>HTTP://MEDIA.PEARSONCMG.COM/PH/CHET/CHET_MYLABS/AKAMAI/TEMPLATE/VIDEO640X480.PHP?TITLE=AIR%20BAG%20REMOVAL&CLIP=PANDC/CHET/2012/AUTOMOTIVE/AUTO_SHOP_SAFETY/CLIP19AIRBAGS1.MOV&CAPTION=CHET/CHET_MYLABS/AKAMAI/2012/AUTOMOTIVE/AUTO_SHOP_SAFETY/XML/CLIP19AIRBAGS1.XML</small></p>
	<p>HANDS-ON TASK: HAVE STUDENTS REMOVE AN AIRBAG TO GAIN ACCESS TO STEERING COLUMN COMPONENTS AND SWITCHES</p>
 	<p>ON-VEHICLE NATEF TASK: DIAGNOSE SUPPLEMENTAL RESTRAINT SYSTEMS; DETERMINE NECESSARY ACTION.</p>
	<p>35. SLIDE 35 EXPLAIN Safety When Manually Deploying Airbags</p> <p>36. SLIDE 36 EXPLAIN Figure 21-18 An airbag being deployed as part of a demonstration in an automotive laboratory.</p>
	<p><u>DEMONSTRATION: DEMONSTRATE & EXPLAIN ALL SAFETY PRECAUTIONS & PROCEDURES TO SAFELY DEPLOY AN AIR BAG</u></p>
	<p>AIRBAG INFLATOR MODULES CAN EASILY EXCEED 400°F WHEN DEPLOYED. LET THEM COOL BEFORE HANDLING</p>
   <p>QUESTION</p>	<p>DISCUSSION: DISCUSS WHY AIRBAGS MUST BE DEPLOYED BEFORE DISPOSAL. IN ADDITION TO ENDANGERING PEOPLE, WHAT OTHER PROBLEMS COULD BE CAUSED BY DISPOSING OF AIRBAGS</p>

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THAT HAVE NOT BEEN DEPLOYED?

ON-VEHICLE NATEF TASK: DISARM AND ENABLE THE AIRBAG SYSTEM FOR VEHICLE SERVICE.

DISCUSSION: DISCUSS IMPORTANCE OF INSTALLING THE AIRBAG SENSOR WITH THE ARROW POINTING IN CORRECT DIRECTION. WHAT DOES THIS DIRECTIONAL MOUNTING ENSURE? TALK ABOUT COMMON LOCATIONS WHERE IMPACT SENSORS ARE MOUNTED ON A LAB VEHICLE. WHY ARE SENSORS MOUNTED IN THESE LOCATIONS?

37. SLIDE 37 **EXPLAIN** Occupant Detection Systems
38. SLIDE 38 **EXPLAIN** Figure 21-19 A dash warning lamp will light if the passenger side airbag is off because no passenger was detected by the seat sensor.
39. SLIDE 39 **EXPLAIN** Figure 21-20 passenger side airbag "on" lamp will light if a passenger is detected on the passenger seat.
40. SLIDE 40 **EXPLAIN** Figure 21-21 gel-filled (bladder-type) occupant detection sensor showing the pressure sensor and wiring.
41. SLIDE 41 **EXPLAIN** Figure 21-22 A resistor-type occupant detection sensor. The weight of the passenger strains these resistors, which are attached to the seat, thereby signaling to the module weight of the occupant.
42. SLIDE 42 **EXPLAIN** Figure 21-23 A test weight is used to calibrate the occupant detection system on a Chrysler vehicle **& EXPLAIN CAUTION**

DISCUSSION: DISCUSS DIFFERENT TYPES OF SEAT SENSORS AND HOW THEY WORK. WHY IS THERE A NEED TO DETERMINE PASSENGER PRESENCE?

DEMONSTRATION: DEMONSTRATE HOW TO USE A SCAN TOOL TO CHECK SEAT SENSOR CALIBRATION.

43. SLIDE 43 **EXPLAIN** Occupant Detection Systems
44. SLIDE 44 **EXPLAIN** Seat and Side Curtain Airbags
45. SLIDE 45 **EXPLAIN** Figure 21-24 A typical seat (side) airbag that deploys from the side of the seat.

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DEMONSTRATION: SHOW STUDENTS HOW TO DECIPHER A BLINKING AIRBAG WARNING LIGHT TO RETRIEVE TROUBLE CODES

46. SLIDE 46 EXPLAIN TECH TIP

47. SLIDE 47 **EXPLAIN CAUTION**

48. SLIDE 48A **EXPLAIN** Event Data Recorders