Automotive Heating and Air Conditioning, 8e

Chapter 3 Air-Conditioning Compressors and Service

Opening Your Class

KEY ELEMENT	EXAMPLES
Introduce Content	This course or class covers operation and service of **Automotive Heating and Air Conditioning, 8e.** It correlates material to task lists specified by ASE and NATEF/ASEEducation.
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. 1. Prepare for the ASE Heating and Air Conditioning (A7) certification test content area "A" (A/C System Service, Diagnosis and Repair). 2. State the different types of A/C compressors. 3. Discuss the parts and operation of compressor clutches. 4. Discuss compressor valves and switches. 5. Explain A/C compressor diagnosis and service.
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 8th Edition Chapter Images found on Jim's web site @ www.jameshalderman.com
LINK CHP 03:
http://www.jameshalderman.com/links/book_hvac/ci/hvac_ci_ch_3.pptx
These Power Point files contain more than just the images.

ICONS	Ch03 A/C Compressors and Service
 	**1. SLIDE 1 AIR-CONDITIONING COMPRESSORS AND SERVICE** **2. SLIDES 2-3 EXPLAIN OBJECTIVES** **Check for ADDITIONAL VIDEOS & ANIMATIONS @ http://www.jameshalderman.com/** **WEB SITE IS CONSTANTLY UPDATED** **Chapter 3 Compressor Videos** http://www.jameshalderman.com/links/book_hvac/vid/ch3/video_frame.html **Crossword Puzzle (Microsoft Word) (PDF)** **Word Search Puzzle (Microsoft Word) (PDF)** **4. SLIDES 4-6 EXPLAIN** Different Types of A/C Compressors **SWASH PLATE COMPRESSOR** **COMPACT VARIABLE COMPRESSOR 1** **COMPACT VARIABLE COMPRESSOR 2** **SWASH PLATE COMPRESSOR** **SCOTCH YOKE COMPRESSOR** **WOBBLE PLATE COMPRESSOR** **DISCUSSION: DISCUSS PURPOSE AND FUNCTION OF AN A/C COMPRESSOR** **DEMONSTRATION: SHOW POSITIVE DISPLACEMENT PISTON COMPRESSOR AND HOW IT WORKS** **DEMONSTRATION: SHOW REED VALVE INSIDE A COMPRESSOR AND DISCUSS HOW IT FUNCTIONS.** **COMPRESSOR REED VALVE OPERATION**

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	7. **SLIDE 7 EXPLAIN FIGURE 3–1** In a piston compressor, when moving downward, piston creates a drop in pressure inside the cylinder. The resulting difference in pressure allows the suction valve to open. Refrigerant then flows into the cylinder. When piston moves upward on discharge stroke, the pressure closes intake valve and forces the refrigerant out discharge valve. 8. **SLIDE 8 EXPLAIN** Vane Compressors
	9. **SLIDE 9 EXPLAIN FIGURE 3–7** As the rotor turns in a counterclockwise direction, the vanes move in and out to follow the contour of the housing. This action forms chambers that get larger at the suction ports and smaller at the discharge ports. Evaporator pressure fills the chambers as they get larger, and the reducing size forces the refrigerant into the high side
	**Vane Compressor (View) (Download)**
	10. **SLIDE 10 EXPLAIN** Scroll Compressors
	11. **SLIDE 11 EXPLAIN FIGURE 3–8** As the orbital scroll moves, it forms pumping chambers/gas pockets that start at the suction port and forces the refrigerant to the discharge port at the center.
	**SCROLL COMPRESSOR**
	12. **SLIDE 12 EXPLAIN** Compressor Clutches
	CLUTCH APPLICATION **COMPRESSOR CLUTCH CONTROL** **COMPRESSOR CLUTCH RPM SENSOR**

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	13. **SLIDE 13 EXPLAIN Figure 3–9** The electromagnetic clutch assembly includes the clutch field coil, where the magnetic field is created; the clutch pulley, which rides on the pulley bearing; and the clutch hub, which is attached to the input shaft of the compressor. The small shims are added or deleted as needed to adjust the air gap between the clutch hub and the clutch pulley. **DISCUSSION: DISCUSS HOW AN ELECTROMAGNETIC CLUTCH WORKS TO CONTROL THE COMPRESSOR** 14. **SLIDE 14 EXPLAIN Figure 3–16** Check service information for exact purpose & function of each of switches located on the compressor because they can vary according to make, model, and year of manufacture of vehicle & can also vary as to what compressor is used 15. **SLIDES 15-16 EXPLAIN** Valves and Switches 17. **SLIDE 17 EXPLAIN Figure 3–17** Typical air-conditioning pressure switches. Check service information to determine the purpose and function of each switch for the vehicle being inspected. 18. **SLIDE 18 EXPLAIN** Compressor Valves and Switches **DISCUSSION: ASK STUDENTS TO DESCRIBE 3 TYPES OF SWITCHES THAT MUST BE FUNCTIONAL TO ENGAGE COMPRESSOR CLUTCH AND HOW EACH FUNCTIONS.** **ANY TIME YOU REPLACE A COMPRESSOR DUE TO MECHANICAL PROBLEMS, FLUSHING AC SYSTEM IS RECOMMENDED. THIS HELPS ENSURE THAT NEW COMPRESSOR IS FREE FROM METAL DEBRIS THAT COULD SHORTEN ITS LIFE.** **NATEF MAST TASK A7A2 RESEARCH APPLICABLE VEHICLE & SERVICE INFORMATION, VEHICLE SERVICE HISTORY, SERVICE PRECAUTIONS, & TECHNICAL SERVICE BULLETINS.** **NATEF MAST TASK A7B4 IDENTIFY HYBRID VEHICLE A/C SYSTEM ELECTRICAL CIRCUITS AND THE SERVICE/SAFETY PRECAUTIONS.** 19. **SLIDES 19-25 EXPLAIN** A/C Compressor Diagnosis and Service

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	DEMONSTRATION: SHOW STUDENTS HOW TO PERFORM THE RADIO POP TRICK. **RADIO "POP" TRICK** **DEMONSTRATION: SHOW A/C COMPRESSOR ELECTROMAGNETIC CLUTCH & DESCRIBE ITS PURPOSE & FUNCTION. SHOW CLUTCH ENGAGING. EXPLAIN HOW DIODE PREVENTS VOLTAGE SPIKE THAT COULD CAUSE DAMAGE TO PCM.** **26. SLIDE 26 EXPLAIN Figure 3–18** After removing retaining nut from A/C compressor shaft, a special puller is used to remove the compressor clutch plate (hub). **27. SLIDE 27 EXPLAIN Figure 3–19a** pulley assembly removed using a special puller on Dodge truck. **19b.** The pulley assembly includes the bearing which may or may not be a replaceable part, depending on the compressor. **NATEF MAST TASK A7B1 INSPECT AND REPLACE A/C COMPRESSOR DRIVE BELTS, PULLEYS, AND TENSIONERS; DETERMINE NECESSARY ACTION. P1** **NATEF MAST TASK A7B2 INSPECT, TEST, SERVICE OR REPLACE A/C COMPRESSOR CLUTCH COMPONENTS AND/OR ASSEMBLY; CHECK COMPRESSOR CLUTCH AIR GAP; ADJUST AS NEEDED. P2** **NATEF MAST TASK A7B3 REMOVE, INSPECT, AND REINSTALL A/C COMPRESSOR AND MOUNTINGS; DETERMINE RECOMMENDED OIL QUANTITY. P2** **NATEF MAST TASK A7D2: DIAGNOSE A/C COMPRESSOR CLUTCH CONTROL SYSTEMS; DETERMINE NECESSARY ACTION. P2** **28. SLIDE 28 EXPLAIN** A/C Compressor Diagnosis and Service

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 	**29. SLIDE 29 EXPLAIN** Replacement Compressors **30. SLIDE 30 EXPLAIN FIGURE 3–29** The decal on this compressor identifies the type (SDB709) and the serial number. Note also that it uses a seven-groove, multi-V clutch, four mounting bolts, and vertical-pad service ports at the side. **31. SLIDE 31 EXPLAIN FIGURE 3–30** (a) The oil should be drained from the old compressor (top left); rotate the compressor shaft and the compressor to help the draining. (b) Drain the oil from the new compressor (top right). (c) Pour the same amount of oil drained from the old compressor or the amount specified by the compressor manufacturer of the proper oil into the new compressor (lower). **32. SLIDE 32 EXPLAIN Summary**