













Automotive Heating and Air Conditioning, 7e

Chapter 15 A/C System Diagnosis and Repair

Opening Your Class

KEY ELEMENT	EXAMPLES
Introduce Content	This course or class covers operation and service of Automotive Heating and Air Conditioning, 7e . 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. Prepare for the ASE Heating and Air Conditioning (A7) certification test content area "A" (A/C System Service, Diagnosis and Repair).2. Describe the eight-step diagnostic procedure for an A/C system.3. Explain how to perform a visual inspection of an A/C system.4. Discuss how to perform an A/C performance test.5. Describe how to determine the root cause of the problem in an A/C system.
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	Ch 15 A/C System Diagnosis and Repair
       <p>QUESTION</p>	<p>1. SLIDE 1 A/C SYSTEM DIAGNOSIS & REPAIR</p> <p>2. SLIDES 2-3 EXPLAIN OBJECTIVES</p> <p>Check for ADDITIONAL VIDEOS & ANIMATIONS @ http://www.jameshalderman.com/</p> <p>WEB SITE IS CONSTANTLY UPDATED</p> <p>4. SLIDES 4-5 EXPLAIN Eight-step Diagnostic Procedure for an A/C system</p> <p><u>DISCUSSION:</u> ASK STUDENTS TO DISCUSS HVAC DIAGNOSTIC PROCEDURES. HAVE THEM EXPLAIN WHY ALL THE STEPS ARE NECESSARY.</p>
	<p>6. SLIDES 6-9 EXPLAIN Visual Inspection of A/C System</p> <p>10. SLIDE 10 EXPLAIN Figure 15–1 A visual inspection checks all of the visible, underhood components for possible wear or damage. The underdash components are checked for noise and proper airflow.</p> <p>12. SLIDES 12-15 EXPLAIN Visual Inspection of A/C System</p>
	<p><u>DEMONSTRATION:</u> POINT OUT HIGH-PRESSURE & LOW-PRESSURE HOSES AND LINES IN A HVAC SYSTEM AND DISCUSS THEIR SIGNIFICANCE.</p>
	<p><u>DEMONSTRATION:</u> SHOW STUDENTS HOW TO USE A PYROMETER TO MEASURE TEMPERATURE OF UPPER RADIATOR HOSE & AREA AROUND THERMOSTAT HOUSING.</p>
	<p>16. SLIDE 16 EXPLAIN Figure 15–2 When a system is operating properly, the suction line to the compressor should be cool, and the discharge line should be hot to very hot. The liquid lines should also be hot.</p>
	<p><u>DEMONSTRATION:</u> SHOW STUDENTS HOW TO USE AN INFRARED THERMOMETER TO MEASURE TEMPERATURE OF A/C INLET & OULET LINES</p>



ANIMATION: SERVICE VALVE ID

Service Fitting and Manual Coupler

Service Fitting and Quick-Connect Coupler

- 17. SLIDES 17-19 EXPLAIN Performing an A/C Performance Test
- 20. SLIDE 20 EXPLAIN Figure 15-6 temperature and humidity gauge is a useful tool for A/C. The higher the relative humidity, the more difficult for air-conditioning system to lower temperature inside vehicle

DISCUSSION: DISCUSS CAUSE OF LOW READINGS FOR BOTH LOW SIDE & HIGH-SIDE PRESSURE? WHAT ABOUT HIGH READINGS FOR BOTH LOW-SIDE & HIGH-SIDE PRESSURE?
















- 21. SLIDES 21-23 EXPLAIN Determine the Root Cause of the Problem in an A/C System





OPTIONAL HANDS-ON TASK: STUDENTS CREATE A CHART FOR SYMPTOMS OF LOW SIDE & HIGH-SIDE PRESSURE

Low-Side Pressure	High-Side Pressure	Causes
25-35 psi	170 - 200	Normal
LOW	LOW	Low refrigerant charge
LOW	LOW	Obstruction in the suction line
LOW	LOW	Clogged orifice tube
LOW	LOW	TXV valve stuck closed
LOW	LOW	Restricted line from condenser to evaporator
LOW	HIGH	Restricted evaporator airflow
HIGH	LOW	Internal compressor damage
HIGH	HIGH	Refrigerant overcharge
HIGH	HIGH	Restricted condenser airflow
HIGH	HIGH	High engine coolant temperature
HIGH	HIGH	TXV valve stuck open
HIGH	HIGH	Air or moisture in the refrigerant

- 24. SLIDE 24 EXPLAIN Figure 15-12 A black light being used to look for refrigerant leaks after a fluorescent dye was injected into or added to the system.

DISCUSSION: ASK STUDENTS TO DISCUSS METHODS FOR DETECTING LEAKS IN AN A/C SYSTEM.

ICONS	Ch 15 A/C System Diagnosis and Repair
	<p>HANDS-ON TASK: HAVE STUDENTS USE FLUORESCENT DYE AND A BLACK LIGHT TO DETECT REFRIGERANT LEAKS</p>
	<p>DEMONSTRATION: SHOW STUDENTS HOW TO PERFORM FIRE EXTINGUISHER TEST TO CHECK FOR A FAULTY EXPANSION VALVE IN AN A/C</p>
	<p>DISCUSSION: ASK STUDENTS TO TALK ABOUT HOW TO <u>REPAIR MOST COMMON REFRIGERANT LEAKS</u>. WHAT PARTS SHOULD ALWAYS BE REPLACED?</p>
	<p>25. SLIDE 25 EXPLAIN Determine the Root Cause of the Problem in an A/C System</p>
 	<p>NATEF MASK TASK A7A1 IDENTIFY AND INTERPRET HEATING AND AIR CONDITIONING PROBLEMS; DETERMINE NECESSARY ACTION. P1</p>
 	<p>NATEF MASK TASK A7A2 RESEARCH APPLICABLE VEHICLE AND SERVICE INFORMATION, VEHICLE SERVICE HISTORY, SERVICE PRECAUTIONS, AND TECHNICAL SERVICE BULLETINS. P1</p>
 	<p>NATEF MASK TASK A7A3 PERFORMANCE TEST A/C SYSTEM; IDENTIFY PROBLEMS. P1</p>
 	<p>NATEF MASK TASK A7A4 IDENTIFY ABNORMAL OPERATING NOISES IN THE A/C SYSTEM; DETERMINE NECESSARY ACTION. P1</p>
 	<p>NATEF MASK TASK A7A5: IDENTIFY REFRIGERANT TYPE; SELECT AND CONNECT PROPER GAUGE SET; RECORD TEMPERATURE AND PRESSURE READINGS. P1</p>
 	<p>NATEF MASK TASK A7A6: LEAK TEST A/C SYSTEM; DETERMINE NECESSARY ACTION. P1</p>

ICONS	Ch 15 A/C System Diagnosis and Repair
	<p><u>NATEF MASK TASK A7A7:</u> INSPECT CONDITION OF REFRIGERANT OIL REMOVED FROM A/C SYSTEM; DETERMINE NECESSARY ACTION. P2</p>
	<p><u>NATEF MASK TASK A7A8:</u> DETERMINE RECOMMENDED OIL AND OIL CAPACITY FOR SYSTEM APPLICATION. P1</p>
	<p><u>NATEF MASK TASK A7A9:</u> USING A SCAN TOOL, OBSERVE AND RECORD RELATED HVAC DATA AND TROUBLE CODES. P3</p>
	<p>26. SLIDES 26-29 EXPLAIN Summary</p>