

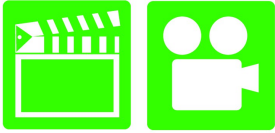
# Advanced Automotive Electricity & Electronics

## Chapter 20 Automatic Temperature Control Systems

### Opening Your Class

KEY ELEMENT	EXAMPLES
<b>Introduce Content</b>	This course or class covers operation and service of <b>Advanced Automotive Electricity and Electronics Systems</b> . It correlates material to task lists specified by ASE and NATEF.
<b>Motivate Learners</b>	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.
<b>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.</b>	Explain the chapter learning objectives to the students. <ol style="list-style-type: none"><li>1. Explain the operation of an automatic A/C system</li><li>2. Identify the type of HVAC system being used on a vehicle.</li><li>3. Describe how dual-climate systems work.</li><li>4. Discuss vacuum and electric motor controls.</li></ol>
<b>Establish the Mood or Climate</b>	Provide a <i>WELCOME</i> , Avoid put downs and bad jokes.
<b>Complete Essentials</b>	Restrooms, breaks, registration, tests, etc.
<b>Clarify and Establish Knowledge Base</b>	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



## Ch20 Auto Temperature Control Systems

### 1. SLIDE 1 CH20 AUTOMATIC TEMPERATURE CONTROL SYSTEMS

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

2. **SLIDE 2 EXPLAIN** Automatic Temperature Control System
3. **SLIDE 3 EXPLAIN FIGURE 20.1** automatic climatic control display is part of the navigation screen on this vehicle.
4. **SLIDE 4 EXPLAIN** Sensors
5. **SLIDE 5 EXPLAIN FIGURE 20.2** outside air temperature sensor is mounted on the radiator core support in front of the A/C condenser on this vehicle.
6. **SLIDE 6 EXPLAIN FIGURE 20.3** The outside air temperature is displayed on the navigation screen on this vehicle and uses the information from the outside air temperature sensor

**DEMONSTRATION: SHOW STUDENTS AN EXAMPLE OF A SENSOR FROM AN AUTOMATIC A/C SYSTEM AND DESCRIBE ITS FUNCTION.**

**DISCUSSION: BREAK CLASS INTO 2 GROUPS. HAVE HALF CLASS TEST THE OTHER ON THE TYPICAL SETTINGS FOR HEATING AND AIR CONDITIONING; THEN REVERSE GROUPS TO TEST SETTINGS FOR VENTILATION & DEFOGGING OR DEFROSTING THE INSIDE FRONT WINDSHIELD.**  
**DISCUSSION: ASK STUDENTS TO TALK ABOUT THE FUNCTIONS OF ALL THE SENSORS RELATING TO AUTOMATIC A/C SYSTEMS. ASK STUDENTS TO IDENTIFY WHERE EACH SENSOR IS LOCATED AND WHAT ITS FUNCTION IS.**

7. **SLIDE 7 EXPLAIN FIGURE 20.4** The airflow from the blower causes airflow to flow past the in-vehicle temperature sensor.
8. **SLIDE 8 EXPLAIN FIGURE 20.5** Sun load sensors are usually located at the top of the instrument panel

## ICONS

## Ch20 Auto Temperature Control Systems



9. SLIDE 9 **EXPLAIN** Sensors

10. SLIDE 10 **EXPLAIN FIGURE 20.6** The engine coolant temperature sensor is usually located near the engine thermostat so it can accurately measure the temperature of the coolant.

11. SLIDE 11 **EXPLAIN FIGURE 20.7** Some automatic HVAC system use the information from factory navigation system to fine tune interior temperature and airflow needs based on location and direction of travel.

12. SLIDE 12 **EXPLAIN CHART 20.1** Sample refrigerant system pressures and possible causes as shown from the pressure sensors and displayed on a scan tool. Check service information for the exact procedures to follow if the pressures are not correct.



**HANDS-ON TASK: ASK STUDENTS TO GO TO A LAB VEHICLE EQUIPPED WITH AUTO A/C & IDENTIFY WHERE EACH SENSOR IS LOCATED AND LABEL IT WITH MASKING TAPE OR A STICKY NOTE.**



**DISCUSSION: ASK STUDENTS TO TALK ABOUT THE AIRFLOW MANAGEMENT COMPONENTS OF AN HVAC SYSTEM. UNDER WHAT CONDITIONS DOES THE SYSTEM PROVIDE AIRFLOW?**

13. SLIDE 13 **EXPLAIN** Airflow Control

14. SLIDE 14 **EXPLAIN FIGURE 20.8** The three major portions of the A/C and heat system are air inlet, plenum, and air distribution. The shaded portions show the paths of the four control doors

15. SLIDES 15-17 **EXPLAIN** Actuators











18. SLIDE 18 **EXPLAIN FIGURE 20.9** Three electric actuators can be easily seen on this demonstration unit. However, accessing these actuators in a vehicle can be difficult.

19. SLIDE 19 **EXPLAIN FIGURE 20.10** The feedback circuit signals the AC control unit with the blend door position.



**FAULTY BLOWER MOTOR OPERATION CAN OFTEN BE TRACED TO A BAD BLOWER MOTOR RESISTOR.**



ICONS	Ch20 Auto Temperature Control Systems
	<p><b>DEMONSTRATION: SHOW AN ACTUATOR FROM AN AUTOMOTIVE A/C SYSTEM AND DESCRIBE ITS FUNCTION</b></p>
	<p><b>DISCUSSION: ASK STUDENTS TO DISCUSS THE TYPES OF ACTUATORS FOUND IN AUTOMOTIVE A/C SYSTEMS. STUDENTS SHOULD DESCRIBE WHAT EACH ACTUATOR DOES &amp; PROVIDE AN EXAMPLE OF EACH USE.</b></p>
	<p><b>DISCUSSION: ASK STUDENTS TO DISCUSS THE ELECTRONIC CONTROLS OF AN AUTOMATIC A/C SYSTEM. WHICH ARE INPUT AND WHICH ARE OUTPUT CONTROLS?</b></p>
	<p>20. SLIDE 20 <b>EXPLAIN</b> FIGURE 20.11 typical HVAC system showing some of the airflow door locations.</p>
	<p>21. SLIDE 21 <b>EXPLAIN</b> FIGURE 20.12 dual-climate control system showing the airflow and how it splits.</p> <p>22. SLIDES 22-23 <b>EXPLAIN</b> Automatic HVAC Controls</p> <p>24. SLIDE 24 <b>EXPLAIN</b> FREQUENTLY ASKED QUESTION</p>
	<p>25. SLIDE 25 <b>EXPLAIN</b> FIGURE 20.13 A block diagram showing the inputs to the electronic control assembly and the outputs; note that some of the outputs have feedback to the ECM.</p>
	<p>26. SLIDE 20 <b>EXPLAIN</b> Air Filtration</p> <p>27. SLIDE 27 <b>EXPLAIN</b> FIGURE 20.14 cabin filter can be accessed either through the glove compartment or under the hood on most vehicles.</p>
	<p>28. SLIDE 28 <b>EXPLAIN</b> REAL WORLD FIX</p>
	<p>29. SLIDE 29 <b>EXPLAIN</b> Automatic Climatic Control Diagnosis</p>
	<p><b>HANDS-ON TASK: HAVE STUDENTS LABEL ELECTRONIC CONTROLS OF AN AUTOMATIC A/C SYSTEM &amp; SHOW WHICH ARE INPUT AND OUTPUT CONTROLS? USE STICKY NOTES OR MASKING TAPE</b></p>
	<p>30. SLIDE 30 <b>EXPLAIN</b> FREQUENTLY ASKED</p>

**ICONS****Ch20 Auto Temperature Control Systems****QUESTION****VIDEO: AUTOMATIC A/C DIAGNOSIS**  
**WWW.MYAUTOMOTIVELAB.COM**

[HTTP://MEDIA.PEARSONCMG.COM/PH/CHET/CHET\\_MYLABS/AKAMAI/TEMPLATE/VIDEO640X480.PHP?TITLE=DIAGNOSING%20AUTOMATIC%20TEMPERATURE%20CONTROL&CLIP=PANDC/CHET/2012/AUTOMOTIVE/TEST\\_READINESS\\_A7/A7\\_CD\\_T15.MOV&CAPTION=CHET/CHET\\_MYLABS/AKAMAI/2012/AUTOMOTIVE/TEST\\_READINESS\\_A7/XML/A7\\_CD\\_T15.XML](http://media.pearsoncmg.com/ph/chet/chet_mylabs/akamai/template/video640x480.php?title=diagnosing%20automatic%20temperature%20control&clip=pandc/chet/2012/automotive/test_readiness_a7/a7_cd_t15.mov&caption=chet/chet_mylabs/akamai/2012/automotive/test_readiness_a7/xml/a7_cd_t15.xml)

31. **SLIDE 31 EXPLAIN CHART 20.2** Sample automatic climatic control diagnostic trouble codes.
32. **SLIDE 32 EXPLAIN FIGURE 20.15** A TECH 2 scan tool is the factory scan tool used on General Motors vehicles.
33. **SLIDE 33 EXPLAIN FIGURE 20.16** An OTC Genisys being used to troubleshoot a vehicle. This scan tool can be used on most makes and models of vehicles and is capable of diagnosing other computer systems in the vehicles such as the automatic temperature control system as well as the antilock braking system (ABS) and airbag systems.
34. **SLIDE 34 EXPLAIN CHART 20.3** Typical sensors and values that may be displayed on a scan tool. Check service information for the exact specifications for the vehicle being serviced.
35. **SLIDE 35 EXPLAIN Automatic Climatic Control Diagnosis**
36. **SLIDE 36 EXPLAIN NOTE**

**ON-VEHICLE NATEF TASK: RESEARCH AUTO/DUAL CLIMATE A/C VEHICLE AND SERVICE INFORMATION.**