

# HVAC Systems

## Student/intern information:

Name \_\_\_\_\_ Date \_\_\_\_\_ Class \_\_\_\_\_

## Vehicle used for this activity:

Year \_\_\_\_\_ Make \_\_\_\_\_ Model \_\_\_\_\_

Odometer \_\_\_\_\_ VIN \_\_\_\_\_

Learning Objective/Task (General Electrical Systems)	2007 NATEF Reference Number	2007 NATEF Priority Level
<ul style="list-style-type: none"> <li>Verify the need for service or repair of HVAC systems based on unusual operating noises; determine needed action.</li> </ul>	6A1	P-1
<ul style="list-style-type: none"> <li>Verify the need for service or repair of HVAC systems based on unusual visual, smell, and touch conditions; determine needed action.</li> </ul>	6A2	P-1
<ul style="list-style-type: none"> <li>Identify system type and components (cycling clutch orifice tube - CCOT, expansion valve) and conduct performance test(s) on HVAC systems; determine needed action.</li> </ul>	6A3	P-1
<ul style="list-style-type: none"> <li>Retrieve diagnostic codes; determine needed action.</li> </ul>	6A4	P-3

Time off \_\_\_\_\_

Time on \_\_\_\_\_

Total time \_\_\_\_\_

### Recommended Resource Materials

- CDX Automotive program
- CDX eTextbook
- Technical service bulletins, shop manuals, and any other information applicable to the specific vehicle or components
- Class notes

### Materials Required

- Vehicles or simulators with HVAC faults
- PC based software and/or data scan tools.
- Vehicle manufacturer's workshop manual including schematic wiring diagrams
- HVAC systems with orifice tubes and expansion valves
- Specialist refrigeration tools, thermometers, manifold set, refrigerant recycler, and vacuum pump
- HVAC parts and refrigerant
- Manufacturer-specific tools depending on the concern

### Some Safety Issues to Consider

- You may be required to handle refrigerant. Use extreme caution: refrigerant is pressurized and very cold. Always wear eye protection and appropriate clothing when working with refrigerant. Never inhale refrigerant.
- Do not release refrigerant to the atmosphere; always use a recycling system to reclaim refrigerant.
- Activities may require test driving the vehicle on the school grounds or on a hoist, both of which carry severe risks. Attempt this task only with full permission from your supervisor/instructor and follow all the guidelines exactly.
- Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with federal, state, and local regulations.
- Always wear the correct protective eyewear and clothing and use the appropriate safety equipment, as well as fender covers, seat protectors, and floor mat protectors.

- Make sure you understand and observe all legislative and personal safety procedures when carrying out practical assignments. If you are unsure of what these are, ask your supervisor/instructor.

### Performance Standard

**0–No exposure:** No information or practice provided during the program; complete training required

**1–Exposure only:** General information provided with no practice time; close supervision needed; additional training required

**2–Limited practice:** Has practiced job during training program; additional training required to develop skill

**3–Moderately skilled:** Has performed job independently during training program; limited additional training may be required

**4–Skilled:** Can perform job independently with no additional training

**▶ TASK** Verify the need for service or repair of HVAC systems based on unusual operating noises; determine needed action. 6A1

1. Research causes of unusual operating noises with HVAC systems and list them below:

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2. List the customer concern:

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3. Examine the vehicle/simulator and determine the need for service or repair based on unusual operating noises. List the unusual operating noises and possible faults:

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4. Write a short description of the purpose and operation of the suspected component(s):

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5. Determine and list any necessary action(s):

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Time off \_\_\_\_\_

Time on \_\_\_\_\_

Total time \_\_\_\_\_

6. Return the vehicle to beginning condition and return any tools that you may have used to their proper locations.
7. Discuss the findings with the instructor.

**Performance Rating**

**2007 NATEF Reference Number: 6A1**

0

1

2

3

4

Supervisor/instructor signature \_\_\_\_\_ Date \_\_\_\_\_

**▶ TASK** Verify the need for service or repair of HVAC systems based on unusual visual, smell, and touch conditions; determine needed action.

**6A2**

1. Research causes of unusual visual, smell and touch conditions with HVAC systems and list them below:

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2. List the customer concern:

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3. Examine the vehicle/simulator and determine the need for service or repair based on unusual visual, smell, and touch conditions. List the unusual visual, smell, and touch conditions and possible faults:

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4. Write a short description of the purpose and operation of the suspected component(s):

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5. Determine and list any necessary action(s):

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Time off \_\_\_\_\_

Time on \_\_\_\_\_

Total time \_\_\_\_\_

6. Return the vehicle to beginning condition and return any tools that you may have used to their proper locations.
7. Discuss the findings with the instructor.

**Performance Rating**

**2007 NATEF Reference Number: 6A2**

0

1

2

3

4

Supervisor/instructor signature \_\_\_\_\_ Date \_\_\_\_\_

**▶ TASK** Identify system type and components (cycling clutch orifice tube - CCOT, expansion valve) and conduct performance test(s) on HVAC systems; determine needed action.

**6A3**

1. Research causes of unusual visual, smell and touch conditions with HVAC systems and list them below:
  - a. Cycling clutch orifice tube CCOT systems:

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- b. Expansion valve systems:

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2. Have your supervisor/instructor verify your research.  
Supervisor/instructor's initials: \_\_\_\_\_

3. Ask your supervisor for a vehicle to check. Install the necessary test equipment, set the parking brake, and lift the cabin or bonnet as necessary.

4. Test the system to determine system performance. List your observations here:

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5. Compare your results to the manufacturer's specifications. List your observations:

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Time off \_\_\_\_\_

Time on \_\_\_\_\_

Total time \_\_\_\_\_

6. Determine any necessary action(s):

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\_\_\_\_\_  
\_\_\_\_\_  
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7. Return the vehicle to beginning condition and return any tools that you may have used to their proper locations.

8. Discuss the findings with the instructor.

Performance Rating

2007 NATEF Reference Number: 6A3

0

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Supervisor/instructor signature \_\_\_\_\_ Date \_\_\_\_\_

▶ **TASK** Retrieve diagnostic codes; determine needed action.

6A4

1. Research how to retrieve diagnostic codes. List below the procedure and type of PC based software and/or data scan tools that will be used for the vehicle:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

2. Connect the PC-based software and/or data scan tool to the vehicle's Data Link Connector (DLC), and retrieve any Diagnostic Trouble Codes (DTC). Using the process described in the flow chart as a guide, undertake the test and list any DTCs here: **((INSERT DTC TROUBLE CODE FLOW CHART HERE))**

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

3. Research the DTCs for this vehicle in the appropriate service manual.

a. List the DTC code descriptions for each code stored:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

b. Print out the procedure for diagnosing each code and attach a copy to this sheet.

4. Have your supervisor/instructor verify satisfactory completion of this section of the procedure.

Supervisor/instructor's initials: \_\_\_\_\_

Time off \_\_\_\_\_

Time on \_\_\_\_\_

Total time \_\_\_\_\_

5. Follow the vehicle service manual procedure to diagnose the specific cause of the DTC and use the PC-based software and/or data scan tool to assist in the diagnosis of the problem. List the data related to this DTC here:

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6. Compare this data to the service manual specifications and list your interpretations:

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7. Determine any necessary action(s):

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8. Have your supervisor/instructor verify satisfactory completion of this section of the procedure and if instructed carry out any rectification required.

Supervisor/instructor's initials: \_\_\_\_\_

9. Return the vehicle to beginning condition and return any tools that you may have used to their proper locations.

10. Discuss the findings with the instructor.

**Performance Rating**

**2007 NATEF Reference Number: 6A4**

**0**

**1**

**2**

**3**

**4**

Supervisor/instructor signature \_\_\_\_\_ Date \_\_\_\_\_