

Operating Systems and Related Controls–Electrical

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
• Identify causes of HVAC electrical control system problems; determine needed action.	6D1-1	P-1
• Inspect and test HVAC blower motors, resistors, switches, relays, modules, wiring, and protection devices; determine needed action.	6D1-2	P-2
• Inspect and test A/C compressor clutch relays, modules, wiring, sensors, switches, diodes, and protection devices; determine needed action.	6D1-3	P-2
• Inspect and test A/C related electronic engine control systems; determine needed action.	6D1-4	P-2
• Inspect and test engine cooling/condenser fan motors, relays, modules, switches, sensors, wiring, and protection devices; determine needed action.	6D1-5	P-2
• Inspect and test electric actuator motors, relays/modules, switches, sensors, wiring, and protection devices; determine needed action.	6D1-6	P-3
• Inspect and test HVAC system electrical/electronic control panel assemblies; determine needed action.	6D1-7	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 electrical faults
- Vehicle manufacturer's workshop manual including schematic wiring diagrams
- DVOM, ammeter, current clamp, PC-based software, and/or data scan tools
- HVAC Electrical spare parts including, fuses, circuit breakers, switches, relays, wires, and connectors
- Manufacturer-specific tools depending on the concern
- Vehicle lifting equipment if applicable

Some Safety Issues to Consider

- Activities require you to measure electrical values. Always ensure the instructor/supervisor checks test instrument connections prior to connecting power or taking measurements.
- Activities will require you to work with the HVAC system. It will contain refrigerant under pressure. Show caution around high pressure refrigerant hoses.
- You may be required to handle refrigerant. Use extreme caution: refrigerant is pressurized 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 Identify causes of HVAC electrical control system problems; determine needed action.

6D1-1

1. Research causes of HVAC electrical control system problems and list them below:

2. Ask your supervisor/instructor for a vehicle or simulator to check.
3. Examine the vehicle/simulator and operate all the electrical controls for the HVAC system to determine fault(s) with HVAC electrical control system in the A/C system.
4. List identified problems:

5. Using the appropriate service information, determine the steps necessary for testing the component(s):

Time off _____

Time on _____

Total time _____

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

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

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

9. Discuss the findings with the instructor.

Performance Rating

2007 NATEF Reference Number: 6D1-1

0

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Supervisor/instructor signature _____ Date _____

▶ TASK Inspect and test HVAC blower motors, resistors, switches, relays, modules, wiring, and protection devices; determine needed action. **6D1-2**

- 1. Research how to inspect and test HVAC blower motors, resistors, switches, relays, modules, wiring, and protection devices and list your findings below:
 - a. Inspect and test blower motors:

b. Inspect and test resistors:

c. Inspect and test switches:

Time off _____

Time on _____

Total time _____

d. Inspect and test modules:

e. Inspect and test wiring:

f. Inspect and test protection devices:

2. Ask your supervisor/instructor for a vehicle or simulator to check.

3. Using the appropriate service information, inspect and test HVAC blower motors, resistors, switches, relays, modules, wiring, and protection devices.

4. List the results of conducting your inspection and tests:

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

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

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: 6D1-2

0

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Supervisor/instructor signature _____ Date _____

▶ TASK Inspect and test A/C compressor clutch relays, modules, wiring, sensors, switches, diodes, and protection devices; determine needed action.

6D1-3

1. Research how to inspect and test A/C compressor clutch relays, modules, wiring, sensors, switches, diodes, and protection devices in an appropriate service information for the vehicle you are working on and list the findings below:

a. A/C compressor clutch relays:

b. Modules:

c. Wiring:

d. Sensors:

e. Diodes:

Time off _____

Time on _____

Total time _____

f. Protection devices:

2. Check your documented procedures with your supervisor/instructor.

Supervisor/instructor's initials: _____

3. Using the appropriate service information, inspect and test A/C compressor clutch relays, modules, wiring, sensors, switches, diodes, and protection devices.

4. List the results of your inspection and tests:

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

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: 6D1-3

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Supervisor/instructor signature _____ Date _____

▶ TASK Inspect and test A/C related electronic engine control systems; determine needed action.

6D1-4

1. Research how to inspect and test A/C related electronic engine control systems and list findings below:

Time off _____

Time on _____

Total time _____

2. Ask your supervisor/instructor for a vehicle or simulator to check.
3. Examine the vehicle/simulator; inspect and test A/C related electronic engine control.
4. List identified problems:

5. Using the appropriate service information, determine the steps necessary for testing the component(s):

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

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

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

9. Discuss the findings with the instructor.

Performance Rating

2007 NATEF Reference Number: 6D1-4

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Supervisor/instructor signature _____ Date _____

▶ TASK Inspect and test engine cooling/condenser fan motors, relays, modules, switches, sensors, wiring, and protection devices; determine needed action.

6D1-5

1. Research how to inspect and test engine cooling/condenser fan motors, relays, modules, switches, sensors, wiring, and protection devices in an appropriate service information for the vehicle you are working on and list the results below:

a. Cooling/condenser fan motors:

b. Relays:

c. Modules:

d. Switches:

e. Sensors:

f. Wiring:

g. Protection devices:

2. Check your documented procedures with your supervisor/instructor.

Supervisor/instructor's initials: _____

Time off _____

Time on _____

Total time _____

3. Using the appropriate service information, inspect and test engine cooling/condenser fan motors, relays, modules, switches, sensors, wiring, and protection devices.
4. List the results of conducting your inspection and tests:

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

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: 6D1-5

0	1	2	3	4
Supervisor/instructor signature _____				Date _____

▶ TASK Inspect and test electric actuator motors, relays/modules, switches, sensors, wiring, and protection devices; determine needed action. **6D1-6**

1. Research how to inspect and test electric actuator motors, relays/modules, switches, sensors, wiring, and protection devices in an appropriate service information for the vehicle you are working on and list the results below:

a. Electric actuator motors:

b. Relays/modules:

Time off _____

Time on _____

Total time _____

c. Switches:

d. Sensors:

e. Wiring:

f. Protection devices:

2. Check your documented procedures with your supervisor/instructor.

Supervisor/instructor's initials: _____

3. Using the appropriate service information, inspect and test electric actuator motors, relays/modules, switches, sensors, wiring, and protection devices.

4. List the results of conducting your inspection and tests:

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

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: 6D1-6

0

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Supervisor/instructor signature _____ Date _____

▶ TASK Inspect and test HVAC system electrical/electronic control panel assemblies; determine needed action.

6D1-7

Time off _____

Time on _____

Total time _____

1. Research how to inspect and test HVAC system electrical/electronic control panel assemblies in an appropriate service information for the vehicle you are working on and list the results below:

2. Check your documented procedures with your supervisor/instructor.
Supervisor/instructor's initials: _____

3. Using the appropriate service information, inspect and test HVAC system electrical/electronic control panel assemblies.

4. List the results of conducting your inspection and tests:

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

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: 6D1-7

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Supervisor/instructor signature _____ Date _____