

Heating and Engine Cooling 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"> Identify causes of outlet air temperature control problems in the HVAC system; determine needed action. 	6C1	P-1
<ul style="list-style-type: none"> Identify window fogging problems; determine needed action. 	6C2	P-2
<ul style="list-style-type: none"> Perform engine cooling system tests for leaks, protection level, contamination, coolant level, coolant type, temperature, and conditioner concentration; determine needed action. 	6C3	P-1
<ul style="list-style-type: none"> Inspect engine cooling and heating system hoses, lines, and clamps; determine needed action. 	6C4	P-1
<ul style="list-style-type: none"> Inspect and test radiator, pressure cap, and coolant recovery system (surge tank); determine needed action. 	6C5	P-1
<ul style="list-style-type: none"> Inspect water pump for leaks and bearing play; determine needed action. 	6C6	P-2
<ul style="list-style-type: none"> Inspect and test thermostats, by-passes, housings, and seals; determine needed repairs. 	6C7	P-2
<ul style="list-style-type: none"> Recover, flush, and refill with recommended coolant/additive package; bleed cooling system. 	6C8	P-1
<ul style="list-style-type: none"> Inspect thermostatic cooling fan system (hydraulic, pneumatic, and electronic) and fan shroud; replace as needed. 	6C9	P-2
<ul style="list-style-type: none"> Inspect and test heating system coolant control valve(s) and manual shut-off valves; determine needed action. 	6C10	P-2
<ul style="list-style-type: none"> Inspect and flush heater core; determine needed action. 	6C11	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 cooling system faults/problems
- Vehicle manufacturer's workshop manual
- Cooling system spare parts including coolant, clamps, hoses, water pump, seals, and valves
- Manufacturer-specific tools depending on the concern
- Coolant recovery system

Some Safety Issues to Consider

- Activities require you work on the vehicle cooling system. The cooling system operates under pressure and with high temperatures. Never remove or release the pressure cap or hoses while the radiator is hot.
- 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 outlet air temperature control problems in the HVAC system; determine needed action.

6C1

1. Research causes of outlet air temperature control problems in the HVAC system and list them below:

2. Examine the vehicle/simulator and determine problems with outlet air temperature control.

3. List the customer concern:

Time off _____

Time on _____

Total time _____

4. Using the appropriate service information, determine the steps necessary for testing air outlet temperature control:

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: 6C1

0

1

2

3

4

Supervisor/instructor signature _____ Date _____

▶ TASK Identify causes of outlet air temperature control problems in the HVAC system; determine needed action.

6C2

1. Research causes of window fogging problems in the HVAC system and list them below:

2. Examine the vehicle/simulator and identify window fogging problems and list possible causes:

Time off _____

Time on _____

Total time _____

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

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

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

6. Discuss the findings with the instructor.

Performance Rating

2007 NATEF Reference Number: 6C2

0

1

2

3

4

Supervisor/instructor signature _____ Date _____

▶ TASK Perform engine cooling system tests for leaks, protection level, contamination, coolant level, coolant type, temperature, and conditioner concentration; determine needed action.

6C3

1. Research how to perform engine cooling system tests for leaks, protection level, contamination, coolant level, coolant type, temperature, and conditioner concentration and list your findings below.
 - a. Engine cooling system leak tests:

b. Protection level:

c. Contamination:

Time off _____

Time on _____

Total time _____

d. Coolant level:

e. Coolant type:

f. Temperature:

g. Conditioner concentration:

2. Have your supervisor/instructor verify your research.

Supervisor/instructor's initials: _____

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

4. Examine the vehicle/simulator, and perform engine cooling system tests for leaks, protection level, contamination, coolant level, coolant type, temperature, and conditioner concentration.

5. List the issues and faults found:

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: 6C3

0

1

2

3

4

Supervisor/instructor signature _____ Date _____

▶ TASK Inspect engine cooling and heating system hoses, lines, and clamps; determine needed action.

6C4

1. Research how to inspect engine cooling and heating system hoses, lines, and clamps and list your findings below:

2. Have your supervisor/instructor verify your research.

Supervisor/instructor's initials: _____

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

4. Examine the vehicle/simulator and inspect engine cooling and heating system hoses, lines, and clamps.

5. List the issues and faults found:

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

Time off _____

Time on _____

Total time _____

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

8. Return the vehicle to the 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: 6C4

0

1

2

3

4

Supervisor/instructor signature _____ Date _____

▶ TASK Inspect and test radiator, pressure cap, and coolant recovery system (surge tank); determine needed action.

6C5

1. Research how to inspect and test radiator, pressure cap, and coolant recovery system (surge tank) and list your findings below:

a. Inspect and test radiator:

b. Inspect and test pressure cap:

c. Inspect and test coolant recovery system (surge tank):

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

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

4. Examine the vehicle/simulator and inspect and test radiator, pressure cap, and coolant recovery system (surge tank).

Time off _____

Time on _____

Total time _____

5. List the issues and faults found:

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: 6C5

0

1

2

3

4

Supervisor/instructor signature _____ Date _____

▶ TASK Inspect water pump for leaks and bearing play; determine needed action. **6C6**

1. Research how to inspect water pump for leaks and bearing play and list your findings below:

a. How to inspect the water pump for leaks:

b. How to inspect the water pump bearing play:

Time off _____

Time on _____

Total time _____

c. List the maximum allowable water pump bearing play:

2. Have your supervisor/instructor verify your research.

Supervisor/instructor's initials: _____

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

4. Examine the water pump for leaks and bearing play.

5. List the issues and faults found:

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: 6C6

0

1

2

3

4

Supervisor/instructor signature _____ Date _____

▶ TASK Inspect and test thermostats, by-passes, housings, and seals; determine needed repairs.

6C7

Time off _____
Time on _____
Total time _____

1. Research how to inspect and test thermostats, by-passes, housings, and seals and list your findings below:

a. How do you inspect and test thermostats:

b. How do you inspect and test by-passes:

c. How do you inspect and test housings and seals:

2. Have your supervisor/instructor verify your research.

Supervisor/instructor's initials: _____

3. Ask your supervisor/instructor for a vehicle to check.

4. Examine, inspect, and test thermostats, by-passes, housings, and seals.

5. List the issues and faults found:

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: 6C7

0

1

2

3

4

Supervisor/instructor signature _____ Date _____

▶ TASK Recover, flush, and refill with recommended coolant/additive package; bleed cooling system.

6C8

1. Research how to recover, flush, and refill with recommended coolant/additive package and bleed cooling system and list your findings below:

a. How to recover coolant/additive:

b. How to flush coolant/additive:

c. How to refill coolant/additive:

d. How to bleed cooling system:

2. Have your supervisor/instructor verify your research.

Supervisor/instructor's initials: _____

3. Ask your supervisor/instructor for a vehicle/simulator to work on.

4. Recover, flush, and refill with recommended coolant/additive package and bleed cooling system.

Time off _____

Time on _____

Total time _____

5. List the steps undertaken:

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: 6C8

0

1

2

3

4

Supervisor/instructor signature _____ Date _____

▶ TASK Inspect thermostatic cooling fan system (hydraulic, pneumatic, and electronic) and fan shroud; replace as needed.

6C9

1. Research how to inspect thermostatic cooling fan system (hydraulic, pneumatic, and electronic) and fan shroud and list your findings below:

a. How to inspect thermostatic cooling fan system hydraulic:

b. How to inspect cooling fan system pneumatic:

c. How to inspect cooling fan system electronic:

d. How to inspect fan shroud:

2. Have your supervisor/instructor verify your research.

Supervisor/instructor's initials: _____

Time off _____

Time on _____

Total time _____

3. Ask your supervisor/instructor for a vehicle/simulator to check.
4. Inspect thermostatic cooling fan system (hydraulic, pneumatic, and electronic) and fan shroud.
5. List the issues and faults found:

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: 6C9

0

1

2

3

4

Supervisor/instructor signature _____ Date _____

▶ TASK Inspect and test heating system coolant control valves and manual shut-off valves; determine needed action.

6C10

1. Research how to inspect and test heating system coolant control valves and manual shut-off valves and list your findings below:
 - a. How do you inspect and test heating system coolant control valves:

Time off _____

Time on _____

Total time _____

b. How do you inspect and test manual shut-off valves:

2. Have your supervisor/instructor verify your research.

Supervisor/instructor's initials: _____

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

4. Inspect and test heating system coolant control valves and manual shut-off valves.

5. List the issues and faults found:

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: 6C10

0

1

2

3

4

Supervisor/instructor signature _____ Date _____

▶ TASK Inspect and flush heater core; determine needed action.

6C11

Time off _____
Time on _____
Total time _____

1. Research how to inspect and flush heater core and list your findings below:

a. How to inspect heater core:

b. How to flush heater core:

2. Have your supervisor/instructor verify your research.

Supervisor/instructor's initials: _____

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

4. Inspect and flush heater core.

5. List the issues and faults found:

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: 6C11

0

1

2

3

4

Supervisor/instructor signature _____ Date _____