# Operating Systems and Related Controls-Electrical

Student/intern	information:			
Name		Date	Class	
Vehicle used fo	r 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
<ul> <li>Inspect and test A/C compressor clutch relays, modules, wiring, sensors, switches, diodes, and protection devices; determine needed action.</li> </ul>	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, sen- sors, wiring, and protection devices; deter- mine needed action.	6D1-5	P-2
<ul> <li>Inspect and test electric actuator motors, relays/modules, switches, sensors, wiring, and protection devices; determine needed action.</li> </ul>	6D1-6	P-3
Inspect and test HVAC system electrical/ electronic control panel assemblies; deter- mine 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**

- **O-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

· TA	ASK Identify causes of HVAC electrical control system problems; determine needs	ed action.
		6D1-1
<b>1.</b> F	Research causes of HVAC electrical control system problems and list them below:	
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-		
. /	Ask your supervisor/instructor for a vehicle or simulator to check.	
	Examine the vehicle/simulator and operate all the electrical controls for the HVAC system to ault(s) with HVAC electrical control system in the A/C system.	determine
. L	ist identified problems:	
-		
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-		
. L	Jsing the appropriate service information, determine the steps necessary for testing the cor	mponent(s):
_		
-		

Time off.

Time on.

Total time.

6. Write a snort descri	ption of the purpose and	operation of the suspect	ea component(s):	
7. Determine and list a	ny necessary action(s):			
8. Return the vehicle t locations.	o beginning condition and	d return any tools that yo	ou may have used to their p	roper
9. Discuss the findings	with the instructor.			
Performance Rating		2007 NATEF Ref	erence Number: 6D1-1	
O Supervisor/instructor signat	<b>1</b> ure	2	3	<b>4</b> Date
protection d  1. Research how to ins protection devices a	evices; determine need pect and test HVAC blow nd list your findings belo	ded action. er motors, resistors, switc	relays, modules, wiring, 6D ches, relays, modules, wiring	1-2 Time off
a. Inspect and te	st blower motors:			Total time
<b>b.</b> Inspect and te	st resistors:			
<b>c.</b> Inspect and te	st switches:			

	a.	. Inspect and test modules:
	e.	Inspect and test wiring:
	f.	Inspect and test protection devices:
2.	Ask y	your supervisor/instructor for a vehicle or simulator to check.
		g the appropriate service information, inspect and test HVAC blower motors, resistors, switches, vs, modules, wiring, and protection devices.
4.	List t	the results of conducting your inspection and tests:
5.	Write	e a short description of the purpose and operation of the suspected component(s):
6.	Dete	rmine and list any necessary action(s):
7.	Retu	rn 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.

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Periormai	nce Rating		2007 NATEF Re	ference Number:	6D1-2		
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Supervisor	/instructor signature					Date	
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► TASK	Inspect and test A/					Tin	ne off_
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	s, and protection devic					On	ne on_
	st the findings below:	оо а арр. ор.			,		
a.	A/C compressor clutch	n relays:					
			 			Tot	tal time
b.	Modules:						
c.	Wiring:						
4	Concorce						
u.	Sensors:						
	D: 1						
e.	Diodes:						

	ted procedures with you				
	e service information, ins hes, diodes, and protecti	spect and test A/C compresion devices.	ssor clutch relays, modu	iles,	
List the results of you	ur inspection and tests:				
Determine and list are					
	y necessary action(s):				
	beginning condition and	d return any tools that you	may have used to their	proper	
Return the vehicle to locations.  Discuss the findings v		I return any tools that you	may have used to their	proper	
locations.  Discuss the findings v			may have used to their	proper	
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locations. Discuss the findings v				proper	
locations.  Discuss the findings vormance Rating  O	with the instructor.	2007 NATEF Refere	ence Number: 6D1-3		
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Discuss the findings volume formance Rating  O ervisor/instructor signature action.	test A/C related electro	2007 NATEF Refere	ence Number: 6D1-3  3  ems; determine need	Pate	
Discuss the findings versions of the formance Rating  Officervisor/instructor signature of the formance in the first of the formance in the fo	test A/C related electro	2007 NATEF Refere	ence Number: 6D1-3  3  ems; determine need	## A Date	
Discuss the findings volume formance Rating  O ervisor/instructor signature action.	test A/C related electro	2007 NATEF Refere	ence Number: 6D1-3  3  ems; determine need	Pate	

2.	Ask your supervisor/i	nstructor for a vehicle	or simulator to check.			
3.	Examine the vehicle/s	simulator; inspect and t	est A/C related electroni	c engine control.		
4.	List identified probler	ms:				
5.	Using the appropriate	e service information, d	etermine the steps neces	sary for testing the compo	nent(s):	
6.	Write a short descript	tion of the purpose and	operation of the suspec	red component(s):		
				·		
7.	Determine and list an	y necessary action(s):				
8.	Return the vehicle to	beginning condition an	d return any tools that y	ou may have used to their p	oroper	
	locations.					
9.	Discuss the findings v	vith the instructor.				
er	formance Rating		2007 NATEF Re	ference Number: 6D1-4		
Sup	<b>O</b> pervisor/instructor signatu	<b>1</b> re	2	3	<b>4</b> Date	
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Time off\_\_\_

Total time\_

		priate service infor es, sensors, wiring,			ooling/condenser	fan motors, relays,	,
<b>4.</b> Lis	t the results (	of conducting your	· 				- -
							- - -
<b>5.</b> De	termine and I						- - -
<b>6.</b> Re	turn the vehic	cle to beginning cor	ndition and returr	n any tools that y	ou may have used	I to their proper	-
<b>7.</b> Dis		ings with the instru	octor.				
erfori	nance Rating			2007 NATEF Re	eference Number: 60	01-5	
Supervi	O sor/instructor s	1 ignature		2	3		<b>4</b> ate
	protection	and test electric a on devices; deterr	mine needed act	ion.		6D1-6	Time off
pro	otection devic sults below:	o inspect and test e es in an appropriat ctuator motors:					d Time on
							Total time
	<b>b.</b> Relays/mo	dules:					_
							_ _ _

**7.** Discuss the findings with the instructor.

Performance Rating		2007 NATEF Refere	ence Number: 6D1-6	
0	1	2	3	4
Supervisor/instructor signature				Date
TASK Inspect and tended action.		ctrical/electronic control	panel assemblies; deterr 6D1-7	Time off
		em electrical/electronic conf cle you are working on and l		Time on
				Total time
2. Check your documente				
Supervisor/instructo	or's initials:			
<b>3.</b> Using the appropriate s	service information, ir	nspect and test HVAC systen	n electrical/electronic contr	·ol
panel assemblies.		,		
4. List the results of cond	ucting your inspectio	n and tests:		
5. Determine and list any	necessary action(s):			
<b>6.</b> Return the vehicle to be locations.	eginning condition an	d return any tools that you	may have used to their prop	per
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7. Discuss the findings with	in the instructor.			
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errormance Rating		2007 10711 110101		
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