
Vehicle Electrification System Standards

X. Vehicle Cabin HVAC Systems

X.c Vehicle Cabin HVAC Systems Operation

Overview:

Vehicle Cabin HVAC Systems Operation

- Electric Air Conditioning 3-Phase Compressor Operation
- Electric Air Conditioning 3-Phase Compressor Controls
- Coolant Chiller System Operation and Control System
- Electric Cabin PTC Heater Electrical Operation and Control System
 - Immersion Type
 - Air-to-Air
- Electric Battery Pack PTC Heater (external) Operation and Control Systems
 - Immersion Type
 - Grid Type
- Electric Battery Pack PTC Heater (internal) Operation and Control Systems
 - Immersion Type
 - Electric Grid Type
- A/C - Indirect Battery Pack Cooling Operation and Control Systems
- Coolant Pump (12V) Operation and Control System

Description:

The HVAC System in BEV, PHEV, FCEV and some HEV products provide control of cabin and High Voltage battery pack thermal systems. Understanding the operation of these systems, knowing how the systems are controlled, and how to performance test them are critical skills necessary for the student to demonstrate as part of HVAC systems study.



Outcome (Goal):

To perform a complete study of BEV, PHEV, FCEV, and some HEV systems the Student will be able to utilize their knowledge of HVAC control systems to determine if the system has correct functionality. The Students will determine the functionality of the system by utilizing test instruments to complete measurements of each device.

Objective:

The Students will be able to:

1. Utilize a DVOM and current clamp to measure load currents of specified HVAC components
 2. Utilize the Scan Tool Special Functions (Output Controls) menu to manipulate HVAC components
 3. Measure coolant pump load current
 4. Convert load current and applied voltage to kW units
 5. Utilize Thermal Imaging Camera and monitor HVAC component and hose temperatures.
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Task:

1. Utilizing OEM service information and a classroom vehicle, the students will document all PIDs, relative to cabin and High Voltage battery pack HVAC systems on a worksheet provided by the instructor
2. Students will measure the electrical current load of the electric A/C compressor with a current clamp and DVOM, use a Scan Tool to command various speeds, and document the data in kW units on a worksheet provided by the instructor
3. Students will measure the electrical current load of the cabin and high voltage battery pack heating systems with a current clamp and DVOM, use a Scan Tool to check battery pack voltage, and document the data in kW units on a worksheet provided by the instructor
4. Utilizing a Scan Tool and OEM service information, the student will locate output function tests on the Scan Tool and execute each test, while documenting the results on a worksheet provided by the instructor



5. While commanding maximum coolant pump speed, Students will measure coolant pump load current and document the data on a worksheet provided by the instructor
 6. Students will utilize a Thermal Imaging Camera to determine if there is a corresponding increase or decrease in temperature of a specified system, while manipulating the control system. Students will document their results on a worksheet provided by the instructor.
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