Vehicle Electrification System Standards

VIII. DC – DC Converters Systems

VIII.d DC-DC Converter Operation

Overview:

DC-DC Converter Operation

- Step-Down (Buck) Operation
- Step-Up (Boost) Operation
- Voltage Regulation
- Current Regulation
- Operating Frequency
- Output Control via Temperature Compensation

Description:

The operational modes of the DC-DC Converter are critical to the function of the vehicle. The DC-DC Converter function is to acquire High Voltage Input electrical power and step-down (Buck) it to a low voltage level (i.e., 14.0Vdc) or acquire low voltage and step-up (Boost) it to a High Voltage (i.e., 60Vdc - 800Vdc). This is accomplished by utilizing an input filtering system, a network of transistors cycled at frequencies of 20KHz to 80kHz, a center tapped transformer, a full wave rectifier bridge, and an output filter system.

Outcome (Goal):

It is essential that Students understand DC-DC Converter operation to more fully comprehend how the high voltage system integrates with other bus components. Therefore, the Students will be able to describe (verbally and through the use of circuit diagrams, how each stage of the DC-DC Converter operates. This is an

important step in student education, as this part of the education program will prepare them for identifying failure modes, systems testing, and diagnostics of the DC-DC Converter.

Objective:

Students shall be able to:

1. Describe, by using a circuit diagram, the DC-DC Converter input filter system operation
2. Describe, by using a circuit diagram, the DC-DC Converter the operation of the Totem-Pole Transistor switching system
3. Describe, by using a circuit diagram, the DC-DC Converter Center Tapped Transformer operation
4. Describe, by using a circuit diagram, the DC-DC Converter output filter operation

Task:

1. When students are presented with various internal DC-DC Converter component failure scenario documentation and associated circuit diagrams, they will provide the expected output results
2. When the students are presented with specific DC-DC Converter input failure modes within an electrical/electronic diagram and accompanying customer complaint documents, the student will provide the probable output failure modes, and how the resulting vehicle low voltage system operation and as result of each fault.

To comment or offer suggestions on this standard, contact Ken Mays:

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