
Vehicle Electrification System Standards

VII. 3-Phase Power Inverter Systems and Controls

VII.c 3-Phase Power Inverter Components

Overview:

3-Phase Power Inverter Components

- (IGBT) Gate Drive Circuit
- BiPolar Transistor (PNP; NPN)
- Boosting Inductor
- Bus Bars
- Bus Capacitors
- Bus Discharge Circuit
- Current Sensor
- EMI Sealing (Gasket, Connectors, Wires/Cables)
- Enclosure
- Field Effect Transistor (MOSFET)
- IGBT (Module)
- Motor Controller
- Motor Controller Circuit Board
- Thermal Grease

Description:

The power inverter module is comprised of various power electronic and passive electrical components. Each component within the Power Inverter Module has a unique application and operational task. The components within the module provide the electric machine with the proper electrical power levels for operating conditions



when in propulsion, regenerative braking, and coasting modes. Understanding the operation of the power inverter module is critical when studying the overall operation of an electrified vehicle.

Outcome (Goal):

1. Students will be able to visually identify components within the power inverter module
 2. Students will be able to disassemble and reassemble a power inverter module
 3. Students will be able to statically test specified power electronics and electrical components within the power inverter module.
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Objective:

Students shall be able to:

1. Correctly identify power, control, and filtering components of the power inverter module
 2. Correctly disassemble and reassemble the power inverter module using the proper sequence of part removal/installation, use correct fastener torque specs, wire and cable routing, and application of thermal grease to power electronic components
 3. When disassembling the power inverter module, lay out and correctly label each component
 4. When the power inverter module is disassembled, statically test the power electronic and passive components to ensure a satisfactory state-of-health
 5. When reassembling the power inverter module, describe the function (rationale) of component
 6. When the Power Inverter Module is disassembled, the students will statically test the IGBT modules and Bus Capacitors
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Task:

1. Students will visually identify the primary Power Inverter Module components when provided physical components or a worksheet with graphics/pictures of the components



2. When provided with a worksheet, Students will be able to define and describe the function for each of the primary hardware components that comprise a 3-Phase power inverter module
 3. Students will disassemble and reassemble a Power Inverter Module assembly
 4. Students will test the IGBT input and output stages to determine if the stages are functioning correctly and complete a lab worksheet with the findings
 5. Students will test the High Voltage Bus Capacitors to for proper capacitance and complete a lab worksheet with the findings
 6. While assembling the Power Inverter Module, students will demonstrate the correct application of thermal grease to power components that require it
 7. Students will use OEM vehicle service information, component supplier information, and vehicle electrification websites to complete the tasks
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