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## Vehicle Electrification System Standards

### VII. 3-Phase Power Inverter Systems and Controls

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## VII.e 3-Phase Power Inverter Diagnostics & Service

### Overview:

#### 3-Phase Power Inverter Diagnostics and Service

- HV 3-Phase Cable Jumper System
- Laptop Based Oscilloscope (Differential)
- AC Current Clamps
- Scan Tool & PIDs
- Power Inverter Service Considerations

### Description:

Acquiring skills in testing and diagnostics of any system or component are the most critical cognitive and skills in the automotive space. Understanding the tools/equipment necessary to perform the testing, how to prepare the vehicle for testing, and how to interpret data and waveform data are key skills for vehicle electrification technicians.

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### Outcome (Goal):

Students will acquire skills in how to select, configure, and connect testing tools/equipment to analyze 3-Phase Power Inverter Module waveforms.

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### Objective:

Students shall be able to:



1. Select the proper oscilloscope and current clamps for acquiring 3-Phase Power Inverter Waveforms
  2. Safety connect jumper cable test leads between the power inverter and the 3-Phase power inverter cabling system
  3. Road test a vehicle that is instrumented with an oscilloscope, current clamps, jumper cable test leads (if necessary) and acquire waveform data
  4. Road test a vehicle with a serial data (scan) tool connected and acquire PIDs associated with the Power Inverter Module
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Task:

1. Students will use a procedural worksheet to configure voltage, time base, and filtering settings for multi-channel digital oscilloscope for acquiring power inverter module 3-Phase waveforms
  2. Complete a procedural worksheet on connecting power cable jumper leads and AC current clamps to the power inverter and power inverter 3-Phase cables
  3. Students will complete a vehicle drive cycle worksheet and acquire 3-Phase waveforms while performing a road test
  4. Students will analyze the 3-Phase power inverter waveforms acquired during a vehicle drive cycle, describe the quality the primary components of the waveform, and complete a written analysis of their findings on a lab worksheet
  5. Using an oscilloscope and AC current clamps, students will determine the Power Factor of a Power Inverter Module during a road test
  6. Using a serial data (scan) tool, students will acquire Power Inverter Module PID data and record it on a lab worksheet while on a vehicle road test
  7. Utilize technical documentation to ensure proper electrical connections to the primary power inverter module for testing
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