Vehicle Electrification System Standards

I. Vehicle Level Vehicle Electrification High Voltage System Architectures

I.b HEV, PHEV, BEV, and FCEV System Architecture

Description:

Correctly identifying the type of vehicle electrification system and locating all high voltage components is key to framing the process of vehicle repair and diagnostics.

(diagrams appended)

Hybrid Electric Vehicle (HEV)

Outcome:

Students will be able to identify the type of HEV system, including all heating and cooling system components, by using OEM service description and operation information, OEM sub-system information, and visually inspecting components and component locations on the vehicle.

Objective:

When provided with an HEV the student will correctly identify the type of HEV system architecture and the location of all high voltage components on the vehicle.

Task:

Students will use the OEM vehicle service information, visual inspections, and populate a provided vehicle chassis/body diagram to visually place the proper position of all high voltage components on the diagram and correctly identify the type of HEV architecture.

- BAS – Belted Alternator-Starter System
- FAS – Flywheel Alternator-Starter System
- BAS + FAS
- Integrated – Electric Machines are located inside of the transmission

Tools:

1. Common components used in all vehicle electrification architectures (block diagrams)
2. Block diagram of each system with wire and cable connections
3. Pictures of components, vehicles, etc. illustrating each architecture

Plug-In Hybrid Electric Vehicle (PHEV)

Outcome:

Students will be able to identify the type of PHEV system, including all heating and cooling system components, by using OEM service description and operation information, OEM sub-system information, and visually inspecting components and component locations on the vehicle.

Objective:

When provided with a PHEV the student will correctly identify the type of PHEV system architecture and the location of all high voltage components on the vehicle.

Task:

Students will use the OEM vehicle service information and visual inspection to populate a vehicle chassis/body diagram to visually place the proper position of all high voltage components on the diagram and correctly identify the type of PHEV architecture.

- BAS – Belted Alternator-Starter System
- FAS – Flywheel Alternator-Starter System
- BAS + FAS

- Integrated – Electric Machines are located inside of the transmission
- Range Extender

Tools:

1. Common components used in all vehicle electrification architectures (block diagrams)
2. Block diagram of each system with wire and cable connections
3. Pictures of components, vehicles, etc. illustrating each architecture

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Battery Electric Vehicle (BEV)

Outcome:

Students will be able to identify the type of BEV system, including all heating and cooling system components, by using OEM service description and operation information, OEM sub-system information, and visually inspecting components and component locations on the vehicle.

Objective:

When provided with a BEV the student will correctly identify the system architecture and the location of all high voltage components on the vehicle.

Task:

Students will use the OEM vehicle service information and visual inspection to populate a vehicle chassis/body diagram to visually place the proper position of all high voltage components on the diagram and correctly identify the type of BEV architecture.

Tools:

1. Common components used in all vehicle electrification architectures (block diagrams)
2. Block diagram of each system with wire and cable connections
3. Pictures of components, vehicles, etc. illustrating each architecture

Fuel Cell Electric Vehicle (FCEV)

Outcome:

Students will be able to identify the type of fuel cell power system, including all heating and cooling system components, by using OEM service description and operation information, OEM sub-system information, and visually inspecting components and component locations on the vehicle.

Objective:

When provided with a FCEV the student will correctly identify the system architecture and the location of all high voltage components on the vehicle.

Task:

Students will use the OEM vehicle service information and visual inspection to populate a vehicle chassis/body diagram to visually place the proper position of all high voltage components on the diagram and correctly identify the type of FCEV architecture.

Tools:

1. Common components used in all vehicle electrification architectures (block diagrams)
2. Block diagram of each system with wire and cable connections
3. Pictures of components, vehicles, etc. illustrating each architecture

Governing Standards (Safety, Testing, Diagnostics or Repair):

J1715 - HEV & EV Terminology

Industry Resource Organization:

- √ Society of Automotive Engineers (SAE)
- ☐ Institute of Electrical & Electronic Engineers (IEEE)
- ☐ International Electrotechnical Commission (IEC)

- ☐ American Society for Testing and Materials (ASTM)
- ☐ Occupational Safety & Health Administration (OSHA)
- ☐ National Fire Protection Association (NFPA)
- ☐ Underwriters Laboratories (UL)

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

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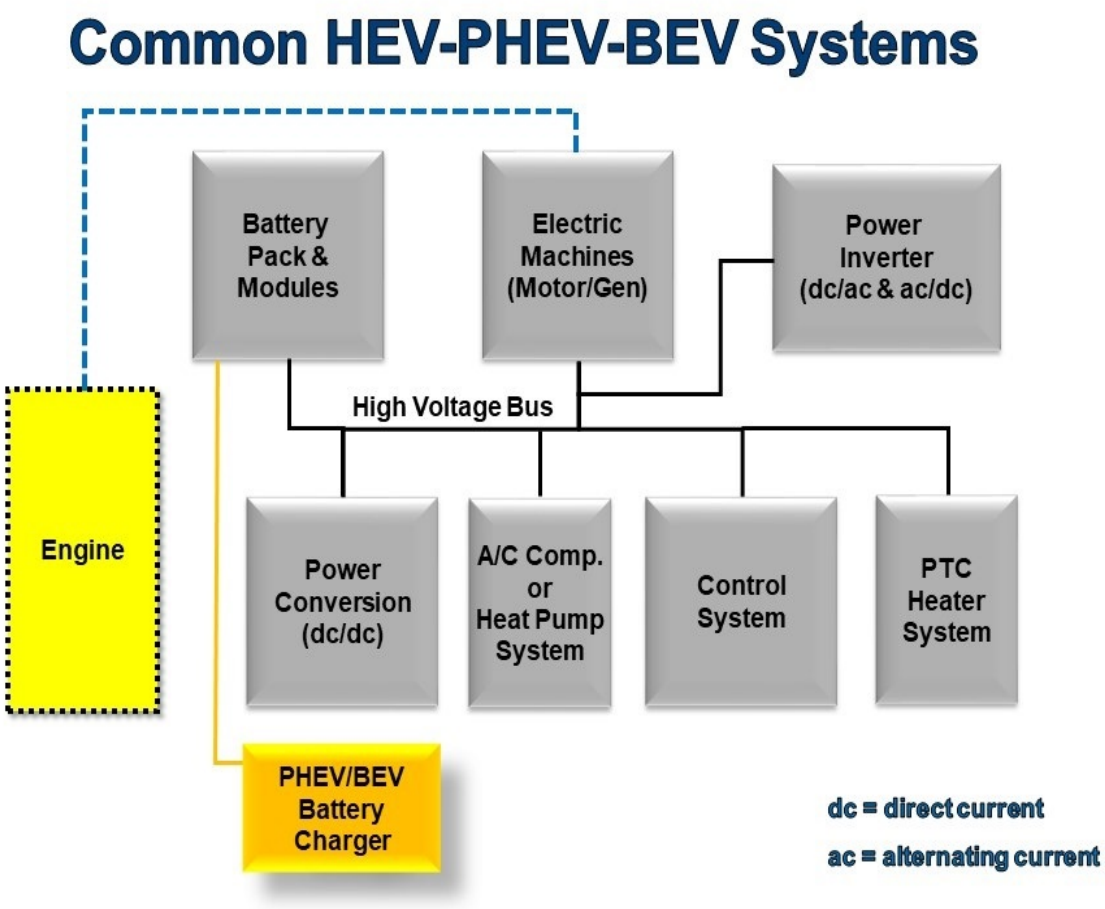
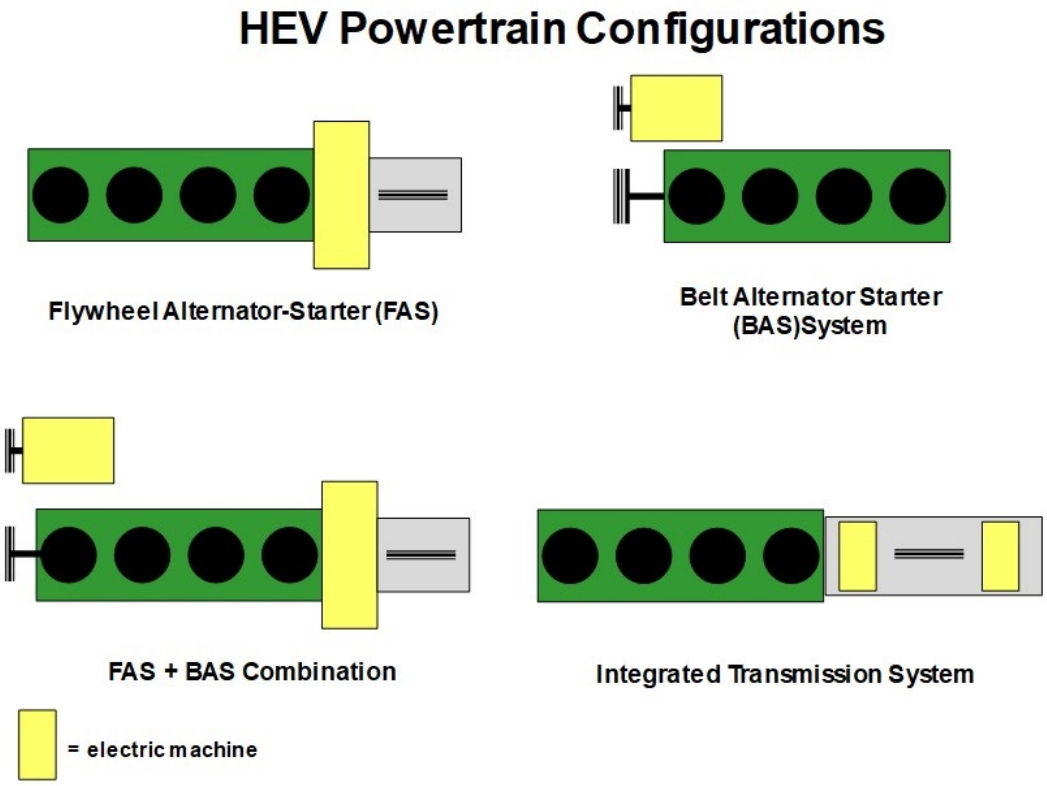


Block diagram of high voltage electric systems architecture components common to most/all vehicle electrification systems.


HEV Powertrain Configurations
Flywheel Alternator-Starter (FAS)
Belt Alternator Starter
(BAS)System
FAS + BAS Combination
Integrated Transmission System
= electric machine
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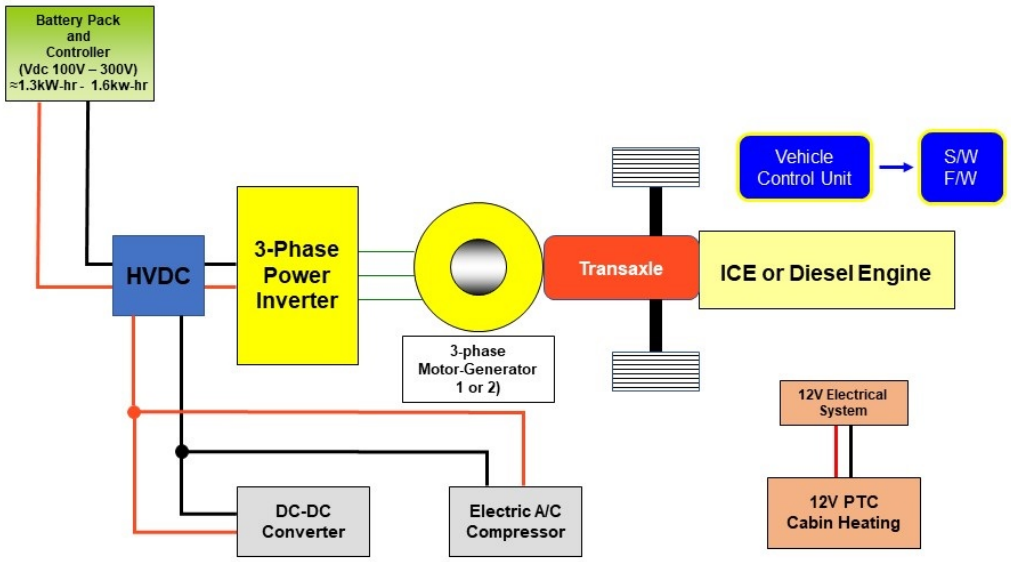
HEV Topology



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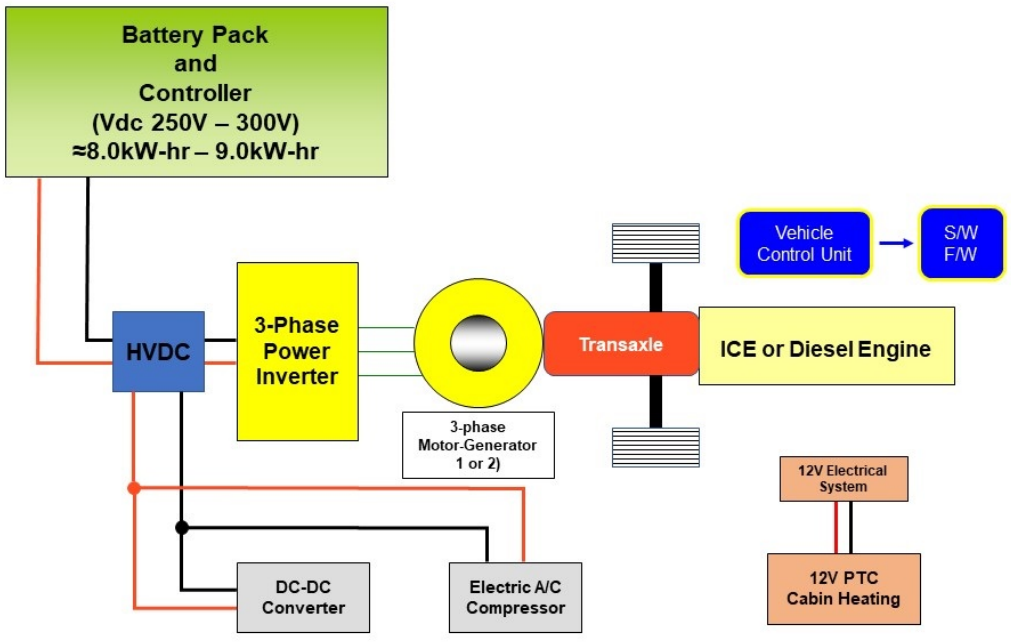
PHEV Topology



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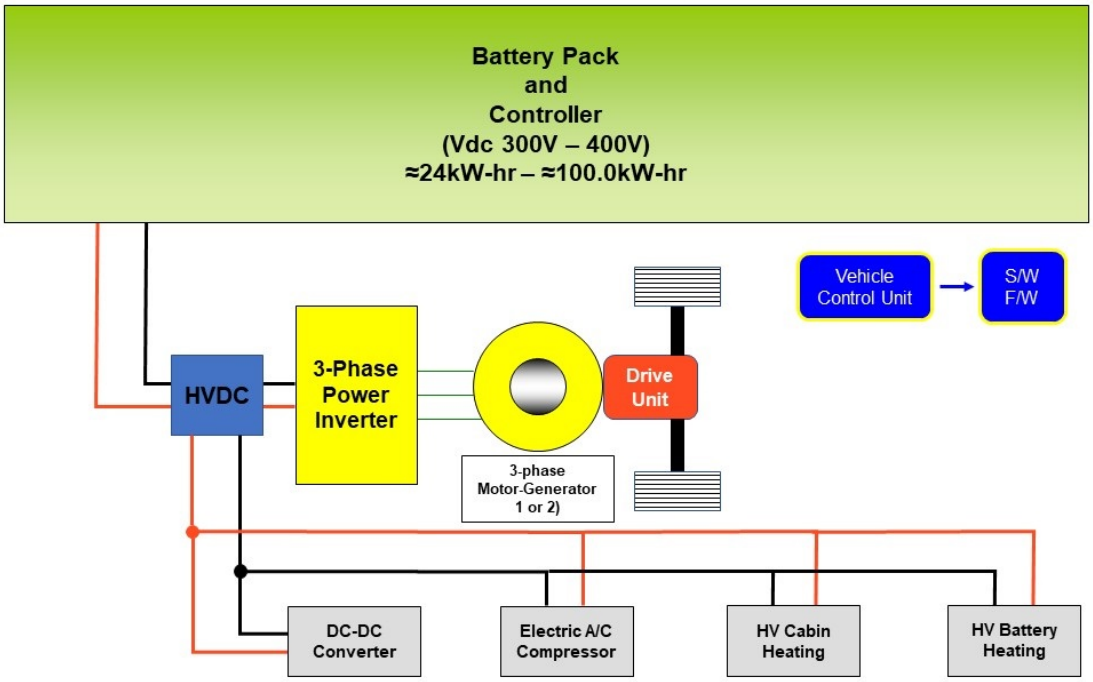
BEV Topology



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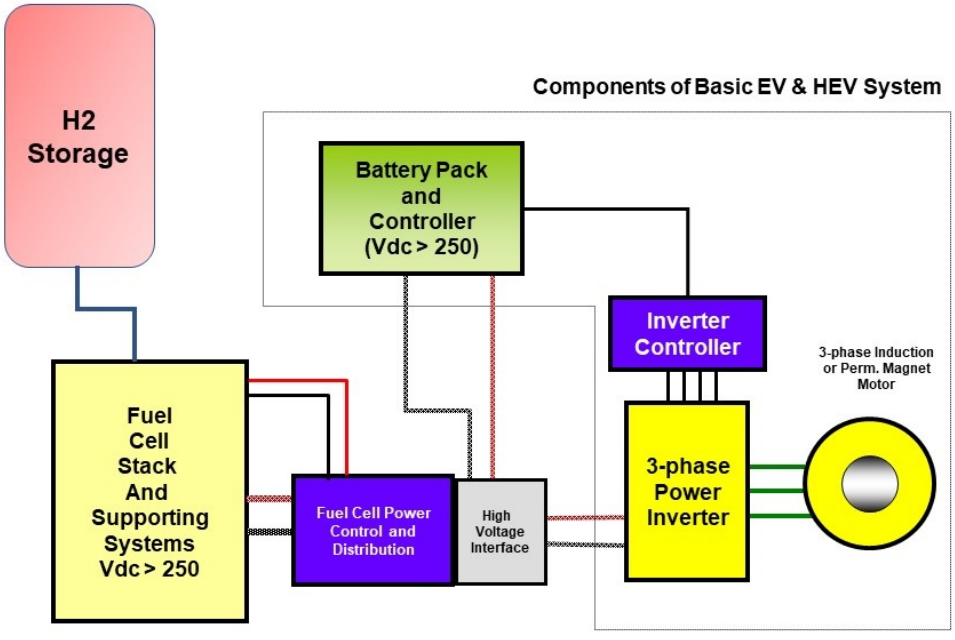
H2 Storage and Fuel Cell Topology



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