Electrical Power Standards for Ground Combat Vehicles

Aric Haynes

U.S.ARMY

DEVCOM GROUND VEHICLE SYSTEMS CENTER

Importance of MIL Power Standards for Army Ground Vehicles

Goal – Cost Savings through:

- Common hardware between vehicle platforms from different OEMs
- Sourcing of common hardware from different suppliers

GROUND VEHICLE 600 VOLTS DC
ELECTRIC POWER CHARACTERISTICS

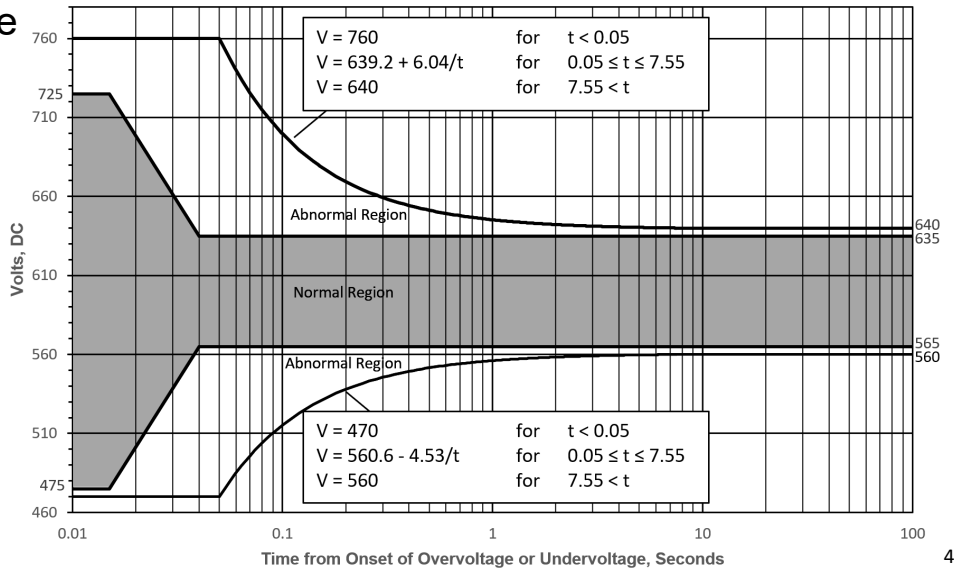
MIL standards bridge gap until industry converges on suitable standards

MIL-STD-3072
Ground Vehicle 600 Volts DC Electric Power Characteristics

$600V_{DC}$ Nominal (balanced ± $300V_{DC}$ with resistive ground reference)

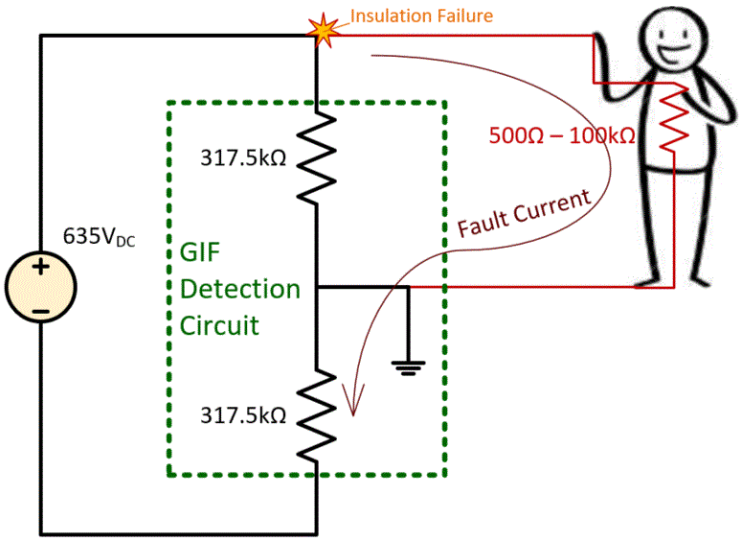
- Factors that contributed to the $600V_{DC}$ decision 20+ years ago:
  - Conceptually sufficient, yet ambitious for meeting mobility and electrification goals
  - Took advantage of existing industrial machines and IGBT based inverters
  - Takes into consideration corona effects in machines at high altitude
  - Allows use of standard 600V rated wire
- Still relevant
  - Leverages 20+ years of Ground Combat Vehicles power system development
  - Suitable for most vehicle electrification requirements

*Complementary handbook MIL-HDBK-3072 provides test methods for compliance



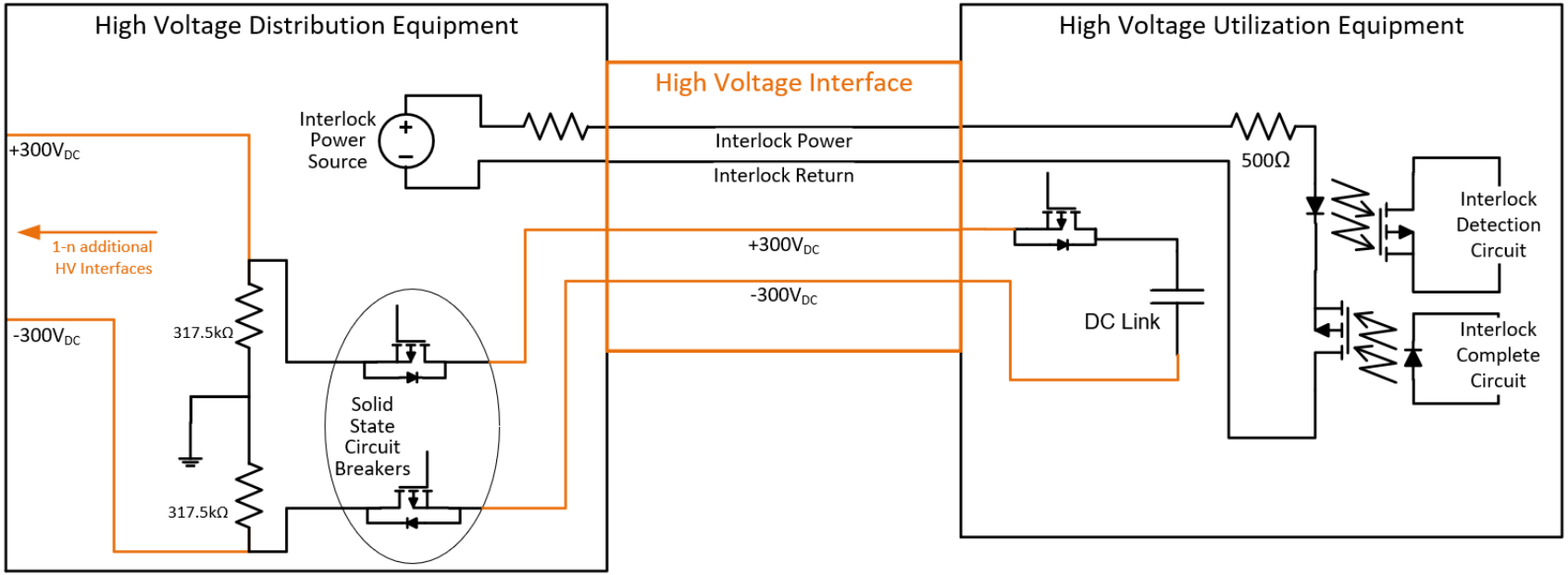
Safety Features

- Ground Isolation Fault Detection
  - Short-to-ground current limited to 2mA
  - Low fault current allows selective removal of power depending on conditions
- Solid-State Circuit Protection
  - Fast (300µsec) response to short circuit and interlock interruption
  - Mitigates arc concerns by limiting fault energy
- Safety Interlock Circuits
  - Triggers solid-state removal of power in case of:
    - Cable disconnect
    - Cable damage
    - Hardware faults

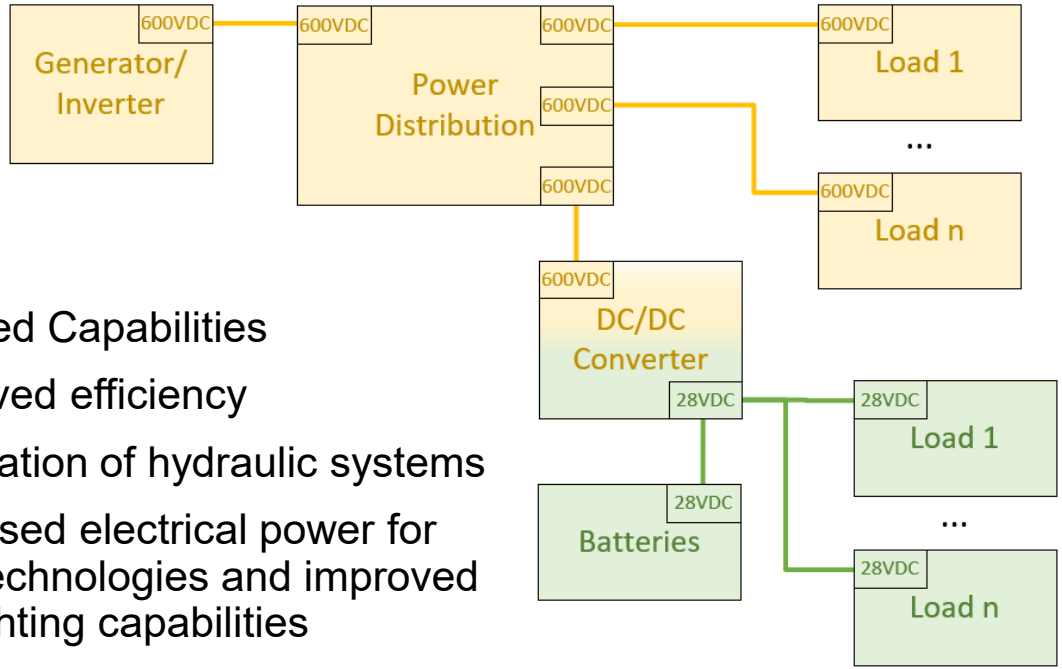


Forthcoming MIL-PRF-3072
Ground Vehicle 600 Volts DC Electric Power System Specification

MIL-PRF-3072 Power Interface



Army Power Standards in Support of Vehicle Electrification for Enhanced Capabilities — 2015



MIL-STD-3072
Typical $600V_{DC}$ Loads:

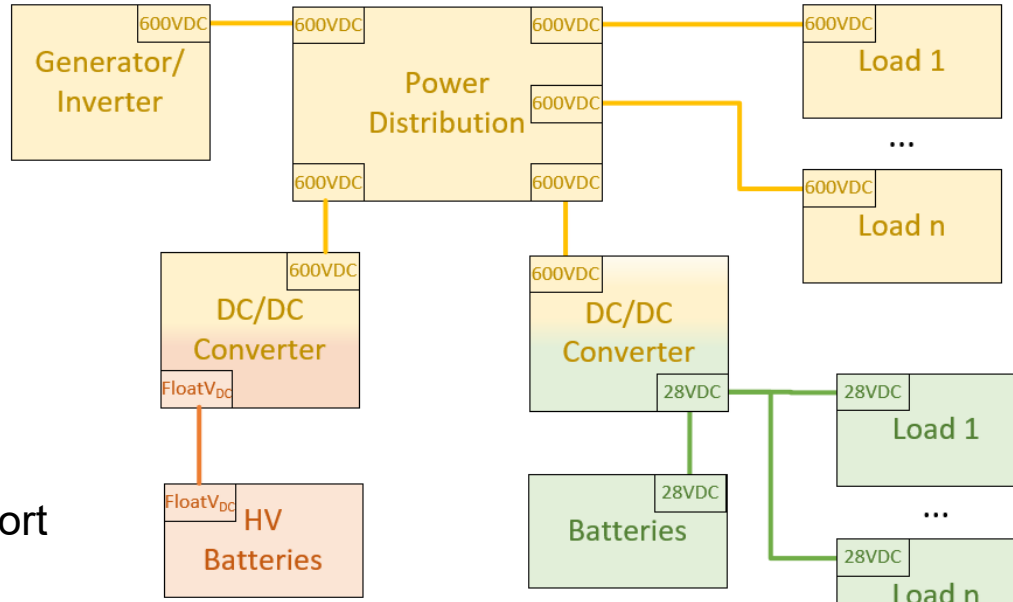
- Main Cooling Fan
- Environmental Controls
- Power Converters
- Servo Motors
- Energy Weapons
- Active Armor

Enhanced Capabilities

- Improved efficiency
- Elimination of hydraulic systems
- Increased electrical power for new technologies and improved warfighting capabilities

MIL-STD-1275
$28V_{DC}$ Legacy Army Ground Vehicle Power Standard

Army Power Standards in Support of Vehicle Electrification for Enhanced Mobility and Capabilities — 2025



MIL-STD-3072
$600V_{DC}$ Power

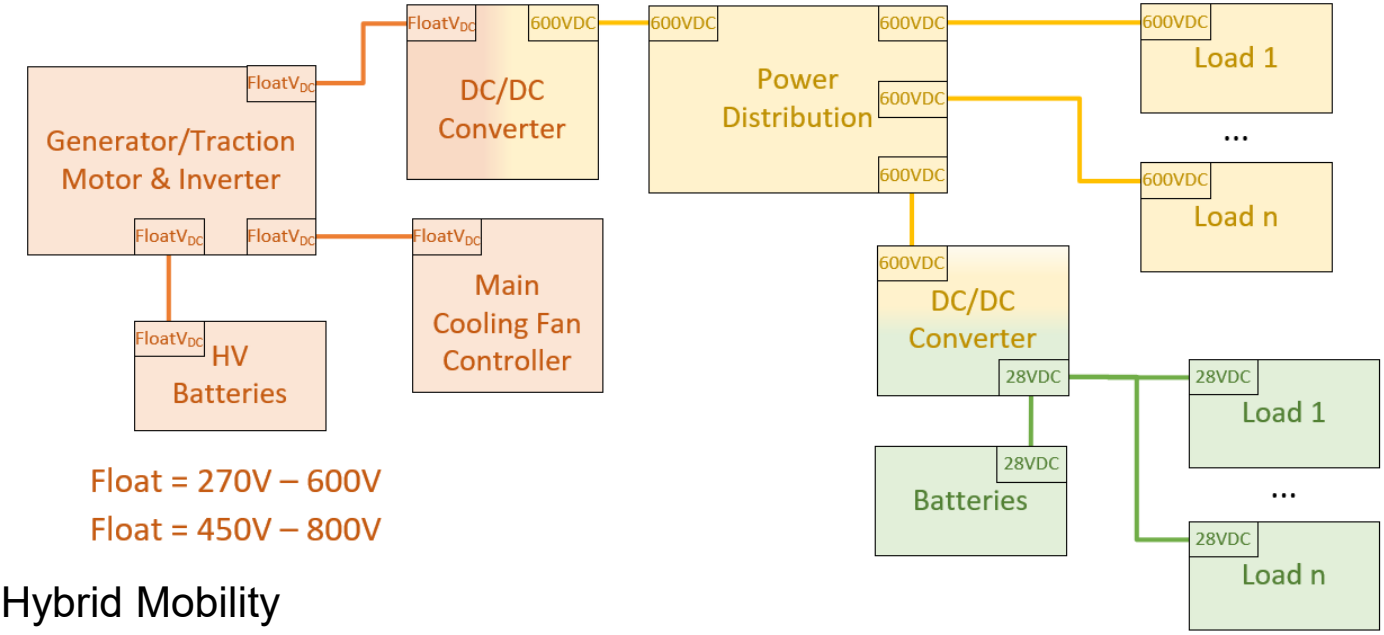
MIL-STD-1275
$28V_{DC}$ Power

Enhanced Mobility
"Mild Hybrid"

- Boosted tractive effort
- Anti-idle capability
- Limited silent mobility

Float = 270V – 600V
Float = 450V – 800V

Army Power Standards in Support of Vehicle Electrification for Mobility and Enhanced Capabilities — 2035



Full Hybrid Mobility

- Boosted tractive effort
- Extended silent mobility

Contact Info

- Thank you!
  - Aric Haynes
  - U.S. Army Combat Capabilities Development Command
  - Ground Vehicle Systems Center
  - (586) 202-4190
  - aric.I.haynes.civ@army.mil