



# SURFACE VEHICLE RECOMMENDED PRACTICE

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## Inverter Requirements for Class Eight Trucks - Truck and Bus

### RATIONALE

SAE J2697 has been reaffirmed to comply with the SAE Five-Year Review policy.

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## 1. SCOPE

This SAE Recommended Practice is intended to describe the application of single-phase DC to AC inverters, and bidirectional inverter/chargers, which supply power to ac loads in Class heavy duty on-highway trucks (10K GVW). The document identifies appropriate operating performance requirements and adds some insight into inverter selection.

- This document applies to factory and after-market installed DC-to-AC inverter systems (Including inverter chargers) providing up to 3000 W of 120 VAC line-voltage power as a convenience for operator and passenger use. Such inverters are intended to power user loads not essential to vehicle Operation or safety (e.g., HVAC, TV, microwave ovens, battery chargers for mobile phones or laptop computers, audio equipment, etc.).
- Systems incorporate the inverter itself as well as the input, output, control, and signal wiring associated with the inverter. Requirements are given for the performance, safety, reliability, and environmental compatibility of the system.
- These are recommended requirements to be used by vehicle manufacturers in the development of their own specifications, which may incorporate more or less stringent requirements.
- This document scope excludes military vehicles, bus and 28 V systems.

### 1.1 Purpose

The purpose of this document is to define requirements for inverters and inverter chargers used on class eight on highway heavy duty trucks.

## 2. REFERENCES

### 2.1 Applicable Documents

The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue of SAE publications shall apply.

### 2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), [www.sae.org](http://www.sae.org).

|              |                                                                                                        |
|--------------|--------------------------------------------------------------------------------------------------------|
| SAE J184     | Qualifying a Sound Data Acquisition System                                                             |
| SAE J1113    | Series of Standards for Electromagnetic Compatibility                                                  |
| SAE J1127    | Low Voltage Battery Cable                                                                              |
| SAE J1128    | Low Voltage Primary Cable                                                                              |
| SAE J1455    | Recommended Environmental Practices for Electronic Equipment Design in Heavy-Duty Vehicle Applications |
| SAE J1939/15 | Reduced Physical Layer, 250K bits/sec, UN-Shielded Twisted Pair (UTP)                                  |
| SAE J2549    | Single Conductor Cable for Heavy-Duty Applications - Truck and Bus                                     |
| SAE J2698    | Primary Single Phase Nominal 120 VAC Wiring Distribution Assembly Design - Truck and Bus               |

### 2.1.2 Underwriters Laboratories Publications

Available from Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096, Tel: 847-272-8800, [www.ul.com](http://www.ul.com).

|         |                                                                                                                                    |
|---------|------------------------------------------------------------------------------------------------------------------------------------|
| UL 458  | Standard for Power Converters/Inverters and Power Converter/Inverter Systems for Land Vehicles and Marine Crafts, Standard No. 458 |
| UL 1699 | Arc-Fault Circuit Interrupters                                                                                                     |

### 2.1.3 Canadian Standards Association Publication

Available from CSA International, 178 Rexdale Boulevard, Toronto, Ontario, Canada M9W 1R3, Tel: 416-747-4000, [www.csa-international.org](http://www.csa-international.org).

|                       |                            |
|-----------------------|----------------------------|
| CSA 22.2 No. 107.1-01 | General Use Power Supplies |
|-----------------------|----------------------------|

### 2.1.4 Other EMC Standards

|                      |                                                                          |
|----------------------|--------------------------------------------------------------------------|
| CISPR 25 Level 3     | CISPR 25 Edition 3.0 2008-03                                             |
| FCC Part 15, Class B | Code Of Federal Regulation, Title 47, Federal Communications Commission. |

### 2.1.5 Other Standards

|                                        |                                                                                            |
|----------------------------------------|--------------------------------------------------------------------------------------------|
| ANSI/RVIA 12V                          | Standard for Low Voltage Systems on Conversions and Recreational Vehicles                  |
| NFPA 70                                | National Electrical Code, 2008 Edition                                                     |
| ABYC Recommended Practice E-11 and A31 | A-31 – Battery Chargers and Inverters; E-11 – AC & DC Electrical Systems on Boats          |
| TMC RP160                              | Wiring and Circuit Protection Guidelines for 12 Vol DC to 120V AC in cab Inverter Systems. |

### 3. ABBREVIATIONS AND DEFINITIONS

#### 3.1 MSW

Modified sine wave, is defined as any wave form not sinusoidal. This may be square wave, step wave, or trapezoidal.

#### 3.2 NEC

National Electric Code, 2008 edition.

#### 3.3 TSW

True sine wave, is a true sinusoidal wave form with a frequency of 60 Hz.

#### 3.4 TYPE 1

Installations inside the truck cab.

#### 3.5 TYPE 2

Installations outside the truck cab usually on the frame rail.

#### 3.6 AMPACITY

Current carry capacity of a conductor.

#### 3.7 THD

Total Harmonic Distortion.

#### 3.8 AFCI

Arc Fault Circuit Interrupter.

#### 3.9 GFCI

Ground Fault Circuit Interrupter.

#### 3.10 NOMINAL 120 VAC

Standard electrical voltage as supplied by electric utilities may vary in tolerance from 100 to 125 VAC is referenced in this document as nominal 120 VAC.

#### 3.11 SHORE POWER

A fixed pedestal or other fixture that provides the interface to the truck for electricity from the land based power grid. An extension cord links the shore power with the truck's fixed shore power connectors.

#### 3.12 SHORE POWER CONNECTOR

The standard connector used to connect on-board wiring to the external power supply from the land base power grid.

#### 3.13 SURGE CURRENT

The surge current is the initial electrical current drawn by a load during its startup. This surge is typically less than 1 s in duration.