



SURFACE VEHICLE RECOMMENDED PRACTICE

J2847™/5

SEP2025

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Communication Between Plug-In Vehicles and Customers

RATIONALE

This update is to correct the switch orientation for AC V2V hardware option using prox signal. It's normally closed instead of normally open for the prox values expected. Additional AC V2L values will be confirmed to make sure they are also correct.

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Documents

Standard, visit Sharing Hub

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1. SCOPE

This SAE Recommended Practice establishes the communication for the variety of potential functions for plug-in electric vehicle (PEV) customers. This includes features for use case items in SAE J2836/3 that may be PEV/customer optional equipment, such as AC vehicle-to-load (V2L) and AC vehicle-to-vehicle systems. These systems conform to SAE J1772 with variations required to identify to the PEV bidirectional onboard charger (OBC) the mode of operation changes and output requirements.

SAE has published multiple documents relating to PEV and vehicle-to-grid (V2G) interfaces. The various document series are listed below, with a brief explanation of each.

- | | |
|-----------|---|
| SAE J2836 | General requirements and use cases. This series is divided into several sections. SAE J2836/1 is for utility/smart grid messaging. SAE J2836/2 is for direct current (DC) charge control. SAE J2836/3 is for reverse energy flow. SAE J2836/4 is for diagnostics. SAE J2836/5 is for consumer requirements and the home area network (HAN). SAE J2836/6 is for wireless charging. |
| SAE J2847 | Functional messaging requirements. This series defines the functional messages required for a given function. This series is divided into several sections that correspond to SAE J2836 above. SAE J2847/1 is for utility/smart grid messaging. SAE J2847/2 is for DC charge control. SAE J2847/3 is for reverse energy flow. SAE J2847/5 is for consumer requirements. SAE J2847/6 is for wireless charging. |
| SAE J2931 | Digital communications for PEVs. This series defines the requirements to enable digital communications for PEVs. This series is divided into several sections. SAE J2931/1 describes overall requirements. SAE J2931/4 is wired communications using PLC. SAE J2931/6 is for wireless charging. SAE J2931/7 includes the security for each of these. |
| SAE J2953 | PEV interoperability with electric vehicle supply equipment (EVSE). This series includes the requirements in SAE J2953/1 and test procedures in SAE J2953/2, for all the previous documents, including SAE J1772's control pilot and proximity circuits and functions. |
| SAE J3072 | Interconnection requirements for onboard, utility-interactive inverter systems. This document includes the requirements for onboard inverters to send/receive the grid signals for V2G functions. |

Figure 1 shows the sequencing of these documents and their primary function (e.g., the SAE J2836 and SAE J2847/1 documents start with smart charging, SAE J2836 and SAE J2847/2 then add DC charging, etc.). The intent is to have subsequent slash sheets complement each other as more functions and features are included. The /6 series of documents add wireless charging items not already included in the proceeding slash sheets. These are all then included in interoperability in SAE J2953 and security in SAE J2931/7. SAE J3072 then includes the PEV to grid requirements for V2G power and communication to match the SAE J2836/3 use cases.

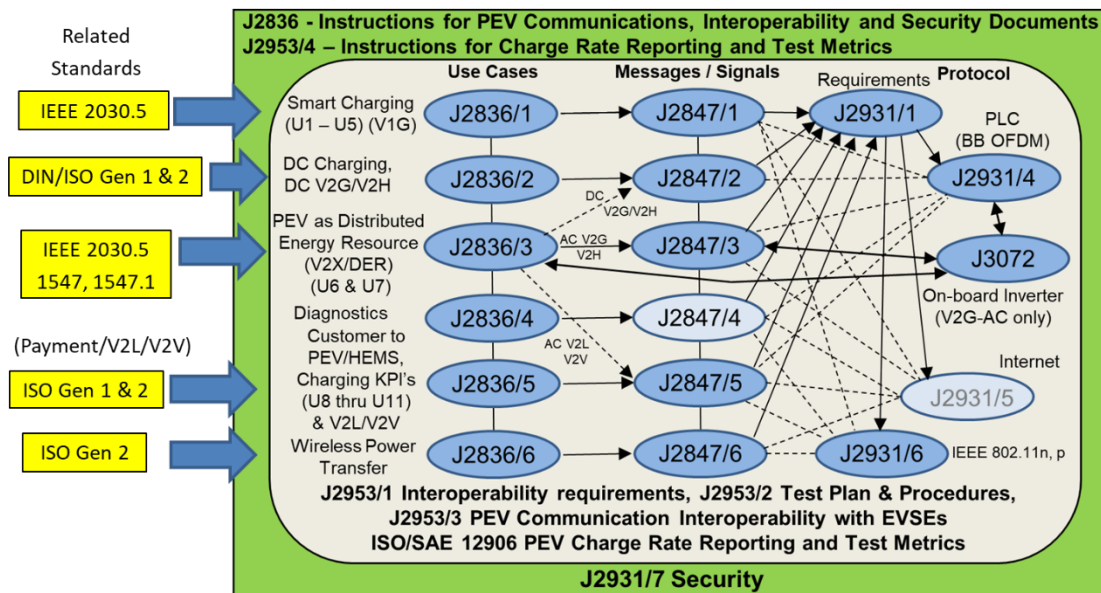


Figure 1 - Document interaction

1.1 Purpose

The primary purpose of SAE J2847/5 is to provide the design and interaction requirements for customer-to-PEV systems.

SAE J2836/3 identifies the use cases, and SAE J2847/5 adds the communication requirements.

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 (U.S. and Canada only) or +1 724-776-4970 (Outside U.S. and Canada), www.sae.org.

SAE J1772	SAE Electric Vehicle and Plug-in Hybrid Electric Vehicle Conductive Charge Coupler
SAE J2836/3	Use Cases for Plug-In Vehicle Communication as a Distributed Energy Resource
SAE J2836/4	Use Cases for Diagnostic Communication for Plug-in Electric Vehicles
SAE J2847/2	Communication Between Plug-in Vehicles and Off-Board DC Chargers
SAE J2847/3	Communication for Plug-in Vehicles as a Distributed Energy Source
SAE J3400	North American Charging System (NACS) for Electric Vehicles

2.1.2 ISO Publications

Copies of these documents are available online at www.iso.org/store.

ISO 15118	Road vehicles grid communication package
ISO 15118-2	Road vehicles - Vehicle to grid communication interface - Part 2: Network and application protocol requirements
ISO 15118-20	Road vehicles - Vehicle to grid communication interface - Part 20: 2nd generation network layer and application layer requirements
ISO 20653	Road vehicles - Degrees of protection (IP code) - Protection of electrical equipment against foreign objects, water and access

2.1.3 UL Publications

Available from UL, 333 Pfingsten Road, Northbrook, IL 60062-2096, Tel: 847-272-8800, www.ul.com.

UL 9741	Standard for Electric Vehicle Power Export Equipment (EVPE)
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2.2 Related Publications

The following publications are provided for information purposes only and are not a required part of this SAE Technical Report.

2.2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (U.S. and Canada only) or +1 724-776-4970 (Outside U.S. and Canada), www.sae.org.

SAE J2836	Instructions for Using Plug-In Electric Vehicle (PEV) Communications, Interoperability, and Security Documents
SAE J2836/1	Use Cases for Communication Between Plug-in Vehicles and the Utility Grid
SAE J2836/2	Use Cases for Communication Between Plug-in Vehicles and Off-Board DC Charger
SAE J2836/5	Use Cases for Customer Communication for Plug-in Electric Vehicles
SAE J2836/6	Use Cases for Wireless Charging Communication for Plug-in Electric Vehicles
SAE J2847/1	Communication for Smart Charging of Plug-in Electric Vehicles Using Smart Energy Profile 2.0
SAE J2847/6	Communication for Wireless Power Transfer Between Light-Duty Plug-in Electric Vehicles and Wireless EV Charging Stations
SAE J2931/1	Digital Communications for Plug-in Electric Vehicles
SAE J2931/4	Broadband PLC Communication for Plug-in Electric Vehicles
SAE J2931/6	Signaling Communication for Wirelessly Charged Electric Vehicles
SAE J2931/7	Security for Plug-In Electric Vehicle Communications

- SAE J2953/1 Plug-in Electric Vehicle (PEV) Interoperability with Electric Vehicle Supply Equipment (EVSE)
- SAE J2953/2 Test Procedures for the Plug-in Electric Vehicle (PEV) Interoperability with Electric Vehicle Supply Equipment (EVSE)
- SAE J3072 Interconnection Requirements for Onboard, Grid Support Inverter Systems

2.2.2 UL Publications

Available from UL, 333 Pfingsten Road, Northbrook, IL 60062-2096, Tel: 847-272-8800, www.ul.com.

- UL 1741 Standard for Inverters, Converters, Controllers, and Interconnection System Equipment for Use with Distributed Energy Resources
- UL 2202 Standard for Safety for Electric Vehicle (EV) Charging System Equipment
- UL 2594 Standard for Safety for Electric Vehicle Supply Equipment

3. DEFINITIONS

3.1 PROX

Prox, as used within this document, is an abbreviation for proximity and is further described in SAE J1772.

3.2 VEHICLE-TO-LOAD (V2L)

This typically refers to the unit or cable that connects to the AC charging inlet on the vehicle. This assembly includes outlets for equipment to be connected to power loads off-board the vehicle.

3.3 VEHICLE-TO-VEHICLE (V2V)

This is a cable that connects between two PEVs in order for a donor vehicle to discharge and provide energy to a receiving vehicle that may be stranded at zero SoC and was unable to complete the drive to a charging station. This may provide sufficient energy for the receiving vehicle to then drive to a charging station to complete the charging session.

3.3.1 V2V OBJECTIVE

The goal for V2V is to provide a quick exchange of energy between the donor vehicle and the receiving vehicle. It is expected the receiver vehicle is stranded and desires sufficient energy to drive to a charging station to finish the total charge needed for the drive cycle. This is analogous to providing a gallon of gasoline to an IC vehicle or a jump start.

Power level example charge times are as follows:

Type 1:

- 240 VAC and 32 A: 7.68 kW
 - Energy and operational time: ~1 mile per 3 minutes (energy transferred for 5 miles is about 2 kW·h ~15 minutes).
- 120 VAC and 12 A: 1.4 kW
 - This is not recommended. Higher power levels are less affected by the 12 V loads on the vehicle of about 250 W that subtracts from this energy going to charge the HV battery. Any additional thermal loads are also reducing the actual HV battery energy, and total charge time for the receiving vehicle to obtain 2 kW·h may be 1.5 to 2 hours. 1.2 kW or less for charging energy is not considered a reasonable time to expect for this feature.

Type 2:

- 400 VAC and 32 A (3P): 22 kW
 - Energy and operational time: ~1 mile per 1 minute (energy transferred for 5 miles is about 2 kW·h ~5 minutes).
- 230 VAC and 32 A (1P): 7.36 kW
 - Slightly less than Type 1, 240 VAC above.

GB/T (China system):

- 380 VAC and 32 A (3P): 21 kW
 - Energy and operational time: ~1 mile per 1 minute (energy transferred for 5 miles is about 2 kW·h ~5 minutes).
- 220 VAC and 32 A (1P): 7 kW
 - Slightly less than Type 1, 240 VAC above.

4. ABBREVIATIONS

For this document, the following abbreviations apply.

A	ampere
AC	alternating current
BPT	bidirectional power transfer
DC	direct current
EV	electric vehicle
EVSE	electric vehicle supply equipment
GB/T	national standard of the People's Republic of China
GFCI	ground fault circuit interrupter
HAN	home area network
HV	high voltage
Hz	hertz
IC	internal combustion
kW	kilowatt
kW·h	kilowatt-hour
n.c.	normally closed
n.o.	normally open

OBC	onboard charger
OBCM	onboard charger module
PEV	plug-in electric vehicle
PLC	powerline carrier
ppm/°C	parts per million per degree centigrade
PWM	pulse width modulation
Pwr	power
SoC	state of charge
sw	switch
V	volt
V2G	vehicle-to-grid
V2L	vehicle-to-load
V2V	vehicle-to-vehicle
V2X	vehicle-to-everything
VAC	volts AC
VOOR	voltage out of range

5. TECHNICAL REQUIREMENTS

5.1 AC V2L and V2V Requirements

- The vehicle OBC shall be bidirectional and operate as a voltage source for V2L and V2V to a grid frequency of 60 Hz.
- The V2L unit or assembly may have single or multiple outlets.
 - If more than one outlet is included, dedicated circuit protection is required to each additional outlet (e.g., if it delivers 32 A and has two outlets, each 20 A outlet needs its own circuit protection device).
- The V2L or V2V connector connects to the SAE J1772 vehicle charging inlet.
- The control unit for the V2V cable should be located within 6 feet of the donor vehicle connector.
- The V2L outlets shall include weather protection when not in use. IP46K rating per ISO 20653 is expected.
- The V2L and V2V off-board unit or cable shall be NRTL listed. UL 9741 provides the requirements.