AIAA S-133-5-2013

# Standard

# Space Plug-and-Play Architecture Standard

## 28V Power Service

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# 28V Power Service



**Sponsored by**

American Institute of Aeronautics and Astronautics

**Approved November 2012**

**Abstract**

The SPA 28V power service is a battery-clamped power bus that may vary with battery charge from 22V to 34V during normal operations. This power service is subject to transient behavior, such as voltage ripple, spikes, and surges, which must be accounted for in the design of SPA components. The SPA 28V Power Service Standard establishes requirements for SPA component and spacecraft grounding, bonding, and isolation.

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## Foreword

This standard was developed through a partnership of the Air Force Research Laboratory Space Vehicles Directorate, the Air Force Office of Operationally Responsive Space, numerous government contractor teams, independent contractor teams, and academic experts. The Space Plug-and-Play Architecture (SPA) is a collection of standards developed to facilitate rapid constitution of spacecraft systems using modular components. In order for a SPA system to meet expected performance requirements, the SPA components and spacecraft must conform to a consistent and widely agreed upon grounding approach. This document includes specifications for SPA component and spacecraft grounding, bonding, and isolation. The Power standard identifies significant features and grounding approaches for SPA power systems. The intent of this document is to allow SPA designers and manufacturers to provide components and/or subsystems that successfully interface with SPA-enabled spacecraft.

This particular volume of the SPA 28V Power Service Standard contains information not recorded in previous documentation. It is part of a set of 10 documents describing other components of the standard:

- SPA Guidebook
- SPA Networking Standard
- SPA Logical Interface Standard
- SPA Physical Interface Standard
- SPA System Timing Standard
- SPA Ontology Standard
- SPA Test Bypass Standard
- SPA SpaceWire Subnet Adaptation Standard
- SPA System Capability Guide

At the time of approval, the members of the AIAA SPA Committee on Standards were:

| | |
|---|---|
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| Scott Cannon | Utah State University |
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| Don Fronterhouse* | PnP Innovations |
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The above consensus body approved this document in June 2012.

The AIAA Standards Executive Council (VP-Standards, Laura McGill, Chairperson) accepted the document for publication in November 2012.

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*Alternate CoS Participant

## Introduction

The SPA 28V power service is a battery-clamped power bus that may vary with battery charge from 22V to 34V during normal operations. This power service is subject to transient behavior, such as voltage ripple, spikes, and surges, which must be accounted for in the design of SPA components.

The voltage reference system (VRS) associated with the spacecraft power service follows a single-point ground (SPG) architecture.

# 1 Scope

This standard is applicable to systems operating under the Space Plug-and-Play Architecture.

The SPA 28V Power Service Standard establishes specifications regarding the quality of the power service such as voltage ripple, transients, and interruptions.

The scope of this document is limited to the interface between a SPA-equipped spacecraft and SPA-compliant device. This interface is implemented at a physical SPA endpoint connector, specified in AIAA S-133-4-2013 SPA Physical Interface Standard, which contains details of the connector type, pin assignments, and wiring harnesses. Details of the design of a specific spacecraft electrical power subsystem, including power sources such as solar arrays and power storage devices such as batteries, are not relevant to the SPA power interface described in this document.

# 2 Tailoring

When viewed from the perspective of a specific program or project context, the requirements defined in this standard may be tailored to match the actual requirements of the particular program or project. Tailoring of requirements shall be undertaken in consultation with the procuring authority where applicable.

NOTE Tailoring is a process by which individual requirements or specifications, standards, and related documents are evaluated and made applicable to a specific program or project by selection, and in some exceptional cases, modification and addition of requirements in the standards. For the purposes of this standard, one must exercise caution in that any tailoring may lead to non-SPA compliant devices.

# 3 Applicable Documents

The following documents contain provisions which, through reference in this text, constitute provisions of this standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies.

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|---|---|
| AIAA S-133-4-2013 | *Space Plug-and-Play Architecture Standard Physical Interface* |
| AIAA A-122-2007 | *Electrical Power Systems for Unmanned Spacecraft Standard* |
| MIL-STD-461E | EMC Requirements (CE101,102) |

# 4 Vocabulary

## 4.1 Acronyms and Abbreviated Terms

| | |
|---|---|
| AIAA | American Institute of Aeronautics and Astronautics |
| ASIM | Appliqué Sensor Interface Module |
| SAR | solar array regulator |
| SPA | Space Plug-and-Play Architecture |
| SPG | single-point ground |
| VRS | voltage reference system |