AIAA S-133-6-2013

Standard

Space Plug-and-Play Architecture Standard

System Timing

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Sponsored by

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Abstract

This document details how common time is provided for Space Plug-and-Play Architecture systems. Timing synchronization is accomplished through the use of time-at-tone messages and synchronization pulse

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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 System Timing standard is one piece of the Space Plug-and-Play Architecture (SPA) which is a system that aims to reduce the cost and timeline of getting spacecraft into operational use. SPA incorporates the use of design tools, standard interfaces for hardware and software, and standard, modular structures and wiring. The system timing methods described herein provide for common time within the system, allowing for synchronization of processes and functions across the system.

This document describes how common time is provided to components in SPA systems using a time-at-tone (TAT) message and synchronization pulses. Annexes A and B are informational and provide information on timing disruptions, time source priority, and master clock source considerations, with descriptions of timing implementation within a reference model.

This particular volume of the SPA System Timing 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 28V Power Service 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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The above consensus body approved this document in June 2013.

The AIAA Standards Executive Council (VP-Standards, Laura McGill, Chairperson) accepted the document for publication in August 2013.

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*Alternate CoS participant.

1 Scope

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

The SPA System Timing Standard establishes a common method for providing common timing within a system of networked SPA components.

Discussions on availability, latency, jitter, and drift provide general guidelines on system timing requirements which are intended to meet the needs of most systems. Systems requiring greater timing accuracy than described herein may be implemented within the Space Plug-and-Play Architecture with enhanced or modified timing provisions as necessary.

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.

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.

AIAA S-133-3-2013	*Space Plug-and-Play Architecture Standard Logical Interface*
AIAA S-133-7-2013	*Space Plug-and-Play Architecture Standard Ontology*
AIAA S-133-9-2013	*Space Plug-and-Play Architecture Standard SpaceWire Subnet Adaptation*
AIAA G-133-10-2013	*Space Plug-and-Play Architecture Guide System Capability*
ANSI/TIA/EIA-422-B	*Electrical Characteristics of Balanced Voltage Differential Interface Circuits*

4 Vocabulary

4.1 Acronyms and Abbreviated Terms

AIAA	American Institute of Aeronautics and Astronautics
GPS	global positioning system
PPS	pulse-per-second
TAT	time-at-tone
xTEDS	extensible transducer electronic data sheet