



AEROSPACE STANDARD

AS5706™**REV. A**Issued 2007-05
Revised 2021-04

Superseding AS5706

Test Plan/Procedure for AS5643/1 S400 Copper Media Interface Characteristics Over Extended Distances

RATIONALE

Revisions to this document include updated reference dates, addition of cable requirements explanation, and updated requirements in Tables 1, 2, and 4. This version removes Test Procedure for Cable Requirements section and QuadraX MIL-DTL-38999 and ARINC 600 High Density Options section.

TABLE OF CONTENTS

1.	SCOPE.....	3
1.1	Purpose.....	3
1.2	Application.....	3
1.3	Interpretation.....	3
2.	REFERENCES.....	3
2.1	Applicable Documents.....	3
2.1.1	SAE Publications.....	3
2.1.2	U.S. Government Publications.....	3
2.1.3	IEEE Publications.....	4
2.2	Acronyms and Definitions.....	4
3.	IEEE-1394-2008 BETA REQUIREMENTS, S400 COPPER MEDIA.....	5
3.1	Cable.....	5
3.1.1	Cable Requirements.....	5
3.1.2	Cable Termination.....	6
3.1.3	Cable Interconnects.....	12
3.2	Bus Isolation.....	13
3.2.1	Link Termination.....	13
3.3	Link Signal Specification.....	13
3.3.1	Signal Configuration.....	13
3.3.2	Verified Transmit Parameters.....	14
3.3.3	Test Equipment.....	14
3.3.4	Transmit Test Procedures.....	15
3.3.5	Verified Receive Parameters.....	18
3.3.6	Receive Test Procedures.....	19
4.	NOTES.....	20
4.1	Revision Indicator.....	20

SAE Executive Standards Committee Rules provide that: "This report is published by SAE to advance the state of technical and engineering sciences. The use of this report is entirely voluntary, and its applicability and suitability for any particular use, including any patent infringement arising therefrom, is the sole responsibility of the user."

SAE reviews each technical report at least every five years at which time it may be revised, reaffirmed, stabilized, or cancelled. SAE invites your written comments and suggestions.

Copyright © 2021 SAE International

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of SAE.

TO PLACE A DOCUMENT ORDER: Tel: 877-606-7323 (inside USA and Canada)
Tel: +1 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
http://www.sae.org

SAE WEB ADDRESS:

Full document details: SAE AS5706A

For more information on this standard, visit
<https://www.sae.org/standards/content/AS5706A/>

Documents

Document Sharing Hub

Figure 1	Connector pin-out, MIL-DTL-38999 series 3 shell size A (9).....	7
Figure 2	Connector pin-out, MIL-DTL-38999 series 3 shell size A (9) with alternate quad aligned contact assignments	7
Figure 3	Connector pin-out, MIL-DTL-38999 series 3 shell size B (11).....	8
Figure 4	Connector pin-out, MIL-DTL-38999 series 3 shell size B (11) with alternate quad aligned contact assignments.....	9
Figure 5	Connector pin-out, MIL-DTL-38999 series 3 shell size C (13)	10
Figure 6	Connector pin-out, MIL-DTL-38999 series 3 shell size C (13) with alternate quad aligned contact assignments.....	11
Figure 7	600 ps exception window example showing $1.2\text{ns}/2 = 600\text{ ps}$ window	12
Figure 8	600 ps exception window example showing $110 +43.5/-21.9\ \Omega$ differential	13
Figure 9	Link measurement points (half connection is shown)	13
Table 1	Cable requirements.....	5
Table 2	Link signal transmitter characteristics (TP2)	14
Table 3	BER test duration	15
Table 4	Link signal receiver characteristics (TP3)	18

1. SCOPE

This document establishes test plans/procedures for the AS5643/1 Slash Sheet. The AS5643/1 Slash Sheet establishes guidelines for the use of IEEE Std 1394-2008 as a data bus network in military and aerospace vehicles. It encompasses the data bus cable and its interface electronics for a system utilizing S400β over copper medium over extended lengths.

1.1 Purpose

The purpose of this document is to establish test plans/procedures for the AS5643/1 Slash Sheet.

This document is controlled and maintained by the SAE with technical support from subsystem vendors.

1.2 Application

The information herein may be used to assist the test of the subsystems that interface via the vehicle's network.

1.3 Interpretation

The following interpretations shall be placed upon these words, unless stated otherwise, where they are used in this document.

May An allowed action

Shall A mandatory requirement

Should A recommended action

Will A declaration of intent

2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this document to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text of this document and references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

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 +1 724-776-4970 (outside USA), www.sae.org.

AS6070/8 Cable, Lightweight Optimized High Speed Data Quad, 110 Ohm, 200 °C

2.1.2 U.S. Government Publications

Copies of these documents are available online at <https://quicksearch.dla.mil/>.

MIL-HDBK-454A Department of Defense Handbook, General Guidelines for Airborne Electronic Equipment

MIL-HDBK-5400 Military Handbook, Electronic Equipment, Airborne, General Guidelines

MIL-STD-461E Department of Defense Interface Standard, Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment

2.1.3 IEEE Publications

Available from IEEE Operations Center, 445 and 501 Hoes Lane, Piscataway, NJ 08854-4141, Tel: 732-981-0060, www.ieee.org.

IEEE Std 1394-2008 IEEE Standard for a High Performance Serial Bus

IEEE Std 1394-2008 includes IEEE-Std 1394-1995, Amendment IEEE Std 1394a-2000, and IEEE Std 1394b-2002 plus additional information and corrections.

2.2 Acronyms and Definitions

B or Beta IEEE-1394-2008 Beta (previously referred to as IEEE-1394b-2002)

BER Bit Error Rate

C Celsius

dB Decibels

DC Direct Current

GHz Gigahertz

Link The Point-To-Point Connection Between Two Ports

LRU Line-Replaceable Unit

mA Milliamps

MBd Megabaud

Mbits Megabits

Mb/s Megabits per Second

MHz Megahertz

ms Milliseconds

mV Millivolts

N/A Not Applicable

pF Picofarad

PHY 1394 Physical Interface Device

ppm Parts per Million

ps Picoseconds

UI	Unit Interval, duration of one bit cell
UUT	Unit Under Test
V	Volts
VRMS	Volts Root Mean Square
Ω	Ohms

3. IEEE-1394-2008 BETA REQUIREMENTS, S400 COPPER MEDIA

The requirements are based on the IEEE Standard for a High Performance Serial Bus (IEEE-1394-2008). This section delineates the options selected and interprets any ambiguities.

3.1 Cable

3.1.1 Cable Requirements

The cable shall meet the electrical requirements of IEEE Standard for a High Performance Serial Bus (IEEE-1394-2008), except as specified in this section. Bulk cable shall meet all the cable requirements defined in AS6070/8 and shall be tested according to the test procedures defined in AS6070/8 and referenced documents.

3.1.1.1 Test Requirements

- Verify that the cable is of quad construction and contains two differential pair transmission lines (positioned on orthogonal axes) with nominal differential impedance of 110 Ω . reference AS6070/8 Figure 1.
- Verify that the insulated wires for the two differential pairs in the cable are color-coded as follows: pair one consists of one Blue wire and one Orange wire (Blue x Orange), and pair two consists of one Red wire and one Green wire (Red x Green). For the Blue x Orange pair, the blue wire connects to the positive signal and the orange wire connects to the negative of a given port; for the Red x Green pair, the Red wire connects to the positive signal and the Green wire connects to the negative of a given port.
- When connecting between two 1394b nodes, verify that one connects from the transmit (TX) of one port to the receive (RX) of the other. (For example, for the Blue x Orange pair, the Blue wire connects to TX+ and the Orange wire connects to TX- on one end of the cable, and the Blue wire connects to RX+ and the Orange wire connects to RX- on the other end of the cable.)
- Cable temperature will affect the values of the tests below; perform tests at 200 °C or your application's maximum expected temperature.

Table 1 is informative; AS6070/8 is the normative reference for all cable requirements.

Table 1 - Cable requirements

Dielectric Withstanding Voltage Conductor/Conductor (Maximum)	1500 VRMS
Dielectric Withstanding Voltage Conductor/Shield (Maximum)	1000 VRMS
Capacitance (Typical) Between Pairs, Ground Floating	13 pF/feet
Differential Impedance @ (100 to 500 MHz)	110 Ω +6/-4 Ω
Temperature Range	-55 to +200 °C
Insertion Loss at 250 MHz, 26 AWG (DB/100 Feet)	14.2 dB
Insertion Loss at 250 MHz, 24 AWG (DB/100 Feet)	10.9 dB
Insertion Loss at 250 MHz, 22 AWG (DB/100 Feet)	8.8 dB
Propagation Delay Skew (Maximum) Within Pairs	4 ps/foot

3.1.1.2 Test Procedures for Cable Requirements

Refer to AS6070/8 for all cable requirement test procedures.

3.1.2 Cable Termination

3.1.2.1 MIL-DTL-38999 Option

- Verify that the connectors use #22D contacts, with pins used at the LRU and #22D contact sockets by the vehicle cabling.
- Verify that all pin locations designated as “not used” remain empty and are not utilized for other non-1394 signals.

3.1.2.1.1 MIL-DTL-38999, Shell Size A

- Verify that for cabling and LRUs utilizing a MIL-DTL-38999 Series 3 connector shell size A (9), insert arrangement 35 is used and is pinned as per Figure 1 or Figure 2.