



IEEE

IEC 63004

Edition 1.0 2015-12

INTERNATIONAL STANDARD

IEEE Std 1505™



Standard for receiver fixture interface

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 25.040

ISBN 978-2-8322-2942-2

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STANDARD FOR RECEIVER FIXTURE INTERFACE

FOREWORD

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International Standard IEC 63004/IEEE Std 1505-2010 has been processed through IEC technical committee 91: Electronics assembly technology, under the IEC/IEEE Dual Logo Agreement.

The text of this standard is based on the following documents:

IEEE Std	FDIS	Report on voting
IEEE Std 1505-2010	91/1275/FDIS	91/1299/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

The IEC Technical Committee and IEEE Technical Committee have decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

IEEE Std 1505™-2010
(Revision of
IEEE Std 1505-2006)

IEEE Standard for Receiver Fixture Interface

Sponsor

**IEEE Standards Coordinating Committee 20 on
Test and Diagnosis for Electronic Systems**

Approved 30 September 2010

IEEE-SA Standards Board

Approved 15 July 2011

American National Standards Institute

Abstract: A mechanical and electrical specification for implementing a common interoperable mechanical quick-disconnect interconnect system for use by industry for interfacing large numbers of electrical signals (digital, analog, RF, power, etc.) is provided. These large interface panels (receiver and fixture panels) are employed primarily in test systems between stimulus/measurement assets and a related unit-under-test (UUT), although any application involving high-density contacts requiring a quick disconnect interface could benefit. The *receiver* is a receptacle that is mounted to test system mates with multiple *fixtures*, which serve as the *buffer* between the UUT and automatic test equipment (ATE). Fixtures translate standard input/output (I/O) signal routing offered at the receiver to a wiring interface that directly connects to the UUT. These UUT interfaces can represent cable connectors, direct plug-in (printed circuit board edge connectors), sensor monitoring, or manual feedback from the test technician.

The primary objectives of this standard are: (a) to establish interface standards that permit interchangeability of mechanical/electrical receiver/fixture/connector product assemblies from various manufacturers under an *open architecture*; and (b) to develop within this framework a defined set(s) of interconnecting connector and mechanical specifications that supports available, accepted, low-cost commercial technology to reduced dependence on proprietary designs and extend life-cycle availability.

Keywords: connector, fixture, framework, interface, interoperability, mass-interconnect, quick disconnect, receiver, specification

1999 Introduction

This introduction is not part of IEEE Std 1505-2010, IEEE Standard for Receiver Fixture Interface.

Historical Background

On September 19, 1996, a group of receiver fixture product vendors/integrators announced the formation of an industry standards group called the RFI Alliance.

The organization later sought to gain identity through a standards organization, which ultimately became the Institute of Electrical and Electronic Engineers, Inc. (IEEE). Under the joint sponsorship of the Instrumentation and Measurement Society TC-5 Connectors/TC-8 Automated Instruments Committees and SCC20 Hardware Interface Subcommittee, an IEEE Std 1505 RFI Working Group was developed and authorized by the IEEE Standards Association. Participation in the IEEE Std 1505 RFI Working Group is open to vendors, integrators, and users.

IEEE Std 1505 Receiver Fixture Interface (RFI) Working Group focus

The IEEE Std 1505 RFI Working Group, sponsored by the IEEE Instrumentation and Measurement Society and IEEE SCC20, Test and Diagnosis for Electronic Systems, was formed to define a common electrical/mechanical interface specifications for applications involving test, production processing, quick-disconnect electrical interfacing, and subassembly mating requirements. The group is made up of technical individuals from industry, government, and academia, which reflect perspective views of a supplier, user, and general interest in the standard. To derive these specifications, the IEEE Std 1505 Working Group utilized the results of a study conducted by the Department of Defense Automatic Test System Research & Development Integrated Product Team (ARI) Critical Interface Working Group (CIWG), which reviewed as part of their tasks the Automatic Test System (ATS) Test Interface and the joint industry/government Common Test Interface (CTI) Working Group. The methodology step process includes: (a) defining the problem, (b) establishing a set of requirements, (c) evaluating available interface designs against a set of parameters that relate to the problem and requirements, and (d) defining a specification that will meet the consensus of the Working Group and industry short- and long-term goals. It was designed upon open standards or functional specifications that are supported by multiple-vendor products.

Cooperative relationship with the Common Test Interface

This document serves as the basis for supplemental pin map configuration standards, such as IEEE Std 1505.1-2008 and others that are expected to meet unique pin map requirements. Future revisions to this document may add new connector styles or types that support RFI needs.

The IEEE Std 1505 Working Group recognizes industry/government end-user integration and maintenance support of a defined CTI, a specific connector/pin map implementation of the standard. This document provides for these CTI end-users, and for its ATE system and hardware integrators, a defined, standardized framework and connector, and configuration specification to enable agency/aerospace interoperability and upward compatibility. The CTI Working Group has developed a *common test interface pin map configuration* (IEEE Std 1505.1) that uses this standard as its basis.

Vendor responsibility

Users and buyers of IEEE-1505-compliant hardware are forewarned that neither the IEEE nor any other referenced agency has responsibility for the warranty or certification of any RFI product compliance. Therefore, purchasers of RFI products are encouraged to request such information from the manufacturer.

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Standard for Receiver Fixture Interface

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1. Overview

1.1 Scope

The scope of this standard is the development of a common receiver fixture interface (RFI) specification that is based upon available commercial standards integrated under a common *open architecture*. This mechanical/electrical interface is intended to serve government/commercial interest for applications in test, system integration, manufacturing, monitoring, and other functional requirements that demand large contact densities and quick-disconnect mechanical operation.

1.2 Purpose

The purpose of this standard is to permit interchangeability of mechanical/electrical receiver/fixture/connector product assemblies from various manufacturers under an open architecture. The standard shall also define, within this framework, a set(s) of interconnecting connector and mechanical specifications that support available, accepted, low-cost commercial technology to reduce dependence on proprietary designs and extend life-cycle availability. Technical requirements incorporated shall be those identified by government and industry, including maximum flexibility, scalability, and range of application.

1.3 Background

A joint technical forum has been operational since 1997 under the auspices of the IEEE Std 1505 RFI Working Group.

Readers of this document are encouraged to comment on details unclear, contradictory, or undefined to the IEEE 1505 RFI Working Group or the IEEE Standards Association for review and change. These organizations can be contacted at the locations described in the Introduction of this standard.

The RFI Working Group serves to encourage vendors to produce same product class types that are intermatable and interchangeable by adhering to performance specifications of this standard.

The document has been developed in accordance with Institute of Electrical and Electronic Engineers (IEEE) Standards Association Policies and Procedures, per *IEEE-SA Standards Board Bylaws* [B24], *IEEE-SA Standards Board Operations Manual* [B25], *IEEE-SA Standards Companion* [B26], and the *IEEE Standards Style Manual* [B27].¹ Additional guidance and reference was utilized from IEEE/ASTM SI 10™-2002 [B13].

1.4 Annexes overview

Included within this document are three informative annexes: Annex A, an overview of the RFI description, background, and application use to inform new users; Annex B, the results of a study conducted by the Department of Defense Automatic Test System Research and Development Integrated Product Team (ARI) Critical Interface Working Group (CIWG), which reviewed as part of their tasks the automatic test system (ATS) test interface²; and Annex C, an informative bibliography.

2. Normative references

The following referenced documents are indispensable for the application of this document (i.e., they must be understood and used, so each referenced document is cited in text and its relationship to this document is explained). For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments or corrigenda) applies.

ASTM A240, Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications; equivalent to SAE-AMS-QQ-S-766.³

ASTM A342, Standard Test Methods for Permeability of Feebly Magnetic Materials; equivalent to MIL-I-17214.

ASTM A484M-03, Standard Specification for General Requirements for Stainless Steel Bars, Billets, and Forgings.

ASTM A581, Standard Specification for Free-Machining Stainless Steel Wire and Wire Rods.

ASTM A582M-05, Standard Specification for Free-Machining Stainless Steel Bars.

ASTM A666-00, Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

ASTM A693-06, Standard Specification for Precipitation-Hardening Stainless and Heat-Resisting Steel Plate, Sheet, and Strip.

¹ The numbers in brackets correspond to those of the bibliography in Annex C.

² For more information, see <http://grouper.ieee.org/groups/sec20/HIWG/index.htm>.

³ ASTM publications are available from the American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959, USA (<http://www.astm.org/>).

ASTM A967-1999E1, Standard Specification for Chemical Passivation Treatments for Stainless Steel Parts; supersedes SAE AMS QQ-P-35C Passivation Treatments for Corrosion-Resistant Steel (cancelled February 2005).

ASTM B16, Standard Specification for Free-Cutting Brass Rod, Bar and Shapes for Use in Screw Machines.

ASTM B36/B36M-08a, Standard Specification for Brass Plate, Sheet, Strip, and Rolled Bar.

ASTM B103, Standard Specification for Phosphor Bronze Plate, Sheet, Strip, and Rolled Bar.

ASTM B121/B121M, Standard Specification for Leaded Brass Plate, Sheet, Strip, and Rolled Bar; and related Federal Specification QQ-B-626 D, Brass, Leaded and Nonleaded: Rod, Shapes, Forgings, and Flat Products with Finished Edges (Bar and Strip).

ASTM B134, Standard Specification for Brass Wire.

ASTM B139/B139M-07, Standard Specification for Phosphor Bronze Rod, Bar, and Shapes; and related Federal Specification QQ-B-750, Phosphor Bronze Bar, Flat Wire, Plate, Sheet, Strip, and Structural Shapes.

ASTM B159, Standard Specification for Wire Phosphor Bronze.

ASTM B194, Standard Specification for Copper-Beryllium Alloy Plate, Sheet, Strip, and Rolled Bar; and related Federal Specification for QQ-C-530/533 Beryllium-Copper (BeCu) Bar, Rod, and Wire/Strip.

ASTM B196, Standard Specification for Copper-Beryllium Alloy Rod and Bar.

ASTM B197, Standard Specification for Copper-Beryllium Alloy Wire.

ASTM B206/B206M, Copper-Nickel-Zinc (Nickel Silver) Wire and Copper-Nickel Alloy Wire; and related Federal Specification QQ-W-321, Copper alloy wire).

ASTM B209-07, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (related to SAE AMS-QQ-A-250/1A, -250/2A, -250/4A, -250/8B, 250/11A, and -250/13 for Aluminum Alloy 3003/2024/5052/6061/and 7075, Plate and Sheet).

ASTM B301/B301M-08, Standard Specification for Free Cutting Copper Rod, Bar, Wire and Shapes.

ASTM B441-04, Standard Specification for Copper-Cobalt-Beryllium, Copper-Nickel-Beryllium, and Copper-Nickel-Lead-Beryllium Rod and Bar (UNS Nos. C17500, C17510, and C17465).

ASTM B488-01(2006), Standard Specification for Electrodeposited Coatings of Gold for Engineering Uses (equivalent to SAE AMS-2422 and MIL-G-45204).

ASTM B740-02, Standard Specification for Copper-Nickel-Tin Spinodal Alloy Strip.

ASTM D4067-03, Standard Specification for Reinforced and Filled Poly(Phenylene Sulfide) (PPS) Injection Molding and Extrusion Materials Using ASMT Methods.

ASTM D5927-09, Standard Specification for Thermoplastic Polyester (TPES) Injection and Extrusion Materials Based on ISO Test, Methods.

ASTM D5948-05e1, Standard Specification for Molding Compounds, Thermosetting.

EIA 364E, Electrical Connector/Socket Test Procedures including Environmental Classifications.⁴

EIA 557B, General Standard for Statistical Process Control Systems.

FED-STD-H28, Screw Thread Standards for Federal Services.⁵

IEC 60309-1, Plugs, socket-outlets, and couplers for industrial purposes—Part 1: General Requirements.⁶

IPC-D-275, Design Standard for Rigid Printed Boards and Rigid Printed Board Assemblies.⁷

ISO 10012-1, Quality Assurance Requirements for Measuring Equipment—Part 1: Meteorological Confirmation System for Measuring Equipment.⁸

ISO/IEC 17025:2005/ANSI/NCSL Z540-1, General Requirements for the Competence of Testing and Calibration Laboratories.⁹

MIL-C-24308C, General Specification for Connectors, Electric, Rectangular, Nonenvironmental, Miniature, Polarized Shell, Rack, and Panel.¹⁰

MIL-C-83517, General Specification for Connector, Coaxial, Radio Frequency for Coaxial, Strip or Microstrip Transmission Line.

MIL-DTL-14072, Finishes for Ground Based Electronic Equipment.

MIL-DTL-16878, General Requirements for Wire, Electrical, Insulated.

MIL-DTL-55302, Connectors, Printed Circuit Subassembly and Accessories,

MIL-HDBK-217F, Reliability Prediction of Electronic Equipment.

MIL-HDBK-454B/4, General Guidelines for Electronic Equipment.

MIL-M-24519E, Military Specification for Molding Plastics, Polyester Thermoplastic, Polyarylether Thermoplastic, Plastic Molding Material, Polyphenylene Sulfide, Glass Fiber Reinforced.

MIL-M-24519/GPT-30F, Thermoplastic polyetherimide compound, 30 percent glass reinforced, flame resistant.

⁴ EIA publications are available from Global Engineering Documents, 15 Inverness Way East, Englewood, Colorado 80112, USA (<http://global.ihs.com/>).

⁵ Fed-Std publications are available from the Defense Industrial Supply Center, 700 Robbins Avenue, Bldg 3 (Code DISSC-ETT), Philadelphia, PA 19111-5096 (www.wbdg.org/ccb/FEDMIL/fedstdh28a.pdf).

⁶ IEC publications are available from the Sales Department of the International Electrotechnical Commission, Case Postale 131, 3, rue de Varembe, CH-121 1, Genève 20, Switzerland/Suisse (<http://www.iec.ch/>). IEC publications are also available in the United States from the Sales Department, American National Standards Institute, 25 West 43rd Street, 4th Floor, New York, NY 10036, USA (<http://www.ansi.org/>).

⁷ IPC publications are available from the Association Connecting Electronics Industries, 3000 Lakeside Drive, 309 S. Bannockburn, IL 60015 or at IPC-D-275 Design Standard for Rigid Printed Boards and Rigid Printed Board Assemblies, IPC-RB-276 Qualification and Performance Specification (www.ipc.org/TOC/IPC-MIL-960.pdf).

⁸ ISO publications are available from the ISO Central Secretariat, Case Postale 56, 1 rue de Varembe, CH-121 1, Genève 20, Switzerland/ Suisse (<http://www.iso.ch/>). ISO publications are also available in the United States from the Sales Department, American National Standards Institute, 25 West 43rd Street, 4th Floor, New York, NY 10036, USA (<http://www.ansi.org/>).

⁹ ISO/IEC publications are also available in the United States from the Sales Department, American National Standards Institute, 25 West 43rd Street, 4th Floor, New York, NY 10036, USA (<http://www.ansi.org/>). See also www.ecalibration.com/Resources/17025b.htm.

¹⁰ Copies of specifications, standards, drawings, and publications required by manufacturers in connection with specific procurement functions may be obtained from the U.S. Government Printing Office, P.O. Box 37082, Washington, DC 20013-7082, USA (<http://www.access.gpo.gov/>) or from other sources that may require additional fees. See also <http://store.mil-standards.com/>.

MIL-M-24519/GST-40F, Thermoplastic polyphenylene sulfide compound, 40 percent glass reinforced, flame resistant.

MIL-PRF-31032, General Specification for Printed Circuit Board/Printed Wiring Board (with Amendment 1) Revision: A, Dated: 24 February 2006.

MIL-PRF-55110, General Specification for Printed Wiring Board, Rigid, (with Amendment 1) FSC 5998.

MIL-STD-1130, Connections, Electrical, Solderless Wrapped (standard has been cancelled with no replacement and should be used for guidance only).

MIL-STD-1285D, Marking of Electrical and Electronic Parts.

MIL-STD-1344A, Test Methods for Electrical Connectors (equivalent standard EIA 364).

MIL-STD-202G, Test Method Standard for Electronic Components.

MIL-STD-2166, Connections, Electrical, Compliant Pin.

MIL-STD-275, Printed Wiring for Electronic Equipment (superseded by IPC-D-275).

MIL-STD-810F, Test Method Standard for Environmental Engineering Considerations and Laboratory Tests.

MIL-STD-889B, Dissimilar Metals.

MS3197, Gage Pin for Socket Contact Engagement Test (superseded by SAE AMS-31971).¹¹

OSHA CPL 02-01-038 [CPL 2-1.38] (October 31, 2002), Enforcement of the Electrical Power Generation, Transmission, and Distribution Standard.¹²

OSHA STD 01-16-007 [STD 1-16.7], Electrical Safety-Related Work Practices—Inspection Procedures and Interpretation Guidelines.¹³

OSHA Technical Manual (OTM), TED 01-00-015 [TED 1-0.15A] (January 20, 1999).

SAE AMS-QQ-N-290, Nickel Plating (Electrodeposited).¹⁴

SAE AMS-QQ-S-763, Steel, Corrosion-Resistant, Bars, Wire, Shapes, and Forgings.

SAE AMS-3197, Gauge Pin for Socket Contact Engagement Test (equivalent to MS-3197).

SAE AMS-P-81728, Plating, Tin-Lead (Electrodeposited) (equivalent to MIL-P-81728).

SAE AMS-2422, Gold Plating for Electronic and Electrical Application (equivalent to ASTM B488 and MIL-G-45204).

¹¹ This document is available from Global Engineering Documents, 15 Inverness Way East, Englewood, Colorado 80112, USA (<http://global.ihs.com/>).

¹² U.S. Regulatory Guides are available from the Superintendent of Documents, U.S. Government Printing Office, P.O. Box 37082, Washington, DC 20013-7082, USA (<http://www.access.gpo.gov/>).

¹³ Occupational Safety & Health Administration (OSHA) publications are available from OSHA, 200 Constitution Avenue, NW, Washington, DC 20210, at Safety and Health Topics: Electrical—Standards Electrical Safety-Related Work Practices—Inspection Procedures and www.osha.gov/SLTC/electrical/standards.html.

¹⁴ SAE publications are available from the Society of Automotive Engineers, 400 Commonwealth Drive, Warrendale, PA 15096, USA (<http://www.sae.org/>).

SAE AMS-2418, Copper Plating (Electrodeposited) (equivalent to ASTM B734, MIL-C-14550).

SAE AMS-QQ-A-250/1A, Aluminum 1100, Plate and Sheet (superseded by ASTM B 209, Alloy 1199).

SAE AMS-QQ-A-250/2A, Aluminum Alloy 3003, Plate and Sheet (superseded by ASTM B 209, Alloy 3003).

SAE AMS-QQ-A-250/4A, Aluminum Alloy 2024, Plate and Sheet (related to ASTM B209).

SAE AMS-QQ-A-250/8B, Aluminum Alloy 5052, Plate and Sheet (related to ASTM B209).

SAE AMS-QQ-A-250/11A, Aluminum Alloy 6061, Plate and Sheet (superseded by SAE AMS 4025).

SAE AMS-QQ-A-250/12 (Edition 97), Aluminum Alloy 7075, Plate and Sheet (related to ASTM B209).

SAE AMS-QQ-B-613, Brass, Leaded/Non-Leaded; Rod/Shapes/Forgings/Flat Products with Finished Edges (Bar and Strip) (equivalent to ASTM B16).

SAE AMS-QQ-B-626D, Brass Wire (equivalent to ASTM B16).

SAE AMS-QQ-B-750, Bronze, Phosphor, Bar, Plate, Rod, Sheet, Strip, Flat Wire, and Structural and Special Shaped Sections (equivalent to ASTM B139).

SAE AMS-QQ-C-530, Copper-Beryllium Alloy Bar/Rod/Wire (Copper Alloy Numbers 172/173) (equivalent to ASTM B196).

SAE AMS-QQ-C-533 Copper-Beryllium Alloy Strip (Copper Alloy Numbers 170 and 172) (equivalent to ASTM B194).

SAE AMS-QQ-P-35, Passivation Treatments for Corrosion-Resistant Steel (cancelled February 2005, superseded by AMS2700).

SAE AMS-QQ-S-766, Steel, Stainless and Heat Resisting, Alloys, Plate Sheet (superseded by ASTM A240).

SAE AMS-QQ-W-321, Wire, Metal, Round, Non-Electrical, Copper Alloy 510 (equivalent to ASTM B134).

SAE AS39029, General Specification for Contacts, Electrical Connector, Socket, Crimp Removable.