SFF-TA-1033

Specification for

Internal High-Speed Cable / Modular Connector System

Rev 0.0.3 November 30, 2022.

SECRETARIAT: SFF TA TWG

This specification is made available for public review at http://www.snia.org/sff/specifications. Comments may be submitted at http://www.snia.org/feedback. Comments received will be considered for inclusion in future revisions of this specification.

The description of the connector in this specification does not assure that the specific component is available from connector suppliers. If such a connector is supplied, it should comply with this specification to achieve interoperability between suppliers.

ABSTRACT: This specification defines the mechanical specifications and general performance requirements for an Internal High-Speed Cable / Modular Connector System that is designed to provide an internal cable and connector solution that supports both high-speed and power transmission and enables broad compatibility across future generations of host process modules.

POINTS OF CONTACT:

Paul Coddington
Amphenol High Speed Interconnects
20 Valley Street
Endicott, NY 13760
Ph: 607-754-4444
Email: paul.coddington@amphenol-highspeed.com

Chairman SFF TA TWG
Email: SFF-Chair@snia.org
Intellectual Property
The user’s attention is called to the possibility that implementation of this specification may require the use of an invention covered by patent rights. By distribution of this specification, no position is taken with respect to the validity of a claim or claims or of any patent rights in connection therewith.
This specification is considered SNIA Architecture and is covered by the SNIA IP Policy and as a result goes through a request for disclosure when it is published. Additional information can be found at the following locations:

- Results of IP Disclosures: http://www.snia.org/sffdisclosures
- SNIA IP Policy: http://www.snia.org/ippolicy

Copyright
The SNIA hereby grants permission for individuals to use this document for personal use only, and for corporations and other business entities to use this document for internal use only (including internal copying, distribution, and display) provided that:

1. Any text, diagram, chart, table or definition reproduced shall be reproduced in its entirety with no alteration, and,
2. Any document, printed or electronic, in which material from this document (or any portion hereof) is reproduced shall acknowledge the SNIA copyright on that material, and shall credit the SNIA for granting permission for its reuse.

Other than as explicitly provided above, there may be no commercial use of this document, or sale of any part, or this entire document, or distribution of this document to third parties. All rights not explicitly granted are expressly reserved to SNIA.

Permission to use this document for purposes other than those enumerated (Exception) above may be requested by e-mailing copyright_request@snia.org. Please include the identity of the requesting individual and/or company and a brief description of the purpose, nature, and scope of the requested use. Permission for the Exception shall not be unreasonably withheld. It can be assumed permission is granted if the Exception request is not acknowledged within ten (10) business days of SNIA’s receipt. Any denial of permission for the Exception shall include an explanation of such refusal.

Disclaimer
The information contained in this publication is subject to change without notice. The SNIA makes no warranty of any kind with regard to this specification, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose. The SNIA shall not be liable for errors contained herein or for incidental or consequential damages in connection with the furnishing, performance, or use of this specification.

Suggestions for revisions should be directed to http://www.snia.org/feedback/.
Foreword
The development work on this specification was done by the SNIA SFF TA TWG, an industry group. Since its formation as the SFF Committee in August 1990, the membership has included a mix of companies which are leaders across the industry.

For those who wish to participate in the activities of the SFF TA TWG, the signup for membership can be found at http://www.snia.org/sff/join.

Revision History

Rev 0.0.1 October dd, 2022:
- Preliminary DRAFT outline

Rev 0.0.2 October 17, 2022:
- Initial DRAFT

Rev 0.0.3 November 30, 2022:
- Added definition for Dual Exit
- Updated Section 4.1.1 and Section 4.1.2
- Updated all page headers (pages 14 and beyond had the wrong Rev number)
- Updated Figure 4-10
- Updated Section 5.1.1
- Updated Figure 5-2, Figure 5-3, and Figure 5-4
- Updated Table 5-1
- Added Figure 5-6 and Figure 5-7
- Added Figure 5-8, Figure 5-9, and Figure 5-10
- Added Figure 5-11, Figure 5-12, and Figure 5-13
- Updated Figure 6-3 and Figure 6-4
- Added Figure 6-5, Figure 6-6, Figure 6-7, Figure 6-8, Figure 6-9, and Figure 6-10
- Added Figure 6-12 and Figure 6-13
- Added Figure 6-15 and Figure 6-16
Contents

1. Scope 7

2. References and Conventions 7
   2.1 Industry Documents 7
   2.2 Sources 7
   2.3 Conventions 8

3. Keywords, Acronyms, and Definitions 9
   3.1 Keywords 9
   3.2 Acronyms and Abbreviations 9
   3.3 Definitions 10

4. General Description 12
   4.1 Configuration Overview/Descriptions 12
      4.1.1 Connector Configuration 1 – Vertical Combo Power DE Connectors for X16+Power Applications 12
      4.1.2 Connector Configuration 2 – Vertical Combo Power DE Connectors for X8+Power Applications 13
      4.1.3 Connector Configuration 3 – Power Connectors Only Applications 15
   4.2 Contact Numbering 16

5. Connector Mechanical Specification 19
   5.1 Overview 19
      5.1.1 Datums 19
   5.2 Mechanical Description: Vertical Board Connectors 22
      5.2.1 Vertical Combo Power DE Connectors for X16+Power 22
      5.2.2 Vertical Combo Power DE Connectors for X8+Power 23
      5.2.3 Vertical Power Connectors 23
   5.3 Outer Locus of the Vertical Connector Mating Contacts 24
   5.4 Outer Locus of the SMT Leads 25

6. Module Mechanical Specification 26
   6.1 Overview 26
   6.2 Mechanical Description: Plug Modules 26
      6.2.1 Combo x16+Power Straight (ST) Plug 27
      6.2.2 Combo x16+Power Right Angle (RA) Plug 27
      6.2.3 Combo x16+Power Reverse Right Angle (RRA) Plug 28
      6.2.4 Combo x8+Power Straight (ST) Plug 28
      6.2.5 Combo x8+Power Right Angle (RA) Plug 29
      6.2.6 Combo x8+Power Reverse Right Angle (RRA) Plug 29
      6.2.7 Straight (ST) Power Plug 30
      6.2.8 Right Angle (RA) Power Plug 30
      6.2.9 Reverse Right Angle (RRA) Power Plug 31
   6.3 Card Edge Description (Mechanical Interface) 32
      6.3.1 Plug Paddle Card for Combo x16+Power Plugs 32
      6.3.2 Plug Paddle Card for Combo x8+Power Plugs 33
      6.3.3 Plug Paddle Card for Power Plugs 33
      6.3.4 X16+Power Add In Card (AIC) 34
      6.3.5 X8+Power Add In Card (AIC) 35
      6.3.6 Power Add In Card (AIC) 35

7. Test Requirements and Methodologies (TS-1000, etc.) 36
   7.1 Performance Tables 36
Tables

1. Table 5-1  Datum Descriptions  
2. Table 7-1  Form Factor Performance Requirements  
3. Table 7-2  EIA-364-1000 Test Details  
4. Table 7-3  Additional Test Procedures  

Copyright © 2022 SNIA. All rights reserved.
1. Scope

This specification defines the general description of this form factor, the connector and mating plug mechanical specification, some performance requirements, and the electrical interface. Additional informative details such as the PCB layouts are included in an appendix.

2. References and Conventions

2.1 Industry Documents

The following documents are relevant to this specification:

- ASME Y14.5 Dimensioning and Tolerancing
- EIA-364-1000 Environmental Test Methodology for Assessing the Performance of Electrical Connectors and Sockets Used in Controlled Environment Applications
- EIA-364-04 Normal Force Test Procedure for Electrical Connectors
- EIA-364-13 Mating and Unmating Forces Test Procedure for Electrical Connectors
- EIA-364-20 Withstanding Voltage Test Procedure for Electrical Connectors
- EIA-364-21 Insulation Resistance Test Procedure for Electrical Connectors
- EIA-364-23 Low Level Contact Resistance Test Procedure for Electrical Connectors
- EIA-364-27 Mechanical Shock Test Procedure for Electrical Connectors
- EIA-364-28 Vibration Test Procedure for Electrical Connectors and Sockets
- EIA-364-98 Housing Locking Mechanism Strength Test Procedure for Electrical Connectors
- IPC-A-610 Acceptability of Electronic Assemblies
- SFF-TA-1016 Internal Unshielded High Speed Connector System

2.2 Sources

The complete list of SFF documents which have been published, are currently being worked on, or that have been expired by the SFF Committee can be found at http://www.snia.org/sff/specifications. Suggestions for improvement of this specification will be welcome. They should be submitted to http://www.snia.org/feedback.

Copies of PCIe standards may be obtained from PCI-SIG (http://pcisig.com).

Copies of IEEE standards may be obtained from the Institute of Electrical and Electronics Engineers (IEEE) (https://www.ieee.org).

Copies of SAS and other ANSI standards may be obtained from the International Committee for Information Technology Standards (INCITS) (http://www.incits.org).

Copies of ASME standards may be obtained from the American Society of Mechanical Engineers (https://www.asme.org).

Copies of Electronic Industries Alliance (EIA) standards may be obtained from the Electronic Components Industry Association (ECIA) (https://www.ecianow.org).
2.3 Conventions

The following conventions are used throughout this document:

DEFINITIONS

Certain words and terms used in this standard have a specific meaning beyond the normal English meaning. These words and terms are defined either in the definitions or in the text where they first appear.

ORDER OF PRECEDENCE

If a conflict arises between text, tables, or figures, the order of precedence to resolve the conflicts is text; then tables; and finally figures. Not all tables or figures are fully described in the text. Tables show data format and values.

LISTS

Lists sequenced by lowercase or uppercase letters show no ordering relationship between the listed items.

EXAMPLE 1 - The following list shows no relationship between the named items:
- a. red (i.e., one of the following colors):
  - A. crimson; or
  - B. pink;
- b. blue; or
- c. green.

Lists sequenced by numbers show an ordering relationship between the listed items.

EXAMPLE 2 - The following list shows an ordered relationship between the named items:
1. top;
2. middle; and
3. bottom.

Lists are associated with an introductory paragraph or phrase, and are numbered relative to that paragraph or phrase (i.e., all lists begin with an a. or 1. entry).

DIMENSIONING CONVENTIONS

The dimensioning conventions are described in ASME Y14.5, Geometric Dimensioning and Tolerancing. All dimensions are in millimeters, which are the controlling dimensional units (if inches are supplied, they are for guidance only).

NUMBERING CONVENTIONS

The ISO convention of numbering is used (i.e., the thousands and higher multiples are separated by a space and a period is used as the decimal point). This is equivalent to the English/American convention of a comma and a period.

<table>
<thead>
<tr>
<th>American</th>
<th>French</th>
<th>ISO</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.6</td>
<td>0,6</td>
<td>0.6</td>
</tr>
<tr>
<td>1,000</td>
<td>1 000</td>
<td>1 000</td>
</tr>
<tr>
<td>1,323,462.9</td>
<td>1 323 462,9</td>
<td>1 323 462.9</td>
</tr>
</tbody>
</table>
3. **Keywords, Acronyms, and Definitions**

For the purposes of this document, the following keywords, acronyms, and definitions apply.

### 3.1 Keywords

**May/ may not:** Indicates flexibility of choice with no implied preference.

**Obsolete:** Indicates that an item was defined in prior specifications but has been removed from this specification.

**Optional:** Describes features which are not required by the SFF specification. However, if any feature defined by the SFF specification is implemented, it shall be done in the same way as defined by the specification. Describing a feature as optional in the text is done to assist the reader.

**Prohibited:** Describes a feature, function, or coded value that is defined in a referenced specification to which this SFF specification makes a reference, where the use of said feature, function, or coded value is not allowed for implementations of this specification.

**Reserved:** Defines the signal on a connector contact [when] its actual function is set aside for future standardization. It is not available for vendor specific use. Where this term is used for bits, bytes, fields, and code values; the bits, bytes, fields, and code values are set aside for future standardization. The default value shall be zero. The originator is required to define a Reserved field or bit as zero, but the receiver should not check Reserved fields or bits for zero.

**Restricted:** Refers to features, bits, bytes, words, and fields that are set aside for other standardization purposes. If the context of the specification applies the restricted designation, then the restricted bit, byte, word, or field shall be treated as a reserved bit, byte, word, or field (e.g., a restricted byte uses the same value as defined for a reserved byte).

**Shall:** Indicates a mandatory requirement. Designers are required to implement all such mandatory requirements to ensure interoperability with other products that conform to this specification.

**Should:** Indicates flexibility of choice with a strongly preferred alternative.

**Vendor specific:** Indicates something (e.g., a bit, field, code value) that is not defined by this specification. Specification of the referenced item is determined by the manufacturer and may be used differently in various implementations.

### 3.2 Acronyms and Abbreviations

- **AIC:** Add In Card
- **AOC:** Active Optical Cable
- **DE:** Dual Exit
- **GND:** Ground
- **EMLB:** Early Mate Late Break
- **IDC:** Insulation Displacement Contact
- **IDT:** Insulation Displacement Termination
- **PCB:** Printed Circuit Board
- **PF:** Press Fit
- **PTH:** Plated Through Hole
- **RA:** Right Angle
- **RRA:** Reverse Right Angle
- **SMT:** Surface Mount Technology
- **ST:** Straight
- **VT:** Vertical
3.3 Definitions

**Alignment guides:** A term used to describe features that pre-align the two halves of a connector interface before electrical contact is established. Other common terms include: guide pins, guide posts, blind mating features, mating features, alignment features, and mating guides.

**Connector:** Each half of an interface that, when joined together, establish electrical contact and mechanical retention between two components. In this specification, the term connector does not apply to any specific gender; it is used to describe the receptacle, the plug or the card edge, or the union of receptacle to plug or card edge. Other common terms include: connector interface, mating interface, and separable interface.

**Contact mating sequence:** A term used to describe the order of electrical contact established/terminated during mating/un-mating. Other terms include: contact sequencing, contact positioning, mate first/break last, EMLB (early mate late break) staggered contacts, and long pin/short pin.

**Contacts:** A term used to describe connector terminals that make electrical connections across a separable interface.

**Dual-exit:** A term used to describe the ability of a board connector that could accept the insertion by multiple plug connector types, such as right angle, reverse right angle, etc. This type of board connector accommodates the latching of those plug types with latch slots located on both sides of the connector.

**Module:** In this specification, module may refer to a plug assembly at the end of a copper (electrical) cable (passive or active), an active optical cable (AOC), an optical transceiver, or a loopback.

**Plug:** A term used to describe the connector that contains the penetrating contacts of the connector interface as shown in Figure 3-1. Plugs typically contain stationary contacts. Other common terms include male, pin connector, and card edge.

**Figure 3-1 Plug and Receptacle Definition**

**Plated through hole termination:** A term used to describe a termination style in which rigid pins extend into or through the PCB. Pins are soldered to keep the connector or cage in place. Other common terms are through hole or PTH.

**Press fit:** A term used to describe a termination style in which collapsible pins penetrate the surface of a PCB. Upon insertion, the pins collapse to fit inside the PCB’s plated through holes. The connector or cage is held in place by the interference fit between the collapsed pins and the PCB.

**Receptacle:** A term used to describe the connector that contains the contacts that accept the plug contacts as shown in Figure 3-1. Receptacles typically contain spring contacts. Other common terms include female and socket connector.
Right Angle: A term used to describe either a connector design where the mating direction is parallel to the plane of the printed circuit board upon which the connector is mounted or a cable assembly design where the mating direction is perpendicular to the bulk cable.

- **Right angle connector**
- **Right angle cable assembly**

![Figure 3-2 Right Angle Connector and Cable Assembly](image)

Straight: A term used to describe a connector design where the mating direction is parallel to the bulk cable.

Surface mount: A term used to describe a termination style in which solder tails sit on pads on the surface of a PCB and are then soldered to keep the connector or cage in place. Other common terms are surface mount technology or SMT.

Termination: A term used to describe a connector’s non-separable attachment point such as a connector contact to a bulk cable or a connector solder tail to a PCB. Common PCB terminations include: surface mount (SMT), plated through hole termination (PTH), and press fit (PF). Common cable terminations include insulation displacement contact (IDC), insulation displacement termination (IDT), wire slots, solder, welds, crimps, and brazes.

Vertical: A term used to describe a connector design where the mating direction is perpendicular to the printed circuit board upon which the connector is mounted.

Wipe: The distance a contact travels on the surface of its mating contact during the mating cycle as shown in Figure 3-3.

![Figure 3-3 Wipe for a Continuous Contact](image)
4. General Description

4.1 Configuration Overview/Descriptions

This specification details a connector system that includes key features such as flexible pin configurations that support dual-exit (DE) and blind mate applications across multiple cable plug types with optimized electrical performance and power delivery.

4.1.1 Connector Configuration 1 – Vertical Combo Power DE Connectors for X16+Power Applications

This configuration can be used in three different ways. One way is for a single add-in card (AIC) to plug into the vertical Combo x16+Power DE connector as shown in Figure 4-1. A second way is for a single combo cable to plug into the vertical Combo x16+Power DE connector as shown in Figure 4-2, Figure 4-3, or Figure 4-4. A third way is for separate individual cables to plug into the vertical Combo x16+Power DE connector where there are two 74-pin cables and a Power cable used as shown in Figure 4-5 or Figure 4-6. In this third case, the Straight Plug with no side flanges for 74 Contacts listed in SFF-TA-1016, the equivalent Right Angle Plug (with no side flanges), or a Reverse Right Angle Plug (with no side flanges) can mate with these receptacle connectors. The standard SFF-TA-1016 Straight Plug for 74 Contacts or the Right Angle Plug for 74 Contacts that include the side flanges will not fit due to the receptacle’s combined design. For this same reason, the SFF-TA-1016 Straight Plug for 148 Contacts or the Right Angle Plug for 148 Contacts will not fit.
4.1.2 Connector Configuration 2 – Vertical Combo Power DE Connectors for X8+Power Applications

This smaller configuration is much like the previous configuration but can still be used in three ways. One way is for a single add-in card (AIC) to plug into the vertical Combo x16+Power DE connector as shown in Figure 4-1. A second way is for a single combo cable to plug into the vertical Combo x8+Power DE connector as shown in Figure 4-8, Figure 4-9, or Figure 4-10. A third way is for separate individual cables to plug into the vertical Combo x8+Power DE connector where there is only one 74-pin cable and a Power cable used as shown in Figure 4-11 or Figure 4-12. In this third case, the Straight Plug with no side flanges for 74 Contacts listed in SFF-TA-1016, the equivalent Right Angle Plug (with no side flanges), or a Reverse Right Angle Plug (with no side flanges) can mate with these receptacle connectors. The standard SFF-TA-1016 Straight Plug for 74 Contacts or the Right Angle Plug for 74 Contacts that include the side flanges will not fit due to the receptacle’s combined design.
Figure 4-7 Sample x8+Power AIC Application

Figure 4-8 Sample x8+Power Combo RA Cable Application

Figure 4-9 Sample x8+Power Combo RRA Cable Application

Figure 4-10 Sample x8+Power Combo STR Cable Application
4.1.3 Connector Configuration 3 – Power Connectors Only Applications

This configuration is much like the previous configurations except it only incorporates the Power connector. It can be used in two ways. One way is for a single add-in card (AIC) to plug into the vertical Power connector as shown in Figure 4-13. A second way is for a single Power cable to plug into the vertical Power connector as shown in Figure 4-14 or Figure 4-15.
4.2 Contact Numbering

The pins or electrical contacts in this connector are numbered as shown in Figure 4-16, Figure 4-17, Figure 4-18 and Figure 4-19.

Figure 4-16 Plug Contact Numbering
Figure 4-17 Combo x16+Power Receptacle Contact Numbering

Figure 4-18 Combo x8+Power Receptacle Contact Numbering
Figure 4-19  Power Receptacle Contact Numbering
5. Connector Mechanical Specification

5.1 Overview

5.1.1 Datums

The datums defined in Figure 5-1, Figure 5-2, Figure 5-3, and Figure 5-4, and in Table 5-1 are used throughout the rest of the document to describe the dimensional requirements of this connector.

Figure 5-1  Vertical Combo Power DE Connectors for X16+Power Receptacle Connector Datum Definitions
Figure 5-2  Vertical Combo Power DE Connectors for X8+Power Receptacle Connector Datum Definitions

Figure 5-3  Vertical Power Receptacle Connector Datum Definitions
Figure 5-4  Plug Datum Definitions

Table 5-1  Datum Descriptions

<table>
<thead>
<tr>
<th>Datum</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Mating Surfaces to the PCB or PCB Pads</td>
</tr>
<tr>
<td>B</td>
<td>Plug and Receptacle Mechanical Stop</td>
</tr>
<tr>
<td>C</td>
<td>Centerline of the Paddle Card / Mating Interface Centerline</td>
</tr>
<tr>
<td>D</td>
<td>Centerline of Paddle Card Thickness</td>
</tr>
<tr>
<td>E</td>
<td>Bottom Surface of Plug Body</td>
</tr>
<tr>
<td>F</td>
<td>Centerline of Key</td>
</tr>
<tr>
<td>G</td>
<td>Leading Edge of Paddle Card</td>
</tr>
<tr>
<td>J</td>
<td>Centerline of the Receptacle Width</td>
</tr>
<tr>
<td>K</td>
<td>Centerline of Plug Body</td>
</tr>
<tr>
<td>L</td>
<td>Receptacle Shell Surface</td>
</tr>
<tr>
<td>P</td>
<td>Receptacle Shell Surface</td>
</tr>
<tr>
<td>V</td>
<td>Centerline of the Receptacle’s Locating Peg</td>
</tr>
<tr>
<td>W</td>
<td>Centerline of the Receptacle’s Locating Peg</td>
</tr>
</tbody>
</table>
5.2 Mechanical Description: Vertical Board Connectors

This specification details a connector system consisting of three variations of board connectors. One is the Vertical Combo Power Dual-Exit (DE) in the x16+Power size, one is the Vertical Combo Power DE in the x8+Power size, and one is the Vertical Power connector by itself.

5.2.1 Vertical Combo Power DE Connectors for X16+Power

![Diagram of Vertical Combo Power DE Connectors for X16+Power]
5.2.2 Vertical Combo Power DE Connectors for X8+Power

Figure 5-6  Vertical Combo Power DE Connectors for X8+Power

5.2.3 Vertical Power Connectors

Figure 5-7  Vertical Power Connectors
5.3 Outer Locus of the Vertical Connector Mating Contacts

Figure 5-8 through Figure 5-10 show the outer locus of the connector contacts at the mating interface.

Figure 5-8 Outer Locus of x16+Power Vertical Combo Power DE Connector Mating Contact Pins

Figure 5-9 Outer Locus of x8+Power Vertical Combo Power DE Connector Mating Contact Pins

Figure 5-10 Outer Locus of Vertical Power Connector Mating Contact Pins
5.4 Outer Locus of the SMT Leads

Figure 5-11 through Figure 5-13 show the outer locus of the flat surfaces of the SMT leads that are intended to mate with the applicable PCB footprint pads for receptacle each connector type.

Figure 5-11  Outer Locus of x16+Power Vertical Combo Power DE Connector SMT Leads

Figure 5-12  Outer Locus of x8+Power Vertical Combo Power DE Connector SMT Leads

Figure 5-13  Outer Locus of Vertical Power Connector SMT Leads
6. Module Mechanical Specification

6.1 Overview

Refer back to section 5.1.1 for definitions of datums used throughout the following sections.

Figure 6-1 Images of various plug modules

6.2 Mechanical Description: Plug Modules

These plug modules include multiple variations. There is the Combo x16+Power Right Angle (RA) plug, the Combo x16+Power Reverse Right Angle (RRA) plug, the Combo x16+Power Straight (ST) plug, the Combo x8+Power RA plug, the Combo x8+Power RRA plug, the Combo x8+Power Straight (ST) plug, the Power RA plug, and the Power RRA plug. In addition, there are 74-pin RA plugs, 74-pin RRA plugs, and 74-pin ST plugs that can be used with separate cables but can still be mated with the Vertical Combo Power DE for x16+Power connectors or the Vertical Combo Power DE for x8+Power connectors.
6.2.1 Combo x16+Power Straight (ST) Plug

Figure 6-2 Combo x16+Power Straight (ST) Plug

6.2.2 Combo x16+Power Right Angle (RA) Plug

Figure 6-3 Combo x16+Power Right Angle (RA) Plug
6.2.3 Combo x16+Power Reverse Right Angle (RRA) Plug

Figure 6-4 Combo x16+Power Reverse Right Angle (RRA) Plug

6.2.4 Combo x8+Power Straight (ST) Plug

Figure 6-5 Combo x8+Power Straight (ST) Plug
6.2.5 Combo x8+Power Right Angle (RA) Plug

Figure 6-6 Combo x8+Power Right Angle (RA) Plug

6.2.6 Combo x8+Power Reverse Right Angle (RRA) Plug

Figure 6-7 Combo x8+Power Reverse Right Angle (RRA) Plug
6.2.7 Straight (ST) Power Plug

Figure 6-8 Straight (ST) Power Plug

6.2.8 Right Angle (RA) Power Plug

Figure 6-9 Right Angle (RA) Power Plug
6.2.9 Reverse Right Angle (RRA) Power Plug

Figure 6-10 Reverse Right Angle (RRA) Power Plug
6.3 Card Edge Description (Mechanical Interface)

The following figures and tables detail the mating interface pads and paddle card dimensions applicable to the mating interface of the plug connectors within this specification.

6.3.1 Plug Paddle Card for Combo x16+Power Plugs

Figure 6-11 Plug Paddle Card for Combo x16+Power Plugs
6.3.2 Plug Paddle Card for Combo x8+Power Plugs

Figure 6-12 Plug Paddle Card for Combo x8+Power Plugs

6.3.3 Plug Paddle Card for Power Plugs

Figure 6-13 Plug Paddle Card for Power Plugs
6.3.4 X16+Power Add In Card (AIC)

Figure 6-14  X16+Power Add In Card (AIC)
6.3.5 X8+Power Add In Card (AIC)

Figure 6-15 X8+Power Add In Card (AIC)

6.3.6 Power Add In Card (AIC)

Figure 6-16 Power Add In Card (AIC)
### 7. Test Requirements and Methodologies (TS-1000, etc.)

#### 7.1 Performance Tables

EIA-364-1000 (TS-1000) shall be used to define the test sequences and procedures for evaluating the connector system described in this document. Where multiple test options are available, the manufacturer shall select the appropriate option where not previously specified. The selected procedure should be noted when reporting data. If there are conflicting requirements or test procedures between EIA-364 procedures and those contained within this document, this document shall be considered the prevailing authority.

Unless otherwise specified, procedures for sample size, data, and collection to be followed as specified in EIA-364-1000. See EIA-364-1000 Annex B for objectives of tests and test groups.

Table 7-1 summarizes the performance criteria that are to be satisfied by the connector described in this document. Most performance criteria are validated by EIA-364-1000 testing, but this test suite leaves some test details to be determined. To ensure that testing is repeatable, these details are identified in Table 7-2. Finally, testing procedures used to validate any performance criteria not included in EIA-364-1000 are provided in Table 7-3.

<table>
<thead>
<tr>
<th>Performance Parameters</th>
<th>Description/ Details</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mechanical/ Physical Requirements</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plating Type</td>
<td>Plating type on connector contacts</td>
<td>Precious</td>
</tr>
<tr>
<td>Surface Treatment</td>
<td>Surface treatment on connector contacts</td>
<td>Non-lubricated</td>
</tr>
<tr>
<td>Wipe length</td>
<td>Designed distance a contact traverses over a mating contact surface during mating and resting at a final position</td>
<td>Greater than 0.127mm</td>
</tr>
<tr>
<td>Rated Durability Cycles</td>
<td>The expected number of durability cycles a component is expected to encounter over the course of its life</td>
<td>Connector: TBD cycles Module: TBD cycles</td>
</tr>
<tr>
<td>Latched Mating Force*</td>
<td>Amount of force needed to mate a module with a connector when latches are deactivated</td>
<td>TBD</td>
</tr>
<tr>
<td>Latched Unmating Force*</td>
<td>Amount of forced needed to separate a module from a connector when latches are deactivated</td>
<td>TBD</td>
</tr>
<tr>
<td>Latch Retention*</td>
<td>Amount of force the latching mechanism can withstand</td>
<td>TBD</td>
</tr>
<tr>
<td>Wrenching Strength*</td>
<td>Amount of force in various directions the product can withstand while mated</td>
<td>TBD N MIN for each axis direction</td>
</tr>
<tr>
<td>Performance Parameters</td>
<td>Description/ Details</td>
<td>Requirement</td>
</tr>
<tr>
<td>------------------------</td>
<td>----------------------------------------------------------------</td>
<td>-----------------------</td>
</tr>
<tr>
<td><strong>Environmental Requirements</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Field Life</td>
<td>The expected service life for a component</td>
<td>10 years</td>
</tr>
<tr>
<td>Field Temperature</td>
<td>The expected service temperature for a component</td>
<td>0°C to +65°C</td>
</tr>
<tr>
<td>Storage Temperature*</td>
<td>The expected storage temperature for a component when not in use</td>
<td>-20°C to +80°C</td>
</tr>
<tr>
<td>Storage Humidity*</td>
<td>The expected storage humidity for a component when not in use</td>
<td>80% Relative Humidity</td>
</tr>
<tr>
<td><strong>Electrical Requirements</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current*</td>
<td>Maximum current to which a contact is exposed in use</td>
<td>TBD per contact MAX</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TBD per power contact MAX</td>
</tr>
<tr>
<td>Operating Rating Voltage</td>
<td>Maximum voltage to which a contact is exposed in use</td>
<td>30V DC per contact MAX</td>
</tr>
</tbody>
</table>

**NOTE:** Performance criteria denoted with stars (*) are not validated by EIA-364-1000 testing. Refer to Table 7-3 for test procedures and pass/fail criteria.
Table 7-2 describes the details necessary to perform the tests described in the EIA-364-1000 test sequences. Testing shall be done in accordance with EIA-364-1000 and the test procedures it identifies in such a way that the parameters/requirements defined in Table 7-1 are met. Any information in this table supersedes EIA-364-1000.

<table>
<thead>
<tr>
<th>Test</th>
<th>Test Descriptions and Details</th>
<th>Pass/ Fail Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mechanical/ Physical Tests</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Durability (preconditioning)</td>
<td>EIA-364-09 To be tested with connector and module (Latches should be locked out)</td>
<td>No evidence of physical damage</td>
</tr>
<tr>
<td>Durability (see Note 1)</td>
<td>EIA-364-09 To be tested with connector and module (Latches should be locked out per EIA-364-1000)</td>
<td>No visual damage to mating interface or latching mechanism</td>
</tr>
<tr>
<td><strong>Environmental Tests</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mixed Flowing Gas (see Note 2)</td>
<td>EIA-364-65 Class IIA Duration: 7 days Test option Per EIA-364-1000: 4</td>
<td>No intermediate test criteria</td>
</tr>
<tr>
<td><strong>Electrical Tests</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low Level Contact Resistance (see Note 3)</td>
<td>EIA-364-23 20 mV DC MAX, 100 mA MAX To include wire termination or connector-to-board termination</td>
<td>20 mΩ MAX change from baseline</td>
</tr>
<tr>
<td>Dielectric Withstanding Voltage</td>
<td>EIA-364-20 Method B 300 VDC minimum for 1 minute Applied voltage may be product / application specific</td>
<td>No defect or breakdown between adjacent contacts -AND- 0.5 mA Max Leakage Current</td>
</tr>
</tbody>
</table>

**NOTES:**
1. If the durability requirement on the connector is greater than that of the module, modules may be replaced after their specified durability rating.
2. Test option, temperature, duration must be reported.
3. The first low level contact resistance reading in each test sequence is used to determine a baseline measurement. Subsequent measurements in each sequence are measured against this baseline.
Table 7-3 describes the testing procedures necessary to validate performance criteria not validated by EIA-364-1000 testing. The tests are to be performed in such a way that the parameters/ requirements defined in Table 7-1 are met.

### Table 7-3  Additional Test Procedures

<table>
<thead>
<tr>
<th>Test (see Note 1)</th>
<th>Test Descriptions and Details</th>
<th>Pass/ Fail Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mechanical/ Physical Tests</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Latched Mating Force</strong></td>
<td>EIA-364-13 To be tested with connector (with integrated latch shroud) and module (plug) without any heat sinks. Latching mechanism deactivated (locked out)</td>
<td>Refer to Table 7-1 -AND- No physical damage to any components</td>
</tr>
<tr>
<td><strong>Latched Unmating Force</strong></td>
<td>EIA-364-13 To be tested with connector (with integrated latch shroud) and module (plug) without any heat sinks. Latching mechanism deactivated (locked out)</td>
<td></td>
</tr>
<tr>
<td><strong>Latch Retention</strong></td>
<td>EIA-364-13 To be tested with connector (with integrated latch shroud) and module (plug) without any heat sinks. Latching mechanism engaged (not locked out)</td>
<td></td>
</tr>
<tr>
<td><strong>Wrenching Strength</strong></td>
<td>Bend cable 90° at minimum bend radius. Pull TBD N Min in each of 4 axis directions for round cable. Pull TBD N Min in each of 2 axis directions for flat cable.</td>
<td>No damage to plug / cable assembly.</td>
</tr>
<tr>
<td><strong>Environmental Tests</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Storage Temperature</strong></td>
<td>EIA-364-32 Method A, Test Condition 1, Duration 4 Use min and max Field Temperatures listed in Table 7-1 for temperature range</td>
<td>Refer to Table 7-1</td>
</tr>
<tr>
<td><strong>Storage Humidity</strong></td>
<td>EIA-364-31</td>
<td>Refer to Table 7-1</td>
</tr>
<tr>
<td><strong>Electrical Tests</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Current</strong></td>
<td>EIA-364-70 Method 3, 30-degree temperature rise 10.5A per power pin</td>
<td>Refer to Table 7-1 for current magnitude</td>
</tr>
</tbody>
</table>

**NOTES:**
1. Requirements and tests specified that fall outside of EIA-364-1000 testing are listed in this table.