SFF-TA-1013

Specification for

Fabric Attached Device Mechanical Specification

Rev 2.0   September 20, 2019

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 must comply with this specification to achieve interoperability between suppliers.

ABSTRACT: This document defines the Fabric Attached Device Mechanical Specification

The Fabric Attached Device is a high availability dual fabric attached subsystem and is agnostic to the fabric interface. The physical form factor will support direct fabric attached devices such as Flash, HDD, compute, GPU, FPGA, and memory. Fabric Attached Devices will be designed to sufficiently enable vendor-unique enclosure designs to accommodate Fabric Attached Devices; they are intended to be compatible with 19" and OCP racks.

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Intellectual Property

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Foreword

The development work on this specification was done by the SNIA SFF 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 TWG, the signup for membership can be found at http://www.snia.org/sff/join.

Revision History

Rev 1.0   March 05, 2019:
                  - Initial approved release of document
                  - Fabric Device Mechanical Specification

Rev 2.0   September 20, 2019:
                  - Configuration/overview revised.
                  - Changes to dimensions in Table 4-1 Fabric Attached Device Dimensions, tolerances
                    added.
                  - Changes to figures in General Description and Connector Mechanical Specification

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1. Scope

This specification defines the Mechanical Specification for the Fabric Attached Device. The intended environment for the Fabric Attached Device is any cabinet, rack, enclosure or similar enclosure residing in an office or data center environment or similar. This specification will provide information that will assist vendors to design products that can fit in the same packaging envelope.

2. References and Conventions

2.1   Industry Documents

- SFF-TA-1014   Connector
- ASME Y14.5M   Dimensioning and Tolerancing
- SFF-TA-1015   Pinout
- UL 60950-1   UL Information Technology Equipment - Safety

2.2   Sources

The complete list of SFF documents which have been completed, 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 ANSI standards may be obtained from the InterNational Committee for Information Technology Standards (http://www.techstreet.com/incitsgate.tmpl).

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

Copies of InfiniBand standards may be obtained from the InfiniBand Trade Association (IBTA) (http://www.infinibandta.org).

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

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

Copies of JEDEC standards may be obtained from the Joint Electron Device Engineering Council (https://www.jedec.org).

Copies of OIF Implementation Agreements may be obtained from the Optical Internetworking Forum (http://www.oiforum.com).

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.

American	French	ISO
0.6	0,6	0.6
1,000	1 000	1 000
1,323,462.9	1 323 462,9	1 323 462.9

3. Keywords, Acronyms, and Definitions

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

3.1   Keywords

May/ may not: A keyword that indicates flexibility of choice with no implied preference.

Obsolete: A keyword indicating that an item was defined in prior specifications but has been removed from this specification.

Optional: A keyword that 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: A keyword used to describe 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: A keyword used for defining 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: A keyword referring to features, bits, bytes, words, and fields that are set aside for other identified standardization purposes. A restricted bit, byte, word, or field shall be treated as a reserved bit, byte, word or field in the context where the restricted designation appears.

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

Should: A keyword indicating flexibility of choice with a strongly preferred alternative.

Vendor specific: A keyword indicating 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

AOC: Active Optical Cable
DAC: Direct Attach Copper (passive or active)
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
SMT: Surface Mount Technology
HDD: Hard Disk Drive
Flash: Flash Memory
GPU: Graphics Processing Unit
FPGA: Field Programmable Gate Array
SSD: Solid State Device or Solid State Drive

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.

Canister: A generic term used to define the structure that contains the Fabric Attached Device components.

Carrier: A generic term for physical part(s) added to a device to aid in removal, insertion, guidance, cosmetics, and indication.

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.

Frontshell / Backshell: A term used to describe the metallic part of a module that provides mechanical and shielding continuity between the plug and receptacle. Other terms commonly used are: housing, snout, and metal shroud.

Module: In this specification, module refers to an assembly that is terminated at the end of a direct attach copper (DAC) or an active optical cable (AOC), intended to mate to a device.

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.
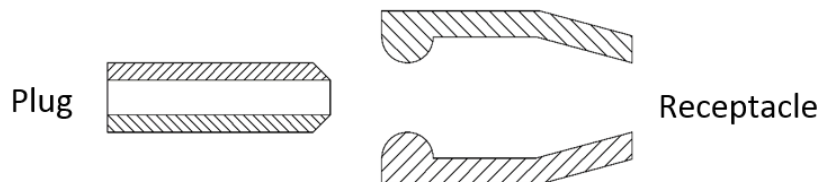
Figure 3-1 Plug and Receptacle Definition

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.

Straddle mount: A term used to describe a termination style that uses surface mount termination points on both sides of a PCB.
**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 pins 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/ a cage to a PCB or flex circuit/ bulk cable to a PCB or flex circuit/ solder tail to 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 3-2.
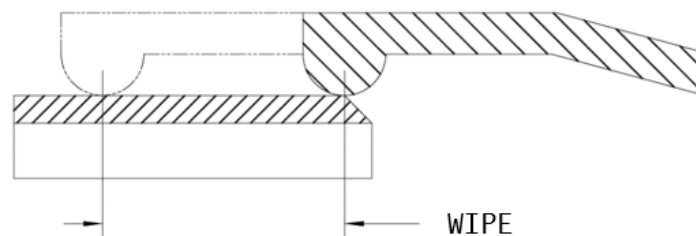
Figure 3-2 Wipe for a Continuous Contact

4. General Description

4.1   Configuration Overview/Descriptions

Table 4-1 Fabric Attached Device Dimensions specifies the dimensions for the Fabric Attached Device and correlates them to the figures. Dimensions identified as obsolete are for reference and may apply to existing Fabric Attached Device features. New Fabric Attached Devices are to be designed to dimensions that are not identified as obsolete.

The specification allows only one location for the interface connector (SFF-TA-1014) on the Fabric Attached Device.
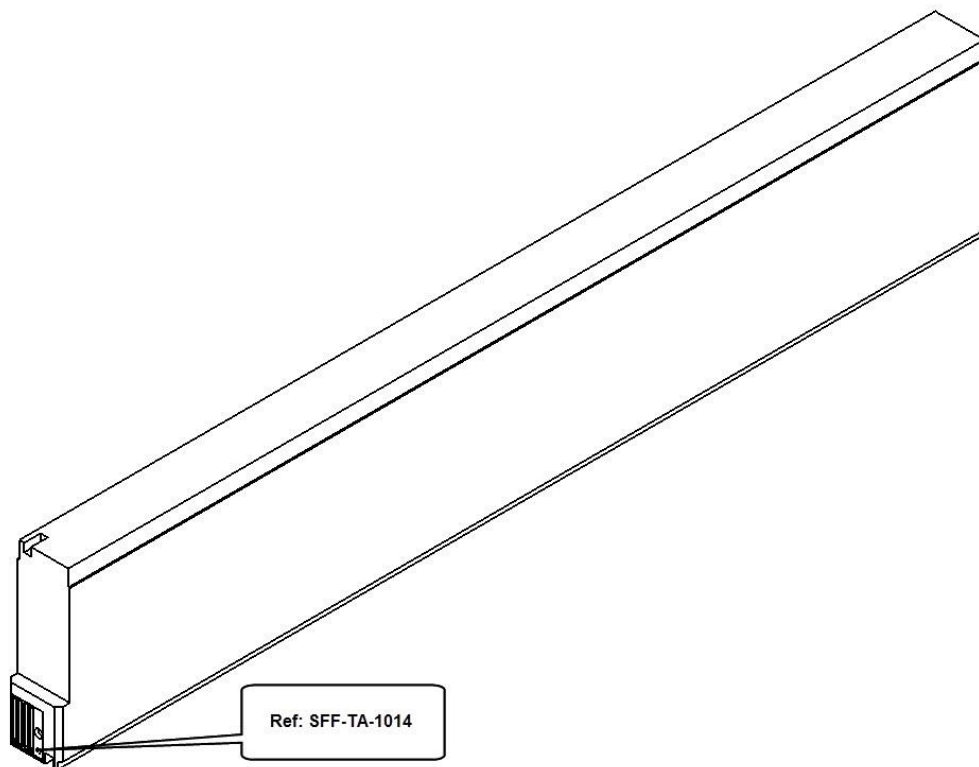
Table 4-1 Fabric Attached Device Dimensions

| Dim	Description	Value (mm)	Tolerance (mm)
A	Fabric Attached Device Width	37.10	±0.35
B	Fabric Attached Device Height	121.00	±0.35
C	Fabric Attached Device Depth	661.35	±0.45
D	Keyhole Vertical Spacing	72.00	±0.50
E	Keyhole Width Spacing	25.50	±0.50
F	Carrier Pin Hole to Lower Keyhole Vertical	85.50	±0.50
G	Lower Keyhole to Fabric Attached Device Base (Reference Dimension)	29.92	-
H	Datum A to Keyhole	7.91	±0.60
I	Datum B to Fabric Attached Device Base	16.61	±0.50
J	Datum B to Lower Keyhole Vertical	13.31	±0.75
K	Datum B to Upper Keyhole Vertical (Reference Dimension)	85.31	-
L	Datum B to Carrier Pin Hole Vertical (Reference Dimension)	98.85	-
M	Datum B to Fabric Attached Device Top (Reference Dimension)	104.39	-

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N	Carrier Pin Hole Diameter	3.25	±0.125
O	Rear Step Height	85.49	±0.125
P	Upper Fabric Attached Device Guide Notch Vertical	11.05	±0.50
Q	Upper Fabric Attached Device Guide Notch Horizontal	1.00	±0.25
R	Lower Left Fabric Attached Device Guide Notch Vertical	6.00	±0.25
S	Datum A to Left Fabric Attached Device Side	14.00	±0.65
T	Datum A to Lower Left Guide Notch	12.30	±0.50
U	Datum A to Right Fabric Attached Device Side	23.10	±0.55
V	Datum A to Right Wall of Top Mechanical Stop Relief	19.00	±0.60
W	Datum A to Left Wall of Top Mechanical Stop Relief	13.33	±0.60
X	Datum C to Depth of Top Mechanical Stop Relief	19.92	±0.35
Y	Datum A to Right Wall of Bottom Mechanical Stop Relief	10.59	±0.60
Z	Datum A to Left Wall of Bottom Mechanical Stop Relief	4.48	±0.60
AA	Datum C to Depth of Bottom Mechanical Stop Relief	6.00	±0.35
BB	Datum A to Carrier Pin Hole Horizontal	4.60	±0.60
CC	Datum B to Bottom Mechanical Stop Relief	9.61	±0.35
DD	Top Mechanical Relief Depth	5.91	±0.125
EE	Datum C to Rear Cutback Face	8.15	±0.125
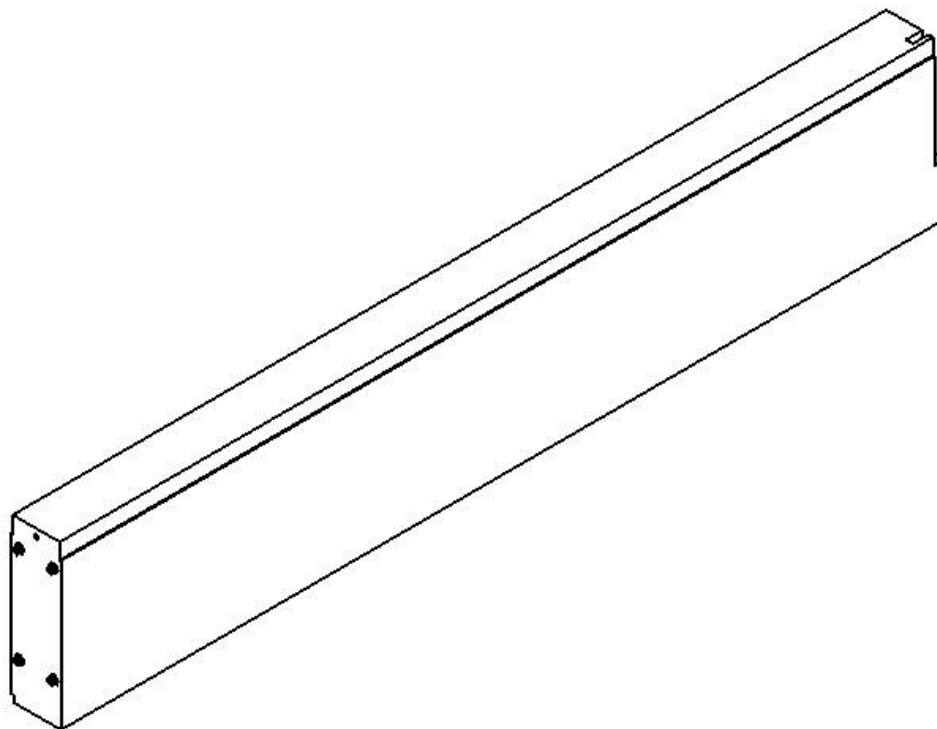
Figure 4-1 Fabric Attached Device Front Isometric View

Ref: SFF-TA-1014

Figure 4-2 Fabric Attached Device Rear Isometric View
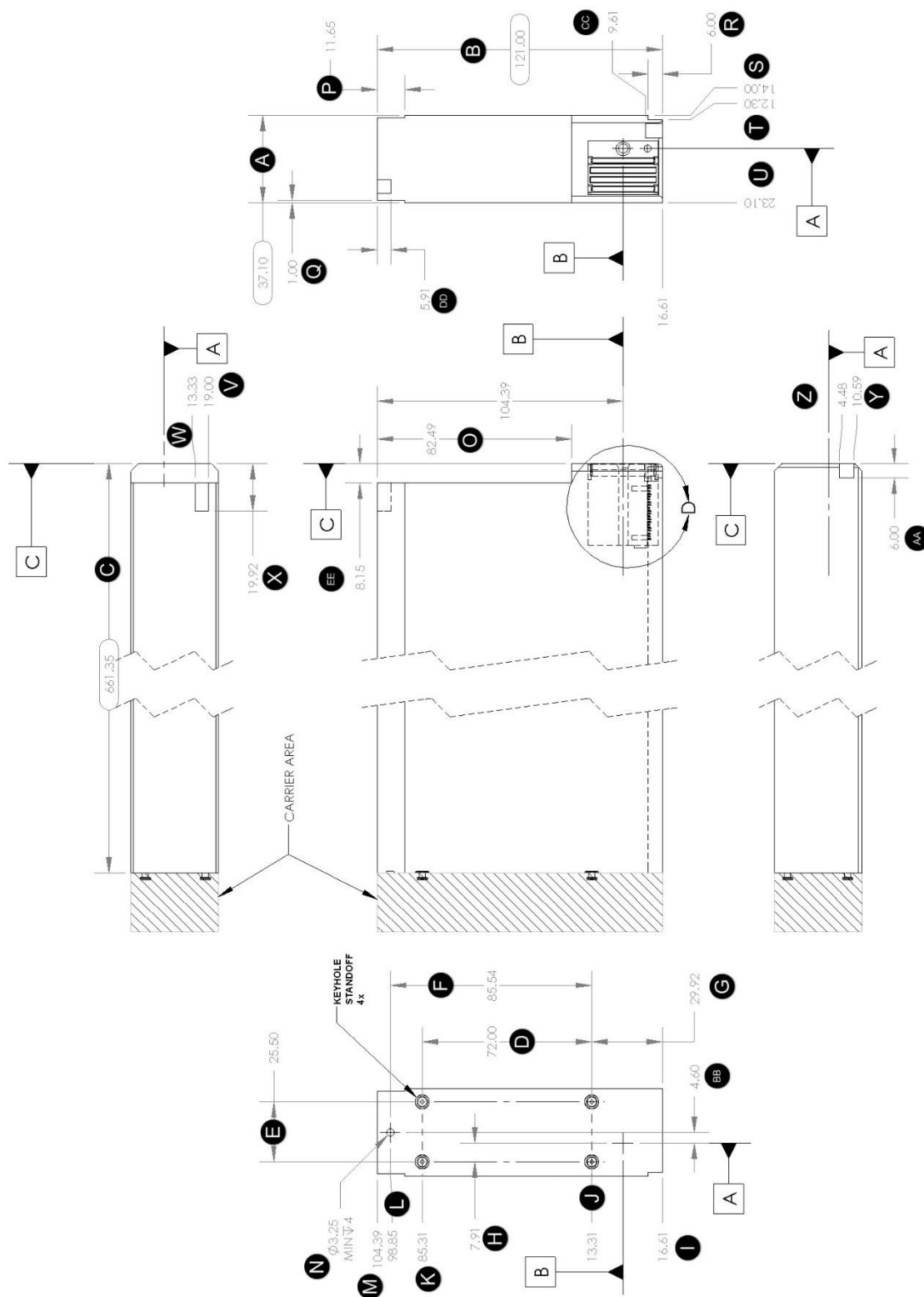
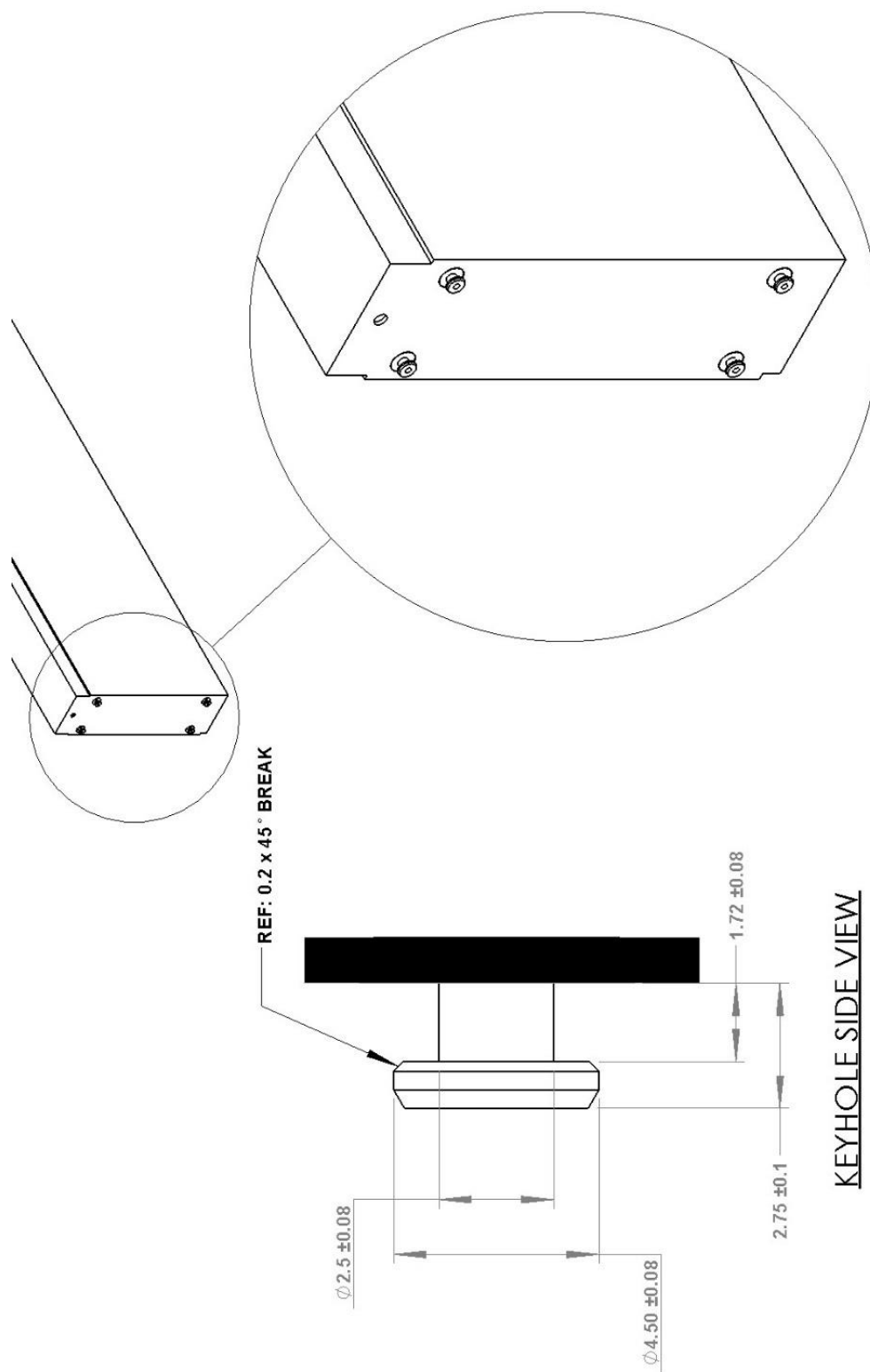**Figure 4-3 Fabric Attached Device Dimensional Details**

Figure 4-4 Carrier Mounting Keyhole Details (reference Figure 4-1)

4.1.1 Carrier Mounting Keyhole

The carrier mounting features are defined as an array of four studs that protrude from the face of the front surface of the exterior of the Fabric Attached Device and can be used for attaching a bezel or similar to the Fabric Attached Device by mating a keyhole shape or similar with the protruding studs. Additionally, the Carrier Pin Hole on the front surface that may be used as a feature for locking a bezel or similar to the front surface.

5. Connector Mechanical Specification

5.1   Overview

The connector and pinout are defined in SFF-TA-1014 and SFF-TA-1015.

5.1.1 Connector Detail

The connector details defined in Figure 5-1, Figure 5-2, Figure 5-3, and Figure 5-4. Figure 5-1 shows one of the three datums (-C-) and the PCB relationship. The remaining figures show connector dimensional relationships as the connector starts and then completes full engagement.
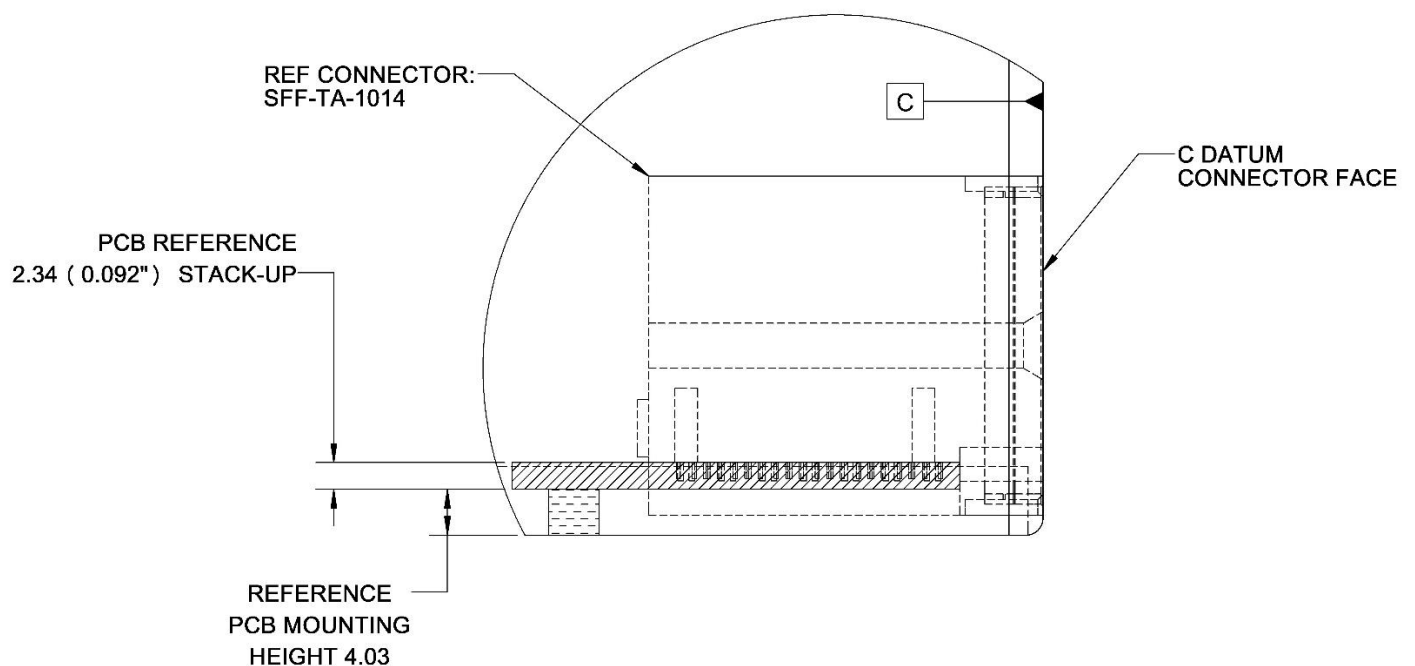
Figure 5-1 Connector Detail "D" (reference Figure 4-3)

FF
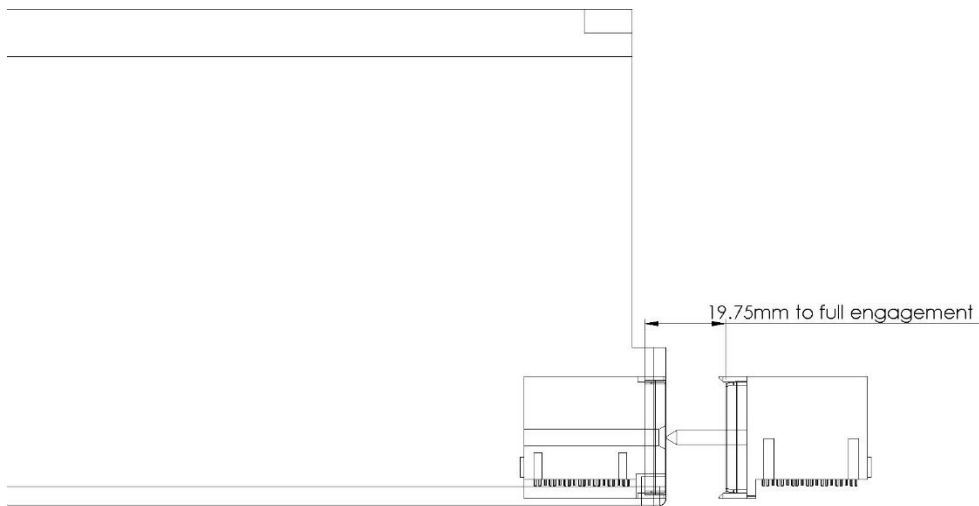
Figure 5-2 Initial Guide Pin Alignment
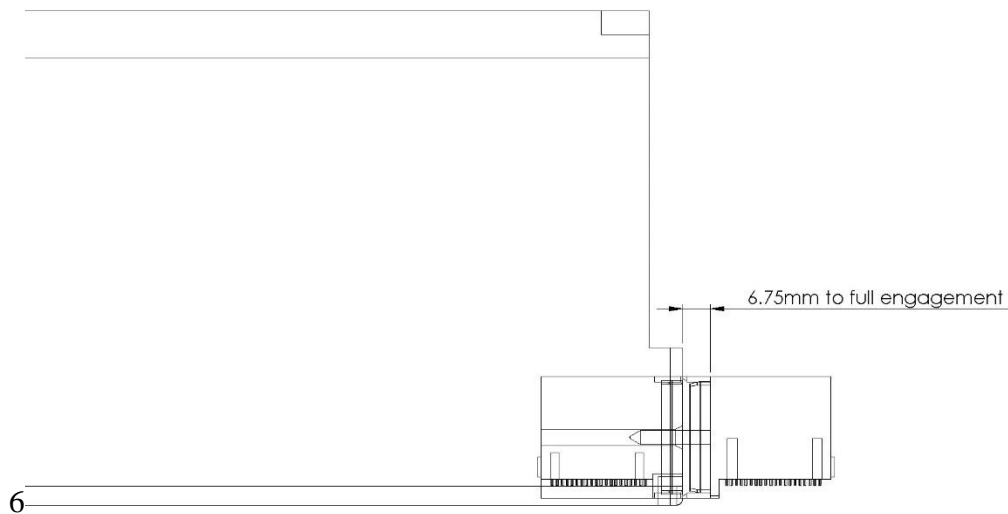
Figure 5-3 Initial Connector Guide Alignment
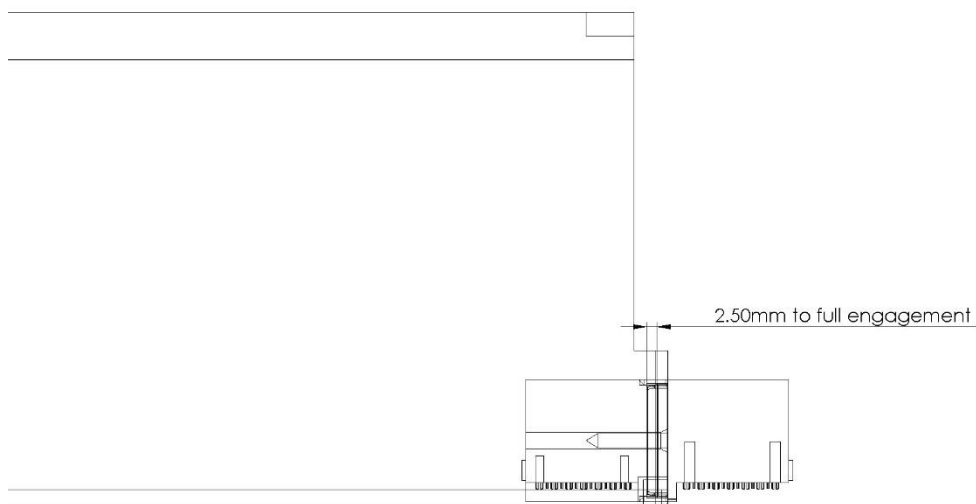
Figure 5-4 Initial Connector Contact (Start of Wipe)

6. Thermal Design

To create Fabric Attached Devices that can operate within a common enclosure, similar cooling strategies must be used. Airflow must flow into the front face and exhaust out the rear face (connector face). In addition, equivalent pressure drop must occur to allow equal flow through all Fabric Attached Devices.

6.1   Maximum External Temperatures

External surfaces of the Fabric Attached Device shall not exceed 70°C according to UL 60950-1 (UL Information Technology Equipment – Safety)

6.2   Airflow Impedance Matching

Proper impedance should be maintained to aid in the control the flow of air through an enclosure of multiple Fabric Attached Devices. This can be done by adding restrictions through the inner portions of the device, and/or restricting the front and rear faces.

6.2.1 Pressure / Impedance Drop

The following equation can be used to define the expected impedance characteristics of a Fabric Attached Device:

Equation 1: Pressure = 60.6(Flow)^2

- Pressure (Pa)
- Flow (m^3/min)
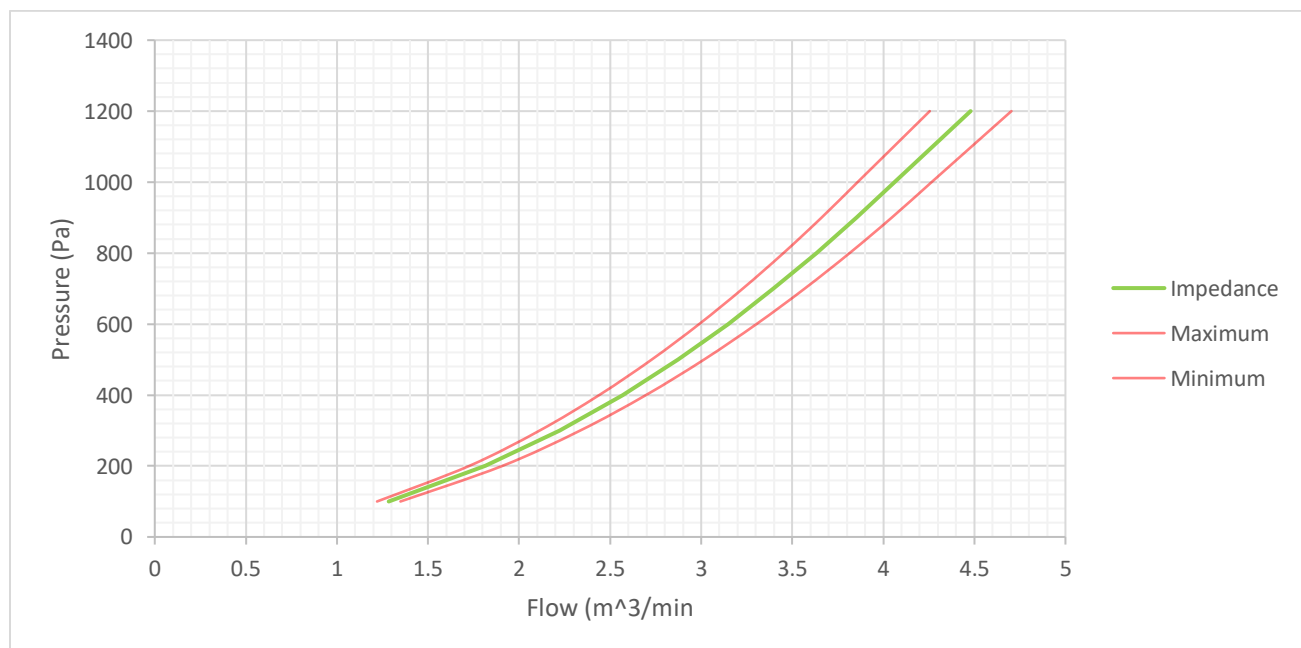
Figure 6-1 Fabric Attached Device Impedance Curve